2019 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference

Advance Programme

Munich ICM

International Congress
Centre Munich, Germany

23 - 27 June 2019

www.cleoeurope.org

Sponsored by
- European Physical Society / Quantum Electronics and Optics Division
- IEEE Photonics Society
- The Optical Society

WORLD OF PHOTONICS CONGRESS

24th International Congress on Photonics in Europe

collocated with LASER World of PHOTONICS 2019
Messe München GmbH, Messegelände, 81823 München, Tel. (+49 89) 949-114 68, info@photonics-congress.com

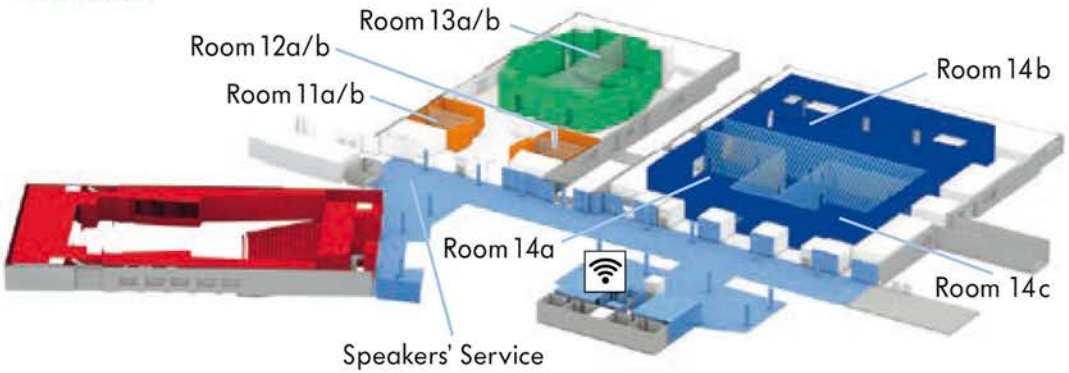
www.world-of-photonics.net

Messe München International

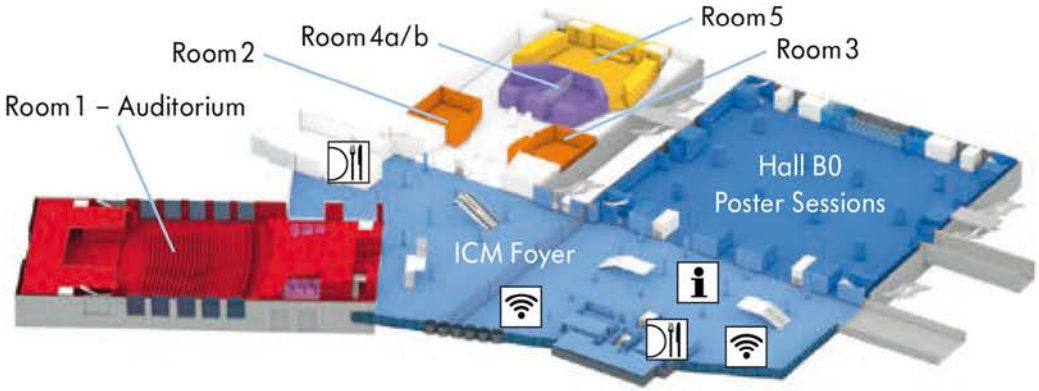
Rooms at the ICM and B0

2nd Floor

1st Floor

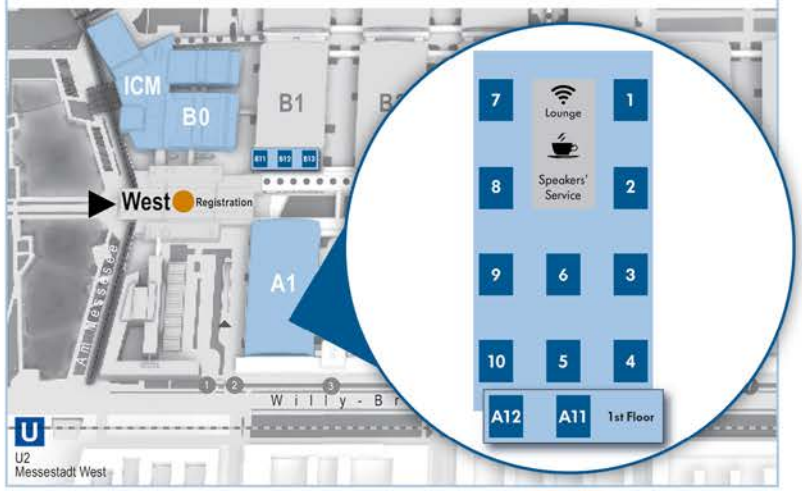


Ground Floor



WiFi Lounge Catering Information Desk

Rooms at the Exhibition Hall A1



1	Room 1 **"Albert Einstein",** Ground Floor, Hall A1
2	Room 2 **"Emmy Noether",** Ground Floor, Hall A1
3	Room 3 **"Theodore Maiman",** Ground Floor, Hall A1
4	Room 4 **"Emmett Leith",** Ground Floor, Hall A1
5	Room 5 **"Marie Curie",** Ground Floor, Hall A1
6	Room 6 **"Charles Townes",** Ground Floor, Hall A1
7	Room 7 **"Dennis Gábor",** Ground Floor, Hall A1
8	Room 8 **"Gustav Hertz",** Ground Floor, Hall A1
9	Room 9 **"Arthur Schawlow",** Ground Floor, Hall A1
10	Room 10 **"Wilhelm Röntgen",** Ground Floor, Hall A1
A11	Room A11 **"Gordon Gould",** 1st Floor, Hall A1
A12	Room A12 **"Max Born",** 1st Floor, Hall A1
B11	Room B11 **"Thomas Edison 1",** 1st Floor, Hall B1
B12	Room B12 **"Thomas Edison 2",** 1st Floor, Hall B1
B13	Room B13 **"Thomas Edison 3",** 1st Floor, Hall B1

Conference room overview:

photonics-congress.com/location

GENERAL INFORMATION

TECHNICAL PROGRAMME

GENERAL INFORMATION

2019 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference

CLEO®/Europe - EQEC 2019

Munich, ICM Congress Centre, Germany, 23 - 27 June 2019

www.cleoeurope.org

Sponsored by
- European Physical Society
  Quantum Electronics and Optics Division
- IEEE Photonics Society
- The Optical Society

Also sponsored by
- World of Photonics Congress

WORLD OF PHOTONICS CONGRESS

- EPS Young Minds

Young Minds

Welcome to the 2019 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference (hereafter CLEO®/Europe-EQEC) at the World of Photonics Congress 2019

Following on from the very successful previous conferences held in Amsterdam (1994), Hamburg (1996), Glasgow (1998), Nice (2000) and Munich (2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017), the General and Programme Chairs warmly welcome you to the 2019 CLEO®/Europe-EQEC 2019 conference, which is being held in Munich from June 23 - 27. CLEO®/Europe-EQEC targets university and industry scientists and researchers as well as students and graduates. We extend a special welcome to attending young researchers, postgraduate and PhD students, and we wish them every success, especially if this is their first participation in a major scientific conference.

The CLEO®/Europe-EQEC conference series has established a strong tradition as the largest, most comprehensive and prestigious gathering of optics and photonics researchers and engineers in Europe. With technical co-sponsorship provided by the European Physical Society (EPS), the Institute of Electrical and Electronics Engineers (IEEE) Photonics Society, and the Optical Society (OSA), CLEO®/Europe and EQEC have a strong international presence in the complementary research areas of laser science, photonics and quantum electronics.

More specifically, CLEO®/Europe emphasizes applied physics, optical engineering and applications of photonics and laser technology, whereas EQEC addresses more basic research in laser physics, nonlinear optics and quantum optics.

CLEO®/Europe will showcase the latest developments in a wide range of laser and photonics areas including solid-state lasers, semiconductor lasers, terahertz sources and applications, appplications of nonlinear optics, optical materials, optical fabrication and characterization, ultrafast optical technologies, high-field laser and attosecond science, optical sensing and microscopy, optical technologies for communications and data storage, fibre and guided wave lasers and amplifiers, micro- and nanophotonics, photonic applications in biology and medicine, and material processing.

EQEC will feature the fundamentals of quantum optics and ultracold quantum matter, quantum information, quantum communication and sensing, topological states of light, precision metrology, ultrafast optical science, nonlinear phenomena, solitons, and self-organization, plasmonics and metamaterials, two-dimensional and novel materials, and theoretical and computational photonics modelling.

CLEO®/Europe-EQEC creates a unique forum where participants can obtain informative overviews and discuss recent advances on a wide range of topics, from fundamental light-matter interaction and new sources of coherent light to technology development, system engineering and various applications of photonics.

Over five days CLEO®/Europe-EQEC 2019 will showcase around 2000 technical contributions in the form of oral presentations in parallel sessions and posters from university, research organisations and industry, drawn from all countries around the world, and will provide an unparalleled opportunity to bring together scientists, engineers and users of laser and photonics technologies under the same roof.

Particular highlights of the 2019 programme will be a series of symposia: Neuromorphic photonics, label-free techniques for molecular identification, photonics for renewable energy and sustainability, nanoscale heat processes, quantum sensing and applications and finally a symposium on 50 years of integrated optics.

This year EPS Young Minds section will invite to a career event on professional paths inside and beyond academia where different career paths and opportunities for physicists will be discussed and promoted. In the form of panel discussions, young physicists – master students, graduate students, and post-docs – will have the opportunity to engage with 5 invited speakers through a Q&As session.

Additionally two joint sessions (ECBO-CLEO®/Europe and SPIE-Optical Metrology-EQEC 2019) held in cooperation with co-located conferences will be organised.

As usual prestigious EPS-QEOD prizes and OSA awards and honours will be remitted during a special plenary and award ceremony to take place on Tuesday 25 June 2019 from 10:30 to 12:30, room 1. For further information, see the separate booklet.

All conferences together form the **World of Photonics Congress** bundling various topical conferences under one roof and under the organisation of Messe München International. It is a strategic and operative umbrella for various individual conferences held by leading associations and organisations. The other co-located conferences include:

- European Conferences on Biomedical Optics organised by SPIE, OSA.
- Imaging and Applied Optics organised by OSA.
- LiM 2019 - Lasers in Manufacturing organised by WLT.
- EOS Optical Technologies organised by EOS.
- Optical Metrology organised by SPIE Europe.

All co-located conferences will share registration and allow delegates to attend sessions.

As in former years, the meeting will be complemented by the **LASER 2019 World of Photonics**, the world's largest tradeshow of laser and optical technology, which will provide researchers with the opportunity to see the latest developments in a very wide range of laser sources, optical and photonics products, and components.

Conference Structure and Technical Sessions

CLEO®/Europe-EQEC consists of a large number of technical presentations in a number of different formats:

Plenary talks are broad-scope, 60-minute long talks given by these world-leading scientists, and are accessible to a general technical audience including conference attendees, exhibitors, and exhibit visitors. Plenary talks are not held in parallel with other sessions, allowing maximum possible attendance. The 2019 plenary talks will be presented by **Michal Lipson** (CLEO®/Europe), **Anton Zeilinger** (EQEC), and **Karsten Danzmann** (World of Photonics). A special plenary highlighting the 2018 Nobel Prize in physics will be held by Nobel laureate **Gérard Mourou**.

Tutorials (60 minute talks) and **Keynote presentations** (45 minute talks) are also given by the world leaders in particular technical areas. They are generally directed at a more specific audience, and are thus delivered in parallel with other sessions. Keynotes provide a survey of exciting recent developments, and Tutorials are particularly valuable for those unfamiliar with a particular field.

Additionally to these talks the conference will feature invited talks, special orals, orals and poster presentations.

Two sessions will be jointly held with co-located conferences:

- JS ECBO-CLEO®/Europe will feature a tutorial talk on "Light sheet microscopy: Imaging faster, wider and deeper" to take place on Sunday evening from 18:00 to 19:00 (room 5, ICM).
- JS SPIE-OM-EQEC will feature a session on computational photonics for metrology application including three invited talks to take place on Monday morning from 11:15 to 12:45 (room 2, ICM).

Other very much appreciated CLEO®/Europe-EQEC meetings are the special **Symposia** settled to anticipate and capture emerging fields in optics by giving emphasis to fast developing, well defined topics. Six symposia have been identified for CLEO®/Europe-EQEC 2019:

- JSI - Neuromorphic photonics
- JSII - Label-free techniques for molecular identification
- JSIII - Photonics for renewable energy and sustainability
- JSIV - Nanoscale heat processes
- JSV - Quantum sensing and applications
- JSVI - 50 years of integrated optics.

CLEO®/Europe-EQEC 2019 will also present twelve Short Courses. All courses at additional cost will take place in parallel on Sunday 23 June 2019.

The conference will also feature two postdeadline sessions on Wednesday evening, 26 June 2019 (19:00 to 20:30). Their purpose is to give the audience the chance to listen to the latest breaking news in optics, and these are usually one of the most attractive events that certainly contribute to the great atmosphere that makes the CLEO®/Europe-EQEC conference a unique meeting.

In addition to the technical sessions involving oral presentations, all scientific areas of both CLEO®/Europe and EQEC will be covered in poster sessions, which will provide an interactive and less formal way for researchers to discuss their work, interact and exchange ideas.

CLEO®/Europe-EQEC is now established as the largest and most comprehensive gathering of optics and photonics researchers and engineers in Europe, spanning classical and quantum optical science, laser technology and photonics applications.

The conference programme could not have been elaborated without the vital support and effort of **271 scientists, forming 13 CLEO®/Europe, 10 EQEC, 6 Joint Symposia and 2 Joint Sessions sub-committees**, who have assembled an excellent series of talks and posters covering a wide range of fields in optics and quantum electronics. The technical programme featuring over 2000 presentations will consist of **4 plenary talks, 5 tutorial talks, 6 keynote talks, 86 invited talks, 22 talks upgraded to invited, 5 special oral contributions and 982 oral presentations**. CLEO®/Europe-EQEC 2019 will feature a poster programme including **896 posters** to be presented among the five poster sessions. 18 oral presentations will also be featured in the two post-deadline sessions to take place on Wednesday evening.

The Conference Chairs would like to extend their sincere thanks to the technical programme committee members for all their hard and fruitful work. A conference as large as CLEO®/Europe-EQEC requires two years of planning and organisation. Here, we also thank the staff of the European Physical Society, and the local conference chair in Munich for invaluable professional assistance during this period. We thank Messe München GmbH, the World of Photonics Congress steering committee, the CLEO/Europe-EQEC steering committee and all the Sponsoring Societies for their guidance, support, and their invaluable advice, which ensures that this event not only remains at the core of optics and photonics research for many nations, but will also be a major event in Europe.

Let us finally thank our attendees. The real success of CLEO®/Europe-EQEC 2019 indeed rests on the efforts and commitments of these researchers and students, who all contribute to the tremendous evolution of our research field and to the high quality of the papers that will be presented.

We wish you all a lively, fruitful, and enjoyable conference, and we are looking forward to see you in Munich!

Member Societies of the European Physical Society

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Armenian Physical Society
Austrian Physical Society
Belarusian Physical Society
Belgian Physical Society
Union of Physicists in Bulgaria
Croatian Physical Society
Cyprus Society of Physicists
Czech Physical Society
Danish Physical Society
Estonian Physical Society
Finnish Physical Society
French Physical Society
Georgian Physical Society
German Physical Society
Hellenic Physical Society
Eotvos Lorand Physical Society
Icelandic Physical Society
Israel Physical Society
Italian Physical Society
Latvian Physical Society
Liechtenstein Scientific Society (Physical Section)
Lithuanian Physical Society
Association Luxembourgeoise des Physiciens
Moldovan Physical Society
Physical Society of Montenegro
Netherlands Physical Society
Norwegian Physical Society
Polish Physical Society
Portuguese Physical Society
Society of Physicists of Macedonia
Romanian Physical Society
United Physical Society of the Russian Federation
Serbian Physical Society
Slovak Physical Society
Society of Mathematicians Physicists and Astronomers of Slovenia
Spanish Royal Physics Society
Swedish Physical Society
Swiss Physical Society
Turkish Physical Society
Ukrainian Physical Society
The Institute of Physics (IOP)

NOTES

	ICM LOCATION					HALL A1 LOCATION					HALL B1 LOCATION	
	ROOM 12A	ROOM 12B	ROOM 22A	ROOM 22B	OSTERSEEN	ROOM 3	ROOM 4	ROOM 5	ROOM A11	ROOM A12	ROOM B12	ROOM B13
08:30												
09:00												
09:30												
10:00												
10:30												
11:00												
11:30												
12:00												
12:30												
13:00												
13:30												
14:00	SH-1	SH-2	SH-3	SH-4	SH-5	SH-6	SH-7	SH-8	SH-9	SH-10	SH-11	SH-12
14:30	Short course 1: Ultrashort pulse charac-terization	Short course 2: High-power fiber lasers	Short course 3: Optical parametric oscillators	Short course 4: Laser beam analysis, propagation…	Short course 5: Practical quan-tum optics	Short course 6: Mid-infrared semiconductor lasers	THz measure-ments and their applica-tions	Atoms and molecules in tailored laser fields	Frequency combs principles and applications	Silicon photonics	Optics in graphene and other 2D materials	Finite element modelling methods for photonics…
15:00												
15:30	BREAK											
16:00	SH-1	SH-2	SH-3	SH-4	SH-5	SH-6	SH-7	SH-8	SH-9	SH-10	SH-11	SH-12
16:30	Short course 1: Ultrashort pulse charac-terization	Short course 2: High-power fiber lasers	Short course 3: Optical parametric oscillators	Short course 4: Laser beam analysis, propagation…	Short course 5: Practical quan-tum optics	Short course 6: Mid-infrared semiconductor lasers	THz measure-ments and their applica-tions	Atoms and molecules in tailored laser fields	Frequency combs principles and applications	Silicon photonics	Optics in graphene and other 2D materials	Finite element modelling methods for photonics…
17:00												
17:30												
18:00												
18:30												
19:00												
19:30												
20:00												

	ICM LOCATION								
	ROOM 1	ROOM 3	ROOM 4A	ROOM 4B	ROOM 5	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B
08:30									
09:00									
09:30									
10:00									
10:30	EB-1 Quantum interfaces	CJ-1 Short-wavelengths thulium-doped fiber lasers				CA-1 Laser beam control	CD-1 Solitons	CK-1 Light management	CM-1 Beam shaping for laser processing
11:00									
11:30									
12:00	LUNCH BREAK								
12:30									
13:00	CE, CF, CI, CJ, JSI, JSII, JSIV AND JSV POSTER SESSIONS - HALL B0								
13:30									
14:00	EB-2 Integrated and engineered photonics	CJ-2 Fiber lasers characterisation and components	JSII-1 Raman spectroscopy I	JSIV-1 Nanoscale heat transfer background		CA-2 Laser facilities	CD-2 Nonlinear spectroscopy	CK-2 Light coupling	CM-2 Silicon structuring by ultrafast lasers
14:30									
15:00									
15:30	COFFEE BREAK								
16:00	EB-3 Quantum communication and applications	CJ-3 Hollow-core fibers and systems	JSII-2 Raman spectroscopy II	JSIV-2 Nanodevices controlled by heat manipulation		CA-3 Waveguide lasers	CD-3 Tunable light sources	CK-3 Active devices	CM-3 Advanced functionalization of materials
16:30									
17:00									
17:30	COFFEE BREAK								
18:00	EB-4 Quantum information processing	CJ-4 Large-mode-area-fiber-based laser systems		JSIV-3 Nanoscale heat processes in plasmonic nanostructures	JS ECBO-CLEO/Europe Joint session ECBO-CLEO/Europe	CA-4 Visible and UV lasers	CD-4 Nonlinear imaging	CB-1 Semiconductor micro-lasers: Novel technology concepts	CM-4 Femtosecond laser writing of integrated photonic devices
18:30									
19:00									
19:30									
20:00									

	ICM LOCATION		HALL A1 LOCATION					HALL B1 LOCATION
	ROOM 14C	ROOM 21	ROOM 1	ROOM 2	ROOM 6	ROOM 7	ROOM 8	ROOM B11
08:30								
09:00								
09:30								
10:00								
10:30	EE-1 New principles of ultrafast spectroscopy	JSV-1 Atom interferometry and quantum optics	CH-1 Optical fibre sensors	CF-1 High-power oscillators	CI-1 Probabilistic shaping and NFT-based transmission	CE-1 Opportunities for advanced nano-structured and non-linear optical materials		
11:00								
11:30								
12:00	LUNCH BREAK							
12:30								
13:00	CE, CF, CI, CJ, JSI, JSII, JSIV AND JSV POSTER SESSIONS - HALL B0							
13:30								
14:00	EE-2 Ultrafast phenomena in 2D materials and on surfaces	JSV-2 Magnetometry and biological imaging	CH-2 LIDAR systems	CF-2 New developments for ultrafast oscillators	CI-2 Advanced high capacity fiber systems	CE-2 Infrared material fibres glasses and applications	JSI-1 Photonic platforms for reservoir computing	
14:30								
15:00								
15:30	COFFEE BREAK							
16:00		JSV-3 Optomechanics and atomic clocks	CH-3 Photoacoustic sensors	CF-3 Fiber lasers	CI-3 Components and systems for metro and short range networks	CE-3 Neuro-inspired computing and random photonics	JSI-2 Neuromorphic processing for optical communications	YM Career event: Options after your PhD
16:30								
17:00								
17:30	COFFEE BREAK							
18:00			CH-4 Integrated sensors I	CF-4 Solitons and self-compression	CI-4 Integrated technologies for data networks	CE-4 Multiferroics and non-linear optics and photonics	JSI-3 Neuromorphic photonic platforms	
18:30								
19:00								
19:30								
20:00								

	ICM LOCATION						
	ROOM 1	ROOM 2	ROOM 3	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B
08:30	PL-1 CLEO®/Europe-EQEC 2019 CLEO/Europe Plenary Talk						
09:00							
09:30	PL-2 (start 09:40) 2019 WoP Congress Opening and Plenary Talk						
10:00							
10:30							
11:00	COFFEE TO GO						
11:30	CJ-5 Mid-IR laser sources and components	JS SPIE-OM-EQEC Computational photonics for metrology application	EB-5 Quantum state engineering	EE-3 Ultrafast control by light	CK-4 Photonic integration	CA-5 Thin disk lasers	
12:00							
12:30							
13:00	LUNCH BREAK						
13:30	CA, CB, CD' CH, CL, CM AND EH POSTER SESSIONS - HALL B0						
14:00							
14:30	CJ-6 Waveguide lasers			EA-1 Quantum effects	CK-5 Microresonators	CA-6 2 µm lasers	CB-2 Semiconductor miro-lasers: Novel dynamics
15:00							
15:30							
16:00	COFFEE BREAK						
16:30	CJ-7 Mode-locked fiber lasers and nonlinear amplifiers			EA-2 Coherent atom-light interaction	CK-6 From nano to quantum sensing	CA-7 Novel laser concepts	CB-3 Integrated semiconductor lasers and amplifiers
17:00							
17:30							
18:00	PL-3 Nobel Prize Plenary Talk						
18:30							
19:00	"BIER & BREZEL" GET-TOGETHER SPONSORED BY SPIE, ICM FOYER, HALL B0 AND GROUND FLOOR (END 21:00)						
19:30							
20:00							

	ICM LOCATION			HALL A1 LOCATION		
	ROOM 14A	ROOM 14B	OSTERSEEN	ROOM 1	ROOM 2	ROOM 3
08:30						
09:00						
09:30						
10:00						
10:30						
11:00	COFFEE TO GO					
11:30	EH-1 Engineering nontrivial light fields	CM-5 Laser nanostructuring of transparent materials for advanced devices	CL-1 Clinical applications	CH-5 Integrated sensors II	CF-5 Techniques for wavelength conversion of ultrashort pulses	CE-5 Novel light confinement waveguides technologies
12:00						
12:30						
13:00	LUNCH BREAK					
13:30	CA, CB, CD' CH, CL, CM AND EH POSTER SESSIONS - HALL B0					
14:00						
14:30	EH-2 Metasurfaces-polarimetry, chirality and photon spin	CM-6 3D laser additive micromanufacturing	CL-2 Nano-optics, light field control and sensing	CH-6 Fibre bio- and medical sensors	CF-6 Characterisation of ultrashort laser pulses	CE-6 Metamaterials and functional photonic bandgap systems
15:00						
15:30						
16:00	COFFEE BREAK					
16:30	EI-1 Optics of graphene and related 2D materials	CM-7 New trends on laser ablation	CL-3 Novel lasers, instruments and technology	CH-7 Microstructured fibre sensors	CF-7 Ultrabroadband laser sources	CE-7 Advances in optical fibre configurations and materials
17:00						
17:30						
18:00						
18:30						
19:00	"BIER & BREZEL" GET-TOGETHER SPONSORED BY SPIE, ICM FOYER, HALL B0 AND GROUND FLOOR (END 21:00)					
19:30						
20:00						

	ICM LOCATION					
	ROOM 1	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A
08:30	CJ-8 Nonlinear frequency conversion and 2 µm fiber lasers	EA-3 Quantum optomechanics	EI-2 Exciton/polariton physics in 2D materials	CB-4 Superluminescent diodes and semiconductor optical amplifiers	CA-8 Ytterbium doped laser materials	CK-7 Metasurface
09:00						
09:30						
10:00	COFFEE BREAK					
10:30	PL-4 2019 EQEC Plenary Talk and Award Ceremony					
11:00						
11:30						
12:00						
12:30	LUNCH BREAK					
13:00	CC, CG, EE, AND EF POSTER SESSIONS - HALL B0					
13:30						
14:00	EA-4 Quantum control	CI-5 Phase and spectrum manipulation for photonic devices	EE-4 Interaction between ultrafast sources and matter	CB-5 High-power semiconductor lasers	CD-5 Nonlinear nano materials	EF-1 Nonlinear nano-optics and plasmonics
14:30						
15:00						
15:30	COFFEE BREAK					
16:00	CJ-9 Multimode nonlinear fiber optics	EA-5 Long-range interactions	EE-5 Ultrafast processes in fibers	CB-6 Long wavelength semiconductor lasers	CD-6 Micro-resonators	EF-2 Mode locking and spatio-temporal localization
16:30						
17:00						
17:30						
18:00						
18:30						
19:00	CLEO®/EUROPE-EQEC CONFERENCE DINNER, LÖWENBRÄUKELLER, MUNICH (END 23:00)					
19:30						
20:00						

	ICM LOCATION		HALL A1 LOCATION		
	ROOM 14B	OSTERSEEN	ROOM 1	ROOM 2	ROOM 3
08:30		CL-4 Chip-based methods and cellular sensing	CH-8 Nanostructured sensors	CF-8 Generation and characterisation of ultraviolet pulses	CE-8 High performance bragg gratings and mirrors
09:00					
09:30					
10:00	COFFEE BREAK				
10:30					
11:00					
11:30					
12:00					
12:30	LUNCH BREAK				
13:00					
13:30	CC, CG, EE, AND EF POSTER SESSIONS - HALL B0				
14:00	CK-8 Novel nano and micro fabrication techniques	CL-5 Label-free imaging and sensing	ED-1 Frequency metrology and transfer	CG-1 Strong-field and high-power sources and interactions	CC-1 THz time-domain spectroscopy
14:30					
15:00					
15:30	COFFEE BREAK				
16:00	CK-9 Frequency combs		ED-2 Precision spectroscopy	CG-2 Strong-field processes in atoms and molecules	CC-2 THz QCL-broadband operation and modelling
16:30					
17:00					
17:30					
18:00					
18:30					
19:00	CLEO®/EUROPE-EQEC CONFERENCE DINNER, LÖWENBRÄUKELLER, MUNICH (END 23:00)				
19:30					
20:00					

	ICM LOCATION					
	ROOM 1	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A
08:30		ED-3 Direct comb spectroscopy I	EI-3 Optical spectroscopy of 2D materials	CB-7 Wavelength control of QCLs	CK-10 Plasmonics and antennas	EF-3 Photon fluids and Hawking-like effect
09:00						
09:30						
10:00	COFFEE BREAK					
10:30		ED-4 Direct comb spectroscopy II	EI-4 Hot electrons and nonlinear dynamics in 2D materials	CA-9 Laser amplifier systems	CK-11 Novel materials and their characterisation	EF-4 Nonlinear integrated photonics
11:00						
11:30						
12:00	LUNCH BREAK					
12:30						
13:00	CK, EA, ED, EF' EI AND EJ POSTER SESSIONS - HALL B0					
13:30						
14:00	CJ-10 Ultrafast 2µm fiber laser systems	EH-3 Plasmonics and metamaterials with 2D-materials	EF-5 Modulation instabilities and recurrence phenomena	CA-10 Mid-infraread lasers	CD-7 Micro-comb-resonators	EG-1 Engineering of complex electromagnetic fields
14:30						
15:00						
15:30	COFFEE BREAK					
16:00	JSVI-1 50 Years of integrated optics I	EH-4 Metasurfaces and metadevices	EF-6 Soliton molecules	CA-11 Nonlinear frequency conversion	CD-8 Spatio-temporal manipulation of light	EG-2 Ultrafast and strong field nano-optics
16:30						
17:00						
17:30						
18:00	HAPPY HOUR SPONSORED BY THE QUANTUM ELECTRONICS AND OPTICS DIVISION (QEOD) OF THE EUROPEAN PHYSICAL SOCIETY, ICM FOYER, HALL B0, GROUND FLOOR					
18:30						
19:00				PD-1 (end 20:30) Postdeadline 1	PD-2 (end 20:30) Postdeadline 2	
19:30						
20:00						

	ICM LOCATION		HALL A1 LOCATION		
	ROOM 14B	OSTERSEEN	ROOM 1	ROOM 2	ROOM 3
08:30	CM-8 Microfluidics and novel applications of laser micromachining		EA-6 Integrated quantum photonics	CG-3 Twisted light fields	CC-3 THz QCL and THz imaging
09:00					
09:30					
10:00	COFFEE BREAK				
10:30	CH-9 Microscopy I	EJ-1 Theoretical and computational photonics methods	EA-7 Nanoclassical light	CG-4 Attosecond dynamics in bulk solids	CC-4 THz quantum optics and spintronics
11:00					
11:30					
12:00	LUNCH BREAK				
12:30					
13:00	CK, EA, ED, EF' EI AND EJ POSTER SESSIONS - HALL B0				
13:30					
14:00	EA/EB-1 Quantum memories I	EJ-2 Computational quantum optics, plasmonics and metamaterials	ED-5 Frequency combs: Sources and characterization I	CG-5 Ultrafast dynamics in molecules	CE-9 Rare earth, polymers, ceramics, fibres and beyond
14:30					
15:00					
15:30	COFFEE BREAK				
16:00	EA/EB-2 Quantum memories II	EJ-3 Application-driven computational photonics modeling	ED-6 Frequency combs: Sources and characterization II	CG-6 Interferometry and imaging	CE-10 Advanced layered materials for photonics
16:30					
17:00					
17:30					
18:00	HAPPY HOUR SPONSORED BY THE QUANTUM ELECTRONICS AND OPTICS DIVISION (QEOD) OF THE EUROPEAN PHYSICAL SOCIETY, ICM FOYER, HALL B0, GROUND FLOOR				
18:30					
19:00					
19:30					
20:00					

	ICM LOCATION					
	ROOM 1	ROOM 4A	ROOM 4B	ROOM 5	ROOM 13A	ROOM 13B
08:30	CJ-11 Spatiotemporal effects in multimode fiber lasers	JSIII-1 Light management for photovoltaics	EF-7 Quantum and random systems	JSVI-2 50 Years of integrated optics II	CB-8 Short pulse generation from semiconductor lasers	EC-1 Novel systems for topological photonics I
09:00						
09:30						
10:00	COFFEE BREAK					
10:30	CJ-12 Single frequency and tunable lasers	JSIII-2 Thermo-photonics, materials and energy efficiency	EF-8 Solitons in microcavities	EB-6 Quantum state characterization and foundation	CB-9 Optical frequency combs in semiconductor lasers	EC-2 Novel systems for topological photonics II
11:00						
11:30						
12:00	LUNCH BREAK					
12:30						
13:00	CD, EB, EC, EG AND JSIII POSTER SESSIONS - HALL B0					
13:30						
14:00	CJ-13 Raman and NIR fiber lasers	EH-5 Nonlinear metasurfaces and plasmonics	EC-3 Lasing and driven dissipative topological systems	EB-7 Colour centres and novel sources	CB-10 Semiconductor laser dynamics	CD-11 Nonlinear application at extreme wavelengths
14:30						
15:00						
15:30	COFFEE BREAK					
16:00	CJ-14 Coherent beam combining and multi-core fibers	EH-6 Plasmonic enhancement of light-matter interactions	EC-4 Nonlinear and quantum aspects in topological photonics	EB-8 Quantum networks	CB-11 Vertical cavity semiconductor lasers	CD-12 Quantum and information technologies
16:30						
17:00						
17:30						
18:00						
18:30						
19:00						
19:30						
20:00						

	ICM LOCATION			HALL A1 LOCATION		
	ROOM 14A	ROOM 14B	OSTERSEEN	ROOM 1	ROOM 2	ROOM 3
08:30	EG-3 Nanoscale imaging and spectroscopy	CH-10 Microscopy II	CD-9 Spectral broadening	CC-5 THz applications	CF-9 Generation of few-cycle pulses	CE-11 Micro resonators and diffractive optics
09:00						
09:30						
10:00	COFFEE BREAK					
10:30	EG-4 Nonlinear nano-optics	CH-11 Infrared gas sensing	CD-10 Novel approaches in nonlinear optics	CC-6 High power THz pulse generation	CF-10 Methods for CEP-stable sources	CG-7 Generation and applications of attosecond pulses
11:00						
11:30						
12:00	LUNCH BREAK					
12:30						
13:00	CD, EB, EC, EG AND JSIII POSTER SESSIONS - HALL B0					
13:30						
14:00	EG-5 Emission control at the nanoscale	CH-12 Spectroscopic sensing	EF-9 Solitons and their applications	CC-7 CW THz systems and spectroscopy	CF-11 XUV generation and characterisation	CG-8 Harmonic generation and spectroscopy
14:30						
15:00						
15:30	COFFEE BREAK					
16:00	EG-6 Coupling at the nanoscale	CH-13 Time-resolved sensing	EF-10 Frequency conversion and localized structures	CC-8 High power THz sources and application	CF-12 New techniques for ultrafast spectroscopy and imaging	CG-9 Photoemission spectroscopy and sources
16:30						
17:00						
17:30						
18:00						
18:30						
19:00						
19:30						
20:00						

PLENARY SESSIONS

PL-1 **2019 CLEO/Europe Plenary Talk**
Monday, 08:30 - 09:30, Room 1 ICM

PL-2 **2019 WoP Congress Opening and Plenary Talk**
Monday, 09:40 - 11:00, Room 1 ICM

PL-3 **Nobel Prize Plenary Talk**
Monday, 18:00 - 19:00, Room 1 ICM

PL-4 **2019 EQEC Plenary Talk and Award Ceremony**
Tuesday, 10:30 - 12:30, Room 1 ICM

SPECIAL EVENT

YM **Career event: Options after your PhD**
Sunday, 16:00 - 17:30, Room B11 Hall B1

CLEO®/EUROPE 2019 SESSIONS

CA – SOLID-STATE LASERS

CA-1 **Laser beam control**
Sunday, 10:30 - 12:00, Room 13a ICM

CA-2 **Laser facilities**
Sunday, 14:00 - 15:30, Room 13a ICM

CA-3 **Waveguide lasers**
Sunday, 16:00 - 17:30, Room 13a ICM

CA-4 **Visible and UV lasers**
Sunday, 18:00 - 19:30, Room 13a ICM

CA-5 **Thin disk lasers**
Monday, 11:15 - 12:45, Room 13a ICM

CA-P **CA Poster session**
Monday, 13:15 - 14:15, Hall B0

CA-6 **2 µm lasers**
Monday, 14:15 - 15:45, Room 13a ICM

CA-7 **Novel laser concepts**
Monday, 16:15 - 17:45, Room 13a ICM

CA-8 **Ytterbium doped laser materials**
Tuesday, 8:30 - 10:00, Room 13b ICM

CA-9 **Laser amplifier systems**
Wednesday, 10:30 - 12:00, Room 13a ICM

CA-10 **Mid-infrared lasers**
Wednesday, 14:00 - 15:30, Room 13a ICM

CA-11 **Nonlinear frequency conversion**
Wednesday, 16:00 - 17:30, Room 13a ICM

CB – SEMICONDUCTOR LASERS

CB-1 **Semiconductor micro-lasers: Novel technology concepts**
Sunday, 18:00 - 19:30, Room 14a ICM

CB-P **CB Poster session**
Monday, 13:15 - 14:15, Hall B0

CB-2 **Semiconductor micro-lasers: Novel dynamics**
Monday, 14:15 - 15:45, Room 13b ICM

CB-3 **Integrated semiconductor lasers and amplifiers**
Monday, 16:15 - 17:45, Room 13b ICM

CB-4 **Superluminescent diodes and semiconductor optical amplifiers**
Tuesday, 08:30 - 10:00, Room 13a ICM

CB-5 **High-power semiconductor lasers**
Tuesday, 14:00 - 15:30, Room 13a ICM

CB-6 **Long wavelength semiconductor lasers**
Tuesday, 16:00 - 17:30, Room 13a ICM

CB-7 **Wavelength control of QCLs**
Wednesday, 08:30 - 10:00, Room 13a ICM

CB-8 **Short pulse generation from semiconductor lasers**
Thursday, 08:30 - 10:00, Room 13a ICM

CB-9 **Optical frequency combs in semiconductor lasers**
Thursday, 10:30 - 12:00, Room 13a ICM

CB-10 **Semiconductor laser dynamics**
Thursday, 14:00 - 15:30, Room 13a ICM

CB-11 **Vertical cavity semiconductor lasers**
Thursday, 16:00 - 17:30, Room 13a ICM

CC – TERAHERTZ SOURCES AND APPLICATIONS

CC-P **CC Poster Session**
Tuesday, 13:00 - 14:00, Hall B0

CC-1 **THz time-domain spectroscopy**
Tuesday, 14:00 - 15:30, Room 3 Hall A1

CC-2 **THz QCL-broadband operation and modelling**
Tuesday, 16:00 - 17:30, Room 3 Hall A1

CC-3 **THz QCL and THz imaging**
Wednesday, 08:30 - 10:00, Room 3 Hall A1

CC-4 **THz quantum optics and spintronics**
Wednesday, 10:30 - 12:00, Room 3 Hall A1

CC-5 **THz applications**
Thursday, 08:30 - 10:00, Room 1 Hall A1

CC-6 **High power THz pulse generation**
Thursday, 10:30 - 12:00, Room 1 Hall A1

CC-7 **CW THz systems and spectroscopy**
Thursday, 14:00 - 15:30, Room 1 Hall A1

CC-8 **High power THz sources and application**
Thursday, 16:00 - 17:30, Room 1 Hall A1

CD – APPLICATIONS OF NONLINEAR OPTICS

CD-1 **Solitons**
Sunday, 10:30 - 12:00, Room 13b ICM

CD-2 **Nonlinear spectroscopy**
Sunday, 14:00 - 15:30, Room 13b ICM

CD-3 **Tunable light sources**
Sunday, 16:00 - 17:30, Room 13b ICM

CD-4 **Nonlinear imaging**
Sunday, 18:00 - 19:30, Room 13b ICM

CD'-P **CD' Poster Session**
Monday, 13:15 - 14:15, Hall B0

CD-5 **Nonlinear nano materials**
Tuesday, 14:00 - 15:30, Room 13b ICM

CD-6 **Micro-resonators**
Tuesday, 16:00 - 17:30, Room 13b ICM

CD-7 **Micro-comb-resonators**
Wednesday, 14:00 - 15:30, Room 13b ICM

CD-8 **Spatio-temporal manipulation of light**
Wednesday, 16:00 - 17:30, Room 13b ICM

CD-9 **Spectral broadening**
Thursday, 08:30 - 10:00, Room Osterseen ICM

CD-10 **Novel approaches in nonlinear optics**
Thursday, 10:30 - 12:00, Room Osterseen ICM

CD-P **CD Poster session**
Thursday, 13:00 - 14:00, Hall B0

CD-11 **Nonlinear application at extreme wavelengths**
Thursday, 14:00 - 15:30, Room 13b ICM

CD-12 **Quantum and information technologies**
Thursday, 16:00 - 17:30, Room 13b ICM

CE – OPTICAL MATERIALS, FABRICATION AND CHARACTERISATION

CE-1 **Opportunities for advanced nanostructured and non-linear optical materials**
Sunday, 10:30 - 12:30, Room 7 Hall A1

CE-P **CE Poster Session**
Sunday, 13:00 - 14:00, Hall B0

CE-2 **Infrared material fibres glasses and applications**
Sunday, 14:00 - 15:30, Room 7 Hall A1

CE-3 **Neuro-inspired computing and random photonics**
Sunday, 16:00 - 17:30, Room 7 Hall A1

CE-4 **Multiferroics and non-linear optics and photonics**
Sunday, 18:00 - 19:30, Room 7 Hall A1

CE-5 **Novel light confinement waveguides technologies**
Monday, 11:15 - 12:45, Room 3 Hall A1

CE-6 **Metamaterials and functional photonic bandgap systems**
Monday, 14:15 - 15:45, Room 3 Hall A1

CE-7 **Advances in optical fibre configurations and materials**
Monday, 16:15 - 17:45, Room 3 Hall A1

CE-8 **High performance bragg gratings and mirrors**
Tuesday, 08:30 - 10:00, Room 3 Hall A1

How to read the Session Codes?

The following pages contain the abstracts of the papers presented at the 2019 CLEO®/Europe-EQEC.

All CLEO®/Europe sessions are on a white background and have a code beginning with a **C**.
All EQEC sessions are on a shaded background and have a code that begins with an **E**.
Both post-deadline sessions including CLEO®/Europe and EQEC presentations are on a white background and have a code beginning with **PD**.

Exceptions mentioned below are on a dark background:

- Short courses referenced with **SH**.
- Plenary talks referenced with **PL**.
- CLEO®/Europe-EQEC joint symposia referenced with **JS**.
- The ECBO-CLEO®/Europe joint session referenced with **JS ECBO-CLEO®/Europe**.
- SPIE-Optical Metrology/EQEC joint session on computational photonics for metrology application referenced with **JS SPIE-OM-EQEC**.
- EPS Young Minds special session on Career event: After your PhD referenced with **YM**.

Oral Presentations

Oral presentations have a code made up of two parts, *e.g.*

CM-1.1 SUN (Invited) 10:30

The first part (CM-1.1) indicates the Conference, the topic title, the session title and the placement of the presentation within the session, *e.g.*

CM-1.1 = CLEO®/Europe
CM-1.1 = Materials processing with lasers
CM-1.1 = Beam shaping for laser processing
CM-1.1 = First paper presented in the "Beam shaping for laser processing" session of the CM topic

The second part indicates the day when the presentation takes place.
SUN = Sunday **TUE** = Tuesday **THU** = Thursday
MON = Monday **WED** = Wednesday
The figures on the right specify at what time the talk begins (10:30 am).

Plenary, Tutorial, Keynote and Invited Talks are marked between brackets.

Posters

Poster presentations have a code made up of two parts, *e.g.*

EG-P.2 THU

The first part indicates the Conference, the topic title, the poster destination, and the order of presentation within the topic, *e.g.*

EG-P.2 = EQEC
EG-P.2 = Light-matter interactions at the nanoscale
EG-P.2 = Poster
EG-P.2 = Second poster in the "Light-matter interactions at the nanoscale" topic of the EQEC conference.

The second part indicates the day when the poster presentation takes place with the same abbreviations as for the oral presentations. All posters are displayed per topic according to their reference numbers over the conference days (see "days at a glance"). For two exceptional cases (CD', EF'), the abbreviation has a ' as the initial presentation day was changed.

CE-9 **Rare earth, polymers, ceramics, fibres and beyond**
Wednesday, 14:00 - 15:15, Room 3 Hall A1

CE-10 **Advanced layered materials for photonics**
Wednesday, 16:00 - 17:30, Room 3 Hall A1

CE-11 **Micro resonators and diffractive optics**
Thursday, 08:30 - 10:00, Room 3 Hall A1

CF – ULTRAFAST OPTICAL TECHNOLOGIES

CF-1 **High-power oscillators**
Sunday, 10:30 - 12:00, Room 2 Hall A1

CF-P **CF Poster session**
Sunday, 13:00 - 14:00, Hall B0

CF-2 **New developments for ultrafast oscillators**
Sunday, 14:00 - 15:30, Room 2 Hall A1

CF-3 **Fiber lasers**
Sunday, 16:00 - 17:30, Room 2 Hall A1

CF-4 **Solitons and self-compression**
Sunday, 18:00 - 19:30, Room 2 Hall A1

CF-5 **Techniques for wavelength conversion of ultrashort pulses**
Monday, 11:15 - 12:45, Room 2 Hall A1

CF-6 **Characterisation of ultrashort laser pulses**
Monday, 14:15 - 15:45, Room 2 Hall A1

CF-7 **Ultrabroadband laser sources**
Monday, 16:15 - 17:45, Room 2 Hall A1

CF-8 **Generation and characterisation of ultraviolet pulses**
Tuesday, 08:30 - 10:00, Room 2 Hall A1

CF-9 **Generation of few-cycle pulses**
Thursday, 08:30 - 10:00, Room 2 Hall A1

CF-10 **Methods for CEP-stable sources**
Thursday, 10:30 - 12:00, Room 2 Hall A1

CF-11 **XUV generation and characterisation**
Thursday, 14:00 - 15:30, Room 2 Hall A1

CF-12 **New techniques for ultrafast spectroscopy and imaging**
Thursday, 16:00 - 17:30, Room 2 Hall A1

CG – HIGH-FIELD LASER AND ATTOSECOND SCIENCE

CG-P **CG Poster session**
Tuesday, 13:00 - 14:00, Hall B0

CG-1 **Strong-field and high-power sources and interactions**
Tuesday, 14:00 - 15:30, Room 2 Hall A1

CG-2 **Strong-field processes in atoms and molecules**
Tuesday, 16:00 - 17:30, Room 2 Hall A1

CG-3 **Twisted light fields**
Wednesday, 08:30 - 10:00, Room 2 Hall A1

CG-4 **Attosecond dynamics in bulk solids**
Wednesday, 10:30 - 12:00, Room 2 Hall A1

CG-5 **Ultrafast dynamics in molecules**
Wednesday, 14:00 - 15:30, Room 2 Hall A1

CG-6 **Interferometry and imaging**
Wednesday, 16:00 - 17:30, Room 2 Hall A1

CG-7 **Generation and applications of attosecond pulses**
Thursday, 10:30 - 12:00, Room 3 Hall A1

CG-8 **Harmonic generation and spectroscopy**
Thursday, 14:00 - 15:30, Room 3 Hall A1

CG-9 **Photoemission spectroscopy and sources**
Thursday, 16:00 - 17:15, Room 3 Hall A1

CH – OPTICAL SENSING AND MICROSCOPY

CH-1 **Optical fibre sensors**
Sunday, 10:30 - 12:00, Room 1 Hall A1

CH-2 **LIDAR systems**
Sunday, 14:00 - 15:30, Room 1 Hall A1

CH-3 **Photoacoustic sensors**
Sunday, 16:00 - 17:30, Room 1 Hall A1

CH-4 **Integrated sensors I**
Sunday, 18:00 - 19:30, Room 1 Hall A1

CH-5 **Integrated sensors II**
Monday, 11:15 - 12:45, Room 1 Hall A1

CH-P **CH Poster Session**
Monday, 13:15 - 14:15, Hall B0

CH-6 **Fibre bio- and medical sensors**
Monday, 14:15 - 15:45, Room 1 Hall A1

CH-7 **Microstructured fibre sensors**
Monday, 16:15 - 17:45, Room 1 Hall A1

CH-8 **Nanostructured sensors**
Tuesday, 08:30 - 10:00, Room 1 Hall A1

CH-9 **Microscopy I**
Wednesday, 10:30 - 12:00, Room 14b ICM

CH-10 **Microscopy II**
Thursday, 08:30 - 10:00, Room 14b ICM

CH-11 **Infrared gas sensing**
Thursday, 10:30 - 12:00, Room 14b ICM

CH-12 **Spectroscopic sensing**
Thursday, 14:00 - 15:30, Room 14b ICM

CH-13 **Time-resolved sensing**
Thursday, 16:00 - 17:30, Room 14b ICM

CI – OPTICAL TECHNOLOGIES FOR COMMUNICATIONS AND DATA STORAGE

CI-1 **Probabilistic shaping and NFT-based transmission**
Sunday, 10:30 - 12:00, Room 6 Hall A1

CI-P **CI Poster session**
Sunday, 13:00 - 14:00, Hall B0

CI-2 **Advanced high capacity fiber systems**
Sunday, 14:00 - 15:30, Room 6 Hall A1

CI-3 **Components and systems for metro and short range networks**
Sunday, 16:00 - 17:30, Room 6 Hall A1

CI-4 **Integrated technologies for data networks**
Sunday, 18:00 - 19:30, Room 6 Hall A1

CI-5 **Phase and spectrum manipulation for photonic devices**
Tuesday, 14:00 - 15:30, Room 4a ICM

CJ – FIBRE AND GUIDED WAVE LASERS AND AMPLIFIERS

CJ-1 **Short-wavelengths thulium-doped fiber lasers**
Sunday, 10:30 - 12:00, Room 3 ICM

CJ-P **CJ Poster session**
Sunday, 13:00 - 14:00, Hall B0

CJ-2 **Fiber lasers characterisation and components**
Sunday, 14:00 - 15:30, Room 3 ICM

CJ-3 **Hollow-core fibers and systems**
Sunday, 16:00 - 17:30, Room 3 ICM

CJ-4 **Large-mode-area-fiber-based laser systems**
Sunday, 18:00 - 19:30, Room 3 ICM

CJ-5 **Mid-IR laser sources and components**
Monday, 11:15 - 12:45, Room 1 ICM

CJ-6 **Waveguide lasers**
Monday, 14:15 - 15:45, Room 1 ICM

CJ-7 **Mode-locked fiber lasers and nonlinear amplifiers**
Monday, 16:15 - 17:45, Room 1 ICM

CJ-8 **Nonlinear frequency conversion and 2 µm fiber lasers**
Tuesday, 08:30 - 10:00, Room 1 ICM

CJ-9 **Multimode nonlinear fiber optics**
Tuesday, 16:00 - 17:30, Room 1 ICM

CJ-10 **Ultrafast 2µm fiber laser systems**
Wednesday, 14:00 - 15:30, Room 1 ICM

CJ-11 **Spatiotemporal effects in multimode fiber lasers**
Thursday, 08:30 - 10:00, Room 1 ICM

CJ-12 **Single frequency and tunable lasers**
Thursday, 10:30 - 12:00, Room 1 ICM

CJ-13 **Raman and NIR fiber lasers**
Thursday, 14:00 - 15:30, Room 1 ICM

CJ-14 **Coherent beam combining and multi-core fibers**
Thursday, 16:00 - 17:30, Room 1 ICM

CK – MICRO- AND NANO-PHOTONICS

CK-1 **Light management**
Sunday, 10:30 - 12:00, Room 14a ICM

CK-2 **Light coupling**
Sunday, 14:00 - 15:30, Room 14a ICM

CK-3 **Active devices**
Sunday, 16:00 - 17:30, Room 14a ICM

CK-4 **Photonic integration**
Monday, 11:15 - 12:45, Room 4b ICM

CK-5 **Microresonators**
Monday, 14:15 - 15:45, Room 4b ICM

CK-6 **From nano to quantum sensing**
Monday, 16:15 - 17:45, Room 4b ICM

CK-7 **Metasurface**
Tuesday, 08:30 - 10:00, Room 14a ICM

CK-8 **Novel nano and micro fabrication techniques**
Tuesday, 14:00 - 15:30, Room 14b ICM

How to find the room?

A map locating the rooms can be found in the inner cover of the advance programme.

Talks and courses: CLEO®/Europe-EQEC talks and courses take place in the congress centre, so called **ICM**, on your left when entering the **main entrance West of Neue Messe Munich** or in the **exhibition hall B1** or in the **exhibition hall A1** located on your right. The rooms in the halls are numbered and named according to famous physicists. A few talks take place in the Osterseen room: Follow your way to the ICM and then on **your right** take the stairs or the elevator to go to the second floor and reach this room at the end of the corridor.
To save space in the layout of the parallel sessions, all locations are abbreviated to the strict minimum such as "Room 1 ICM" instead of "Room 1, Ground Floor / First Floor, Congress Centre". Below you will find the detailed locations of all CLEO®/Europe-EQEC rooms:

Rooms located in the ICM:

Room 1, Ground Floor / First Floor, Congress Centre
Room 2, Ground Floor, Congress Centre
Room 3, Ground Floor, Congress Centre
Room 4a, Ground Floor, Congress Centre
Room 4b, Ground Floor, Congress Centre
Room 5, Ground Floor, Congress Centre
Room 12a, First Floor, Congress Centre (SH only)
Room 12b, First Floor, Congress Centre (SH only)
Room 13a, First Floor, Congress Centre
Room 13b, First Floor, Congress Centre
Room 14a, First Floor, Congress Centre
Room 14b, First Floor, Congress Centre
Room 14c, First Floor, Congress Centre
Room 21, Second Floor, Congress Centre
Room 22a, Second Floor, Congress Centre (SH only)
Room 22b, Second Floor, Congress Centre (SH only)
Room Osterseen, Second Floor, Congress Centre

Rooms located in the exhibition hall A1:

Room 1 "Albert Einstein", Ground Floor, Exhibition Hall A1
Room 2 "Emmy Noether", Ground Floor, Exhibition Hall A1
Room 3 "Theodore Maiman", Ground Floor, Exhibition Hall A1
Room 4 "Emmett Leith", Ground Floor, Exhibition Hall A1 (SH only)
Room 5 "Marie Curie", Ground Floor, Exhibition Hall A1 (SH only)
Room 6 "Charles Townes", Ground Floor, Exhibition Hall A1
Room 7 "Dennis Gábor", Ground floor, Exhibition Hall A1
Room 8 "Gustav Hertz", Ground Floor, Exhibition Hall A1
Room A11 "Gordon Gould", First Floor, Exhibition Hall A1 (SH only)
Room A12 "Max Born", First Floor, Exhibition Hall A1 (SH only)

Rooms located in the exhibition hall B1:

Room B11 "Thomas Edison 1", First Floor, Exhibition Hall B1
Room B12 "Thomas Edison 2", First Floor, Exhibition Hall B1 (SH only)
Room B13 "Thomas Edison 3", First floor, Exhibition Hall B1 (SH only)

Note: Be aware that a few minutes are required to walk from the ICM to the rooms located in the exhibition hall A1.

Posters: All poster sessions take place in the Hall B0, Ground Floor, Congress Centre.

CK-9 **Frequency combs**
Tuesday, 16:00 - 17:30, Room 14b ICM

CK-10 **Plasmonics and antennas**
Wednesday, 08:30 - 10:00, Room 13b ICM

CK-11 **Novel materials and their characterisation**
Wednesday, 10:30 - 12:00, Room 13b ICM

CK-P **CK Poster session**
Wednesday, 13:00 - 14:00, Hall B0

CL – PHOTONIC APPLICATIONS IN BIOLOGY AND MEDICINE

CL-1 **Clinical applications**
Monday, 11:15 - 12:45, Room Osterseen ICM

CL-P **CL Poster session**
Monday, 13:15 - 14:15, Hall B0

CL-2 **Nano-optics, light field control and sensing**
Monday, 14:15 - 15:45, Room Osterseen ICM

CL-3 **Novel lasers, instruments and technology**
Monday, 16:15 - 17:45, Room Osterseen ICM

CL-4 **Chip-based methods and cellular sensing**
Tuesday, 08:30 - 10:00, Room Osterseen ICM

CL-5 **Label-free imaging and sensing**
Tuesday, 14:00 - 15:30, Room Osterseen ICM

CM – MATERIALS PROCESSING WITH LASERS

CM-1 **Beam shaping for laser processing**
Sunday, 10:30 - 12:00, Room 14b ICM

CM-2 **Silicon structuring by ultrafast lasers**
Sunday, 14:00 - 15:30, Room 14b ICM

CM-3 **Advanced functionalization of materials**
Sunday, 16:00 - 17:30, Room 14b ICM

CM-4 **Femtosecond laser writing of integrated photonic devices**
Sunday, 18:00 - 19:30, Room 14b ICM

CM-5 **Laser nanostructuring of transparent materials for advanced devices**
Monday, 11:15 - 12:45, Room 14b ICM

CM-P **CM Poster session**
Monday, 13:15 - 14:15, Hall B0

CM-6 **3D laser additive micromanufacturing**
Monday, 14:15 - 15:45, Room 14b ICM

CM-7 **New trends on laser ablation**
Monday, 16:15 - 17:45, Room 14b ICM

CM-8 **Microfluidics and novel applications of laser micromachining**
Wednesday, 08:30 - 10:00, Room 14b ICM

EQEC 2019 SESSIONS

EA – QUANTUM OPTICS AND ULTRACOLD QUANTUM MATTER

EA-1 **Quantum effects**
Monday, 14:15 - 15:45, Room 4a ICM

EA-2 **Coherent atom-light interaction**
Monday, 16:15 - 17:45, Room 4a ICM

EA-3 **Quantum optomechanics**
Tuesday, 08:30 - 10:00, Room 4a ICM

EA-4 **Quantum control**
Tuesday, 14:00 - 15:30, Room 1 ICM

EA-5 **Long-range interactions**
Tuesday, 16:00 - 17:30, Room 4a ICM

EA-6 **Integrated quantum photonics**
Wednesday, 08:30 - 10:00, Room 1 Hall A1

EA-7 **Nanoclassical light**
Wednesday, 10:30 - 12:00, Room 1 Hall A1

EA-P **EA Poster session**
Wednesday, 13:00 - 14:00, Hall B0

EA/EB-1 **Quantum memories I**
Wednesday, 14:00 - 15:30, Room 14b ICM

EA/EB-2 **Quantum memories II**
Wednesday, 16:00 - 17:30, Room 14b ICM

EB – QUANTUM INFORMATION, COMMUNICATION, AND SENSING

EB-1 **Quantum interfaces**
Sunday, 10:30 - 12:00, Room 1 ICM

EB-2 **Integrated and engineered photonics**
Sunday, 14:00 - 15:30, Room 1 ICM

EB-3 **Quantum communication and applications**
Sunday, 16:00 - 17:30, Room 1 ICM

EB-4 **Quantum information processing**
Sunday, 18:00 - 19:30, Room 1 ICM

EB-5 **Quantum state engineering**
Monday, 11:15 - 12:45, Room 3 ICM

EB-6 **Quantum state characterization and foundation**
Thursday, 10:30 - 12:00, Room 5 ICM

EB-P **EB Poster session**
Thursday, 13:00 - 14:00, Hall B0

EB-7 **Colour centres and novel sources**
Thursday, 14:00 - 15:30, Room 5 ICM

EB-8 **Quantum networks**
Thursday, 16:00 - 17:30, Room 5 ICM

EC – TOPOLOGICAL STATES OF LIGHT

EC-1 **Novel systems for topological photonics I**
Thursday, 08:30 - 10:00, Room 13b ICM

EC-2 **Novel systems for topological photonics II**
Thursday, 10:30 - 12:00, Room 13b ICM

EC-P **EC Poster session**
Thursday, 13:00 - 14:00, Hall B0

EC-3 **Lasing and driven dissipative topological systems**
Thursday, 14:00 - 15:30, Room 4b ICM

EC-4 **Nonlinear and quantum aspects in topological photonics**
Thursday, 16:00 - 17:30, Room 4b ICM

ED – PRECISION METROLOGY AND FREQUENCY COMBS

ED-1 **Frequency metrology and transfer**
Tuesday, 14:00 - 15:30, Room 1 Hall A1

ED-2 **Precision spectroscopy**
Tuesday, 16:00 - 17:30, Room 1 Hall A1

ED-3 **Direct comb spectroscopy I**
Wednesday, 08:30 - 10:00, Room 4a ICM

ED-4 **Direct comb spectroscopy II**
Wednesday, 10:30 - 12:00, Room 4a ICM

ED-P **ED Poster session**
Wednesday, 13:00 - 14:00, Hall B0

ED-5 **Frequency combs: Sources and characterization I**
Wednesday, 14:00 - 15:30, Room 1 Hall A1

ED-6 **Frequency combs: Sources and characterization II**
Wednesday, 16:00 - 17:30, Room 1 Hall A1

EE – ULTRAFAST OPTICAL SCIENCE

EE-1 **New principles of ultrafast spectroscopy**
Sunday, 10:30 - 12:00, Room 14c ICM

EE-2 **Ultrafast phenomena in 2D materials and on surfaces**
Sunday, 14:00 - 15:30, Room 14c ICM

EE-3 **Ultrafast control by light**
Monday, 11:15 - 12:45, Room 4a ICM

EE-P **EE Poster Session**
Tuesday, 13:00 - 14:00, Hall B0

EE-4 **Interaction between ultrafast sources and matter**
Tuesday, 14:00 - 15:30, Room 4b ICM

EE-5 **Ultrafast processes in fibers**
Tuesday, 16:00 - 17:30, Room 4b ICM

EF – NONLINEAR PHENOMENA, SOLITONS AND SELF-ORGANIZATION

EF-P **EF Poster session**
Tuesday, 13:00 - 14:00, Hall B0

EF-1 **Nonlinear nano-optics and plasmonics**
Tuesday, 14:00 - 15:30, Room 14a ICM

EF-2 **Mode locking and spatio-temporal localization**
Tuesday, 16:00 - 17:30, Room 14a ICM

EF-3 **Photon fluids and Hawking-like effect**
Wednesday, 08:30 - 10:00, Room 14a ICM

EF-4 **Nonlinear integrated photonics**
Wednesday, 10:30 - 12:00, Room 14a ICM

EF'-P **EF Poster Session**
Wednesday, 13:00 - 14:00, Hall B0

EF-5 **Modulation instabilities and recurrence phenomena**
Wednesday, 14:00 - 15:30, Room 4b ICM

EF-6 **Soliton molecules**
Wednesday, 16:00 - 17:30, Room 4b ICM

EF-7 **Quantum and random systems**
Thursday, 08:30 - 10:00, Room 4b ICM

EF-8 **Solitons in microcavities**
Thursday, 10:30 - 12:00, Room 4b ICM

EF-9 **Solitons and their applications**
Thursday, 14:00 - 15:30, Room Osterseen ICM

EF-10 **Frequency conversion and localized structures**
Thursday, 16:00 - 17:30, Room Osterseen ICM

EG – LIGHT-MATTER INTERACTIONS AT THE NANOSCALE

EG-1 **Engineering of complex electromagnetic fields**
Wednesday, 14:00 - 15:30, Room 14a ICM

EG-2 **Ultrafast and strong field nano-optics**
Wednesday, 16:00 - 17:30, Room 14a ICM

EG-3 **Nanoscale imaging and spectroscopy**
Thursday, 08:30 - 10:00, Room 14a ICM

EG-4 **Nonlinear nano-optics**
Thursday, 10:30 - 12:00, Room 14a ICM

EG-P **EG Poster session**
Thursday, 13:00 - 14:00, Hall B0

EG-5 **Emission control at the nanoscale**
Thursday, 14:00 - 15:30, Room 14a ICM

EG-6 **Coupling at the nanoscale**
Thursday, 16:00 - 17:30, Room 14a ICM

EH – PLASMONICS AND METAMATERIALS

EH-1 **Engineering nontrivial light fields**
Monday, 11:15 - 12:45, Room 14a ICM

EH-P **EH Poster session**
Monday, 13:15 - 14:15, Hall B0

EH-2 **Metasurfaces-polarimetry, chirality and photon spin**
Monday, 14:15 - 15:45, Room 14a ICM

EH-3 **Plasmonics and metamaterials with 2D-materials**
Wednesday, 14:00 - 15:30, Room 4a ICM

EH-4 **Metasurfaces and metadevices**
Wednesday, 16:00 - 17:30, Room 4a ICM

EH-5 **Nonlinear metasurfaces and plasmonics**
Thursday, 14:00 - 15:30, Room 4a ICM

EH-6 **Plasmonic enhancement of light-matter interactions**
Thursday, 16:00 - 17:30, Room 4a ICM

EI – TWO-DIMENSIONAL AND NOVEL MATERIALS

EI-1 **Optics of graphene and related 2D materials**
Monday, 16:15 - 17:45, Room 14a ICM

EI-2 **Exciton/polariton physics in 2D materials**
Tuesday, 08:30 - 10:00, Room 4b ICM

EI-3 **Optical spectroscopy of 2D materials**
Wednesday, 08:30 - 10:00, Room 4b ICM

EI-4 **Hot electrons and nonlinear dynamics in 2D materials**
Wednesday, 10:30 - 12:00, Room 4b ICM

EI-P **EI Poster session**
Wednesday, 13:00 - 14:00, Hall B0

EJ – THEORETICAL AND COMPUTATIONAL PHOTONICS MODELLING

EJ-1 **Theoretical and computational photonics methods**
Wednesday, 10:30 - 12:00, Room Osterseen ICM

EJ-P **EJ Poster session**
Wednesday, 13:00 - 14:00, Hall B0

EJ-2 **Computational quantum optics, plasmonics and metamaterials**
Wednesday, 14:00 - 15:30, Room Osterseen ICM

EJ-3 **Application-driven computational photonics modelling**
Wednesday, 16:00 - 17:30, Room Osterseen ICM

CLEO®/EUROPE-EQEC 2019 JOINT SYMPOSIA SESSIONS

JSI – NEUROMORPHIC PHOTONICS

JSI-P **JSI Poster session**
Sunday, 13:00 - 14:00, Hall B0

JSI-1 **Photonic platforms for reservoir computing**
Sunday, 14:00 - 15:30, Room 8 Hall A1

JSI-2 **Neuromorphic processing for optical communications**
Sunday, 16:00 - 17:30, Room 8 Hall A1

JSI-3 **Neuromorphic photonic platforms**
Sunday, 18:00 - 19:30, Room 8 Hall A1

JSII – LABEL-FREE TECHNIQUES FOR MOLECULAR IDENTIFICATION

JSII-P **JSII Poster session**
Sunday, 13:00 - 14:00, Hall B0

JSII-1 **Raman spectroscopy I**
Sunday, 14:00 - 15:30, Room 4a ICM

JSII-2 **Raman spectroscopy II**
Sunday, 16:00 - 17:30, Room 4a ICM

JSIII – PHOTONICS FOR RENEWABLE ENERGY AND SUSTAINABILITY

JSIII-1 **Light management for photovoltaics**
Thursday, 08:30 - 10:00, Room 4a ICM

JSIII-2 **Thermo-photonics, materials and energy efficiency**
Thursday, 10:30 - 12:00, Room 4a ICM

JSIII-P **JSIII Poster session**
Thursday, 13:00 - 14:00, Hall B0

JSIV – NANOSCALE HEAT PROCESSES

JSIV-P **JSIV Poster session**
Sunday, 13:00 - 14:00, Hall B0

JSIV-1 **Nanoscale heat transfer background**
Sunday, 14:00 - 15:30, Room 4b ICM

JSIV-2 **Nanodevices controlled by heat manipulation**
Sunday, 16:00 - 17:30, Room 4b ICM

JSIV-3 **Nanoscale heat processes in plasmonic nanostructures**
Sunday, 18:00 - 19:30, Room 4b ICM

JSV – QUANTUM SENSING AND APPLICATIONS

JSV-1 **Atom interferometry and quantum optics**
Sunday, 10:30 - 12:00, Room 21 ICM

JSV-P **JSV Poster Session**
Sunday, 13:00 - 14:00, Hall B0

JSV-2 **Magnetometry and biological imaging**
Sunday, 14:00 - 15:30, Room 21 ICM

JSV-3 **Optomechanics and atomic clocks**
Sunday, 16:00 - 17:30, Room 21 ICM

JSVI – 50 YEARS OF INTEGRATED OPTICS

JSVI-1 **50 Years of integrated optics I**
Wednesday, 16:00 - 17:30, Room 1 ICM

JSVI-2 **50 Years of integrated optics II**
Thursday, 08:30 - 10:00, Room 5 ICM

ECBO-CLEO®/EUROPE 2019 JOINT SESSION

JS ECBO-CLEO®/Europe
Joint Session ECBO-CLEO®/Europe
Sunday, 18:00 - 19:30, Room 5 ICM

SPIE-OPTICAL METROLOGY-EQEC 2019 JOINT SESSION

JS SPIE-OM-EQEC
Computational photonics for metrology application
Monday, 11:15 - 12:45, Room 2 ICM

POSTDEADLINE SESSIONS

PD-1 **Postdeadline 1**
Wednesday, 19:00 - 20:30, Room 13a ICM

PD-2 **Postdeadline 2**
Wednesday, 19:00 - 20:30, Room 13b ICM

NOTES

CLEO®/Europe 2019 Topics

CA – Solid-state Lasers

Advances in solid-state lasers: novel solid-state lasers and amplifiers; high-power and high-energy lasers; power-scalable laser architectures; solid-state micro-chip lasers; crystalline waveguide lasers ns- and ps-pulse generation; short wavelength lasers; mid-infrared lasers; wavelength tuning techniques and tunable lasers; intracavity wavelength conversion; upconversion lasers; techniques for thermal management and beam quality control; amplitude and frequency stability; novel pump sources and pumping configurations; laser resonator design; spectroscopic characterisation of solid-state gain media; advanced laser crystals and glasses; laser characterisation and modelling; lasers for large-scale facilities.

CHAIR: Christian Kränkel, *University of Hamburg, Germany*

CB – Semiconductor Lasers

New technology, devices and applications; UV lasers, visible lasers, near-infrared lasers; mid to far-infrared semiconductor lasers including quantum cascade and inter-subband lasers; quantum well, wire, dot and dash lasers; high power and high brightness lasers; vertical (extended) cavity surface emitting lasers; optically-pumped semiconductor lasers; photonic crystal semiconductor lasers, micro-cavity lasers, nanolasers, plasmonic lasers, polariton lasers; semiconductor ring lasers; short-pulse generation, mode locking; semiconductor optical amplifiers; novel characterization techniques; functional applications, including but not limited to: switching, clock recovery, signal processing; semiconductor lasers in integrated photonic circuits; laser dynamics, synchronization, chaos.

CHAIR: Mariangela Gioannini, *Politecnico di Torino, Italy*

CC – Terahertz Sources and Applications

Sources for generating terahertz (far-infrared) radiation in the range from 200 GHz to 100 THz, based on various physical principles including ultrafast time-domain systems, direct generation using terahertz lasers, and sources based on nonlinear optical mixing and laser-created plasmas; applications using terahertz radiation for spectroscopy, nonlinear THz phenomena, sensing, and imaging; advances in terahertz communications; new terahertz measurement techniques and instrumentation, including advances in imaging, detector technologies, terahertz devices, terahertz imaging and environmental monitoring.

CHAIR: Jérôme Faist, *ETH Zurich, Switzerland*

CD – Applications of Nonlinear Optics

Novel applications of nonlinear optical phenomena and new devices; nonlinear frequency conversion for the UV, visible and IR; telecommunications applications and all-optical switching; all-optical delay lines and slow light; optical parametric devices such as optical parametric amplifiers and oscillators; nonlinear optics in waveguides and fibres, including photonic crystal structures and microstructured optical fibres; quasi-phasematched materials and devices; novel nonlinear materials; metamaterials and nanostructures; stimulated scattering processes and devices; applications of optical solitons and photorefractives; electro-optic and Kerr devices in crystals and semiconductors; Raman based devices including amplifiers and lasers; nonlinear probing of surfaces; multi-photon imaging and coherent Raman microscopy; quantum oriented applications.

CHAIR: Gregor Knoop, *Paul Scherrer Institute, Villigen, Switzerland*

CE – Optical Materials, Fabrication and Characterisation

Fabrication of optical materials; new crystalline and glass laser materials in bulk, fiber and waveguide geometry; micro- and nano-fabrication and -engineering techniques; heterogeneous integration techniques; optical characterisation of laser and nonlinear materials, micro-structured fibre and photonic crystal waveguides, micro- and nano-crystalline materials, single defect centres, quantum wells, quantum wires and quantum dots, nano-tubes and nano-needles, innovative organic materials.

CHAIR: Pier Sazio, *University of Southampton, UK*

CF – Ultrafast Optical Technologies

Femtosecond and picosecond pulse generation from solid state, fiber and waveguide sources; mode-locked lasers; few-cycle optical pulses; pulse compression, carrier-envelope phase stabilization and pulse characterization; light waveform synthesis metrology; ultrashort-pulse semiconductor lasers and devices; ultrafast parametric amplifiers and parametric chirped pulse amplifiers; ultrashort-pulse mid-IR generation; supercontinuum generation; dispersion management; ultrafast electro-optics; pulse-shaping; carrier-envelope effects; ultrafast characterization methods and measurement techniques, ultrafast optoelectronic systems and devices; applications of ultrafast technology, technological aspects of ultrafast spectroscopy; ultrafast microscopic techniques; electro-optic sampling; ultrashort XUV and x-ray pulse generation.

CHAIR: Hans-Jakob Wörner, *ETH Zurich, Switzerland*

CG – High-field Laser and Attosecond Science

Strong-field and attosecond phenomena; attosecond pulse generation; strong-field ionization and ionization dynamics; novel technologies for high-field physics and attosecond science; probing of ultrafast dynamics with intense free-electron laser pulses; control of high-field and attosecond phenomena; laser-driven rescattering and recollision phenomena; high-harmonic generation; time-resolved XUV/soft x-ray spectroscopy, interferometry and microscopy; attosecond and femtosecond diffraction imaging with electrons or photons; molecular dynamics driven by strong fields or probed by high-field/attosecond methods; attosecond or strong-field driven electron dynamics in the condensed phase, bulk media, nanostructures, quantum-confined structures or at surfaces/interfaces; ultra-high-intensity laser physics and technology; laser-plasma interaction and particle acceleration; relativistic nonlinear optical phenomena.

CHAIR: Lukas Gallmann, *University of Bern and ETH Zurich, Switzerland*

CH – Optical Sensing and Microscopy

Inspection of a wide range of objects, from the macroscopic to the nanometric scale; recent progress in all aspects of optical sensing and metrology, particularly in new photonic sensor technologies and applications; plasmonic sensors; metamaterial sensors; biosensors; terahertz sensors; new trends in optical remote sensing; fibre sensors using conventional and photonic crystal fibres; active multispectral and hyperspectral imaging; sensor multiplexing; novel spectroscopic techniques, nanospectroscopy; applications and systems; novel measurement methods and devices based on interferometry; holography; diffractometry or scatterometry; critical dimension metrology; multiscale surface metrology; UV and DUV microscopy; resolution enhancement technologies in microscopy; inverse problems; adaptive optics; phase retrieval.

CHAIR: Marian Marciniak, *National Institute of Telecommunications, Warsaw, Poland*

CI – Optical Technologies for Communications and Data Storage

Fibre devices including dispersion compensating and nonlinear fibre, fibre propagation and polarization effects, fibre gratings; Semiconductor devices for generation, processing and detection of optical signals including laser sources, detectors and modulators, performance monitoring devices, switches, optical components for enabling WDM and OTDM systems including filtering and switching; Digital signal processing and coding techniques, forward error correction, coded-modulation, nonlinear Fourier transform, faster-than-Nyquist; Transmission techniques for submarine, core and metropolitan transport networks, communication and access networks; multi-core / multi-mode fibre for transmission, optical amplification and functions, multi-band (O,E, S, C, L) optical amplification and transmission. Optical sub-systems including clock recovery techniques, packet/burst switching subsystems, advanced modulation formats, subcarrier-multiplexing, receivers for coherent detection, radio-over-fiber and microwave photonic technologies, optical regeneration, optics in storage area networks, optical delays and buffering, holographic and 3D optical data storage, near-field recording and super-resolution.

CHAIR: Alessandro Tonello, *XLIM, Limoges, France*

CJ – Fibre and Guided Wave Lasers and Amplifiers

Waveguide and fibre laser oscillators and amplifiers including novel waveguide and fibre geometries; power and energy scaling of waveguide and fibre lasers – including beam combination techniques (for both pump and signal beams) and new waveguide coupling approaches; up-conversion lasers; nonlinear frequency conversion and pulse generation and compression; advances in fibre waveguide materials; fabrication techniques for doped waveguide and fibre devices; active microstructured fibre and waveguide laser devices; novel waveguide and fibre sources for industrial applications.

CHAIR: Ammar Hideur, *Université de Rouen, Saint-Etienne du Rouvray, France*

CK – Micro- and Nano-Photonics

Nanostructured materials and fabrication techniques for photonic applications; novel phenomena occurring when light is created, transported and detected in environments where either dimensionality or size are reduced and, in particular, when light-matter interaction occurs in regions smaller than or similar to the wavelength of light (nanophotonics). Periodic or quasi-periodic nanostructures (photonic crystals); issues related to order/disorder in nanostructured materials; photonic integrated circuits and applications advancing the integration of photonic devices for biology, lighting, communication, sensing and energy efficiency; optical MEMS; hybrid and 2D nanomaterials including in-/organic nano-layers/wires, nanocrystals and single molecules.

CHAIR: Olivier Gauthier-Lafaye, *LAAS CNRS, Toulouse, France*

CL – Photonic Applications in Biology and Medicine

Emerging concepts in biophotonics: single particle/molecule detection and tracking; spatio-temporal manipulation of light fields for biomedicine; enhanced linear and nonlinear excitation and detection; micro-fluidics, optofluidics and micro-optics; new optical probes for local measurements including organic and inorganic nanoparticles, electric fields and temperature measurements; New routes and modalities for optical detection in biophotonics : spectroscopy; holography, adaptive optics, phase conjugation time reversal; optics in biological media: scattering; coherence; polarization; symmetry and invariance. Advanced light sources and geometries for microscopy, phototherapy, surgery, biomedicine.

CHAIR: Varpu Marjomäki, *University of Jyväskylä, Finland*

CM – Materials Processing with Lasers

Fundamentals of laser-materials interactions: phase transformation, chemical reactions, diffusion processes, ablation; high-power laser-materials processing: welding, cutting, surface treatment; laser ablation; thin-film growth: PLD, LCVD; direct write techniques: MAPLE, LIFT, near-field techniques; 2D and 3D micro/nano structuring; plasma related processes; laser assisted nanosynthesis; femtosecond micromachining; ultrafast laser processing: volume modification, index engineering; laser-assisted manufacturing; additive manufacturing: two-photon polymerization and 3D laser printing.

CHAIR: Roberto Osellame, *Istituto di Fotonica e Nanotecnologie – CNR, Milano, Italy*

EQEC 2019 Topics

EA – Quantum Optics and Ultracold Quantum Matter

Quantum light sources and applications; nonlocality and quantum interference; squeezing and entanglement; quantum correlations, coherence, and measurement; quantum fluid of light; multimode and mesoscopic quantum optics; single photon emission and absorption; quantum optics in cavities; slow light and quantum memories; quantum imaging and quantum lithography; quantum coherent effects in biology; Developments in few- and many-body phenomena with ultracold quantum gases of atoms and molecules; quantum simulation; superfluidity and thermodynamics in Bose and Fermi systems; dipolar physics with atoms and molecules; Efimov physics; atom interferometry; hybrid systems such as cold and trapped ion/atom setups, optomechanical devices.

CHAIR: Markus Hennrich, *Stockholm University, Sweden*

EB – Quantum Information, Communication, and Sensing

Quantum computers and quantum communication systems; quantum algorithms and communication protocols, quantum simulations, quantum key distribution, quantum logic gates, entanglement distribution and distillation, interfaces between static and flying qubits, quantum memories; integrated quantum devices, quantum nano-mechanics, ion-trap arrays, superconducting structures, quantum dots, cavity QED systems.

CHAIR: Harald Weinfurter, *University of Munich, Germany*

EC – Topological States of Light

Advances in topological photonic lattices, topological edge states, topological pumps, synthetic dimensions, Dirac and Weyl points, topological lasers, topology and disorder, topology in non-Hermitian systems, probes of topological invariants, topological aspects of photonic quasicrystals, nonlinear topological effects, Floquet-topological photonics, spin-orbit coupling in photonic materials, non-reciprocity.

CHAIR: Alberto Amo, *Laboratoire PhLAM, Lille, France*

ED – Precision Metrology and Frequency Combs

Precision interferometry and spectroscopy including frequency combs; quantum metrology; ultimate limitations of measurement precision as imposed by the nature of quanta; tests of fundamental symmetries; definition of basic units; measurement of fundamental constants; applications in different spectral ranges, including mid-infrared.

CHAIR: Piotr Maslowski, *Nicolaus Copernicus University in Toruń, Poland*

EE – Ultrafast Optical Science

Fundamental aspects of ultrafast science in all spectral regimes; propagation and instabilities of ultrashort pulses in linear and nonlinear media, supercontinuum generation, ultrafast filamentation and applications, extreme events, rogue waves and turbulence dynamics; ultrafast spectroscopy of molecules, solids and low dimensional structures; ultrafast phenomena in physics, chemistry and biology; propagation media: gas, liquid, and solid materials; free-space and waveguided geometries; coherent control using femtosecond pulses.

CHAIR: Stefan Haacke, *University of Strasbourg, CNRS IPCMS, France*

EF – Nonlinear Phenomena, Solitons and Self-organization

Nonlinear optical phenomena including dynamics and self-organization; frequency conversion, wave mixing, parametric processes, conservative and dissipative solitons, pattern formation, interaction between disorder and nonlinearities, complex behaviours and statistically heavy-tailed phenomena. Applications of nonlinear phenomena; nonlinear imaging and manipulation, novel optical materials, devices and systems. Fundamental aspects of nonlinear dynamics in single or coupled photonic devices, polariton condensates, micro and nano lasers, photonic crystals, optomechanical systems.

CHAIR: Rachel Grange, *ETH Zurich, Switzerland*

EG – Light-matter Interactions at the Nanoscale

Fundamental aspects of light-matter interactions at the nanoscale: nanoantennas and nanophotonic architectures, classical and quantum models, detection, emission and manipulation of light and/or matter; quantum nano-optics: coherent, quantum and nonlinear optical effects; ultrafast and strong-field phenomena at the nanoscale: interactions with electrons/plasma and their applications, ultrafast dynamics; optical imaging and spectroscopy: nanoscopy, nano-optical forces and tweezers; nano-energy: radiative transfer, photovoltaics and catalysis.

CHAIR: Niek van Hulst, *ICFO - The Institute of Photonic Sciences, Castelldefelds, Barcelona, Spain*

EH – Plasmonics and Metamaterials

Metal nanophotonics from fundamentals towards applications and including all spectral regimes: plasmonic nanostructures, antennas, cavities and waveguides; metamaterials; hybrid materials; nonlinear structures and effects; active systems, systems with gain.

CHAIR: Femius Koenderink, *AMOLF, Amsterdam, The Netherlands*

EI – Two-dimensional and Novel Materials

Fundamental aspects and applications of graphene and other two-dimensional materials in optics and optoelectronics; light-matter interactions in 2D materials; ultrafast dynamics and nonlinear phenomena in 2D and novel materials, and mode-locked lasers; light sources, modulators, detectors, and other optoelectronic devices; photovoltaics; smart windows and flexible displays; terahertz devices; tunable plasmonics and metamaterials; integration with cavities and waveguides; multi-layered 2D heterostructures; perovskites and perovskite optoelectronics; NV centres; phase change materials.

CHAIR: Thomas Mueller, *Vienna University of Technology, Austria*

EJ – Theoretical and Computational Photonics Modelling

Predictive theoretical and computational approaches for all fields of optics and photonics: full and semi-analytical treatments; applied mathematics and numerical analysis of partial differential equations; high-performance computing, massively parallel codes, including utilization of hardware accelerators. Modelling of singular nonlinear processes, shocks, wave collapse, material processing; first principle calculations of optical properties in dielectrics, plasmas, semiconductors and plasmonic structures; modelling of artificial optical materials.

CHAIR: Evangelos Siminos, *Chalmers University, Gothenburg, Sweden*

CLEO®/Europe-EQEC 2019 Joint Symposia Topics

JSI – Neuromorphic Photonics

Photonic neurons, attojoule per bit optoelectronic devices, photonic synaptic devices, spiking and excitability, analog optical computing, reservoir computing, neuromorphic algorithms, neuromorphic hardware, optical neural networks architecture, complex systems, deep learning hardware accelerators, Ising machines.

CO-CHAIRS:

Paul Prucnal, *Princeton University, USA*

Peter Bienstman, *University of Ghent, Belgium*

JSII – Label-free Techniques for Molecular Identification

The main focus of this symposium is to discuss novel lasers and methodologies for label-free molecular spectroscopy and imaging and Novel methods for mass-spectrometry. In addition to this topic the workshop covers the state of the art research on optical sensing, nonlinear spectro-microscopy, infrared spectroscopy and microscopy, Stimulated Raman (SRS) and CARS microscopy.

CO-CHAIRS:

Ji-Xin Cheng, *Boston University, USA*

Hanieh Fattahi, *Max Planck Institute of Quantum Optics, Garching, Germany*

JSIII – Photonics for Renewable Energy and Sustainability

Advances in optics and photonics play an outsized role in reshaping the landscape of the next-generation energy-harvesting, conversion and saving technologies. Nanostructured devices and materials offer a way to overcome the conventional light absorption limits. Novel optical spectrum splitting and photon-recycling schemes boost the efficiency of optical energy-conversion platforms. Furthermore, optical design concepts are rapidly expanding into the infrared energy band, offering new approaches to harvest waste heat and to reduce the thermal emission losses in solar-thermal and solar water desalination platforms. Broadband engineering of the emission properties of optical materials and devices also paves the way to achieving noncontact radiative cooling of solar

cells, electronic circuitries, buildings, and vehicles. Light–matter interaction enabled by nanophotonics and plasmonics underlie the performance of the third- and fourth-generation energy-conversion devices, including up- and down-conversion of photon energy, near-field radiative energy transfer, and hot electron generation and harvesting. Miniaturization of the energy harvesting photonic devices combined with the recent effort in developing optical materials for fully passive thermal regulation via radiation holds the promise to revolutionize wearable technologies. Low-loss optical communication networks help to reduce the growing energy demands and environmental heating effects. This symposium will put in the spotlight these recent advances in photonics and their applications to traditional and emerging applications in energy generation and sustainability. It seeks contributions offering transformative ideas on photon harvesting, spectral sorting, up- and down-conversion, emission control, and new applications beyond conventional solar cell technologies.

CO-CHAIRS:

Svetlana Boriskina, *MIT, Boston, USA*

Jan Goldschmidt, *Fraunhofer ISE, Freiburg, Germany*

JSIV – Nanoscale Heat Processes

Heat is one of the main forms of energy and its control is of critical importance to efficiently manage the energy resources of nature and global warming issues. Nanoscale heat transfer and management is an extremely "hot" research topic, challenging due to the continuous miniaturization of devices, and in rapid development as proven by many scientific articles published in the best journals and magazines of physics, material science, optics and chemistry.

The purpose of the symposium is to discuss the state of the art in the Nanoscale Heat Transfer and management, as well as the recent advances in the study of self-heating via electron-phonon interaction in nano devices, and of near field radiation, allowing to exchange relevant information, to promote collaboration among scientists and to provide the scientific basis to the newcomers. The symposium will bring together scientists, technology developers and young researchers who are interested in the theoretical tools and in the development and investigation of a large variety of new materials and applications. Participants are encouraged to present their own results in the field.

CO-CHAIRS:

Sebastian Volz, *Tokyo University, Japan*

Roberto Li Voti, *University Rome, Italy*

JSV – Quantum Sensing and Applications

Based on the development in controlling and manipulating systems at the quantum level in the recent past, a whole new technology – quantum technology- has emerged. Its specific implementations span a large variety of systems ranging from single electronic spins over atomic systems to solid state structures at the nano- and micrometer scale, and it covers notably novel schemes for computation, communication and sensing.

The focus of the joint symposium is the latter aspect in its broadest sense including the application of quantum technology tools and protocols for high-resolution scientific investigations.

CO-CHAIRS:

Sebastian Gleyzes, *Collège de France, Paris, France*

Michael Drewsen, *Aarhus University, Denmark*

JSVI – 50 Years of Integrated Optics

Early developments of integrated optics. Advances in active and passive, linear and nonlinear integrated optical components. Numerical tools for integrated optical circuit design. Future directions in integrated optics. The symposium will only comprise invited talks.

CO-CHAIRS:

Trevor Benson, *University of Nottingham, United Kingdom*

Valdas Pasiskevicius, *KTH – Royal Institute of Technology, Stockholm, Sweden*

ECBO-CLEO®/Europe 2019 Joint Session

JS ECBO-CLEO®/Europe – Joint Session ECBO-CLEO/Europe

The session to take place on Sunday evening will comprise a tutorial talk on "Light sheet microscopy: Imaging faster, wider and deeper".

CO-CHAIRS:

Rainer Leitgeb, *Medical University of Vienna, Austria*

Varpu Majormäki, *University of Jyväskylä, Finland*

Joint Session SPIE-Optical Metrology-EQEC 2019 – Computational photonics for metrology application

One session to be presented on Monday morning will comprise a tutorial talk and two contributed talks from CLEO®/Europe (CL topic - Photonic Applications in Biology and Medicine) and ECBO.

CO-CHAIRS:

Thomas Huser, *University of Bielefeld, Bielefeld, Germany*

Rainer Leitgeb, *Medical University Vienna, Vienna, Austria*

YM: Career event: Options

The EPS Young Minds section invites to a career event on professional paths inside and beyond academia where different career paths and opportunities for physicists will be discussed and promoted. In the form of panel discussions, young physicists – master students, graduate students, and post-docs – will have the opportunity to engage with 5 invited speakers through a Q&As session. The session takes place on Sunday afternoon.

CO-CHAIRS:

Araceli Venegas-Gomez, *University of Strathclyde, Glasgow, United Kingdom*

Chiara Trovatello, *Politecnico di Milano, Italy*

NOTES

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NOTES

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GENERAL INFORMATION

Short abstracts of the papers to be presented at CLEO®/Europe-EQEC 2019 appear in this advance programme.

The CLEO®/Europe-EQEC 2019 technical programme will feature around **2000 presentations including 4 plenary talks, 5 tutorial talks, 6 keynote talks, 86 invited talks, 22 talks upgraded to invited, 5 special oral contributions, 982 oral presentations and 896 posters** presented among the five poster sessions. **18 oral presentations will also be featured in the two post-deadline sessions** on Wednesday evening. Additionally **12 short courses** will be proposed.

From 11 to 17 parallel sessions will take place daily during the conference. All sessions and short courses will be held at the International Congress Centre in Munich (so called ICM) or the exhibition halls of the trade fair grounds LASER World of PHOTONICS 2019. These rooms are named according to famous physicists.

Conference Dates

CLEO®/Europe-EQEC 2019 will be running from Sunday 23 June, 10:30 to Thursday 27 June, 17:30.

New at CLEO®/Europe-EQEC! EPS Young Minds section invites to a career event

EPS Young Minds section invites to a career event on professional paths inside and beyond academia where different career paths and opportunities for physicists will be discussed and promoted. In the form of panel discussions, young physicists – master students, graduate students, and postdocs – will have the opportunity to engage with 5 invited speakers through a Q&As session.
After a PhD, there are several ways to start a professional career. It is well known that a large percentage of Physics PhD students goes on to, ultimately, occupy a non-academic position. At the same time, there are several cases of successful careers as a researcher. Would you like to know the key to their success? Or are you looking for alternative careers? Some opportunities both in and outside academia will be presented during this career event.

This event will also present a view on different professional profiles, such as:

- Researchers in attosecond physics, photonics and ultrafast laser science;
- A laser consultant;
- A chief scientist and advisor; and
- A large photonics company founder and CEO.

Announced Speakers:

- **Hanieh Fattahi**, *Laser physicist and research group leader at Max Planck Institute of Quantum Optics*
- **Wilhelm Kaenders**, *Co-Founder and President, TOPTICA Photonics AG*
- **Gregory Quarles**, *Chief Scientist at The Optical Society (OSA)*
- **Clara Saraceno**, *Professor at Ruhr-Universität Bochum*
- **Gabrielle Thomas**, *Consultant*

Further information, see www.cleoeurope.org/eps-young-minds-career-event/

2019 World of Photonics congress opening and plenary talk

The official World of Photonics congress opening will take place on **Monday 24 June, from 9:40 to 11:00, room 1**.

Time schedule:

09:40 – 10:00

- Opening - Words of welcome by **Reinhard Pfeiffer**, *deputy CEO, Messe München GmbH.*
- Welcome address by **Peter Loosen**, *president of the World of Photonics congress steering committee, deputy director Fraunhofer Institute for Laser Technology (ILT).*

10:00 - 11:00

- Plenary talk "**Gravitational Waves Astronomy: Listening to the sounds of the dark universe!**" by **Karsten Danzmann**, *Max Planck Institute for Gravitational Physics (Albert Einstein Institute) and Institute for Gravitational Physics, Leibniz Universität, Hannover, Germany.*

Prizes and Awards

A series of Prize and Award ceremonies will take place during the EQEC Plenary session scheduled **Tuesday 25 June from 10:30 to 12:30, room 1**.

During this session **Anton Zeilinger**, *Vienna Center for Quantum Science and Technology University of Vienna, Austria; Institute for Quantum Optics and Quantum Information, Vienna, Austria* will present a plenary talk on "Ph**otonic Entanglement: from Foundations to Applications**".

The following prizes and awards will be presented:

- **EPS-QEOD and EPS Young Minds 2019 Travel Grant Student Awards**
- **2019 Awards of the European Physical Society – Quantum Electronics and Optics Division:**
  - **(2) Quantum Electronics prizes.**
  - **(2) Fresnel prizes.**
  - **(4) PhD Thesis prizes.**
- **The Optical Society (OSA) Awards and Honours:**
  - **2019 Herbert Walther Award.**
  - **2019 Advocate of Optics**
  - **OSA Fellow Members**

See PRIZES AND AWARDS CEREMONY BROCHURE.

- **IUPAP C17 Young Scientist Prizes (YSP)**

Commission 17 (C17) on "Laser Physics and Photonics" of the **International Union of Pure and Applied Physics (IUPAP)** will remit its **IUPAP Young Scientist Prizes (YSP)**. C17 commission awards these prizes every two years to excellent young researchers in laser physics and photonics in recognition of their outstanding contribution. Further information at http://iupap.org/commissions/c17-laser-physics-and-photonics/c17-awards/

Speakers' Information

Duration of the talks:

- Oral and special oral presentations are 15 minutes including discussion.
- Post-deadline presentations are 10 minutes including discussion.
- Invited presentations are 30 minutes including discussion.
- Tutorial presentations are 60 minutes including discussion.
- Keynote presentations are 45 minutes including discussion.
- Plenary presentations are 60 minutes including discussion.

Speakers are asked to check-in with the session chair in the room of their relevant session ten minutes before the beginning of the session.

During the World of Photonics congress a network-based presentation system will be used

along with a congress specific interface to ensure a high quality of all presentations: A software will distribute and relay all lectures onto the laptop in the conference room and display the overview of the ongoing program on the information screens inside and outside the room.

All speakers can upload their presentations to a protected server of Neumann & Müller prior to the conference. Upload-link and login details will be announced until 14 June. Each speaker will get an own account and a link where to upload the presentation until one hour before the session starts.

Those who did not do it are kindly requested to upload their presentation on-site in the **Speakers' Check-in** located in the **foyer on the 1st floor of the ICM**.

Important: In any case all speakers need to check their presentations at the Speakers' Check-in when they arrive to the ICM!

Please be assured that the presentations are securely protected against any external access. This applies for both the online upload as well as the upload on-site. After the conference all submitted files will be deleted from all storage media.

Location of the Speakers' Check-In:
The Speakers' Check-in is located in the foyer on the 1st floor of the ICM.

Opening times of the Speakers' Check-in with technicians available to assist the speakers:

- Sunday, 23 June 7:30 a.m. – 7:30 p.m.
- Monday, 24 June 7:30 a.m. – 6:30 p.m.
- Tuesday, 25 June 7:30 a.m. – 6:30 p.m.
- Wednesday, 26 June 7:30 a.m. – 6:00 p.m.
- Thursday, 27 June 7:30 a.m. – 5:00 p.m.

In any case each presentation must be reviewed and the speaker needs to check her/his presentation in the Speakers' Check-in, when she/he arrives at the ICM, to guarantee that the presentation works correct!

It is possible to check or edit the presentation up to one hour prior to the session time slot.

Note: Even though there are several uploading stations available at the Speakers' Check-in, there might be waiting periods at peak times.

Guidelines for presentation formats:

- We recommend **PowerPoint presentations** for all speakers with a slide ratio 16:9.
- It is also possible to use PDF, Word and Excel files.
- We prefer h264 video in mp4 file container. It is also possible to use (.wmv), (.avi) or (.mov).
- If you are using PowerPoint 2007 or older please do not forget to submit any videos as separate files as PowerPoint will not have embedded them into the presentation.
- There is **no Internet available on the presentation computers**

In the rooms, the computers are installed with Microsoft Windows 8 with PowerPoint 2013. In case you have to use another presentation software, please contact
mediacheck@neumannmueller.com

Presentation Technology:
Each conference room is equipped with a laptop, a beamer, a screen and a desk. **Own hardware cannot be connected in the rooms**. The upload of a presentation at the laptop in the conference room is not possible. For this reason **all presentations must be uploaded in advance to the presentation management system of Neumann & Müller**.

Provided audiovisual equipment
HD video projector, screen with ratio 16:9 and lectern microphone.

Session Chairs

For each oral session a nominated session chair will act to introduce the speakers, make sure the speakers stay within the appropriate time limits, help generate discussion.

Poster Sessions

Posters are a major attraction and provide an intimate interaction between the presenter and the viewer. To allow participants to see as many posters as possible, all CLEO®/Europe-EQEC 2019 posters will be displayed in **Hall B0** (ground floor) next to the ICM centre. The conference will feature 5 poster sessions taking place from Sunday to Thursday after lunchtime. There will be no oral presentations during this time.

Poster time schedules:

- **Sunday:** 13:00 - 14:00
  (CE, CF, CI, CJ, JSI, JSII, JSIV and JSV topics)
- **Monday:** 13:15 - 14:15
  (CA, CB, CD', CH, CL, CM and EH topics)
- **Tuesday:** 13:00 - 14:00
  (CC, CG, EE and EF topics)
- **Wednesday:** 13:00 - 14:00
  (CK, EA, ED, EF', EI and EJ topics)
- **Thursday:** 13:00 - 14:00
  (CD, EB, EC, EG and JSIII topics)

Authors are requested to display their poster on their allocated board in the morning of the day of their presentation. The poster presentations can remain on the boards until 4:00pm.

In order to present their work and answer questions, authors are requested to be present in the vicinity of their poster on the day of their presentation time. There will be no oral presentations during this time.

Each author is provided with one board on which to display a summary of the paper. The size of the poster should not exceed 100-105 cm wide × 150 cm high. Fixing material (adhesive tape) will be provided.

The boards will be grouped by topics and marked with the poster reference numbers. The schedule of the poster sessions is presented on the respective pages of the advance programme.

All poster presenters need to be physically present during their assigned poster session on the assigned day. In case of no show, the poster presentation will be discarded from the publications.

Short Courses

Twelve short courses at an extra cost will be presented in parallel on Sunday afternoon 23 June 2019. Each course is scheduled in two parts: Course Part I (1 hour ½), coffee break (30 minutes), Course Part II (1 hour ½). The courses are open to attendees of the World of Photonics congress and Laser World of Photonics exhibition subject to payment of the course fee. Advance registration is required in order to obtain the short course material. This material will not be available for purchase during the conference.

Laboratory Tours

Guided laboratory tours through selected Munich (Garching) Laser Laboratories are scheduled to take place on Friday morning 28 June 2019 from 10:00 to 12:00.

Participating laboratories and contact email addresses are listed at http://www.cleoeurope.org/laboratory-tours/. CLEO®/Europe-EQEC participants are invited to sign up for the laboratory visits via email to the contacts given on this page.

If possible, laboratory tour attendants should book their return flights in the evening, to be sure, that there is enough time.

Important: Transport!
Transportation needs to be arranged by the visitor. To find connections from the hotel to the chosen laboratory, please go to the Munich public transport website (MVV) with a screen for English speakers: https://efa.mvv-muenchen.de/index.html - trip@enquiry

You can enter either the street or subway station near the hotel as a starting point and, respectively, the same choice, for your intended destination. Please type in the field "arrival": 9:35. You head for labs in Garching? Please specify by typing: "Garching Forschungszentrum".

For additional information on the Munich public transportation see www.mvv-muenchen.de/en/homepage/index.html

Social Events

All conference participants are cordially invited to attend the following parties:

Monday 24 June 2019, from 19:00 to 21:00
"Bier & Brezel" Get together kindly sponsored by SPIE - ICM Foyer and Hall B0, ground floor

Wednesday 26 June 2019, from 17:45 to 18:45
Happy Hour kindly sponsored by EPS-QEOD - ICM Foyer and Hall B0, ground floor

CLEO®/Europe-EQEC conference dinner

Tuesday 25 June 2019, beginning from 19:00, Löwenbräukeller, Munich
The delegates registered with CLEO®/Europe-EQEC 2019 are invited to the conference reception at a special cost of € 10,- (including buffet + 2 drinks) per participant and € 35,- per additional guest. The dinner will take place at the famous Löwenbräukeller (www.loewenbraeukeller.com/en/home/) in downtown Munich. A rich selection of fine Bavarian food will be provided. Place is limited to 1000 seats. Registration and advance payment needs to be done via the conference on line registration system. No on site reservations are possible. Only persons in possession of a valid invitation card will be able to participate.

Conference publication

The accepted one-page summaries (oral or posters) will be available on line during the conference for those who have registered for the full week.

Post conference publications

After the conference, if approval given during the on line submission, the one-page summaries will be published on line by OSA Publishing (www.osa.org/en-us/publications/) and IEEE Photonics Society's IEEE Xplore Digital Library (http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6778445).
Only papers (either oral or poster) for which the author(s) physically made the presentation at the conference will be eligible for the publications.

Copyright

The CLEO®/Europe-EQEC conference digest series, containing papers presented as part of the conference programme, is registered in the name of IEEE. To the extent protectable by copyright law, the 2019 CLEO®/Europe-EQEC conference digest as a whole shall be copyrighted by IEEE.
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IEEE defines plagiarism as the reuse of someone else's prior ideas, processes, results, or words without explicitly acknowledging the original author and source. It is important for all IEEE authors to recognize that plagiarism in any form, at any level, is unacceptable and is considered a serious breach of professional conduct, with potentially severe ethical and legal consequences. To reuse someone else's work and make it appear to be your own denies the original author credit for his or her contributions to the research and to Society. If you neglect to properly credit the work you have reused, either by choice or by accident, you are committing plagiarism.

Note: Part of the process of signing a publication agreement may include giving permission or not to IEEE to make and distribute video and audio recordings of their conference presentation. Granting IEEE this simple permission to record your presentation will not affect in any way your rights or your employer's rights to own and use your presentations.

OSA is the exclusive owner of all rights, titles and interests throughout the world of the names "Conference on Lasers and Electro-Optics" and "CLEO" which is a registered trademark CLEO®.

Anti-harassment Policy and Code of Conduct
CLEO®/Europe-EQEC is committed to providing an environment that is conducive to the free and robust exchange of scientific ideas. This environment requires that all participants be treated with equal consideration and respect. While CLEO®/Europe-EQEC encourages vigorous debate of ideas, personal attacks create an environment in which people feel threatened or intimidated.

This is not productive and does not advance the cause of science. All participants in CLEO®/Europe-EQEC and CLEO®/Europe-EQEC-managed events and activities are therefore expected to conduct themselves professionally and respectfully.

It is the policy of CLEO®/Europe-EQEC that all forms of bullying, discrimination, and harassment, sexual or otherwise, are prohibited in any CLEO®/Europe-EQEC or CLEO®/Europe-EQEC-managed events or activities. This policy applies to every individual at the event, whether attendee, speaker, exhibitor, award recipient, staff, contractor or other. It is also a violation of this policy to retaliate against an individual for reporting bullying, discrimination or harassment or to intentionally file a false report of bullying, discrimination, or harassment.

Bullying, discrimination, and harassment of any sort by someone in a position of power, prestige or authority is particularly harmful since those of lower status or rank may be hesitant to express their objections or discomfort out of fear of retaliation.

CLEO®/Europe-EQEC may take any disciplinary action it deems appropriate if, after thorough investigation, it finds a violation occurred.

Audio, video, photography, digital recording policy

Conferences, courses, and poster sessions: For copyright reasons, photographs or recordings of any kind are prohibited without the prior written consent of the presenter or instructor.
Exhibition halls: For security and courtesy reasons, recordings of any kind are prohibited unless one has explicit permission from on-site company representatives.

Capture and use of a person's image

By registering at CLEO®/Europe-EQEC, the registrant grants full permission to the management society to capture, store, use, and/or reproduce his/her image to be used in the future CLEO®/Europe-EQEC marketing materials or conference website. The registrant also waives any right to inspect or approve the use of the images or recordings. She/he also waives any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials.

Persons not wishing to be photographed or videotaped from the management staff or its supplier need to send their request by email to conferences@eps.org including their picture to allow their identification.

By registering at CLEO®/Europe-EQEC, the registrant also agrees to have Messe München GmbH use his/her personal particulars (title, first name, last name, company name, company address, country) for badge printing purposes and to pass on said information to exhibitors in case the registrant allowed to scan the badge during the online registration.

Exhibition Information

From Monday to Thursday, a major exhibition of laser and electro-optic equipment and services, **LASER World of PHOTONICS 2019** will be held in conjunction with the congress. The latest technology first hand will be exhibited. The range of products exhibited will cover innovative optical technologies:

- Laser and optoelectronics;
- Optics;
- Manufacturing technology for optics;
- Sensors, test and measurement;
- Optical measurement systems;
- Laser and laser systems for production engineering;
- Optical information and communication;
- Biophotonics and medical engineering;
- Imaging;
- Illumination and energy;
- Security.

All conference registrants will have free entrance to the technical exhibition. Longer lunch breaks are organised to allow visits to the exhibition.

This combination of theory and practice, an extensive program of conferences and related events and the presence of all market leaders, decision-makers and users, make LASER World of PHOTONICS unique and, at the same time, the most important international information and networking platform for the industrial, research and development sectors.

LASER World of PHOTONICS features around 1 300 exhibitors in 5 halls and gives a complete overview of all the latest trends and applications. The exhibition should attract over 32 000 visitors.

Further information on the exhibition is available at https://world-of-photonics.com/index-2.html

Opening hours of the exhibition

The exhibition will be opened from Monday through Wednesday 09:00 - 17:00 and on Thursday 09:00 - 16:00.

Application Panels

The application panels organised by Messe München International are now a permanent part of the World of Photonics congress. The series of lectures that are held in the forums of the LASER World of PHOTONICS 2019 exhibition halls bridge the gap between science and practical application.

Well-known speakers from industry and research institutes report on the latest industrial and medical application findings in the sector for optical technologies and discuss current challenges with you. They will give attendees a comprehensive look at the latest trends and developments

A series of 17 application panels will be held from Monday to Thursday. Broken down into four main categories:

- **Biophotonics and medical applications (Hall B2),**
- **Lasers materials processing (Hall A3),**
- **Lasers and optics (Hall B3),**
- **Optical metrology and imaging (Hall B2).**

The admission is free for all trade-fair visitors, exhibitors and congress participants. All are held in English.

For further information download:
http://www.world-of-photonics.com/trade-fair/supporting-program/information/application-panels/index.html

On-site Facilities for Attendees

Online lecture database

The entire programme of events at the World of Photonics Congress is available online at: https://www.photonics-congress.com/congress-program.html. With this online database you can get information about every conference, sub conference, session, oral lecture or poster presentation. For every lecture at least the information about the room and time data, the speaker and the assignment to the structure is available.

World of Photonics Congress App

The **World of Photonics Congress-App** is available in the Appstore and the Google Play Store. It offers an innovative tool, which can be used to prepare your timetable in an easy and professional way. This tool will allow to find the complete congress programme, save sessions/lectures in your personal calendar, easily create and access favourite lists, access detailed conference room plans, give general information about the congress. Online-push-notifications will be sent to app users during the congress. The Android and iOs links are to found at:
https://www.photonics-congress.com/about/app/index.html

Internet and W-LAN lounges

All congress participants using their own laptops/notebooks/pads have free access to W-LAN lounges located as follows:

- **ICM foyer Süd**
- **ICM main foyer of the ICM main entrance**
- **ICM 1st floor, opposite the Speakers' Check-In**
- **Exhibition Hall A1**

Internet is with high-speed access and unlimited download.

In the rooms, only the wifi-version with limited bandwidth (up to 1.5 Mbit/second) and limited download volume (50 MB per user per day) is available.

The reception quality and signal availability depends on structures, exhibits and other sources of interference in the halls and cannot be guaranteed.

How it works:

- Switch on the WiFi function on your terminal device.
- Search for wireless networks and connect to the messeWifi network.
- Start your Internet browser.
- Enter any Internet address.
- The portal page of the free WiFi will appear on screen.
- Once you have accepted the General Terms and Conditions, you may access the Internet.
- You only need to register one time during the entire event.

Business Centre

The business centre (open from Sunday to Thursday from 08:00 to 17:00 hour, closed Saturday) is centrally located next to the main entrance of the ICM.

Office services currently proposed at cost:

- PC workstation with printers (applications from all MS Office packages)
- Internet access
- Laptop connections
- E-mail and fax (receive/send)
- Colour/black-and-white copies
- Stamps
- Additional services:
- Information about cultural attractions in Munich
- Hotel information
- Flight/train information
- Information about Munich International Trade Fairs
- Taxi service (directly in front of ICM main entrance)

Message board

A message board will be installed. Participants should consult it daily for internal messages. It will be placed in the corridor between Entrance West and ICM.

Career center (Hall B2)

Are you looking for a position or a new challenge in the photonics industry? The LASER World of PHOTONICS career center gives you a number of specific options for your professional development.

At the Career Center in Hall B2, booth 122, visitors who have questions about careers and job applications, job changes or career entry will receive a free career consultation between 10.00 am to 5.00 pm from experienced personnel consultants of the consulting group Wirth + Partner who have a focus on the photonics industry. The registration for the coaching takes place under info@wirth-partner.com or 089/4599580 or on site at the exhibition stand.

Already now you can find the exhibitor's job vacancies in the online career center.

See the following links:
German: https://exhibitors.world-of-photonics.com/onlinekatalog/2019/stellenangebote
English: https://exhibitors.world-of-photonics.com/onlinecatalog/2019/job_offers

Further information at:
https://world-of-photonics.com/visitors/supporting-program/career-center/index.html

Catering

All conference attendees are invited to attend the free coffee breaks as marked in the tables of the days at a glance (first pages of the advance programme). Lunches are **not included in the conference fee**.

A number of gastronomy facilities are available on site. Depending on the weather the **beer garden** outside (located between Halls A1 and B1) will be open.

Besides two permanent food service operations in the foyer – the **ICM Bistro** and the **ICM Café** – you can also visit the **restaurant "Am See"**, which can be reached directly via the 1st floor.

Snack bars with large assortments of snacks and beverages are located on the ground floor in each hall. The **snack bars in the ICM** are located on the ground floor and on the first floor. More information is available from the staff at the information counters or consult www.messe-muenchen.de/en/services/visitor_services/visitor_services_sub_subtypes_7681.php).

Full-service restaurants are located on the first floors of the East and West entrances and above the halls. Other **self-service restaurants** located on the first floor can also be found in the exhibition halls offering international cuisine. Many **snack bars** located in the exhibition halls offer Alpine, American, Asian, and Italian cuisine.

Other catering places can be found at the **"Riem Arcaden" shopping centre** located at the exit of the "Messestadt West" subway station.

Banks

No bank-counter but ATM-machines to withdraw money.

Two of them are operated by ReiseBank in the West Entrance, ground floor, and on the 1st floor along the Expressway between Halls B3 and B4. Stadtsparkasse München has three cash machines, located on the ground floor of the East Entrance (near the corridor to Hall B6), the North Entrance (under the stairs) and the Northwest Entrance (in the passageway to the parking garage).

At the "Riem Arcaden" (three-minute walk from West Entrance) you will find:

- An ATM self-service machine (Münchner Bank).
- A branch office of the Sparda-Bank for customers to make deposits and withdraw funds. No currency exchange.

Other banks are also to be found in the centre of Munich or at the main railway station.

Taxi service
The taxi service is located in front of the ICM main entrance.

Airport shuttle
An airport shuttle operated by Autobus Oberbayern is organised in connection with the trade fair (from Sunday to Thursday) to and from Munich airport. For further details, see part on **Conference venue**.

First-aid
First-aid stations are located in the East and West Entrances and on the North side of Hall C4.
As a service partner of Munich International Trade Fairs, Aicher Ambulanz Union is responsible for the medical needs of guests and visitors at the trade-fair center and the ICM.
Phone: +49 89 742200, +49 89 949 28103 (for first-aid emergency call), mobile: +49 171 5663514.

Security service / Lost and found office
The security headquarters are located in the administration building by gate 1. Open around-the-clock the office is accessible from the inside (via the administration building) and from the outside. This is also where you can claim lost items or turn in objects found at the Lost & Found office.

Pharmacy
The nearest pharmacy is "SaniPlus" in the Riem Arcaden shopping centre. It is located on the ground floor in the right portion of the building. Opening hours: Monday through Saturday 09:00 - 20:00.

Optician
The optician "Fielmann" has a retail outlet in the Riem Arcaden shopping centre.

Groceries with bakery, cloakroom, and Information/travel service
… are located in the Main Hall of the Entrance West leading to Halls A1 and B1.

Post office
Deutsche Post has a small branch office in the Riem Arcaden shopping centre (lower level next to the "Edeka" supermarket).

Dry cleaning
"Die Reinigung" dry cleaning is located in the Riem Arcaden shopping centre.

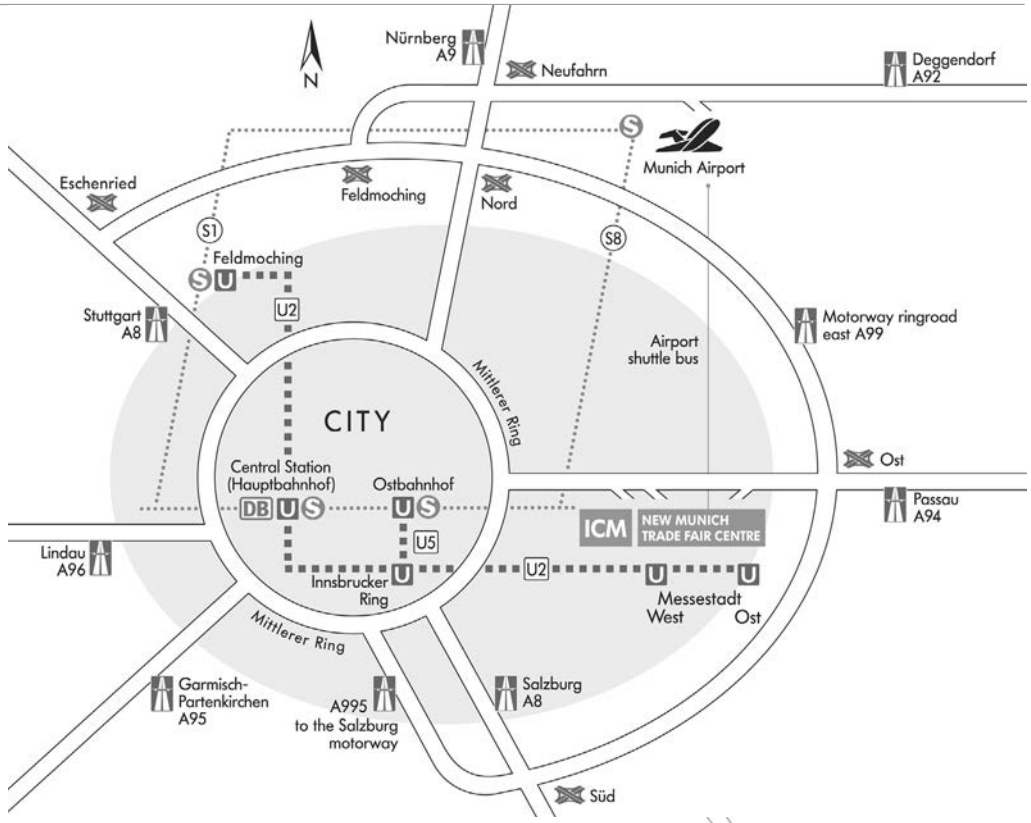
Press services
All members of the press are requested to register by Messe Munich. They will receive the conference material and badges that will admit them to all technical sessions and the exhibition.

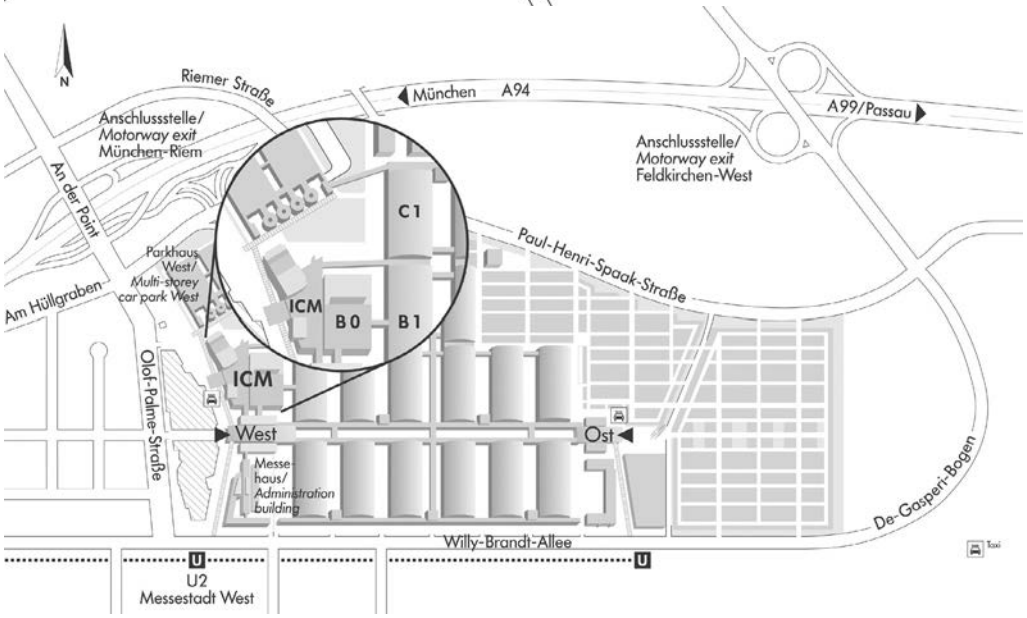
Cloakroom
For congress attendees a cloakroom is located on the intermediate level of the ICM. In addition a cloakroom is located on the lower levels of the West Entrance. As a rule, it starts one hour before the exhibition begins and ends one hour after the exhibition closes.

Note for smokers
Smoking in the ICM is forbidden. Smoking on the grounds of the exhibition space is only permitted in designated smoking areas outside the halls.

Conference Venue

CLEO®/Europe-EQEC 2019 will take place at the New Munich Trade Fair Centre at the ICM - International Congress Centre, Am Messesee 6, 81829 Munich, Germany. Please visit:
http://www.messe-muenchen.de/ or
http://www.icm-muenchen.de.





How to reach the ICM Centre

By car: simply follow the trade fair signs from the outskirts and throughout the city to the ICM. There you will find parking space.

By train: The ICM is about 20 minutes from Munich central station (Hauptbahnhof) by underground U2, exit "Messestadt West". The U2 subway runs from 4:12 in the morning to about 1:00 after midnight. Further information on the underground is available at http://www.mvv-muenchen.de/ or at the information counters on the trade fair grounds.

From the airport: At Munich airport, the station for urban railway lines S1 and S8 is directly below the central area. Trains in the direction of the city centre run at 10-minute intervals. There are two routes from the airport to the ICM:
Route S1 / U2: S1 from the airport to Feldmoching station or Munich Central Station (Hauptbahnhof). Change to underground U2 that takes you directly to the ICM - Messestadt West.
Route S8 / U2: S8 from the airport to Munich central station (Hauptbahnhof). Change to underground U2 that takes you directly to the ICM - Messestadt West.

By taxi from the airport: Taxis are available in front of the terminals. The journey takes about 35 minutes, depending on the volume of traffic (cost around € 75).

By hire car from the airport: All the major car rental firms are represented at Munich airport. The car rental centre with its own parking facilities is in front of module A, to the north of car park P6.
Please take the following route: From Munich Airport follow the signs "Messe/ICM" on the A92 in the direction of Munich to the motorway intersection Eching/Neufahrn. Then take the A9 in the direction of Munich to the motorway intersection München-Nord. Continue on the motorway ring road A99 in the direction of Salzburg to the motorway intersection München-Ost. Then take the A94 in the direction of Munich to the exit Feldkirchen-West or München-Riem. The journey takes about 35 minutes, depending on the volume of traffic.

How to take a taxi from the ICM Centre to the airport
You will find taxi ranks at all trade fair entrances and in front of the ICM going to the airport (Central Building).

Airport shuttle
An airport shuttle operated by Autobus Oberbayern is organised in connection with the trade fair (from Sunday to Thursday) to and from Munich airport. The bus departs every 20 minutes and travels nonstop to the exhibition grounds and the ICM. The bus directly stops in front of the West, East and North Entrances and in front of the entrance of the ICM congress centre. It provides service between the Munich airport and the trade-fair centre during the following schedule (every 20 minutes):
Departure times at Munich airport: from 8 am to 6 pm.
Terminal 1, Area A: at 00, at 20 and at 40
Terminal 1, Area Z (central area) four minutes later, at 04, at 24 and at 44
Terminal 2: four minutes earlier, at 56, at 16 and at 36 (Please note: no stop in Area D).
Departure times at the exhibition grounds / ICM: from 9:40 am to 8 pm
The bus runs every 20 minutes. See the exact schedules at the information desk of the ICM.
The trip takes approximately 45 minutes. The ride costs €9.00 one-way or €15.00 round trip.

Conference Registration

CONFERENCE REGISTRATION FEES	
EPS/OSA/IEEE Member *with the online digest*	€ 650
Non-Member *with the on line digest*	€ 780
EPS/OSA/IEEE Student Member (*) *with the online digest*	€ 250
Student Non-Member (*) *with the online digest*	€ 280
One Day without the online digest	€ 320
Student (*) extra fee for Short Course	€ 220
Regular extra fee for Short Course	€ 350
Dinner ticket per participant	€ 10
Additional dinner ticket per guest	€ 35
(All registration fees are exempt from Value Added Tax). (*) Applications for the student rates must include a copy of an official student identity card, which must also be presented on-site when collecting registration materials.	

The full week registration fee for the meeting includes admission to all CLEO®/Europe-EQEC 2019 technical sessions, as well as to those of all conferences co-located with the congress. It includes admission to the technical exhibition. Digest will be online. A login and password will be given. Coffee breaks as marked in the days at a glance are included. Lunches and tickets for public transportation are not included in the fees.

One-day registration fees are available for those wishing to attend one particular session rather than the whole conference. Please note that the online digest will not be included. Coffee breaks are included. Lunches and tickets for public transportation are not included in the fees.

Note: One-day registration tickets are activated on the day the participant goes through the gates of the congress or the fair and will only be valid for that day.

Registration forms are available on site.

Cancellation Policy

An administration charge of € 50 will be made for processing refunds. A request for cancellation must be made in writing. In the case of cancellation, requests received on or before Friday 14 June 2019 will be refunded (less the administration charge). No refunds will be available if notice of cancellation is received after 14 June 2019.

Conference management

European Physical Society
6 rue des Frères Lumière
68200 Mulhouse, France
This programme is edited by Patricia Helfenstein and André Wobst.

Language

English is the official language of the conferences.

Note to Exhibitors

Each exhibitor at LASER World of PHOTONICS 2019 is entitled to one free ticket to the World of Photonics congress 2019. Each exhibitor may also purchase up to five congress tickets for a special price.

All tickets are personalized, *i.e.* they are valid only for the person whose name appears on the ticket, and they are not transferrable.

Special tickets to the World of Photonics Congress may only be ordered and used by exhibiting companies.
The official congress proceedings are not included in the discount price for special tickets for exhibitors.
Messe Munich manages the order of these tickets: Congress tickets for exhibitors can be ordered via the Online Exhibitor Shop in the same way as exhibitor passes. After personalisation, these ticket(s) will be sent as e-ticket(s) by e-mail to the recipient(s).
Beyond that, exhibitors must purchase any additional tickets to the World of Photonics congress from one of the organizing scientific associations at the regular price.

Note: Neither the free special tickets nor the discounted special tickets are available to speakers or poster presenters appearing at the World of Photonics congress 2019. Speakers and poster presenters must register with the respective organizing association.

Registration hours and location

Registration for technical sessions will take place at the ICM centre. To enter the ICM centre please take the main Entrance West (named "Haupteingang WEST"). CLEO®/Europe-EQEC 2019 registration counters are located on the left side at the end of the main corridor just prior you enter the exhibition halls.

Registration hours

Saturday 22 June	16:30-18:00
Sunday 23 June	08:00-17:30
Monday 24 June	07:30-17:30
Tuesday 25 June	08:00-17:00
Wednesday 26 June	08:00-17:00
Thursday 27 June	08:00-15:00

Conference hours (including poster sessions)

Sunday 23 June	10:30-12:00 (CE-1, 12:30) - 13:00-19:30
Monday 24 June	08:30-12:45 - 13:15-18:00
Tuesday 25 June	08:30-12:30 - 13:00-17:30
Wednesday 26 June	08:30-12:00 - 13:00-20:30
Thursday 27 June	08:30-12:00 - 13:00-17:30

Short course hours

Sunday 25 June	14:00-15:30
	16:00-17:30

Supports

All supports were distributed. No additional requests can be received.

Hotel Information

The International Congress Centre (ICM) is located about 20 minutes from the Munich Central Station (Hauptbahnhof) by underground U2, exit "**Messestadt West**". Whether you are looking for a hotel, a guesthouse, a private accommodation, or a boarding house you should be able to find your accommodation downtown or in the surrounding area of Munich.

Messe Munich has arranged for an on-line hotel reservation which can be used for the CLEO®/Europe-EQEC 2019 participants. View https://tradefairs.com/en/LASER%20World%20of%20PHOTONICS/2019/Hotels/M%C3%BCnchen

The hotel guide of the Munich Trade Fairs offers you a large variety of accommodation possibilities for a pleasant stay. Whether near the ICM or centrally located and in the middle of the nightlife of Munich's trendy neighbourhoods or close to the mountains with a high recreation value - here you will find a comprehensive offer of accommodation in and around Munich as well as in the alpine upland - meeting your personal criteria. Hotels can be directly searched and booked via the hotel directory.

A larger variety of rooms can be found using the link of the Tourism office: https://www.muenchen.de/int/en/accomodation-hotels.html

Hotels, pensions, apartments or youth hostels in Munich can also be found at:
https://www.euro-youth-hotel.de/
https://www.hostelworld.com/

Considering the large number of attendants to the exhibition, running in conjunction with the conference, we recommend to make your hotel reservation as soon as possible.

Transportation in Munich

Munich offers very good transportation means (hire cars, trams, metro and buses).

Participants of the World of Photonics congress who use local public transportation to get to Neue Messe Munich must buy a travel ticket, at their own expense.

Tickets can be purchased from all bus drivers, tram drivers, automatic ticket-dispensing machines at stations (S and U-Bahn stops) and from kiosks displaying the MVV logo. The machines understand several languages. Just select your flag. Some ticket machines accept 10 € and 20 € banknotes and most will give change. Please have some small coins ready! You can select your respective language on the ticket machines. Online tickets and mobile tickets can now also be purchased.

Buy your ticket depending on the zones you will cross and the time length you will need to travel:

- **Stripe ticket (Streifenkarte):** Stamp two stripes per zone. You are allowed to change and interrupt your journey. Return and round trips are not permitted.
- **Single trip ticket:** Valid for one person for one trip. You are allowed to change and interrupt your journey. Return and round trips are not permitted. The fare depends on the number of zones passed through.
- **Single day ticket (Tageskarte):** The most popular day tickets are also available as excellent value-for-money 3-day tickets. If you want to stay for 2 days, 4 days or even longer, simply combine the 1-day ticket and 3-day tickets.
- **Partner day ticket:** Available for as many trips as you like for up to five adults together.

Fares for single day tickets

1. Inner District (Innenraum) *white zone*	€ 6,70
2. Munich XXL (München XXL) *white and green zones*	€ 8,90
3. Outer District (Außenraum) *green, yellow, red zones*	€ 6,70
4. Entire Network (Gesamtnetz) *all zones*	€ 13,00
Fare for 3-day Inner District *white zone*	€ 16,80

For your trip Munich city / Munich airport you will need a stripe ticket (8 stamps) or an entire network ticket. Inner district includes the city centre (Marienplatz, Hauptbahnhof, ...) and Neue Messe Munich.

Once you have purchased your ticket, be sure to validate it by stamping it in the blue boxes you will see. This should be done prior to entering the station or immediately after boarding a bus or tram. To validate a stripe ticket (Streifenkarte) you must fold back the sections not required and

insert the ticket into the validating machine (see below for number of required sections). Once you have validated your ticket, you can travel with any form of transport as long as you continue to travel in the same direction.

More information at www.mvv-muenchen.de/en/homepage/index.html

Subway map at www.travelsthroughgermany.com/website2/munichsubway.htm

Munich, Germany

The celebrated capital of Bavaria, located in the foothills of the Alps, is one of the major cities in Europe. The 1,3 million inhabitants city is famous for its science and industry environment. Munich offers fantastic opportunities for shopping, museums, theatres, art galleries and sightseeing. Its October beer festival is world famous. Tourist attractions include the Bavarian beer and South German cuisine tradition, and many half-day or one-day excursion opportunities to the nearby Bavarian Alps or places such as the fairy-tale castle of Neuschwanstein or the beautiful Tegernsee.

In June the weather is likely to be warm and the sun is likely to shine, although rain is not impossible.

Munich enjoys an outstanding public transportation system, and the modern Münchner Messe complex where CLEO®/Europe-EQEC 2019 and all Laser 2019 events will be held is easy to reach from the airport, from the city centre and from most parts of the city by U-Bahn and S-Bahn lines.

Munich's Churches:

Munich is well-known for its many churches, among them:

- **Frauenkirche (Church Of Our Lady),**
  1 Frauenplatz,Munich
  Opening hours: 07:00-20:30 (no visits during the church services).
  Getting there: all S-Bahn train, U-Bahn lines 3/6 to Marienplatz

- **Alter Peter (Church Of St. Peter),**
  1 Rindermarkt,Munich
  Climb the 299 steps of this parish church to enjoy a beautiful view of the Munich city centre.
  Opening hours: Monday through Friday 09:00-18:30. Saturday, Sunday and holidays: 10:00-18:30.
  Getting there: all S-Bahn trains, U-bahn lines 3/6, Bus 52 to Marienplatz

- **Heiliggeistkirche,**
  Tal 77, 80331 Munich, Tel. 089/22 44 02
  Opening hours: Monday through Saturday 09:00-19:00, Sunday 08:30-19:00 (no visits during the church services)
  Getting there: U-Bahn lines 3/6 to Marienplatz, Bus line 52/62/132 - station stop Viktualienmarkt Hl.Geist

Munich's famous places to be visited:

- **Marienplatz**
  The Marienplatz is named according to the column of the Virgin Mary at its centre. The statue, erected in 1638 to celebrate the end of the Swedish invasion, is topped by a gilded statue of Virgin Mary that was sculpted earlier, in 1590 by Hubert Gerhard. At each corner of the column's pedestal is a statue of a putti, created by Ferdinand Murmann. The four putti's symbolize the city's overcoming of war, pestilence, hunger and heresy.
  The place is famous for its carillon in the New Town Hall Tower (Glockenspiel im Rathausturm). This is the largest carillon in Germany, with near-lifesize figures performing the traditional Coopers' Dance and a jousting match. Three times a day at 11:00, 12:00 and 17:00.
  The Marienplatz is a central place for the city's Founding Festival as well as for Fasching (carnival) celebrations and the popular Christmas market. The major restaurants, coffees and shops are located in this area. Shops are closed on Sunday.

- **Königsplatz**
  Commissioned by Ludwig I, this neo-Classical square boasts the Propyläen gateway and the Glyptothek, a small but enchanting collection of Greek and Roman sculpture. It is the sight of an annual summer outdoor concert series.

- **Isartor (Isar Gate)**
  Most easterly of Munich's three remaining town gates, dating from the 14th century. Careful restoration has recreated the dimensions and appearance of the original structure. The Isar Gate accommodates the Valentin Museum.

- **Karlstor (Charles' Gate)**
  Westerly town gate from 14th century. Incorporated at the end of the 18th century into the square known as "Stachus" (officially Karlsplatz). Today it marks one end of Munich's primary pedestrian zone.

- **Sendlinger Tor (Sendlinger Gate)**
  Remaining towers of southerly fortifications from the 14th century.

Beer Gardens

Nothing defines Munich more than its beer. You cannot talk about one without the other and you could never fully discover Munich without at least sampling its brews. Today the Munich breweries dispense 123 million gallons of beer annually. That is why many beer gardens are located in Munich:

- **Augustiner-Großgaststätte**
  Pedestrian Zone, Neuhauser Straße 16, 80331 Munich, Tel. 089/2 60 41 06.
  The Augustiner Großgaststätte is one of the more traditional Munich establishments, with a history that reaches back to 1328. The Augustin Brothers began brewing something heavenly in Augustiner's back rooms up until 1855 when

the actual brewing plant was moved to Landsberger Straße. Today Augustiner Großgaststätte is a traditional beer hall with a small courtyard beer garden, smack dab in the middle of Munich's Marienplatz pedestrian zone. The food is great and the beer is the best.

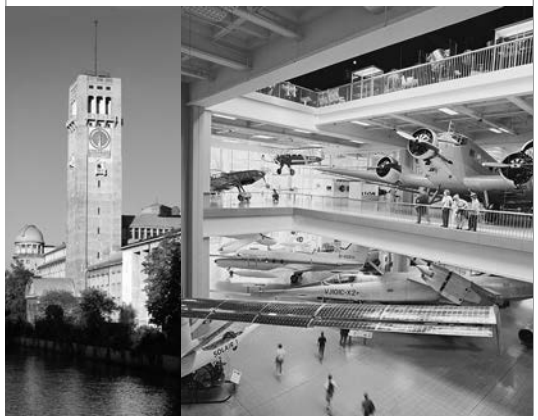
- **Altes Hackerhaus**
  Sendlinger Str. 14, Munich,
  Tel. 089/2605026, http://www.hackerhaus.de
  Opening hours: 9 am to midnight daily.
  Located in Munich's newspaper publishing district and near Sendlinger Tor, Altes Hackerhaus has a long history involving two of the City's most renowned beer producing families, the Hackers and the Pschorrs. An entire wall in the restaurant is dedicated to the family tree, dating back to 1738 when the first Hackerhaus was founded. Highlights include a small but comfortable interior courtyard beer garden, and an outstanding restaurant serving excellent Bavarian fare. Although average by Munich high standards, Altes Hackerhaus benefits from its proximity to the Marienplatz (just a few blocks away) and easy access from the nearby U-Bahn stop at Sendlinger Tor.

- **Chinesischer Turm (Chinese Tower)**
  (Chinese tower) is one of Munich's largest beer gardens, and perhaps its most famous. With more than 7,000 seats around the famous erzat Chinese pagoda in the middle of **Englischer Garten** (900-acre park with shaded paths, brooks, ponds and swans), this place could hardly be overlooked. Location: Englischer Garten 3, open from 11.00 to midnight.
  The park stretches from the centre of the city (near Odeonsplatz) to the northern city border. Access: The best way to reach it is the bus No. 54 from "Muenchner Freiheit" underground station (exit at stop "Chinesischer Turm")

Munich is very famous for its **theatres** but also for its **Olympic Park** (see www.olympiapark.de/index.html) located Spiridon-Louis-Ring 21, 80809 Munich, Tel.: 089/30 67 - 0, Fax: 089/30 67 - 22 22
Getting there: U-Bahn line 3 to Olympiazentrum

Munich's Museums:
- Bayerisches Nationalmuseum
- BMW Museum
- Deutsches Museum
- Deutsches Museum Flugwerft Schleißheim
- Glyptothek
- Münchner Stadtmuseum
- Neue Pinakothek
- Villa Stuck

and many others (see https://www.muenchen.de/int/en/sights/museums.html).



For those who prefer city sightseeing with hop on - hop off buses:
In the double-decker buses of City Sightseeing visitors to Munich can enjoy the open roof. During the hour-long city round trips the participants have a view of the best attractions that Munich offers. Explanations are given in eight different languages.
Highlights and stops: The historic city centre, the Main Station, Odeonsplatz, the Opera, Maximilian Street, the Food Market, Stachus, the Pinakotheken, Nymphenburg Castle, Neuhausen, Olympia Park, Schwabing, the English Garden, Haidhausen…

Three tours are available that can be combined: City-Tour / Nymphenburg-Olympia-Tour / Schwabing-Tour. The tickets can also be used flexibly. They can be purchased on line in advance (with a price reduction) or in the bus and are valid for one or even two days. The departures of all the tours start at the 'Bahnhofsplatz' outside Elisenhof near the main railway station Munich.

For further information see:
https://www.citysightseeing-munich.com/

Further information on Munich is available at http://www.muenchen.de/ (8 languages available).

NOTES

SHORT COURSES

CLEO®/Europe EQEC 2019 will present **twelve short courses** held in parallel to take place on **Sunday afternoon 23 June 2019. The courses are at extra cost.**

Advance registration is recommended in order to obtain the short course material. This material will not be available for purchase during the conference.

The courses are intended for engineers, scientists and graduate students with some general knowledge of optics and photonics, who wish to improve their detailed understanding of the particular technical domains covered. Each course is scheduled in two parts: Course Part 1 (90 minutes), coffee break (30 minutes), Course Part 2 (90 minutes).

Short course topics and presenters

Ultrashort pulse characterization SH-1

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 12a ICM**
Selcuk Aktürk, *Athens, Greece*

High-power fiber lasers SH-2

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 12b ICM**
Andy Clarkson, *University of Southampton, United Kingdom*

Optical parametric oscillators SH-3

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 22a ICM**
Majid Ebrahim-Zadeh, *ICFO, Castelldefels (Barcelona), Spain*

Laser beam analysis, propagation and spatial shaping techniques SH-4

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 22b ICM**
James R. Leger, *University of Minnesota, Minneapolis, USA*

Practical quantum optics SH-5

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room Osterseen ICM**
Gerd Leuchs, *Max Planck Institute for the Science of Light and University of Erlangen, Erlangen, Germany*

Mid-infrared semiconductor lasers SH-6

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 3 Hall A1**
Jérôme Faist, *ETH Zürich, Switzerland*

Terahertz measurements and their applications SH-7

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 4 Hall A1**
Daniel M. Mittleman, *Rice University, Houston, TX, USA*

Atoms and molecules in tailored laser fields SH-8

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room 5 Hall A1**
Thomas Pfeifer, *Max Planck Institute for Nuclear Physics, Heidelberg, Germany*

Frequency combs principles and applications SH-9

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room A11 Hall A1**
Thomas Udem, *Max-Planck-Institut für Quantenoptik, Garching, Germany*

Silicon photonics SH-10

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room A12 Hall A1**
Dries Van Thourhout, *Ghent University, Belgium*

Optics in graphene and other 2D materials SH-11

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room B12 Hall B1**
Coskun Kocabas, *University of Manchester, UK*

Finite element modelling methods for photonics and optics SH-12

14:00 - 15:30 Part 1 / 16:00 - 17:30 Part 2

▸ **Room B13 Hall B1**
Arti Agrawal, *University of Technology Sydney, Australia*

The biographies of the short course speakers, the descriptions of the short courses are to be found on the conference web site:

http://www.cleoeurope.org/short-courses/

NOTES

PLENARY TALKS

PL-1: CLEO/Europe 2019 Plenary Talk

▸ **Monday, 8:30 – 9:30**
Location: *Room 1 ICM*

PL-1.1 MON 08:30

The revolution of silicon photonics

Michal Lipson,
Columbia University, New York, USA

Biography
Michal Lipson is the Eugene Higgins Professor at Columbia University. Her research focus is on Nanophotonics and includes the investigation of novel phenomena, as well as the development of novel devices and applications.
Lipson pioneered critical building blocks in the field of Silicon Photonics, which today is recognized as one of the most promising directions for solving the major bottlenecks in microelectronics. She is the inventor of over 30 issued patents and has co-authored more than 200 scientific publications. In recognition of her work in silicon photonics she was elected as a member of the National Academy of Sciences. She was also awarded the NAS Comstock Prize in Physics, the MacArthur Fellowship, the Blavatnik Award, the Optical Society's R. W. Wood Prize, the IEEE Photonics Award, and has received an honorary degree from Trinity College, University of Dublin. Since 2014 every year she has been named by Thomson Reuters as a top 1% highly cited researcher in the field of Physics.

Abstract
We are now experiencing a revolution in optical technologies, where one can print and control massive optical circuits, on a microelectronic chip. This revolution is enabling a whole range of applications that are in need for scalable optical technologies and its opening the door to areas that only a decade ago were unimaginable.

PL-2: 2019 World of Photonics Congress Opening and Plenary Talk

▸ **Monday, 9:40 – 11:00**
Location: *Room 1 ICM*

PL-2.1 MON 09:40

Gravitational wave astronomy: Listening to the sounds of the dark universe!

Karsten Danzmann,
Max Planck Institute of Gravitational Physics, Hannover, Germany

Biography
Karsten Danzmann was born in 1955 and received his PhD in 1980. He worked at Stanford University, PTB Berlin and the Max Planck Institute for Quantum Optics in Garching.
Currently he is Director of the Institute for Gravitational Physics of Leibniz Universität Hannover and Director at the Max Planck Institute for Gravitational Physics (Albert Einstein Institute) in Hannover, where he heads the Laser Interferometry and Gravitational Wave Astronomy Division. He is Consortium Lead of the LISA space mission, Lead Scientist of the GEO Collaboration and Speaker of the QuantumFrontiers Cluster of Excellence. He is a recipient of the Körber European Science Prize, the Stern Gerlach Medal, the Otto Hahn Prize, and shared the Edison Volta Prize, the Gruber Cosmology Prize, and the Special Breakthrough Prize in Fundamental Physics.

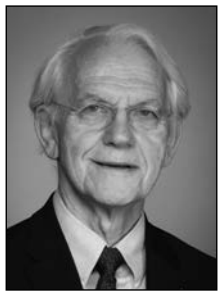
Abstract
Since 3 years astronomy has been different. Gravitational waves finally let us listen to the universe. Ground-based detectors are now routinely detecting signals from the coalescences of Black Holes with dozens of solar masses. And space-based detectors will open the low-frequency gravitational wave sky in the early 2030s.

PL-3: Nobel Prize Plenary Talk

▸ **Monday, 18:00 – 19:00**
Location: *Room 1 ICM*

PL-3.1 MON 18:00

A passion for extreme light



Gérard Mourou,
École Polytechnique, Palaiseau, France

Biography
Gérard Mourou is Professor Haut-Collège at the École polytechnique. He is also the A.D. Moore Distinguished University Emeritus Professor of the University of Michigan. He received his undergraduate education at the University of Grenoble (1967) and his Ph.D. from University Paris VI in 1973. He has made numerous contributions to the field of ultrafast lasers, high-speed electronics, and medicine. But, his most important invention, demonstrated with his student Donna Strickland while at the University of Rochester (N.Y.), is the laser amplification technique known as Chirped Pulse Amplification (CPA), universally used today. CPA revolutionized the field of optics, opening new branches like attosecond pulse generation, Nonlinear QED, compact particle accelerators. It extended the field of optics to nuclear and particle physics. In 2005, Prof. Mourou proposed a new infrastructure; the Extreme Light Infrastructure (ELI), which is distributed over three pillars located in Czech Republic, Romania, and Hungary. Prof. Mourou also pioneered the field of femtosecond ophthalmology that relies on a CPA femtosecond laser for precise myopia corrections and corneal transplants. Over a million such procedures are now performed annually. Prof. Mourou is member of the U.S. National Academy of Engineering, and a foreign member of the Russian Science Academy, the Austrian Sciences Academy, and the Lombardy Academy for Sciences and Letters. He is Chevalier de la Légion d'honneur and was awarded the 2018 Nobel Prize in Physics with his former student Donna Strickland.

Abstract
Extreme light is providing a vast range of high energy radiations and particles along with the highest field, highest pressure. Its applications in science and technology will be discussed.

PL-4: 2019 EQEC Plenary Talk and Awards Ceremony

▸ **Tuesday, 10:30 – 12:30**
Location: *Room 1 ICM*

This session will feature a plenary talk presented together with a series of prize and award ceremonies. See separate brochure.

PL-4.1 TUE 10:30

Photonic entanglement: From foundations to applications

Anton Zeilinger, *University of Vienna, Austria*

Biography
Anton Zeilinger was always interested in the foundations of quantum mechanics. He performed many fundamental quantum experiments with neutrons, atoms, molecules, and photons. He became me most fascinated by quantum entanglement. With entangled photons he performed pioneering experiments on quantum teleportation, on quantum cryptography, on quantum gates, on interaction-free measurement, on quantum imaging, on test of realism and locality *etc.* To his surprise these experiments helped lay the basics for a number of procedures in the field of quantum information technology. The stations of his career include the Technical Universities of Vienna and Munich, M.I.T. and the University of Innsbruck.

Anton Zeilinger is Professor of Physics Emeritus at the University of Vienna and President of the Austrian Academy of Sciences.

Abstract
Entangled photons have become an essential workhorse for experiments on the foundations of quantum mechanics. Tests of Bell's Inequality (cf. the Einstein- Podolsky-Rosen Paradox) have with increasing sophistication ruled out more and more alternative views to quantum mechanics.

TUTORIAL TALKS

Joint session ECBO-CLEO/Europe

▸ **Sunday, 18:00 – 19:00**
Location: *Room 5 ICM*

JS ECBO-CLEO/Europe.1 SUN 18:00

Light sheet microscopy: Imaging faster, wider and deeper

Kishan Dholakia, *University of St Andrews, St Andrews, United Kingdom*

This talk will describe the basics of light sheet microscopy. The latest advances for this field in neuroscience and developmental biology using beam shaping will be discussed.

EH-1: Engineering nontrivial light fields

▸ **Monday, 11:15 – 12:45**
Location: *Room 14a ICM*

EH-1.1 MON 11:15

Metamaterials, anapoles and flying donuts

Nikolay Zheludev, *University of Southampton, Southampton, United Kingdom*

Metamaterials have been the platform for experimental development of a new chapter in electrodynamics devoted to toroidal and anapole modes of excitation and the generation of electromagnetic flying donuts, topologically robust formation of vortices.

EI-1: Optics of graphene and related 2D materials

▸ **Monday, 16:15 – 17:45**
Location: *Room 14a ICM*

EI-1.1 MON 16:15

Graphene for photonics and optoelectronics

Andrea Ferrari, *University of Cambridge, Cambridge, United Kingdom*

Graphene has great potential in photonics and optoelectronics, where the combination of its unique optical and electronic properties can be fully exploited, and the absence of a bandgap can be beneficial.

JSVI-1: 50 Years of integrated optics I

▸ **Wednesday, 16:00 – 17:30**
Location: *Room 1 ICM*

JSVI-1.1 WED 16:00

Quantum dot lasers epitaxially grown on Si

John Bowers, *University of California, Santa Barbara, USA*

InAs quantum dot lasers epitaxially grown on Si show promise for achieving lower threshold, higher temperature, reduced reflection sensitivity and lower cost. Optimization of the buffer layers on Si reduces dislocation densities and improves lifetimes.

CG-7: Generation and applications of attosecond pulses

▸ **Thursday, 10:30 – 12:00**
Location: *Room 3 Hall A1*

CG-7.1 THU 10:30

An introduction to attosecond pulses and attosecond physics

Anne L'Huillier, *Lund University, Lund, Sweden*

This tutorial will discuss the physics behind the generation of attosecond pulses, their temporal and spatial properties, including spatio-temporal couplings, and their application to study the dynamics of resonant and non-resonant photoionization.

KEYNOTE TALKS

CD-4: Nonlinear imaging

▸ **Sunday, 18:00 – 19:30**
Location: *Room 13b ICM*

CD-4.1 SUN 18:00

Challenges and trends in optical molecular imaging

Sophie Brasselet, *Institut Fresnel, Marseille, France*
We describe possibilities that optics offers to investigate ultratstructural properties of matter, from nanomaterials to cells and tissues, using polarized imaging in fluorescence and nonlinear optics.

ED-1: Frequency metrology and transfer

▸ **Tuesday, 14:00 – 15:30**
Location: *Room 1 Hall A1*

ED-1.1 TUE 14:00

Magic conditions for optical lattice clocks to operate at 10^{-19} uncertainty

Hidetoshi Katori, *The University of Tokyo, Tokyo, Japan*
We report recent progress of optical lattice clocks in our group, which includes investigation of operational magic intensity for strontium atoms, transportable clocks, and determination of the magic wavelength for cadmium.

CJ-9: Multimode nonlinear fiber optics

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 1 ICM*

CJ-9.1 TUE 16:00

Nonlinear optics exploiting the spatial dimension

Siddharth Ramachandran, *Boston University, Boston, USA*
Nonlinear optics with spatial modes requires conservation of spin and orbital angular momentum in addition to linear momentum (*i.e.* propagating phase). We review the principles of, and unique applications afforded by, this emerging platform.

EF-4: Nonlinear integrated photonics

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 14a ICM*

EF-4.1 WED 10:30

A renaissance in Stimulated Brillouin Scattering

Benjamin Eggleton, *University of Sydney, Sydney, Australia*
There has been a recent renaissance in Brillouin scattering research, driven by the maturity in new photonic integration platforms and possibilities offered by exotic nanophotonic systems, leading to a diversity of new systems with distinct and complementary capabilities.

EC-1: Novel systems for topological photonics I

▸ **Thursday, 8:30 – 10:00**
Location: *Room 13b ICM*

EC-1.1 THU 08:30

Topological photonics

Mordechai (Moti) Segev, *Technion, Haifa, Israel*
The fundamentals of the new area called Topological Photonics will be reviewed, along with exciting applications such as topological insulator lasers, new ideas related to topology in synthetic dimensions, current challenges and open questions.

CC-5: THz applications

▸ **Thursday, 8:30 – 10:00**
Location: *Room 1 Hall A1*

CC-5.1 THU 08:30

Wireless Terahertz communications

Wolfgang Freude, *Karlsruhe Institute of Technology, Karlsruhe, Germany*
T-waves ranging from 0.1 THz to 1 THz become increasingly important as carriers for wireless high-speed data transmission. Data rates of 100 Gbit/s were achieved, and distances of 100 m to 1 km are targeted.

INVITED TALKS

EB-1: Quantum interfaces

▸ **Sunday, 10:30-12:00**
Location: *Room 1 ICM*

EB-1.1 SUN 10:30

Diamond light matter quantum interface

Fedor Jelezko, *Institute of Quantum Optics, Ulm University, Ulm, Germany*

CM-1: Beam shaping for laser processing

▸ **Sunday, 10:30-12:00**
Location: *Room 14b ICM*

CM-1.1 SUN 10:30

Temporal airy pulses: high aspect ratio nanomachining of dielectrics, cell poration and light amplification in excited dielectrics

Thomas Baumert, *University of Kassel, Institute of Physics and CINSaT, Kassel, Germany*

NOTES

EE-1: New principles of ultrafast spectroscopy

▸ **Sunday, 10:30-12:00**
Location: *Room 14c ICM*

EE-1.1 SUN 10:30

Femtosecond covariance spectroscopy

Daniele Fausti, *University of Trieste, Trieste, Italy*

JSV-1: Atom interferometry and quantum optics

▸ **Sunday, 10:30-12:00**
Location: *Room 21 ICM*

JSV-1.1 SUN 10:30

Gravitational physics with atomic quantum sensors

Guglielmo M. Tino, *Università di Firenze Istituto Nazionale di Fisica Nucleare, Sesto Fiorentino (Firenze), Italy*

CH-1: Optical fibre sensors

▸ **Sunday, 10:30-12:00**
Location: *Room 1 Hall A1*

CH-1.1 SUN 10:30

The photonic guitar pickup: a high-sensitivity, high-bandwidth fiber strain sensor

Jack A. Barnes, Hans-Peter Loock, *Queen's University, Kingston, Canada*

CI-1: Probabilistic shaping and NFT-based transmission

▸ **Sunday, 10:30-12:00**
Location : Room 6 Hall A1

CI-1.3 SUN 11:00

Probabilistic shaping and its applications to optical communications

Georg Böcherer, *Mathematical and Algorithmic Sciences Lab, Huawei Technologies, France S.A.S.U., Boulogne-Billancourt, France*

CE-1: Opportunities for advanced nanostructured and non-linear optical materials

▸ **Sunday, 10:30-12:00**
Location: *Room 7 Hall A1*

CE-1.1 SUN 10:30

New opportunities with old optical materials

Marko Loncar, *Harvard University, Cambridge, USA*

EB-2: Integrated and engineered photonics

▸ **Sunday, 14:00 – 15:30**
Location: *Room 1 ICM*

EB-2.1 SUN 14:00

Integrated semiconductor quantum photonics

Gregor Weihs[1], Silke Auchter[1], Huan Chen[2], Kaisa Laiho[3], Benedikt Pressl[4,1], Alexander Schlager[1], Hannah Thiel[1], Holger Suchomel[5], Christian Schneider[5], Martin Kamp[5], and Sven Höfling[5,6]
[1]Universität Innsbruck, Innsbruck, Austria, [2]National University of Defense Technology, Changsha, China, [3]Technische Universität Berlin, Berlin, Germany, [4]Innsbruck Medical University, Innsbruck, Austria, [5]Universität Würzburg, Würzburg, Germany, [6]University of St. Andrews, St Andrews, UK

JSII-1: Raman spectroscopy I

▸ **Sunday, 14:00 – 15:30**
Location: *Room 4a ICM*

JSII-1.1 SUN 14:00

From coherent Raman microscopy to endoscopy

Hervé Rigneault, *Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*

JSII-1.2 SUN 14:30

The potential of linear and non-linear Raman spectroscopy for bedside and intraoperative medical diagnosis and therapy

Juergen Popp, *Institute of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller University Jena, Jena, Germany, Leibniz Institute of Photonic Technology and Member of the Research Alliance "Leibniz Health Technologies", Jena, Germany, InfectoGnostics Research Campus Jena, Centre for Applied Research, Jena, Germany*

JSIV-1: Nanoscale heat transfer background

▸ **Sunday, 14:00 – 15:30**
Location: *Room 4b ICM*

JSIV-1.1 SUN 14:00

Phonon transport in disordered 2D phononic crystals

Marianna Sledzinska[1], Bartlomiej Graczykowski[2], David Lacroix[3], Francesc Alzina[1], Konstantinos Termentzidis[4], Umberto Melia[5], and Clivia M. Sotomayor Torres[1,6]
[1]Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and BIST, Bellaterra (Barcelona), Spain, [2]Adam Mickiewicz University, Poznan, Poland, [3]Université de Lorraine, CNRS, LEMTA, Nancy, France, [4]CNRS, INSA-Lyon, Université Claude Bernard Lyon 1, Lyon, France, [5]ESAII, Univ. Politècnica de Catalunya, Barcelona, Spain, [6]ICREA – Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain

CA-2: Laser facilities

▸ **Sunday, 14:00 – 15:30**
Location: *Room 13a ICM*

CA-2.3 SUN 14:30

First kilojoule pulse operation at ELI-beamlines

Erhard Gaul[1,2], Sandra Bruce[1,2], Gavin Friedman[2], Gilles Chériaux[1], Pavel Trojek[2], Teddy Borger[1], Štepán Vyhlidka[2], František Batysta[2], Roman Antipenkov[2], Eric Beutlich[1], Jack Naylon[2], Jan Hubácek[2], Jan Bartonícek[2], Jeffrey Jarboe[2], Samuel Buck[2], Joshua King[1], Mathew Tyrrell[1], David Hessen[1], Andreas Gaul[1], Christopher Jaska[1], Jonas Kolenda[3], Michael Donovan[1,2], Todd Ditmire[1], Pavel Bakule[2], Daniel Kramer[2], and Bedrich Rus[2]
[1]National Energetics, Austin, USA, [2]Eli-Beamlines, Institute of Physics, Praha, Czech Republic, [3]Ekspla, Vilnius, Lithuania

CD-2: Nonlinear spectroscopy

▸ **Sunday, 14:00 – 15:30**
Location: *Room 13b ICM*

CD-2.1 SUN 14:00

Time-domain ptychography

Thomas Feurer[1], Michael Brügmann[1], Tobias Schweizer[1], Alexander Heidt[1], Dirk Spangenberg[2], and Erich Rohwer[2]
[1]University of Bern, Bern, Switzerland, [2]Stellenbosch University, Matieland, South Africa

CM-2: Silicon structuring by ultrafast lasers

▸ **Sunday, 14:00 – 15:30**
Location: *Room 14b ICM*

CM-2.1 SUN 14:00

Internal structuring of silicon by ultrafast laser irradiation

David Grojo, *Aix-Marseille University, CNRS, LP3, Marseille, France*

EE-2: Ultrafast phenomena in 2D materials and on surfaces

▸ **Sunday, 14:00 – 15:30**
Location: *Room 14c ICM*

EE-2.1 SUN 14:00

Ultrafast SFG Study towards Water Splitting on TiO_2

Ellen Backus[1,2], Shumei Sun [2], Saman Hosseinpour [2], Simon Schlegel[2], and Mischa Bonn[2]
[1]University of Vienna, Vienna, Austria, [2]Max Planck Institute for Polymer Research, Mainz, Germany

JSV-2: Magnetometry and biological imaging

▸ **Sunday, 14:00 – 15:30**
Location: *Room 21 ICM*

JSV-2.1 SUN 14:00

Magnetic field imaging with microfabricated optically-pumped magnetometer arrays

Nicholas Nardelli[1], Sean Krzyzewski[1], Branislav Korenko[1], Gleb Romanov[1], Jeramy Hughes[1,2], Orang Alem[1,2], and Svenja Knappe[1,2]
[1]University of Colorado, Boulder, USA, [2]FieldLine Inc., Boulder, USA

CI-2: Advanced high capacity fiber systems

▸ **Sunday, 14:00 – 15:30**
Location: *Room 6 Hall A1*

CI-2.3 SUN 14:30

Multi-band optical systems to enable ultra-high speed transmissions

Alessio Ferrari[1], Antonio Napoli[2], Nelson Costa[3], Johannes K. Fischer[4], Joao Pedro[3], Wladek Forysiak[5], Andre Richter[6], Erwan Pincemin[7], and Vittorio Curri[1]
[1]Politecnico di Torino, Torino, Italy, [2]Infinera Germany, Munich, Germany, [3]Infinera Portugal, Carnaxide, Portugal, [4]Fraunhofer Institute for Telecommunications HHI, Berlin, Germany, [5]AIPT, Aston University, Birmingham, United Kingdom, [6]VPI Photonics, Berlin, Germany, [7]Orange Labs, Lannion, France

CE-2: Infrared material fibres glasses and applications

▸ **Sunday, 14:00 – 15:30**
Location: *Room 7 Hall A1*

CE-2.3 SUN 14:30

Mid-infrared (MIR) glasses and fibres for medical applications

Angela B. Seddon, *University of Nottingham, Nottingham, United Kingdom*

JSI-1: Photonic platforms for reservoir computing

▸ **Sunday, 14:00 – 15:30**
Location: *Room 8 Hall A1*

JSI-1.1 SUN 14:00

In-memory computing using electrical and photonic memory devices

Abu Sebastian, *IBM Research - Zurich, Rueschlikon, Switzerland*

EB-3: Quantum communication and applications

▸ **Sunday, 16:00 – 17:30**
Location: *Room 1 ICM*

EB-3.1 SUN 16:00

Qubits in Space

Paolo Villoresi[1], Giuseppe Vallone[1], Luca Calderaro[1], Costantino Agnesi[1], Matteo Schiavon[1], Alberto Santamato[1], AndreaStanco[1], Vincenza Luceri[2], Daniele Dequal[3], and Giuseppe Bianco[3]
[1]Università di Padova, DEI, Padova, Italy, [2]e-GEOS, Matera, Italy, [3]MLRO Agenzia Spaziale Italiana, Matera, Italy

JSII-2: Raman spectroscopy II

▸ **Sunday, 16:00 – 17:30**
Location: *Room 4a ICM*

JSII-2.1 SUN 16:00

Probing neuronal membrane potentials and ionic fluxes at the single cell level by means of water

Sylvie Roke, *École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*

JSIV-2: Nanodevices controlled by heat manipulation

▸ **Sunday; 16:00 – 17:30**
Location: *Room 4b ICM*

JSIV-2.1 SUN 16:00

Evaporative electron cooling in asymmetric double barrier semiconductor heterostructures

Marc Bescond[1,2], Aymen Yangui[1,2], Tifei Yan[1], Naomi Nagai[1], and Kazuhiko Hirakawa[1,2,3]
[1]Institute of Industrial Science, University of Tokyo, Tokyo, Japan, [2]LIMMS/CNRS-IIS, UMI 2820, Tokyo, Japan, [3]Institute for Nano Quantum Information Electronics, University of Tokyo, Tokyo, Japan

JSIV-2.2 SUN 16:30

Magneto-optical control for nanoscale thermotronics

Annika Ott[1], Riccardo Messina[2], Philippe Ben-Abdallah[2], and Svend-Age Biehs[1]
[1]Institut für Physik, Carl von Ossietzky Universität, Oldenburg, Germany, [2]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud, Palaiseau, France

CA-3: Waveguide lasers

▸ **Sunday, 16:00 – 17:30**
Location: *Room 13a ICM*

CA-3.3 SUN 16:30

Femtosecond-laser-written waveguide lasers at ~2 um

Xavier Mateos[1], Esrom Kifle[1], Pavel Loiko[2], Carolina Romero[3], Javier Rodriguez[3], Airán Ródenas[1,4], SunYung Choi[5], JiEun Bae[5], Fabian Rotermund[5], Uwe Griebner[6], Valentin Petrov[6], Magdalena Aguiló[1], and Francesc Díaz[1]

[1]Universitat Rovira i Virgili, Tarragona, Spain, [2]Centre de recherche sur les Ions, les Matériaux et la Photonique, Caen, France, [3]University of Salamanca, Salamanca, Spain, [4]Istituto di Fotonica e Nanotecnologie, Milan, Italy, [5]Department of Physics, KAIST, Daejeon, South Korea, [6]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

CM-3: Advanced functionalization of materials

▸ **Sunday, 16:00 – 17:30**
Location: *Room 14b ICM*

CM-3.3 SUN 16:30

Diamond functionalization by ultrafast laser pulses

Patrick Salter, *Engineering Science, Oxford, United Kingdom*

JSV-3: Optomechanics and atomic clocks

▸ **Sunday, 16:00 – 17:30**
Location: *Room 21 ICM*

JSV-3.1 SUN 16:00

Quantum measurement of a mechanical resonator at and below the standard quantum limit

Massimiliano Rossi[1,2], David Mason[1,2], Junxin Chen[1,2], Yeghishe Tsaturyan[1], and Albert Schliesser[1,2]
[1]Niels Bohr Institute, Copenhagen, Denmark, [2]Center for Hybrid Quantum Networks (Hy-Q), Copenhagen, Denmark

JSV-3.2 SUN 16:30

Ultra-low dissipation mechanical resonators for cavity optomechanics

Mohammad J. Bereyhi[1], Alberto Beccari[1], Sergey A. Fedorov[1], Amir H. Ghadimi[1], Ryan Schilling[1], Dalziel J. Wilson[2], Nils J. Engelsen[1], and Tobias J. Kippenberg[1]
[1]Institute of Physics (IPHYS), École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, [2]IBM Research, Zurich, Switzerland

CF-3: Fiber lasers

▸ **Sunday, 16:00 – 17:30**
Location: *Room 2 Hall A1*

CF-3.1 SUN 16:00

Ultrafast spectroscopy and control in the limits of single electrons and virtual photons

Alfred Leitenstorfer, *University of Konstanz, Konstanz, Germany*

CE-3: Neuro-inspired computing and random photonics

▸ **Sunday, 16:00 – 17:30**
Location: *Room 7 Hall A1*

CE-3.3 SUN 16:30

Neuro-inspired computing: From resistive memory to optics

Charles Mackin, Pritish Narayanan, Hsinyu Tsai, Stefano Ambrogio, An Chen, and Geoffrey Burr
IBM Research - Almaden, San Jose, USA

JSI-2: Neuromorphic processing for optical communications

▸ **Sunday, 16:00 – 17:30**
Location: *Room 8 Hall A1*

JSI-2.1 SUN 16:00

Photonic machine learning implementations as decoders for optical communication systems

Apostolos Argyris, Julian Bueno, and Ingo Fischer
Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (UIB-CSIC), 07122 Palma, Spain

JSI-2.4 SUN 17:00

Reinforcement learning in a large scale photonic network

Sheler Maktoobi, Louis Andreoli, Laurent Larger, Maxime Jacquot, and Daniel Brunner
FEMTO-ST Institute/Optics Department, CNRS & University Bourgogne Franche-Comté, Besançon, France

JSIV-3: Nanoscale heat processes in plasmonic nanostructures

▸ **Sunday, 18:00 – 19:30**
Location: *Room 4b ICM*

JSIV-3.1 SUN 18:00

Ultrafast thermo-optical dynamics of plasmonic nanoparticles

Francesco Banfi[1], Paolo Maioli[1], Aurélien Crut[1], Marco Gandolfi[2,3], Fabio Medeghini[1], Fabrice Vallée[1], and Natalia Del Fatti[1]
[1]FemtoNanoOptics group Université de Lyon Institut Lumière Matière (iLM), Université Lyon 1 and CNRS 10 rue Ada Byron, 69622 Villeurbanne cedex, France, [2]Dipartimento Matematica e Fisica & Interdisciplinary Laboratories for Advanced Materials Physics (I-LAMP), Università Cattolica del Sacro Cuore, Italy, Brescia, Italy, [3]Laboratory for Soft Matter and Biophysics, Department of Physics and Astronomy, KU Leuven, Celestijnenlaan 200D, B-3001 Leuven, Belgium

CB-1: Semiconductor micro-lasers: Novel technology concepts

▸ **Sunday, 18:00 – 19:30**
Location: *Room 14a ICM*

CB-1.1 SUN 18:00

Flexible and Ultra-lightweight Polymer Membrane Lasers

Markus Karl, James M.E. Glackin, Marcel Schubert, Nils M. Kronenberg, Graham A. Turnbull, Ifor D.W. Samuel and Malte C. Gather
School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom

CH-4: Integrated sensors I

▸ **Sunday, 18:00 – 19:30**
Location: *Room 1 Hall A1*

CH-4.1 SUN 18:00

On-chip infrared sensor technologies for Chem/Bio diagnostics: Quo vadis?

Boris Mizaikoff, *Ulm University, Institute of Analytical and Bioanalytical Chemistry, Ulm, Germany*

CF-4: Solitons and self-compression

▸ **Sunday, 18:00 – 19:30**
Location: *Room 2 Hall A1*

CF-4.1 SUN 18:00

Non-linear propagation of ultrashort mid-IR pulses

Valentina Shumakova[1], Skirmantas Alisauskas[2], Pavel Malevich[1], Claudia Gollner[1], Alexander Voronin[3,4], Alexander Mitrofanov[3,4], Dmitriy Sidorov-Biryukov[3,4], Aleksei Zheltikov[3,4,5], Daniil Kartashov[6], Andrius Baltuska[1,7], and Audrius Pugzlys[1,7]
[1]Photonics Institute, TU Wien, Vienna, Austria, [2]DESY, Hamburg, Germany, [3]Physics Department, M.V. Lomonosov Moscow State University, Moscow, Russia, [4]Russian Quantum Center, Skolkovo, Russia, [5]Department of Physics and Astronomy, Texas A&M University, College Station, USA, [6]Friedrich-Schiller University Jena, Jena, Germany, [7]Center for Physical Sciences & Technology, Vilnius, Lithuania

CE-4: Multiferroics and non-linear optics and photonics

▸ **Sunday, 18:00 – 19:30**
Location: *Room 7 Hall A1*

CE-4.3 SUN 18:30

Nonlinear laser spectroscopy of multiferroic materials

Manfred Fiebig, *Dept. of Materials, ETH Zurich, Zurich, Switzerland*

JSI-3: Neuromorphic photonic platforms

▸ **Sunday, 18:00 – 19:30**
Location: *Room 8 Hall A1*

JSI-3.1 SUN 18:00

Multiwavelength neuromorphic silicon photonics

Bhavin J. Shastri[1], Alexander N. Tait[2], Mitchell A. Nahmias[2], Thomas Ferreira de Lima[2], Hsuan-Tung Peng[2], and Paul R. Prucnal[2]
[1]Queen's University, Kingston, Canada, [2]Princeton University, Princeton, USA

CJ-5: Mid-IR laser sources and components

▸ **Monday, 11:15 – 12:45**
Location: *Room 1 ICM*

CJ-5.1 MON 11:15

Chalcogenide glass fiber components for the fabrication of mid-infrared optical sources

Martin Rochette, *McGill University, Montréal, Canada*

JS SPIE-OM-EQEC: Computational photonics for metrology application

▸ **Monday, 11:15 – 12:45**
Location: *Room 2 ICM*

JS SPIE-OM-EQEC.1 MON 11:15

Numerical optimization of resonant photonic devices

Martin Hammerschmidt[1], Lin Zschiedrich[1], Philipp-Immanuel Schneider[1], Felix Binkowski[2], Xavier Garcia Santiago[1,3], and Sven Burger[1,2]
[1]JCMwave GmbH, Berlin, Germany, [2]Zuse Institute Berlin, Berlin (ZIB), Germany, [3]Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

JS SPIE-OM-EQEC.2 MON 11:45

Lensless metrology for semiconductor lithography at EUV

Iacopo Mochi, Rajendran Rajeev, Dimitrios Kazazis, Li-Ting Tseng, Patrick Helfenstein, Sara Fernandez, Uldis Locans, Atoosa Dejkameh, Ricarda Nebling, and Yasin Ekinci
Paul Scherrer Institute, Villigen, Switzerland

JS SPIE-OM-EQEC.3 MON 12:15

Metrology for and with Nanooptics

Thomas Pertsch, Friedrich Schiller *University, Jena, Germany, Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany, Max Planck School of Photonics, Munich, Germany*

EE-3: Ultrafast control by light

▸ **Monday, 11:15 – 12:45**
Location: *Room 4a ICM*

EE-3.1 MON 11:15

Lightwave valleytronics at multi-terahertz clock rates

Christoph P. Schmid[1], Fabian Langer[1], Stefan Schlauderer[1], Martin Gmitra[1], Jaroslav Fabian[1], Philipp Nagler[1], Tobias Korn[1], Christian Schüller[1], Peter G. Hawkins[2], Johannes T. Steiner[2], Ulrich Huttner[2], Stefan W.Koch[2], Mackillo Kira[3], and Rupert Huber[1]
[1]University of Regensburg, Regensburg, Germany, [2]University of Marburg, Marburg, Germany, [3]University of Michigan, Ann Arbor, USA

CK-4: Photonic integration

▸ **Monday, 11:15 – 12:45**
Location: *Room 4b ICM*

CK-4.5 MON 12:15

Surface plasmon optoelectronics on silicon

Pierre Berini, *University of Ottawa, Ottawa, Canada*

CM-5: Laser nanostructuring of trans-parent materials for advanced devices

▸ **Monday, 11:15 – 12:45**
Location: *Room 14b ICM*

CM-5.3 MON 11:45

Low-loss geometric phase elements by femtosecond laser writing in silica glass

Masaaki Sakakura, Yuhao Lei, Lei Wang, Yanhao Yu, and Peter G. Kazansky
University of Southampton, Southampton, United Kingdom

CH-5: Integrated sensors II

▸ **Monday, 11:15 – 12:45**
Location: *Room 1 Hall A1*

CH-5.1 MON 11:15

Comparison of thin-film-transistor and photonic crystal protein sensors

Jian Jang Huang, *Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei City, Taiwan*

CF-5: Techniques for wavelength conversion of ultrashort pulses

▸ **Monday, 11:15 – 12:45**
Location: *Room 2 Hall A1*

CF-5.3 11:45

Mastering ultrafast UV light in hollow-core photonic crystal fibres

David Novoa, *Max-Planck Institute for the Science of Light, Erlangen, Germany*

CE-5: Novel light confinement waveguides technologies

▸ **Monday, 11:15 – 12:45**
Location: *Room 3 Hall A1*

CE-5.1 MON 11:15

The Light Cage - an on-chip hollow-core waveguide implemented by 3D nanoprinting

Julian Gargiulo[1], Bumjoon Jang[2], Guangrui Li[2], Stefan A. Maier[2], and Markus A. Schmidt[2,3,4]
[1]Chair in Hybrid Nanosystems, Nanoinstitute Munich, Ludwig-Maximilians-Universität, Munich, Germany, [2]Leibniz Institute of Photonic Technology, Jena, Germany, [3]Otto Schott Institute of Materials Research (OSIM), Friedrich Schiller University, Jena, Germany, [4]Abbe Center of Photonics and Faculty of Physics, Friedrich-Schiller-University, Jena, Germany

CJ-6: Waveguide lasers

▸ **Monday, 14:15 – 15:45**
Location: *Room 1 ICM*

CJ-6.1 MON 14:15

A multiple-waveguide mode-locked chip-laser architecture

David G. Lancaster[1], Nicholas Bourbeau Hébert[2], Wenqi Zhang[1], Fiorina Piantedosi[1], Tanya M. Monro[1], and Jerome Genest[2]
[1]Laser Physics and Photonics Devices labs, University of South Australia, Mawson Lakes, SA, Australia, [2]Centre d'optique, photonique et laser, Université Laval, Québec, Canada

CB-2: Semiconductor micro-lasers: Novel dynamics

▸ **Monday, 14:15 – 15:45**
Location: *Room 13b ICM*

CB-2.3 MON 14:45

Nonhermitian physics of nanophotonic molecule lasers

Mercedeh Khajavikhan, *CREOL, University of Central Florida, USA*

CM-6: 3D laser additive micromanufacturing

▸ **Monday, 14:15 – 15:45**
Location: *Room 14b ICM*

CM-6.5 MON 15:15

True 3D additive-manufacturing of glass-ceramics down to nanoscale

Mangirdas Malinauskas, *Laser Research Center at Vilnius University, Vilnius, Lithuania*

CL-2: Nano-optics, light field control and sensing

▸ **Monday, 14:15 – 15:45**
Location: *Room Osterseen ICM*

CL-2.3 MON 14:45

Optical antenna based fluorescence correlation spectroscopy of biomembranes

Pamina Winkler[1], Raju Regmi[2], Valentin Flauraud[3], Juergen Brugger[3], Herve Rigneault[2], Maria Garcia-Parajo[1], and Jérôme Wenger[2]
[1]ICFO - Institute of Photonic Sciences, Castelldefels, Spain — [2]Aix Marseille Univ - CNRS - Institut Fresnel, Marseille, France — [3]École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

CH-6: Fibre bio- and medical sensors

▸ **Monday, 14:15 – 15:45**
Location: *Room 1 Hall A1*

CH-6.1 MON 14:15

The next dimension of detection: Biomechanical analysis of tissue using optical elastography

Andrea Armani[1], Alexa Hudnut[1], Nicholas Trasolini[2], Lian Lash-Rosenberg[1], An Xin[1], George Hatch[2], Cecilia Zurita-Lopez[3], and Qiming Wang[1]
[1]University of Southern California, Los Angeles, USA, [2]University of Southern California, Keck Medical School, Los Angeles, USA, [3]California State University, Los Angeles, USA

CE-6: Metamaterials and functional photonic bandgap systems

▸ **Monday, 14:15 – 15:45**
Location: *Room 3 Hall A1*

CE-6.1 MON 14:15

Giant broadband refraction in the visible in a nanodisordered ferroelectric perovskite

Ludovica Falsi[1,2], Fabrizio Di Mei[1], Mariano Flammini[1], Davide Pierangeli[1,3], Paolo Di Porto[1], Aharon J. Agranat[4], and Eugenio DelRe[1]
[1]Department of Physics, University of Rome "La Sapienza", Rome, Italy, [2]S.B.A.I. Department, Physics Section, University of Rome "La Sapienza", Rome, Italy, [3]ICL-2DMOST, College of Optoelectronic Engineering, Shenzhen University, Shenzhen, China, [4]Applied Physics Department, Hebrew University of Jerusalem, Jerusalem, Israel

EA-2: Coherent atom-light interaction

▸ **Monday, 16:15 – 17:45**
Location: *Room 4a ICM*

EA-2.5 MON 17:15

Atomic vapor confined in a nanoscale geometry: from mesoscopic to collective effects

Tom Peyrot[1], James Keaveney[2], Yvan Sortais[1], Armen Sargsyan[3], Jean Jacques Greffet[1], Ifan Hughes[2], Charles Adams[2], and Antoine Browaeys[1]
[1]Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Palaiseau, France [2]Department of Physics, Rochester Building, Durham University, United Kingdom, [3]Institute for Physical Research, National Academy of Sciences, Ashtarak 2, Armenia

CA-7: Novel laser concepts

▸ **Monday, 16:15 – 17:45**
Location: *Room 13a ICM*

CA-7.1 MON 16:15

Titanium Sapphire: A decade of diode-laser pumping

Jamie C. E. Coyle[1,2], John-Mark Hopkins[2], Alexander A. Lagatsky[2], and Alan J. Kemp[1]
[1]Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom, [2]Fraunhofer Centre for Applied Photonics, Glasgow, United Kingdom

CA-7.4 MON 17:15

LED pumped transition metal lasers

Pierre Pichon[1,2], François Balembois[1], Frédéric Druon[1], Jean-Philippe Blanchot[2], and Patrick Georges[1]
[1]Laboratoire Charles Fabry, Palaiseau, France, [2]EFFILUX, Les Ulis, France

CF-7: Ultrabroadband laser sources

▸ **Monday, 16:15 – 17:45**
Location: *Room 2 Hall A1*

CF-7.1 MON 16:15

51 W, multi-GW few-cycle laser spanning 1.2 – 2.2 µm wavelength

Martin Gebhardt[1,2], Christian Gaida[1], Tobias Heuermann[1,2], Cesar Jauregui[1], Jose Antonio-Lopez[3], Axel Schülzgen[3], Rodrigo Amezcua-Correa[3], Jan Rothhardt[1,2,4], and Jens Limpert[1,2,4]
[1]Institute of Applied Physics, Friedrich-Schiller-Universität Jena, Jena, Germany, [2]Helmholtz Institute Jena, Jena, Germany, [3]CREOL, College of Optics and Photonics, University of Central Florida, Orlando, USA, [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

EI-2: Exciton/polariton physics in 2D materials

▸ **Tuesday, 8:30 – 10:00**
Location: *Room 4b ICM*

EI-2.1 TUE 8:30

Condensation and expansion of cavity polaritons based on two-dimensional crystals

Christian Schneider[1], Maximilian Waldherr[1], Nils Lundt[1], Martin Klaas[1], Lukasz Dusanovski[1], Alexey Kavokin[2], and Sven Höfling[1]
[1]Technische Physik, University ofWürzburg, Germany, Würzburg, Germany, [2]WIAS, Shilongshan Road, Cloud Town,Hangzhou, China

CK-7: Metasurface

▸ **Tuesday, 8:30 – 10:00**
Location: *Room 14a ICM*

CK-7.1 TUE 8:30

Towards semiconductor-based Metasurfaces

Gauthier Briere[1], Sébastien Héron[1], Peinan Ni[1], Stéphane Vézian[1], Virginie Brandli[1], Benjamin Damilano[1], Jean Yves Duboz[1], Masanobu Iwanaga[2], and Patrice Genevet[1]
[1]CRHEA, CNRS, Sophia antipolis, France, [2]National Institute for Materials Science (NIMS), Tsukuba, Japan

EA-4: Quantum control

▸ **Tuesday, 14:00 – 15:30**
Location: *Room 1 ICM*

EA-4.1 TUE 14:00

The journey from manipulating single quantum systems to quantum information processing

Peter Knight, *Imperial College, London, United Kingdom*

EA-4.2 TUE 14:30

Shaping of coherent state superpositions via deterministically created Schrödinger-cat states

Severin Daiss, Bastian Hacker, Stephan Welte, Armin Shaukat, Stephan Ritter, Lin Li, and Gerhard Rempe
Max-Planck-Institut für Quantenoptik, Garching, Germany

CD-5: Nonlinear nano materials

▸ **Tuesday, 14:00 – 15:30**
Location: *Room 13b ICM*

CD-5.1 TUE 14:00

Nonlinear optics with nanomaterials

Zhipei Sun, *Aalto University, Espoo, Finland*

CD-5.4 TUE 15:00

Optically engineered nonlinear photonic structures in ferroelectrics

Krzysztof Switkowski[1], Shan Liu[2], Wieslaw Krolikowski[2,3], and Yan Sheng[3]
[1]Warsaw University of Technology, Warsaw, Poland, [2]Australian National University, Canberra, Australia, [3]Texas A&M University at Qatar, Doha, Qatar

EF-1: Nonlinear nano-optics and plasmonics

▸ **Tuesday, 14:00 – 15:30**
Location: *Room 14a ICM*

EF-1.3 TUE 14:30

Nonlinear Mie-resonant meta-optics and metasurfaces

Yuri Kivshar, *Australian National University, Canberra, Australia*

CL-5: Label-free imaging and sensing

▸ **Tuesday, 14:00 – 15:30**
Location: *Room Osterseen ICM*

CL-5.1 TUE 14:00

Label-free phytoplankton analysis by high-throughput quantitative phase imaging cytometry and machine learning

Queenie T.K. Lai, Kelvin C.M. Lee, Kenneth K.Y. Wong, and Kevin K. Tsia
The University of Hong Kong, Hong Kong, China

EA-5: Long-range interactions

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 4a ICM*

EA-5.3 TUE 16:30

Solitons and droplets in two-component Bose-Einstein condensates

Cesar R. Cabrera, Julio Sanz, Anika Frölian, Craig Chisholm, Philip Thomas, Bruno Naylor, Luca Tanzi, Pierrick Cheiney, and Leticia Tarruell
ICFO-The Institute of Photonic Sciences, Castelldefels, Spain

CB-6: Long wavelength semiconductor lasers

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 13a ICM*

CB-6.1 TUE 16:00

GaSb-based swept-wavelength lasers for spectroscopic sensing applications in the 1.7-2.5 micron spectral range

Augustinas Vizbaras[1], Ieva Šimonytė[1], Augustinas Trinkūnas[1], Arūnas Miasojedovas[1], Tadas Bučiūnas[1], Andreas De Groote[2], Mindaugas Greibus[1], Greta Naujokaitė[1], Valentinas Andrulis[1], Daan Martens[2], Serge Droz[3], Nicolas Torcheboeuf[3], Dmitri Boiko[3], Žilvinas Dambrauskas[4], Antanas Gulbinas[4], and Kristijonas Vizbaras[1]
[1]Brolis Semiconductors UAB, Vilnius, Lithuania, [2]Brolis Semiconductors BVBA, Ghent, Belgium, [3]Centre Suisse d'Electronique et de Microtechnique SA (CSEM), Neuchatel, Switzerland, [4]Institute for Digestive Research, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania

EF-2: Mode locking and spatio-temporal localization

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 14a ICM*

EF-2.5 TUE 17:00

Light bullets in passively mode-locked lasers: Dynamics and instabilities

Svetlana Gurevich, *Institute for Theoretical Physics, University of Münster, Münster, Germany*

CK-9: Frequency combs

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 14b ICM*

CK-9.1 TUE 16:00

Frequency combs in synchronously-driven optical microresonators

Ewelina Obrzud[1,2], Victor Brasch[1], Steve Lecomte[1], and Tobias Herr[1]
[1]CSEM, Neuchatel, Switzerland, [2]Geneva Observatory, Versoix, Switzerland

CK-9.4 TUE 17:00

Nanophotonic supercontinuum based mid-infrared dual-comb spectroscopy

Hairun Guo[1,2], Wenle Weng[1], Junqiu Liu[1], Fan Yang[3], Wolfgang Hansel[4], Camille-Sophie Bres[5], Luc Thevenaz[3], Ronald Holzwarth[4], and Tobias Kippenberg[1]
[1]LPQM, EPFL, Lausanne, Switzerland, [2]Shanghai University, Shanghai, China, [3]GFO, EPFL, Lausanne, Switzerland, [4]Menlo Systems GmbH, Martinsried, Germany, [5]PHOSL, EPFL, Lausanne, Switzerland

CG-2: Strong-field processes in atoms and molecules

▸ **Tuesday, 16:00 – 17:30**
Location: *Room 2 Hall A1*

CG-2.3 TUE 16:30

Spin and angular momentum in strong-field ionization

Sebastian Eckart, Daniel Trabert, Maksim Kunitski, Kilian Fehre, Alexander Hartung, Markus Schöffler, Till Jahnke, and Reinhard Dörner
University Frankfurt, Frankfurt, Germany

ED-3: Direct comb spectroscopy I

▸ **Wednesday, 8:30 – 10:00**
Location: *Room 4a ICM*

ED-3.1 WED 8:30

Infrared electric-field sampled frequency comb spectroscopy

Scott Diddams, *National Institute of Standards and Technology (NIST), Boulder, USA, Department of Physics, University of Colorado, Boulder, USA*

CB-7: Wavelength control of QCLs

▸ **Wednesday, 8:30 – 10:00**
Location: *Room 13a ICM*

CB-7.1 WED 8:30

Large area surface-emitting photonic crystal quantum cascade laser

Zhixin Wang[1], Yong Liang[1], Bo Meng[1], Yanting Sun[2], Giriprasanth Omanakuttan[2], Emilio Gini[3], Mattias Beck[1], Ilia Sergachev[4], Sebastian Lourdudoss[2], Jérôme Faist[1], and Giacomo Scalari[1]
[1]ETH Zurich, Institute for Quantum Electronics, Zurich, Switzerland, [2]KTH-Royal Institute of Technology, Department of Applied Physics, Stockholm, Sweden, [3]FIRST laboratory ETH Zurich, Zurich, Switzerland, [4]Wyss Zurich, Zurich, Switzerland

CK-10: Plasmonics and antennas

▸ **Wednesday, 8:30 – 10:00**
Location: *Room 13b ICM*

CK-10.1 WED 8:30

Plasmonic Doppler grating and photoluminescence-driven broadband directional optical nanoantennas

Jer-Shing Huang[1,2,3,4], Kel-Meng See[2], Fan-Cheng Lin[2], Tzu-Yu Chen[2], You-Xin Huang[2], Chen-Hsien Huang[2], and A. T. Mina Yesilyurt[1]
[1]Leibniz Institute of Photonic Technology, Jena, Germany, [2]Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan, [3]Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan, [4]Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan

EA-6: Integrated quantum photonics

▸ **Wednesday, 8:30 – 10:00**
Location: *Room 1 Hall A1*

EA-6.3 WED 9:00

Nonlinear quantum devices

Christine Silberhorn, *Paderborn University, Paderborn, Germany*

CG-3: Twisted light fields

▸ **Wednesday, 8:30 – 10:00**
Location: *Room 2 Hall A1*

CG-3.1 WED 8:30

Transfer of orbital angular momentum in high harmonic generation using two driving beams

Thierry Ruchon[1], Céline Chappuis[1], Romain Géneaux[1,2], David Bresteau[1], Olivier Gobert[1], Giovanni De Ninno[3,4], David Gauthier[3], and Thierry Auguste[1]

[1]LIDYL, CEA, CNRS, Université Paris-Saclay, Gif Sur Yvette, France, [2]Department of Physics, University of California, Berkeley, Berkeley, USA, [3]Elettra-Sincrotrone Trieste, Trieste, Italy, [4]Laboratory of Quantum Optics, University of Nova Gorica, Slovenia

EI-4: Hot electrons and nonlinear dynamics in 2D materials

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 4b ICM*

EI-4.1 WED 10:30

Hybrid van derWaals hetero-structures for quantum sensing

Dmitri Efetov, *ICFO, Castelldefels, Spain*

EF-4: Nonlinear integrated photonics

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 14a ICM*

EF-4.3 WED 11:30

Generation and manipulation of quantum frequency states of light with Al-GaAs chips

Saverio Francesconi[1], Giorgio Maltese[1], Félicien Appas[1], Aristide Lemaître[2], Florent Baboux[1], Maria Ines Amanti[1], and Sara Ducci[1]
[1]Laboratoire Matériaux et Phénomènes Quantiques, Université Paris Diderot, Sorbonne Paris Cité, Paris, France, [2]Centre de Nanosciences et de Nanotechnologies, CNRS/Université Paris Sud, Palaiseau, France

CH-9: Microscopy I

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 14b ICM*

CH-9.1 WED 10:30

A hyperspectral camera based on a birefringent ultrastable common-path interferometer

Antonio Perri[1,2], Barbara E. Nogueira de Faria[3], Danielle C. Teles Ferreira[3], Fabrizio Preda[1,2], Dario Polli[1,2], Ana Maria de Paula[3], Daniela Comelli[1], Gianluca Valentini[1], Giulio Cerullo[1,2], and Cristian Manzoni[1]
[1]IFN-CNR, Physics Department, Politecnico di Milano, Milan, Italy, [2]NIREOS S.R.L., Milan, Italy, [3]Departamento de Física, UFMG, Belo Horizonte, Brazil

CG-4: Attosecond dynamics in bulk solids

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 2 Hall A1*

CG-4.5 WED 11:30

Petahertz magnetization dynamics

Julia Anthea Gessner[1,2], Florian Siegrist[1,2], Marcus Ossiander[1], Christian Denker[3], Yi-Ping Chang[1,2], Malte C. Schröder[1,2], Alexander Guggenmos[1,2], Yang Cui[2], Jakob Walowski[3], Ulrike Martens[3], John K. Dewhurst[4], Ulf Kleineberg[1,2], Markus Münzenberg[3], Sangeeta Sharma[5], and Martin Schultze[1,2]
[1]Max-Planck-Institute of Quantum Optics, Garching, Germany, [2]Fakultät für Physik, Ludwig-Maximilians-Universität München, Garching, Germany, [3]Institut für Physik, Universität Greifswald, Greifswald, Germany, [4]Max-Planck-Institute of Microstructure Physics, Halle (Saale), Germany, [5]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

CC-4: THz quantum optics and spintronics

▸ **Wednesday, 10:30 – 12:00**
Location: *Room 3 Hall A1*

CC-4.1 WED 10:30

Spatial and temporal field correlation measurements on the quantum ground state of electromagnetic radiation

Ileana Cristina Benea Chelmus, Francesca Fabiana Settembrini, Giacomo Scalari, and Jerome Faist
Quantum Optoelectronics Group, ETHZ, Zurich, Switzerland

CC-4.2 WED 11:00

Spintronics with terahertz radiation: Insights and applications for spin dynamics and terahertz photonics

Tobias Kampfrath, *Freie Universität, Berlin, Germany, FHI/Max Planck Society, Berlin, Germany*

CJ-10: Ultrafast 2µm fiber laser systems

▸ **Wednesday, 14:00 – 15:30**
Location: *Room 1 ICM*

CJ-10.1 WED 14:00

High performance ultrafast thulium-doped fiber lasers

Jens Limpert[1,2,3], Martin Gebhardt[1,2], Christian Gaida[1], Tobias Heuermann[1,2], Ziyao Wang[1], and Cesar Jauregui[1]
[1]Institute of Applied Physics, FSU Jena, Jena, Germany, [2]Helmholtz-Institute Jena, Jena, Germany, [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

EH-3: Plasmonics and metamaterials with 2D-materials

▸ **Wednesday, 14:00 – 15:30**
Location: *Room 4a ICM*

EH-3.1 WED 14:00

Control of light-matter interaction in two-dimensional materials

Vinod Menon, *City College & Graduate Center of CUNY, New York, USA*

CA-10: Mid-infrared lasers

▸ **Wednesday, 14:00 – 15:30**
Location: *Room 13a ICM*

CA-10.3 WED 14:30

Rare-earth doped sesquioxide ceramics for highly efficient mid-infrared lasers

Jun Wang[1], Danlei Yin[1], Peng Liu[2], Jie Ma[2], Ying Wang[2], and Dingyuan Tang[1]
[1]Nanyang Technological University, Singapore, Singapore, [2]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, Jiangsu Normal University, XuZhou, China

EG-1: Engineering of complex electromagnetic fields

▸ **Wednesday, 14:00 – 15:30**
Location: *Room 14a ICM*

EG-1.3 WED 14:30

Colour Engineering: form nature to applications

Silvia Vignolini, *Chemistry Department University of Cambridge, Cambridge, UK*

EJ-2: Computational quantum optics, plasmonics and metamaterials

▸ **Wednesday, 14:00 – 15:30**
Location: *Room Osterseen ICM*

EJ-2.1 WED 14:00

Quantum phenomena in the electrodynamics of nanoplasmonic structures

N. Asger Mortensen, *Center for Nano Optics, University of Southern Denmark, Odense, Denmark*

JSVI-1: 50 Years of integrated optics I

▸ **Wednesday, 16:00 - 17:30**
Location: *Room 1 ICM*

JSVI-1.2 WED 17:00

Photonic chipscale soliton frequency combs

Tobias J. Kippenberg, *EPFL, Lausanne, Switzerland*

CD-8: Spatio-temporal manipulation of light

▸ **Wednesday, 16:00 - 17:30**
Location: *Room 13b ICM*

CD-8.1 WED 16:00

Phase manipulation with nonlinear metasurfaces

Nitipat Pholchai[1] and Thomas Zentgraf[2]
[1]Department of Industrial Physics and Medical Instrumentation, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand, [2]University of Paderborn, Department of Physics, Paderborn, Germany

EJ-3: Application-driven computational photonics modeling

▸ **Wednesday, 16:00 -17:30**
Location: *Room Osterseen ICM*

EJ-3.1 WED 16:00

THz emission driven by ionization pressure in relativistic plasmas

Luc Bergé and Jérémy Déchard
CEA-DAM, DIF, Arpajon, France

CJ-11: Spatiotemporal effects in multimode fiber lasers

▸ **Thursday, 8:30 – 10:00**
Location: *Room 1 ICM*

CJ-11.3 THU 9:00

Spatiotemporal mode-locking in multimode fiber lasers

Frank Wise, *Cornell University, Ithaca, NY, USA*

JSIII-1: Light management for photovoltaics

▸ **Thursday, 8:30 – 10:00**
Location: *Room 4a ICM*

JSIII-1.1 THU 8:30

Tailored disorder for the light management in photovoltaics

Stefan Nanz[1], Aimi Abass[2], Evgeniia Slivina[2], Peter M. Piechulla[3], Alexander Sprafke[3], Ralf B. Wehrspohn[3,4], and Carsten Rockstuhl[1,2]
[1]Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology, Karlsruhe, Germany, [2]Institute of Nanotechnology, Karlsruhe Institute of Technology, Karlsruhe, Germany, [3]Institute of Physics, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany, [4]Fraunhofer Institute for Microstructure of Materials and Systems, Halle (Saale), Germany

JSVI-2: 50 Years of integrated optics II

▸ **Thursday, 8:30 – 10:00**
Location: *Room 5 ICM*

JSVI-2.1 THU 8:30

Glass integrated optics: 50 Years and still growing strong

Giancarlo C. Righini[1,2], Simone Berneschi[1], Andrea Chiappini[3], Alessandro Chiasera[3], Maurizio Ferrari[3,2], Gualtiero Nunzi Conti[1,2], and Stefano Pelli[1,2]
[1]IFAC-CNR, Institute of Applied Physics "N. Carrara", Firenze, Italy, [2]Enrico Fermi Center, Roma, Italy, [3]IFN-CNR, Institute of Photonics & Nanotechnologies, Trento, Italy

JSVI-2.2 THU 9:00

Numerical techniques for modelling integrated optical circuits

Francesco Prudenzano, *Department of Electrical and Information Engineering, Polytechnic University of Bari, Bari, Italy*

JSVI-2.3 THU 9:30

Challenges in the miniaturization of Mid-IR sensors fully integrated on Si

Sergio Nicoletti, Jean-Marc Fédéli, Maryse Fournier, Pierre Labeye, Pierre Barritault, Adrien Marchant, Alain Glière, Alexandre Teulle, Jean Guillaume Coutard, and Laurent Duraffourg
Univ. Grenoble Alpes, CEA, LETI, DOPT, SNAP/LCO, Grenoble, France

EG-3: Nanoscale imaging and spectroscopy

▸ **Thursday, 8:30 – 10:00**
Location: *Room 14a ICM*

EG-1.3 THU 8:30

Dynamic plasmonic displays and holograms

Laura Na Liu, *University of Heidelberg, Heidelberg, Germany*

JSIII-2: Thermo-photonics, materials and energy efficiency

▸ **Thursday, 10:30 – 12:00**
Location: *Room 4a ICM*

JSIII-2.1 THU 10:30

Control of thermo-photonic energy flows with nano-structured and 2D materials

Ognjen Ilic, *Caltech, Pasadena, USA*

EF-8: Solitons in microcavities

▸ **Thursday, 10:30 – 12:00**
Location: *Room 4b ICM*

EF-8.3 THU 11:00

Observation of laser-cavity solitons in micro-resonators

Hualong Bao[1], Andrew Cooper[1], Maxwell Rowley[1], Luigi Di Lauro[1], Juan Sebastian Totero Gongora[1], Sai T. Chu[2], Brent E. Little[3], Gian-Luca Oppo[4], Roberto Morandotti[5,6,7], David J. Moss[8], Benjamin Wetzel[1,9], Marco Peccianti[1], and Alessia Pasquazi[1]
[1]University of Sussex, Brighton, United Kingdom, [2]City University of Hong Kong, Hong Kong, China, [3]Xi'an Institute of Optics and Precision

Mechanics, Xi'an, China, [4]SUPA, University of Strathclyde, Glasgow, United Kingdom, [5]INRS-EMT, Québec, Canada, [6]Institute of Fundamental and Frontier Sciences, Chengdu, China, [7]ITMO University, St. Petersburg, Russia, [8]Centre for Microphotonics, Hawthorn, Australia, [9]Xlim Research Institute, Limoges, France

EC-2: Novel systems for topological photonics II

▸ **Thursday, 10:30 – 12:00**
Location: *Room 13b ICM*

EC-2.1 THU 10:30

Exploring topological photonics in synthetic dimensions

Hannah M. Price[1], Tomoki Ozawa[2], Nathan Goldman[3], Oded Zilberberg[4], and Iacopo Carusotto[5]
[1]University of Birmingham, Birmingham, United Kingdom, [2]Interdisciplinary Theoretical and Mathematical Sciences Program (iTHEMS), RIKEN, Saitama, Japan, [3]Université Libre de Bruxelles, Brussels, Belgium, [4]ETH Zurich, Zurich, Switzerland, [5]INO-CNR BEC Center, Trento, Italy

CJ-13: Raman and NIR fiber lasers

▸ **Thursday, 14:00 – 15:30**
Location: *Room 1 ICM*

CJ-13.1 THU 14:00

Diode-pumped multimode Raman fiber lasers

Sergey A. Babin, *Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia, Novosibirsk State University, Novosibirsk, Russia*

EH-5: Nonlinear metasurfaces and plasmonics

▸ **Thursday, 14:00 – 15:30**
Location: *Room 4a ICM*

EH-5.5 THU 15:00

Giant nonlinear response at a plasmonic nanofocus drives effcient four wave mixing over micron length scales

Rupert Oulton, Nicholas Gusken, Michael Nielsen, Xingyuan Shi, Paul Dichtl, and Stefan Maier
Imperial College London, London, UK

EC-3: Lasing and driven dissipative systems

▸ **Thursday, 14:00 – 15:30**
Location: *Room 4b ICM*

EC-3.3 THU 14:30

Topological insulator laser

Miguel A. Bandres[1,2], Steffen Wittek[2], Gal Harari[1], Midya Parto[2], Jinhan Ren[2], Morderchai Segev[1], Demetrios N. Christodoulides[2], and Mercedeh Khajavikhan[2]
[1]Technion, Haifa, Israel, [2]CREOL, Univeristy of Central Florida, Orlando, USA

EB-7: Colour centres and novel sources

▸ **Thursday, 14:00 – 15:30**
Location: *Room 5 ICM*

EB-7.1 THU 14:00

Multi-qubit registers of individually addressable solid-state defect centers

Eric Bersin[1], Michael Walsh[1], Sara Mouradian[1], Matthew Trusheim[1], Kevin Chen[1], Tim Schröder[2], and Dirk Englund[1]
[1]Massachusetts Institute of Technology, Cambridge, USA, [2]Humboldt University of Berlin, Berlin, Germany

CD-11: Nonlinear application at extreme wavelengths

▸ **Thursday, 14:00 – 15:30**
Location: *Room 13b ICM*

CD-11.1 THU 14:00

XUV free electron laser based nonlinear optics

Claudio Masciovecchio, *Elettra Sincrotrone Trieste, Trieste, Italy*

EG-5: Emission control at the nanoscale

▸ **Thursday, 14:00 – 15:30**
Location: *Room 14a ICM*

EG-5.1 THU 14:00

The next generation of quantum emitters?

David Norris, *ETH Zurich, Zurich, Switzerland*

EF-9: Solitons and their applications

▸ **Thursday, 14:00 – 15:30**
Location: *Room Osterseen ICM*

EF-9.1 THU 14:00

Experimental demonstration and numerical study of plasmon-soliton waves

Gilles Renversez[1], Mahmoud Elsawy[1], Mathieu Chauvet[2], Tintu Kuriakose[2], Tomaz Halenkovic[3], Virginie Nazabal[4], and Petr Nemec[3]
[1]Aix-Marseille Univ, CNRS, Institut Fresnel, Marseille, France, [2]FEMTO-ST Institute, CNRS, Université de Bourgogne Franche-Comté, Besançon, France, [3]Department of Graphic Arts and Photophysics, Faculty of Chemical Technology, University of Pardubice, Pardubice, Czech Republic, [4]Institut des sciences chimiques de Rennes, CNRS, Equipe Verres et Céramiques, Université de Rennes 1, Rennes, France

CC-7: CW THz systems and spectroscopy

▸ **Thursday, 14:00 – 15:30**
Location: *Room 1 Hall A1*

CC-7.5 THU 15:00

Room-temperature 1 to 7.5 THz metrological grade terahertz spectrometer

Michele De Regis[1], Luigi Consolino[1,2], Saverio Bartalini[1,2], and Paolo De Natale[1,2]
[1]INO, Istituto Nazionale di Ottica-CNR, Florence, Italy, [2]LENS, European Laboratory for Nonlinear Spectroscopy, Sesto Fiorentino (FI), Italy

CF-11: XUV generation and characterisation

▸ **Thursday, 14:00 – 15:30**
Location: *Room 2 Hall A1*

CF-11.1 THU 14:00

Realization of polarization control in high-order harmonic generation

Pei-Chi Huang[1], Po-Yao Huang[1], Kuang-Yu Chang[1], and Ming-Chang Chen[1,2]

[1]*Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan,* [2]*Department of Physics, National Tsing Hua University, Hsinchu, Taiwan*

EH-6: Plasmonic enhancement of light-matter interactions

▸ **Thursday, 16:00 – 17:30**
Location: *Room 4a ICM*

EH-6.3 THU 16:30

Strong plasmon-exciton interactions at a single nanoantenna level

Timur Shegai, *Chalmers University of Technology, Gothenburg, Sweden*

CD-12: Quantum and information technologies

▸ **Thursday, 16:00 – 17:30**
Location: *Room 13b ICM*

CD-12.1 THU 16:00

Demonstration of distributed quantum sensing using nonlinear optics

Xueshi Guo[1], Casper Breum[1], Johannes Borregaard[2], Shuro Izumi[1], Mikkel V. Larsen[1], Jonas S. Neergaard-Nielsen[1], and Ulrik L. Andersen[1]
[1]*Technical University of Denmark, Department of Physics, Lyngby, Denmark,* [2]*University of Copenhagen, Department of Mathematical Sciences, Copenhagen, Denmark*

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ROOM 1 ICM

10:30 – 12:00

EB-1: Quantum interfaces

Chair: Viktor Krutianskii, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria

EB-1.1 SUN (Invited) 10:30

Diamond light matter quantum interface

•*F. Jelezko*; *Institute of Quantum Optics, Ulm University, Ulm, Germany*

Interfacing coherent optical transitions with long-lived spin qubits will be the main topic of this talk. Prospects for realizing coherent quantum registers based on optically controlled GeV centers will be discussed

ROOM 3 ICM

10:30 – 12:00

CJ-1: Short-wavelengths thulium-doped fiber lasers

Chair: Sébastien Février, Univ. Limoges, CNRS, XLIM UMR 7252, Limoges, France

CJ-1.1 SUN 10:30

Short-wavelength, near-diffraction-limited beam, 792 nm cladding pumped efficient thulium-doped fiber laser in a power-scalable fiber design

•*S. Pidishety, P. Barua, P. C Shardlow, P. G Rojas Hernandez, M. Belal, Y. Feng, N. k Thipparapu, J. K Sahu, and J. Nilsson*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

A thulium-doped fiber laser tunable from 1850 to 1900 nm with near-diffraction-limited beam quality and designed for power scalability and efficient two-for-one cross-relaxation at short wavelengths exceeds 50% slope efficiency wrt launched 792-nm pump power.

CJ-1.2 SUN 10:45

Thulium-doped Fibre Laser with 25 W Single-mode Output at 1726 nm

•*M. Burns, P. Shardlow, P. Barua, T. Jefferson-Brain, J. Sahu, and W. Clarkson*; *Optoelectronics Research Centre, Southampton, United Kingdom*

A thulium-doped fibre laser, core-pumped by an erbium-only doped fibre laser at 1580 nm, yields 25.3 W of single-mode output at 1726 nm with a slope efficiency of 76.7% with respect to launched pump power.

ROOM 13a ICM

10:30 – 12:00

CA-1: Laser beam control

Chair: Marwan Abdou-Ahmed, Institut für Strahlwerkzeuge, Stuttgart, Germany

CA-1.1 SUN 10:30

Up to 290 W radially polarized output power from a single-stage single-crystal Yb:YAG amplifier

•*F. Beirow*[1], *M. Eckerle*[1], *N. Aubry*[2], *M. Perrier*[2], *J. Didierjean*[2], *P. Beaure D'augères*[2], *T. Graf*[1], *and M. Abdou Ahmed*[1]; [1]*Institut für Strahlwerkzeuge, University Stuttgart, Stuttgart, Germany*; [2]*Fibercryst SAS, Decines Charpieu, France*

We present the amplification of a radially polarized beam in a single-stage single-crystal fiber Yb:YAG amplifier to an output power of 290W in continuous wave operation and 270W in femtosecond operation.

CA-1.2 SUN 10:45

Hybrid Ho:YAG laser with 50W radially-polarised output

•*P.C. Shardlow, M.J. Barber, A.C. Butler, and W.A. Clarkson*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

An all-fibre 1907.3nm Tm fibre laser source is re-formatted into an annular profile and imaged into a Ho:YAG crystal. The induced thermal birefringence and cavity design are utilised to generate 50W of radially polarised output.

ROOM 13b ICM

10:30 – 12:00

CD-1: Solitons

Chair: Thomas Feurer, IAP Univeristät Bern, Bern, Switzerland

CD-1.1 SUN 10:30

Comparative Study of Harmonic Generation in Air and Argon in Light Filaments Driven by Circularly Polarized mid-IR Pulses

•*V. Shumakova*[1], *C. Gollner*[1], *A. Voronin*[2,3], *A. Mitrofanov*[2,3], *D. Sidorov Biryukov*[3], *A. Zheltikov*[2,3,4], *D. Kartashov*[5], *A. Baltuska*[1,6], *and A. Pugzlys*[1,6]; [1]*Photonics Institute, TU Wien, Austria*; [2]*Physics Department, M.V. Lomonosov Moscow State University, Moscow, Russia*; [3]*Russian Quantum Center, Skolkovo, Russia*; [4]*Department of Physics and Astronomy, Texas A&M University, College Station, USA*; [5]*Friedrich-Schiller University Jena, Germany*; [6]*Center for Physical Sciences & Technology, Vilnius, Lithuania*

Low-order harmonics in mid-IR laser filaments are generated in air and argon at different ellipticity of driving pulses. Rotational excitation of molecules allows generation of harmonics in air in the case of circular polarization.

CD-1.2 SUN 10:45

Multioctave Supercontinua from Shock-Coupled Soliton Self-Compression in Hollow-Core Antiresonance-Guiding PCF

•*E.A. Stepanov*[1,2], *A.A. Voronin*[1,2], *F. Meng*[4], *A.V. Mitrofanov*[1,2,5,6], *D.A. Sidorov-Biryukov*[1,2,5], *M.V. Rozhko*[1,2], *P.B. Glek*[1], *Y. Li*[4], *A.B. Fedotov*[1,2], *A. Pugzlys*[7], *A. Baltuska*[7], *C. Wang*[4], *M. Hu*[4], *and A.M. Zheltikov*[1,2,3,5]; [1]*Physics Department, International Laser Center, M.V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Russian Quantum Center, Moscow, Russia*; [3]*Department of Physics and Astronomy, Texas A&M University, College Station, USA*; [4]*Tianjin University, Tianjin, China*; [5]*Kurchatov Institute National Research Center, Moscow, Russia*; [6]*Institute of*

ROOM 14a ICM

10:30 – 12:00

CK-1: Light management

Chair: Peter Smith, University of Southampton, Southampton, United Kingdom

CK-1.1 SUN 10:30

Tuning the chirality of a dipole moment in an achiral particle with structured light

•*J.S. Eismann*[1,2], *M. Neugebauer*[1,2], *and P. Banzer*[1,2]; [1]*Max Planck Institute for the Science of Light, Staudstr. 2, D-91058 Erlangen, Germany*; [2]*Institute of Optics, Information and Photonics, University Erlangen-Nuremberg, Staudstr. 7/B2, D-91058 Erlangen, Germany*

We use structured light to excite a chiral dipole emitting circular polarisation of only one handedness. Changing the ratio between the radial and azimutal excitation beams facilitates tuning of the chirality of the dipole moment.

CK-1.2 SUN 10:45

Experimental Realization of a Handedness-Preserving Chiral Photonic Crystal Mirror

•*B. Semnani*[1,2], *J. Flannery*[1,3], *R. Al Maruf*[1,2], *and M. Bajcsy*[1,2,3]; [1]*Institute for Quantum Computing, University of Waterloo, Waterloo, Canada*; [2]*Department of Electrical and Computer Engineering,University of Waterloo, Waterloo, Canada*; [3]*Department of Physics and Astronomy, University of Waterloo, Waterloo, Canada*

This work reports on our unprecedented experimental observation of a giant chira-optical effect in an ultra-thin photonic crystal mirror. The mirror selectively reflects one spin state of light while, unconventionally, preserving its handedness.

ROOM 14b ICM

10:30 – 12:00

CM-1: Beam shaping for laser processing

Chair: Patrick Salter, Oxford University, Oxford, United Kingdom

CM-1.1 SUN (Invited) 10:30

Temporal Airy pulses: high aspect ratio nanomachining of dielectrics, cell poration and light amplification in excited dielectrics

•*T. Baumert*; *University of Kassel, Institute of Physics and CINSaT, Heinrich-Plett-Str. 40, D-34132 Kassel, Germany*

We demonstrate the generation of high aspect ratio ablation structures in fused silica utilizing single-shot temporal Airy pulses in a regime where the chosen intensity is well below the threshold for self-focusing and thus filamentation.

ROOM 14c ICM

10:30 – 12:00

EE-1: New principles of ultrafast spectroscopy

Chair: Stefan Haacke, University of Strasbourg - CNRS, Strasbourg, Germany

EE-1.1 SUN (Invited) 10:30

Femtosecond covariance spectroscopy

•D. Fausti; University of Trieste, Trieste, Italy

I will review the possibility to retrieve nonlinear responses in complex materials by measuring noise correlations of classical and quantum nature

ROOM 21 ICM

10:30 – 12:00

JSV-1: Atom interferometry and quantum optics

Chair: Michael Drewsen, Aarhus University, Aarhus, Denmark

JSV-1.1 SUN (Invited) 10:30

Gravitational Physics with Atomic Quantum Sensors

•G.M. Tino; Dipartimento di Fisica e Astronomia and LENS Laboratory, Università di Firenze Istituto Nazionale di Fisica Nucleare, Sezione di Firenze, Sesto Fiorentino (Firenze), Italy

I will describe experiments for precision tests of gravitational physics using new quantum devices based on ultracold atoms, namely, atom interferometers and optical clocks.

ROOM 1 Hall A1

10:30 – 12:00

CH-1: Optical fibre sensors

Chair: Marian Marciniak, National Institute of Telecommunications, Warsaw, Poland

CH-1.1 SUN (Invited) 10:30

The photonic guitar pickup: a high-sensitivity, high-bandwidth fiber strain sensor

J.A. Barnes and •H.-P. Loock; Dept. of Chemistry, Queen's University , Kingston, Canada

We present a fiber strain sensor based on a locked fiber Fabry-Perot (FFP) and its use to monitor acoustic and ultrasound signals. Examples are an acoustic guitar, medical ultrasound and two different (photo-)acoustic resonators.

ROOM 2 Hall A1

10:30 – 12:00

CF-1: High-power oscillators

Chair: Zhixin Wang, ETH Zurich, Zurich, Switzerland

CF-1.1 SUN 10:30

350-W Average-Power SESAM-Modelocked Ultrafast Thin-Disk Laser

F. Saltarelli[1], •I. Graumann[1], L. Lang[1], D. Bauer[2], C. Phillips[1], and U. Keller[1]; [1]Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland; [2]TRUMPF Laser GmbH, Schramberg, Germany

We present an Yb:YAG thin-disk oscillator delivering a record-high 350-W average power with 940-fs, 40-uJ pulses exploiting vacuum operation, multiple passes on the disk, and large pump spot. Power scaling toward 500 W appears feasible.

CF-1.2 SUN 10:45

Towards 45 watt single-cycle pulses from Yb:YAG thin-disk oscillators

•G. Barbiero[1,2], R.N. Ahmad[1,2], H. Wang[1,2], F. Köttig[3], D. Novoa[3], F. Tani[3], J. Brons[4], P.S.J. Russell[3], F. Krausz[1,2], and H. Fattahi[2]; [1]Ludwig-Maximilians-Universität München, Garching, Germany; [2]Max-Planck-Institut für Quantenoptik, Garching, Germany; [3]Max-Planck-Institut für die Physik des Lichts, Erlangen, Germany; [4]Currently at: TRUMPF Laser GmbH, Schramberg, Germany

By employing a hybrid external nonlinear stage, 45-W, 7-fs pulses from a 6-μJ, 265-fs Yb:YAG thin-disk oscillator are generated. Careful optimization of parameters holds promise for generation of self-compressed, single-cycle pulses at 45 W.

ROOM 6 Hall A1

10:30 – 12:00

CI-1: Probabilistic shaping and NFT-based transmission

Chair: Antonio Napoli, Infinera, Munich, Germany

CI-1.1 SUN 10:30

Statistical Properties of Phase and Eigenvalues of Nonlinear Fourier Transform of Second Order Solitons

M. Tanner[1,2], W.Q. Zhang[1,2], T. Chan[1], T.M. Monro[2], and •S. Afshar V.[2]; [1]Institute for Telecommunications Research, University of South Australia, Adelaide, Australia; [2]Laser Physics and Photonic Devices Laboratories, School of Engineering, University of South Australia, Adelaide, Australia

We investigate the noise properties of the phase and eigenvalues of Nonlinear Fourier Transform (NFT) of second-order solitons and show that they are both correlated and approaching a maxima at a NFT phase differences of π.

CI-1.2 SUN 10:45

Signal-dependent noise for b-modulation NFT-based transmission

A. Vasylchenkova, •M. Pankratova, J. Prilepsky, N. Chichkov, and S. Turitsyn; Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom

We study the correlation properties of effective noise for communication systems employing the nonlinear Fourier transform and b-modulation. It is shown that the effective noise covariance functions depend on propagations distance and signal power.

ROOM 7 Hall A1

10:30 – 12:30

CE-1: Opportunities for advanced nanostructured and non-linear optical materials

Chair: Katia Gallo, KTH - Royal Institute of Technology, Stockholm, Sweden

CE-1.1 SUN (Invited) 10:30

New Opportunities with Old Optical Materials

•M. Loncar; Harvard University, Cambridge, USA

Nanostructured diamond and lithium niobate (LN) devices will be presented, with applications in quantum communications, data- and tele-com, sensing (e.g. using frequency combs), and so on.

ROOM 1 ICM

EB-1.2 SUN 11:00

Time-Bin Entanglement Between a Diamond Spin and a Telecom Photon.

•*A. Tchebotareva*[1,2], *S. Hermans*[1,3], *P. Humphreys*[1,3], *D. Voigt*[1,2], *P. Harmsma*[1,2], *L. Cheng*[2], *A. Verlaan*[2], *N. Dijkhuizen*[2], *W. de Jong*[2], *A. Dréau*[1,3,4], *and R. Hanson*[1,3]; [1]*QuTech, Delft University of Technology, Delft, Netherlands*; [2]*TNO - Netherlands Organisation for Applied Scientific Research, Delft, Netherlands*; [3]*Kavli Institute of Nanoscience, Delft University of Technology, Delft, Netherlands*; [4]*Laboratoire Charles Coulomb, Université de Montpellier and CNRS, Montpellier, France*

We experimentally demonstrate entanglement preservation between an NV spin in diamond and the NV-emitted photon upon its quantum frequency conversion to the telecom band. This is crucial for realizing long-distance NV-based quantum networks.

EB-1.3 SUN 11:15

Conversion of Two Photons with Different Color by a Single Waveguide for Quantum Networks

•*C. Müller, T. Kroh, and O. Benson*; *Humboldt-Universität zu Berlin, Berlin, Germany*

We present a frequency conversion for single photon pairs with different wavelengths on a single device. This enables conversions of time-bin entangled photon pairs from the NIR to the telecom band.

ROOM 3 ICM

CJ-1.3 SUN 11:00

All-normal-dispersion mode-locked Tm:ZBLAN fiber laser

•*H. Sagara and M. Tokurakawa*; *ILS, UEC, Tokyo, Japan*

We have developed an all-normal-dispersion Tm:ZBLAN fiber laser at 1.9 um. An output power of 63mW at 70.6MHz repetition rate with ~80nm spectral bandwidth were obtained. 106 fs pulse duration was obtained after compression.

CJ-1.4 SUN 11:15

Ultrafast Light Source at 1.8 μm Based on Thulium-Doped Fibers for Three-Photon Microscopy

•*Y. Nomura*[1,2], *H. Murakoshi*[3], *and T. Fuji*[1]; [1]*Institute for Molecular Science, Okazaki, Japan*; [2]*JST-PRESTO, Kawaguchi, Japan*; [3]*National Institute for Physiological Sciences, Okazaki, Japan*

An ultrafast thulium-doped fiber laser system operating at 1.8 μm is demonstrated. The output pulses are used to observe the images of red fluorescent beads through three-photon excitation processes.

ROOM 13a ICM

CA-1.3 SUN 11:00

Compact Non-Astigmatic Alexandrite Ring Laser with Unidirectional Single-Longitudinal-Mode operation

•*J. Sathian*[1], *G. Tawy*[1], *X. Sheng*[1], *A. Minassian*[2], *and M. Damzen*[1]; [1]*Imperial College London, London, United Kingdom*; [2]*Unilase Ltd, London, United Kingdom*

We report single-longitudinal-mode operation of a wavelength-tunable Alexandrite unidirectional ring laser with a simplified non-astigmatic design, producing continuous-wave output 0.69 W and in excellent TEM00 beam quality (M2 < 1.1) across its full pumping range.

CA-1.4 SUN 11:15

Generation of Multiple Up-converted OAM States from a Tunable Optical Vortex Parametric Laser Source

•*R. Mamuti*[1], *S. Nishida*[1], *K. Miamoto*[1,2], *and T. Omatsu*[1,2]; [1]*Chiba University, Chiba, Japan*; [2]*Molecular Chirality Research Center, Chiba, Japan*

We report on the first demonstration of a tunable vortex laser source with multiple up-converted OAM states based on a singly resonant optical parametric oscillator formed of a non-critical phase-matching LiB3O5 crystal.

ROOM 13b ICM

Laser and Information Technologies, Shatura, Russia; [7]*Photonics Institute, Vienna University of Technology, Vienna, Austria*

Ultrashort mid-IR pulses are used to generate multioctave supercontinua spanning from the ultraviolet to the mid-infrared in antiresonance-guiding single-ring hollow-core PCF. Field evolution behind the generation of this supercontinuum involves soliton self-compression to sub-half-cycle field transients.

CD-1.3 SUN 11:00

Soliton self-compression in air filled Kagome HCPCF

•*M. Maurel*[1,2], *F. Amrani*[1], *B. Debord*[1,2], *F. Gérôme*[1,2], *and F. Benabid*[1,2]; [1]*GPPMM group, Xlim laboratory, Limoges, France*; [2]*GLOphotonics, Limoges, France*

We report on experimental propagation dynamics of ultra-short-pulse in HCPCF showing compression to a highly stable 22-fs-pulse in a single-stage, and original sequence between soliton red and blue frequency-shift for input pulse-energy-range of 100-250 μJ.

CD-1.4 SUN 11:15

Topological Control of Optical Nonlinear Waves

•*G. Marcucci*[1], *D. Pierangeli*[1], *A. Agranat*[2], *E. DelRe*[1], *and C. Conti*[1]; [1]*Sapienza University, Rome, Italy*; [2]*Hebrew University of Jerusalem, Jerusalem, Israel*

We introduce the topological control, based on correspondences between phases and genus of toroidal surfaces associated with nonlinear Schroedinger equation. We prove it experimentally and report observations of controlled transitions from shock to rogue waves.

ROOM 14a ICM

CK-1.3 SUN 11:00

Airy Plasmon Pulses investigated by Multiphoton Photoemission Electron Microscopy (PEEM)

•*A.V. Singh, M. Falkner, T. Kaiser, M. Zilk, M. Steinert, and T. Pertsch*; *Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller Universität, Jena, Germany*

We experimentally investigate the propagation of an Airy SPPs on a metallic film by Multiphoton Photoemission Electron Microscopy and compare the result with numerical simulations. The creation of ultrashort spatiotemporal hotspots are also considered.

CK-1.4 SUN 11:15

Spatial phase modulator based on optomechanically deformable gratings

•*C.B. Rojas Hurtado*[1], *J. Dickmann*[1], *and S. Kroker*[1,2]; [1]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [2]*Technische Universität Braunschweig, Braunschweig, Germany*

We propose a deformable nanostructured surface consisting of a subwavelength grating as a phase shifter modulator by exploiting its tunable optomechanical response, which can be controlled either optically or piezo-electrically.

ROOM 14b ICM

CM-1.2 SUN 11:00

Shaped accelerating beams for materials processing

D. Mansour[1,2] *and* •*D. Papazoglou*[1,2]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas (FORTH), Heraklion, Greece*; [2]*Materials Science and Technology Department, University of Crete, Heraklion, Greece*

Accelerating optical wavepackets, further focused by a lens or an axicon can be tuned to achieve a rich control of the focal voxel over an extended range of working distances and act as light scalpels.

CM-1.3 SUN 11:15

Conical-phase front beam shaping for deep laser-writing of optical waveguides

•*E. Alimohammadian, S. Liu, E. Ertorer, J. Li, and P.R. Herman*; *Department of Electrical & Computer Engineering, University of Toronto, Toronto, Canada*

Conical phase front shaping of focussed femtosecond laser beams are shown to manipulate countering effects of surface aberration and Kerr lensing in deep focussing and permit writing of low loss optical waveguides in fused silica.

ROOM 14c ICM

EE-1.2 SUN 11:00

Generalizing time-domain ptychography for single beam applications

•*D.-M. Spangenberg*[1], *M. Brügmann*[2], *E. Rohwer*[1], *and T. Feurer*[2]; [1]*Laser Research Institute, Stellenbosch University, Stellenbosch, South Africa*; [2]*Institute of Applied Physics, University of Bern, Bern, Switzerland*

Time-domain ptychography has found many applications since migration from the spatial domain. Here I will discuss a generalised extension of the reconstruction algorithm for single beam applications.

EE-1.3 SUN 11:15

Bi-elliptical High Harmonic Spectroscopy of Atomic Potentials

•*E. Bordo*[1], *O. Neufeld*[1], *O. Kfir*[2], *A. Fleischer*[3], *and O. Cohen*[1]; [1]*Physics Department and Solid State Institute, Technion - Israel Institute of Technology, Haifa, Israel*; [2]*4th Physical Institute, University of Göttingen, Göttingen, Germany*; [3]*Raymond and Beverly Sackler Faculty of Exact Science, School of Chemistry, Tel Aviv University, Tel Aviv , Israel*

We theoretically and experimentally demonstrate that bi-elliptical high harmonic generation is sensitive to the effective potential structure and to the valence-orbital width of noble gas atoms, and analyze the responsible (non semi-classical) physical mechanisms.

ROOM 21 ICM

JSV-1.2 SUN 11:00

Improving the accuracy of atom gravimeters with ultracold sources

•*R. Karcher, A. Imanaliev, S. Merlet, and F. Pereira dos Santos*; *LNE-SYRTE, Paris, France*

Using ultracold atoms we tackled and improved by a factor three the uncertainty of the limiting effect of atom gravimeters: the wavefront aberration bias due to distortions of the laser beamsplitters driving the interferometer.

JSV-1.3 SUN 11:15

The role of trap symmetry in an atom-chip interferometer above the Bose-Einstein condensation threshold

•*M. Dupont-Nivet*[1], *C. Westbrook*[2], *and S. Schwartz*[3]; [1]*Thales Research and Technology France, Palaiseau, France*; [2]*Laboratoire Charles Fabry de l'Institut d'Optique, Palaiseau, France*; [3]*Laboratoire Kastler Brossel de l'Ecole Normale Supérieur, Paris, France*

We study an atom-chip interferometer using 87 rubidium above the Bose-Einstein condensation threshold. The temperature and the traps symmetry dependencies of the contrast are in agreement with previous theoretical prediction.

ROOM 1 Hall A1

CH-1.2 SUN 11:00

Functionalized carbon reinforcement structures with optical fibre sensors for carbon concrete composites

•*K. Bremer*[1], *L.S.M. Alwis* [2], *F. Weigand*[3], *M. Kuhne*[4], *R. Helbig*[3], *and B. Roth*[1,5]; [1]*Hannover Centre for Optical Technologies, Hannover, Germany*; [2]*Edinburgh Napier University, Edinburgh, United Kingdom*; [3]*Saxon Textile Research Institute, Chemnitz, Germany*; [4]*Materialforschungs- und -prüfanstalt an der Bauhaus-Universität Weimar, Weimar, Germany*; [5]*Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany*

We present our latest efforts in the development of functionalized carbon reinforcement structures (FCSs). FCSs are textile based carbon structures with integrated optical fibre sensors for the reinforcement and structural health monitoring of concrete composites.

CH-1.3 SUN 11:15

Optical Fibre Sensors for Monitoring Sewer Concrete Corrosion

•*M. Ams*[1], *P. Giri*[1], *P. Dekker*[1], *S. Taheri*[2], *J. Gonzalez*[3], *S. Clark*[2], *T. Kuen*[4], *L. Vorreiter*[3], *H. Bustamante*[3], *and M. Withford*[1]; [1]*Department of Physics and Astronomy, Macquarie University, North Ryde, NSW, Australia*; [2]*Department of Earth and Planetary Sciences, Macquarie University, North Ryde, NSW, Australia*; [3]*Sydney Water Corporation, Parramatta, NSW, Australia*; [4]*Melbourne Water, Docklands, VIC, Australia*

We outline the development of long-lived optical fibre sensors to monitor temperature, strain, moisture and pH levels in wastewater concrete structures. The sensors will enable asset managers to monitor concrete corrosion and reduce maintenance costs.

ROOM 2 Hall A1

CF-1.3 SUN 11:00

Thin-disk Mamyshev oscillator supporting discrete similaritons

•*F.Ö. Ilday*[1,2,3], *D.K. Kesim*[1,2], *M. Hoffmann*[4], *and C.J. Saracneo*[4]; [1]*UNAM-National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey*; [2]*Department of Electrical and Electronics Engineering, Bilkent University, Ankara, Turkey*; [3]*Department of Physics, Bilkent University, Ankara, Turkey*; [4]*Department of Electrical Engineering and Information Technology, Ruhr University Bochum, Bochum, Germany*

We present numerical simulations demonstrating that this approach is promising for the generation of multi-mJ pulses from thin-disk oscillators without any additional saturable absorbers.

CF-1.4 SUN 11:15

Overcoming the challenges in power scaling ultrafast thin-disk oscillators: nonlinearity management and thermal effects

F. Saltarelli, A. Diebold, I. Graumann, •*C. Phillips, and U. Keller*; *Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*

We present a novel approach to nonlinearity management in a 210-W average power, 780-fs pulse thin-disk oscillator through an intracavity phase-mismatched nonlinear crystal and discuss how to overcome the thermal-lensing challenges for further power scaling.

ROOM 6 Hall A1

CI-1.3 SUN (Invited) 11:00

Probabilistic Shaping and its Applications to Optical Communications

•*G. Böcherer*; *Mathematical and Algorithmic Sciences Lab, Huawei Technologies France S.A.S.U., Boulogne-Billancourt, France*

The development of probabilistic shaping for optical communications is reviewed. The enabling architecture, design criteria, and algorithms for shaping and forward error correction are discussed. Topics for future research are highlighted.

ROOM 7 Hall A1

CE-1.2 SUN 11:00

THz Spectroscopy of Photogenerated Carriers in Fe:LiNbO3 for Optical Control of 2D Materials

S. Blundell[1], •*J. Gorecki*[2], *N. Papasimakis*[2], *S. Mailis*[3], *and V. Apostolopoulos*[1]; [1]*School of Physics and Astronomy, University of Southampton, Southampton, United Kingdom*; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [3]*Skolkovo Institute of Science and Technology, Skolkovo, Russia*

We report large numbers of photogenerated free charge carriers (1.5x10^14 /cm3) in iron doped lithium niobate (Fe:LiNbO3) measured by THz spectroscopy, providing insight for Fe:LiNbO3 as a platform for optically controlled tuning of 2D materials.

CE-1.3 SUN 11:15

Integrated Waveguide Fourier Transform Spectrometer on Thin-Film Lithium Niobate

•*D. Pohl*[1], *M. Reig Escalé*[1], *M. Madi*[2], *P. Brotzer*[1], *F. Kaufmann*[1], *A. Sergeyev*[1], *P. Giaccari*[2], *U. Meier*[2], *E. Alberti*[2], *and R. Grange*[1]; [1]*Optical Nanomaterial Group, Institute for Quantum Electronics, Departement of Physics, ETH Zürich, Zürich, Switzerland*; [2]*Micos Engineering GmbH, Dübendorf, Switzerland*

We demonstrate the principle of an integrated waveguide spectrometer on a lithium niobate-on-insulator platform. The electro-optic effect allows to retrieve the interferogram of a broadband source with a static array of metallic evanescent field samplers.

ROOM 1 ICM

EB-1.4 SUN 11:30

Multimode Opto-Electro-Mechanical Transducer for Non-Reciprocal Conversion of Radio-Frequency and Optical Signals

•*M. Nicola, H. Iman Moaddel, N. Riccardo, D.G. Giovanni, and V. David*; *Università di Camerino, Camerino, Italy*

By exploiting multi-mode electro-opto-mechanical interaction, we experimentally show the bandwidth increase of electro-opto-mechanical transducers, based on a SiN membrane capacitively coupled to an LC-circuit. Moreover, we show that such system may realize a non-reciprocal transducer.

EB-1.5 SUN 11:45

Generating maximal entanglement between spectrally distinct solid-state emitters

•*K. Joanesarson*[1], *D. Hurst*[2], *J. Iles-Smith*[2], *J. Mørk*[1], *and P. Kok*[2]; [1]*Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*University of Sheffield, Sheffield, United Kingdom*

We have developed a protocol for deterministic and maximal entanglement generation between two spectrally distinct emitters embedded in a Mach-Zehnder interferometer. Via optical state optimization the requirement for perfect spectral overlap can be relaxed

ROOM 3 ICM

CJ-1.5 SUN 11:30

Tunable Mode-locked Fiber Laser in 1750-1870nm by Bending Normal Dispersion Thulium-doped Fiber as A Distribution Filter

•*S. Chen, Y. Chen, K. Liu, Q. Wang, D. Tang, and S. Yoo*; *Nanyang Technological University, Singapore, Singapore*

We report a tunable mode-locked fiber laser in the 1750-1870nm region by incorporating a normal dispersion thulium-doped fiber (NDTF), with the tunability of lasing wavelength achieved by bending NDTF as a distributed long-wavelength filter.

CJ-1.6 SUN 11:45

96 fs all-fiber polarization maintaining thulium doped amplifier seeded by coherent supercontinuum

•*A. Rampur*[1,2], *G. Stępniewski*[1,2], *D. Dobrakowski*[1,2], *Y. Stepanenko*[3], *T. Feurer*[4], *A. Heidt*[4], *and M. Klimczak*[1,2]; [1]*Institute of Electronic Materials Technology, Warsaw, Poland*; [2]*University of Warsaw, Warsaw, Poland*; [3]*Institute of Physical Chemistry,Polish Academy of Sciences, Warsaw, Poland*; [4]*Institute of Applied Physics, University of Bern, Bern, Switzerland*

Coherently seeded, broadband ultrafast thulium doped fiber amplifier is demonstrated. The system comprising only polarization-maintaining fibers delivers 96 fs long pulses, centered at 1900 nm, with 85 nm FWHM and 18 dB polarization extinction ratio.

ROOM 13a ICM

CA-1.5 SUN 11:30

Handedness control of visible optical vortex output from a diode-pumped Pr3+:YLF Laser

•*Y. Ma*[1], *J.-C. Tung*[3], *Y.-F. Chen*[3], *A. Valle-Mari*[2], *K. Toyoda*[1], *K. Miyamoto*[1,2], *and T. Omatsu*[1,2]; [1]*Graduate School of Advanved Integration Science, Chiba University, Chiba , Japan*; [2]*Molecular Chirality Research Center, Chiba University, Chiba , Japan*; [3]*Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan*

We demonstrate, for the first time, the direct generation and selective handedness control of visible vortex mode from a diode-pumped Pr3+:YLF laser with an off-axis pumping configuration.

CA-1.6 SUN 11:45

Coherent Beam combining of 37 femtosecond fiber amplifiers

•*I. Fsaifes*[1], *L. Daniault*[1], *A. Heilmann*[1], *J. Le Dortz*[2], *S. Bellanger*[1], *J. Bourderionnet*[2], *C. Larat*[2], *E. Lallier*[2], *M. Antier*[3], *E. Durand*[3], *A. Brignon*[2], *and J.-C. Chanteloup*[1]; [1]*Ecole Polytechnique, Palaiseau, France*; [2]*Thales Research & Technology, Palaiseau, France*; [3]*Thales LAS France SAS, Elancourt, France*

We report on the coherent beam combining of 37 fiber chirped-pulse amplifiers involving a tiled-aperture geometry along with an interferometric phase measurement technique, as the last step towards 61 combined channels.

ROOM 13b ICM

CD-1.5 SUN 11:30

The continuum mechanics of soliton collisions

O. Melchert[1,2,3], *S. Willms*[1,2], *I. Babushkin*[1,2,4], *B. Roth*[2,3], *G. Steinmeyer*[4,5], *U. Morgner*[1,2], *and* •*A. Demircan*[1,2,3]; [1]*Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across Disciplines), Hannover, Germany*; [3]*Hannover Centre for Optical Technologies, Hannover, Germany*; [4]*Max-Born-Institute (MBI), Berlin, Germany*; [5]*Humboldt University Berlin, Berlin, Germany*

We demonstrate that the interaction of unequal solitons may not only fulfill particle-like behavior in accord to the general case of Newtonian collision, but also act like extended massive objects, exhibiting elastic deformation.

CD-1.6 SUN 11:45

Experimental Observation of Coexisting Differently Polarized Cavity Solitons in a Monochromatically Driven Passive Kerr Resonator

•*A.U. Nielsen*[1,2], *B. Garbin*[1,2], *S. Coen*[1,2], *S.G. Murdoch*[1,2], *and M. Erkintalo*[1,2]; [1]*Department of Physics, University of Auckland, Auckland 1010, New Zealand*; [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*

We report on the first experimental observation of coexistence between differently polarized vector cavity solitons in a passive Kerr resonator driven with monochromatic light.

ROOM 14a ICM

CK-1.5 SUN 11:30

Generalized Conductance Fluctuations in Anderson Localization at the Two Limits of Disorder

R. Kumar[1], *S. Mondal*[1], *M. Balasubrahmaniyam*[1], *M. Kamp*[2], *and* •*S. Mujumdar*[1]; [1]*Nano-optics and Mesoscopic Optics Laboratory, Tata Institute of Fundamental Research, Mumbai, India*; [2]*Technische Physik, University of Wuerzburg, Wuerzburg, Germany*

We quantify the generalized conductance fluctuations in two-dimensional Anderson localization of light under near-periodic disorder and strong disorder. Our statistically consistent measurement reveals hitherto-unknown differences in the two localization approaches.

CK-1.6 SUN 11:45

Fundamental design principles for reflective membranes in thermal noise limited cavities

•*J. Dickmann*[1], *J. Meyer*[2], *T. Käseberg*[1], *F.F. Bruns*[1], *R. Norte*[3], *P.G. Steeneken*[3], *and S. Kroker*[1,2]; [1]*Physikalisch-Technische Bundesanstalt Braunschweig, Braunschweig, Germany*; [2] *Technische Universitt Braunschweig, LENA Laboratory for Emerging Nanometrology, Braunschweig, Germany*; [3]*Delft University of Technology, Delft, Netherlands*

We present the analytical calculation of Brownian thermal noise of reflective membranes in Fabry Perot cavities. Using this analysis in combination with the sensitivity dependencies of the membrane, we can optimize the signal-to-noise ratio.

ROOM 14b ICM

CM-1.4 SUN 11:30

Beam shaping with higher Laguerre-Gaussian orders for high power Bessel beams

•*M.P. Siems*[1], *J.U. Thomas*[2], *C. Vetter*[3], *K. Bergner*[1], *H. Gross*[1,4], *and S. Nolte*[1,4]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Albert-Einstein-Straße 15, Jena, Germany*; [2]*SCHOTT AG, Hattenbergstraße 10, Mainz, Germany*; [3]*FEMTO-ST Institute, Univ. Bourgogne Franche-Comté, CNRS, 15B Avenue des Montboucons, Besançon, France*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Straße 7, Jena, Germany*

Elongated foci are essential for scaling ultrashort laser processes. However, axicon tips limit the quality of Bessel beams – especially at high powers. We demonstrate how an apt combination of Laguerre-Gauss modes can circumvent these singularities.

CM-1.5 SUN 11:45

Generation of vector Mathieu beams using geometrical phase elements and their application to laser micro processing

•*S. Orlov*[1], *P. Šlevas*[1,2], *V. Vosylius*[1], *P. Gotovski*[1], *O. Ulčinas*[1,2], *and T. Gertus*[1,2]; [1]*Center for Physical Sciences and Technology, Industrial Laboratory for Photonic Technologies, Vilnius, Lithuania*; [2]*Workshop of Photonics, Altechna R&D, Vilnius, Lithuania*

Vectorial geometrical phase elements are designed and implemented using nanogratings inscribed in the glass. We encode phase masks for generation of vector Mathieu beam, which is used to induce volume modifications of transparent materials

ROOM 14c ICM

EE-1.4 SUN 11:30

Observing Molecular Dynamics Using Frequency Resolved X-ray Scattering

•*J. Glownia*[1], *M. Ware*[2,3], *N. Al-Sayyad*[2,3], *and P. Bucksbaum*[2,3,4]; [1]*LCLS, SLAC National Accelerator Lab, Menlo Park, USA*; [2]*Physics Department, Stanford University, Stanford, USA*; [3]*PULSE institute, Stanford, USA*; [4]*Applied Physics Department, Stanford, USA*

The method of Frequency Resolved X-ray Scattering (FRXS) allows for the separation and identification of ultrafast molecular dynamics without the overhead of fitting or spatially inverting a time resolved x-ray scattering image.

EE-1.5 SUN 11:45

All-Optical Background-Free Detection of Ring Currents by Dynamical Symmetry Breaking High Harmonic Spectroscopy

•*O. Neufeld and O. Cohen*; *Physics Department and Solid State Institute, Technion - Israel Institute of Technology, Haifa, Israel*

We propose and theoretically explore an all-optical technique for measuring atomic, molecular, or solid ring-currents based on high harmonic generation, where the presence of ring currents in the media considerably alters the observed harmonic ellipticity.

ROOM 21 ICM

JSV-1.4 SUN 11:30

Quantum-limited time-frequency multiparameter estimation through mode-selective photon measurement

•*V. Ansari*[1], *J.M. Donohue*[1], *J.G. Lopez*[1], *J. Rehacek*[2], *Z. Hradil*[2], *B. Stoklasa*[2], *M. Paur*[2], *B. Brecht*[1], *L.L. Sanchez-Soto*[3], *and C. Silberhorn*[1]; [1]*Paderborn University, Paderborn, Germany*; [2]*Palacky University, Olomouc, Czech Republic*; [3]*Max-Planck-Institute für die Physik des Lichts, Erlangen, Germany*

We experimentally demonstrate time and frequency projective measurements to estimate multiparameters - i.e. the centroid, the separation, and the relative intensities - of two incoherent sources with quantum-limited precision.

JSV-1.5 SUN 11:45

Symmetrical Clock Synchronization with Time-Correlated Photon Pairs

•*J. Lee*[1], *L. Shen*[1,2], *A. Cerè*[1], *J. Troupe*[3], *A. Lamas-Linares*[1,4], *and C. Kurtsiefer*[1,2]; [1]*Centre for Quantum Technologies, Singapore, Singapore*; [2]*Department of Physics, National University of Singapore, Singapore, Singapore*; [3]*Applied Research Laboratories, Austin, USA*; [4] *Texas Advanced Computing Center, Austin, USA*

We demonstrate a distance-independent clock synchronization protocol, using counter-propagating photons from spontaneous parametric down-conversion pair sources, secure against symmetric-delay attacks. With rates of 200 coincidences/s, we record a precision of 51 ps over 100 s.

ROOM 1 Hall A1

CH-1.4 SUN 11:30

Twin Multicore Fiber Interferometers for Precision Sensing

•*J. Villatoro*[1,2], *E. Antonio-Lopez*[3], *J. Zubia*[1], *A. Schülzgen*[3], *and R. Amezcua-Correa*[3]; [1]*University of the Basque Country UPV/EHU, Bilbao, Spain*; [2]*IKERBASQUE—Basque Foundation for Science, Bilbao, Spain*; [3]*CREOL, The College of Optics & Photonics, University of Central Florida, Orlando, USA*

We introduce an innovative sensing architecture that consists of two identical multicore fiber interferometers in series. The reflection spectrum of the twin interferometers has a single, narrow peak that is easy to track and analyze.

CH-1.5 SUN 11:45

A Compressed Sensing Approach to Fibre Bragg Grating Interrogation

•*S. Sugavanam*[1], *A.A. Gbadebo*[1], *M. Kamalian-Kopae*[1], *and A. Majumdar*[2]; [1]*Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*; [2]*Indraprastha Institute of Information Technology, Okhla Industrial Estate, Phase III, New Delhi, India*

We experimentally realise a fibre Bragg grating interrogator based on computational compressed sensing principles, using a broadband ASE source and a single-pixel detector. Interrogator functionality is demonstrated by estimating the spectral shift of a temperature-tuned grating.

ROOM 2 Hall A1

CF-1.5 SUN 11:30

Field enhancement in an doubly resonant optical parametric oscillator

•*C.M. Dietrich*[1,2], *I. Babushkin*[1,2,3,4], *J.R. C. Andrade*[1,2], *L. Rust*[1,2], *and U. Morgner*[1,2,4]; [1]*Institut für Quantenoptik, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD, Hannover, Germany*; [3]*Max Born Institute, Berlin, Germany*; [4]*Hannover Centre for optical Technologies, Hannover, Germany*

We show a intracavity power enhancement and self-phase locking in an doubly resonant optical parametric oscillator pumped by a thin disk laser which makes it possible to generate strong intracavity field waveforms.

CF-1.6 SUN 11:45

Power-Scaling Nonlinear-Mirror Modelocked Thin-Disk Lasers

•*I.J. Graumann*[1], *F. Saltarelli*[1], *L. Lang*[1], *V.J. Wittwer*[2], *T. Südmeyer*[2], *C.R. Phillips*[1], *and U. Keller*[1]; [1]*Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*; [2]*Laboratoire Temps-Fréquence, Institut de Physique, Université de Neuchâtel, Neuchâtel, Switzerland*

We present a power-scaled SESAM-assisted nonlinear-mirror-modelocked thin-disk laser delivering up to 87 W with 586 fs pulses, and pulses as short as 430 fs at 66 W. We discuss design trade-offs and further power-scaling prospects.

ROOM 6 Hall A1

CI-1.4 SUN 11:30

Artificial Neural Network-Based Equaliser in the Nonlinear Fourier Domain for Fibre-Optic Communication Applications

•*M. Kamalian Kopae, A. Vasylchenkova, O. Kotlyar, M. Pankratova, J. Prilepsky, and S. Turitsyn*; *Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

In this work, we have implemented an equaliser for a periodic nonlinear Fourier transform-based fibre-optic communication system using the artificial neural network and obtained a significant improvement in system performance.

CI-1.5 SUN 11:45

A Novel Fourth-Order Difference Scheme for the Direct Zakharov-Shabat Problem

S.B. Medvedev[1,2], •*I.A. Vaseva*[2], *I.S. Chekhovskoy*[1,2], *and M.P. Fedoruk*[1,2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Computational Technologies, Novosibirsk, Russia*

A novel forth-order method for the direct Zakharov-Shabat problem is presented. It is based on the second-order Boffetta-Osborne algorithm and preserves the integral of the system for the continuous spectrum.

ROOM 7 Hall A1

CE-1.4 SUN 11:30

3D vertical directional coupler using slope waveguides on Si

•*V. Mittal*[1], *A. Tarazona*[1], *A. Khokar*[1], *M. Banakar*[1], *D. Thomson*[1], *G. Reed*[1], *and H. Chong*[2]; [1]*Optoelectronics Research Centre, University of Southampton, SOUTHAMPTON, United Kingdom*; [2]*School of Electronics and Computer Science, University of Southampton, SOUTHAMPTON, United Kingdom*

Interlayer coupling between two Si layers is demonstrated using a vertical directional coupler with a slope angle of 13.6º. Preliminary optical characterization shows a coupling of 14dB for a coupling length of 37μm at wavelength=1610nm.

CE-1.5 SUN 11:45

Development of Orientation-Patterned GaP Growth on GaAs for Nonlinear Frequency Conversion

A. Strömberg[1], *G. Omanakuttan*[1], *H. Jang*[1], *P.V. Natesan*[1], *T.S. Tofa*[1], *M. Bailly*[2], *A. Grisard*[2], *B. Gérard*[3], *V. Pasiskevicius*[1], *F. Laurell*[1], *S. Lourdudoss*[1], *and* •*Y.-T. Sun*[1]; [1]*Department of Applied Physics, Royal Institute of Technology-KTH, Stockholm, Sweden*; [2]*Thales Research & Technology, Paris, France*; [3]*III-V Lab, Paris, France*

Heteroepitaxy of orientation-patterned GaP with high growth rate and maintained domain fidelity was developed on wafer bonded GaAs templates by hydride vapour phase epitaxy. The conductivity of heteroepitaxial GaP/GaAs was examined in the terahertz range.

ROOM 1 ICM

14:00 – 15:30

EB-2: Integrated and engineered photonics

Chair: Paolo Villoresi, University of Padua, Padova, Italy

EB-2.1 SUN (Invited) 14:00

Integrated semiconductor quantum photonics

•*G. Weihs*[1], *S. Auchter*[1], *H. Chen*[2], *K. Laiho*[3], *B. Pressl*[4,1], *A. Schlager*[1], *H. Thiel*[1], *H. Suchomel*[5], *C. Schneider*[5], *M. Kamp*[5], *and S. Höfling*[5,6]; [1]*Universität Innsbruck, Innsbruck, Austria*; [2]*National University of Defense Technology, Changsha, China*; [3]*Technische Universität Berlin, Berlin, Germany*; [4]*Innsbruck Medical University, Innsbruck, Austria*; [5]*Universität Würzburg, Würzburg, Germany*; [6]*University of St. Andrews, St Andrews, United Kingdom*

AlGaAs is a versatile semiconductor material, which is suitable for a variety of quantum photonics applications. We will present our results on photon pair creation and on integration of these sources towards a complete platform.

ROOM 3 ICM

14:00 – 15:30

CJ-2: Fiber lasers characterisation and components

Chair: Mikhail Likhachev, FORC-RAS, Moscow, Russia

CJ-2.1 SUN 14:00

Investigation of noise sources down to the shot-noise limit in Yb-doped fiber amplifiers for TMI investigations

•*A. Popp*[1,2,3], *V. Bock*[4], *F. Sedlmeir*[1,2], *C.R. Müller*[1,2], *N. Haarlammert*[5], *T. Schreiber*[5], *C. Marquardt*[1,2], *A. Tünnermann*[4,5], *and G. Leuchs*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Department of Physics, University of Erlangen- Nuremberg, Erlangen, Germany*; [3]*SAOT, Graduate School in Advanced Optical Technologies, Erlangen, Germany*; [4]*Institute of Applied Physics, Friedrich-Schiller-University Jena, Jena, Germany*; [5]*Fraunhofer IOF Jena, Jena, Germany*

We use balanced self-homodyne detection to measure the amount of intensity noise in a fiber amplifier in relation to the shot noise limit, quantifying the impact of different noise sources at various frequencies.

CJ-2.2 SUN 14:15

Time Response Characteristics of Photodarkening-Induced Loss in Yb-Doped Fiber Amplifier

•*Y. Feng*[1], *C. Codemard*[2], *P. Barua*[1], *H. Lin*[1],

ROOM 4a ICM

14:00 – 15:30

JSII-1: Raman spectroscopy I

Chair: Hanieh Fattahi, Max Planck Institute for Quantum Optics, Munich, Germany

JSII-1.1 SUN (Invited) 14:00

From coherent Raman microscopy to endoscopy

•*H. Rigneault*; *Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*

Advanced in coherent Raman scattering (CRS) microscopy and endoscopy to acquire rapid images in few tens of micro-second per pixel is presented.

ROOM 4b ICM

14:00 – 15:30

JSIV-1: Nanoscale heat transfer background

Chair: Sebastien Volz, CNRS, France and the University of Tokyo, Japan

JSIV-1.1 SUN (Invited) 14:00

Phonon transport in disordered 2D phononic crystals

M. Sledzinska[1], *B. Graczykowski*[2], *D. Lacroix*[3], *F. Alzina*[1], *K. Termentzidis*[4], *U. Melia*[5], *and* •*C.M. Sotomayor Torres*[1,6]; [1]*Catalan Institute of Nanoscience & Nanotechnology (ICN2), CSIC and BIST, Bellaterra (Barcelona), Spain*; [2]*Adam Mickiewicz University, Poznan, Poland*; [3]*Université de Lorraine, CNRS, LEMTA, Nancy, France*; [4]*CNRS, INSA-Lyon, Université Claude Bernard Lyon 1, Lyon, France*; [5]*ESAII, Univ. Politècnica de Catalunya, Barcelona, Spain*; [6]*ICREA-Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain*

We discuss phonon transport experiments in suspended 2D phononic crystal and compare them to simulations by Monte Carlo methods. Factors including symmetries, shape, surface roughness, filling factor, boundary conditions and temperature are considered.

ROOM 13a ICM

14:00 – 15:30

CA-2: Laser facilities

Chair: Paul Mason, Central Laser Facility, STFC, United Kingdom

CA-2.1 SUN 14:00

Versatile OPCPA Pump-Probe Laser System for the FLASH2 XUV FEL beamline at DESY.

•*T. Lang, S. Alisauskas, U. Große-Wortmann, T. Hülsenbusch, B. Manschwetus, C. Mohr, J. Müller, F. Peters, N. Schirmel, S. Schulz, A. Swiderski, J. Zheng, and I. Hartl*; *Deutsches Elektronen Synchroton (DESY), Hamburg, Germany*

We report on a highly flexible, high repetition-rate femtosecond OPCPA laser system developed and installed for pump-probe experiments at the FLASH2 free-electron laser facility in Hamburg. The laser system operates in a 10Hz 0.8ms burst-mode.

CA-2.2 SUN 14:15

Progress of the development of new Vulcan PW OPCPA beamline

•*G. Archipovaite*[1], *M. Galletti*[1,2], *P. Oliveira*[1], *M. Ahmad*[1], *R. Clarke*[1], *D. Neely*[1], *N. Booth*[1], *R. Heathcote*[1], *M. Galimberti*[1], *I. Musgrave*[1], *and C. Hernandez-Gomez*[1];

ROOM 13b ICM

14:00 – 15:30

CD-2: Nonlinear spectroscopy

Chair: Tiago Buckup, University of Heidelberg, Heidelberg, Germany

CD-2.1 SUN (Invited) 14:00

Time-Domain Ptychography

•*T. Feurer*[1], *M. Brügmann*[1], *T. Schweizer*[1], *A. Heidt*[1], *D. Spangenberg*[2], *and E. Rohwer*[2]; [1]*University of Bern, Bern, Switzerland*; [2]*Stellenbosch University, Matieland, South Africa*

Recently, we demonstrated time domain ptychography. Here, I will show ptychographic reconstruction of different time domain objects, ranging from ultrafast laser pulses, complex supercontinua, attosecond XUV pulses to X-ray free electron laser pulses.

ROOM 14a ICM

14:00 – 15:30

CK-2: Light coupling

Chair: Olivier Gauthier-Lafaye, LAAS-CNRS, Toulouse, France

CK-2.1 SUN 14:00

Out-of-plane Focussing Polarization Control Grating Couplers for Photonic-Spintronic Integration

•*H. Becker*[1], *C.J. Krückel*[2], *D. Van Thourhout*[2], *and M.J.R. Heck*[1]; [1]*Aarhus University, Aarhus, Denmark*; [2]*Ghent University -imec, Ghent, Belgium*

We demonstrate the first out-of-plane 2D focusing grating coupler on silicon designed for photonic-spintronic integration, allowing for full polarization control. We present design and experimental characterization and argue for their applicability in spintronic integration.

CK-2.2 SUN 14:15

Tailored Coupling Coefficient within sub-wavelength nanostructured waveguides arrays: towards compact and efficient devices

•*A. Talneau, F. Hentinger, and N. Belabas*; *CNRS C2N , Palaiseau, France*

Sub-, below band-gap

ROOM 14b ICM

14:00 – 15:30

CM-2: Silicon structuring by ultrafast lasers

Chair: Roberto Osellame, IFN-CNR, Milan, Italy

CM-2.1 SUN (Invited) 14:00

Internal structuring of silicon by ultrafast laser irradiation

•*D. Grojo*; *Aix-Marseille University, CNRS, LP3, Marseille, France*

Recent demonstrations of internal structuring of silicon have open new perspectives for the important field of three-dimensional ultrafast laser writing. We discuss the applied methodologies and the remaining challenges to address microfabrication applications in silicon.

ROOM 14c ICM

14:00 – 15:30

EE-2: Ultrafast phenomena in 2D materials and on surfaces

Chair: Daniele Fausti, Elettra Sincrotrone Trieste, Trieste, Italy

EE-2.1 SUN (Invited) 14:00

Ultrafast SFG Study towards Water Splitting on TiO_2

•*E. Backus*[1,2], *S. Sun*[2], *S. Hosseinpour*[2], *S. Schlegel*[2], *and M. Bonn*[2]; [1]*University of Vienna, Vienna, Austria*; [2]*Max Planck Institute for Polymer Research, Mainz, Germany*

Clean energy like hydrogen can be generated on TiO_2 by photocatalytic water splitting with UV light. Here, we present how we unravel the mechanism of this reaction and show results for the first reaction step.

ROOM 21 ICM

14:00 – 15:30

JSV-2: Magnetometry and biological imaging

Chair: Sébastien Gleyzes, Collège de France, Paris, France

JSV-2.1 SUN (Invited) 14:00

Magnetic field imaging with microfabricated optically-pumped magnetometer arrays

N. Nardelli[1], *S. Krzyzewski*[1], *B. Korenko*[1], *G. Romanov*[1], *J. Hughes*[1,2], *O. Alem*[1,2], *and* •*S. Knappe*[1,2]; [1]*University of Colorado, Boulder, USA*; [2]*FieldLine Inc., Boulder, USA*

Microfabricated optically-pumped magnetometer (OPM) arrays can be used for magnetic field imaging applications over a variety of sizes ranging from tens of micrometers for microscopy, over millimeters for magnetoencephalography, to kilometers for geophysical mapping.

ROOM 1 Hall A1

14:00 – 15:30

CH-2: LIDAR systems

Chair: Martina Gerken, Kiel University, Kiel, Germany

CH-2.1 SUN 14:00

Low Intensity LiDAR using Depth Aware Compressive Sensing and a Photon Number Resolving Detector

•*Y. Sher, L. Cohen, D. Istrati, and H.S. Eisenberg*; *The Hebrew University in Jerusalem, Jerusalem, Israel*

The biggest challenge for LiDAR systems is the trade-off between speed, resolution and range – but what if we could have them all? Compressive sensing photon-counting LiDARs are still in their infancy, and we present several simple improvements for them.

CH-2.2 SUN 14:15

Speckle Noise Reduction by Fiber Scrambling for Improving the Measurement Precision of an Airborne Wind Lidar System

•*O. Lux, C. Lemmerz, F. Weiler, U. Marksteiner, B. Witschas, E. Nagel, and O. Reitebuch*; *German*

ROOM 2 Hall A1

14:00 – 15:30

CF-2: New developments for ultrafast oscillators

Chair: Daniele Brida, University of Luxembourg, Luxembourg

CF-2.1 SUN 14:00

Dual-color 1.25-MHz sub-70-fs source at 1.3 and 1.7 μm for multimodal 3-photon microscopy in water-transparency bands

F. Druon[1], *K. Guesmi*[1], *L. Abdeladim*[2], *T. Berberian*[1,3], *P. Rigaud*[1], *J. Frrer Ortas*[2], •*M. Hanna*[1], *P. Mahou*[2], *J. Livet*[4], *W. Supatto*[2], *P. Georges*[1], *and E. Beaurepaire*[2]; [1]*Laboratoire Charles Fabry, Palaiseau, France*; [2]*Laboratoire d'Optique et Biosciences, Palaiseau, France*; [3]*Amplitude Laser Group, Pessac, France*; [4]*Institut de la vision, Paris, France*

A novel ultrafast laser concept providing simultaneous excitation in the two water-transparency windows at 1.3 and 1.7 μm,Is presented. We also demonstrate its potentiality performing 3-photon microscopy on real brain tissues.

CF-2.2 SUN 14:15

Directly Diode-Pumped, Kerr-Lens Mode-Locked Cr:ZnSe Oscillator

•*N. Nagl*[1], *S. Gröbmeyer*[1], *V. Pervak*[1], *O. Pronin*[2], *K.F. Mak*[2], *and F. Krausz*[1,2]; [1]*Ludwig-Maximilians-Universität München, Garching,*

ROOM 6 Hall A1

14:00 – 15:30

CI-2: Advanced high capacity fiber systems

Chair: Georg Böcherer, Mathematical and Algorithmic Sciences Lab - Huawei, Paris, France

CI-2.1 SUN 14:00

Wavelength Independent Image Classification Through A Multimode Fiber Using Deep Neural Networks

•*E. Kakkava*[1], *N. Borhani*[1], *B. Rahmani*[2], *U. Teğin*[1,2], *C. Moser*[2], *and D. Psaltis*[1]; [1]*Optics Laboratory, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*Laboratory of Applied Photonic Devices, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

Deep Neural Networks recognize images of handwritten digits propagated through multimode fibers from the speckle patterns formed at the output. Study of the classification performance for different input wavelengths is performed.

CI-2.2 SUN 14:15

Mode-Dependent Crosstalk Penalty in Few-mode Multi-Core Fiber Transmission

•*G. Rademacher*[1], *B.J. Puttnam*[1], *R.S. Luis*[1], *A. Ross-Adams*[2], *S. Gross*[2], *M. Withford*[2], *N. Riesen*[3], *Y. Sasaki*[4], *H. Furukawa*[1], *K. Saitoh*[5], *K. Aikawa*[4], *Y. Awaji*[1], *and N. Wada*[1]; [1]*National Institute of Information and Communications Technology*

ROOM 7 Hall A1

14:00 – 15:30

CE-2: Infrared material fibres glasses and applications

Chair: Maurizio Ferrari, IFN-CNR, Trento, Italy

CE-2.1 SUN 14:00

Transparent $Yb:Lu_3Al_5O_{12}$ Laser Ceramics Based on Nanopowders Produced by Laser Ablation

•*L. Basyrova*[1], *R. Maksimov*[2,3], *V. Shitov*[3], *M. Baranov*[1], *X. Mateos*[4], *and P. Loiko*[1]; [1]*ITMO University, St. Petersburg, Russia*; [2]*Ural Federal University, Ekaterinburg, Russia*; [3]*Institute of Electrophysics, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia*; [4]*Física i Cristal·lografia de Materials i Nanomaterials (FiCMA-FiCNA)-EmaS, Universitat Rovira i Virgili (URV), Tarragona, Spain*

Highly-transparent Yb:Lu3Al5O12 ceramics are synthesized by solid-state-reaction method at 1800 °C from Yb:Lu2O3 and Al2O3 nanopowders obtained by CO2 laser ablation. Their spectroscopic properties are studied. The ceramics are promising for Ytterbium thin-disk lasers.

CE-2.2 SUN 14:15

RF-sputtering technique for fabrication of dielectric multilayer structures with low-threshold coherent emission at 1.5 μm

•*A. Chiasera*[1], *C. Meroni*[1,2], *F. Scotognella*[3,4], *Y. Boucher*[5], *A. Lukowiak*[6], *D. Ristic*[7], *G. Speranza*[8,1], *S. Varas*[1], *L. Zur*[1], *M. Ivanda*[7], *S. Taccheo*[9], *L.T.N. Tran*[1,10,11], *D. Zonta*[10,1,12], *R. Ramponi*[13], *G. Righini*[14,15], *and M. Ferrari*[1,14]; [1]*IFN - CNR CSMFO Lab. & FBK*

ROOM 8 Hall A1

14:00 – 15:30

JSI-1: Photonic platforms for reservoir computing

Chair: Paul R. Prucnal, Princeton University, Princeton, United States

JSI-1.1 SUN (Invited) 14:00

In-memory computing using electrical and photonic memory devices

•*A. Sebastian*; *IBM Research - Zurich, Rueschlikon, Switzerland*

In-memory computing is a paradigm where physical attributes of memory devices are exploited to compute in place. I will introduce in-memory computing using both electrical and photonic memory devices and present applications in machine learning.

NOTES

ROOM 1 ICM

EB-2.2 SUN 14:30

Deterministic integration of quantum dots into on-chip multi-mode interference couplers via in-situ electron beam lithography

P. Schnauber[1], J. Schall[1], S. Bounouar[1], T. Höhne[2], S.-I. Park[3], G.-H. Ryu[3], T. Heindel[1], S. Burger[2], J.-D. Song[3], S. Rodt[1], and •S. Reitzenstein[1]; [1]Technische Universität Berlin, Berlin, Germany; [2]Zuse Institut Berlin, Berlin, Germany; [3]Korea Institute of Science and Technology, Berlin, South Korea

We report on the deterministic fabrication of complex quantum dot waveguide circuits using in-situ electron-beam lithography. Single-photon routing and 50/50 mode splitting by an MMI-coupler is demonstrated via an on-chip Hanbury Brown and Twiss experiment.

ROOM 3 ICM

S. Zhu[1], Y. Feng[1], S. Pidishety[1], S. Hong[1], J. Sahu[1], and J. Nilsson[1]; [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2]Advanced Laser Laboratory, SPI Lasers Ltd., Southampton, United Kingdom

The transmission of a 660-nm probe changes by 15% within 1 ms of switching on the pump of a photodarkened Yb-doped fiber amplifier. The change is lower or absent at lower levels of photodarkening.

CJ-2.3 SUN 14:30

Power Dependent Noise Performance of fs Supercontinuum Generation in Normal Dispersion Fibers with a Long Zero-dispersion Wavelength

•S. Rao D. S.[1], R.D. Engelsholm[1], I.B. Gonzalo[1], B. Zhou[1], P. Bowen[2], P.M. Moselund[2], M. Bache[1], and O. Bang[1,2]; [1]DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Ørsteds Plads, Kongens Lyngby, Denmark; [2]NKT Photonics A/S, Blokken 84, Birkerød, Denmark

We demonstrate how the noise of normal-dispersion fs-pumped supercontinuum generation varies with power in fibers with a zero-dispersion. When power crosses into the anomalous dispersion region localized noisy dispersive waves move through the low-noise spectrum

ROOM 4a ICM

JSII-1.2 SUN (Invited) 14:30

The potential of linear and non-linear Raman spectroscopy for bedside and intraoperative medical diagnosis and therapy

•J. Popp; Institute of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller University Jena, Jena, Germany; Leibniz Institute of Photonic Technology and Member of the Research Alliance "Leibniz Health Technologies", Jena, Germany; InfectoGnostics Research Campus Jena, Centre for Applied Research, Jena, Germany

The presentation reports on innovative technological and data analysis concepts for bringing Raman spectroscopy closer to clinical use in terms of diagnosing and targeted therapy of infectious diseases and cancer.

ROOM 4b ICM

JSIV-1.2 SUN (Special Oral) 14:30

Phononics learns photonics

•M. Nomura; The University of Tokyo, Tokyo, Japan

Thermal conduction control technique based on ballisticity of phonons and wave nature of phonons in Si phononic nanostructures are demonstrated. We all so discuss similarity between photonics and phononics.

ROOM 13a ICM

[1]Central Laser Facility, STFC, Didcot, UK; [2]GoLP/IPFN, Instituto Superior Tecnico, Universidade de Lisboa, Lisboa, Portugal

We present a new PW beam line for Vulcan facility. The beamline is based on OPCPA technology and is designed to deliver 30J, 30fs pulses at 880 nm with the repetition rate of 5 mins.

CA-2.3 SUN (Invited) 14:30

First Kilojoule Pulse Operation at ELI-Beamlines

•E. Gaul[1,2], S. Bruce[1,2], G. Friedman[2], G. Chériaux[1], P. Trojek[2], T. Borger[1], Š. Vyhlidka[2], F. Batysta[2], R. Antipenkov[2], E. Beutlich[1], J. Naylon[2], J. Hubáček[2], J. Bartoníček[2], J. Jarboe[2], S. Buck[2], J. King[1], M. Tyrrell[1], D. Hessen[1], A. Gaul[1], C. Jaska[1], J. Kolenda[3], M. Donovan[1,2], T. Ditmire[1], P. Bakule[2], D. Kramer[2], and B. Rus[2]; [1]National Energetics, Austin, USA; [2]Eli-Beamlines, Institute of Physics, Praha, Czech Republic; [3]Ekspla, Vilnius, Lithuania

The L4-Aton laser, now installed at ELI-BL, designed as a 10 PW, 1.5 kJ laser or a 2 kJ ns laser, has successfully demonstrated pulse energies above 1 kJ in each of its two configurations.

ROOM 13b ICM

CD-2.2 SUN 14:30

Near-infrared fieldoscopy of water

•A. Alismail[1,2], H. Wang[1,3], G. Barbiero[1,3], F. Krausz[1,3], and H. Fattahi[3]; [1]Ludwig-Maximilians-Universität München, Fakultät für Physik, Munich, Germany; [2]Physics and Astronomy Department, King Saud University, Riyadh, Saudi Arabia; [3]Max-Planck-Institut für Quantenoptik, Munich, Germany

We introduce the concept of near-infrared molecular fieldoscopy and demonstrate the first bench-marking measurements. The technique holds promise for high-resolution overtone spectroscopy and microscopy with an unparalleled sensitivity and specificity over the entire molecular fingerprint region.

ROOM 14a ICM

2-dimentional nanostructured coupled waveguides arrays demonstrate robust control and a tailored tuning of the coupling coefficient for compact devices

CK-2.3 SUN 14:30

Coupling Quantum Emitters in Nanodiamonds to Microring Resonators for Integrated Quantum Photonics

*•V. Leong[1], D.A. Kalashnikov[1], J. Dai[1], G. Alagappan[2], T. Hu[3], V.A. Davydov[4], V.N. Agafonov[5], and L.A. Krivitskiy[1]; [1]Institute of Materials Research and Engineering, A*STAR, Singapore, Singapore; [2]Institute of High Performance Computing, A*STAR, Singapore, Singapore; [3]Institute of Microelectronics, A*STAR, Singapore, Singapore; [4]L.F. Vereshchagin Institute for High Pressure Physics, The Russian Academy of Sciences, Moscow, Russia; [5]GREMAN, UMR CNRS-7347, Université F. Rabelais, Tours, France*

Silicon-vacancy (SiV) centers in nanodiamonds are coupled to silicon nitride photonic circuits via microring cavities. SiV-cavity interaction leads to the SiV fluorescence collected through a bus waveguide being modulated by cavity resonances.

ROOM 14b ICM

CM-2.2 SUN 14:30

Spatial-control of laser-written in-chip Si structures with Bessel beams

•A. Turnali[1], A. Ishraq[2], G. Makey[2,3], and O. Tokel[2,3]; [1]Department of Electrical and Electronics Engineering, Bilkent University, Ankara, Turkey; [2]UNAM- National Nanotechnology Research Center and Institute of Material Science and Nanotechnology, Bilkent University, Ankara, Turkey; [3]Department of Physics, Bilkent University, Ankara, Turkey

We present subsurface structure fabrication inside silicon using spatial light modulator based Bessel beams. Submicron modifications with high-aspect ratio are observed. Control over the modification diameter is demonstrated.

ROOM 14c ICM

EE-2.2 SUN 14:30

Few-femtosecond Plasmon Transients Probed with nm-scale Sensitivity

B. Lovász[1], P. Sándor[1], Z. Pápa[1], B. Éles[1], B. Bánhegyi[1], P. Rácz[1], C. Prietl[2], J.R. Krenn[2], and •P. Dombi[1]; [1]Wigner Research Centre for Physics, Budapest, Hungary; [2]Institut für Physik, Karl-Franzens-Universitaet, Graz, Austria

Photoelectron probing of few-femtosecond plasmon transients on nanostructures reveals the ultrafast dynamics of localized plasmon oscillation decay with nm-scale sensitivity at plasmonic hot spots.

ROOM 21 ICM

JSV-2.2 SUN 14:30

The contribution has been withdrawn.

JSV-2.3 SUN 14:45

Towards room-temperature laser magnetometry with NV centres in open fibre cavities

•S. Raman Nair[1,2], L. J. Rogers[1,2], J. Jeske[3,4], X. Vidal[1], A. Wood[1,2], F. Jelezko[5], A. D. Greentree[3,6], and T. Volz[1,2]; [1]Department of Physics and Astronomy, Macquarie University, NSW 2109, Australia;

ROOM 1 Hall A1

Aerospace Center (DLR), Institute of Atmospheric Physics, Oberpfaffenhofen, Germany

Fiber scrambling has significantly reduced the frequency and intensity fluctuations and thus the measurement error of an airborne Doppler wind lidar instrument by overcoming detrimental speckle noise introduced through the use of a multimode fiber.

CH-2.3 SUN 14:30

Short-Range Supercontinuum Based LIDAR for Temperature Profiling

•A. Saleh[1,2], A. Aalto[1], P. Ryczkowski[1], T. Mikkonen[1], and J. Toivonen[1]; [1]Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland; [2]Valmet Technologies Oy, Energy Services, Lentokentankatu 11, Tampere, Finland

A new technique employing a supercontinuum light source has been developed for simultaneous remote sensing of multiple parameters. The approach enables temperature mapping inside a thermal device using only one inspection window.

ROOM 2 Hall A1

Germany; [2]Max-Planck-Institut für Quantenoptik, Garching, Germany

We report the first directly diode-pumped, Kerr-lens mode-locked oscillator based on Cr^{2+}-doped II-VI material, providing 45 fs pulses at 500 mW-level. This represents a new class of low-noise and affordable femtosecond mid-infrared (2-3 μm) lasers.

CF-2.3 SUN 14:30

Towards Fully Stabilized 10GHz Optical Frequency Combs From SESAM-Modelocked Yb:CALGO Lasers

•L. Krüger, A. Mayer, C. Phillips, and U. Keller; Department of Physics, Institute of Quantum Electronics, ETH Zurich, Zurich, Switzerland

We present low-energy supercontinuum generation in silicon nitride waveguides driven by a repetition-rate stablilized SESAM-modelocked 10-GHz Yb:CALGO laser with 118-fs-pulses at 580 mW suitable for self-referenced carrier-envelope offset frequency detection without amplification

ROOM 6 Hall A1

(NICT), Koganei, Japan; [2] MQ Photonics Research Centre, Sydney, Australia; [3]University of South Australia, Mawson Lakes, Australia; [4]Fujikura Ltd, Sakura, Japan; [5]Hokkaido University, Sapporo, Japan

We present an experimental study of crosstalk-induced Q-factor penalties on 16-QAM signals, transmitted over a three-mode four-core fiber. We observed increased Q-factor penalties in higher order modes, presumably due to larger extends of their mode-fields.

CI-2.3 SUN (Invited) 14:30

Multi-Band Optical Systems to Enable Ultra-High Speed Transmissions

A. Ferrari[1], •A. Napoli[2], N. Costa[3], J.K. Fischer[4], J. Pedro[3], W. Forysiak[5], A. Richter[6], E. Pincemin[7], and V. Curri[1]; [1]Politecnico di Torino, Torino, Italy; [2]Infinera Germany, Munich, Germany; [3]Infinera Portugal, Carnaxide, Portugal; [4]Fraunhofer Institute for Telecommunications HHI, Berlin, Germany; [5]AIPT, Aston University, Birmingham, United Kingdom; [6]VPI Photonics, Berlin, Germany; [7]Orange Labs, Lannion, France

We assess, by using the generalized Gaussian-noise model, the fiber capacity for DCI transmitting over {L,C,S,E,O}-band. We estimate a total capacity of about 500 Tb/s/fiber over 40 km in presence of stimulated Raman scattering.

ROOM 7 Hall A1

CMM, Trento, Italy; [2]Dipartimento di Fisica, Università di Trento, Italy; [3]Pol. di Milano, Dip. Fisica and IFN-CNR, Milano, Italy; [4]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia, Milano, Italy; [5]Laboratoire FOTON (UMR CNRS 6082) Équipe Systèmes Photoniques, ENSSAT, Lannion, France; [6]Inst. of Low Temperature and Structure Research, PAS, Wroclaw, Poland; [7]Center of Excellence for Advanced Materials and Sensing Devices, Ruder Bošković Institute, Zagreb, Croatia; [8]FBK CMM FMPS Unit, Trento, Italy; [9]College of Engineering, Swansea University, Swansea, UK; [10]Dep. Civil, Environment and Mechanical, Engineering, University of Trento, Trento, Italy; [11]Dep. of Applied Sciences, Ho Chi Minh City Univ. of Tech. and Education, Ho Chi Minh City , Vietnam; [12]Dep. of Civil and Environmental Engineering, University of Strathclyde, Glasgow, UK; [13]IFN – CNR and Politecnico di Milano, Dipartimento di Fisica, Milano, Italy; [14]Enrico Fermi Center, Roma, Italy; [15]MiPLab. IFAC - CNR, Firenze, Italy

The design, fabrication by rf-sputtering and characterization of Er3+ doped SiO2/TiO2 1D photonic microcavity is presented. Coherent emission with threshold at 4μW and a first step towards the integration on the fiber tip are presented.

CE-2.3 SUN (Invited) 14:30

Mid-infrared (MIR) glasses and fibres for medical applications

•A.B. Seddon; University of Nottingham, Nottingham, United Kingdom

A new paradigm in mid-infrared (MIR) biophotonics is opening up. The idea is for portable, real-time, MIR spectroscopic sensing and imaging in healthcare, including for real-time, in vivo cancer diagnosis, based on new MIR fibre-optics.

ROOM 8 Hall A1

JSI-1.2 SUN 14:30

Photonic Reservoir Computing based on the Random Interaction of Transverse Optical Modes in Large Cross-Section Waveguides

•C. Mesaritakis; Dept. Information and Communication Systems Engineering, University of the Aegean, Samos, Greece

A reservoir computing scheme is presented, whose efficiency relies on the interaction of transverse modes in a large cross-section waveguide. Results confirm the principle of operation, whereas the classification of high-speed image streams is demonstrated.

NOTES

ROOM 1 ICM

EB-2.3 SUN 14:45

Integration of Single Quantum Dots in Suspended Phononic Waveguides

A. Vogele[1], X. Yuan[2], M. Sonner[1], M. Weiß[1], E. Nysten[1], S. da Silva[2], A. Rastelli[2], and •H. Krenner[1]; [1]Experimentalphysik 1, Universität Augsburg, Augsburg, Germany; [2]Institute of Semiconductor and Solid State Physics, Johannes Kepler Universität Linz, Linz, Austria

Single Quantum Dots are integrated into suspended nanophononic waveguides. When strained by the guided flexural Lamb mode, Quantum Dots exhibit enhanced optomechanical coupling.

EB-2.4 SUN 15:00

On-chip photon pair source with pump rejection filter

•D. Oser[1], F. Mazeas[2], C. Alonso Ramos[1], X. Le Roux[1], L. Vivien[1], S. Tanzilli[2], É. Cassan[1], and L. Labonté[2]; [1]Center for nanosciences and nanotechnologies, Palaiseau, France; [2]Institut de physique de Nice, Nice, France

Silicon micro-resonators have shown bright photon-pair generation. However, on chip integration of pump-rejection filters remains a challenge. We demonstrate photon-pair

ROOM 3 ICM

CJ-2.4 SUN 14:45

A Combinatorial Buffered Oxide Etching Method for High-Power Cladding Light Stripper

•E. Yapar Yildirim, A. Karatutlu, E.T. Balk, Y. Midilli, and B. Ortaç; UNAM-National Nanotechnology Research Center and Institute of Material Science and Nanotechnology, 06800, Bilkent University, ANKARA, TURKEY

We show the first studies of the formation mechanisms and optimum conditions of CLS with ~17.2 dB stripping performance at 333 W launched power using BOE by a combined method of stain and vapor-phase etching.

CJ-2.5 SUN 15:00

Fiber Fuse Effect in Hollow Core Optical Fibers

•I. Bufetov, A. Kolyadin, and A. Kosolapov; Fiber Optics Research Center of RAS, Moscow, Russia

Optical discharge propagation in air-filled hollow-core fibers under the ~1W average power laser radiation with an average velocity of ~1m/s was investigated. The results provide us insight into the nature of this process.

ROOM 4a ICM

JSII-1.3 SUN 15:00

Dual-Colour-Pump Broadband CARS in Single-Ring Gas-Filled Photonic Crystal Fibre

•R. Tyumenev[1], L. Späth[1], B.M. Trabold[1], G. Ahmed[1], M.H. Frosz[1], and P.S.J. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany

Gas-filled hollow-core PCF is used for broadband coherent anti-Stokes Raman scattering with dual-color pumping. Suppression

ROOM 4b ICM

JSIV-1.3 SUN (Special Oral) 14:45

The fluctuation-dissipation theorem for heat exchange between nanoparticles at very small distances

•J.M. Rubi[1], A. Perez-Madrid[1], and L. Lapas[2]; [1]Department of Condensed Matter Physics, University of Barcelona, Barcelona, Spain; [2]Interdisciplinary Centre for Natural Sciences, Universidade Federal da Integração LatinoAmericana, Foz do Iguazú, Brazil

We present a generalization of the fluctuation-dissipation theorem when interactions between two nanoparticles are not dipolar. Our theory sheds light on the mechanisms leading to the generation of forces by fluctuations such as Casimir forces.

JSIV-1.4 SUN 15:00

Dynamics of Highly Excited Electrons in 3D and 2D Semiconductors: Theory and Experiments

•J. Sjakste[1], L. Perfetti[1], N. Vast[1], and K. Tanimura[2]; [1]Laboratoire des Solides Irradies, Ecole Polytechnique, CNRS , Palaiseau, France; [2]Research Center for Ultra-High Voltage Electron Microscopy, Osaka, Japan

We study the hot electron relaxation in silicon and in doped InSe, and the role of electron-phonon coupling, using the computational methods based on density functional theory, and the time- energy-

ROOM 13a ICM

CA-2.4 SUN 15:00

Characterization, Integration and Operation of a 100-W Solid State Amplifier in the Advanced-VIRGO Pre-Stabilized Laser System

F. Cleva, J.-P. Coulon, and •F. Kéfélian; ARTEMIS : Université Côte d'Azur & Observatoire de la Côte d'Azur & CNRS, Nice, France

We report on a new 100-W solid state 1064-nm amplifier integrated in Advanced VIRGO pre-stabilized laser system. Short and long term stability parameters comply with gravitational wave detector require-

ROOM 13b ICM

CD-2.3 SUN 14:45

Observation of a chemical reaction in a microfluidic device using stimulated Raman scattering microscopy

•P. Fimpel, M.J. Winterhalter, and A. Zumbusch; University of Konstanz, Department of Chemistry, D-78457 Konstanz, Germany

We use stimulated Raman scattering (SRS) microscopy to study a chemical reaction in a microfluidic device and show the excellent signal properties of SRS for this application with respect to other chemical sensitive imaging techniques.

CD-2.4 SUN 15:00

Interferometric Fourier-Transform Stimulated Raman Scattering

A. de la Cadena Pérez-Gallardo, V. Kumar, A. Perri, F. Preda, G. Cerullo, and •D. Polli; Politecnico di Milano, Milano, Italy

We introduce interferometric Fourier-transform stimulated Raman scattering to measure the broadband complex nonlinear vibrational susceptibility of molecules, combining high-sensitivity single-channel lock-in detection with time-domain Fourier-transform spectroscopy using a compact and ultra-stable

ROOM 14a ICM

CK-2.4 SUN 14:45

Suspended Epoxy Polymer Inverted Tapers for Scalable Fibre-Coupled Single-Photon Devices

•A.D. Ugurlu[1], H. Thyrrestrup[1], R. Uppu[1], C. Ouellet-Plamondon[1], R. Schott[2], A.D. Wieck[2], A. Ludwig[2], P. Lodahl[1], and L. Midolo[1]; [1]Center for Hybrid Quantum Networks (Hy-Q), Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark; [2]Lehrstuhl fuer Angewandte Festkoerperphysik, Ruhr-Universitaet Bochum, Germany

We present an adiabatic inverted taper mode converter for the end-fire coupling of suspended Gallium Arsenide waveguides to lensed fibres. The demonstrated out-coupler plays a key role in building efficient and scalable quantum photonic networks.

CK-2.5 SUN 15:00

Tapered Fiber Coupling of Single Defect Centers in Two-Dimensional Materials

•A.W. Schell[1,2], H. Takashima[2], T.T. Tran[3], I. Aharonovich[3], and S. Takeuchi[2]; [1]Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic; [2]Department of Electronic Science and Engineering, Kyoto University, Kyoto, Japan; [3]School of Mathematical and Physical Sciences, University of Technology Sydney, Sydney, Australia

The near-field coupling

ROOM 14b ICM

CM-2.3 SUN 14:45

Anatomy of picosecond laser-written waveguides inside silicon

•M. Chambonneau[1], H. Kämmer[1], G. Matthaüs[1], K. Pollok[2], M. Blothe[1], F. Langenhorst[2], and S. Nolte[1]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Germany; [2]Analytical Mineralogy of Nano- and Microstructures, Institute of Geosciences, Friedrich Schiller University Jena, Germany

Micro- and nano-scale analyses are carried out for characterizing the morphology of picosecond-laser-written waveguides inside silicon. These investigations on material transformations highlight the origin of the recently demonstrated waveguiding and the associated losses inside silicon.

CM-2.4 SUN 15:00

Nanostructure formation on Silicon suboxide with plasmonic near-field ablation induced by femtosecond laser pulses

T. Takaya[1], •G. Miyaji[1], L. Richter[2], and J. Ihlemann[2]; [1]Tokyo University of Agriculture and Technology, Kognei, Tokyo, Japan; [2]Laser-Laboratorium Göttingen e. V., Göttingen, Germany

We have shown that the ultrafast excitation of surface plasmon polaritons can be controlled to directly imprint a homogeneous nanostructure on Silicon suboxide surface

ROOM 14c ICM

EE-2.3 SUN 14:45

Visible/Multi-THz 2D Spectroscopy for Phase Sensitive Investigation of Ultrafast Carrier Dynamics

•*J. Allerbeck*[1], *L. Spitzner*[1], *T. Kurihara*[1,3], *A. Leitenstorfer*[1], *and D. Brida*[1,2]; [1]*University of Konstanz, Konstanz, Germany*; [2]*Université du Luxembourg, Luxembourg, Luxembourg*; [3]*Japan Society for the Promotion of Science, Tokyo, Japan*

Asymmetric two-dimensional spectroscopy with visible excitation and multi-THz readout enables phase sensitive investigation of correlations between high- and low-energy excitations as demonstrated in preliminary studies that track ultrafast carrier dynamics in graphite.

EE-2.4 SUN 15:00

Observing Nonlinear Plasmon-Exciton Coupling for Enhanced Harmonic Generation

•*J. Zhong*[1], *J. Yi*[1], *D. Wang*[2], *A. Korte*[1], *A. Chimeh*[1], *P. Schaaf*[2], *E. Runge*[3], *and C. Lienau*[1]; [1]*Institut für Physik, Carl von Ossietzky Universität, Oldenburg, Germany*; [2]*Institut für Werkstofftechnik, Technische Universität Ilmenau, Ilmenau, Germany*; [3]*Institut für Physik, Technische Universität Ilmenau, Ilmenau, Germany*

The microscopic origin of plasmon-enhanced

ROOM 21 ICM

[2]*ARC Centre of Excellence for Engineered Quantum Systems, Macquarie University, NSW 2109, Australia*; [3]*Chemical and Quantum Physics, School of Sciences, RMIT University, Melbourne 3001, Australia*; [4]*Fraunhofer Institut für Angewandte Festkörperphysik (IAF), Freiburg, Germany*; [5]*Institute for Quantum Optics / IQST, Universität Ulm, Ulm, Germany*; [6]*ARC Centre of Excellence for Nanoscale BioPhotonics, School of Sciences, RMIT University, Melbourne, VIC 3001, Australia*

We report the progress of our experimental study towards NV laser magnetometry in open fibre cavities and the theoretical study of NV absorbed diamond Raman laser in such a micro-cavity for magnetic sensing applications.

JSV-2.4 SUN 15:00

Use of optical quantum sensors to study chemical processes

•*V. Cimini, I. Gianani, L. Ruggiero, T. Gasperi, M. Sbroscia, E. Roccia, D. Tofani, F. Bruni, M.A. Ricci, and M. Barbieri*; *Università degli studi di Roma Tre, Roma, Italy*

Optimal sensors should have two basic features: use quantum effects and follow noisy dynamic processes. Here we implement a quantum multiparameter protocol, robust against time-varying noise to study the dynamic of a chemical process.

ROOM 1 Hall A1

CH-2.4 SUN 14:45

Extending the Exposure Time in High-Resolution Mobile Tunnel LIDAR

•*T. Murakami, N. Saito, T. Michikawa, Y. Komachi, M. Sakashita, S. Kogure, K. Kase, S. Wada, and K. Midorikawa*; *RIKEN Center for Advanced Photonics, 2-1 Hirosawa, Wako, Saitama, Japan*

We showed that enough exposure time is essential to satisfy the SN ratio and safety standards in a high-resolution vehicle-mounted laser measurement, and introduced time delay integration method as a solution

CH-2.5 SUN 15:00

Atmospheric CO_2-detection via Scheimpflug DIAL Employing a Simple Fiber Amplifier

X. Yang[1,2], *J. Larsson*[3], •*R. Lindberg*[1], *C. Xu*[4], *J. Bood*[3], *M. Brydegaard*[3,5], *and F. Laurell*[1]; [1]*Department of Applied Physics, Royal Institute of Technology (KTH), Stockholm, Sweden*; [2]*Centre for Optical and Electromagnetic Research (COER), State Key Laboratory of Modern Optical Instrumentation, Hangzhou, China*; [3]*Department of Physics, Div. of Com-*

ROOM 2 Hall A1

CF-2.4 SUN 14:45

76 fs SWCNT-SA mode-locked Tm:MgWO4 laser at 2 μm

L. Wang[1], *Y. Zhao*[1], *Y. Wang*[1], *L. Zhang*[2], *H. Lin*[2], *J.E. Bae*[3], *S.Y. Choi*[3], *F. Rotermund*[3], *P. Loiko*[4], *X. Mateos*[5], *U. Griebner*[1], *V. Petrov*[1], *and* •*W. Chen*[1,2]; [1]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [2]*Key Laboratory of Optoelectronic Materials Chemistry and Physics, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, China*; [3]*Department of Physics, KAIST, Daejeon, South Korea*; [4]*ITMO University, Petersburg, Russia*; [5]*Física i Cristal·lografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili (URV), Tarragona, Spain*

We report on a SWCNT-SA mode-locked Tm:MgW laser with chirped mirrors for dispersion management, delivering pulses as short as 76 fs at 2037 nm with a repetition rate of 86.5 MHz.

CF-2.5 SUN 15:00

Chirped-pulse optical parametric oscillators

•*P. Liu and Z. Zhang*; *Huazhong University of Science & Technology, Wuhan, China*

We demonstrated that by introducing self-phase-modulation effects into a conventional optical-parametric-oscillator (OPO) cavity and dis-

ROOM 6 Hall A1

CI-2.4 SUN 15:00

Experimental observation of propagation direction dependent performance of single-mode multi-core and few-mode fiber links

•*R. S. Luis*[1], *G. Rademacher*[1], *B.J. Puttnam*[1], *H. Furukawa*[1], *Y. Awaji*[1], *R. Maruyama*[2], *K. Aikawa*[2], *and N. Wada*[1]; [1]*NICT, Koganei, Japan*; [2]*Fujikura Ltd., Chiba, Japan*

We report the observation of direction dependent performance on links using multi-core and few-mode fibers. We show increased crosstalk sensitivity by 0.9 dB for

ROOM 7 Hall A1

CE-2.4 SUN 15:00

Super-Quadratic Upconversion Luminescence among Lanthanide Ions

•*I. Carrasco*[1], *L. Laversenne*[2], *S. Bigotta*[3], *A. Toncelli*[3], *M. Tonelli*[3], *A.I. Zagumennyi*[4], *and M. Pollnau*[1]; [1]*Advanced Technology Institute, Department of Electrical and Electronic Engineering, University of Surrey, Guildford, United Kingdom*; [2]*Department of Materials and Functions, Institut NEEL, CNRS/UGA UPR2940, Grenoble, France*; [3]*NEST-Istituto Nanoscienze-CNR and Dipartimento di Fisica, Universita di Pisa, Pisa, Italy*; [4]*Prokhorov Institute of General Physics, Russian Academy of Sciences, Moscow, Russia*

We measured the dependence between upconversion (visible)

ROOM 8 Hall A1

JSI-1.3 SUN 14:45

Non-volatile photonic weights and their impact on photonic reservoir computing systems

•*P. Stark*[1], *J. Geler Kremer*[2,1], *F. Eltes*[1], *D. Caimi*[1], *J. Fompeyrine*[1], *B.J. Offrein*[1], *and S. Abel*[1]; [1]*IBM Research – Zurich, Rüschlikon, Switzerland*; [2]*The University of Texas at Austin, Austin, USA*

We demonstrate non-volatile synaptic weights based on ferroelectric barium titanate films integrated on Si waveguides for a photonic reservoir computing system. We discuss the impact of imperfections in such hardware weights on the reservoir performance.

JSI-1.4 SUN 15:00

Photonic Delay-based Reservoir Computing Integrated on InP Chip

•*K. Harkhoe*[1], *G. Verschaffelt*[1], *A. Katumba*[2], *P. Bienstman*[2], *and G. Van der Sande*[1]; [1]*Applied Physics Research Group, Vrije Universiteit Brussel, Brussel, Belgium*; [2]*Photonics Research Group, Ghent University – IMEC, Gent, Belgium*

We present an experimental validation of delay-based reservoir computing using a semiconductor laser integrated on an InP chip, reaching computation speeds of up to 0.87

NOTES

ROOM 1 ICM

generation with nearly perfect visibility based on fully integrated silicon micro-resonator and pump-rejection filter.

EB-2.5 SUN 15:15

Time/frequency high-dimensional entanglement via engineered parametric downconversion

•*F. Graffitti*[1], *A. Pickston*[1], *P. Barrow*[1], *M. Proietti*[1], *D. Kundys*[1], *A.M. Brańczyk*[2], *and A. Fedrizzi*[1]; [1]*Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Perimeter Institute, Waterloo, Canada*

We introduce and experimentally benchmark a new scheme for generating frequency-entangled photon pairs in engineered parametric downconversion processes. We discuss how this technique can be used to easily generate high-dimensional entangled bi-photon states.

ROOM 3 ICM

CJ-2.6 SUN 15:15

Machine learning based characterisation of dissipative solitons

A. Kokhanovskiy[1], *A. Bednyakova*[1,2], •*E. Kuprikov*[1], *A. Ivanenko*[1], *and S. Turitsyn*[1,3]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Computational Technologies, Novosibirsk, Russia*; [3]*Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

By combining machine learning methods and dispersive Fourier transformation method we demonstrate a possibility to determine the temporal duration, optical spectrum, and power of picosecond-scale laser pulses using nanosecond photodetector with accuracy up to 97%

ROOM 4a ICM

of the non-resonant background by 15 dB permits detection of trace gas concentrations of 20 ppm under ambient conditions.

JSII-1.4 SUN 15:15

Retrieving the complex vibrational susceptibility with interferometric stimulated Raman scattering

•*C.M. Valensise*[1], *V. Kumar*[2], *S. De Silvestri*[1], *G. Cerullo*[1], *and D. Polli*[1]; [1]*Politecnico di Milano, Milan, Italy*; [2]*Universität Duisburg-Essen, Essen, Germany*

A common path interferometer is applied to a conventional Stimulated Raman Scattering setup to allow the measurement of the real part of the nonlinear vibrational susceptibility, allowing a complete measurement of this complex quantity.

ROOM 4b ICM

and momentum- resolved spectroscopy.

JSIV-1.5 SUN 15:15

Squeezed Thermal States: the Right Timing for More Energy-Efficient Electronics

•*J. Klaers*; *Complex Photonic Systems (COPS), MESA+ Institute of Nanotechnology, University of Twente, Enschede, Netherlands*

Squeezed thermal states, which can naturally arise in pulse-driven system such as digital electronics circuits, can be used to lower the Landauer energy penalty of erasing one bit of information.

ROOM 13a ICM

ments. Impact of pump transport is discussed.

CA-2.5 SUN 15:15

High-Energy, sub-20 fs OPCPA Laser System Operating at 1 kHz Repetition Rate

•*R. Boge*[1], *F. Batysta*[1,2], *J. Novák*[1], *Z. Hubka*[1,2], *M. Greco*[1], *V. Šobr*[1], *E. Erdman*[1,3], *A. Špaček*[1,2], *L. Indra*[1,2], *M. Torun*[1], *B. Tykalewicz*[1], *P. Mazůrek*[1], *K. Majer*[1], *R. Antipenkov*[1], *J.T. Green*[1], *J.A. Naylon*[1], *P. Bakule*[1], *and B. Rus*[1]; [1]*ELI Beamlines, Prague, Czech Republic*; [2]*Czech Technical University, Prague, Czech Republic*; [3]*Charles University, Prague, Czech Republic*

We report on the commissioning of the Allegra laser system at ELI-Beamlines. Output energy of 20 mJ has been achieved with 5 out of 7 stages of OPCPA; this demonstrates the feasibility of 100 mJ at full performance.

ROOM 13b ICM

birefringent common-path interferometer.

CD-2.5 SUN 15:15

Non-collinear Optical Parametric Oscillator for Video Rate Stimulated Raman Spectroscopy of Microplastics

•*L. Beichert*[1,2], *Y. Binhammer*[1,2], *J.R. C. Andrade*[1,2], *A.-K. Kniggendorf*[2,3], *B. Roth*[2,3], *and U. Morgner*[1,2,3]; [1]*Institut für Quantenoptik, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics and Engineering - Innovation Across Disciplines), Hannover, Germany*; [3]*Hannoversches Zentrum für Optische Technologien, Hannover, Germany*

We demonstrate a Non-collinear Optical Parametric Oscillator, broadly tunable from 650-950 nm within a few milliseconds. It acts as light source for video rate Stimulated Raman Spectroscopy of microplastic particles in a water flow.

ROOM 14a ICM

of a single defect in hexagonal boron nitride to the guided modes of a tapered fiber is demonstrated resulting in an efficient system for photon collection.

CK-2.6 SUN 15:15

Fundamental Limits in the Coupling Between Light and 2D Polaritons using Point and Line Scatterers

•*E.J.C. Brioso Dias*[1] *and F.J. García de Abajo*[1,2]; [1]*ICFO - The Institute of Photonic Sciences, Castelldefels, Spain*; [2]*ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We explore the coupling between light and 2D polaritons using 0D/1D scatterers. We find that this intrinsically inefficient process is limited by fundamental principles which bound the scatterer effective polarizability and the coupling cross-section.

ROOM 14b ICM

in air with femtosecond laser ablation.

CM-2.5 SUN 15:15

Slicing Crystalline Silicon Wafer by Deep Subsurface Laser Processing and Selective Chemical Etching

•*M. Zolfaghari Borra*[1,2], *H. Nasser*[1], *E.H. Ciftpinar*[1,2], *A. Turnali*[3], *P. Deminskyi*[3], *T. Colakoglu*[1], *O. Tokel*[3], *F.O. Ilday*[3], *I. Pavlov*[1,4], *R. Turan*[1,2,4], *and A. Bek*[1,2,4]; [1]*The Center for Solar Energy Research and Applications (GÜNAM), Middle East Technical University, Ankara, Turkey*; [2]*Micro and Nanotechnology Graduate Program, Middle East Technical University, Ankara, Turkey*; [3]*Department of Physics, I. D. Bilkent University, Ankara, Turkey*; [4]*Department of Physics, Middle East Technical University, Ankara, Turkey*

We demonstrate c-Si slices fabrication using nanosecond-pulsed fiber laser operating at 1.55-micrometer and focused in Si-subsurface followed by selective chemical etching. To obtain slices with smooth surface, the chemistry of the etching solution was optimized.

ROOM 14c ICM

nonlinearities in metal-dielectric composites is unclear. By spectrally and temporally probing coherent second harmonic fields we show how nanometer-sized plasmonic hot spots in gold nanosponges drive the emission from embedded zinc-oxide nanoparticles.

EE-2.5 SUN 15:15

Photon number fluctuation in time domain experiment in superconducting B2212

•*F. Giusti*[1], *A. Marciniak*[1], *and D. Fausti*[1,2]; [1]*Department of Physics, Università degli Studi di Trieste, Trieste, Italy*; [2]*Elettra-Sincrotrone Trieste S.C.p.A., Trieste, Italy*

We propose a new approach to time resolved measurements in condensed matter, in which the noise on the probe photon number is exploited to get additional information on the system under study.

ROOM 21 ICM

JSV-2.5 SUN 15:15

Quantum Sensing of Absorbance and the Beer-Lambert Law

•*E.J. Allen*[1,2], *J. Sabines-Chesterking*[1], *P.M. Birchall*[1], *A. McMillan*[1], *S.K. Joshi*[1], *and J.C.F. Matthews*[1]; [1]*Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical & Electronic Engineering, University of Bristol, BS8 1FD, Bristol, United Kingdom*; [2]*Quantum Engineering Centre for Doctoral Training, H. H. Wills Physics Laboratory and Department of Electrical & Electronic Engineering, University of Bristol, BS8 1FD, Bristol, United Kingdom*

We theoretically and experimentally demonstrate that when absorbance estimation in the Beer-Lambert law is considered, the advantage offered by optical quantum sensing strategies is drastically reduced by optimisation over the length of absorbing material.

ROOM 1 Hall A1

bustion Physics, Lund University, Lund, Sweden; [4]*NEOLund, Lund, Sweden*; [5]*Norsk Elektro Optikk, Skedsmokorset, Norway*

We present a simple fiber amplifier designed for continuous-wave DIAL measurements of atmospheric CO_2-concentration. The results from in-field measurements are also presented.

CH-2.6 SUN 15:15

A single free-running dual-comb MIXSEL for fast and precise distance measurements

•*J. Nürnberg, C.G.E. Alfieri, D. Waldburger, L. Krüger, M. Golling, and U. Keller*; *Department of Physics, Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland*

We present time of flight LIDAR with a single, unstabilized dual-comb modelocked integrated external-cavity surface emitting laser. We achieve accuracies as high as 20 μm at update rates as fast as 20 μs.

ROOM 2 Hall A1

persion management, a chirped-pulse OPO can be constructed, generating optical pulses with an instantaneous bandwidth much wider than the pump bandwidth.

CF-2.6 SUN 15:15

Charting the entropy of mode-locking maps, a new perspective to approach passive mode-locking in fiber lasers

•*G. Makey*[1,2], *T. Teamir*[1], *S. Ilday*[2], *and F.Ö. Ilday*[1,2,3]; [1]*Department of Physics, Bilkent University, Ankara, Turkey*; [2]*UNAM, Bilkent University, Ankara, Turkey*; [3]*Department of Electrical and Electronics Engineering, Bilkent University , Ankara, Turkey*

We introduce the mode-locking maps along with the entropy maps to approach the complexity of passive mode-locking in fiber lasers. That enables better understanding of the passively mode-locked lasers as far-from-equilibrium systems.

ROOM 6 Hall A1

the direction with the multi-core fiber located closer to the receiver.

CI-2.5 SUN 15:15

Combining the Discrete NFT Spectrum with b-modulation for High-Effciency Optical Transmission

•*A. Vasylchenkova, J.E. Prilepsky, N.B. Chichkov, and S.K. Turitsyn*; *Aston Institute of Photonic Technologies, Aston University, B4 7ET, Birmingham, United Kingdom*

For the first time we combine the *b*-modulation nonlinear Fourier transform-based optical transmission technique with the modulation of the discrete nonlinear spectrum and show the resulting system's performance gain.

ROOM 7 Hall A1

and direct (infrared) luminescence decay of Nd3+-doped laser materials under equivalent pump conditions. We found a strongly super-quadratic instead of the expected quadratic dependence. Calculations partially explain experiments.

CE-2.5 SUN 15:15

Ge/YbF3 and ZnS/YbF3 thin-film combinations open new perspectives in production of broadband optics for mid-infrared laser applications

•*T. Amotchkina*[1], *M. Trubetskov*[2], *M. Schulz*[3], *and V. Pervak*[1]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [3]*Agilent Technologies, Waldbronn, Germany*

Two broadband of ZnS/YbF3 and Ge/YbF3 dichroic filters transmitting mid-infrared and reflecting near-infrared radiation were produced for Brewster angle of ZnSe. The coatings can be used in pump-probe spectroscopy studying ultrafast dynamics of biological molecules.

ROOM 8 Hall A1

GSa/s. The scheme is benchmarked using timeseries prediction tasks.

JSI-1.5 SUN 15:15

Nanophotonic Hardware for Reservoir Computing - Spectrally Homogeneous Microlaser Arrays

•*J. Große*[1], *T. Heuser*[1], *D. Brunner*[2], *I. Fischer*[3], *and S. Reitzenstein*[1]; [1]*Technische Universität Berlin, Institut für Festkörperphysik, Berlin, Germany*; [2]*FEMTO-ST, Département d'Optique, Besancon, France*; [3]*Instituto de Fisica Interdisciplinar y Sistemas Complejos, IFISC (UIB-CSIC), Palma de Mallorca, Spain*

We present a novel nanophotonic hardware platform for optical reservoir computing. Our concept is based on the diffractive coupling of microlasers in large-scale arrays of up to 900 devices with high spectral homogeneity.

NOTES

ROOM 1 ICM

16:00 – 17:30

EB-3: Quantum communication and applications

Chair: Gregor Weihs, Universität Innsbruck, Innsbruck, Austria

EB-3.1 SUN (Invited) 16:00

Qubits in Space

•*P. Villoresi*[1], *G. Vallone*[1], *L. Calderaro*[1], *C. Agnesi*[1], *M. Schiavon*[1], *A. Santamato*[1], *A. Stanco*[1], *V. Luceri*[2], *D. Dequal*[3], *and G. Bianco*[3]; [1]*Università di Padova, DEI, Padova, Italy*; [2]*e-GEOS, Matera, Italy*; [3]*MLRO Agenzia Spaziale Italiana, Matera, Italy*

Space channels from medium-Earth-orbits allows for novel applications of quantum protocols and fundamental tests. For these orbits, we demonstrate experimentally the exchange of single photons and the temporal detection to sub-nanosecond scale.

ROOM 3 ICM

16:00 – 17:30

CJ-3: Hollow-core fibers and systems

Chair: Ammar Hideur, CORIA, Rouen, France

CJ-3.1 SUN 16:00

Ultra-violet optical amplifier based on plasma-core PCF

•*F. Delahaye, F. Amrani, B. Debord, F. Gérôme, and F. Benabid*; *Xlim, Limoges, France*

We report the first DUV/UV amplifier using an all plasma-core photonic crystal fiber architecture with a maximum gain of 25 dB and a total optical power of 11 μW at 315 nm.

ROOM 4a ICM

16:00 – 17:30

JSII-2: Raman spectroscopy II

Chair: Dario Polli, Politecnico di Milano, Milano, Italy

JSII-2.1 SUN (Invited) 16:00

Probing neuronal membrane potentials and ionic fluxes at the single cell level by means of water

•*S. Roke*; *École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*

Second harmonic imaging of neuronal membrane potentials and ion fluxes using water molecules as a contrast agent is proposed. Spatiotemporal videos of membrane potential and ion flux distributions are following potassium activation are demonstrated.

ROOM 4b ICM

16:00 – 17:30

JSIV-2: Nanodevices controlled by heat manipulation

Chair: Sebastien Volz, CNRS, France and the University of Tokyo, Japan

JSIV-2.1 SUN (Invited) 16:00

Evaporative Electron Cooling in Asymmetric Double Barrier Semiconductor Heterostructures

•*M. Bescond*[1,2], *A. Yangui*[1,2], *T. Yan*[1], *N. Nagai*[1], *and K. Hirakawa*[1,2,3]; [1]*Institute of Industrial Science, University of Tokyo, Tokyo, Japan*; [2]*LIMMS/CNRS-IIS, UMI 2820, Tokyo, Japan*; [3]*Institute for Nano Quantum Information Electronics, University of Tokyo, Tokyo, Japan*

We report both theoretically and experimentally an efficient refrigeration technique based on evaporative electron cooling in asymmetric AlGaAs/GaAs double barrier heterostructures. At 300 K, Electron temperature in the quantum well remarkably decreased by 50 K.

ROOM 13a ICM

16:00 – 17:30

CA-3: Waveguide lasers

Chair: Nicolaie Pavel, National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

CA-3.1 SUN 16:00

Three-Dimensional Laser Nanostructuring of Optical Crystals: Towards Nanophotonic-Engineered Solid-State Media

•*A. Ródenas*[1,2], *M. Gu*[3], *G. Corrielli*[1], *P. Paie*[1], *S. John*[4], *A. Kar*[5], *and R. Osellame*[1]; [1]*Istituto di Fotonica e Nanotecnologie (IFN) Consiglio Nazionale delle Ricerche (CNR), Milan, Italy*; [2]*Departamento de Fisica, Universidad de La Laguna (ULL), Santa Cruz de Tenerife, Spain*; [3]*Royal Melbourne Institute of Technology (RMIT), Melbourne, Australia*; [4]*Department of Physics, University of Toronto (UoT), Toronto, Canada*; [5]*Institute of Photonics and Quantum Sciences, HWU, Edinburgh, United Kingdom*

We report on the sub-wavelength engineering of YAG and sapphire laser crystals, by means of ultrafast 3D laser structuring. We thus anticipate the advent of nanophotonic-engineered crystals, incorporating metaoptics, dispersion-control and other functions all inside-the-crystal.

ROOM 13b ICM

16:00 – 17:30

CD-3: Tunable light sources

Chair: Cristian Manzoni, IFN-CNR Politecnico di Milano, Milano, Italy

CD-3.1 SUN 16:00

Degenerate Mirrorless Optical Parametric Oscillator

A.-L. Viotti, •*P. Mutter, A. Zukauskas, V. Pasiskevicius, and C. Canalias*; *Department of Applied Physics, KTH Royal Institute of Technology, Stockholm, Sweden*

We present the first degenerate mirrorless optical parametric oscillator (MOPO), generating counter-propagating signal and idler in the telecom spectral band. The MOPO was realized in 420nm-period PPRKTP and achieved a conversion efficiency of 49%.

ROOM 14a ICM

16:00 – 17:30

CK-3: Active devices

Chair: Stephan Calvez, LAAS-CNRS, Toulouse, France

CK-3.1 SUN 16:00

III-V on SOI Photonic Crystal nano-amplifier and nanolaser

•*F. Manegatti, D. Fitsios, D. Sanchez, R. Raj, and F. Raineri*; *Centre for Nanoscience and Nanotechnology, Palaiseau, France*

We demonstrate the design, fabrication and experimental evaluation of novel compact and power efficient electrically pumped nano-amplifiers and nanolasers based on InP photonic crystal (PhC) nanocavities and integrated on the Silicon-on-Insulator (SOI) platform.

ROOM 14b ICM

16:00 – 17:30

CM-3: Advanced functionalization of materials

Chair: Yves Bellouard, EPFL, Lausanne, Switzerland

CM-3.1 SUN 16:00

Fabrication of Metal Microstructures in Elastic Hydrogel by Multiphoton Photoreduction

•*M. Terakawa*[1], *M. Machida*[1], *H. Onoe*[1], *T. Niidome*[2], *and A. Heisterkamp*[3]; [1]*Keio University, Yokohama, Japan*; [2]*Kumamoto University, Kumamoto, Japan*; [3]*Gottfried-Wilhelm-Leibniz Universität Hannover, Hannover, Germany*

We demonstrated the fabrication of silver, gold, and bimetallic microstructures inside a single hydrogel by multiphoton photoreduction, which will contribute to realize spatially-selective-light-based actuators and tunable optical sensors by changing optical properties in a hydrogel.

ROOM 21 ICM

16:00 – 17:30

JSV-3: Optomechanics and atomic clocks

Chair: Michael Drewsen, Aarhus University, Aarhus, Denmark

JSV-3.1 SUN (Invited) 16:00

Quantum Measurement of a Mechanical Resonator At and Below the Standard Quantum Limit

M. Rossi[1,2], D. Mason[1,2], J. Chen[1,2], Y. Tsaturyan[1], and •A. Schliesser[1,2]; [1]Niels Bohr Institute, Copenhagen, Denmark; [2]Center for Hybrid Quantum Networks (Hy-Q), Copenhagen, Denmark

We measure mechanical displacements within 35% of the Heisenberg limit. By exploiting quantum correlations in an optomechanical system, we achieve for the first time a total sensitivity below the standard quantum limit by 1.5 dB.

ROOM 1 Hall A1

16:00 – 17:30

CH-3: Photoacoustic sensors

Chair: Hans-Peter Loock, Queen's University Kingston, Kingston, Canada

CH-3.1 SUN 16:00

Long Range Distributed Optical Acoustic Sensor based on In-line Raman Amplification

•A. Masoudi, T. Newson, and G. Brambilla; University of Southampton, Southampton, United Kingdom

A long range single ended distributed optical fibre acoustic sensor is demonstrated capable of fully quantifying strain level along 60km long sensing fibre with a minimum detectable strain of 100 nano-strain and frequency range of 250Hz.

ROOM 2 Hall A1

16:00 – 17:30

CF-3: Fiber lasers

Chair: Christopher Phillips, ETH, Zurich, Switzerland

CF-3.1 SUN (Invited) 16:00

Ultrafast Spectroscopy and Control in the Limits of Single Electrons and Virtual Photons

•A. Leitenstorfer; University of Konstanz, Konstanz, Germany

Quantum phenomena in elementary dimensions of real time and space are studied with ultrasensitive femtosecond technologies, including few-fermion dynamics in semiconductor quantum dots and atom-sized metallic junctions as well as vacuum fluctuations of mid-infrared fields.

ROOM 6 Hall A1

16:00 – 17:30

CI-3: Components and systems for metro and short range networks

Chair: Juan-Diego Anja Castanon, Instituto de Óptica CSIC, Madrid, Spain

CI-3.1 SUN 16:00

VCSEL Technologies for High-capacity Dense WDM Networks

•M. Rapisarda[1], A. Gatto[1], P. Martelli[1], P. Parolari[1], C. Neumeyr[2], M. Svaluto Moreolo[3], J.M. Fabrega[3], L. Nadal[3], and P. Boffi[1]; [1]Politecnico di Milano - DEIB, Milan, Italy; [2]Vertilas GmbH, Garching, Germany; [3]Centre Tecnològic de Telecomunicacions de Catalunya, Castelldefels, Spain

We analysed the chirp impact of different VCSEL technologies when direct DMT modulation is employed to achieve more than 50 Gb/s capacity per wavelength in multi-Tb/s transmitter modules for dense WDM metropolitan networks.

ROOM 7 Hall A1

16:00 – 17:30

CE-3: Neuro-inspired computing and random photonics

Chair: Markus Schmidt, Friedrich-Schiller University, Jena, Germany

CE-3.1 SUN 16:00

Tailoring random lasing emission by pulsed polymer ablation

E. Soria[1], •A. Consoli[1,2], N. Caselli[1], and C. López[1]; [1]Material Science Factory, Instituto de Ciencias de Materiales de Madrid (ICMM), Consejo Superior de Investigaciones Científicas (CSIC), Sor Juana Ines de la Cruz 3, 28049 , Madrid, Spain; [2]ETSI de Telecomunicación, Universidad Rey Juan Carlos, C. Tulipán s/n, 28933, Madrid, Spain

Random lasers with gain region placed between two scattering surfaces are fabricated by means of pulsed laser ablation. By engineering the roughness of the scattering surfaces we prove to control the number of lasing modes

ROOM 8 Hall A1

16:00 – 17:30

JSI-2: Neuromorphic processing for optical communications

Chair: Peter Bienstman, Ghent University, Ghent, Belgium

JSI-2.1 SUN (Invited) 16:00

The contribution has been withdrawn.

ROOM B11 Hall B1

16:00 – 17:30

YM: Career event: Options after your PhD

Chair: Araceli Venegas-Gomez, University of Strathclyde, Glasgow, United Kingdom and Chiara Trovatello, Politecnico di Milano, Milano, Italy

EPS Young Minds section invites to a career event on professional paths inside and beyond academia where different career paths and opportunities for physicists will be discussed and promoted. In the form of panel discussions, young physicists – master students, graduate students, and post-docs – will have the opportunity to engage with 5 invited speakers through a Q&As session. See further description in the General Information part of this programme.

NOTES

ROOM 1 ICM

EB-3.2 SUN 16:30

Quantum Key Distribution with Small Satellites

Ö. Bayraktar[4], •P. Freiwang[3], D. Garbe[1], M. Grünefeld[6], R. Haber[1], C. Marquardt[4], F. Moll[2], J. Pudelko[4], B. Rödiger[2], W. Rosenfeld[3], K. Schilling[1], C. Schmidt[2], and H. Weinfurter[3,5]; [1]Center for Telematics (ZfT), Würzburg, Germany; [2]German Aerospace Center (DLR) IKN, Oberpfaffenhofen, Germany; [3]Ludwig-Maximilian-University (LMU), Munich, Germany; [4]Max Planck Institute for the Science of Light (MPL), Erlangen, Germany; [5]Max Planck Institute of Quantum Optics (MPQ), Garching, Germany; [6]OHB System AG, Oberpfaffenhofen, Germany

We present concepts for compact, robust and stable QKD nano-satellite payloads, which will be designed within

ROOM 3 ICM

CJ-3.2 SUN 16:15

Activation of the Self-Focusing Process in Hollow-Core Fibers: Influence of the Spatio-Temporal Dynamics.

•A. Crego, E. Conejero Jarque, and J. San Roman; University of Salamanca, Salamanca, Spain

We study numerically the role of the nonlinear temporal dynamics on the spatial collapse of an ultrashort laser pulse inside a hollow-core fiber, directly related to the multimode nature of this propagation.

CJ-3.3 SUN 16:30

All-fiber High-average-power 4.42-μm Raman Laser Based on Silica Fiber

•A. Gladyshev[1], M. Astapovich[1], M. Khudyakov[1,2], A. Kosolapov[1], M. Likhachev[1], and I. Bufetov[1]; [1]Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia; [2]Moscow Institute of Physics and Technology , Dolgoprudny, Russia

We demonstrate an alignment-free single-mode 4.42-μm Raman laser based on a hollow-core silica fiber spliced to a 1.56-μm erbium-doped fiber laser. Output average power of 360 mW and quantum efficiency of 46 % is achieved.

ROOM 4a ICM

JSII-2.2 SUN 16:30

Phase-contrast microscope with molecular contrast

•K. Toda[1], M. Tamamitsu[1], R. Horisaki[2,3], and T. Ideguchi[1,3]; [1]Department of Physics, The University of Tokyo, Tokyo, Japan; [2]Graduate School of Information Science and Technology, Osaka, Japan; [3]PRESTPO, Japan Science and Technology Agency, Saitama, Japan

A simple label-free molecular imaging method is presented based on optical-phase-sensitive detection of mid-infrared molecular-vibrational photothermal effect utilizing a standard visible-light-based phase-contrast microscope, offering high sensitivity, imaging speed and spatial resolution under low-power optical illumination.

ROOM 4b ICM

JSIV-2.2 SUN (Invited) 16:30

Magneto-optical control for nanoscale thermotronics

A. Ott[1], R. Messina[2], P. Ben-Abdallah[2], and •S.-A. Biehs[1]; [1]Institut für Physik, Carl von Ossietzky Universität, Oldenburg, Germany; [2]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud, Palaiseau, France

Magneto-optical materials show interesting effects like the radiative thermal Hall effect, persistent heat currents, giant magnetoresistance, and circular heat fluxes allowing to actively control nanoscale heat radiation. We review some recent developments in this direction of magneto-optical thermotronics.

ROOM 13a ICM

CA-3.2 SUN 16:15

Yb:KLuW channel waveguide lasers passively Q-switched by evanescent-field interaction with carbon nanotubes

•J.E. Bae[1], T.G. Park[1], E. Kifle[2], X. Mateos[2], M. Aguiló[2], F. Díaz[2], C. Romero[3], J.R.V.d. Aldana[3], and F. Rotermund[1]; [1]Dept. of Physics, KAIST, Daejeon, South Korea; [2]Universitat Rovira i Virgili, Tarragona, Spain; [3]University of Salamanca, Salamanca, Spain

We report the first Q-switched operation of Yb:KLuW channel waveguides based on evanescent-field interaction with single-walled carbon nanotubes. Sub-100-ns pulses at repetition rates of about 1 MHz are generated with slope efficiencies above 50%.

CA-3.3 SUN (Invited) 16:30

Femtosecond-Laser-Written Waveguide Lasers at ~2 um

•X. Mateos[1], E. Kifle[1], P. Loiko[2], C. Romero[3], J. Rodriguez[3], A. Ródenas[1,4], S. Choi[5], J. Bae[5], F. Rotermund[5], U. Griebner[6], V. Petrov[6], M. Aguiló[1], and F. Díaz[1]; [1]Universitat Rovira i Virgili, Tarragona, Spain; [2]Centre de recherche sur les Ions, les Matériaux et la Photonique , Caen, France; [3]University of Salamanca, Salamanca, Spain; [4]Istituto di Fotonica e Nanotecnologie, Milan, Italy; [5]Department of Physics, KAIST, Daejeon, South Korea; [6]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

The fabrication, optical characterization and CW and PQS laser operation of 2-μm waveguide lasers produced by

ROOM 13b ICM

CD-3.2 SUN 16:15

Photon Pair Generation at 2.080 μm by Down-conversion

•T. Shields[1], S. Prabhakar[1], D. Powell[1], G.G. Taylor [1], D. Morozov[1], M. Ebrahim[1], M. Kues[1], L. Caspani[2], C. Gawith[3], R.H. Hadfield[1], and M. Clerici[1]; [1]University of Glasgow, Glasgow, UK; [2]University of Strathclyde, Glasgow, UK; [3]Covesion Ltd. & Optoelectronics Research Centre, University of Southampton, Southampton, UK

We report the generation and coincidence detection of a pulsed spontaneous parametric down-conversion photon pair source at 2.080 μm, as a basis for free-space quantum communication in an atmospheric window with low solar background.

CD-3.3 SUN 16:30

Continuous tunability of a microresonator parametric oscillator

T. Bi[1,2], N. Sayson[1,2,3], V. Ng[1,2], L. Trainor[2,4], H. Schwefel[2,4], S. Coen[1,2], M. Erkintalo[1,2], and •S. Murdoch[1,2]; [1]Physics Department, University of Auckland, Auckland, New Zealand; [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand; [3]Physics Department, Mindanao State University - Iligan Institute of Technology, Iligan City, Philippines; [4]Physics Department, University of Otago, Dunedin, New Zealand

We experimentally demonstrate the continuous tunability of parametric sidebands in a Kerr microresonator parametric oscillator. Enabled the intrinsic thermal

ROOM 14a ICM

CK-3.2 SUN 16:15

Three-dimensional pyramid microlasers

•S. Bittner[1,2], M.A. Guidry[1], Y. Song[3], C. Lafargue[1], R. Sobcyk[1], D. Decanini[4], B. Dietz[3], L. Huang[3], J. Zyss[1], A. Grigis[5], and M. Lebental[1]; [1]Laboratoire de Photonique Quantique et Moléculaire, CNRS UMR 8537 ENS Paris-Saclay, CentraleSupélec, Cachan, France; [2]Chaire Photonique, LMOPS, CentraleSupélec, University Paris-Saclay, Metz, France; [3]School of Physical Science and Technology, and Key Laboratory for Magnetism and Magnetic Materials of MOE, Lanzhou University, Lanzhou, China; [4]Centre de Nanosciences et de la Nanotechnologie, CNRS, University Paris-Sud, University Paris-Saclay, Marcoussis, France; [5]Laboratoire d'Analyse, Géometrie et Applications, CNRS UMR 7539, University Sorbonne Paris City, University Paris 13, Institut Galilée, Villetaneuse, France

3d organic microlasers were fabricated by direct laser writing and lasing on a 3d periodic orbit was observed. The implications of the 3d orbit for the emission patterns and polarization state are discussed.

CK-3.3 SUN 16:30

Optically controlling the emission chirality of microlasers

•N. Carlon Zambon[1], P. St-Jean[1], M. Milićević[1], A. Lemaître[1], L. Le Gratiet[1], A. Harouri[1], I. Sagnes[1], O. Bleu[2], D.D. Solnyshkov[2], G. Malpuech[2], S. Ravets[1], A. Amo[3], and J. Bloch[1]; [1]Centre de Nanosciences et de Nanotechnologies (C2N), CNRS

ROOM 14b ICM

CM-3.2 SUN 16:15

Direct photoreduction of graphene oxide film for flexible electronics using femtosecond laser pulses

•*T.-S.D. Le, J. An, and Y.-J. Kim*; *Singapore Centre for 3D Printing, School of Mechanical and Aerospace Engineering, Nanyang Technological University (NTU), 50 Nanyang Avenue, Singapore 639798, Singapore*

Direct photoreduction of graphene oxide film coated on heat-sensitive polymers was enabled using femtosecond laser pulses. One-step fabrication, design flexibility, and high patterning resolution make this technique a promising candidate for flexible graphene electronics.

CM-3.3 SUN (Invited) 16:30

Diamond functionalization by ultrafast laser pulses

•*P. Salter*; *Engineering Science, Oxford, United Kingdom*

Ultrashort pulse lasers offer many new opportunities for the functionalization of diamond substrates for technology applications. Electrical wires, optical waveguides and coherent colour centres can all be fabricated in 3D beneath the diamond surface.

ROOM 21 ICM

JSV-3.2 SUN (Invited) 16:30

Ultra-low dissipation mechanical resonators for cavity optomechanics

M.J. Bereyhi[1], *A. Beccari*[1], *S.A. Fedorov*[1], *A.H. Ghadimi*[1], *R. Schilling*[1], *D.J. Wilson*[2], •*N.J. Engelsen*[1], *and T.J. Kippenberg*[1]; [1]*Institute of Physics (IPHYS), Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*IBM Research, Zurich, Switzerland*

We study the theory of dissipation dilution and realize two experimental techniques — "elastic-strain engineering" and "clamp-tapering" — for exceptional mechanical quality factors ($Q \times f > 10^1$5Hz) of high stress Si_3N_4 nanobeams at room temperature.

ROOM 1 Hall A1

CH-3.2 SUN 16:15

Novel DAS extension system based on pulse regeneration

•*D. Sanahuja*[1], *J. Preciado*[1,2], *J. Subías*[1], *C. Heras*[1], *P. Sevillano*[2], *J.J. Martínez*[2], *and A. Villafranca*[2]; [1]*Universidad de Zaragoza, Zaragoza, Spain*; [2]*Aragón Photonics Labs (APL), Zaragoza, Spain*

This paper presents results obtained from a DAS extension system using a discrete lumped amplification - detection scheme that far extends conventional DAS sensing range, limited by Modulation Instability threshold, with minimal sensing performance impairment.

CH-3.3 SUN 16:30

Compact photoacoustic spectrometer based on a widely tunable mid-infrared pulsed optical parametric oscillator

L. Lamard [1], *D. Balslev-Harder*[2], *A. Peremans*[2,3], *J.C. Petersen*[1], *and* •*M. Lassen*[1]; [1]*Danish Fundamental Metrology, Hørsholm, Denmark*; [2]*Laserspec BVBA, Namur, Belgium*; [3]*University of Namur, Namur, Belgium*

We demonstrate the usefulness of a nanosecond-pulsed single-mode mid-infrared (MIR) optical parametric oscillator (OPO) integrated with photoacoustic (PA) spectroscopic. The compact PA sensor targets the major market opportunities in environnemental monitoring and breath gas analysis.

ROOM 2 Hall A1

CF-3.2 SUN 16:30

100 μJ, 100 kHz, CEP-Stable High-Power Few-Cycle Fiber Laser

•*E. Shestaev*[1], *D. Hoff*[2,3], *S. Hädrich*[4], *F. Just*[4], *T. Eidam*[4], *P. Jójárt*[5], *Z. Várallyay*[5], *K. Osvay*[5], *G.G. Paulus*[2,3], *A. Tünnermann*[1,3,6], *and J. Limpert*[1,3,4,6]; [1]*Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Jena, Germany*; [2]*Friedrich-Schiller-Universität Jena, Institut für Optik und Quantenelektronik, Jena, Germany*; [3]*Helmholtz-Institute Jena, Jena, Germany*; [4]*Active Fiber Systems GmbH, Jena, Germany*; [5]*ELI-ALPS, ELI-HU Non-Profit Ltd., Szeged, Hungary*; [6]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*

We present a high-power Yb:fiber laser system deliver-

ROOM 6 Hall A1

CI-3.2 SUN 16:15

Artificial Neural Network Equalizers for PAM-4 Using DML-on-Silicon

•*N.P. Diamantopoulos, T. Fujii, H. Nishi, K. Takeda, T. Kakitsuka, and S. Matsuo*; *NTT Corporation, Atsugi, Kanagawa, Japan*

Two types of artificial neural network nonlinear equalizers (ANN-NLEs) are studied for energy-efficient short-reach optical interconnects using a 1.3-μm directly-modulated membrane laser on silicon (DML-on-Si) and PAM-4 signals over 2-km of standard single-mode fiber.

CI-3.3 SUN 16:30

Two-Way PAM8/PAM4 VCSEL-Based IVLLC System with Parallel Optical Injection Locking

•*Y.-R. Wu*[1], *C.-W. Su*[1], *C.-Y. Li*[2], *W.-S. Tsai*[3], *and H.-H. Lu*[1]; [1]*National Taipei University of Technology, Taipei, Taiwan*; [2]*National Taipei University, New Taipei City, Taiwan*; [3]*Ming Chi University of Technology, New Taipei City, Taiwan*

A two-way PAM8/PAM4 VCEL-based IVLLC system with a parallel optical injection-locked VCSEL transmitter is proposed and demonstrated. This demonstrated two-way PAM4/PAM8 IVLLC system brings important enhancements in the scenario characterized by high-speed two-way free-space transmissions.

ROOM 7 Hall A1

CE-3.2 SUN 16:15

Strong localization effects in weakly scattering medium

•*F. Monet*[1], *S. Loranger*[2], *and R. Kashyap*[1,3]; [1]*Engineering Physics, Polytechnique Montreal, Montreal, Canada*; [2]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [3]*Electrical Engineering, Polytechnique Montreal, Montreal, Canada*

We report the first observation of strong localization in random, weakly-scattering media in the form of a highly random fiber Bragg grating, with significant implications for disordered 2-3D quasi-periodic media such as crystals and semiconductors.

CE-3.3 SUN (Invited) 16:30

Neuro-inspired Computing: From Resistive Memory to Optics

•*C. Mackin, P. Narayanan, H. Tsai, S. Ambrogio, A. Chen, and G. Burr*; *IBM Research - Almaden, San Jose, USA*

This talk summarizes our work on resistive memory as hardware accelerators for deep neural networks (DNNs) and attempts to assess what our experience might imply for optical implementations of DNNs and other brain-inspired computational algorithms.

ROOM 8 Hall A1

JSI-2.2 SUN 16:30

Signal shaping and neuromorphic processing for optical communications

•*M. Sorokina and S. Turitsyn*; *Aston University, Birmingham, United Kingdom*

We demonstrate an advantage of combining probabilistic shaping and neuromorphic computing processing based on the fiber-optic echo state network analogue (FESNA) for optical communications systems.

ROOM 1 ICM

the QUBE mission to demonstrate the feasibility and usability of QKD components on a LEO CubeSat.

EB-3.3 SUN 16:45

Co-existence of 87 Mbit/s quantum and 10 Gbit/s classical communications in 37-core fiber

•*B. Da Lio[1], D. Bacco[1], D. Cozzolino[1], F. Da Ros[1], X. Guo[2], Y. Ding[1], Y. Sasaki[3], K. Aikawa[3], S. Miki[4], H. Terai[4], T. Yamashita[5], J.S. Neergaard-Nielsen[2], M. Galili[1], K. Rottwitt[1], U.L. Andersen[2], T. Morioka[1], and L.K. Oxenløwe[1]; [1]CoE SPOC, Dep. Photonics Eng., Technical University of Denmark, Kgs. Lyngby 2800, Denmark; [2]CoE bigQ, Dep. of Physics., Technical University of Denmark, Kgs. Lyngby 2800, Denmark; [3]Advanced Technology Laboratory, Fujikura Ltd., 1440, Mutsuzaki, Sakura, Chiba, 285-8550, Japan; [4]Advanced ICT Res. Inst., National Institute of Information and Communications Technology, 588-2 Iwaoka, Nishi-ku, Kobe, 651-2429, Japan; [5]Department of Electronics, Graduate School of Engineering, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, Japan*

Quantum key distribution faces a big obstacle in the integration with the existing infrastructure. As a step forward, we demonstrate the co-existence of high rate quantum communications with a classical channel in a 37-core fiber.

EB-3.4 SUN 17:00

Trace-free Counterfactual Communication with a Nanophotonic Processor

•*I. Alonso Calafell[1], T. Strömberg[1], D.R.M.*

ROOM 3 ICM

CJ-3.4 SUN 16:45

Mid-IR HCPCF gas-laser emitting at 4.6 μm

•*F. Gérôme[1], F. Aghbolagh[2], V. Nampoothiri[2], B. Debord[1], L. Vincetti[3], F. Benabid[1], and W. Rudolph[2]; [1]GPPMM Group, Xlim Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France; [2]Department of Physics and Astronomy, University of New Mexico, Albuquerque, USA; [3]Dept. of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, Modena, Italy*

We report on an optically pumped gas-laser based on N2O-filled IC-HCPCF. The pulsed N2O HOFGLAS is pumped at 1.517μm and emits at 4.6μm with a photon conversion efficiency of 9% and a slope of 3%.

CJ-3.5 SUN 17:00

355 nm-laser pumped hydrogen UV Raman comb

•*M. Chafer[1], B. Beaudou[1], J. Osorio[2], F. Delahaye[2], F. Amrani[2], B. Debord[1,2], F. Gérôme[1,2], and F. Benabid[1,2]; [1]GLOphotonics, Limoges, France; [2]GPPMM, Limoges, France*

A Raman comb is generated in a hydrogen-filled HCPCF specially tailored to be pumped by a 355nm microchip. 20 UV Raman components are obtained with a maximum

ROOM 4a ICM

JSII-2.3 SUN 16:45

Visualizing Cellular Secretion with Single-Protein Sensitivity via Interferometric Scattering Microscopy (iSCAT)

•*A. Gemeinhardt[1], K. König[1,2], F. Nicoli[1], M. Dahmardeh[1], and V. Sandoghdar[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Friedrich Alexander University Erlangen-Nürnberg, Erlangen, Germany*

We employ interferometric scattering microscopy (iSCAT) to detect single biomolecules without the need for any type of labeling. This method allows for the investigation of secretion dynamics from living cells in real-time.

JSII-2.4 SUN 17:00

High-contrast coherent Raman scattering imaging using a self-synchronized dual-color fiber laser

•*C. Kong[1], C. Pilger[2], H. Hachmeister[2], X. Wei[3], K.K. Tsia[1], T. Huser[2], and K.K.Y. Wong[1]; [1]Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong, China; [2]Biomolecular Photonics, Department of Physics, University of Bielefeld, Bielefeld, Germany; [3]Division*

ROOM 4b ICM

JSIV-2.3 SUN (Special Oral) 17:00

Light shaping for reconfigurable microscale temperature control

C. Liu[1,2], P. Berto[1,2], I. Flores[2], M. Guillon[2], and •G. Tessier[1,2]; [1]Sorbonne Université, CNRS, INSERM, Institut de la Vision, Paris, France; [2]Neurophotonics Laboratory, UMR 8250 CNRS, Université Paris Descartes, Paris, France

Using a spatial light modulator, a pre-calculated heat source distribution is

ROOM 13a ICM

femtosecond direct laser writing in thulium or holmium doped monoclinic crystals are presented. Several saturable absorbers are studied.

CA-3.4 SUN 17:00

In-band Pumping of Tm:LiYF$_4$ Channel Waveguide: A Power Scaling Strategy for ~2 μm Waveguide Lasers

•*P. Loiko[1], R. Thouroude[1], R. Soulard[1], G. Brasse[1], J.-L. Doualan[1], B. Guichardaz[2], A. Braud[1], A. Tyazhev[3], A. Hideur[3], M. Laroche[1], and P. Camy[1]; [1]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), Normandie University, Caen, France; [2]FEMTO-ST Institute,*

ROOM 13b ICM

shift of the resonator we observe over 10 GHz of continuous tunability for each sideband.

CD-3.4 SUN 16:45

Broad-band optical parametric amplification in a tapered silicon core fiber pumped in the telecom band

•*D. Wu[1], L. Shen[1,2], H. Ren[1], T. Hawkins[3], J. Ballato[3], U.J. Gibson[4], and A.C. Peacock[1]; [1]Optoelectronics Research Centre, University of Southampton,, Southampton, United Kingdom; [2]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China; [3]COMSET, Department of Materials Science and Engineering, Clemson University, Clemson, USA; [4]Department of Physics and Porelabs, Norwegian University of Science and Technology, Trondheim, Norway*

Broad-band optical parametric amplification is reported in a 5-mm-long tapered silicon core fiber for the first time. The maximum on/off gain is 6.6 dB with 220 nm conversion bandwidth is achieved with a telecoms pump.

CD-3.5 SUN 17:00

Infrared ultra-short pulses generation using Stimulated Raman Scattering in gas-filled HC-PCF

•*D. Kergoustin, F. Amrani, B. Debord, F. Gérôme, and F. Benabid; GPPMM group - Xlim research institute UMR CNRS 7252, Limoges, France*

We present the generation of first vibrational Stokes, ultra-short 1.8 μm pulses, by using stimulated Raman scattering in hydrogen-filled HC-PCF and a 1030 nm ultra-

ROOM 14a ICM

– Université Paris-Saclay, Palaiseau, France; [2]Institut Pascal, PHOTON-N2, CNRS - University Clermont Auvergne, Clermont-Ferrand, France; [3]Université de Lille, CNRS, UMR 8523 – PhLAM – Physique des Lasers Atomes et Molécules, Lille, France

We propose and demonstrate a novel scheme, based on spin-orbit interactions of light, to realize integrated orbital angular momentum microlasers with a chirality that can be optically controlled.

CK-3.4 SUN 16:45

Bi-Junction Carrier Depletion Type Electro-Optic Phase-Shifters

•*M. Ashour[1], S. Schneider[1], E.M. Weig[2], and J.N. Caspers[2]; [1]Robert Bosch GmbH, Renningen, Germany; [2]University of Konstanz, Konstanz, Germany*

We present a low-loss technology-compatible bi-junction depletion-type electro-optic phaseshifter through increasing overlap of voltage-controlled depletion area with the optical mode by 25% compared to a conventional PN implementation under the same implants conditions.

CK-3.5 SUN 17:00

Saturable Absorption with CNT Coupled WGM and Fabrication of Er-doped Microresonator for On-chip Mode-locked Laser

•*R. Imamura[1], S. Fujii[1], T.S.L.P. Suzuki[1], R. Suzuki[1], R. Ishida[1], M. Ito[1], H. Maki[2,4], L. Yang[3], and T. Tanabe[1]; [1]Department of Electronics and Electrical Engineering, Keio University, Yokohama, Japan; [2]Department of Applied Physics and Physico-Informatics, Keio*

ROOM 14b ICM

CM-3.4 SUN 17:00

Laser-induced multi-functional biomimetic surfaces

•*E. Skoulas*[1,2], *A. Mimidis*[1,2], *A. Papadopoulos*[1,2], *C. Lanara*[1,2], *N. Livakas*[1,2], *E. Petrakakis*[1,2], *G. Tsibidis*[1], *and E. Stratakis*[1,2]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology (FORTH), Heraklion, Greece*; [2]*Materials Science and Technology Department, University of Crete, Heraklion, Greece*

ROOM 21 ICM

JSV-3.3 SUN 17:00

Sandwich in the middle: enhancing the optomechanical coupling

•*P. Piergentili*[1,2], *L. Catalini*[1], *M. Bawaj*[1,2], *S. Zippilli*[1,2], *N. Malossi*[1,2], *R. Natali*[1,2], *D. Vitali*[1,2,3], *and G. Di Giuseppe*[1,2]; [1]*School of Science and Technology, Physics Division, University of Camerino, Camerino, Italy*; [2]*INFN, Sezione di Perugia, Perugia, Italy*; [3]*CNR-INO, Firenze, Italy*

We present an optome-

ROOM 1 Hall A1

CH-3.4 SUN 16:45

Optical Frequency Comb Photoacoustic Spectroscopy

I. Sadiek[1], *T. Mikkonen*[2], *M. Vainio*[2,3], *J. Toivonen*[2], *and* •*A. Foltynowicz*[1]; [1]*Department of Physics, Umeå University, Umeå, Sweden*; [2]*Photonics Laboratory, Tampere University, Tampere, Finland*; [3]*Department of Chemistry, University of Helsinki, Helsinki, Finland*

We combine for the first time a mid-infrared optical frequency comb Fourier transform spectrometer with cantilever-enhanced photoacoustic detection, and measure high-resolution broadband spectra of the fundamental band of methane in a few milliliter sample volume.

CH-3.5 SUN 17:00

Sensitivity Enhancement of a Cantilever-Enhanced Photo-Acoustic Spectroscopic Sensor by an Optical Build-Up Cavity

T. Tomberg[1], *T. Hieta*[2], •*M. Vainio*[1,3], *and L. Halonen*[1]; [1]*University of Helsinki, Helsinki, Finland*; [2]*Gasera Ltd., Turku, Finland*; [3]*Tampere University, Tampere, Finland*

We have combined a cantilever-enhanced photoacoustic trace gas sensor with

ROOM 2 Hall A1

ing few-cycle, 100 μJ pulses at 100 kHz with a high CEP stability of <340 mrad in the frequency range of 10 Hz to 50 kHz.

CF-3.3 SUN 16:45

All-Polarization-Maintaining Dual-Color/Dual-Comb Yb:Fiber Laser

J. Fellinger[1], •*A.S. Mayer*[1], *G. Winkler*[1], *S. Droste*[2], *C. Li*[2], *C.M. Heyl*[2,3], *I. Hartl*[2], *and O.H. Heckl*[1]; [1]*Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna, Vienna, Austria*; [2]*Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany*; [3]*Helmholtz-Institute Jena, Jena, Germany*

We present a dual-color/dual-comb all-polarization-maintaining 77-MHz mode-locked Yb:fiber-laser. We use mechanical spectral subdivision to generate two pulse trains with a tunable difference in repetition rate (1 kHz to 6 kHz) from a single cavity.

CF-3.4 SUN 17:00

Generating Picosecond Pulses from Mid-Infrared Fiber Lasers Using Frequency-Shifted Feedback

•*M. Majewski, R. Woodward, and S. Jackson*; *Macquarie University, North Ryde, Australia*

We present frequency-shifted feedback as a novel alternative method for producing picosecond pulses from mid-IR fiber lasers. Record performance is achieved in both tuning range and pulse dura-

ROOM 6 Hall A1

CI-3.4 SUN 16:45

28-Gbaud PAM-4 Signal Detection through 16-core Fiber using High Speed 2D Photodetector Array Device

•*T. Umezawa and N. Yamamoto*; *National Institute Information and Communications Technology, Tokyo, Japan*

We designed and fabricated a high speed 16-pixel two dimensional photodetector array device for space division multiplexing fiber communications. The 16-paralell, 28-Gbuad signals with PAM4 format was directly detected by the 16-pixel PDA.

CI-3.5 SUN 17:00

FSO communication system with multi actuator adaptive lens

A. Moosavi[1], *M. Quintavalla*[1], *J. Mocci*[2], *R. Muradore*[2], *H. Saghafir*[3], *and* •*S. Bonora*[1]; [1]*CNR-IFN, Padova, Italy*; [2]*Università di Verona, Verona, Italy*; [3]*Ashtar University, Ashtar, Iran*

We demonstrate that a multi actuator adaptive lens with closed loop adaptive optics can strongly reduce the effect of the Turbulence on coupling

ROOM 7 Hall A1

CE-3.4 SUN 17:00

Random Laser Action From Electrospun Polymeric Nanofibers Doped Either with Organic Dye or Semiconductor Nanoprisms

•*L. Menezes*[1], *M. Oliveira*[2], *M. Neto*[3], *P. Pincheira*[4], *C. Rojas-Ulloa*[5], *N. Gomez*[2], *H. Oliveira*[2], *C. Araújo*[1], *and A. Gomes*[1]; [1]*Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil*; [2]*Graduate Program in Materials Science, Universidade Federal do Vale do São*

ROOM 8 Hall A1

JSI-2.3 SUN 16:45

Scaling laws and topology-properties of Boolean reinforcement learning in photonic neural networks

•*L. Andreoli, X. Porte, M. Jacquot, L. Larger, and D. Brunner*; *Femto-st Institute - Optics Department, Besançon, France*

In recent years, neural networks have strongly impacted multiple domains, but their hardware implementation remains a real challenge. We have experimentally implemented an optical neural network with Boolean weights, exhibiting exceptional scalability in reinforcement learning.

JSI-2.4 SUN (Invited) 17:00

Reinforcement Learning in a Large Scale Photonic Network

S. Maktoobi, L. Andreoli, L. Larger, M. Jacquot, and •*D. Brunner*; *FEMTO-ST Institute/Optics Department, CNRS & University Bourgogne Franche-Comté, Besançon, France*

Photonic neural networks are considered as a future breakthrough technology for computing. We have implemented the first large scale photonic

ROOM 1 ICM

Arvidsson-Shukur[2], L.A. Rozema[1], V. Saggio[1], C. Greganti[1], N.C. Harris[3], M. Prabhu[3], J. Carolan[3], M. Hochberg[4], T. Baehr-Jones[4], D. Englund[3], C.H.W. Barnes[2], and P. Walther[1]; [1]University of Vienna, Vienna, Austria; [2]University of Cambridge, Cambridge, United Kingdom; [3]MIT, Cambridge, USA; [4]Elenion Technologies, New York, USA

In counterfactual communication particles and information can travel in opposite directions. With our high-fidelity programmable nanophotonic processor we implement the first trace-free counterfactual protocol without post-selection with a counterfactual violation as low as 2.4%.

EB-3.5 SUN 17:15

Quantum Rangefinding

•*S. Frick and J. Rarity; University of Bristol, Bristol, United Kingdom*

Rangefinders use easily detectable light from lasers to illuminate an object and determine the distance to it. Replacing it with thermal light from a photon-pair source guarantees covert illumination for rangefinding.

ROOM 3 ICM

spectral density as high as 4mW/nm per line.

CJ-3.6 SUN 17:15

Non–invasive Real–time Characterization of Hollow–core Photonic Crystal Fibres Using Whispering Gallery Mode Spectroscopy

•*M.H. Frosz[1], R. Pennetta[1], M.T. Enders[1], G. Ahmed[1], and P.S.J. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

We demonstrate the first non-invasive diameter measurements of cladding capillaries inside a hollow-core microstructured fibre while the fibre is being drawn. The diameter is measured with sub-micron accuracy and at <4 cm axial resolution.

ROOM 4a ICM

of Engineering and Applied Science, California Institute of Technology, Pasadena, USA

We show a passively-synchronized pulsed fiber laser source that provides excellent stability, power level and wavelength tunability. Both high quality coherent anti-Stokes Raman scattering (CARS) and stimulated Raman scattering (SRS) images are demonstrated.

JSII-2.5 SUN 17:15

The contribution has been withdrawn.

ROOM 4b ICM

projected on a plasmonic nanoparticle layer to produce a fast, reconfigurable and accurate temperature distribution in an arbitrarily-shaped 2D region

JSIV-2.4 SUN (Special Oral) 17:15

Periodic Amplication of Radiative Heat Transfer

•*J. Ordonez-Miranda[1], K. Joulain[1], Y. Ezzahri[1], J. Drevillon[1], and J. Alvarado-Gil[2]; [1]Institute Pprime, CNRS, Futuroscope, France; [2]Cinvestav, Merida, Mexico*

We demonstrate that the direction and values of the radiative heat flux exchanged by two phase-change materials excited with a temperature difference periodic in time, can efficiently be tuned through their common steady-state temperature.

ROOM 13a ICM

Besançon, France; [3]CORIA UMR6614, Université de Rouen, Saint Etienne du Rouvray, France

Tm:LiYF4/LiYF4 channel waveguides are produced by Liquid Phase Epitaxy and diamond-saw-dicing. Under in-band pumping by a 1679-nm Raman fiber laser, the Tm:LiYF4 waveguide laser generates 2.05 W at 1881.0 nm with a 78.3% slope efficiency.

CA-3.5 SUN 17:15

Versatile waveguide chip laser for 2.9 μm emission

•*P. Guay[1], N. Bourbeau Hébert[1], J. Genest[1], and D. Lancaster[2]; [1]Centre d'optique, photonique et laser, Université Laval, Québec, Québec, G1V 0A6, Canada; [2]Laser Physics and Photonics Devices Laboratory, Future Industries Institute, and School of Engineering, University of South Australia, Mawson Lakes, SA 5095, Australia*

With strong potential for mid-infrared spectroscopy applications, an Ho^{3+} and Pr^{3+} co-doped glass chip laser is reported. The latest developments of the laser platform are presented, including results in continuous-wave and mode-locked regime.

ROOM 13b ICM

short pulse source.

CD-3.6 SUN 17:15

High power 2nd Stokes diamond Raman optical frequency conversion

•*M. Heinzig[1], G. Palma-Vega[1,2], B. Yildiz[1], T. Walbaum[1], T. Schreiber[1], R. Eberhardt[1], and A. Tünnermann[1,2]; [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany; [2]Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany*

We report the highest output-power from an external cavity diamond Raman oscillator in continuous-wave operation mode at 1478 nm. Output power of 34 W with 11 % conversion efficiency was achieved.

ROOM 14a ICM

University, Yokohama, Japan; [3]Department of Electrical and Systems Engineering, Washington University, St Louis, Missouri, USA; [4]PRESTO, Japan Science and Technology Agency, Saitama, Japan

We explore the possibility of a passive mode-locked laser with CNT as a saturable absorber and erbium-doped microresonator.

CK-3.6 SUN 17:15

Strong Enhancement of Light Extraction Efficiency in Sub-wavelength AlGaAs/GaAs Vertical-emitting Nanopillars

•*B. Romeira[1], J. Borme[2], H. Fonseca[3], J. Gaspar[3], and J. Nieder[1]; [1]Dept. of Nanophotonics, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal; [2]Dept. of Quantum and Energy Materials, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal; [3]Dept. of Micro and Nanofabrication, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal*

We report a 27-fold improvement of light-extraction in sub-μm vertical-emitting AlGaAs/GaAs nanopillars compared to theoretical predictions. This enables emission intensities comparable to μm-sized devices, which is crucial for efficient optoelectronic devices for nanophotonic integrated circuits.

ROOM 14b ICM

We report on the fabrication of biomimetic multi-functional surfaces via femtosecond laser processing. The functionality of these surfaces is attributed to micro/nano self-assembled structures whose formation is exploited to texture the surface.

CM-3.5 SUN 17:15

Laser writing of 2D nanostructures in silver-doped phosphate glass

•*E. Smetanina*[1,2], *B. Chimier*[1], *Y. Petit*[1,3], *J.M. Mok*[3,4], *C.H. Park*[4], *S.H. Park*[4], *T. Cardinal*[3], *L. Canioni*[1], *and G. Duchateau*[1]; [1]*University of Bordeaux - CNRS - CEA, Centre Lasers Intenses et Applications, UMR 5107, 33405, 33405 Talence Cedex, France*; [2]*Department of Physics, University of Gothenburg, Origovägen 6, SE-412 96 Göteborg, Sweden*; [3]*University of Bordeaux, CNRS, ICMCB, UMR 5026, 87 avenue du Dr. A. Schweitzer, 33608 Pessac cedex, France*; [4]*Institute of Physics and Applied Physics, Yonsei University, 120-749 Seoul, South Korea*

We present a multi-scale theoretical modeling of direct laser writing in silver-containing glass, which includes silver-based chemical reactions, silver clusterization and charge separation. This modeling is applied for moving laser source and various beam geometries.

ROOM 21 ICM

chanical experiment where two Si_3N_4 membranes are placed inside a driven high finesse Fabry-Pérot cavity. We obtain an enhancement of the optomechanical coupling strength by a factor ~ 2.47.

JSV-3.4 SUN 17:15

Spin Squeezing in a Metrologically Relevant Regime

M.-Z. Huang[1], *T. Mazzoni*[2], *K. Ott*[1], *C.L. Garrido Alzar*[2], *and •J. Reichel*[1]; [1]*Laboratoire Kastler Brossel, Paris, France*; [2]*LNE-SYRTE, Paris, France*

We report preliminary results of a quantum-enhanced atom chip clock. Using rubidium atoms inside an on-chip optical cavity, we investigate light-induced spin squeezing in the $10^{-13}s^{-1/2}$ region of relative frequency stability.

ROOM 1 Hall A1

a passive optical power build-up cavity, resulting in a 100 times sensitivity enhancement and an unprecedented NNEA of $1.75\times10^{-12}Wcm^{-1}Hz^{-1/2}$.

CH-3.6 SUN 17:15

Fourier transform photoacoustic spectroscopy with supercontinuum light source

•*T. Mikkonen*[1], *C. Amiot*[1,2], *A. Aalto*[1], *K. Patokoski*[1], *G. Genty*[1], *and J. Toivonen*[1]; [1]*Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland*; [2]*Institut FEMTO-ST, UMR 6174 CNRS, Université Bourgogne Franche-Comté, Besançon, France*

We demonstrated broadband photoacoustic spectroscopy using a supercontinuum and a Fourier transform spectrometer. We achieved a 20- and 70-fold increase in photoacoustic signal as compared to the use of a conventional infrared radiator.

ROOM 2 Hall A1

tion compared to saturable absorber systems.

CF-3.5 SUN 17:15

High energy level Raman-assisted Fiber Optical Parametric Chirped Pulse Amplification

•*L. Fouché-Forté*[1], *C. Grosset-Grange*[1], *P. Morin*[1], *J. Dubertrand*[1], *P. Beaure d'Augères*[1], *Y. Quiquempois*[2], *G. Bouwmans*[2], *A. Mussot*[2], *and E. Hugonnot*[1]; [1]*CEA CESTA, Le Barp, France*; [2]*PhLAM, Lille, France*

We demonstrate fiber optical parametric chirped pulse amplification up to 1μJ with recompression up to 560fs. This high energy level originates from combined Raman and parametric processes in specially designed solid core photonic bandgap fibers.

ROOM 6 Hall A1

efficiency in free space optical communication system.

CI-3.6 SUN 17:15

Sub-ms Visible-Light-Communication Relay Chain for I2V and V2V Intelligent transportation Systems

T. Nawaz[1], *M. Seminara*[2], *S. Caputo*[3], *F.S. Cataliotti*[2,4], *L. Mucchi*[3], *and •J. Catani*[1,3]; [1]*CNR-INO National Institute of Optics, CNR, Sesto Fiorentino, Italy*; [2]*LENS, European Lab. for NonLinear Spectroscopy, Sesto Fiorentino, Italy*; [3]*DINFO Dept. of Information Engineering - Università di Firenze, Firenze, Italy*; [4]*Dipartimento di Fisica e Astronomia - Università di Firenze, Firenze, Italy*

We report on characterization of an ITS communication platform based on VLC, connecting realistic road signaling infrastructures (regular traffic light) and incoming receiving units. Our systems features decode-and-relay times below 1 ms, and attainable distances above 50 m.

ROOM 7 Hall A1

Francisco, Juazeiro-BA, Brazil; [3]*Graduate Program in Materials Science, Universidade Federal de Pernambuco, Recife-PE, Brazil*; [4]*Departamento de Ciencias Fisicas, Universidad de la Frontera, Temuco, Chile*; [5]*Departamento de Ingeniería Mecánica, Universidad de la Frontera, Temuco, Chile*

We developed a matrix based on electrospun cellulose nanofibers and doped it either with rhodamine 6G or ZnO nanoprisms to generate two kinds of flexible, environment-friendly random laser systems, which were also optically characterized.

CE-3.5 SUN 17:15

Plasmonic random laser with the embedding of silver nanostructure materials

•*Z.-Y. Li, J.-H. Hsiao, J.-J. Wu, S.-Y. Tsay, Y.-H. Chen, and J.-H. Lin*; *Department of Electro-Optical Engineering, National Taipei University of Technology, Taipei, Taiwan*

We investigated the plasmonic random laser from the dye-covered PVA film with the embedding of different size and shape of silver nano-particles to discuss the influence of light scattering and the localized surface plasmon.

ROOM 8 Hall A1

neural network and demonstrate reinforcement learning fully in hardware.

ROOM 1 ICM

18:00 – 19:30

EB-4: Quantum information processing

Chair: John Rarity, University of Bristol, Bristol, United Kingdom

EB-4.1 SUN 18:00

Quantum Circuit Training with Trapped Ions

•*N. Linke*[1], *D. Zhu*[1], *M. Benedetti*[2,3], *K.A. Landsman*[1], *N.H. Nguyen*[1], *C.H. Alderete*[1], *A. Perdomo-Ortiz*[2], *N. Corda*[4], *A. Garfoot*[4], *C. Brecque*[4], *L. Egan*[1], *O. Perdomo*[5], *and C. Monroe*[1,6]; [1]*Joint Quantum Institute, University of Maryland, College Park, USA*; [2]*Department of Computer Science, University College London, London, United Kingdom*; [3]*Cambridge Quantum Computing Limited, Cambridge, United Kingdom*; [4]*Mind Foundry Limited, Oxford, United Kingdom*; [5]*Department of Mathematics, Central Connecticut State University, New Britain, USA*; [6]*IonQ, Inc., College Park, USA*

We implement a generative modeling task using a quantum-classical hybrid scheme where the quantum circuits are executed on a trapped-ion quantum computer. We contrast two different classical training schemes, particle swarm and Bayesian optimization.

EB-4.2 SUN 18:15

Towards Continuous Variables Quantum Computing with Trapped Ions

•*G. Maslennikov*[1], *J. Gan*[1], *K.-W. Tseng*[1], *C.H. Nguyen*[1], *and D. Matsukevich*[1,2]; [1]*Centre for Quantum Technologies, National University of Singapore, Singapore, Singapore*;

ROOM 3 ICM

18:00 – 19:30

CJ-4: Large-mode-area-fiber-based laser systems

Chair: Bülend Ortaç, Bilkent University, Ankara, Turkey

CJ-4.1 SUN 18:00

71 W average power sub-MW peak power diffraction-limited monolithic tapered fiber amplifier

•*K. Bobkov*[1], *A. Levchenko*[1], *V. Velmiskin*[1], *T. Kochergina*[1], *S. Aleshkina*[1], *M. Bubnov*[1], *D. Lipatov*[2], *A. Laptev*[2], *A. Guryanov*[2], *and M. Likhachev*[1]; [1]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [2]*G.G. Devyatykh Institute of High Purity Substances, Russian Academy of Sciences, Nizhny Novgorod, Russia*

Monolithic Yb-doped tapered fiber ps pulse amplifier design was optimized to scale output average power to 71 W, while keeping sub-MW peak power and diffraction-limited output beam quality.

CJ-4.2 SUN 18:15

Fluorine-Doped Large-Mode-Area Yb Fibers for High Peak Power Generation in Tapered Amplifiers

M. Leich[1], *A. Kalide*[1], *M. Lorenz*[1], *T. Eschrich*[1], *A. Schwuchow*[1], *J. Kobelke*[1], *J. Bierlich*[1], *C. Aichele*[1], *K. Wondraczek*[1], *D. Schönfeld*[1],

ROOM 4b ICM

18:00 – 19:30

JSIV-3: Nanoscale heat processes in plasmonic nanostructures

Chair: Sebastien Voltz, CNRS, France and the University of Tokyo, Japan

JSIV-3.1 SUN (Invited) 18:00

Ultrafast Thermo-Optical Dynamics of Plasmonic Nanoparticles

•*F. Banfi*[1], *P. Maioli*[1], *A. Crut*[1], *M. Gandolfi*[2,3], *F. Medeghini*[1], *F. Vallée*[1], *and N. Del Fatti*[1]; [1]*FemtoNanoOptics group Université de Lyon Institut Lumière Matière (iLM), Université Lyon 1 and CNRS 10 rue Ada Byron, 69622, Villeurbanne, France*; [2]*Dipartimento MAtematica e Fisica & Interdisciplinary Laboratories for Advanced Materials Physics (I-LAMP), Università Cattolica del Sacro Cuore, Brescia, Italy*; [3]*Laboratory for Soft Matter and Biophysics, Department of Physics and Astronomy, KU Leuven, Celestijnenlaan 200D, B-3001, Leuven, Belgium*

Modeling of the optothermal dynamics involved in pump-probe multi-wavelength experiments allows selective inspection of either the thermal dynamic of a metallic nano-object or its dielectric environment. This allows retrieval of the nanoscale interfacial thermal resistance.

ROOM 5 ICM

18:00 – 19:00

JS ECBO-CLEO/Europe: Joint session ECBO-CLEO/Europe

Chair: Rainer Leitgeb, Medical University of Vienna, Austria

JS ECBO-CLEO/Europe.1 SUN (Tutorial) 18:00

Light Sheet Microscopy: imaging faster, wider and deeper

•*K. Dholakia*; *University of St Andrews, St Andrews, United Kingdom*

This talk will describe the basics of light sheet microscopy. The latest advances for this field in neuroscience and developmental biology using beam shaping will be discussed.

ROOM 13a ICM

18:00 – 19:30

CA-4: Visible and UV lasers

Chair: Xavier Mateos, Universitat Rovira i Virgili, Tarragona, Spain

CA-4.1 SUN 18:00

Diode-pumped visible laser operation of Tb^{3+}:$LiLuF_4$

•*E. Castellano-Hernández and C. Kränkel*; *Center for Laser Materials, Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany*

We report on the first diode-pumped laser operation of any Tb^{3+}-doped laser material. An 18.5 mm long $Tb^{3+}(28at.\%) : LiLuF_4$ delivers a slope efficiency of 53% at 542 nm in the green spectral range.

CA-4.2 SUN 18:15

A Fascinating Material for Metrology: the Pr:$LiGdF_4$ Solid-state Laser

•*A. Di Lieto*[1,2], *E. Damiano*[2,3], *A. Sottile*[1,2], *and M. Tonelli*[1,2]; [1]*Dipartimento di Fisica, Università di Pisa, Pisa, Italy*; [2]*NEST, Istituto Nanoscienze – CNR, Pisa,*

ROOM 13b ICM

18:00 – 19:30

CD-4: Nonlinear imaging

Chair: Gregor Knopp, Paul Scherrer Institute, Villingen, Switzerland

CD-4.1 SUN (Keynote) 18:00

Challenges and Trends in Optical Molecular Imaging

•*S. Brasselet*; *Institut Fresnel, Marseille, France*

We describe possibilities that optics offers to investigate ultratstructural properties of matter, from nanomaterials to cells and tissues, using polarized imaging in fluorescence and nonlinear optics.

ROOM 14a ICM

18:00 – 19:30

CB-1: Semiconductor micro-lasers: Novel technology concepts

Chair: Mercedeh Khajavikhan, University of Central Florida, Orlando, USA

CB-1.1 SUN (Invited) 18:00

Flexible and Ultra-light-weight Polymer Membrane Lasers

M. Karl, J.M.E. Glackin, M. Schubert, N.M. Kronenberg, G.A. Turnbull, I.D.W. Samuel, and •*M.C. Gather*; *School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom*

We report on thin organic distributed feedback lasers that offer ultralow-weight and excellent mechanical flexibility. The lasers can be transferred onto various substrates, e.g. a contact lens, where they can be used as security tag.

ROOM 14b ICM

18:00 – 19:30

CM-4: Femtosecond laser writing of integrated photonic devices

Chair: Stefan Nolte, University of Jena, Jena, Germany

CM-4.1 SUN 18:00

Broadband mid-infrared directional and multimode interference couplers in GLS glass fabricated using femtosecond laser direct-writing

T. Gretzinger[1], •S. Gross[1], A. Arriola[1], T. Fernandez[1], D. Strixner[2], J. Tepper[2], L. Labadie[2], and M. Withford[1]; [1]MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, North Ryde, Australia; [2]Universität zu Köln, Köln, Germany

Mid-infrared broadband directional and multimode interference couplers for the detection of exoplanets using astronomical interferometry are presented. The devices are based on femtosecond laser written waveguides in GLS glass optimized for 4 micron wavelength.

CM-4.2 SUN 18:15

Direct Laser Writing of Mid-Infrared Straight and Bent Waveguides

•P. Masselin[1], J. Carcreff[2], and D. Le Coq[2]; [1]Université du Littoral-Côte d'Opale, Dunkerque, France; [2]Université de Rennes, Rennes, France

We introduce a new proce-

ROOM 1 Hall A1

18:00 – 19:30

CH-4: Integrated sensors I

Chair: Andrea Armani, University of Southern California, Los Angeles, United States

CH-4.1 SUN (Invited) 18:00

On-Chip Infrared Sensor Technologies for Chem/Bio Diagnostics: Quo Vadis?

•B. Mizaikoff; Ulm University, Institute of Analytical and Bioanalytical Chemistry, Ulm, Germany

State-of-the-art infrared sensing platforms ideally benefit from miniaturized and integrated optical technologies providing direct access to molecule-specific information in point-of-care diagnostics enabling localized on-site analysis close to real time.

ROOM 2 Hall A1

18:00 – 19:30

CF-4: Solitons and self-compression

Chair: Thomas Feurer, IAP Univeristät Bern, Bern, Switzerland

CF-4.1 SUN (Invited) 18:00

Non-Linear Propagation of Ultrashort mid-IR Pulses

•V. Shumakova[1], S. Alisauskas[2], P. Malevich[1], C. Gollner[1], A. Voronin[3,4], A. Mitrofanov[3,4], D. Sidorov-Biryukov[3,4], A. Zheltikov[3,4,5], D. Kartashov[6], A. Baltuska[1,7], and A. Pugzlys[1,7]; [1]Photonics Institute, TU Wien, Vienna, Austria; [2]DESY, Hamburg, Germany; [3]Physics Department, M.V. Lomonosov Moscow State University, Moscow, Russia; [4]Russian Quantum Center, Skolkovo, Russia; [5]Department of Physics and Astronomy, Texas A&M University, College Station, USA; [6]Friedrich-Schiller University Jena, Jena, Germany; [7]Center for Physical Sciences & Technology, Vilnius, Lithuania

By controlling focusing strength, polarization and chirp of filamenting 3.9-μm multi-mJ pulses one can deliver terawatt peak powers on a remote target in a high-quality beam. Formation of mid-IR light-bullets in air is experimentally verified.

ROOM 6 Hall A1

18:00 – 19:30

CI-4: Integrated technologies for data networks

Chair: Alessandro Tonello, Université de Limoges, Limoges, France

CI-4.1 SUN 18:00

Passive Si3N4 Photonic Integrated Platform at 1-um for Short-Range Optical Interconnects

X. Hu[1], Z. Ye[1], •M. Girardi[1], P. Muñoz[2], A. Larsson[1], and V. Torres-Company[1]; [1]Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden; [2]Photonics Research Labs, Universitat Politècnica de València, Valencia, Spain

We develop a silicon nitride passive technology at 1 um with an equivalent loss < 0.2 dB/cm. Different passive devices are shown, indicating the potential of the platform for future high-capacity short-range interconnects.

CI-4.2 SUN 18:15

Silicon-integrated high-speed modulators based on barium titanate with record-large Pockels coefficients

•F. Eltes[1], J.E. Ortmann[2], P. Castera[3], D. Urbonas[1], D. Caimi[1], L. Czornomaz[1], P. Sanchis[3], J. Fompeyrine[1], and S. Abel[1]; [1]IBM Research –

ROOM 7 Hall A1

18:00 – 19:30

CE-4: Multiferroics and non-linear optics and photonics

Chair: Marko Loncar, Harvard University, Cambridge, United States

CE-4.1 SUN 18:00

Gap States Contribution in the Non-Linear Optical Response of Glassy Semiconductors

•E. Romanova[1], A. Afanasev[2], M. Sukhanov[3], A. Velmuzhov[3], V. Shiryaev[3], A. Nezhdanov[4], Y. Kuzyutkina[1], D. Furniss[5], T. Benson[5], A. Seddon[5], and S. Guizard[6]; [1]Saratov State University, Saratov, Russia; [2]Institute of Applied Physics of RAS, Nizhny Novgorod, Russia; [3]Institute of Chemistry of High Purity Substances of RAS, Nizhny Novgorod, Russia; [4]Lobachevsky State University of Nizhni Novgorod, Nizhny Novgorod, Russia; [5]The University of Nottingham, Nottingham, United Kingdom; [6]Ecole Polytechnique, Palaiseau, France

The pump-probe measurements of the time-resolved non-linear optical response of chalcogenide glassy semiconductors allowed us to identify how the gap states excitation affects dispersion of non-linear refractive index and photo-induced variation of dielectric constant.

CE-4.2 SUN 18:15

Nonlinear Characterization of Blue-Luminescent Graphene Quantum Dots in Water in Ultraviolet, Visible and Infrared Domains

•C. Ciret, H. Wang, C. Cassagne, and G. Boudebs; Laboratoire de Photonique d'Angers, Université d'Angers, Angers,

ROOM 8 Hall A1

18:00 – 19:30

JSI-3: Neuromorphic photonic platforms

Chair: Abu Sebastian, IBM Research, Zurich, Switzerland

JSI-3.1 SUN (Invited) 18:00

Multiwavelength Neuromorphic Silicon Photonics

•B.J. Shastri[1], A.N. Tait[2], M.A. Nahmias[2], T. Ferreira de Lima[2], H.-T. Peng[2], and P.R. Prucnal[2]; [1]Queen's University, Kingston, Canada; [2]Princeton University, Princeton, USA

Neuromorphic photonics promises orders of magnitude improvements in both speed and energy efficiency over digital electronics. We will give an overview of neuromorphic silicon photonic systems and their application to optimization and/or machine learning problems.

NOTES

ROOM 1 ICM

[2]*Department of Physics, National University of Singapore, Singapore, Singapore*
We experimentally realize the conditional beam splitter gate using spin-motion coupling in a trapped Ytterbium ion. We demonstrate the applications of this gate with the aim to realize universal quantum computation toolbox with continuous variables.

EB-4.3 SUN 18:30

8×8 Programmable SiN Photonic Processor for Linear Quantum Processing
C. Taballione[1], T.A.W. Wolterink[2], J. Lugani[2], A. Eckstein[2], B.A. Bell[2], R. Grootjans[3], I. Visscher[3], D. Geskus[3], C.G.H. Roeloffzen[3], J.J. Renema[4], I.A. Walmsley[2], •P.W.H. Pinkse[4], and K.-J. Boller[1]; [1]Laser Physics and Nonlinear Optics (LPNO), University of Twente, Enschede, Netherlands; [2]Ultrafast Quantum Optics and Optical Metrology, University of Oxford, UK; [3]Lionix International BV, Enschede, Netherlands; [4]Complex Photonic Systems (COPS), University of Twente, Enschede, Netherlands
We demonstrate quantum interference and several single-photon high-dimensional gates on a 8×8 mode Blass matrix as universal transformation circuit for linear-optical quantum information processing implemented on stoichiometric SiN waveguides.

EB-4.4 SUN 18:45

On Chip Quantum Simulation of Open System Dynamics
C. Sparrow[1,2], E. Martín-López[3], •N. Maraviglia[1], A. Neville[1,2], C. Harrold[1], J. Carolan[4], Y.N. Joglekar[5], T. Hashimoto[6], N. Matsuda[6], J.L. O'Brien[1], D.P. Tew[1], and

ROOM 3 ICM

A. Langner[2], C. Schmitt[2], J. Plass[2], G. Schötz[2], and •M. Jäger[1]; [1]Leibniz Institute of Photonic Technology, Jena, Germany; [2]Heraeus Quarzglas GmbH & Co. KG, Hanau, Germany
High peak power picosecond pulse amplification in excess of 1 Megawatt based on a 0.75m short locally tapered fluorine co-doped Ytterbium fiber is presented. Beam quality with M2=1.5 is achieved without significant stimulated Raman scattering.

CJ-4.3 SUN 18:30

Ultrafast High Repetition Rate Burst Mode Fiber Laser Using Double Side Pumped Gain Fiber with Gradually Increasing Core Size
•G. Alpakut[1], S. Yavas[1,2], S.G. Karamuk[2], T. Gurcan[1], and M.B. Unlu[1]; [1]Department of Physics, Bogazici University, Istanbul, Turkey; [2]Lumos Laser Inc., Istanbul, Turkey
We developed high repetition-rate ultrafast fiber laser utilizing gain fiber with core size changing from 30 μm to 100 μm. We obtained 210 fs pulses at 10 μJ pulse and 500 μJ burst energy.

CJ-4.4 SUN 18:45

The impact of fiber core design and thermally-induced phase shifts on the threshold of mode instabilities
C. Jauregui[1], •C. Stihler[1], A. Tünnermann[1,2,3], and J. Limpert[1,2,3]; [1]Institute of Applied Physics, Abbe

ROOM 4b ICM

JSIV-3.2 SUN 18:30

Tracking Ultrafast Energy Flow in Plasmonic Nanocrystal Assemblies
•A. Mazzanti[1], Z. Yang[2], M.-P. Pileni[3], G. Cerullo[1], P. Laporta[1], and G. Della Valle[1]; [1]Politecnico di Milano, Milan, Italy; [2]Université Paris Diderot, Paris, France; [3]CEA/IRAMIS, Saclay, France
The photothermal energy flow in 100-nm sized gold nanocrystal assemblies is investigated by a combination of pump-probe spectroscopy and semiclassical modeling. Our results indicate efficient ultrafast light-heat conversion in these novel kind of plasmonic nanostructures.

JSIV-3.3 SUN 18:45

Transient, stable and oscillatory single vapour nanobubble formation by boiling around a gold nanosphere
•T. Jollans and M. Orrit; Huygens–Kamerlingh Onnes Laboratory, Leiden University, Leiden, Netherlands

ROOM 5 ICM

ROOM 13a ICM

Italy; [3]Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Università di Siena, Siena, Italy
We present the first development of a compact, high-quality reliable laser source based on a Pr^{3+}-doped single-crystal $LiGdF_4$, generating all the wavelengths needed for Sr-based optical clocks. This represents an interesting perspective for metrology.

CA-4.3 SUN 18:30

The first demonstration of a 639-nm regenerative laser amplifier
N. Sugiyama, •S. Fujita, Y. Hara, and F. Kannari; Keio University, Yokohama, Japan
We have demonstrated a 639-nm picosecond-pulse regenerative amplifier using a Pr:YLF crystal for the first time, and obtained the maximum output pulse energy of 13 μJ with repetition rate of 10 kHz .

CA-4.4 SUN 18:45

Generation of 10W, 1ns Deep Ultraviolet Pulse at 193nm
•H. Igarashi, Y. Tamaru, C. Qu, A. Fuchimukai, Y. Murakami, Y. Kamba, T. Miura, J. Fujimoto, and H. Mizoguchi; Gigaphoton Inc.,

ROOM 13b ICM

CD-4.2 SUN 18:45

Passively Q-switched Nd3+:YVO4 Laser System for Self-illuminated and Self-synchronized Up-conversion of Images
•A.J. Torregrosa[1], H. Maestre[1], M.L. Rico[2], and J. Capmany[1]; [1]Departamento de Ingeniería

ROOM 14a ICM

CB-1.2 SUN 18:30

Threshold power investigations of optically-pumped photonic crystal lasers with buried heterostructure gain regions
•A. Sakanas[1], K.S. Mathiesen[1], Y. Yu[1], E. Semenova[1], L. Ottaviano[1,2], J. Mørk[1], and K. Yvind[1]; [1]DTU Fotonik, Technical University of Denmark, Kongens Lyngby, Denmark; [2]Alight Technologies ApS, Farum, Denmark
This contribution presents fabrication of InGaAsP/InAlGaAs quantum wells buried heterostructure embedded in the photonic crystal cavities in InP membrane directly bonded to Si, and experimental threshold power investigations of the line-defect lasers with varied lengths.

CB-1.3 SUN 18:45

Mechanism of Wavelength Tuning over 200 nm Range from InP/InGaAs Nano-lasers Grown on SOI
•W.K. Ng[1], Y. Han[2], K.M. Lau[2], and K.S. Wong[1]; [1]Department of Physics, Hong Kong University of

ROOM 14b ICM

dure for direct laser writing of high performance waveguides. The propagation losses are measured on the order of 0.2 dB/cm in the mid-infrared (λ = 4.5 μm).

CM-4.3 SUN 18:30

Boson band vibrations aid refractive index mapping of waveguides in high index chalcogenide glass

T. Gretzinger, •T. Fernandez, S. Gross, A. Arriola, and M. Withford; MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, New South Wales, Australia

The boson band mapping of waveguides fabricated by femtosecond laser inscription was used for the first time to identify and understand the material densification profile in chalcogenide glasses.

CM-4.4 SUN 18:45

Direct writing of 3D integrated photonic circuits for astrophotonics

•S. Piacentini[1], G. Corrielli[2], A.S. Nayak[3], E. Pedretti[3], S. Minardi[3], and R. Osellame[2]; [1]Dipartimento di Fisica, Politecnico di Milano, Milano,

ROOM 1 Hall A1

CH-4.2 SUN 18:30

All-dielectric High-Q Metasurfaces for Infrared Absorption Spectroscopy Applications

•A. Leitis[1], A. Tittl[1], M. Liu[2], F. Yesilkoy[1], D.-Y. Choi[3], D.N. Neshev[2], Y.S. Kivshar[2], and H. Altug[1]; [1]Institute of BioEngineering, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland; [2]Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, Australia; [3]Laser Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, Australia

We present a nanophotonic method capable of detecting mid-infrared molecular fingerprints without the need for spectrometry, frequency scanning, or moving mechanical parts. We leverage high-Q metasurfaces with gradually tuned resonance frequencies to retrieve absorption signatures.

CH-4.3 SUN 18:45

Towards a Mid-infrared Lab-on-chip Sensor Using Ge-on-Si Waveguides

•R. Millar[1], U. Griskevicuite[1], K. Gallacher[1], L. Baldassarre[2], M. Sorel[1], M. Ortolani[2], and D. Paul[1]; [1]University of Glasgow, Glasgow, United King-

ROOM 2 Hall A1

CF-4.2 SUN 18:30

Soliton Self-Compression in Hollow Capillary Fibres

•J. Travers, T. Grigorova, C. Brahms, and F. Belli; School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We demonstrate soliton self-compression of 0.3 mJ pulses to 2.7 fs in a 3 m long gas-filled hollow capillary fibre. Scaling to higher energies and convincing evidence of further compression to 1 fs is discussed.

CF-4.3 SUN 18:45

Soliton compression in a multipass cell

•G. Jargot[1,2], N. Daher[1], L. Lavenu[1,3], X. Delen[1], N. Forget[2], M. Hanna[1], and P. Georges[1]; [1]Laboratoire Charles Fabry, Palaiseau, France; [2]Fastlite, Antibes,

ROOM 6 Hall A1

Zurich, Ruschlikon, Switzerland; [2]Department of Physics, The University of Texas, Austin, USA; [3]Nanophotonics Technology Center, Universitat Politècnica València, Valencia, Spain

Using hybrid BaTiO3-Si/SiN waveguides, we reveal the largest Pockels coefficients ever reported in integrated photonic structures. We also show two practical use cases for the technology, high-speed modulation and low-power tuning.

CI-4.3 SUN 18:30

SiC-SiO2 MEMS-DBR based widely tunable optical filters around 1550 nm with narrow FWHM

•J. Cesar, S. Paul, F. Küppers, and T. Kusserow; IMP, TU Darmstadt, Darmstadt, Germany

We are presenting widely tunable optical Fabry-Perot filters based on novel material combination SiC/SiO2 MEMS-DBR. Large refractive index step (high reflectivity) enables very narrow FWHM of <0.1 nm with an FSR of >114 nm.

CI-4.4 SUN 18:45

High-Speed Balanced Avalanche Photodetector for Homodyne Detection

•T. Beckerwerth, F. Ganzer, P. Runge, and M. Schell; Fraunhofer Heinrich Hertz Institute, Berlin, Germany

A High-Speed Balanced

ROOM 7 Hall A1

France

We characterize the nonlinear optical properties of blue-luminescent graphene quantum dots structures. Positive Kerr index and saturable absorption are found under ultraviolet illumination. We then infer the nonlinear properties of a single graphene nanoparticle

CE-4.3 SUN (Invited) 18:30

Nonlinear laser spectroscopy of multiferroic materials

•M. Fiebig; Dept. of Materials, ETH Zurich, Zurich, Switzerland

Nonlinear laser optics is an extremely powerful tool for analyzing and controlling the coupling between the coexisting magnetic and ferroelectric order in so-called multiferroics with consequences for both basic research and oxide-electronic devices.

ROOM 8 Hall A1

JSI-3.2 SUN 18:30

Solving MAXCUT optimization problems with a coherent Ising machine based on opto-electronic oscillators

•F. Böhm, G. Verschaffelt, and G. Van der Sande; Vrije Universiteit Brussel, Brussels, Belgium

We present a new concept for coherent Ising machines which is based on opto-electronic oscillators. We demonstrate a compact and inexpensive photonic setup that is able to solve difficult optimization problems.

JSI-3.3 SUN 18:45

Large-scale Ising machine based on spatial light modulation

•D. Pierangeli[1,2], G. Marcucci[1,2], and C. Conti[1,2]; [1]University of Rome la Sapienza, Rome, Italy; [2]Institute for Complex Systems

NOTES

ROOM 1 ICM

A. Laing[1]; [1]*University of Bristol, UK*; [2]*Imperial College London, UK*; [3]*Nokia Bell Labs, Cambridge, UK*; [4]*MIT, Cambridge, USA*; [5]*Indiana University Purdue University, Indianapolis, USA*; [6]*NTT Corporation, Atsugi, Japan*

We experimentally demonstrate a reprogrammable integrated linear optic device as valid platform for quantum simulation of molecular vibrations and describe how our simulation methods can be extended further to simulate open system dynamics.

EB-4.5 SUN 19:00

Time-Domain Multiplexed Two-Dimensional Cluster State for Large-Scale Universal Multi-Input One-Way Quantum Computation

•*W. Asavanant*[1], *Y. Shiozawa*[1], *B. Charoensombutamon*[1], *H. Emura*[1], *S. Yokoyama*[2], *R.N. Alexander*[3], *N.C. Menicucci*[4], *S. Takeda*[1,5], *J.-i. Yoshikawa*[1], *H. Yonezawa*[2], *and A. Furusawa*[1]; [1]*The University of Tokyo, Tokyo, Japan*; [2]*University of New South Wales, Canberra, Australia*; [3]*University of New Mexico, New Mexico, USA*; [4]*RMIT University, Melbourne, Australia*; [5]*PRESTO, Saitama, Japan*

We report realization of two-dimensional cluster state, a resource for universal one-way quantum computation, based on time-domain multiplexing approach. The state generation is unlimited and we verify the state up to 24,960 entangled light modes.

ROOM 3 ICM

Center of Photonics, Friedrich Schiller University Jena, Jena, Germany; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

In this contribution we analyze the impact of fiber core design on the modal energy transfer responsible for modal instabilities.

CJ-4.5 SUN 19:00

High gain and PER in double-pass rod fiber amplifier module

•*J.-f. Lupi*[1], *M.M. Johansen*[2], *M. Michieletto*[2], *and J. Laegsgaard*[1]; [1]*DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Lyngby, Denmark*; [2]*NKT Photonics, Birkerød, Denmark*

We realized double-pass amplification using rod-type fiber. This device deliver up to 112W (20ps, 20MHz, 1030nm), with a gain of 35dB, 23dB PER and excellent beam quality. We also report mitigation of static performance degradation.

ROOM 4b ICM

We explore the boiling at the nanoscale by observing plasmonic vapour nanobubbles around a single gold nanoparticle. We move from explosive to stable nanobubbles through a Leidenfrost-like point. ~40 MHz nanobubble oscillations are observed.

JSIV-3.4 SUN (Special Oral) 19:00

Interfacial Thermal Resistance between Light and Matter

C.-L. Chiu, T.-K. Hsiao, B.-Y. Chen, and •*C.-W. Chang*; *Center for Condensed Matter Sciences, National Taiwan University, Taipei, Taiwan*

We experimentally observe non-negligible interfacial thermal resistance between light and matter. The previously overlooked effect is ubiquitous, and is found to be correlated with optical absorptivity as well as thermal conductivity of materials.

ROOM 5 ICM

ROOM 13a ICM

Oyama, Japan

We demonstrate the generation of 10W, 1ns optical pulse at 193nm for precise micromachining application. Seed pulse is generated by the cascaded sum frequency generation using CLBO crystals and is amplified by ArF excimer amplifier.

CA-4.5 SUN 19:00

Space-Qualified Pulsed DPSS UV Laser for Martian Subsurface Exploration

•*A. Büttner*[1], *M. Ernst*[1], *M. Hunnekuhl*[1], *R. Kalms*[1], *L. Willemsen*[1], *P. Weßels*[1], *D. Kracht*[1], *J. Neumann*[1], *and t. MOMA laser team*[1,2]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*Max Planck Institute for Solar System Research, Göttingen, Germany*

We will give an overview over the design, realization, evolution and qualification of the flight model of the 266 nm diode-pumped passively Q-switched solid-state laser for the Mars Organic Molecule Analyzer (MOMA) instrument.

ROOM 13b ICM

de Comunicaciones. Universidad Miguel Hernández, Elche, Spain; [2]*Departamento de Tecnología informática y computación. Universidad de Alicante, Alicante, Spain*

We propose a self-illuminated and self-synchronized passively Q-switched compact diode-pumped Nd3+:YVO4 laser system at 1342 nm for intra-cavity coincedence pulsed image up-conversion. The system is based on type-II second harmonic generation in a KTP crystal.

CD-4.3 SUN 19:00

Theoretical modelling and experimental demonstration of a mid-infrared femtosecond upconversion system

•*A.S. Ashik*[1], *C.F. O'Donnell*[2,3], *S.C. Kumar*[2,3], *M. Ebrahim-Zadeh*[2,3,4], *P. Tidemand-Lichtenberg*[1], *and C. Pedersen*[1]; [1]*DTU Fotonik, Technical University of Denmark, DK-4000, Roskilde, Denmark*; [2]*Radiantis, Edifici RDIT, Mediterranean Technology Park, 08860 Castelldefels, Barcelona, Spain*; [3]*ICFO-Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, 08860 Castelldefels, Barcelona, Spain*; [4]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Passeig Lluís Companys 23, 08010, Barcelona, Spain*

We develop a theoretical model, integrating the concepts of broad bandwidth and reduced interaction length associated with ultrashort pulses (< 1 picosecond), to describe the experimental results of a mid-IR femtosecond upconversion imaging system.

ROOM 14a ICM

Science and Technology, Hong Kong, China; [2]*Department of Electronic and Computer Engineering, Hong Kong University of Science and Technology, Hong Kong, China*

The wavelength tunability of monolithic InP/InGaAs nanolasers over a 200nm range was achieved via truncating cavities into different lengths. A theoretical model for the gain spectrum explained the mechanisms behind the experimentally-observed S-shaped wavelength-length relationship.

CB-1.4 SUN 19:00

Loss-Coupled DFB Nanoridge Laser Monolithically Grown on a Standard 300-mm Si Wafer

•*Y. Shi*[1], *M. Baryshnikova*[2], *Y. Mols*[2], *M. Pantouvaki*[2], *J. Van Campenhout*[2], *B. Kunert*[2], *and D. Van Thourhout*[1,2]; [1]*INTEC Department, Ghent University, Gent, Belgium*; [2]*IMEC, Heverlee, Belgium*

We present a loss-coupled GaAs/InGaAs DFB nanoridge laser directly grown on Silicon. Despite the extra loss induced by the metallic grating, the lasing threshold remains low, proving the high material quality.

ROOM 14b ICM

Italy; [2]*Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Milano, Italy*; [3]*Leibniz-Institut für Astrophysik Potsdam (AIP), Potsdam, Germany*
We propose a low loss polarization insensitive discrete beam combiner, a device used for performing integrated stellar interferometry and realized with the femtosecond laser micromachining followed by an annealing process to reduce the waveguides birefringence.

CM-4.5 SUN 19:00

Low Bend Loss Femtosecond Written Waveguides Exploiting Microcrack Enhanced Modal Confinement
•*T. Lee, Q. Sun, R. Ismaeel, M. Beresna, and G. Brambilla*; *University of Southampton, Southampton, United Kingdom*
Waveguide bends with a stress-induced crack to inhibit radiative bend loss were inscribed in silica by femtosecond writing. A 3dB/cm loss level was recorded at a bend radius of only 7mm, for a 1550nm wavelength.

ROOM 1 Hall A1

dom; [2]*Universita di Roma La Sapienza, Rome, Italy*
Molecular sensing is demonstrated using low loss Ge-on-Si waveguides in the range of 7.5 – 10 μm wavelength, using an absorbing polymer. The results highlight the potential of the platform for integrated mid-infrared molecular fingerprint sensing.

CH-4.4 SUN 19:00

The contribution has been withdrawn.

ROOM 2 Hall A1

France; [3]*Amplitude Laser, Pessac, France*
We report on soliton compression of a SWIR OPCPA in a multipass-cell in net anomalous dispersion. This allows the generation of 22 fs, 14 μJ pulses at 125 kHz and 1550 nm.

CF-4.4 SUN 19:00

Two-color soliton molecules
O. Melchert[1,2,3], *S. Willms*[1,2], *I. Babushkin*[1,2], *S. Bose*[1,2], *B. Roth*[2,3], *U. Morgner*[1,2], *and* •*A. Demircan*[1,2,3]; [1]*Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across Disciplines), Hannover, Germany*; [3]*Hannover Centre for Optical Technologies, Hannover, Germany*
We propose a novel type of ultrashort optical soliton-molecules with high spectral density, exhibiting quantum mechanical analogies, such as emission of dipole-like radiation, great robustness against perturbation, or evaporation of localized states upon impact.

ROOM 6 Hall A1

Avalanche Photodetector (APD) on InP substrate is demonstrated. Based on the device performance an energy efficient homodyne detection scheme using DQPSK signals withoud the need of a locals oscillator is derived.

CI-4.5 SUN 19:00

InP MEMS Mach-Zehnder Interferometer Optical Switch on Silicon
•*T. Liu*[1], *F. Pagliano*[1,2], *R. van Veldhoven*[1], *V. Pogoretskii*[1], *Y. Jiao*[1], *and A. Fiore*[1]; [1]*Institute for Photonic Integration, Eindhoven University of Technology, Eindhoven, Netherlands*; [2]*nanoPHAB, Eindhoven, Netherlands*
A novel MEMS Mach-Zehnder interferometer optical switch is presented by tuning the vertical gap between two coupled waveguides. The switching requires a voltage of 4.4V, provides a solution to on-chip optical switching for low-voltage applications.

ROOM 7 Hall A1

CE-4.4 SUN 19:00

Second Harmonic Generation in Thermally Poled Nitroaniline All-Solid Microstructured Optical Fibers
•*G. Violakis and S. Pissadakis*; *Foundation for Research and Technology-Hellas (FORTH), Institute of Electronic Structure and Laser (IESL), N. Plastira 100, 70013, Heraklion, Greece*
Microstructured optical fibers infiltrated with 2-methyl 4-nitroaniline are subjected to electric field poling under different temperatures. The effect of this process on the second harmonic generation efficiency and spectral characteristics of the fiber is examined.

ROOM 8 Hall A1

ISC-CNR, Rome, Italy
We propose and experimentally demonstrate the use of spatial light modulation for calculating the ground state of an Ising Hamiltonian. We realize configurations with thousands of interacting spins that settle in a low-temperature ferromagnetic-like phase.

JSI-3.4 SUN 19:00

Multiple round-trip delay-based architecture for Si-integrated photonic reservoir computing
•*F. Denis le Coarer*[1,2], *D. Rontani*[1,2], *and M. Sciamanna*[1,2]; [1]*Chaire Photonique, LMOPS EA 4423 laboratory, CentraleSupélec, and Univ. Paris-Saclay, 57070 Metz, France*; [2]*Chaire Photonique, LMOPS EA 4423 laboratory, CentraleSupéelec, and Univ. de Lorraine, 57070 Metz, France*
We present a novel architecture for delay-based reservoir computing integrated on a silicon photonic chip. We attain state-of-the-art levels of performance on typical tasks (e.g. the Santa Fe task)

NOTES

ROOM 1 ICM

EB-4.6 SUN 19:15

Optical d-level frequency-time-based cluster states

•*M. Kues*[1,2], *C. Reimer*[1,3], *S. Sciara*[1,4], *P. Roztocki*[1], *M. Islam*[1], *L. Romero Cortés*[1], *Y. Zhang*[1], *B. Fischer*[1], *S. Loranger*[5], *R. Kashyap*[5,6], *A. Cino*[4], *S.T. Chu*[7], *B.E. Little*[8], *D.J. Moss*[9], *L. Caspani*[10], *W.J. Munro*[11,12], *J. Azaña*[1], *and R. Morandotti*[1,13,14]; [1]*Institut National de la Recherche Scientifique – Énergie Matériaux Télécommunications, Varennes, Canada*; [2]*School of Engineering, University of Glasgow, Glasgow, UK*; [3]*HyperLight Corporation, Cambridge, USA*; [4]*Department of Energy, Information Engineering and Mathematical Models, University of Palermo, Palermo, Italy*; [5]*Engineering Physics Department, Polytechnique Montreal, Montreal, Canada,* [6]*Electrical Engineering Department, Polytechnique Montreal, Montreal, Canada* [7]*Department of Physics and Material Science, City University of Hong Kong, Hong Kong, China* [8]*State Key Laboratory of Transient Optics, Xi'an Institute of Optics and Precision Mechanics, Xi'an, China* [9]*Centre for Micro Photonics, Swinburne University of Technology, Hawthorn, Austria* [10]*Institute of Photonics, Department of Physics, University of Strathclyde, Glasgow, UK* [11]*NTT Basic Research Laboratories and NTT Research Center for Theoretical Quantum Physics, NTT Corporation, Kanagawa, Japan* [12]*National Institute of Informatics, Tokyo, Japan* [13]*Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, China* [14]*ITMO University, St. Petersburg, Russia*

We demonstrated the generation of d-level cluster states based on optical high-dimensional hyper-entanglement in the time- and frequency-domain manipulated by a deterministic controlled phase gate. We show d-dimensional measurement-based quantum computing operations.

ROOM 3 ICM

CJ-4.6 SUN 19:15

Pump-power-noise influence on mode instabilities in high-power fiber laser systems

•*C. Stihler*[1], *C. Jauregui*[1], *A. Tünnermann*[1,2,3], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Experiments have revealed that pump-power noise can significantly decrease the transverse-mode-instability (TMI) threshold of fiber lasers and likely act as the trigger for TMI. Thus, developing low-noise diodes and drivers could increase the TMI threshold.

ROOM 4b ICM

JSIV-3.5 SUN 19:15

Advances in Photoacoustic and Photothermal Techniques for Nondestructive Characterization at Nanoscopic Scale

•*R. Li Voti, G. Leahu, E. Petronijevic, A. Belardini, M. Centini, C. Sibilia, and M. Bertolotti*; *Sapienza Università di Roma, Dipartimento SBAI, Roma, Italy*

Recent advances for the optothermal characterization of chiral materials, ordered/disordered nanowires/spheres by Photoacoustic and Photothermal techniques are summarized. Photothermal radiometry is also introduced to measure the effective thermal diffusivity in synthetic opals and Carbon Nanotubes

ROOM 5 ICM

ROOM 13a ICM

CA-4.6 SUN 19:15

High-energy two-colour picosecond Nd:YAG laser for Satellite Laser Ranging

A. Kornev [2], •*R. Balmashnov*[1], *I. Kuchma*[2], *and A. Davtian*[2]; [1]*ITMO University, Saint-Petersburg, Russia*; [2]*"Lasers and Optical Systems" Co. Ltd., Saint-Petersburg, Russia*

We report a high-energy high-repetition-rate two-colour picosecond Nd:YAG laser. The energy of 0.43 J and 0.3 J at 1064 nm and 532 nm wavelengths, respectively, and 200 Hz pulse repetition rate distinguish it from analogues.

ROOM 13b ICM

CD-4.4 SUN 19:15

Electro-optic control of intra-cavity image up-conversion for fast range-gated systems

A.J. Torregrosa[1], *H.J. Maestre*[1], *M.L. Rico*[2], *and* •*J. Capmany*[1]; [1]*Dpto. de Ingeniería de Comunicaciones. Universidad Miguel Hernández., Elche, Spain*; [2]*Dpto.de Tecnología Informática y Computación, Universidad de Alicante., Dpto.de Tecnología Informática y Computación, Universidad de Alicante, San Vicente del Raspeig, Spain*

We present an electro-optic technique to achieve fast and arbitrary gating time control of an intra-cavity CW up-conversion imaging system, which allows the use of EM-CCDs in rang-gated imaging applications as an alternative to ICCDs with fast gating.

ROOM 14a ICM

CB-1.5 SUN 19:15

Micropillar Lasers with Site-controlled Quantum Dots as Active Medium

A. Kaganskiy, S. Kreinberg, X. Porte, and •*S. Reitzenstein*; *Technische Universität Berlin, Berlin, Germany*

We report on high-beta micropillar lasers based on a controlled number of positioned quantum dots. The quantum dots are grown by the buried-stressor approach to integrate 1-20 emitters at the antinode of the cavity field.

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ROOM 14b ICM

CM-4.6 SUN 19:15

Femtosecond pulse inscription of 3D arrays of Bragg gratings in selected cores of a multicore optical fiber

•*A. Wolf*[1,2], *K. Bronnikov*[1,2], *A. Dostovalov*[1,2], *and S. Babin*[1,2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Automation and Electrometry of the SB RAS, Novosibirsk, Russia*

We report on inscription of point-by-point FBG arrays in different 7-core optical fibers by femtosecond IR laser pulses.

ROOM 1 Hall A1

CH-4.5 SUN 19:15

Suspended Tantalum Pentoxide Rib Waveguides for Laser Absorption Spectroscopy

•*M. Vlk*[1], *V. Mittal*[2], *G.S. Murugan*[2], *and J. Jágerská*[1]; [1]*Department of Physics and Technology, UiT The Arctic University of Norway, Tromsø, Norway*; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We demonstrate successful fabrication of air-suspended tantalum pentoxide rib waveguides for gas sensing. The fine, high-aspect-ratio membrane structures were realized via selective removal of Si substrate using XeF_2 etching and Al_2O_3 passivation.

ROOM 2 Hall A1

CF-4.5 SUN 19:15

Soliton Self-Compression and Spectral Broadening of 1 μm Femtosecond Pulses in Single-Domain KTiOPO4

•*A.-L. Viotti*[1], *B. Hessmo*[1], *S. Mikaelsson*[2], *C. Guo*[2], *C. Arnold*[2], *A. L'Huillier*[2], *B. Momgaudis*[3], *A. Melnikaitis*[3], *F. Laurell*[1], *and V. Pasiskevicius*[1]; [1]*Royal Institute of Technology, Stockholm, Sweden*; [2]*Lund University, Lund, Sweden*; [3]*Laser Research Center, Vilnius University, Vilnius, Lithuania*

We demonstrate spectral broadening and pulse self-compression down to sub-20 fs in unpoled KTiOPO4 around 1030 nm. Different focusing configurations are investigated as well as pulse temporal characterization with a custom-built d-scan setup.

ROOM 6 Hall A1

CI-4.6 SUN 19:15

Towards High-Speed Energy-Efficient Pulse-Switching Networks Implemented in Carrier-Injection-Based Si-Photonics

•*C. Krückel*[1,2], *H. Becker*[3], *Y. Ban*[2], *M. Heck*[3], *J. Van Campenhout*[2], *and D. Van Thourhout*[1,2]; [1]*Photonics Research Group, INTEC, Ghent University-IMEC,, Ghent, Belgium*; [2]*IMEC, Kapeldreef 75,, Leuven, Belgium*; [3]*Department of Engineering, Aarhus University, Aarhus, Denmark*

We show that carrier-injection-based Si-photonics is a suitable platform for reconfigurable networks to switch ps pulses with sub-GHz repetition. The usage of pre-emphasis-based driving results in ns switching transitions and reduces energy consumption by ~40%.

ROOM 7 Hall A1

CE-4.5 SUN 19:15

Four-wave Mixing Parametric Oscillation in Deuterated Silicon Nitride Microresonators Prepared by Low-temperature (100 ^{o}C) PECVD Platform

•*Z. Wu*[1], *Z. Xu*[1], *Y. Zhang*[1], *H. Chen*[1], *Y. Chen*[1], *and S. Yu*[1,2]; [1]*Sun Yat-sen University, Guangzhou, China*; [2]*University of Bristol, Bristol, United Kingdom*

We report a low-temperature-deposited (100 ^{o}C) nitrogen-rich deuterated silicon nitride platform based on PECVD technique for nonlinear integrated photonics. High-Q microring resonators are fabricated and utilized for generating broadband four-wave-mixing parametric oscillation.

ROOM 8 Hall A1

JSI-3.5 SUN 19:15

Short and Long Term Memory in Regenerative Spiking Micropillar Lasers

•*V.A. Pammi*[1], *S. Terrien*[2], *N.G.R. Broderick*[2], *B. Krauskopf*[2], *and S. Barbay*[1]; [1]*Centre de Nanosciences et de Nanotechnologies – C2N, Palaiseau, France*; [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*

Excitable micropillar lasers when delayed coupled to themselves demonstrate regenerative multistable spike trains. Here we review the evolution of such spike trains which demonstrate short term memory and long term associative memory in the system.

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13:00 – 14:00

CE-P: CE Poster Session

CE-P.1 SUN

The contribution has been withdrawn.

CE-P.2 SUN

Fabrication of nanometric gratings with electron beam lithography for stadying the atome-surface interaction

•*H. Bricha*; *Laser Physics Laboratory , Villetaneuse, France*

Nanometric grating have many existing and potential applications such as atom-beam diffraction and interferometry and X and soft X-ray spectroscopy in astrophysics. A custom-made fabrication process has been developed to create free-standing gratings of versatile shapes in silicon nitride membrane.

CE-P.3 SUN

Improvement in Radiative Recombination Efficiency and Emission Power Density of Surface-Passivated InGaN Nano-disk in a Wire Heterostructure Array

•*P.K. Saha, V. Pendem, S. Ganguly, and D. Saha*; *Indian Institute of Technology Bombay, Mumbai, India*

In this work, the improvement in emission power density is demonstrated by fabricating InGaN nano-disk. Due to higher surface-to-volume ratio, internal quantum efficiency depends heavily on side-wall and hence, increases after surface treatment.

CE-P.4 SUN

Thermal Radiation Polarization Analysis of the Crystal Fiber Growth Zone: Determination of the Crystal Melt Refractive Index

•*G. Bufetova*[1], *S. Rusanov*[1], *V. Seregin*[1], *V. Kashin*[1], *and V. Tsvetkov*[1,2]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*National Research Nuclear University MEPhI, Moscow, Russia*

Difference in polarization components intensity of thermal radiation measured across crystal fiber growth zone enables to determine the refractive index of crystal melt. For sapphire melt it is n=1.570.03 near melt point in visible range

CE-P.5 SUN

An Optical Method for the Determination of Azimuthal Orientation of Triangular Lattice Silica Glass Microstructured Optical Fiber

•*N. Korakas*[1,2], *G. Violakis*[1], *and S. Pissadakis*[1]; [1]*Foundation for Research and Technology-Hellas (FORTH), Institute of Electronic Structure and Laser (IESL), , Heraklion, Greece*; [2]*Department of Materials Science & Technology, University of Crete, Heraklion, Greece*

A simple and precise (<5o) optical method for the determination of microstructured optical fibers azimuthal lattice orientation is presented, based on the diffraction pattern generated upon cw visible laser light illumination of the fiber.

CE-P.6 SUN

Light transport and vortex formation in all solid band gap fibres

•*A. Pryamikov*[1], *G. Alagashev*[1], *and S. Turitsyn*[2]; [1]*Mendeleev University of Chemical Technology of Russia, 9 Miusskaya square, 125047, Moscow, Russia*; [2]*Aston Institute of Photonics Technologies, Birmingham, United Kingdom*

In this work we demonstrate that formation of optical vortices in cladding elements of all solid band gap fibres can lead to a sharp decrease of the loss level by several orders of magnitude for the fundamental core mode.

CE-P.7 SUN

Optical properties of Ce-doped silica fiber

•*A. Yadav*[1], *E. Zherebtsov* [2], *N. Chichkov*[1], *R. Gumenyuk*[3], *M. Melkumov*[4], *M. Yashkov*[5], *E. Dianov*[4], *and E. Rafailov*[1]; [1]*Aston University, Birmingham, United Kingdom*; [2]*University of Oulu, Oulu, Finland*; [3]*Tampere University of Technology, Tampere, Finland*; [4]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [5]*Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod , Russia*

Fluorescence properties of Ce-doped silica fiber have been analysed in frequency domain using high speed lock-in amplifier. Two components of the emission with lifetimes 23.0-34.2 ns and 63.1-76.6 ns respectively have been identified.

CE-P.8 SUN

High-power limitations of graphene nanocoated optical taper saturable absorbers

•*P. Mouchel*[1,2], *M. Kemel*[1], *G. Semaan*[1], *M. Salhi*[1], *M. Le Flohic*[2], *and F. Sanchez*[1]; [1]*Laboratoire de Photonique d'Angers, E.A.4464, Université d'Angers, 2 boulevard Lavoisier , 49045 Angers, France*; [2]*Lumibird, 2 rue Paul Sabatier, 22300 Lannion, France*

In this communication we point out the deterioration of the saturable absorption properties of graphene nanocoated fiber taper under high optical power. This is connected to thermal effects resulting from low thermal dissipation of graphene nano-flakes.

CE-P.9 SUN

Fabrication and characterization of new phosphate glasses and glass-ceramics suitable for drawing optical and biophotonic fibers

P. Lopez-Iscoa[1], *N. Ojha*[2], *D. Pugliese*[1], *R. Gumenyuk*[2], *J. Massera*[3], *N.G. Boetti*[4], *D. Janner*[1], *C. Boussard-Plédel*[5], *D. Milanese*[1,6], *and •L. Petit*[2]; [1]*Politecnico di Torino, Dipartimento di Scienza Applicata e Tecnologia, Torino, Italy*; [2]*Photonics Laboratory, Tampere University, Tampere, Finland*; [3]*Faculty of Biomedical Science and Engineering and BioMediTech Institute, Tampere University, Tampere, Finland*; [4]*Fondazione LINKS – Leading Innovation & Knowledge for Society, Torino, Italy*; [5]*University of Rennes, Rennes, France*; [6]*IFN - CNR, CSMFO Laboratory, Povo, Italy*

We will show that glass development pave the way towards new glasses, glass-ceramics and particles containing glasses with enhanced spectroscopic properties, which can be drawn into new optical and biophotonic fibers.

CE-P.10 SUN

Structural variations and their influence on the optical properties of Rare Earth Orthophosphates

•*S.K. Sharma*[1,2], *J. Beyer*[1], *M. Fuchs*[2], *R. Gloaguen*[2], *and J. Heitmann*[1]; [1]*Institute of Applied Physics, Technical University Bergakademie Freiberg, Leipzeiger Str. 23, Freiberg, Germany*; [2]*Helmholtz-Zentrum Dresden-Rossendorf, Helmholtz-Institute Freiberg for Resource Technology, Chemnitzer Str. 40, Freiberg, Germany*

We present results on the influence of crystal structure on optical properties of REPO4. Focus is to understand optical properties in the blue, green, and red region of e.m. spectrum, for suitability in lighting application.

CE-P.11 SUN

Mid-infrared spectroscopy of Pr3+:Lu2O3 single crystal

•*A. Toncelli*[1], *J. Xu*[1], *A. Tredicucci*[1], *A. Heuer*[2,3], *and C. Kränkel*[4]; [1]*NEST-Istituto Nanoscienze CNR and Physics Department "Enrico Fermi", University of Pisa, Pisa, Italy*; [2]*Institut für Laser-Physik, Universität Hamburg, Hamburg, Germany*; [3]*The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany*; [4]*Zentrum für Lasermaterialien - Kristalle (ZLM-K) am Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany*

Spectroscopic investigation of Pr:Lu2O3 in mid-infrared is presented. The transmission range extends to 8 micron. Absorption and emission bands have been characterized in NIR and MIR, with the longest one at around 7 micron.

CE-P.12 SUN

Suppressing 1.06 μm Emission of Nd3+ Ions in Tellurite All Solid Photonic Bandgap Fibers With Double Cladding

•*H.T. Tong, K. Miura, N. Nishiharaguchi, T. Suzuki, and Y. Ohishi*; *Research Center for Advanced Photon Technology, Nagoya, Japan*

Novel Nd3+-doped tellurite all solid photonic bandgap fibers with double cladding were proposed for the first time to suppress the 1.06-μm emission. Compared to homogeneous structure, the heterogeneous structure provides effective control of photonic bandgap.

CE-P.13 SUN

Rare-Earth Doped Oxide Glasses and Fibers for Lasers Emitting in the 2-3 μm Spectral Range

•*B. Denker*[1,4], *B. Galagan*[1,4], *V. Dorofeev*[2,4], *S. Motorin*[2,4], *V. Koltashev*[3], *and S. Sverchkov*[1,4]; [1]*Prohorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*Devyatykh Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [3]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [4]*Center of Laser Technology and Material Science, Moscow, Russia*

Luminescent and lasing experiments with bulk and fiber samples showed that the properties of deeply dehydrated rare-earth doped tellurite and calcium-aluminate glasses are quite pertinent for lasers emitting in the 2-3μm spectral range.

CE-P.14 SUN

Photo darkening suppression in highly Yb-doped Aluminophosphosilicate fiber by addition of Cerium

•*R. Sidharthan*[1], *H. Li*[1], *K.J. Lim*[2], *S.H. Lim*[2], *Y.M. Seng*[1], *S.L. Chua*[2], *and S. Yoo*[1]; [1]*Nanyang Technological University, Singapore, Singapore*; [2]*DSO National Laboratories, Singapore, Singapore*

We report fabrication of photodarkening suppressed, high absorption, step index large-mode-area fiber for high power lasers. Extremely low PD is achieved by realizing cerium co-doping to equimolar Al:P fiber with very high 0.5mol% Yb2O3 concentration.

CE-P.15 SUN

Persistent luminescence features in hexagonal Sr1-x/2Al2-xSixO4:Eu2+,Dy3+ compounds

V. Castaing[1], *C. Monteiro*[2], *M. Allix*[2], *and •B. Viana*[1]; [1]*PSL Research University, Chimie ParisTech, CNRS, Institut de Recherche de Chimie Paris,, Paris, France*; [2]*CNRS, CEMHTI UPR3079, University of Orléans, F-45071, Orléans, France*

White persistent phosphors are actively needed for new lighting applications. Rare-earth doped strontium

aluminosilicate phosphors present persistent emission shifted toward the white color and the stabilization of the hexagonal phase leads to enhanced properties

CE-P.16 SUN

Fabrication of Fluorescent Gold Nanoclusters in Thin Polymer Films by Direct Laser Writing

•*M. Bitarafan, S. Suomala, and J. Toivonen*; *Tampere University, Tampere, Finland*

We produce fluorescent gold nanoclusters in thin polymer film using sub-microwatt laser beam. With this method, fluorescent micro-patterns can be made in an easy and cost-effective way.

CE-P.17 SUN

Optically Reconfigurable Surface Microstructures on Polymeric Thin Films

J. Krüger [1], *T. Calvelo*[1], *N. Bolle*[2], *I. Reed*[2], *S. Masiuk*[2], *R. Conwell*[2], *and* •*D.J. McGee*[2]; [1] *Beuth Hochschule für Technik , Berlin, Germany*; [2]*The College of New Jersey, Ewing, USA*

Optically reconfigurable microstructures have applications in diffractive optics. We report the optical erasure and amplification of surface gratings written on azobenzene-polymer films by combining the reversible photomechanical film response with film scanning.

CE-P.18 SUN

Optical simulations of printed Polymer Optical Waveguides (POWs): search for their optical limitations caused by fabrication and application geometry

•*C. Backhaus*[1], *C. Vögl*[1], *J. Zeitler*[2], *T. Reitberger*[2], *N. Lindlein*[1], *and J. Franke*[2]; [1]*Institut of Optics, Information and Photonics, Erlangen, Germany*; [2]*Institute for Factory Automation and Production Systems, Erlangen, Germany*

The research group OPTAVER established with printed Polymer Optical Waveguides (POWs) a new customised fabrication of short-range data transmission networks. To characterise the POWs the limitations in fabrication and application are monitored by optical simulations.

CE-P.19 SUN

X-ray microscopy of polymer photonic structures

E. Marakis[1], *R. Uppu*[1], *A.T.J. Pacureanu*[2], *P. Cloetens*[2], •*W.L. Vos*[1], *and P.W.H. Pinkse*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*European Synchrotron Radiation Facility, Grenoble, France*

We deterministically nanofabricate photonic structures by direct laser writing. X-ray tomography enables 3D volume reconstruction with deep sub-optical-wavelength resolution. We compare the design with the fabricated structures.

CE-P.20 SUN

Lanthanum Hexaboride: A Novel Material For Solar Energy Exploitation

•*E. Sani*[1], *L. Mercatelli*[1], *M. Meucci*[1], *L. Zoli*[2], *and D. Sciti*[2]; [1]*CNR-INO National Institute of Optics, Firenze, Italy*; [2]*CNR-ISTEC Institute of Science and Technology for Ceramics, Faenza, Italy*

We proof that optical properties of bulk ceramic LaB6 are promising for a new concept of concentrating solar energy exploitation, which merges a high-temperature thermodynamic conversion to a direct power generation by thermionic effect.

CE-P.21 SUN

Laser-induced damage in passive and active polymer optical fibers

•*K. Kiedrowski*[1], *F. Jakobs*[2], *J. Kielhorn*[2], *H.-H. Johannes*[2], *W. Kowalsky*[2,4], *D. Kracht*[3], *I. Balasa*[3], *and D. Ristau*[1,3,4]; [1]*Leibniz Universität Hannover, Hannover, Germany*; [2]*Technische Universität Braunschweig, Braunschweig, Germany*; [3]*Laser Zentrum Hannover e.V., Hannover, Germany*; [4]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across Disciplines), Hannover, Germany*

Using a nanosecond pulsed laser system, various passive and active polymer optical fibers were investigated regarding the maximum transmittable pulse energy up to which no laser-induced damage was observed.

CE-P.22 SUN

Spectroscopic characterization of Er,Yb:Y2Ti2O7 nanoparticles for forensic applications

•*A. Toncelli*[1], *J. Xu*[1], *M. Gouiaa*[2], *and R. Maalej*[2]; [1]*NEST-Istituto Nanoscienze CNR and Physics Department "Enrico Fermi", University of Pisa, Pisa, Italy*; [2]*2 Laboratoire Géoressources, Matériaux, Environnement et Changements Globaux, Faculty of Sciences of Sfax, Sfax, Tunisia*

We report preparation of Er3+:YTO and Er3+/Yb3+:YTO powders and their spectroscopic characterization. We used the optimized compositions to detect fingerprints on the surface of different objects, for example glass, under UV illumination.

CE-P.23 SUN

Comparative Study Of Spectroscopic Properties Of Pr3+-doped LiY0.3Lu0.7F4, LiYF4 And LiLuF4 Crystals

•*M. Demesh*[1], *N. Gusakova*[1], *A. Nizamutdinov*[2], *O. Morozov*[2], *S. Korableva*[2], *V. Semashko*[2], *V. Kisel*[1], *A. Yasukevich*[1], *and N. Kuleshov*[1]; [1]*Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus*; [2]*Institute of Physics, Kazan Federal University, Kazan, Russia*

We present the detailed spectroscopic properties of Pr3+:LiY0.3Lu0.7F4 crystal in comparison with Pr-doped LiYF4 and LiLuF4 crystals.

CE-P.24 SUN

Yb-doped Double Tungstate Crystals for PV Down-Conversion Applications

•*E. Sani*[1], *A. Brugioni*[1], *L. Mercatelli*[1], *E.V. Zharikov*[2], *D.A. Lis*[2], *and K.A. Subbotin*[2,3]; [1]*CNR-INO National Institute of Optics, Firenze, Italy*; [2]*Prokhorov General Physics Institute of Russian Academy of Sciences, Moscow, Russia*; [3]*Mendeleev University of Chemical Technology of Russia, Moscow, Russia*

Yb-doped scheelite-like double tungstate crystals of different chemical compositions were investigated. The efficient 900-nm emission from Yb was obtained under UV excitation, thanks to non-radiative energy transfer from donor centers of the hosts.

CE-P.25 SUN

Spectroscopy of Tm:Y2O3 Transparent Ceramic at Cryogenic Temperatures

•*F. Yue*[1], *V. Jambunathan*[1], *S. Paul David*[1], *P. Navratil*[1], *J. Maria Serres*[2], *X. Mateos*[2], *M. Aguiló*[2], *F. Díaz*[2], *A. Lucianetti*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics Czech Academy of Sciences, Prague, Czech Republic*; [2]*Física i Cristal·lografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili, Tarragona, Spain*

The spectroscopy of Tm:Y2O3 ceramics is studied at cryogenic temperatures. An absorption cross-section of 4.78×10^-21 cm^2 at 793nm and an emission cross-section of 24.9×10^-21 cm^2 at 1930.9nm for 80K respectively are estimated.

CE-P.26 SUN

UV Luminescence in Ho:ZBLAN Glasses

•*A. Jusza, P. Komorowski, J. Olas, K. Anders, and R. Piramidowicz*; *Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland*

In this work we present our recent results of extensive studies on short-wavelength luminescence in holmium-doped ZBLAN glass, with special emphasis on transitions originating from high energy levels emitting in UV and VIS spectral range.

CE-P.27 SUN

Temperature Dependence of Magnetic Permeability and Optical Polarization Rotation of Gallium-Terbium Garnet Crystals

•*R. Ismagilova*[2], *R. Shaidullin*[1,2], *and O. Ryabushkin*[1,2]; [1]*Moscow Institute of Physics and Technology , Fryazino, Russia*; [2]*Kotelnikov Institute of Radio Engineering and Electronics of RAS, Fryazino, Russia*

Magneto-optical characteristics of gallium-terbium garnet crystal (TGG) were analyzed. Temperature dependences of TGG magnetic permeability, Verdet constant and optical absorption coefficient were experimentally measured. Influence of uniform and non-uniform heating on polarization rotation was investigated.

CE-P.28 SUN

Characterization of the Verdet constant of Dy2O3 ceramics in the two micron spectral range

•*D. Vojna*[1,2], *O. Slezák*[1], *H. Furuse*[3], *R. Yasuhara*[4], *A. Lucianetti*[1], *T. Mocek*[1], *and M. Čech*[2]; [1]*HiLASE Centre, Institute of Physics ASCR v.v.i., Dolni Brezany, Czech Republic*; [2]*Department of Physical Electronics, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic*; [3]*Kitami Institute of Technology, Kitami, Japan*; [4]*National Institute for Fusion Science, National Institutes of Natural Sciences, Toki, Japan*

We present magneto-optical characterizations of novel material samples of Dy2O3-based ceramics in a broad spectral range of 0.6 – 2.4 μm. The material has a high potential for utilization in a high power mid-IR optical isolators.

CE-P.29 SUN

Terbium Aluminium Garnet Ceramics for Ultrahigh Power Laser Isolators

•*S. Tokita*[1], *M. Nishio*[1], *H. Uehara*[1], *T. Yanagitani*[2], *K. Fujioka*[1], *J. Kawanaka*[1], *and R. Yasuhara*[3]; [1]*Institute of Laser Engineering, Osaka University, Osaka, Japan*; [2]*Konoshima Chemical Co. Ltd., Kagawa, Japan*; [3]*National Institute for Fusion Science, Gifu, Japan*

We report measurement results of thermal and optical properties of a high-quality TAG ceramic. It is expected that the TAG ceramic can be used as 10 kW-level high-power isolator at a low temperature.

CE-P.30 SUN

Measuring the thermal expansion coefficient of ultrastable materials with 10^{-9} K^{-1} uncertainty

•*M. Ghazi Zahedi, T. Legero, and U. Sterr*; *Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*

We report on an optimized interferometric technique and setup to determine the coefficient of thermal expansion (CTE) of dimensionally stable materials with small uncertainties of 10^{-9} K^{-1}.

CE-P.31 SUN

Crystal growth and optical properties of mid-infrared nonlinear optical crystals

•*S. Wang, X. Tao, and Z. Gao*; *State Key Laboratory of Crystal Materials, Jinan, China*

We investigated the growth and properties of large-sized lithium containing chalcogenide crystals. A 3.6-4.8 and 7-12 μm widely tunable picosecond (ps) MIR optical parametric amplifier (OPA) based on LISe crystal was demonstrated .

CE-P.32 SUN

Measurement of Effective Four-Photon Absorption in Semiconductors

•*G. Polónyi*[1,2], *B. Monoszlai*[1,3], *P.S. Nugraha*[1], *G. Tóth*[2], *L. Pálfalvi*[1], *L. Nasi*[1], *Z. Ollmann*[1,4], *E. Rohwer*[4], *G. Gäumann*[4], *T. Feurer*[4], *J. Hebling*[1,2], *and J.A. Fülöp*[1,2,3]; [1]*Institute of Physics and Szentágothai Research Centre, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*ELI-ALPS, ELI-Hu Nonprofit Ltd., Szeged, Hungary*; [4]*Institute of Applied Physics University of Bern, Bern, Switzerland*

Effective four-photon absorption coefficients of GaP and ZnTe have been measured by the z-scan method at 1.75 μm pump wavelength. Anisotropy in the effective four-photon absorption has been shown in GaP.

CE-P.33 SUN

Thermal analysis of new ionic liquids by EZ-scan technique

•*V.C. Ferreira*[1], *G. Marin*[2], *J. Dupont*[2,3], *and R.R.B. Correia*[1]; [1]*Optics, Photonics and Materials Group, Institute of Physics, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*; [2]*Laboratory of Molecular Catalysis, Institute of Chemistry, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*; [3]*School of Chemistry, University of Nottingham, Nottingham, United Kingdom*

Two new ionic liquids presented an alteration in the electrical conductivity by the presence of light. Thermal characterizations for both ionic liquids by EZ-scan are presented and discussed a possible origin of conductivity change.

CE-P.34 SUN

Glass-hosted carbon nanotubes as a saturable absorber for ultrafast laser

C. Jin, Y. Cui, and •*X. Liu*; *State Key Laboratory of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang University, Hangzhou, China*

We successfuly prepare single-walled carbon nanotube (SWCNT) glass composite as saturable absorber, which greatly enhances the thermal damage threshold. Moreover, the dissipative solitons are achieved with such SWCNT-glass composite for the first time.

CE-P.35 SUN

Tunable LiNbO3-based Diffraction Optical Elements for Control of Coherent Light

•*A.R. Akhmatkhanov*[1], *A.A. Esin*[1], *V.S. Pavelyev*[2], *and V.Y. Shur*[1]; [1]*Institute of Natural Sciences and Mathematics, Ural Federal University, Ekaterinburg, Russia*; [2]*Image Processing Systems Institute, Russian Academy of Sciences, Samara, Russia*

The electric field tunable diffraction optical elements, such as circular zone plates and 2D diffraction gratings, based on the stable tailored ferroelectric domain patterns created in lithium niobate single crystals will be presented.

CE-P.36 SUN

Periodically Poled MgO:LiNbO3, MgO:LiTaO3 and KTiOPO4 Crystals for Laser Light Frequency Conversion

•*V. Shur*[1], *A. Akhmatkhanov*[1], *M. Chuvakova*[1], *A. Esin*[1], *O. Antipov*[2], *A. Boyko*[3], *and D. Kolker*[3]; [1]*Institute of Natural Sciences and Mathematics, Ural Federal University, Ekaterinburg, Russia*; [2]*Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [3]*Novosibirsk State University, Novosibirsk, Russia*

The recent achievements in periodical poling of lithium niobate, lithium tantalate and potassium titanyl phosphate crystals and experimental results of the deep study of the domain structure evolution and domain wall motion will be presented.

CE-P.37 SUN

Spectral characterization of transverse modes in random lasers

•*A. Consoli*[1,2], *S. Robalino*[1], *N. Caselli*[1], *and C. López*[1]; [1]*Material Science Factory, Instituto de Ciencias de Materiales de Madrid (ICMM), Consejo Superior de Investigaciones Científicas (CSIC), Sor Juana Ines de la Cruz 3, 28049, Madrid, Spain*; [2]*ETSI de Telecomunicación, Universidad Rey Juan Carlos, C. Tulipán s/n, 28933, Madrid, Spain*

Lateral emission from random lasers is spatially and spectrally characterized, observing bright and localized hotspots at different lasing wavelengths. Results suggest a simple theoretical interpretation and that wavelength selection is possible via spatial filtering.

CE-P.38 SUN

Low stress, anomalous dispersive silicon nitride waveguides fabricated by reactive sputtering

•*A. Frigg*[1,3], *A. Boes*[1], *G. Ren*[1], *D.-Y. Choi*[2], *S. Gees*[3], *and A. Mitchell*[1]; [1]*School of Engineering, RMIT University, Melbourne, Australia*; [2]*Research School of Physics and Engineering, Australian National University, Canberra , Australia*; [3]*Evatec Ltd., Hauptstrasse 1a, Trübbach, Switzerland*

We introduce 850nm thick silicon nitride fabricated by reactive sputtering deposition for anomalous dispersive waveguides. A low stress of 41MPa, low roughness, good uniformity and a thin-film material loss of 0.3dB/cm was achieved.

CE-P.39 SUN

Silicon Photonics at the Interface with a Phase Change Material

•*A. Hache*; *Département de physique, Université de Moncton, Moncton, Canada*

Total internal reflection of light travelling in silicon interfaced with a phase change material is studied. Important changes in polarization states occur during the phase transition, which could be modulated on fast timescales by optical activation.

CE-P.40 SUN

Ultrafast dynamics in quantum dot doped nanocomposites at low temperatures: study by means of site-selective spectroscopy

•*K. Karimullin*[1,2], *A. Arzhanov*[1,2], *and A. Naumov*[1,2,3]; [1]*Institute for Spectroscopy RAS, Moscow, Russia*; [2]*Moscow State Pedagogical University, Moscow, Russia*; [3]*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*

The combination of site-selective spectroscopy techniques with high time-domain and spatial resolution made it possible to study the interaction of quantum dots with a solid matrix as well as the their intrinsic dynamics.

CE-P.41 SUN

The contribution has been withdrawn.

CE-P.42 SUN

Placing quantum dots in 3D photonic crystals and finding them back

A.S. Schulz[1], *D.A. Grishina*[1], *C.A.M. Harteveld*[1], *A. Pacureanu*[2], *A. Lagendijk*[1], *J. Huskens*[1], *G.J. Vancso*[1], *P. Cloetens*[2], *and* •*W.L. Vos*[2]; [1]*MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*European Synchrotron Radiation Facility (ESRF), Grenoble, France*

We have functionalized 3D silicon photonic band gap crystals with PbS nanocrystal quantum dots. In X-ray fluorescence imaging experiments, we detect the 3D position of the quantum dots with 50 nm spatial resolution.

CE-P.43 SUN

Simulation of the plasmonic properties of gold nanosponges with nanotomographically reconstructioned models

H. Honig, •*D. Wang, and P. Schaaf*; *Institute of Micro and Nanotechnologies and Institute of Materials science and Egineering, TU Ilmenau, Ilmenau, Germany*

Real models of individual gold nanosponges have been reconstructed by using 3D FIB nanotomography, and have been adopted for the FDTD simulation to study the distinct plasmonic properties.

13:00 – 14:00

CF-P: CF Poster session

CF-P.1 SUN

Optical Pulsewidth Measurement Technology Based on Carbon Nanotube Saturable Absorber

P. Xiao[1], •*K. Wu*[1], *D. Mao*[2], *and J. Chen*[1]; [1]*Shanghai Jiao Tong University, Shanghai, China*; [2]*Northwestern Polytechnical University, Xi'an, China*

We propose and demonstrate a novel pulsewidth measurement technology based on carbon nanotube saturable absorber which achieves a minimum pulse energy of 75 fJ and an average-power-peak-power product of 5.44×10^{-7} W^2 near 1560 nm.

CF-P.2 SUN

High-acquisition-rate single-shot pump-probe measurement using chirped-fiber Bragg gratings

•*M. Kobayashi*[1], *Y. Arashida*[1], *G. Yamashita*[2], *E. Matsubara*[2,3], *M. Ashida*[2], *J.A. Johnson*[4], *and I. Katayama*[1]; [1]*Graduate School of Engineering, Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama, Kanagawa 240-8501, Japan*; [2]*Graduate School of Engineering Science, Osaka University, 1-3 Machikaneyama-cho, Toyonaka, Osaka 560-8531, Japan*; [3]*Department of Physics, Osaka Dental University, 8-1 Kuzuha-hanazono, Hirakata, Osaka 573-1121, Japan*; [4]*Department of Chemistry and Biochemistry, Brigham Young University, Provo, Utah 84602, USA*

To improve the noise level of the single-shot pump-probe waveforms at a high repetition rate, we combined the chirped-pulse single-shot detections and photonic time-stretch technique using a chirped-fiber Bragg grating (CFBG).

CF-P.3 SUN

Ultrashort, picosecond OPCPA FrontEnd for the new Vulcan TAP beamline

•*M. Galletti*[1,2], *G. Archipovaite*[1], *P. Oliveira*[1], *M. Ahmad*[1], *E. Dilworth*[1], *N. Rutherford*[1], *M. Galimberti*[1], *I. Musgrave*[1], *and C. Hernandez-Gomez*[1]; [1]*Central Laser Facility, STFC, RAL, Didcot, United Kingdom*; [2]*GoLP/IPFN Instituto Superior Tecnico, Universidade de Lisboa, Lisbon, Portugal*

We present an ultrashort, picosecond OPCPA FrontEnd for the new Vulcan beamline. Broadband Ti:Sa pulses are amplified up to 1 mJ in a 4-stage OPA system pumped by picosecond Yb regenerative amplifier at 100 Hz.

CF-P.4 SUN

Real-time observation of build-up and shut-down dynamics of dispersion-managed soliton fiber laser

•*Y. Cui and X. Liu*; *State Key Laboratory of Modern Optical Instrumentation, Department of Optical Engineering, Zhejiang University, Hangzhou, China*

We measure the the birth and extinction processes of dispersion-managed soliton (DMS) in nanotube-mode-locked fiber laser, and several interesting phenonmena are observed, which deviates from the previous reports about the formation of solitons.

CF-P.5 SUN

Laser Beam Homogenization Technology and Its Application in High Speed Photography

•*X. Zhao, W. Wen, and L. Chang*; *Institute of Fluid Physics, China Academy of Engineering Physics, mianyang, China*

We proposed a method of laser beam homogenization based on diffractive optical components. Applications in experiments show that the homogenization system reduce the focal spot non-uniformity in high speed photography.

CF-P.6 SUN

Nonlinear Polarization Evolution Influence on Pump-induced Repetition Frequency Dynamics in Hybridly Mode-locked Erbium Fiber Laser

•*S. Leonov*[1] *and A. Krylov*[2]; [1]*Bauman Moscow State Technical University, Moscow, Russia*; [2]*Fiber Optics Research Center of the RAS, Moscow, Russia*

We have shown for the first time a decisive contribution from Nonlinear Polarization Evolution mechanism to pump-induced repetition frequency response dynamics via frequency dependent loss term in stretched-pulse Erbium-doped all-fiber ring oscillator with distributed polarizer

CF-P.7 SUN

Direct observation of intracavity pulse dynamics in all-normal dispersion all-fiber oscillator

•*J. Szczepanek*[1], *T.M. Kardas*[2,3], *C. Radzewicz*[1], *and Y. Stepanenko*[2,3]; [1]*Faculty of Physics, University of Warsaw, Pasteura 5, 02-093, Warsaw, Poland*; [2]*Fluence Sp. z o.o., Kasprzaka 44/52, 01-224, Warsaw, Poland*; [3]*Institute of Physical Chemistry Polish Academy of Sciences, Kasprzaka 44/52, 01-224, Warsaw, Poland*

We present the experimental study of ultrashort pulse dynamics inside the all-PM-fiber all-normal dispersion laser cavity using dispersive Fourier transform technique. The destabilization of pulse spectrum due to the stimulated Raman scattering process was investigated.

CF-P.8 SUN

Generation of identical femtosecond pulses with adjustable carrier-envelope phase

N. Golovin[1], *N. Dmitrieva*[1], *E. Gorohov*[1], *and* •*A. Dmitriev*[1,2]; [1]*Novosibirsk state technical university, Novosibirsk, Russia*; [2]*Institute of laser physics of SB RAS, Novosibirsk, Russia*

The method is proposed for creating femtosecond radiation without frequency comb offset when generating a synthesized pulse train with an adjustable carrier-envelope phase

CF-P.9 SUN

Passively mode-locked depressed-cladding waveguide laser in Yb fluorozirconate glass

•*F. Piantedosi, G.Y. Chen, T.M. Monro, and D.G. Lancaster*; *Laser Physics & Photonic Devices Laboratories, University of South Australia, Mawson Lakes, Australia*

We report the first continuous-wave passively mode-locked Yb:glass ultrafast laser inscribed depressed-cladding waveguide laser. It operates with a pulse width of 6.43 ps and a repetition rate of 272.5 MHz at λ = 1021 nm.

CF-P.10 SUN

Output characteristics of terawatt picosecond CO2 laser systems

A. Pezh and •*H. Saghafifar*; *Malek-Ashtar University of Technology, Isfahan, Iran*

The key parameters for design of advanced terawatt picosecond CO2 laser systems are discussed and the optimization process were explored by numerical modeling.

CF-P.11 SUN

Interferometric Autocorrelation Measurements of Supercontinuum by Two-Photon Absorption in a GaP photodetector

•*S. Toenger*[1], *R. Mäkitalo*[1], *J. Ahvenjärvi*[1], *P. Ryczkowski*[1], *M. Närhi*[1], *J.M. Dudley*[2], *and G. Genty*[1]; [1]*Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland*; [2]*Institut FEMTO-ST, UMR 6174 CNRS-Université Bourgogne Franche-Comté, Besançon, France*

Interferometric autocorrelation measurement of a broadband supercontinuum light is performed using a GaP photodetector based on two-photon absorption. The measured trace gives information of the second-order coherence properties, the average envelope and sub-pulses duration.

CF-P.12 SUN

Light bullets from chirped high-power femtosecond pulses under normal GVD for mid-IR optical parametric amplification

•*E. Smetanina*[1], *E. Migal*[3], *I. Thiele*[2], *and F. Potemkin*[3]; [1]*Department of Physics, University of Gothenburg, SE-412 96 Gothenburg, Sweden*; [2]*Department of Physics, Chalmers University of Technology, SE-412 96 Gothenburg, Sweden*; [3]*Faculty of Physics and International Laser Center, M. V. Lomonosov Moscow State University, 119991 Moscow, Russia*

We perform an extensive parametric analysis of supercontinuum generation in various dielectric materials and present a generation regime of the supercontimuum red wing that is highly appropriate as a seed for optical parametric amplifiers.

CF-P.13 SUN

Megawatt peak-power femtosecond ultralong ring fibre laser with InN SESAM

•*F. Gallazzi*[1], *M. Jimenez-Rodriguez*[2], *E. Monroy*[3], *P. Corredera*[1], *M. González-Herráez*[2], *F.B. Naranjo*[2], *and J.D. Ania Castañón*[1]; [1]*Instituto de Óptica Daza de Valdés, IO-CSIC, Madrid, Spain*; [2]*Photonics Engineering Group, Electronics Dept (EPS), Universidad de Alcalá, Alcalá de Henares, Spain*; [3]*University Grenoble-Alpes, CEA-INAC-PHELICS, Grenoble, France*

We experimentally demonstrate fundamental mode-locked fibre lasing at 1.56μm in a 2.37km ring cavity with InN SESAM, with peak powers over 1MW, over 200 nJ pulse energy and pulse durations below 250fs.

CF-P.14 SUN

Ultrafast mid-IR Dysprosium fluoride fiber laser

•*Y. Wang*[1,2], *F. Jobin*[3], *S. Duval*[3,4], *V. Fortin*[3], *P. Laporta*[1,2], *M. Bernier*[3], *G. Galzerano*[2,1], *and R. Vallée*[3]; [1]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Istituto di Fotonica e Nanotecnologie - CNR, Milano, Italy*; [3]*Centre d'optique, photonique et laser (COPL), Université Laval, Québec, Canada*; [4]*Femtum inc., Québec, Canada*

We present a passively mode-locked Dy^{3+}-doped fluoride fiber laser emitting around 3.1 μm based on nonlinear polarization evolution (NPE) technique in a ring configuration, using in-band pumping at 2.8 μm, able to produce sub-picosecond (ps) pulses.

CF-P.15 SUN

Quantum-Efficiency and Bandwidth Optimized Electro-Optic Sampling

•*C. Hofer*[1,2], *S.A. Hussain*[2], *W. Schweinberger*[2,3], *M. Huber*[2], *T.P. Butler*[1], *D. Gerz*[1,2], *N. Karpowicz*[1], *F. Krausz*[1,2], *and I. Pupeza*[1,2]; [1]*Max Planck Insitute of Quantum Optics, Garching, Germany*; [2]*Ludwig-Maximlians-University Munich, Faculty of Physics, Garching, Germany*; [3]*King Saud University, Department of Physics and Astronomy, Riyadh, Saudi Arabia*

We discuss the bandwidth-efficiency tradeoff in electro-optic-sampling-based detection of mid-infrared waveforms. With high-power, 1-μm gating pulses we demonstrate record photon detection efficiencies, and predict a further improvement of this trade-off for 2-μm gating pulses.

CF-P.16 SUN

Controlling the spatio-temporal distribution of ultrashort pulses near focus by means of diffractive focusing and pulse shaping

Í.J. Sola[1], *J. Pérez-Vizcaíno*[2], *G. Mínguez-Vega*[2], •*C. Hernández-García*[1], *and B. Alonso*[1,3]; [1]*University of Salamanca, Salamanca, Spain*; [2]*Universitat Jaume I, Castellón, Spain*; [3]*Sphere Ultrafast Photonics, Porto, Portugal*

Complex spatio-temporal irradiance patterns of ultrafast pulses near focus have been created and controlled by the combined effect of diffractive focusing and pulse shaping. Experimental and theoretical results are in agreement, explaining the symmetries arising.

CF-P.17 SUN

Development of high-efficiency beam converter for ultrafast spatio-temporal control of light waves

•*K. Yamane*[1], *K. Iwasa*[1], *R. Sasaki*[1], *K. Oka*[2], *Y. Toda*[1], *and R. Morita*[1]; [1]*Hokkaido University, Sapporo, Japan*; [2]*Hirosaki University, Hirosaki, Japan*

We developed the high-efficiency beam converter for ultrafast spatio-temporal control of light waves and succeeded in controlling the light waves both in the azimuth and radial directions in the ultrafast regime.

CF-P.18 SUN

Monolithic and In-line Method for the Measurement of Time-dependent Polarization of Ultrashort Pulses

B. Alonso[1,2], •*C. Hernández-García*[2], *and Í.J. Sola*[2]; [1]*Sphere Ultrafast Photonics, S.A., Porto, Portugal*; [2]*Grupo de Aplicaciones del Láser y Fotónica (ALF), University of Salamanca, Salamanca, Spain*

We show theoretically and experimentally the performance of a compact and robust in-line method to characterize ultrashort laser pulses exhibiting time-dependent polarization presenting high stability and precision thanks to its monolithic configuration.

CF-P.19 SUN

Octave-spanning high-repetition-rate mid-IR supercontinuum for frequency comb synthesis

•*Y. Wang*[1,2], *S.O. Leonov*[3], *V.S. Shiryaev*[4], *G.E. Snopatin*[4], *B.S. Stepanov*[4], *V.G. Plotnichenko*[5], *V.E. Karasik*[3], *E. Vicentini*[1,2], *A. Gambetta*[1,2], *N. Coluccelli*[1,2], *C. Svelto*[6], *P. Laporta*[1,2], *and G. Galzerano*[1,2]; [1]*Istituto di Fotonica e Nanotecnologie - CNR, Milano, Italy*; [2]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [3]*Bauman Moscow State Technical University, Moscow, Russia*; [4]*G.G. Devyatykh Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [5]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [6]*Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Milano, Italy*

We report SC generation in tapered suspended-core As_2Se_3 photonics crystal fiber pumped by a few-optical-cycle Cr:ZnSe ultrafast laser at 2.4 μm. The generated SC covers the spectral region from 1.4 to 4.2 μm.

CF-P.20 SUN

Novel InN-based SESAMs with ultra-short time response

•*L. Monroy*[1], *E. Monroy*[2], *M. González-Herráez*[1], *and F.B. Naranjo*[1]; [1]*University of Alcalá, Madrid, Spain*; [2]*University Grenoble-Alpes, Grenoble, France*

This work focuses on the optimization of InN-based SESAMs characterized by a 800% of nonlinear change in transmission, and the creation of pulses with 30 mW of average power and temporal durations of 150 fs

CF-P.21 SUN

Wide and continuous tunable mode-locked Erbium-doped fiber laser based on the graphene oxide

•*Z.-Y. Li, L.-Y. Tsai, J.-J. Wu, S.-Y. Tsay, Y.-H. Chen, and J.-H. Lin*; *Department of Electro-Optical Engineering, National Taipei University of Technology, Taipei, Taiwan*

Based on the graphene/PVA film and nonlinear polarization technique, we investigated the wide and continuous tuning of the wavelength from mode-locked pulses from the Erbium-doped fiber laser that reveled relatively stable operation state.

CF-P.22 SUN

Carrier to Envelope Phase (CEP) Stable, 2.37μm, Ultrashort Pulses from a Hybrid Parametric – Laser Amplifier

P. Komm[1], *U. Sheintop*[1,2], *S. Noach*[2], *and* •*G. Marcus*[1]; [1]*Hebrew University, Jerusalem, Israel*; [2]*Jerusalem College of Technology, Jerusalem, Israel*

Combination of parametric generator and Cr:ZnSe laser amplifier resulted 30 uJ , 72fs pulses, at λcentral ≈ 2375nm. The CEP stability of the parametrically generated seed stands firm through 6 orders of magnitude of amplification. .

CF-P.23 SUN

Supercontinuum generation in As_2S_3-silica nanospike waveguide pumped by Tm-doped fiber laser

A. Donodin[1], *S. Xie*[2], •*V. Voropaev*[1], *A. Voronets*[1], *D. Vlasov*[1], *V. Lazarev*[1], *M. Tarabrin*[1,3], *J. Troles*[4], *P.S.J. Russell*[2], *and V. Karasik*[1]; [1]*Bauman Moscow State Technical University, Moscow, Russia*; [2]*Max Planck Institute for the Science of Ligh, Erlangen, Germany*; [3]*P. N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia*; [4]*Université de Rennes I, Sciences Chimiques de Rennes, Rennes, France*

We report the first results of spectral broadening in As_2S_3-silica nanospike waveguide pumped in different multi-pulse regimes by a high-power femtosecond Tm-doped fiber laser. Results show that soliton-like regimes are preferable for supercontinuum generation.

CF-P.24 SUN

Frequency-Tunable Two-Colour Ultrafast Fiber Laser for Nonlinear Microscopy in the Fingerprint Regime Emitting at Central Frequencies 780 nm and 810 nm to 950 nm

•*K.J. Birkmeier*[1,2], *A. Brodschelm*[1], *and A. Hartschuh*[2]; [1]*TOPTICA Photonics AG, Graefelfing, Germany*; [2]*Ludwig-Maximilians-Universitaet Munich, Munich, Germany*

We present a pulsed two-arm fiber laser emitting in the near infrared. The central frequency of one arm is tunable over a broad range allowing difference frequencies between 500 cm^{-1} and 2000 cm^{-1}.

CF-P.25 SUN

Double-Pass Amplification of Picosecond Pulses with a Tapered Quantum-Dot Semiconductor Amplifier

•*A.F. Forrest*[1,2], *M. Krakowski*[3], *P. Bardella*[4], *and M.A. Cataluna*[1,2]; [1]*Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Previously also with the School of Science and Engineering, University of Dundee, Dundee, United Kingdom*; [3]*III V Lab, Palaiseau, France*; [4]*Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Turin, Italy*

Double-pass amplification of picosecond pulses is shown for the first time, with up to 7dB gain enhancement compared to single-pass, as demonstrated with 5GHz, 2.2ps pulses (1258nm), generated by a mode-locked quantum-dot laser diode seed.

CF-P.26 SUN

4-nJ Erbium all-fiber hybrid highly chirped dissipative soliton oscillator

•*I. Zhdanov*[1,2], *D. Kharenko*[1,2], *A. Bednyakova*[2,3], *M. Fedoruk*[2,3], *S. Turitsyn*[2,4], *and S. Babin*[1,2]; [1]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Institute of Computational Technologies SB RAS, Novosibirsk, Russia*; [4]*Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

We perform a next step in dissipative soliton generation in an all-fiber Erbium oscillator. More than 3 times energy increasing up to 4 nJ has been achieved by lengthening the cavity with PM Raman fiber.

CF-P.27 SUN

Radially and azimuthally polarized few-cycle pulses by post-compression in a multipass cell

•*H. Cao, R.S. Nagymihaly, V. Chvykov, N. Khodakovskiy, K. Osvay, and M. Kalashnikov*; *ELI-ALPS, ELI-HU Non-Profit Ltd., Szeged, Hungary*

Feasibility of the post compression of radially and azimuthally polarized ultrashort pulses in a multipass cell to few-cycle duration in the NIR is shown. Spatio-spectral homogeneity was thoroughly investigated for solid-state and gaseous nonlinear media.

CF-P.28 SUN

All-Fiber Mode-Locked Thulium Doped Fiber Laser Using a Novel Femtosecond Laser Inscribed 45°-Tilted Fiber Grating

A. Theodosiou[1], *J. Aubrecht*[2], •*N. Kanagaraj*[2], *P. Peterka*[2], *K. Kalli*[1], *I. Kašík*[2], *and P. Honzatko*[2]; [1]*Photonics and Optical Sensors Research Laboratory, Cyprus University of Technology, Saripolou, Cyprus*; [2]*Institute of Photonics and Electronics of the CAS, Prague, Czech Republic*

Passively mode-locked fiber laser based on the novel 45°-tilted fiber grating inscribed by femtosecond laser is demonstrated. A stable 862fs soliton-like pulse at 1870nm is reported, confirming the capability of the grating for stable laser operation.

CF-P.29 SUN

Plasma profile along a hollow-core photonic crystal fibre measured with counter-propagating probe solitons

•*F. Tani, M. I. Suresh, J. R. Koehler, and P. St.J. Russell*; *Max Planck Institute for the Science of Light, Erlangen, Germany*

The free electron density distribution along gas-filled photonic crystal fibre, created by a self-compressed soliton that ionises the gas, is studied via the frequency shift of the dispersive wave emitted by a counter-propagating probe soliton.

CF-P.30 SUN

Ultra-broadband partially coherent accelerating beams

•*D. Mansour*[1,2] *and D. Papazoglou*[1,2]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas (FORTH), Heraklion, Greece*; [2]*Materials Science and Technology Department, University of Crete, Heraklion, Greece*

Using optical aberrations of reflecting systems as continuous phase-masks we generate ultra-broadband partially coherent accelerating beams of varying spatial coherence. Our approach opens new ways to generate accelerating wave-packets all over the electromagnetic spectrum.

CF-P.31 SUN

Numerical investigation of broadband OPCPA configurations for direct amplification of TW-level, two-cycle pulses

•*S. Tóth*[1], *T. Stanislauskas*[2], *I. Balciunas*[2], *R. Budriunas*[2], *G. Veitas*[2], *D. Gadonas*[2], *J. Csontos*[1], *Á. Börzsönyi*[1], *T. Somoskői*[1], *L. Tóth*[1], *and K. Osvay*[1]; [1]*ELI-ALPS, Szeged, Hungary*; [2]*Light Conversion Ltd., Vilnius, Lithuania*

In this work, broadband NOPCPA schemes were numerically investigated which are capable to amplify two-cycle bandwidth with a single-color pump only. The examined amplifier configurations are implemented in the ELI-ALPS SYLOS laser system.

CF-P.32 SUN

Dual-comb spectroscopy using a single frequency-shifting loop

•*V. Durán*[1,2], *L. Djevarhidjian*[2], *and H. Guillet de Chatellus*[2]; [1]*GROC-UJI, Institute of New Imaging Technologies (INIT), Universitat Jaume I, 12071 Castellón , Spain*; [2]*Univ. Grenoble Alpes, CNRS, LIPhy, 38000 Grenoble, France*

We present a bidirectional frequency-shifting loop that generates two acousto-optic frequency combs with tunable line spacing. This system allows us to perform dual-comb measurements with integration times far beyond the millisecond without any stabilization mechanism.

CF-P.33 SUN

High Power, Ultrafast Yellow Laser using Fourth-harmonic Generation of Ultrafast Mid-IR Cr2+:ZnS Laser in MgO:PPLN Crystal

•*D. Yadav, A. Ghosh, R.K. Saripalli, and G.K. Samanta*; *Photonic Sciences Lab, Physical Research Laboratory, Thaltej , Ahmedabad, India*

We report on efficient generation of ultrafast tunable optical radiation in yellow wavelength range through two-stage, single-pass, frequency-doubling of Cr2+:ZnS laser with maximum average power of ~ 1 W at a conversion efficiency of 21%.

CF-P.34 SUN

Design of a 10 kHz, mJ-level mid-IR OPCPA system

•*S. Tóth*[1], *R.S. Nagymihály*[1], *R. Flender*[1], *B. Kiss*[1], *M. Kurucz*[1], *L. Haizer*[1], *E. Cormier*[2], *and K. Osvay*[1]; [1]*ELI-ALPS, ELI-HU Non-Profit Ltd., Szeged, Hungary*; [2]*CELIA, Université de Bordeaux-CNRS-CEA, Bordeaux, France*

In this work a 3D OPCPA modelling software and Comsol Multiphysics was used to simulate amplification and heat load in a mJ-level, ultrafast mid-IR laser system, driven by a 2 kW picosecond pump laser.

CF-P.35 SUN

Energy Scalable Self-Compression at 1 μm Wavelength in All-Bulk Multi-Pass Geometry

•*S. Gröbmeyer*[1], *K. Fritsch*[1], *B. Schneider*[1], *M. Poetzlberger*[2], *V. Pervak*[1], *J. Brons*[1], *and O. Pronin*[2]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We demonstrate self-compression with 300 fs input pulses in an all-bulk Herriott-type multi-pass cell yielding 31 fs at 142 MW peak power and 1030 nm central wavelength. The concept is scalable towards millijoule pulse energies.

CF-P.36 SUN

50 fs compression of UV laser using IC-HCPCF

•*M. Maurel*[1,2], *M. Chafer*[2], *F. Amrani*[1], *B. Debord*[1,2], *C. Honninger*[3], *F. Gérôme*[1,2], *E. Mottay*[3], *and F. Benabid*[1,2]; [1]*GPPMM group, Xlim laboratory, Limoges, France*; [2]*GLOphotonics, Limoges, France*; [3]*Amplitude Systèmes, Pessac, France*

We report on self-phase-modulation spectral-broadening and compression to 50 fs of 250 fs and μJ energy-scale UV laser-pulses at 343 nm using gas-filled Inhibited-Coupling hollow-core photonic crystal fiber.

CF-P.37 SUN

Femtosecond Pulse Shortening Using Cascaded Quadratic Nonlinearities for High Temporal Contrast

•*V. Aleksandrov, G. Bleotu, and D. Ursescu*; *Extreme Light Infrastructure - Nuclear Physics, Bucharest - Magurele, Romania*

Using numerical simulations, we compare two femtosecond pulse shortening techniques based on: third order and second order nonlinearity. The latter one allows reaching higher temporal contrast, crucial for experiments with high peak power lasers.

CF-P.38 SUN

CEP-Stabilized, sub-18 fs, 10 kHz and TW-Class 1 kHz Dual Output Ti: Sa Laser with Wavelength Tunability Option

•*X. Chen*[1], *A. Golinelli*[1,2], *B. Bussiere*[1], *E. Gontier*[1], *P.-M. Paul*[3], *O. Tcherbakoff*[2], *P. d'Oliveira*[2], *and J.-F. Hergott*[2]; [1]*Amplitude laser group, Lisses operations, Evry, France*; [2]*LIDYL, CEA, CNRS, Université Paris-Saclay, UMR 9222 CEA-SACLAY, Gif-sur-Yvette, France*; [3]*Amplitude laser group, San Jose operations, San Jose, USA*

We present here a Ti: Sa based 10kHz/1 kHz hybrid laser system delivering 17.8 fs, 0.9 TW 1kHz pulses with 350 mrad shot to shot CEP noise, with wavelength tunability function.

CF-P.39 SUN

Octave spanning flat-plateau white-light generation in multi-thin plates by utilizing self-steepening and induced phase modulation

•*S. Fang*[1], *Y. Su*[1], *J. Jiang*[1], *H. Liu*[1], *and Z. Wei*[1,2]; [1]*Institute of Physics, Chinese Academy of Sciences, Beijing, China*; [2]*University of Chinese Academy of Sciences, Beijing, China*

We generate 0.7-mJ pulses spanning the range from 380 to 910 nm (corresponding to 1.5-fs, transform-limited pulses) featuring a flat plateau spanning approximately from 430 to 670 nm with a flatness of 5%.

CF-P.40 SUN

High-fidelity few-cycle laser pulses generated via nonlinear ellipse rotation

•*N. Khodakovskiy*[1,2], *M. Kalashnikov*[1,2], *B. Mercier*[3], *V. Pajer*[1], *Z. Cheng*[3], *M. Lozano*[3], *A. Blumenstein*[4,5], *P. Simon*[5], *T. Nagy*[2], *and R. Lopez-Martens*[3]; [1]*ELI-ALPS, Szeged, Hungary*; [2]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [3]*Laboratoire d'Optique Appliquée, ENSTA-Paristech, Ecole Polytechnique, Palaiseau, France*; [4]*Laser-Laboratorium Göttingen e.V., Göttingen, Germany*; [5]*University of Kassel, Kassel, Germany*

We show that nonlinear ellipse rotation driven by 30 fs pulses in a hollow fiber operated with a pressure gradient can be used to efficiently generate few-cycle pulses with more than 10^3 temporal contrast enhancement.

CF-P.41 SUN

Studying the Role of Nonlinear Medium Thickness in the Characterization of 1.5-Cycle Pulses Using XPW Dispersion Scan

•*A. Tajalli*[1,2], *M. Ouillé*[3], *A. Vernier*[3], *F. Böhle*[3], *E. Escoto*[4], *S. Kleinert*[1,2], *R. Romero*[5], *J. Csontos*[6], *U. Morgner*[1,2,7,8], *G. Steinmeyer*[4], *H. Crespo*[5,9], *R. Lopez-Martens*[3], *and T. Nagy*[4]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation AcrossDisciplines), Hannover, Germany*; [3]*Laboratoire d'Optique Appliquée, ENSTA-Paristech, Ecole Polytechnique, CNRS, Université Paris-Saclay, Palaiseau, France*; [4]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [5]*Sphere Ultrafast Photonics, Porto, Portugal*; [6]*ELI-HU Non-Profit Ltd., Szeged, Hungary*; [7]*Laser Zentrum Hannover e.V., Hannover, Germany*; [8]*Hannoversches Zentrum für Optische Technologien, Leibniz Universiät Hannover, Hannover, Germany*; [9]*IFIMUP-IN and Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, Porto, Portugal*

We study the influence of dispersion and self-phase modulation in the nonlinear material used in cross-polarized wave generation dispersion scan on the characterization of 1.5-cycle pulses.

CF-P.42 SUN

Femtosecond Laser-Based Measurement of Relativistic Electron Bunch Shapes in Accelerators

•*C. Szwaj*[1], *E. Roussel*[1], *C. Evain*[1], *M. Le Parquier*[1], *S. Bielawski*[1], *M.-A. Tordeux*[2], *M. Labat*[2], *J.-B. Brubach*[2], *L. Manceron*[2], *P. Roy*[2], *M. Caselle*[3], *M. Patil*[3], *L. Rota*[3], *G. Niehues*[3], *S. Funkner*[3], *M. Nasse*[3], *E. Brundermann*[3], *and A.-S. Muller*[3]; [1]*Univ. Lille, CNRS, UMR 8523 - PhLAM, Lille, France*; [2]*Synchrotron SOLEIL, Gif-Sur-Yvette, France*; [3]*Karlsruhe Institute of Technology - KIT, Karlsruhe, Germany*

We present ultrafast laser-based measurement strategies that enable to record relativistic electron bunch shapes and their complex evolutions in accelerators, at ultra-high repetition rates, in real-time and single shot.

CF-P.43 SUN

Towards Ultrafast All-Fiber Laser at 2.8 μm Based on a SESAM and a Fiber Bragg Grating

•*P. Paradis, S. Duval, V. Fortin, R. Vallée, and M. Bernier*; *Centre d'optique, photonique et laser (COPL), Québec, Canada*

We present a 2.8 μm mode-locked fiber laser based on a SESAM and a fiber Bragg grating that generates 15 ps pulses. This brings ultrafast mid-infrared lasers closer to an all-fiber design for field applications.

CF-P.44 SUN

High-power Short-wavelength Infrared Supercontinuum Generation in a Multimode Fluoride Fiber

•*Z. Eslami, P. Ryczkowski, C. Amiot, L. Salmela, and G. Genty*; *Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland*

We demonstrate the generation of octave-spanning supercontinuum (SC) generation from 1100 nm to over 2500 nm with 600 mW average power in a short length of multimode fluoride fiber with 100 μm core diameter.

CF-P.45 SUN

Compact single-shot d-scan setup for the characterization of few-cycle laser pulses

•*I. Sytcevich, M. Louisy, C. Guo, L. Neoricic, S. Mikaelsson, J. Vogelsang, F. Langer, S. Zhong, A. L'Huillier, C. Arnold, and M. Miranda*; *Department of Physics, Lund University, Skåne, Sweden*

We report a compact and elegant single-shot implementation of ultrashort pulse characterization via the dispersion scan technique. We compare our results with a common (scanning) d-scan and find good agreement.

CF-P.46 SUN

Soliton Raman self-frequency shifting of high-power 1 μm, μJ-level femtosecond pulses at multi-megahertz repetition rate

•*K. Fritsch*[1], *S. Gröbmeyer*[1], *M. Poetzlberger*[2], *K.F. Mak*[2], *F. Krausz*[1,2], *J. Brons*[1], *and O. Pronin*[2]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We present experimental results and numerical verification of soliton Raman self-frequency shifting in an all bulk-based, nonlinear multi-pass system driven by a nonlinearly compressed 15 fs, 2.5 μJ and 70 W Yb:YAG thin-disk laser oscillator.

CF-P.47 SUN

The contribution has been withdrawn.

CF-P.48 SUN

Evaluation of the Coherent Artifact in Ultrashort Laser Pulses using D-scan and its Application to Broadband Fiber Lasers

•*B. Alonso*[1], *S. Torres-Peiró*[2], *R. Romero*[1], *P.T. Guerreiro*[1], *H. Muñoz-Marco*[2], *P. Pérez-Millán*[2], *and H. Crespo*[3]; [1]*Sphere Ultrafast Photonics, S.A., Porto, Portugal*; [2]*FYLA LASER SL, Paterna (Valencia), Spain*; [3]*Universidade do Porto, Porto, Portugal*

We study the coherent artifact by adding different random phases to the simulated pulse train, finding that the self-calibrating d-scan is sensitive and can quantify the source decoherence, with experimental validation in a fiber laser.

CF-P.49 SUN

Sub-20 fs-duration ultra-short pulse train generation using transient SRS in H2-filled Inhibited Coupling Kagome fiber

•*D. Kergoustin, F. Amrani, B. Debord, F. Gérôme, and F. Benabid*; *GPPMM group - Xlim research institute UMR CNRS 7252, Limoges, France*

We present the generation of 57 fs-period pulse train using rotational stimulated Raman scattering in transient regime, by pumping a hydrogen-filled Kagome HC-PCF with 1 micron ultra-short and powerful pulses.

CF-P.50 SUN

Arbitrary splitting ratio coupler at single photon level with sub-nanosecond switching time

•*V. Švarc, M. Nováková, G. Mazin, and M. Ježek*; *University Palacky Olomouc, Olomouc, Czech Republic*

We report an ultra-fast photonic router with arbitrary tunable splitting ratio. We achieve the operation with extinction ratio exceeding 25dB and sub-nanosecond time jitter. We demonstrate qudit preparation and balanced time-multiplexed photon-number-resolving detector application.

CF-P.51 SUN

Extremely high resolution chirp measurements over an octave bandwidth with spectrally resolved interferometry

•*I. Seres*[1], *T. Somoskői*[1,2], *Á. Börzsönyi*[1,2], *Á. Sipos*[2,3], *and A. Kovács P.*[1,2]; [1]*ELI-ALPS, ELI-HU Nonprofit Ltd., Szeged, Hungary*; [2]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*; [3]*CE Optics Ltd., Szeged, Hungary*

We report on 0.03nm resolution GDD measurements of octave bandwidth positively chirped mirror pairs. A Michelson interferometer with supercontinuum source and optical spectrum analyzer provided accurate reconstruction of GDD curves based on Windowed Fourier Transform.

CF-P.52 SUN

Multioctave white light waveform synthseiser

•*E. Ridente*; *Max Planck Institute of Quantum Optics, München, Germany*

A multi-channel waveform synthesiser has been used to shape the output of a hollow core fiber. The synthesiser can support pulses down to 6.6 fs centred at 1.8 um.

CF-P.53 SUN

All PM-fiber thulium-doped mode-locked fiber laser and amplifier based on nonlinear loop mirror

•*M. Michalska, L. Gorajek, P. Grzes, and J. Swiderski*; *Institute of Optoelectronics, Military University of Technology, gen. W. Urbanowicza 2, 00-908 Warsaw, Poland*

We present an ultrafast thulium-doped all-PM-fiber laser with a NOLM operating at a wavelength of 1996.6 nm. The oscillator generates linearly polarized sub-picosecond solitons. The pulses were amplified in a single-stage thulium-doped fiber amplifier.

CF-P.54 SUN

Generation and Control of Ultrafast 10 μm Laser Pulses for Driving Chemical Dynamics

•*M.A. Jakob*[1,2], *M. Namboodiri*[1], *and T. Laarmann*[1,2]; [1]*Deutsches Elektronen-Synchrotron, Hamburg, Germany*; [2]*The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

We demonstrate pulse shaping via acousto-optic modulation at a tunable mid-infrared source between wavelengths of 8–15 μm. The optimised pulse shapes aim at modification of molecular wavepackets in the electronic ground state.

CF-P.55 SUN

Dependencies of picosecond pulse driven supercontinuum properties on repetition rate

•*L. Roškot*[1,2], *O. Novák*[1], *B. Csanaková*[1,2], *J. Mužík*[1,2], *M. Jelínek*[2], *M. Smrž*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics AS CR, Za Radnicí 828, 252 41, Dolní Břežany, Czech Republic*; [2]*Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Břehová 7, 115 19, Praha, Czech Republic*

Loosely focused ~2 ps, 1030 nm pulses are used for supercontinuum generation in a 13 cm long YAG crystal. Output properties, such as spectrum, beam size, and divergence are studied in dependence on the repetition rate.

CF-P.56 SUN

Development of figure-8 variable pulse width fiber laser using coherent resonator coupling technology

•*M. Miyazaki and M. Yoshida*; *3-4-1, Kowakae, Higashi-osaka, Osaka, Japan*

We have developed figure-8 variable pulse width fiber laser using coherent resonator coupling technology. We confirmed that the pulse width was expanded from 150 to 550 fs by providing a difference in coupling resonator length.

CF-P.57 SUN

Mid-Infrared Broadband Long-Pass Filter Based on Grating Diffraction

•*D. Gerz*[1,2], *W. Schweinberger*[1,3], *T.P. Butler*[2], *T. Siefke*[4,5], *M. Heusinger*[4], *T. Amotchkina*[1], *V. Pervak*[1], *U. Zeitner*[4,6], *and I. Pupeza*[1,2]; [1]*Ludwig Maximilians University Munich, Garching, Germany*; [2]*Max Planck Institute of Quantum Optics, Garching, Germany*; [3]*King Saud University, Department of Physics and Astronomy, Riyadh, Saudi Arabia*; [4]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [5]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [6]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present a power-scalable long-pass filter, based on a gold coated silicon grating, suited for chromatic-dispersion-free separation of a >4-μm mid-infrared beam from a collinear, high-power, broadband 2-μm beam. The optic is ideal for intrapulse-difference-frequency-generation experiments.

CF-P.58 SUN

Femtosecond Tm-Ho co-doped fiber laser using a CoSb3-skutterudite-based passive mode-locker

•*J. Lee, Y. Kim, and J.H. Lee*; *University of Seoul, Seoul, South Korea*

We experimentally demonstrate a femtosecond pulse fiber laser using a CoSb3-based passive mode-locker. Using the mode-locker, stable soliton pulses with a 838-fs temporal width could be obtained from a Tm-Ho co-doped fiber cavity.

CF-P.59 SUN

Experimental Demonstration of High-throughput Transmission Spectrum Measurement for Electro-absorption Modulator using the Time-stretch Method

•*H. Furukawa*[1], *T. Makino*[1], *X. Wang*[2], *T. Kobayashi*[2], *B. Jalali*[3], *D. Capewell*[4], *W. Man*[5], *K. Tsang*[5], *and N. Wada*[1]; [1]*National Institute of Information and Communications Technology, Koganei, Japan*; [2]*Optoquest, Ageo, Japan*; [3]*University of California, Los Angeles, USA*; [4]*Roguescope, Los Angeles, USA*; [5]*Amonics Ltd., Kowloon, Hong Kong*

We demonstrate high throughput measurement of the transmission spectrum of electro-absorption optical modulators with 11.7 ns refresh time and 50 pm spectral resolution based on time stretch dispersive Fourier Transform method for the first time.

CF-P.60 SUN

A pellicle coupled optical resonator

•*E. Fill*[1,2], *L. Voronina*[1,2], *N. Lilienfein*[2], *and I. Pupeza*[1,2]; [1]*Department of Physics, Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We demonstrate a new type of laser resonator in which the laser is coupled in through a pellicle. Changing the angle of incidence on the pellicle, the finesse of the cavity can be altered without replacing components.

CF-P.61 SUN

Discovering memory ability of relaxation oscillations in mode-locked lasers

•*X. Liu, Y. Zhang, and Y. Cui*; *State Key Laboratory of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang University, Hangzhou, China*

We measure the single-shot dynamics and evolution of pulses during rasied relaxation oscillations stage in a mode-locked laser, and experimentally discover the memory ability and competitive dynamics of relaxation oscillations.

CF-P.62 SUN

Carrier Envelope Phase Dependence of High harmonic Generation from Long Duration Multi-Cycle Multi-Timescale Pump Pulses

•*O. Neufeld*[1], *A. Fleischer*[2], *and O. Cohen*[1]; [1]*Physics Department and Solid State Institute, Technion - Israel Institute of Technology, Haifa, Israel*; [2]*Chemistry Department, Tel Aviv University, Tel Aviv, Israel*

We theoretically explore strong carrier envelope phase effects in high harmonic generation driven by long multi-cycle pulses (up to 200fs at central wavelength 800nm) that appear when the driving laser pulse exhibits multi-timescale behavior.

CF-P.63 SUN

Overcoming avalanche ionization to generate multi-octave supercontinuum pumped by a Ho:YLF regenerative amplifier

•*S. Cheng*[1,2], *G. Chatterjee*[1], *F. Tellkamp*[1], *A. Ruehl*[3,4], *and R.J.D. Miller*[1,5,6]; [1]*Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany*; [2]*Department of Physics, University of Hamburg, Hamburg, Germany*; [3]*Leibniz University Hannover, QUEST-Leibniz-Research School, Institute of Quantum Optics, Hannover, Germany*; [4]*Laser Znetrum Hannover e. V., Hannover, Germany*; [5]*Centre for Ultrafast Imaging(CUI), University of Hamburg, Hamburg, Germany*; [6]*Department of Chemistry and Physics, University of Toronto, Toronto, Canada*

We demonstrate supercontinuum generation ranging from 500 nm to 4.5 μm (to 1e-4) generated in YAG & ZnSe, driven by 3-ps pulses centered at 2.05 μm (from a Ho:YLF regenerative amplifier) by overcoming avalanche-ionization-induced damage.

13:00 – 14:00

CI-P: CI Poster session

CI-P.1 SUN

Pulse doublets generated by a frequency-shifting loop containing an electro-optic amplitude modulator

H. Yang[1,2], M. Brunel[1], •M. Vallet[1], H. Zhang[2], and C. Zhao[2]; [1]Univ Rennes, CNRS, Institut FOTON, Rennes, France; [2]Beijing Institute of Technology, Beijing, China

We demonstrate an original regime of picosecond pulse doublets at 1.5 μm in an all-fibered loop, where both the repetition rate and pulse interval are tunable. Experimental results agree well with a time-delayed interference model.

CI-P.2 SUN

Dynamic study of Talbot lasers

•V. Billault[1,2], V. Crozatier[1], G. Baili[1], D. Dolfi[1], and H. Guillet de Chatellus[2]; [1]Thales Research and Technology, Palaiseau, France; [2]Université Grenoble Alpes, CNRS, LIPhy, Grenoble, France

We developed a simple model based on rate equations to understand the dynamic response of Talbot lasers. Results are in good agreement with experiments in different conditions, without parameter adjustment.

CI-P.3 SUN

Channel spacing-switchable comb spectra for orthogonal input polarization states using polarization-diversified-loop

•S.-L. Lee[1], J. Kim[2], S. Choi[1], M.S. Kim[1], D.K. Kim[1], J.S. Han[2], and Y.W. Lee[1,2]; [1]Interdisciplinary Program of Biomedical, Mechanical & Electrical Engineering, Pukyong National University, Busan, South Korea; [2]School of Electrical Engineering, Pukyong National University, Busan, South Korea

We propose and demonstrate a polarization-diversified-loop based optical comb filter that offers switching operation between dual transmission spectra with different channel spacings by controlling orthogonal input polarization states without changing any configuration of the filter.

CI-P.4 SUN

Hybrid Integrated Silicon External Cavity Laser with Integrated Modulator for Optical Interconnects

•P.K. Singaravelu[1,2], S.M. Butler[1,2], A.P. Bakoz[1,2], A.A. Liles[3], G.C.R. Devarapu[1,2,3], R.N. Sheehan[1,2], S.P. Hegarty[1,2], and L.O. Faolin[1,2,3]; [1]Centre for Advanced Photonics and Process Analysis, Cork Institute of Technology, Cork, Ireland; [2]Tyndall national Institute , Cork, Ireland; [3]Scottish Universities Physics Alliance (SUPA), School of Physics and Astronomy, St andrews, United Kingdom

We demonstrate the possibility of the direct frequency modulation can convert into intensity modulation of a hybrid laser by tuning the PhC resonances using a p-n junction.

CI-P.5 SUN

Design of FBG-based Linear Passive All-optical NOT Gate

•S. Kaushal and J. Azana; INRS-EMT, Montreal, Canada

We propose a phase modulation apodization technique-based fibre Bragg grating design for the realization of narrow phase only filters aimed at implementation of passive all-optical NOT gates for high speed return to zero on-off keying data signals.

CI-P.6 SUN

Integrated InP-based Multichannel Transmitters for WDM-PON System

•A. Paśnikowska, S. Stopiński, and R. Piramidowicz; Warsaw University of Technology, Warsaw, Poland

We report transmitters for experimental WDM-PON system realized as InP-based photonic integrated circuits. Low threshold current, good SMSR, extinction ratio and open eye diagram prove the applicability of PICs to transmitters in access systems.

CI-P.7 SUN

MEMS-Based Tunable Single-Passband Microwave Photonic Filter

H.E. Kotb[1,2], M.S. Abdallah[2], H. Elhehyawy[2], Y.M. Sabry[3,4], and •H. Omran[2]; [1]Transmission Department, National Telecommunication Institute, Cairo , Egypt; [2]Laboratory of Micro Optics, Faculty of Information Engineering and Technology, German University in Cairo (GUC), New Cairo, Egypt; [3]Faculty of Engineering, Ain Shams University, Cairo, Egypt; [4]Optical MEMS Business Unit, Si-Ware System, Cairo, Egypt

We report a tunable compact size single passband microwave photonic filter having center frequency ranging from 1.64 to 2.32 GHz. An optical interferometer based on Microelectromechanical Systems is used to tune the filter center frequency.

CI-P.8 SUN

Inter-channel Interference in Non-linear Frequency-division Multiplexed Networks on Fibre Links with Lumped Amplification

•X. Yangzhang, D. Lavery, and P. Bayvel; University College London, London, United Kingdom

We estimate the inter-channel interference (ICI) in non-linear frequency-division multiplexed (NFDM) network. When the number of channels is larger than 25, ICI in NFDM networks is weaker than the ICI in the wavelength division multiplexed network.

CI-P.9 SUN

Generalized Spiral Transformations for Mapping Vortex Phase to Linear Phase

•Y. Wen[1], I. Chremmos[2], Y. Chen[1], Y. Zhang[1], and S. Yu[1,3]; [1]Sun Yat-sen University, Guangzhou, China; [2]Hellenic Electricity Distribution Network Operator S. A., Athens, Greece; [3]University of Bristol, Bristol, United Kingdom

A generalized spiral transformation is put forward for mapping the vortex phase of OAM modes to a linear phase of tilted plane waves, which can be used for OAM mode sorting and its performance optimization.

CI-P.10 SUN

Bi-directional Fiber-IVLLC Convergence with Parallel/Orthogonally Polarized Dual-Sideband Operation and Two RSOAs Scheme

•C.-W. Su[1], Z.-H. Wang[1], W.-S. Tsai[2], C.-Y. Li[3], and H.-H. Lu[1]; [1]National Taipei University of Technology, Taipei, Taiwan; [2]Ming Chi University of Technology, New Taipei City, Taiwan; [3]National Taipei University, New Taipei City, Taiwan

A bi-directional fiber-IVLLC convergence with parallel/orthogonally polarized dual-sideband operation and two RSOAs scheme is practically illustrated. Such offered bi-directional fiber-IVLLC convergence is a prominent one for affording high downstream transmission capacity with enhanced upstream performance.

CI-P.11 SUN

DFT-spread Hybrid OFDM-DFMA PONs Incorporating Directly Modulated DFB Laser-based ONUs

•Y. Dong, W. Jin, and J. Tang; Bangor University, Bangor, United Kingdom

DFT-spread hybrid OFDM-DFMA PONs incorporating low-cost direct modulated laser-based ONUs is, for the first time, proposed for 5G network convergence. Results show that ~3dB system power budget improvements are achievable due to DFT-induced PAPR reduction.

CI-P.12 SUN

Detector-free bidirectional symmetric communication scheme based on compound states of two mutually coupled diode lasers

M. Weidmann[1], •A. Herdt[1], R. Phelan[2], and W. Elsäßer[1]; [1]Technische Universität Darmstadt, Institut für Angewandte Physik, Darmstadt, Germany; [2]Eblana Photonics Ltd., Dublin, Ireland

We present a detector-free bidirectional symmetric communication scheme based on two coupled 1550nm diode lasers. Information is encoded into compound states of the coupled laser system and read out utilizing DC-voltage changes at both lasers.

CI-P.13 SUN

From 4.2Gbps Asymmetrical Clipping (ACO)-OFDM to 8.7Gbps Layered-ACO-FBMC with Intensity-Modulation Direct-Detection for PONs

•S. Sarmiento[1], J.A. Altabas[2], S. Spadaro[1], and J.A. Lazaro[1]; [1]Universitat Politècnica de Catalunya, Barcelona, Spain; [2]Aragon Institute of Engineering Research, University of Zaragoza, Zaragoza, Spain

ACO/LACO-FBMC/OFDM are experimentally assessed in terms of the sensitivity using a PIN-based receiver, and the spectral efficiency for optical IM/DD. Results show improvements from 4.2Gbps with ACO-OFDM, to 7.2Gbps(8.7Gbps) by LACO-OFDM(-FBMC) with just 2.6dB penalty.

CI-P.14 SUN

Improvement of resolution in orbital angular momentum decomposition based on beam duplication by using a Sagnac interferometer

•K. Yamane[1], Y. Watanabe[1], K. Oka[2], Y. Toda[1], and R. Morita[1]; [1]Hokkaido University, Sapporo, Japan; [2]Hirosaki University, Hirosaki, Japan

We developed new device to greatly improve the resolution in orbital angular momentum decomposition based on geometrical transformation by using beam duplication technique without spoiling the advantages of the low loss and reversibility.

CI-P.15 SUN

Non-Orthogonal Multiple Access based on Carrierless Amplitude Phase format for coherent PON flexible resource provisioning

•D. Izquierdo[1,2], J.A. Altabas[2,3], P. Millan[2], J. Clemente[2], J.A. Lazaro[4], S. Rommel[5], R. Puerta[6,7], J.J. Vegas Olmos[8], I. Tafur Monroy[5], and I. Garces[2]; [1]Centro Universitario de la Defensa, Zaragoza, Spain; [2]Universidad de Zaragoza, Zaragoza, Spain; [3]Bifrost Communications, Lyngby, Denmark; [4]Universitat Politècnica de Catalunya, Barcelona, Spain; [5]Eindhoven University of Technology, Eidnhoven, Netherlands; [6]Ericsson AB, Stockholm, Sweden; [7]Pontificia Universidad Javeriana, Bogotá, Colombia; [8]Mellanox Technologies, Roskilde, Denmark

Non-Orthogonal Multiple Access based on Carrierless Amplitude Phase (CAP) format has been used to flexible resource provisioning in a pay-as-you-grow Passive Optical Network (PON) architecture with 10Gbps aggregate data rate using coherent detection.

CI-P.16 SUN

Low Noise Optical Buffering Based on Non-degenerate Phase Sensitive Parametric Amplification

•A. Bogris; University of West Attica, Athens, Greece

An optical buffer exploiting phase sensitive amplification

based non-degenerate four-wave mixing is theoretically analyzed. The proposed buffer offers a noise figure advantage which scales from 3dB to 6 dB compared to typical optical buffers

CI-P.17 SUN

Phase dislocations in the negative curvature hollow core fibres

•*A. Pryamikov*[1], *G. Alagashev*[1], *and S. Turitsyn*[2]; [1]*Fiber Optics Research Center of RAS, Moscow, Russia*; [2]*Aston Institute of Photonics Technologies, Birmingham, United Kingdom*

We demonstrate formation of phase dislocations and optical vortices for the fundamental air core mode in the negative curvature hollow core fibres (NCHCFs). Study of this phenomenon is important for deeper understanding of light guiding mechanism in NCHCFs.

13:00 – 14:00

CJ-P: CJ Poster session

CJ-P.1 SUN

Realization and numerical simulation of a high power and high efficiency Holmium doped fiber laser at 2.1 μm

•*J. Le Gouët*[1], *F. Gustave*[1], *P. Bourdon*[1], *A. Laurent*[2], *T. Robin*[2], *and B. Cadier*[2]; [1]*ONERA, Palaiseau, France*; [2]*iXblue, Lannion, France*

We present the first results of a fiber laser, based on a holmium-doped triple-clad fiber with high purity silica. The numerical simulation shows very good agreement with the experimental results.

CJ-P.2 SUN

Kerr optical frequency combs generated around 2-μm in a dual–pumped Brillouin fiber ring resonator

•*M. Deroh*[1,2], *G. Xu*[2], *H. Maillotte*[1], *T. Sylvestre*[1], *J.-C. Beugnot*[1], *and B. Kibler*[2]; [1]*Institut FEMTO-ST, UMR 6174 CNRS, Université Bourgogne Franche-Comté, Besançon, France*; [2]*Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS, Université Bourgogne Franche-Comté, Dijon, France*

We report the generation of Kerr optical frequency combs in the 2-μm region using a dual-wavelength pumped Brillouin fiber ring laser. Both frequency spacing and center wavelength are tunable.

CJ-P.3 SUN

Time- and spectral-domain dynamics of 2-μm pulses in the holmium-doped fiber amplifier

•*V. Kamynin*[1], *S. Filatova*[1], *I. Zhluktova*[1], *and V. Tsvetkov*[1,2]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*National Research Nuclear University 'MEPhi', Moscow, Russia*

Time and spectral dynamics of 2-μm ultrashort pulses in HoDFA were investigated. Pulses width reduction to 116 fs was observed. Spectral broadening up to 2400 nm was achieved at the output power of 800 mW.

CJ-P.4 SUN

High energy dissipative soliton resonance in a thulium-doped fiber laser at 1750 nm

C. Li, •*C. Kong, and K.K.Y. Wong*; *Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong SAR, China*

We demonstrate high energy dissipative soliton resonance in a mode-locked thulium-doped fiber laser at 1750 nm. A maximum single pulse energy of 321.2 nJ is achieved with a fundamental repetition rate of 782 kHz.

CJ-P.5 SUN

A tandem-pumped, tunable thulium-doped fiber laser in the 2.1 μm wavelength region

F. Liu[1], •*P. Liu*[2], *X. Feng*[3], *and Z. Zhang*[4]; [1]*Huazhong University of Science and Technology, Wuhan, China*; [2]*Huazhong University of Science and Technology, Wuhan, China*; [3]*Huazhong University of Science and Technology, Wuhan, China*; [4]*Huazhong University of Science and Technology, Wuhan, China*

We present a continuously-tunable thulium (Tm)-doped fiber laser (TDFL) with a wavelength-tuning range over 2000-2172 nm, which is tandem-pumped by another TDFL at 1908 nm located at the long-wavelength absorption tail of the Tm fiber.

CJ-P.6 SUN

Comparison of different mode-locking methods in the Ho-doped fiber laser

•*S.A. Filatova*[1], *V.A. Kamynin*[1], *N.R. Arutyunyan*[1,2], *A.S. Pozharov*[1], *E.D. Obraztsova*[1,3], *and V.B. Tsvetkov*[1,2]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*National Research Nuclear University 'MEPhi', Moscow, Russia*; [3]*Moscow Institute of Physics and Technology (State University), Dolgoprudny, Russia*

We demonstrate a comparison of different mode-locking methods in an all-fiber Holmium laser and analyze the parameters of obtained pulsed radiation. We have compared such methods as NPE and two hybrid regimes: NPE+single walled CNTs, NPE+graphene.

CJ-P.7 SUN

All-fiber 2.07 μm distributed feedback laser based on π-phase-shifted FBG inscribed in heavily doped holmium fiber by femtosecond laser pulses

•*A. Wolf*[1,2], *M. Skvortsov*[1,2], *S. Abdullina*[1], *V. Kamynin*[3], *I. Zhluktova*[3], *A. Dostovalov*[1,2], *V. Tsvetkov*[3,4], *and S. Babin*[1,2]; [1]*Institute of Automation and Electrometry of the SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [4]*National Research Nuclear University MEPhI, Moscow, Russia*

We report on the creation of holmium-doped distributed-feedback fiber laser with a wavelength of 2.07 μm and output power up to 36 mW operating in single-frequency regime.

CJ-P.8 SUN

Efficient Pump Absorption in Twisted Double Clad Thulium-Doped Fibers Drawn of CO2 Laser Shaped Preform

•*A.A. Jasim*[1], *J. Aubrech*[1], *P. Peterka*[1], *M. Kamrádek*[1,2], *O. Podrazký*[1], *F. Todorov*[1], *I. Kašík* [1], *and P. Honzátko*[1]; [1]*Institute of Photonics and Electronics CAS, v.v.i, Chaberská 57, 18251 Prague, Czech Republic*; [2]*Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Břehová 7, 115 19 Prague, Czech Republic*

Absorption in double-clad Thulium fiber with different spun-rates was investigated for the first time. The 10-dB peak absorption of 1.5-m length octagonal untwisted fiber was increased by at least 6 dB in the twisted case.

CJ-P.9 SUN

Raman soliton generation in Holmium all- fiber MOPA

•*N. Tolstik*[1,2] *and I.T. Sorokina*[1,2]; [1]*Department of Physics, NTNU - Norwegian University of Science and Technology, Trondheim, Norway*; [2]*Atla Lasers AS, Trondheim, Norway*

We report for the first time to our knowledge the Raman soliton generation in all-fiber all-single-mode diode-pumped holmium MOPA. Solitons initially generated at 2090 nm reach 2250 nm due to self-frequency shift.

CJ-P.10 SUN

All-fiber system at 1750nm delivering 35fs 230kW peak power pulses

•*G. Granger*[1], *H. Delahaye*[1], *D. Franz*[2], *W. Boutu*[2], *H. Merdji*[2], *and S. Février*[1]; [1]*Xlim Research Institut, Limoges, France*; [2]*CEA LIDYL, Paris, France*

We report on a fully fusion-spliced fiber source of 35 fs pulses based on solitonic effects. The source delivers pulses with 230 kW peak power at 1750 nm.

CJ-P.11 SUN

Passive Q-switch and Rectangular Mode-locked Pulses from a Dumbbell Shaped Holmium Fiber Laser

D. Majumder, S. Das Chowdhury, M. Pal, A. Dhar, and •*A. Pal*; *CSIR-Central Glass and Ceramic Research Institute, Kolkata, India*

Here using a dumbbell shaped cavity architecture, passive Q-switch pulses of micro-second duration and rectangular shaped passive mode-locked pulses of nanosecond duration has been demonstrated from a holmium fiber laser at 2.04 μm.

CJ-P.12 SUN

1975 nm Linearly-Polarized MOFA CPA System based on CFBG Stretcher and 1+3-Pass CVBG Compressor Configuration

•*E. Lee*[1,2], *B. Sun*[1], *J. Luo*[1,2], *X. Yu*[1], *D. Yong*[1], *and Q. Wang*[2]; [1]*Precision Measurements Group, Singapore Institute of Manufacturing Tehcnology, Singapore, Singapore*; [2]*School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore, Singapore*

A 4.2ps, 50μJ, linearly-polarized 1975nm master oscillator fiber amplifier laser system using chirped pulse amplification technique at 100kHz repetition rate was demonstrated using chirped fiber Bragg gratings and 1+3-pass chirped volume Bragg grating compressor configuration.

CJ-P.13 SUN

1 uJ pulse energy all-fiber thulium doped mode-locked MOPA system

•*R.A. Richter*[1], *N. Tolstik*[1,2], *and I.T. Sorokina*[1,2]; [1]*Norwegian university for science and technology, Department of Physics, Trondheim, Norway*; [2]*Atla Lasers AS, Richard Birkelands vei 2b, Trondheim, Norway*

A compact all-fiber MOPA system, capable of generating 1 uJ pulses, centered around 2175 nm with a pulse duration of 2 ps and a repetition rate of 7.6 MHz, is presented.

CJ-P.14 SUN

L-band Amplifiers Based on Cladding-Pumped Er-Doped (Yb-Free) Fibers with Al2O3-SiO2 Core Highly Doped by Fluorine

M. Khudyakov[1], *M. Yashkov*[2], *D. Lipatov*[2], *N. Vechkanov*[2], *A. Abramov*[2], *A. Guryanov*[2], *and* •*M. Likhachev*[1]; [1]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [2]*G.G. Devyatykh Institute of Chemistry of High-Purity Substances, Russian Academy of Sciences, Nizhnii Novgorod, Russia*

Improvement of pump to signal conversion efficiency of double-clad Er-doped fibers by utilization of novel F-Al2O3-SiO2 glass matrix has been demonstrated.

CJ-P.15 SUN

Single-mode Er-Yb Fiber with 20 μm F-P2O5-SiO2 Core

•*D. Lipatov*[1], *A. Lobanov*[1], *A. Abramov*[1], *A. Guryanov*[1], *M. Khudyakov*[2], *S. Aleshkina*[2], *K. Bobkov*[2], *M. Bubnov*[2], *T. Kochergina*[2], *and M. Likhachev*[2]; [1]*G.G. Devyatykh Institute of Chemistry of High-Purity Substances, Russian Academy of Sciences, Nizhny Novgorod, Russia*; [2]*Fiber Optics Research Center, Russian Academy of Sciences, Moscow, Russia*

Single-mode fiber with 20 μm Er2O3-Yb2O3-F-P2O5-SiO2 core was fabricated by all gas-phase MCVD method. The slope efficiency in laser based on the fabricated fiber reached 34 % relative to the launched pump power.

CJ-P.16 SUN

Erbium-doped all-fiber laser based on AlPO4 silica glass

•*M.-P. Lord, O. Boily, G. Gariépy, S. Grelet, L. Talbot, P. Paradis, N. Grégoire, S. Morency, Y. Messaddeq, and M. Bernier*; *Centre d'Optique, Photonique et Laser (COPL), Québec, Canada*

We present an erbium-doped aluminophosphosilicate all-fiber laser yielding a slope efficiency of 30% with respect to the 976 nm absorbed pump power. Clustering is minimized in the fiber core due to the integration of AlPO4.

CJ-P.17 SUN

Single-frequency Er^{3+} doped phosphate fiber MOPA

•*P. Booker*[1], *M. Dürbeck*[1], *N.G. Boetti*[2], *D. Pugliese*[3], *S. Abrate*[2], *D. Milanese*[3], *M. Steinke*[1], *J. Neumann*[1], *and D. Kracht*[1]; [1]*Laser Zentrum Hannover e.V., Hanover, Germany*; [2]*LINKS - Leading Innovation & Knowledge for Society, Turin, Italy*; [3]*Politecnico di Torino, Turin, Italy*

In this work, the performance of a novel single-mode Er^{3+} doped (2 mol%) phosphate glass LMA fiber (10/125 μm and 0.08 NA) is compared to its frequently used fused silica counterpart in terms of the challenging requirements for gravitational wave detection.

CJ-P.18 SUN

High power specially-designed fiber laser operating at 1018 nm using 20/400 μm ytterbium-doped fibers

M. Lafouti[1], *H. Latifi*[1,2], •*H. Fathi*[3], *S. Ebrahimzadeh*[3], *S. Sarikhani*[3], *H. Sarabi*[2,3], *V. Vatani*[3], *and S.H. Nabavi*[3]; [1]*Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran*; [2]*Department of Physics, Shahid Beheshti University, Tehran, Iran*; [3]*Iranian National Center for Laser Science and Technology, Tehran, Iran*

We present a specially-designed fiber laser at 1018 nm via low core/cladding ratio diameter active fibers, 20/400μm. The output power of 407W was achieved with slope efficiency of about 40% and M2 factor of 1.5.

CJ-P.19 SUN

Monolithic amplifier based on a Chirally-coupled-core fiber

•*S. Hochheim*[1], *M. Steinke*[1], *J. Koponen*[2], *T. Lowder*[3], *S. Novotny*[2], *J. Neumann*[1], *and D. Kracht*[1]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*nLight Oy, Lohja, Finland*; [3]*nLIGHT Inc., Vancouver, USA*

We present the first monolithic fiber amplifier based on a combination of standard single-mode fibers and a 3C-fiber. For further power scaling and due to the excellent fundamental mode-content, it's promising for a variety of applications.

CJ-P.20 SUN

2.5 mJ narrow-linewidth, linearly-polarized pulse-burst high-power Yb-doped fiber amplifier system

•*H. Lin*[1], *Y. Feng*[1], *T.W. Hawkins*[2], *Z. Huang*[1], *Y. Feng*[1], *J.H.V. Price*[1], *L. Dong*[2], *and J. Nilsson*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*ECE/COMSET, Clemson University , South Carolina, USA*

Narrow-linewidth bursts of 50 1-ns pulses from a Yb-doped fiber amplifier system reach 2.5-mJ burst energy and 250 W average power at 100 kHz burst frequency with 19-dB polarization extinction ratio at 1064 nm.

CJ-P.21 SUN

Robust all-fiber 200W single frequency laser at 1064 nm with low intensity noise

•*C. Dixneuf*[1,2], *G. Guiraud*[1], *Y.-V. Bardin*[1], *G. Santarelli*[2], *N. Traynor*[1], *C. Pierre*[3], *and J. Boullet*[3]; [1]*Azur Light Systems, Pessac, France*; [2]*LP2N, Talence, France*; [3]*Alphanov, Talence, France*

We developed a high power all-fiber single frequency laser with low intensity noise. This MOPA, based on ytterbium doped fiber, can emit up to 200W at 1064 nm making it suitable for next generation gravitational wave detectors.

CJ-P.22 SUN

All-Fiber 100-ns Single-Frequency 0.5mJ Anisotropic MOPA with Double Clad Tapered Yb-doped Gain Fiber

J. Rissanen[1,2], *T. Noronen*[1], *K. Patokoski*[2,3], *R. Gumenyuk*[2], *Y. Chamorovskii*[4], *J. Toivonen*[2], *and* •*V. Filippov*[1,5]; [1]*Ampliconyx, Tampere, Finland*; [2]*Tampere University, Tampere, Finland*; [3]*Vaisala Oy, Vantaa, Finland*; [4]*Kotel'nikov Institute of Radio Engineering and Electronics, Moscow, Russia*; [5]*Peter the Great St.Petersburg State Polytechnical University, St.Petersburg, Russia*

High power 100ns (0.5mJ, 5kW peak power) MOPA with active tapered double clad ytterbium fiber as a gain media experimentally demonstrated.

CJ-P.23 SUN

High Energy Pulsed Operation of a Yb Fibre MOPA with Amplified Spontaneous Emission Output

•*E. Park*[1], *J. Park*[2], *H. Jeong*[3], *and J. Kim*[2]; [1]*Department of Applied Physics, Hanyang University ERICA, 55 Hanyangdaehak-ro, Ansan, 15588, South Korea*; [2]*Department of Photonics and Nanoelectronics, Hanyang University ERICA, 55 Hanyangdaehak-ro, Ansan, 15588, South Korea*; [3]*Korea Institute of Industrial Technology, Cheonan, Chungcheongnam-do 31056, South Korea*

Pulsed operation of a fibre superfluorescent source from a Yb fibre master oscillator power amplifier system is reported. The efficient light source yielded 415.0 uJ of the maximum pulsed output at 100 kHz.

CJ-P.24 SUN

Pulsed Yb-doped Phospho-silicate Fiber MOPA Source with 25kW Peak Power and Excellent Beam Quality

•*J.K. Sahu, D. Lin, N.J. Ramírez-Martínez, A.A. Umnikov, M. Núñez-Velázquez , and P. Barua*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We report an optimized all-vapor-phase MCVD process to fabricate Yb2O3-P2O5-SiO2 fiber. When tested in a 1035nm ps-MOPA, this fiber generated 25kW peak-power at repetition-rate 2.95MHz and average-power of 13.3W in a diffraction-limited beam, M2 ~1.13.

CJ-P.25 SUN

Coherent Beam Combining of Fiber Amplifiers Seeded by Commercial Low Cost Diode

A. Babazadeh, J. Jafari Dashkasan, •*E. Aghayari, A. Kamkar, V. Vatani, S.H. Nabavi, and M. Karimi*; *Iranian National Center for Laser Science and Technology, Tehran, Iran*

We report a coherent beam combining fiber amplifier setup using low cost diode laser stochastic parallel gradient descent algorithm. A 300 W near diffraction limited beam is achieved by a 1×3 diffractive optical element.

CJ-P.26 SUN

Experimental Measurement and Simple Analytical Estimation of Signal Gain in Yb-doped Fiber

•*O.V. Shtyrina*[1,2], *A.Y. Kokhanovskiy*[1], *M. Dyatlov*[1], *S. Efremov*[1], *I.A. Yarutkina*[1], *A. Skidin*[1], *and M.P. Fedoruk*[1,2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Computational Technologies SB RAS, Novosibirsk, Russia*

We propose the experimental scheme to measure the signal gain in Yb-doped fiber and develop the theoretical method to estimate the small signal gain and saturation power as a function of experimental parameters.

CJ-P.27 SUN

Self-sweeping operation of Nd-doped fiber laser

E.K. Kashirina[1,2], •*I.A. Lobach*[1], *and S.I. Kablukov*[1]; [1]*Institute of automation and electrometry of SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk state technical university, Novosibirsk, Russia*

Self-sweeping operation in a four-level laser system based on neodymium-doped fiber is demonstrated for the first time. The single-frequency self-induced spectral dynamics is observed in the region of 1.06 μm with sweeping range of up to 1.8 nm.

CJ-P.28 SUN

All-Fiber Single-Mode PM Yb-doped Pre-Amplifier at 0.976 μm

•*S. Aleshkina*[1], *D. Lipatov*[2], *L. Kotov*[3], *V. Temyanko*[3], *V. Velmiskin*[1], *T. Bardina*[1,4], *M. Bubnov*[1], *A. Guryanov*[2], *and M. Likhachev*[1]; [1]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [2]*Institute of High Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [3]*College of Optical Sciences, University of Arizona, Tucson, USA*; [4]*Moscow Institute of Physics and Technology (State University), Dolgoprudny, Russia*

Yb-doped PM-fiber compatible with standard 10-μm-core single-mode fiber was optimized for fabrication of all-fiber 0.98 μm pre-amplifier. Slope pump-to-signal conversion efficiency of 11.5% and a high signal-to-noise ratio were demonstrated.

CJ-P.29 SUN

Multi-watt low noise all-fiber 997nm-1017nm tunable laser

B. Gouhier[1], •*C. Dixneuf*[1], *A. Hilico*[1], *G. Guiraud*[2], *N. Traynor*[2], *and G. Santarelli*[1]; [1]*LP2N, Talence, France*; [2]*ALS, Pessac, France*

We report the development of a low-noise, all-fiber, single-frequency, linearly polarized high-power MOPA, tunable from 1017(16W) nm down to 997 nm (>3W). The OSNR exceeds 40dB for the worst case up to more than 60dB.

CJ-P.30 SUN

915 nm Pumped 1018 nm Yb-Doped All-Fiber High Power Fiber Laser System

•*Y. Midilli*[1], *O.B. Efunbajo*[1,2], *B. Şimşek*[1], *and B. Ortaç*[1]; [1]*National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey*; [2]*Department of Health Technology, Technical University of Denmark, Anker Engelunds Vej 1, Building 101A, 2800 , Kgs. Lyngby, Denmark*

We demonstrate the first 915 nm pumped 1018 nm high power fiber laser system above 100 W and tested laser efficiency change with respect to the change in the pump wavelength.

CJ-P.31 SUN

Rare-earth doped phosphate optical fibres and rods for compact pulsed optical amplification

•*N.G. Boetti*[1], *D. Pugliese*[2], *D. Gallichi Nottiani*[2], *D. Janner*[2], *and D. Milanese*[2,3]; [1]*Fondazione LINKS – Leading Innovation & Knowledge for Society Via P. C. Boggio 61, 10138, Torino, Italy*; [2]*Politecnico di Torino, Dipartimento di Scienza Applicata e Tecnologia (DISAT) and RU INSTM, Corso Duca degli Abruzzi 24, 10129 , Torino, Italy*; [3]*Consiglio Nazionale delle Ricerche, Istituto di Fotonica e Nanotecnologie, Via alla Cascata 56/C, 38123 , Trento, Italy*

With the aim of realizing short-length amplifiers in the 1 and 1.5 μm wavelength range, highly Yb3+ and Yb3+-Er3+-doped phosphate glass fibres were manufactured. Preliminary results of optical amplification are presented for single stage MOPA.

CJ-P.32 SUN

Efficient Er and Nd:Ti:$LiNbO_3$ ridge waveguide lasers for the development of mid infrared sources

•*D. Brüske, S. Suntsov, C.E. Rüter, and D. Kip*; *Helmut Schmidt University, Faculty of Electrical Engineering, Hamburg, Germany*

In this paper, we report on efficient Er and Nd:Ti:$LiNbO_3$ ridge waveguide lasers. For the sample fabrication we used our novel technique of three-side deposition and in-diffusion for Er/Nd and Ti incorporation into predefined ridges.

CJ-P.33 SUN

Fluoride Glass Pulsed Laser in Middle Infrared Wavelength Range

•*M.C. Falconi*[1], *D. Laneve*[1], *C. Clemente*[1], *G. Ricchiuti*[1], *A. Loconsole*[1], *V. Portosi*[1], *A. Crudele*[1], *G. Galzerano*[2], *and F. Prudenzano*[1]; [1]*Department of Electrical and Information Engineering, Politecnico di Bari, Bari, Italy*; [2]*IFN-CNR, Department of Physics, Politecnico di Milano, Milano, Italy*

A finite-difference time-domain (FDTD) algorithm is developed in order to investigate the generation of optical pulses at 3.0 μm in an in-band pumped dysprosium-doped ZBLAN fiber laser by means of the gain switching technique.

CJ-P.34 SUN

2 W single-mode visible laser oscillation in Pr-doped double-clad structured waterproof fluoro-aluminate glass fiber

•*Y. Fujimoto*[1], *M. Nakahara*[2], *P. Binun*[2], *S. Motokoshi*[3], *O. Ishii*[4], *M. Watanabe*[4], *M. Yamazaki*[4], *T. Shinozaki*[2], *T. Sato*[2], *and Y. Yanomori*[2]; [1]*Chiba Institute of Technology, Narashino, Japan*; [2]*Kimmon Koha Co., Ltd., Itabashi-ku, Japan*; [3]*Institute of Laser Technology, Osaka, Japan*; [4]*Sumita Optical Glass, Inc., Saitama City, Japan*

2 W single-mode visible laser oscillation in Pr-doped double-clad structured waterproof fluoro-aluminate glass fiber is reported. The maximum output and slope efficiency were measured to be 2.0 W and 36.1%, respectively.

CJ-P.35 SUN

Structural writing on an antiresonant hollow core fiber

•*Y. Zhou, J. Zang, and S. Yoo*; *Nanyang Technological University, Singapore, Singapore*

Structural writing on an in-house hollow-core antiresonant fiber using electric arc pulses is demonstrated to influence the modal coupling of the fiber and generate filter like attenuation at designed wavelengths.

CJ-P.36 SUN

Cascaded Stimulated Raman Scattering in a Chalcogenide optical fiber

T. Cheng[1,2], *S. Li*[2], *X. Yan*[2], *T. Suzuki*[1], *and* •*Y. Ohishi*[1]; [1]*Research Center for Advanced Photon Technology, Nagoya, Japan*; [2]*Northeastern University, Shenyang, China*

Using a nanosecond laser operated at 1545 nm as the pump source, mid-infrared cascaded SRS up to eight orders is obtained in a 16 m As-S fiber.

CJ-P.37 SUN

Fluorescence dynamics of laseractive nanocrystals emitting in the visible

•*S. Spelthann*[1], *J. Thiem*[1], *L. Neumann*[2], *H.-H. Johannes*[2], *W. Kowalsky*[2,4], *D. Kracht*[3,4], *J. Neumann*[3,4], *A. Ruehl*[1,3], *and D. Ristau*[1,3,4]; [1]*Leibniz Universität Hannover, Hannover, Germany*; [2]*Technische Universität Braunschweig, Braunschweig, Germany*; [3]*Laser Zentrum Hannover e. V., Hannover, Germany*; [4]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across disciplines), Hannover, Germany*

Multiphonon quenching of excited Ions can avoid laseroperation in nanocrystals. The fluorescence lifetime of nanocrystals emitting in the visible spectral regime has been investigated using Foerster-Resonant-Energy-Transfer (FRET) and Dexter-Energy-Transfer (DET).

CJ-P.38 SUN

Optimisation of dispersion flatness in nanostructured core fibres

•*D. Michalik*[1,2], *T. Stefaniuk*[1,2], *D. Pysz*[2], *A. Filipkowski*[2], *and R. Buczyński*[1,2]; [1]*Institute of Electronic Materials Technology, Warsaw, Poland*; [2]*Faculty of Physics - University of Warsaw, Warsaw, Poland*

A fibre composed of pure silica nanorods and silica nanorods highly doped with Ge (concentration of GeO2 equals 20% mol). Modification of core internal structure affects electric field distribution allowing to achieve flat dispersion profile.

CJ-P.39 SUN

Bismuth doped fiber for filtering applications

•*D. Jain*[1], *N.K. Thipparapu*[2], *and J.K. Sahu*[2]; [1]*School of Physics, University of Sydney, Sydney, Australia*; [2]*Optoelectronics Research Center, University of Southampton, Southampton, United Kingdom*

A novel bismuth-alumina doped fiber has been developed. This offers very high suppression of the wavelengths below 1050 nm with a steep edge and act as a high pass filter.

CJ-P.40 SUN

Infrared 1000-nm-Supercontinuum by Means of Self-Frequency Shift of Raman Solitons Supported by Four-Wave Mixing

•*M. Zajnulina*; *Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

I present and numerically study a fibre-based system for generation of a 1000-nm-wide equally intense near-IR supercontinuum resulting from an interplay of self-frequency shift of Raman solitons and four-wave mixing in a highly-nonlinear fibre.

CJ-P.41 SUN

Mitigating Supercontinuum Shot-to-Shot Fluctuations in an Anomalous Dispersion Highly Nonlinear Fiber by Length Optimization

•*R. Lindberg*[1], *J. Sotor*[2], *T. Martynkien*[3], *V. Pasiskevicius*[1], *and G. Soboń*[2]; [1]*Department of Applied Physics, Royal Institute of Technology , Stockholm, Sweden*; [2]*Laser & Fiber Electronics Group, Faculty of Electronics, Wrocław University of Science and Technology, Wrocław, Poland*; [3]*Faculty of Fundamental Problems of Technology, Wrocław University of Science and Technology, Wrocław, Poland*

We experimentally demonstrate, by employing dispersive Fourier transform measurements, reduced shot-to-shot fluctuations in infrared supercontinua generated in an anomalous dispersion highly nonlinear fiber by length optimization.

CJ-P.42 SUN

Development of all-glass all-normal dispersion highly nonlinear photonic crystal fibers with introduced birefringence

•*D. Dobrakowski*[1,2], *A. Rampur*[1,2], *G. Stępniewski*[1,2], *R. Kasztelanic*[1,2], *A. Anuszkiewicz*[1,2], *D. Pysz*[1], *R. Buczyński*[1,2], *and M. Klimczak*[1,2]; [1]*Institute of Electronic Materials Technology, Glass Department, Warsaw, Poland*; [2]*University of Warsaw, Faculty of Physics, Warsaw, Poland*

Development of normal dispersion, polarization maintaining nonlinear fibers is discussed. High nonlinearity, flattened normal dispersion and 10^(-4) birefringence are shown in physical fibers. Lamellar core fiber variant with 10^(-3) birefringence is discussed using numerical simulations.

CJ-P.43 SUN

Highly birefringent nanostructured core optical fiber compatible with SMF28 standard

•*D. Michalik*[1,2], *T. Stefaniuk*[1,2], *D. Pysz*[1], *A. Filipkowski*[1], *and R. Buczyński*[1,2]; [1]*Institute of Electronic Materials Technology, Warszawa, Poland*; [2]*Faculty of Physics - University of Warsaw, Warszawa, Poland*

We propose a new fiber design compatible with SMF28 standard but exhibiting strong birefringence. It is composed from thousand of pure silica and Ge-doped nanorods, stacked together to form low and high refractive index stripes.

CJ-P.44 SUN

Signal Amplification in CsPbBr3 Nanoparticle-Doped Photonic Crystal Fibers

•*J. Navarro-Arenas*[1], *I. Suárez*[1,2], *A. Ferrando*[3], *A. F. Gualdrón-Reyes*[4], *I. Mora-Seró*[4], *F. Gao*[5], *P. Wang*[5], *J. Martínez-Pastor*[1], *and Z. Sun*[6]; [1]*Instituto de Ciencia de Materiales, Valencia, Spain*; [2]*School of Telecommunications Engineering, Fuenlabrada, Spain*; [3]*. Departament d'Òptica i Optometria i Ciències dela Visió, Valencia, Spain*; [4]*Institute of Advanced Materials , Castelló, Spain*; [5]*Beijing Engineering Research Centre of Laser Technology, Beijing, China*; [6]*Department of Electronics and Nanoengineering, Espoo, Finland*

Here we present detailed modelling and characterisation of a Photonic Crystal Fiber filled with a nano-ink based on CsPbBr3 Colloidal-Nanoparticles allowing for signal amplification with a +4 dB gain figure.

CJ-P.45 SUN

Generation of Multi-gigahertz Laser Pulses in Optical Lattice-like Cladding Waveguides with PdSe2 as A New Saturable Absorber

•*Z. Li*[1], *N. Dong*[2], *J. Wang*[2], *J.R. Vázquez de Aldana*[3], *H. Yu*[4], *and F. Chen*[1]; [1]*School of Physics, State Key Laboratory of Crystal Materials, Shandong University, Jinan, China*; [2]*Laboratory of Micro-Nano Optoelectronic Materials and Devices, Key Laboratory of Materials for High-Power Laser, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai, China*; [3]*Laser Microprocessing Group, Facultad Ciencias, Universidad de Salamanca, Salamanca, Spain*; [4]*State Key Laboratory of Crystal Materials and Institute of Crystal Materials, Shandong University, Jinan, China*

We report on 9.25 GHz fundamentally mode-locked monolithic waveguide laser based on optical lattice-like cladding microstructures and palladium diselenide as a new saturable absorber.

CJ-P.46 SUN

Modeling of the Ultra-Stable Operating Regime in Fourier Domain Mode Locked (FDML) Lasers

•*M. Schmidt*[1], *T. Pfeiffer*[2], *C. Grill*[2], *R. Huber*[2], *and C. Jirauschek*[1]; [1]*Technical University of Munich, Munich, Germany*; [2]*Universität zu Lübeck, Lübeck, Germany*

We theoretically describe the formation of a recently observed ultra-stable operation in Fourier domain mode locked (FMDL) lasers and show that perturbations such as a residual dispersion can be compensated by a passive self-stabilizing mechanism.

CJ-P.47 SUN

Mode re-locking in an RF detuned actively mode-locked fiber ring laser

•*S. Krishnamoorthy*[1,2], *S. Mayor*[2], *and A. Prabhakar*[1]; [1]*Indian Institute of Technology, Madras, Chennai, India*; [2]*National Centre for Biological Sciences, Bengaluru, India*

The perturbed model of the RF detuned actively mode-locked laser is extended for multiple inputs. Injection-lock is recovered and an increase in range of the cavity modes is achieved with two inputs.

CJ-P.48 SUN

Dual-wavelength mode-locking of waveguide Nd:YAG laser with graphene

•*M. Ponarina*[1], *A. Okhrimchuk*[2], *M. Smayev*[3], *and P. Obraztsov*[1]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [3]*D. Mendeleyev University of Chemical Technology of Russia, Moscow, Russia*

Here we unite femtosecond-laser inscribed waveguide and graphene saturable absorber to create miniature dual-wavelength IR laser system operating in mode-locking regime with multi-gigahertz repetition rate.

CJ-P.49 SUN

4.37 GHz L-band Passively Harmonic Mode-locked Fiber Laser Based on Nonlinear Polarization Rotation

•*Y. Ling*[1], *Q. Huang*[1], *Z. Xing*[2], *Z. Yan*[2], *and C. Mou*[1]; [1]*Shanghai University, Shanghai, China*; [2]*Huazhong University of Science and Technology, Wuhan, China*

An L-band passively harmonic mode-locked fiber laser based on nonlinear polarization rotation is firstly demonstrated. 4.37 GHz pulses with the super-mode suppression ration of 34 dB are obtained at 712 mW pump power.

CJ-P.50 SUN

Compact One-octave Spanning Supercontinuum Generation by Amplification of Noise Like Pulses in Yb-doped Fiber Amplifier

•*E. Aghayari*[1,2], *K. Jamshidi Ghaleh*[1], *M. Karimi*[2], *V. Vatani*[2], *and S.H. Nabavi*[2]; [1]*Department of physics, Azarbaijan Shahid Madani University, Tabriz, Iran*; [2]*Iranian National Center for Laser Science and Technology, Tehran, Iran*

We report on a 7.5 W compact supercontinuum source with 10-dB spectral bandwidth of 1130 nm by amplification of noise like pulses in Yb-doped fiber amplifier that operates in nonlinear regime

CJ-P.51 SUN

Generation of Optical Pulses with 69-nm-Wide Broadband Spectrum Directly from a Mode-locked Yb-doped Fibre Laser

•*L. Jin, S.Y. Set, and S. Yamashita*; *The University of Tokyo, Tokyo, Japan*

A broadband 1 um coherent source based on the mode-locked Yb-doped fibre laser was demonstrate, which delivers a maximum 10-dB spectral width of 69 nm with the average power higher than 100 mW.

CJ-P.52 SUN

Optical Repetition Rate Stabilization Techniques of Ultrafast Yb Doped All Fiber Oscillator

•*K. Madeikis*[1,2], *K. Viskontas*[1], *R. Danilevicius*[1,2], *T. Bartulevicius*[1,2], *L. Veselis*[1,2], *A. Michailovas*[1,2], *and N. Rusteika*[1,2]; [1]*Ekspla, Vilnius, Lithuania*; [2]*State research institute Center for Physical Sciences and Technology, Vilnius, Lithuania*

We demonstrate all-fiber ultrafast SESAM-based optically repetition rate locked oscillator concept. Pump induced refractive index change in the active erbium fiber for the precise delay line was tested. Different schemes were analyzed and compared.

CJ-P.53 SUN

An All-Fiber Ultra-Low Numerical Aperture High Power Fiber MOPA System with an Output Power above 500 W

•*Y. Midilli and B. Ortaç*; *National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey*

We demonstrate an all-fiber monolithic high power Yb-doped ultra-low NA (0.032) fiber laser system with an output power above 500 W and having M2 values Mx2=1.22 and My2=1.20 in both x and y coordinates respectively.

CJ-P.54 SUN

μs pulsed, low repetition rate, 30 W fiber laser at 1550 nm

•*S. Pavlova*[1,3], *E. Yagci*[1,4], *K. Eken*[1], *E. Tunckol*[1], *and I. Pavlov*[2,3]; [1]*FiberLAST, A.S., Ankara, Turkey*; [2]*Middle East Technical University, Ankara, Turkey*; [3]*Institute of Physics of the NAS of Ukraine, Kiev, Ukraine*; [4]*Hacettepe University, Ankara, Turkey*

We report a ErYb system at 1551 nm wavelength, emitting controllable rectangular-shape μs pulses with peak power up to 32 W.

CJ-P.55 SUN

Controllable Generation of Ultrashort Multi-bound Solitons in a Mode-locked Erbium-doped Ring Laser with a Highly-nonlinear Resonator

•*D.A. Dvoretskiy*[1], *S.G. Sazonkin*[1], *I.O. Orekhov*[1], *I.S. Kudelin*[2], *A.B. Pnev*[1], *V.E. Karasik*[1], *and L.K. Denisov*[1]; [1]*Bauman Moscow State Technical University, Moscow, Russia*; [2]*Aston Institute of Photonics Technologies Aston University, Birmingham, United Kingdom*

In this paper, we have experimentally demonstrated the formation of ultrashort multi-bound solitons with the controllable number of bound states by pump power variation obtained in a highly-nonlinear all-fiber ring cavity.

CJ-P.56 SUN

Dual-wavelength dual-comb mode locked Er-doped fiber laser based on Saganc fiber loop mirror

X. Luo, T. Tuan, T. Saini, H. Nguyen, T. Suzuki, and •*Y. Ohishi*; *Toyota Technological Institute, Nagoya, Japan*

We report an all-fiber dual-wavelength dual-comb mode locked fiber laser based on a Sagnac fiber loop mirror. Two asynchronous mode locked pulse trains with repetition rate difference of 218 Hz was realized.

CJ-P.57 SUN

The Optimization of Compact High Energy Fiber CPA System for Bio-Imaging Applications

•*T. Bartulevičius*[1,2], *L. Veselis*[1,2], *K. Madeikis*[1,2], *A. Michailovas*[1,2], *and N. Rusteika*[1,2]; [1]*Ekspla Ltd, Vilnius, Lithuania*; [2]*Center for Physical Sciences and Technology, Vilnius, Lithuania*

A compact 10 μJ energy and 26 MW peak power fiber chirped pulse amplification system together with numerical calculations for optimization of laser output parameters and mitigation of photodarkening effect is presented.

CJ-P.58 SUN

The Influence of Negative Cavity Dispersion on Timing Jitter of an All-PM SESAM Mode-Locked Fiber Oscillator

•*K. Viskontas, K. Madeikis, R. Danilevicius, and A. Michailovas*; *Ekspla Ltd., Vilnius, Lithuania*

We experimentally investigate the timing jitter of an all-PM fiber oscillators with different amount of negative cavity dispersion. The lowest dispersion laser showed best phase noise performance with an integrated timing jitter <150 fs.

CJ-P.59 SUN

Effect of polarization modulation on the stability of a 1.5 μm laser locked to a fibre cavity

•*K. Manamanni, V. Roncin, M. Sahni, and F. Du-Burck*; *Laboratoire de Physique des Lasers-CNRS-univ. Paris13, Villetaneuse, France*

We show theoretically and experimentally that ellipticity and misalignment of the input polarization of an electro-optic modulator result in polarization modulation. The effects on a cavity output detected signal are analysed.

CJ-P.60 SUN

On modelling of NPE mode-locked fiber laser in presence of Raman scattering

•*A. Bednyakova*[1,2], *D. Kharenko*[1,3], *and A. Yarovikov*[1,2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Computational Technologies SB RAS, Novosibirsk, Russia*; [3]*Institute of Automation and Electrometry, SB RAS, Novosibirsk, Russia*

We compare hybrid and scalar models describing pulse evolution in NPE-based fiber laser. The laser provides stable generation of highly-chirped dissipative solitons at 1.55 μm with the output pulse energy above the Raman threshold.

CJ-P.61 SUN

Coherent beam combining by noncollinear sum-frequency generation

•*J. Želudevičius, R. Rutkauskas, and K. Regelskis*; *Center for Physical Sciences & Technology, Vilnius, Lithuania*

We demonstrate coherent combining of picosecond pulsed beams from 4 fiber amplifiers in the LBO nonlinear crystal. Maximum combining efficiency of 49 % is demonstrated and maximum combined pulse energy of 108 μJ is achieved.

CJ-P.62 SUN

Single-mode operation with no mode-hops of a 110m long Brillouin fiber laser with non-resonant pumping

G. Danion[1], *L. Frein*[1], *D. Bacquet*[2], *G. Pillet*[3], *S. Molin*[3], *L. Morvan*[3], *G. Ducournau*[4], •*M. Vallet*[1], *P. Szriftgiser*[2], *and M. Alouini*[1]; [1]*Univ. Rennes, CNRS, Institut FOTON*

- UMR 6082, Rennes, France; [2]Lab. PHLAM, UMR Université de Lille1 - CNRS 8523, Lille, France; [3]Thalès Resarch and Technology, Palaiseau, France; [4]IEMN, UMR Université de Lille1 - CNRS 8520, Lille, France

We present a reliable method for suppressing mode-hopping in narrow linewidth Brillouin fiber lasers with non resonant pumping, based on a phase-locked loop which locks the pump-Stokes detuning to a local RF oscillator.

CJ-P.63 SUN

Raman based power combining and wavelength conversion of multiple fiber lasers – Number scaling and limits on wavelength separation

•V. Balaswamy, S. Aparanji, and V.R. Supradeepa; Centre for Nano Science and Engineering, Indian Institute of Science , Bengaluru, India

We investigate scalability of number of pumps and limits on wavelength separation in Raman based power combining and wavelength conversion. Power combining at 1.5μm with 3 independent Yb lasers with 5nm-29nm wavelength separation was achieved.

CJ-P.64 SUN

Brillouin assisted optoelectronic self-narrowing of laser linewidth

G. Danion[1], M. Vallet[1], L. Frein[1], P. Szriftgiser[2], and •M. Alouini[1]; [1]Univ. Rennes, CNRS, Institut FOTON - UMR 6082, Rennes, France; [2]Lab. PHLAM, UMR Université de Lille1 - CNRS 8523, Lille, France

Optical phase-locking of a 1.55 μm solid state laser pumping a long Brillouin fiber laser leads to a 2Hz linewidth narrowing for the pump laser itself. The method can be extended to almost any laser.

CJ-P.65 SUN

Deep-UV extended tunable micro-plasma radiation source

•F. Delahaye, F. Amrani, B. Debord, F. Gérôme, and F. Benabid; Xlim, Limoges, France

We report on the generation of deep-UV extended micro-plasma in hollow-core photonic crystal fiber and demonstrate tunable UV radiation by integrating Littrow-like configuration cavity.

CJ-P.66 SUN

Tolerance analysis for piston and tilt error in hexagonal laser phased array

•P. Gontar and J.K. Jabczynski; Military University of Technology, Warsaw, Poland

Numerical analysis of the influence of beam shape on the piston and tilt error tolerances for the hexagonal array was carried out. Our results show that the Gaussian beam has a higher tolerance than top-hat.

CJ-P.67 SUN

Optimization of Signal Characteristics in Fiber Laser with Quasi-Distributed Gain

•O.V. Shtyrina[1,2], S.A. Efremov[1], I.A. Yarutkina[1], A.S. Skidin[1], A.V. Ivanenko[1], and M.P. Fedoruk[1,2]; [1]Novosibirsk State University, Novosibirsk, Russia; [2]Institute of Computational Technologies SB RAS, Novosibirsk, Russia

We propose the general theoretical method to find the gain distribution in fiber laser with quasi-distributed gain and study the behavior of the output signal for various parameters of fiber laser with cavity dumping

CJ-P.68 SUN

Different Lasing Regimes of Parity-Time Symmetric Fiber Ring Laser

S. Smirnov, M. Makarenko, and •D. Churkin; Novosibirsk State University, Novosibirsk, Russia

We demonstrate a novel PT-symmetric fiber laser scheme that supports turbulent, laminar and pulsed lasing regimes. Switching between regimes of different types and symmetry can be done by adjustment of pump power and phase shift.

CJ-P.69 SUN

Design and optimization of laseractive nanoparticles for fiber lasers

•J. Thiem[1], S. Spelthann[1], L. Neumann[2], H.-H. Johannes[2], W. Kowalsky[2], D. Kracht[3,4], J. Neumann[3,4], A. Rühl[1,3], and D. Ristau[1,3,4]; [1]Leibniz Universität Hannover, Hannover, Germany; [2]Technische Universität Braunschweig, Braunschweig, Germany; [3]Laser Zentrum Hannover e.V., Hannover, Germany; [4]Cluster of Excellence PhoenixD (Photonics, Optics and Engineering - Innovation Across Disciplines), Hannover, Germany

The effects of fluorescence lifetime, scattering and material attenuation on the gain of a fiber laser, doped with nanoparticles consisting of a doped core and an undoped shell, have been investigated and optimized.

CJ-P.70 SUN

Cooling of Active Fibers in Lasing Conditions using Different Passive Heat Dissipation Systems

•N. Tereshchenko[1], A. Kostrov[1], N. Vanyushkin[1], R. Shaidullin[1,2], and O. Ryabushkin[1,2]; [1]Moscow Institute of Physics and Technology, Dolgoprudniyy, Russia; [2]Kotelnikov Institute of Radio-Engineering and Electronics of RAS, Fryazino, Russia

The heat sink system based on a grooved copper plate was used for cooling of active fibers by sealing them with low-temperature melting alloy. Cooling efficiency was 10 times higher comparing to the convective air-cooling.

CJ-P.71 SUN

Investigation of longitudinal temperature distribution in active fiber under conditions of laser generation using piezoelectric crystal thermal sensors

•A. Kostrov[1], N. Tereshchenko[1], N. Vanyushkin[1], R. Shaidullin[1,2], and O. Ryabushkin[1,2]; [1]Moscow Institute of Physics and Technology, Dolgoprudnyy, Russia; [2]Kotelnikov Institute of Radio-Engineering and Electronics, Fryazino, Russia

We introduce a novel technique based on radiofrequency impedance spectroscopy for measuring the temperature of active fibers in lasing conditions using LiNbO3 piezoelectric resonators placed onto the fiber surface as the temperature sensors

CJ-P.72 SUN

Self-healing dynamically controllable micro-comb

•H. Bao[1], J.S. Totero Gongora[1], M. Rowley[1], S.T. Chu[2], B.E. Little[3], R. Morandotti[4,5,6], D.J. Moss[7], M. Peccianti [1], and A. Pasquazi[1]; [1]University of Sussex, Brighton, United Kingdom; [2]City University of Hong Kong, Hong Kong, China; [3]Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Science, Xi'an, China; [4]INRS-EMT, Québec, Canada; [5]University of Electronic Science and Technology of China, Chengdu, China; [6]ITMO University, St. Petersburg , Russia; [7]Swinburne University of Technology, Hawthorn, Australia

We demonstrate the generation of stable micro-combs by nesting a micro-cavity in a fibre-laser cavity. The addition of an all-pass, fibre-based filter produces a periodical spectral-phase modulation which stabilises the comb for long fibre amplifiers.

CJ-P.73 SUN

Determining the waveguide profile using the overlap integral

•A. Alberucci[1], C.P. Jisha[1], and S. Nolte[1,2]; [1]Friedrich-Schiller-Universitat, Jena, Germany; [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We introduce a new near-field method to determine the refractive index distribution of a waveguide by translating the input beam. The technique is based upon the inversion of the overlap integral using deconvolution algorithms.

CJ-P.74 SUN

Phase Sensitive Amplification in a Periodically Poled Silica Fiber

•N. Englebert[1], F. De Lucia[2], P.-J.A. Sazio[2], S.-P. Gorza[1], and F. Leo[1]; [1]Opera-Photonics, Université libre de Bruxelles, 50 av. F.D. Roosevelt, CP194/5, B-1050, Bruxelles, Belgium; [2]Optoelectronics Research Centre, University of Southampton, SO17 1BJ, Southampton, United Kingdom

Phase sensitive amplification is demonstrated for the first time in a periodically poled silica fiber. A 6.7 times larger gain compared to FWM based amplification in HNL-SMF with identical length and pump power is obtained.

CJ-P.75 SUN

Demonstration of Spatial Mode Selection in a Coherently Combined Fiber Laser

•E. Tilseth, W. Kunkel, and J. Leger; Department of Electrical and Computer Engineering, University of Minnesota, Minneapolis, USA

Self-phasing due to spatial mode selection is demonstrated experimentally in a passive coherent beam combining resonator. The output power and phase difference in a two-core fiber laser exhibit reduced sensitivity to induced phase error.

CJ-P.76 SUN

Intra-cavity mode-selective coupler assisted ultrafast cylindrical vector fiber laser

•F. Shi[1], T. Wang[1], P. Cheng[1], Z. Luo[2], and X. Zeng[1]; [1]Shanghai University, Shanghai, China; [2]Xiamen University, Xiamen, China

We demonstrate an intra-cavity mode-selective coupler assisted all fiber laser that allow direct generation of ultrafast vector beams.

CJ-P.77 SUN

Phasing and Guidance Properties of Multi-Core Fibers under Heat Load

•L. Rosa[1,2], S. Mckee[3], C. Molardi[4], F. Poli[3], S. Selleri[3], L. Vincetti[1], and A. Cucinotta[3]; [1]University of Modena and Reggio Emilia, Modena, Italy; [2]Swinburne University of Technology, Hawthorn, Australia; [3]University of Parma, Parma, Italy; [4]Nazarbayev University, Astana, Kazakhstan

We study the phase shift and guidance properties of 16-core Yb-doped fibers under heavy heat load conditions, employing analysis by thermal-optical simulations to develop criteria for beam stability and single-mode heated operation.

CJ-P.78 SUN

Experimental observation of anomalous RIN transfer in random distributed feedback Raman fiber lasers

S. Rota-Rodrigo[1], D. Leandro[2], G. Rizzelli[3], •J.D. Ania-Castañon[3], G. Santarelli[1], and M. Lopez-Amo[2]; [1]LP2N, IOGS, CNRS, Université de Bordeaux, Talence, France; [2]Public University of Navarra, ISC, Navarra, Spain; [3]Instituto de Óptica, CSIC, Madrid, Spain

We report the experimental observation of anomalous RIN transfer function in ultralong random distributed feedback fiber lasers, confirming theoretical predictions

and opening up the possibility of low-frequency RIN reduction via laser design.

CJ-P.79 SUN

2.5 W, narrow linewidth, 259.0 nm, ruggedized DUV fiber laser source for remote benzene detection

•*L. Desbiens, V. Roy, J.-F. Gravel, and Y. Taillon*; *Institut national d'optique (INO), Quebec city, Canada*

A precisely-tunable, high power DUV fiber laser (259.0 nm) was developed to selectively, and remotely detect volatile benzene as a tracer for a broad range of hydrocarbons in the context of environmental monitoring applications.

CJ-P.80 SUN

Spectral correlations in radiation of random distributed feedback Raman fiber laser

I. Vatnik[1,2], •*O. Gorbunov*[1,2], *S. Sugavanam*[3], *D. Churkin*[1,2], *and E. Podivilov*[2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [3]*Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*

Spectral correlations in a multiwavelength fiber laser with randomly distributed feedback were directly measured. It was proved that correlations appear at the input of the fiber and are established by relative intensity noise (RIN) transfer.

13:00 – 14:00

JSI-P: JSI Poster session

JSI-P.1 SUN

Deep-Learning-aided three-dimensional direct laser writing of the complete connectome of mushroom body from an insect brain

•*H. Yu, W. Shao, Q. Zhang, F. Salim, and M. Gu*; *RMIT University, Melbourne, Australia*

Deep-learning-aided 3D direct-laser-writing of mushroom-body from Drosophila brain with submicrometer feature size is demonstrated, which provides a potential pathway to replicate neuronal-circuits at larger scale and higher-level understanding of structure-function relationships in engineered neural networks.

JSI-P.2 SUN

High Performance Optical Reservoir Computing based on Spatially Extended Systems

•*J. Pauwels*[1,2], *G. Verschaffelt*[1], *S. Massar*[2], *and G. Van der Sande*[1]; [1]*Vrije Universiteit Brussel, 1050 Brussels, Belgium*; [2]*Université libre de Bruxelles, 1050 Brussels, Belgium*

We focus on photonic reservoir computing with spatially parallel encoded neurons. The spatiotemporal nonlinear diffusive dynamics are exploited to achieve state of the art performance. We present numerical results and are working towards experimental verification.

JSI-P.3 SUN

Laser printing of a nano-imager to perform full optical machine learning

•*E. Goi and M. Gu*; *RMIT University, Melbourne, Australia*

We design a nano-imager for a full optical implementation of a multilayered artificial neural network and explore the feasibility of fabricating the nano-imager in the near infrared using a two-photon symmetry-preserving laser direct fabrication method.

JSI-P.4 SUN

High numerical aperture aberration compensation enabled by an artificial neural network

•*B.P. Cumming and M. Gu*; *Laboratory of Artificial-Intelligence Nanophotonics, School of Science, RMIT University, Melbourne, Australia*

We demonstrate the direct determination the phase aberration of a high numerical aperture optical system from a single forward propagation of two point spread function images through a multi-layer perceptron artificial neural network.

JSI-P.5 SUN

Phase noise robustness of a coherent spatially parallel optical reservoir

•*R. Alata*[1], *J. Pauwels*[2,3], *G. Van der Sande*[3], *A. Bouwens*[1,4], *M. Haelterman*[1], *and S. Massar*[2]; [1]*Université libre de Bruxelles, OPERA, Brussels, Belgium*; [2]*Université libre de Bruxelles, LIQ, Brussels, Belgium*; [3]*Vrije Universiteit Brussel, APHY, Brussels, Belgium*; [4]*KU Leuven, MIP, Leuven, Belgium*

We propose strategies to counter the negative effects of phase noise in a coherent photonic reservoir computer without active stabilization. Our approach uses novel training schemes and readout layer architecture.

JSI-P.6 SUN

Nonlinear Activation Function Generation based on Silicon Microring Resonators for Integrated Photonic Neural Networks

•*M. Catuneanu*[1], *R. Hamerly*[2], *N. Annavarapu*[1], *S. Sabouri*[1], *and K. Jamshidi*[1]; [1]*Technische Universität Dresden, Dresden, Germany*; [2]*Massachusetts Institute of Technology, Cambridge, USA*

By embedding silicon microring resonators in a biased PIN junction, free carrier effects can be controlled. The use of such resonators in photonic neural networks as nonlinear function generators is described and numerically simulated.

JSI-P.7 SUN

Inhibitory Integrate and Fire Neuron based on Quantum-Dot Intra-Band Transitions in a Semiconductor Laser

M. Skontranis[1], *G. Sarantoglou*[2], *and* •*C. Mesaritakis*[1]; [1]*Dept. Information and Communication Systems Engineering, University of the Aegean, Samos, Greece*; [2]*Dept. Informatics and Telecommunications, National and Kapodistrian University of Athens, Athens, Greece*

We demonstrate results concerning optically triggered inhibitory photonic neurons based on single-section lasers. The devices exhibit fire and integrate functionality, offer picosecond neural spikes, whereas inhibition and excitation are encoded as quantum-dot related waveband transitions.

JSI-P.8 SUN

Type II excitability with quantum dot lasers: Canards, bistabilities and more

•*M. Dillane*[1,2], *J. Robertson*[4], *D. Goulding*[2,3], *A. Hurtado*[4], *and B. Kelleher*[1,2]; [1]*Department of Physics, University College Cork,, Cork, Ireland*; [2]*Tyndall National Institute, University College Cork, Lee Maltings, Dyke Parade,, Cork, Ireland*; [3]*Centre for Advanced Photonics and Process Analysis, Cork Institute of Technology,, Cork, Ireland*; [4]*Institute of Photonics, SUPA Department of Physics, University of Strathclyde, TIC Centre, 99 George Street,, Glasgow, United Kingdom*

Quantum dot lasers under optical injection are rich with nonlinear dynamic properties. We show that square wave dynamics can manifest from a Canard Explosion or through a subcritical Hopf. The squares can be deterministically triggered.

JSI-P.9 SUN

Control of neuromorphic dynamics in two state quantum dot lasers

•*M. Dillane*[1,2], *I. Dubinkin*[3], *N. Federov*[3], *T. Erneux*[4], *D. Goulding*[2,5], *B. Kelleher*[1,2], *and E. Viktorov*[3,4]; [1]*University College Cork, Cork, Ireland*; [2]*Tyndall National Institute, Cork, Ireland*; [3]*National Research University of Information Technologies, Mechanics and Optics, St. Petersburg, Russia*; [4]*Université Libre de Bruxelles, Brussels, Belgium*; [5]*Cork Institute of Technology, Cork, Ireland*

Dual state quantum dot lasers provide unique opportunities for neuromorphic dynamics. We demonstrate control over the number of spikes in a bursting regime and over the refractory time in a Type I excitable regime.

JSI-P.10 SUN

Noise and Consistency of Analogue Spatio-Temporal Photonic Neural Networks

•*X. Porte, L. Andreoli, N. Semenova, V. Semenov, M. Jacquot, L. Larger, and D. Brunner*; *FEMTO-ST Institute, Besançon, France*

Physical analogue implementations of neural networks represent a novel and powerful computational paradigm. We analyze in detail the impact of noise on the performance of analogue and large-scale parallel photonic neural networks.

13:00 – 14:00

JSII-P: JSII Poster session

JSII-P.1 SUN

Homodyne scanning and Heterodyne multiplex Sum Frequency spectroscopy in a shaper based nonlinear microscope

•*N. Müller, T. Buckup, and M. Motzkus*; *Physikalisch-Chemisches Institut, Heidelberg, Germany*

High spectral resolution in sum frequency spectroscopy is implemented via pulse shaping of sub 10fs NIR- and MIR-pulses in two detection schemes: homodyne MIR scanning- and heterodyne multiplex detection.

JSII-P.2 SUN

Coherent anti-Stokes Raman Fourier ptychography

•*H. Rigneault, S. Heuke, K. Belkebir, P. Chaumet, and A. Sentenac*; *Aix Marseille University, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*

We present a new wide field imaging scheme by means of coherent Raman Fourier ptychography

JSII-P.3 SUN

Terahertz spectroscopy of different phenotypes of Arabidopsis thaliana

K. Singh[1], D. Garg[1], A. Katiyar[2], Y. Mudgil[2], •A. Bandyopadhyay[3], and A. Sengupta[1]; [1]Department of Physics, Indian Institute of Technology Delhi, New Delhi, India; [2]Department of Botany, Delhi University, New Delhi, India; [3]IITD-JATC, Indian Institute of Technology Delhi, New Delhi, India

We report the results of THz spectroscopic measurements on two different T-DNA insertion mutants in Arabidopsis thaliana. The spectrum shows several absorption peaks corresponding to water and other biochemical molecules, such as, sucrose.

JSII-P.4 SUN

Combining broadband IR-spectroscopy with decomposition of molecular complexity for cancer detection in human blood

•C. Leonardo[1,2], L. Voronina[1,2], M. Huber[1,2], M. Trubetskov[1], K.V. Kepesidis[2], F. Krausz[1,2], and M. Zigman[1,2]; [1]Max-Planck-Institut of Quantum Optics, Garching, Germany; [2]Ludwig-Maximilians-University Department of Physics, Garching, Germany

FTIR spectroscopy combined with chemical decomposition of blood serum and plasma from cancer patients was established. Applications for enhancing cancer detection and providing coarse molecular information about cancer conditions will be discussed.

JSII-P.5 SUN

Mid-infrared spectroscopy and mass spectrometry combined to build a comprehensive lung cancer fingerprint of blood plasma

•L. Voronina[1,2], M. Huber[1,2], P. Geyer[3], J. Muller[3], C. Leonardo[1,2], M. Trubetskov[1,2], K.V. Kepesidis[1], M. Mann[3], F. Krausz[1,2], and M. Zigman[1,2]; [1]Department of Physics, Ludwig-Maximilians-University, Garching, Germany; [2]Max-Planck-Institut of Quantum Optics, Garching, Germany; [3]Max-Planck Institute of Biochemistry, Martinsried, Germany

Combination of infrared spectroscopic fingerprinting and mass spectrometry-based proteomics of human blood plasma provides an insight into the changes in its molecular composition caused by lung cancer and paves the way for spectroscopic disease diagnostics.

JSII-P.6 SUN

Live multi-color coherent Raman imaging enabled by millisecond wavelength tuning

•M. Brinkmann[1,2], T. Hellwig[1,2], and C. Fallnich[1,2]; [1]Institute of Applied Physics, University of Münster, Münster, Germany; [2]Refined Laser Systems, University of Münster, Münster, Germany

We present multi-color coherent Raman imaging with a frame rate of 8 Hz and rapid wavelength tuning within only 5 ms between successive images, enabled by a novel fiber optical parametric oscillator.

13:00 – 14:00

JSIV-P: JSIV Poster session

JSIV-P.1 SUN

Heat-assisted femtosecond breakdown of plasmonic nanoparticles

B.J. Nagy[1,2], Z. Pápa[1,2], L. Péter[1], C. Prietl[3], J.R. Krenn[3], and •P. Dombi[1,2]; [1]MTA Wigner Research Centre for Physics, Budapest, Hungary; [2]ELI-ALPS Research Institute, Szeged, Hungary; [3]Institut für Physik, Karl-Franzens Universität Graz, Graz, Austria

Hot-spot melting of lithographically produced plasmonic nanoparticles induced by femtosecond pulses shows that plasmonic breakdown starts at peak field locations. Highly different damage morphologies are attributed to different peak intensities of the plasmon driving pulse.

JSIV-P.2 SUN

Thermal Contact Resistance Measurement in a combined Scanning Thermal Microscope/ Scanning Electron Microscope

•A. AYARI[1], D. Renahy[1], P. Vincent[1], N. Blanchard[1], E. Guen[2], P.-O. Chapuis[2], S. Merabia[1], and S. Gomés[2]; [1]Univ Lyon, CNRS, UCBL1, ILM UMR 5306, F-69622, Villeurbanne, France; [2]Univ Lyon, CNRS, INSA-Lyon, UCBL1, CETHIL UMR5008, F-69621, Villeurbanne, France

We will present thermal contact measurements on a combined Scanning Thermal Microscope/ Scanning Electron Microscope.

JSIV-P.3 SUN

In-situ Optical Temperature Measurement in Micro-Scale during Ultrafast Laser 3D Nanolithography

•S. Varapnickas[1], J.B. Queiroz[2], D. Baziulytė-Paulavičiienė[3], S. Šakirzanovas[3], and M. Malinauskas[1]; [1]Laser Research Center, Vilnius University, Vilnius, Lithuania; [2]Department of Physics, Faculty of Science and Technology, University of Coimbra, Coimbra, Portugal; [3]Faculty of Chemistry and Geoscience, Vilnius University, Vilnius, Lithuania

We propose a method and setup to monitor temperature dynamics in-situ within microscopic volumes of polymer. Temperature sensing capabilities of different upconverting nanoparticles are investigated and local heating in polymer during 3D laser nanolithography demonstrated.

JSIV-P.4 SUN

Plasmonic Heating of Gold Nanoparticles for Controlling of Current Across Lipid Membranes in Modulating Neuronal Behavior Applications

M.H. Seyed Nazari[1], A. Ghorbani[1], F. Akbari[1], J. Fahanik Babaei[2], A. Eliassi[2], L. Dargahi[3], H. Latifi[1], and •M.I. Zibaii[1]; [1]Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran; [2]Neuroscience Research Center and Department of Physiology, Shahid Beheshti University of Medical Sciences, Tehran, Iran; [3]Neuroscience Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran

An optical stimulation technique based on local plasmonic heating of gold nanoparticles (AuNPs) was used to temperature manipulation of neural cells at the nanoscale which can be utilized to regulate membrane currents and conductance situations of membranes.

JSIV-P.5 SUN

Extraordinary Phonon Transmission and Heat Transfer through Hidden Lattice-Wave Nanochannels

•Y. Kosevich and I. Strelnikov; Semenov Institute of Chemical Physics of Russian Academy of Sciences , Moscow, Russia

We demonstrate theoretically the existence of extraordinary phonon transmission in THz frequency range. We model the layered nanostructure of Ge atoms embedded in Si lattice, which provides narrow transmission peak on almost zero transmission background.

JSIV-P.6 SUN

Spectral Thermal Band Gaps in the Near Field Heat Flux

•G. Pirruccio, J. Perez-Rodriguez, and R. Esquivel-Sirvent; Instituto de Física, Universidad Nacional Autónoma de México, Mexico City, Mexico

We demonstrate the opening and control of spectral band gaps in the near filed heat flux by means of surface plasmon-surface phonon polariton coupling in bilayer nanocavities made of semiconductors and dielectrics.

13:00 – 14:00

JSV-P: JSV Poster Session

JSV-P.1 SUN

Compact quantum imaging based on induced coherence

•M. Gilaberte Basset, J.R. León Torres, and M. Gräfe; Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

We demonstrate quantum imaging based on induced coherence without induced emission in a compact single-crystal setup. Our first results will stimulate further work towards extreme light imaging devices for life science.

JSV-P.2 SUN

Multi-Pulse Fitting of Transition Edge Sensor Signals from a Near-Infrared Continuous-Wave Source

•J. Lee[1], L. Shen[1,2], A. Cerè[1], and C. Kurtsiefer[1,2]; [1]Centre for Quantum Technologies, Singapore, Singapore; [2]Department of Physics, National University of Singapore, Singapore, Singapore

The slow recovery time of Transition-edge sensors limits their photon number resolution and timing accuracy in high photon-flux conditions. We present a solution to resolve overlapping events to the limit of the sensors jitter time.

JSV-P.3 SUN

Towards Terahertz Sensing Based on Precision Measurements of the AC-Stark Effect with Cold Trapped HD^(+) Ions

•F.L. Constantin; Laboratoire PhLAM, CNRS UMR 8523, Villeneuve d'Ascq, France

SI-traceable, broadband THz wave vector detection with sensitivity beyond the Hz/(W/m^2) level may be provided by 10^(-12)-precision measurements of the AC-

Hall B0

Stark shifts induced on the two-photon rovibrational transitions of cold trapped HD^(+) ions.

JSV-P.4 SUN

Mid-infrared sensing by induced coherence in a single nonlinear waveguide

•*P. Kumar, S. Saravi, T. Pertsch, and F. Setzpfandt*; *Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Albert-Einstein-Str. 15, Jena, Germany*

We study photon-pair generation and induced coherence in homogeneous nonlinear waveguides using a general formalism based on Green's functions. We demonstrate that the arising quantum interference enables mid-infrared spectroscopy without detecting mid-infrared photons.

JSV-P.5 SUN

Quantification of NV-centres in Diamond for Room-Temperature Maser

•*J. Sathian*[1], *J. Breeze*[1], *B. Breeze*[3], *A. Frangeskou*[2], *G. Morley*[2], *and N. Alford*[1]; [1]*Department of Materials, Imperial College London, London, United Kingdom*; [2]*Department of Physics, University of Warwick, Coventry, United Kingdom*; [3]*Spectroscopy Research Technology Platform, University of Warwick, Coventry, United Kingdom*

We report the spectroscopic (absorbance, fluorescence and EPR), and charge transfer studies of NV defect centres in CVD-grown diamond samples for room-temperature continuous maser. The sample concentrations vary from 0.001-2.5 ppm suitable for maser action.

NOTES

ROOM 1 ICM

8:30 – 9:30

PL-1: 2019 CLEO/Europe Plenary Talk
Chair: Trevor Benson, University of Nottingham, Nottingham, United Kingdom

PL-1.1 MON (Plenary) 8:30

The revolution of silicon photonics
•*M. Lipson*; *Columbia University, New York, USA*
We are now experiencing a revolution in optical technologies, where one can print and control massive optical circuits, on a microelectronic chip.

9:40 – 11:00

PL-2: 2019 WoP Congress Opening and Plenary Talk

09:40 – 10:00

Welcome address chaired by **Peter Loosen**, *president of the World of Photonics congress steering committee, Fraunhofer Institute for Laser Technology ILT, Aachen, Germany.*

PL-2.1 MON (Plenary) 10:00

Gravitational Wave Astronomy: Listening to the sounds of the dark universe!
•*K. Danzmann*; *Max Planck Institute of Gravitational Physics, Hannover, Germany*
For thousands of years we have been looking at the universe with our eyes. But most of the universe is dark and will never be observable with electromagnetic waves. Since September 14th, 2015, everything is different: Gravitational waves were discovered!

ROOM 1 ICM

11:15 – 12:45

CJ-5: Mid-IR laser sources and components
Chair: Jesper Loegsgaard, Technical University of Denmark, Kgs. Lyngby, Denmark

CJ-5.1 MON (Invited) 11:15

Chalcogenide Glass Fiber Components for the Fabrication of Mid-Infrared Optical Sources
•*M. Rochette*; *McGill University, Montréal, Canada*
This talk features recent achievements of the Nonlinear Photonics Group at McGill University towards the fabrication of chalcogenide-based mid-infrared optical fiber components such as nonlinear gain fiber and optical fiber couplers.

ROOM 2 ICM

11:15 – 12:45

JS SPIE-OM-EQEC: Computational photonics for metrology application
Chair: Bernd Bodermann, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

JS SPIE-OM-EQEC.1 MON (Invited) 11:15

Numerical Optimization of Resonant Photonic Devices
•*M. Hammerschmidt*[1], *L. Zschiedrich*[1], *P.-I. Schneider*[1], *F. Binkowski*[2], *X.G. Santiago*[1,3], *and S. Burger*[1,2]; [1]*JCMwave GmbH, Berlin, Germany*; [2]*Zuse Institute Berlin (ZIB), Berlin, Germany*; [3]*Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*
We report on new numerical techniques to characterize and optimize light-matter interaction with photonic nanoresonators. We employ a Riesz-projection based expansion to analyze dispersive nanoresonators and use machine learning to optimize a single-photon emitter.

ROOM 3 ICM

11:15 – 12:45

EB-5: Quantum state engineering
Chair: Nicolò Spagnolo, Sapienza Università di Roma, Rome, Italy

EB-5.1 MON 11:15

Programming Multiphoton Entanglement: Theory and Practice
•*J.C. Adcock, C. Vigliar, S. Morley-Short, R. Santagati, J.W. Silverstone, and M.G. Thompson*; *Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom*
Graph states provide an essential language of entanglement for quantum information. We develop 4-8 photon graph state generators and experimentally implement the four-photon variant to demonstrate both kinds of four-qubit graph state entanglement.

EB-5.2 MON 11:30

Hypercube states for sub-Planck sensing
•*T. Weinhold*[1], *L. Howard*[1], *J. Combes*[1], *F. Shahandeh*[2], *M. Vanner*[3], *M. Ringbauer*[4], *and A. White*[1]; [1]*Centre for Engineered*

ROOM 4a ICM

11:15 – 12:45

EE-3: Ultrafast control by light
Chair: Ellen Backus, Max Planck Institute for Polymer Research, Mainz, Germany

EE-3.1 MON (Invited) 11:15

Lightwave valleytronics at multi-terahertz clock rates
•*C.P. Schmid*[1], *F. Langer*[1], *S. Schlauderer*[1], *M. Gmitra*[1], *J. Fabian*[1], *P. Nagler*[1], *T. Korn*[1], *C. Schüller*[1], *P.G. Hawkins*[2], *J.T. Steiner*[2], *U. Huttner*[2], *S.W. Koch*[2], *M. Kira*[3], *and R. Huber*[1]; [1]*University of Regensburg, Regensburg, Germany*; [2]*University of Marburg, Marburg, Germany*; [3]*University of Michigan, Ann Arbor, USA*
Intense multi-terahertz fields recollide electron-hole pairs in monolayer tungsten diselenide and flip their valley pseudospin by subcycle intraband transport. This dynamics manifests in high-odd-order sideband generation and paves the way to ultimately fast valleytronics.

ROOM 4b ICM

11:15 – 12:45

CK-4: Photonic integration
Chair: Max Yan, KTH - Royal Institute of Technology, Stockholm, Sweden

CK-4.1 MON 11:15

Thermal Generation and Manipulation of Graphene Plasmons
•*E.J.C. Brioso Dias*[1], *R. Yu*[1], *and F.J. García de Abajo*[1,2]; [1]*ICFO - The Institute of Photonic Sciences, Castelldefels, Spain*; [2]*ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*
We propose the generation and modulation of surface plasmons in graphene by using localized or periodic heat patterns, which locally heat the graphene electrons and modulate its conductivity, thus allowing for the excitation of plasmons.

CK-4.2 MON 11:30

Integrated 2D Beam-steering device assisted by fixed lens
•*C. Li, X. Cao, K. Wu, X. Li, and J. Chen*; *State Key Laboratory of Advanced Optical Communication Systems and Networks, Department*

ROOM 13a ICM

11:15 – 12:45

CA-5: Thin disk lasers
Chair: Oleg Pronin, Helmut-Schmidt-Universität, Hamburg, Germany

CA-5.1 MON 11:15

95-fs Yb:Lu_2O_3 Thin-Disk Laser Operating at 21 W Average Power
•*N. Modsching*[1], *J. Drs*[1], *J. Fischer*[1], *C. Paradis*[1], *F. Labaye*[1], *M. Gaponenko*[1], *C. Kränkel*[2], *V.J. Wittwer*[1], *and T. Südmeyer*[1]; [1]*Laboratoire Temps-Fréquence, Institut de Physique, Université de Neuchâtel, Avenue de Bellevaux 51, Neuchâtel, Switzerland*; [2]*Center for Laser Materials, Leibniz-Institut für Kristallzüchtung, Max-Born-Str. 2, Berlin, Germany*
We demonstrate power-scaling of a thin-disk laser oscillator operating at sub-100-fs pulse duration by a factor of two while tripling its optical-to-optical efficiency. This is the highest average power achieved by any sub-100-fs oscillator.

CA-5.2 MON 11:30

High-power dual-comb thin-disk oscillator
•*K. Fritsch*[1], *J. Brons*[1], *M. Ianduskii*[1], *K.F. Mak*[2], *Z. Chen*[2], *F. Krausz*[1,2], *N. Picqué*[2], *and O. Pronin*[2]; [1]*Ludwig-Maximilians-Universität München,*

NOTES

ROOM 14a ICM

11:15 – 12:45

EH-1: Engineering nontrivial light fields

Chair: Femius Koenderink, AMOLF, Amsterdam, The Netherlands

EH-1.1 MON (Tutorial) 11:15

Metamaterials, Anapoles and Flying Donuts

•*N. Zheludev*; *University of Southampton, Southampton, United Kingdom*; *Nanyang Technological University, Singapore, Singapore*

Metamaterials have been the platform for experimental development of a new chapter in electrodynamics devoted to toroidal and anapole modes of excitation and the generation of electromagnetic flying donuts, topologically robust formation of vortices.

ROOM 14b ICM

11:15 – 12:45

CM-5: Laser nanostructuring of transparent materials for advanced devices

Chair: Airán Ródenas, CNR-Institute for Photonics and Nanotechnologies, Milan, Italy

CM-5.1 MON 11:15

Control of Laser Induced Stress for Diffractive Optics in Transparent Media

•*Q. Sun, T. Lee, M. Beresna, and G. Brambilla*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We demonstrate a stress modification technique for improving the diffraction efficiency of diffractive optics written in silica with femtosecond Bessel beam pulses. A 2-layer Fresnel lens with 60% efficiency was achieved.

CM-5.2 MON 11:30

Femtosecond laser induced of Nano-gratings on a thin GaN layer grown on a sapphire substrate

•*A. Halstuch and A.A. Ishaaya*; *Ben-Gurion University, Beer Sheva, Israel*

Nano-gratings with various periods

ROOM Osterseen ICM

11:15 – 12:45

CL-1: Clinical applications

Chair: Varpu Marjomäki, University of Jyväskylä, Jyväskylä, Finland

CL-1.1 MON 11:15

Guiding prostate cancer biopsies using time resolved 3D fluorescence tomography combined with ultrasound imaging

•*C. Handschin*[1], *C. Genevois*[1], *S. Vidal*[2], *G. Machinet*[2], *J. Boullet*[2], *M. Perriollat*[3], *O. Redon*[4], *F. Couillaud*[1], *and N. Grenier*[1]; [1]*Imagerie moléculaire et thérapies innovantes en oncologie, EA 7435, Université de Bordeaux, Bordeaux, France*; [2]*ALPhANOV, Optics and lasers technology center, Talence, France*; [3]*CEA-LETI, Département micro technologies pour la biologie et la santé, Grenoble, France*; [4]*CEA Tech en Nouvelle-Aquitaine, Pessac, France*

We implemented an instrument based on time resolved fluorescence tomography coupled with ultrasound to localize prostate tumors. An in-vivo demonstration has been carried out on a mice model to evaluate the pertinence of the method.

CL-1.2 MON 11:30

Multi-elemental Imaging of Breast Cancer Tissues Using Laser-Induced Breakdown Spectroscopy

•*X. Li*[1,2], *S. Yang*[1,2], *X. Chen*[3], *G. Yao*[4], *A. Liu*[3], *and X. Yu*[1,2];

ROOM 1 Hall A1

11:15 – 12:45

CH-5: Integrated sensors II

Chair: Hatice Altug, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

CH-5.1 MON (Invited) 11:15

Comparison of Thin-Film-Transistor and Photonic Crystal Protein Sensors

•*J.J. Huang*; *Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei City, Taiwan*

We present two novel biosensing schemes. We first demonstrate an IGZO TFT with dual gates for biomaterial and bioreaction sensing. Second, we show compact 2D photonic crystal biosensors based on a cut-off wavelength approach.

ROOM 2 Hall A1

11:15 – 12:45

CF-5: Techniques for wavelength conversion of ultrashort pulses

Chair: Andrius Baltuska, Technical University Vienna, Vienna, Austria

CF-5.1 MON 11:15

Inter-pulse dynamics at high repetition rates by femtosecond ionization in gas-filled fibres

•*F. Köttig*[1], *J.R. Koehler*[1], *F. Tani*[1], *and P.S.J. Russell*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

The guiding characteristics of hollow-core PCFs are modified at high repetition rates due to long-lived gas density changes after femtosecond ionization. The resulting changes in dispersion cause the generated UV dispersive waves to redshift.

CF-5.2 MON 11:30

High-Power 50-MHz Source of Waveform-Stable, Multi-Octave Infrared Pulses

•*T.P. Butler*[1], *J. Xu*[1], *N. Lilienfein*[1], *N. Nagl*[2], *D. Gerz*[1,2], *C. Hofer*[1,2], *C. Gaida*[3], *T. Heuermann*[3,4], *M. Gebhardt*[3,4], *M. Fischer*[5], *R. Holzwarth*[5], *M. Mei*[5], *J. Limpert*[3,4,6], *F. Krausz*[1,2], *K.F. Mak*[1], *O. Pronin*[1], *and I. Pupeza*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig Maximillian*

ROOM 3 Hall A1

11:15 – 12:45

CE-5: Novel light confinement waveguides technologies

Chair: Pier Sazio, ORC University of Southampton, Southampton, United Kingdom

CE-5.1 MON (Invited) 11:15

The Light Cage – an on-chip hollow-core waveguide implemented by 3D nanoprinting

•*J. Gargiulo*[1], *B. Jang*[2], *G. Li*[2], *S.A. Maier*[2], *and M.A. Schmidt*[2,3,4]; [1]*Chair in Hybrid Nanosystems, Nanoinstitute Munich, Ludwig-Maximilians-Universität, Munich, Germany*; [2]*Leibniz Institute of Photonic Technology, Jena, Germany*; [3]*Otto Schott Institute of Materials Research (OSIM), Friedrich Schiller University, Jena, Germany*; [4]*Abbe Center of Photonics and Faculty of Physics, Friedrich-Schiller-University, Jena, Germany*

We present a nanoprinted on-chip hollow-core light cage allowing guided light propagation over centimeters. The structure is side-wise open and concentrates >99% of modal field to the hollow region, enabling applications in sensing and quantum technology.

ROOM 1 ICM

CJ-5.2 MON 11:45

Tunable all-fiber laser for remote sensing of methane near 3.4 μm

•*L.-P. Pleau, V. Fortin, F. Maes, R. Vallée, and M. Bernier; Centre d'optique, photonique et laser, Québec, Canada*

We present a tunable all-fiber laser operating near 3.43 μm with 3 W of output power, specifically designed for remote sensing of methane via absorption lines decoupled from other atmospheric gases.

CJ-5.3 MON 12:00

High Energy Pulses from a Wavelength Tunable Dy:ZBLAN Mid-Infrared Fiber Laser

•*M. Majewski, R. Woodward, and S. Jackson; Macquarie University, North Ryde, Australia*

We present an actively Q-switched dysprosium mid-IR fiber laser. Pulse energies of up to 12 μJ at a

ROOM 2 ICM

JS SPIE-OM-EQEC.2 MON (Invited) 11:45

Lensless Metrology for Semiconductor Lithography at EUV

•*I. Mochi, R. Rajeev, D. Kazazis, L.-T. Tseng, P. Helfenstein, S. Fernandez, U. Locans, A. Dejkameh, R. Nebling, and Y. Ekinci; Paul Scherrer Institute, Villigen, Switzerland*

Extreme ultra violet (EUV) semiconductor lithography requires at wavelength metrology to identify defects as small as 10 nm. We describe an experimental approach to perform lensless inspection of EUV masks using Coherent Diffraction Imaging.

ROOM 3 ICM

Quantum Systems, Brisbane, Australia; [2]Department of Physics, Swansea, United Kingdom; [3]QOLS, Blackett Laboratory, London, United Kingdom; [4]Institute für Experimentalphysik, Innsbruck, Austria

Hypercube states, a new quantum mechanical states class highly sensitive to displacements, have potential for sensing at the sub-Planck scale. We investigate the effects of noise and coupling strength and present an experimental realisation.

EB-5.3 MON 11:45

Plug-and-Play generation and manipulation of squeezing on chip

•*F. Mondain[1], T. Lunghi[1], A. Zavatta[2,3], E. Gouzien[1], F. Doutre[1], M. de Micheli[1], S. Tanzilli[1], and V. d'Auria[1]; [1]Université Côte d'Azur, Institut de Physique de Nice (INPHYNI), CNRS UMR 7010, Nice, France; [2]Istituto Nazionale di Ottica (INO-CNR), Florence, Italy; [3]LENS and Department of Physics, Universitá di Firenze, Florence, Italy*

We demonstrate a plug-and-play squeezing experiment entirely based on lithium-niobate integrated optics and off-the-shelves fiber components. We achieve -2 dB of squeezing confirming the validity of this original approach that opens to real-world continuous-variable experiments.

EB-5.4 MON 12:00

Generation of non-Gaussian quantum states of multimode light field

•*Y.-S. Ra[1,2], A. Dufour[1], M. Walschaers[1], C. Jacquard[1], T. Michel[1,3], C. Fabre[1], and N. Treps[1]; [1]Laboratoire Kastler Brossel, Paris, France; [2]Korea Advanced Institute of Science and Technology*

ROOM 4a ICM

EE-3.2 MON 11:45

Femtosecond Streaking and Control of Electrons from a Plasmonic Nanofocusing Taper by Photoemitted Charges in a Nanoantenna

G. Hergert[1], A. Woeste[1], J. Vogelsang[1], D. Wang[2], •P. Gross[1], and C. Lienau[1]; [1]Carl von Ossietzky University, Oldenburg, Germany; [2]TU Ilmenau, Ilmenau, Germany

We observe photoemission of electrons and probe their motion inside a plasmonic nanoantenna with ultrafast point-projection electron microscopy. Measuring the kinetic energy of the slow probe provides evidence of streaking by the free charges.

EE-3.3 MON 12:00

Extreme-Ultraviolet Pulses with Self-Torque

•*L. Rego[1], K.M. Dorney[2], N.J. Brooks[2], Q. Nguyen[2], C.-T. Liao[2], J. San Roman[1], D.E. Couch[2], A. Liu[2], E. Pisanty[3], M. Lewenstein[3], L. Plaja[1], H.C. Kapteyn[2], M.M. Murnane[2], and C. Hernandez-Garcia[1]; [1]University of Salamanca,*

ROOM 4b ICM

of Electronic Engineering, Shanghai Jiao Tong University, shanghai, China

An integrated 2D beam-steering device is demonstrated on a silicon nitride platform assisted by a fixed lens. The device has O(logN) power consumption, 19 dB background suppression and 0.0167-degree beam divergence.

CK-4.3 MON 11:45

Ultrafast perturbation mapping for characterization of photonic integrated circuits

•*N.J. Dinsdale[1], K. Vynck[2], M. Milosevic[1], P. Lalanne[2], G.T. Reed[1], and O.L. Muskens[1]; [1]University of Southampton, Southampton, United Kingdom; [2]LP2N, Bordeaux, France*

Ultrafast photomodulation spectroscopy is a powerful non-destructive characterization tool capable of remotely mapping photonic integrated circuits at the wafer scale through a far-field optically induced scanning perturbation.

CK-4.4 MON 12:00

Inverse Design of Compact Digital Nanophotonic Power Dividers with Arbitrary Power Ratios Using Modified Adjoint Method

•*Y. Zhang[1], X. Ren[1], D. Liu[1], M. Yan[2], and M. Zhang[1]; [1]Huazhong University of Science and Technology, Wuhan, China; [2]KTH - Royal Insti-*

ROOM 13a ICM

Garching, Germany; [2]Max-Planck-Institut für Quantenoptik, Garching, Germany

A new design of dual-comb system is demonstrated with a fully-passive Yb:YAG think-disk femtosecond laser of an average power of 12W. Spectra exhibiting resolved comb lines of sub-hertz linewidth are obtained without any active stabilization.

CA-5.3 MON 11:45

Thin-disk laser emitting beams with 980 W of CW-output power and radial polarization

•*T. Dietrich[1], M. Rumpel[2], C.-M. Mateo[3], C. Pruss[3], W. Osten[3], T. Graf[1], and M. Abdou-Ahmed[1]; [1]Institut für Strahlwerkzeuge (IFSW), University of Stuttgart, Stuttgart, Germany; [2]MarTec Photonics, Stuttgart, Germany; [3]Institut für Technische Optik (ITO), University of Stuttgart, Stuttgart, Germany*

We report on radially polarized laser beams with up to 980 W of output power in cw operation by integrating polarization selective highly-reflective grating-waveguide mirrors into an Yb:LuAG thin-disk laser setup.

CA-5.4 MON 12:00

Thin disk laser operating in fundamental mode up to a power of 4kW

•*S. Nagel, B. Metzger, T. Gottwald, V. Kuhn, A. Killi, and S.-S. Schad; TRUMPF Laser GmbH, 78713 Schramberg, Germany*

We present a thin disk laser system operating in fundamental mode up

ROOM 14a ICM | ROOM 14b ICM | ROOM Osterseen ICM | ROOM 1 Hall A1 | ROOM 2 Hall A1 | ROOM 3 Hall A1

were inscribed on the surface of a thin GaN layer grown on a sapphire substrate. These gratings are generated by illuminating the surface with 800 nm femtosecond pulses and a phase-mask.

CM-5.3 MON (Invited) 11:45

Low-loss geometric phase elements by femtosecond laser writing in silica glass

•*M. Sakakura, Y. Lei, L. Wang, Y. Yu, and P.G. Kazansky*; *University of Southampton, Southampton, United Kingdom*

Birefringent modification with high optical transmission is produced by focusing femtosecond laser pulses inside silica glass. Geometric phase elements with negligible loss from UV to IR are demonstrated.

[1]*Inst. of Opto-electronics, Harbin Inst. of Technology, Harbin, China*; [2]*Nat. Key Laboratory on Tunable Laser, Harbin Inst. of Technology, Harbin, China*; [3]*Depart. of Hematology, Harbin Medical Univ. Cancer Hospital, Harbin, China*; [4]*Depart. of Pathology, Harbin Medical Univ. Cancer Hospital, Harbin, China*

Multi-elemental imaging of beast cancer tissues was investigated using laser-induced breakdown spectroscopy. Distribution of calcium, potassium, magnesium and sodium in the cancer tissues was obtained and analysed.

CL-1.3 MON 11:45

Field-resolved infrared spectroscopy of human blood to tackle lung, prostate and breast cancer detection

•*M. Huber*[1,2], *L. Voronina*[1,2], *W. Schweinberger*[2,3], *C. Leonardo*[1,2], *K.V. Kepesidis*[2], *C. Hofer*[1,2], *S.A. Hussain*[2], *M. Trubetskov*[1], *A.M. Azzeer*[3], *I. Pupeza*[1,2], *F. Krausz*[1,2], *and M. Zigman*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig Maximillian University Munich, Department of Physics, Garching, Germany*; [3]*King Saud University, Department of Physics and Astronomy, Riyadh, Saudi Arabia*

We perform field-resolved spectroscopy demonstrating sub-μg/ml sensitivities and asses its applicability for cancer detection in a clinical study of 336 individuals by measuring sera of lung, breast and prostate cancer patients along with reference subjects.

CL-1.4 MON 12:00

Restoration of Damaged Dental Enamels using Nano-scale Iron-Calcium Phosphate Minerals and Femto-second pulsed near-IR Lasers

A. Anastasiou[1], *S. Strafford*[2], *M. Malinowski*[2], *A.P. Brown*[1], *M.S. Duggal*[2], *M.N. Routledge*[3], *T.J. Edwards*[4], *C.T.A. Brown*[4], *and*

CH-5.2 MON 11:45

Miniaturised, Planar, Integrated Bragg Grating Spectrometer

•*J.W. Field, S.A. Berry, R.H.S. Bannerman, D.H. Smith, J.C. Gates, C.B.E. Gawith, and P.G.R. Smith*; *Optoelectronics Research Centre, Southampton, United Kingdom*

We present a planar, integrated spectrometer using blazed, large-angle, chirped, Bragg gratings. These gratings were fabricated with direct UV writing in FHD silica-on-silicon. Our device has a 2.3 nm spectral resolution over 100 nm bandwidth.

CH-5.3 MON 12:00

On-chip photocurrent displacement sensor based on a wave-guide-coupled nanomechanical photonic crystal cavity

•*F. Galeotti*[1], *I. Sersic Vollenbroek*[1], *M. Petruzzella*[1,2], *F. Pagliano*[1,2], *F. van Otten*[1], *Z. Zobenica*[1], *H. Sadeghian Marnani*[3], *A. Mohtashami*[3], *R. van der Heijden*[1],

University, Munich, Germany; [3]*Friedrich Schiller University Jena, Jena, Germany*; [4]*Helmholtz Institute Jena, Jena, Germany*; [5]*Menlo Systems GmbH, Martinsreid, Germany*; [6]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present a fibre-based 50-MHz laser source of Watt-scale, waveform-stable pulses, covering nearly 4 octaves in the spectral region of fundamental and overtone molecular vibrations (1.4 to 20 μm) with 3 channels.

CF-5.3 MON (Invited) 11:45

Mastering Ultrafast UV Light in Hollow-Core Photonic Crystal Fibres

•*D. Novoa*; *Max-Planck Institute for the Science of Light, Erlangen, Germany*

Self-compression of ultrashort UV pulses to sub-6-fs duration and generation of broad supercontinua are demonstrated in gas-filled hollow-core fibres. Optimization of parameters such as core size and core-wall thickness lead to an improved ultraviolet performance

CE-5.2 MON 11:45

Composite Material Antiresonant Fibre Optical Modulator with >3dB Depth

•*A.H. Lewis, F. De Lucia, W. Belardi, C.-C. Huang, J.R. Hayes, F. Poletti, D.W. Hewak, and P.J.A. Sazio*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

Here, we integrate an antiresonant fibre with a 2D material, MoS2, for the creation of a CM-ARF. By applying an electrical field onto the device, we show electro-absorptive modulation, reaching a modulation depth of 3.52dB.

CE-5.3 MON 12:00

Experimental observation of non-orthogonal modes in tight-binding lattices

•*L. Maczewsky, S. Weimann, M. Kremer, M. Heinrich, and A. Szameit*; *Universität Rostock, Institute of Physics, Rostock, Germany*

The non-orthogonality of modes is often neglected yet indispensable for

ROOM 1 ICM

duration of 270 ns are achieved over a tunable wavelength range of 2.97 to 3.23 μm.

CJ-5.4 MON 12:15

Chalcogenide Glass Polarization-Maintaining Photonic Crystal Fiber for Mid-Infrared Supercontinuum Generation

•*A.N. Ghosh*[1], *M. Meneghetti*[2], *C.R. Petersen*[4], *O. Bang*[4], *L. Brilland*[3], *S. Venck*[3], *J. Troles*[2], *J.M. Dudley*[1], *and T. Sylvestre*[1]; [1]*Institut FEMTO-ST, CNRS, Universite Bourgogne Franche-Comte, Besancon, France*; [2]*Glasses and Ceramics Group, ISCR UMR-CNRS 6226, University of Rennes 1, 35042 Rennes, France*; [3]*SelenOptics, 263 Avenue du Gal Leclerc, Campus de Beaulieu, 35700 Rennes, France*; [4]*DTU Fotonik, Dept. of Photonics Engineering, Technical University of Denmark, Ørsteds Plads 343, 2800 Kongens Lyngby, Denmark*

Polarization-maintaining mid-IR supercontinuum generation from 3.1 μm up to 6.02 μm is experimentally demonstrated in an As38Se62 glass highly-birefringent photonic crystal fiber pumped by an optical parametric generation source for OCT applications.

CJ-5.5 MON 12:30

Long-wave IR luminescence of Tb3+ and Sm3+ doped Ga5Ge20Sb10Se65 fibers

•*F. Starecki*[1], *N. Abdellaoui*[2], *A. Braud*[1], *J.-L. Doualan*[1], *C. Boussard-Plédel*[2], *B. Bureau*[2], *P. Camy*[1], *and V. Nazabal*[2]; [1]*CIMAP UMR6252 CEA-CNRS-ENSICAEN, Université de Caen, France, Caen, France*; [2]*ISCR Institut des Sciences Chimiques de Rennes, UMR-CNRS 6226,*

ROOM 2 ICM

JS SPIE-OM-EQEC.3 MON (Invited) 12:15

Metrology for and with Nanooptics

•*T. Pertsch*; *Friedrich Schiller University, Jena, Germany*; *Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*; *Max Planck School of Photonics, Munich, Germany*

While quantitatively characterizing nanooptical elements requires dedicated metrology methods, nanooptics itself enables novel ultraprecise measurement methods. Reported advances in these techniques range from white light interferometry and nearfield optical microscopy to lensless XUV metrology.

ROOM 3 ICM

(KAIST), Daejeon, South Korea; [3]*The Australian National University, Canberra, Australia*

We generate non-Gaussian quantum states of multimode light by subtracting a photon from multimode Gaussian states, which exhibits negativity of a Wigner function. We observe that photon subtraction makes non-trival effects on multimode entangled states.

EB-5.5 MON 12:15

Maximisation of Quantum Correlations under Local Filtering Operations

•*S. Wollmann*[1], *A. Ducara*[1], *X. Qiang*[2,3], *J. Tasker*[1], *X. Zhou*[4], *J. Wang*[5], *C. Wilkes*[1], *T. Loke*[6], *S. O'Gara*[1], *L. Kling*[1], *G. Marshall*[1], *R. Santagati*[1], *T. Ralph*[7], *J. Wang*[1], *J. O'Brien*[1], *M. Thompson*[1], *P. Skrzypczyk*[1], *and J. Matthews*[1]; [1]*University of Bristol, Bristol, United Kingdom*; [2]*National University of Defense Technology, Changsha, China*; [3]*National Innovation Institute of Defense Technology, Beijing, China*; [4]*Sun Yat-sen University, Guangzhou, China*; [5]*Peking University, Beijing, China*; [6]*The University of Western Australia, Crawley, Australia*; [7]*University of Queensland, Brisbane, Australia*

We show the first experimental demonstration of quantum steering ellipsoids with integrated photonics. Further, we show a new local filtering operation and how it can improve properties of the quantum steering ellipsoid.

EB-5.6 MON 12:30

An optimal strategy to recover nonlocality of polarization-entangled state from a SPDC source via entanglement swapping relay

•*Y. Tsujimoto*[1], *C. You*[1,2], *K. Wakui*[1], *M. Fujiwara*[1], *K. Hayasaka*[1], *S. Miki*[3,4], *H. Terai*[3], *M. Sasaki*[1], *J. P. Dowling*[2,5,6], *and M. Takeoka*[1]; [1]*National Institute of Information and Communications Technology (NICT), Tokyo, Japan*; [2]*Louisiana*

ROOM 4a ICM

Salamanca, Spain; [2]*JILA - University of Colorado , Boulder, USA*; [3]*ICFO - Institut de Ciencies Fotoniques, Castelldefels, Spain*

We present a novel class of light pulses presenting self-torque —beams carrying time-dependent orbital angular momentum. Self-torqued pulses in the extreme-ultraviolet regime are created theoretically and experimentally through high harmonic generation.

EE-3.4 MON 12:15

Subcycle observation of lightwave-driven Dirac currents in a topological surface band

•*S. Schlauderer*[1], *J. Reimann*[2], *C.P. Schmid*[1], *F. Langer*[1], *S. Baierl*[1], *K.A. Kokh*[3], *O.E. Tereshchenko*[4], *A. Kimura*[5], *C. Lange*[1], *J. Güdde*[2], *R. Huber*[1], *and U. Höfer*[2]; [1]*University of Regensburg, Regensburg, Germany*; [2]*Fachbereich Physik, Philipps-Universität, Marburg, Germany*; [3]*V.S. Sobolev Institute of Geology and Mineralogy , Novosibirsk, Russia*; [4]*A.V. Rzhanov Institute of Semiconductor Physics , Novosibirsk, Russia*; [5]*Graduate School of Science, Hiroshima University, Hiroshima, Japan*

The first subcycle angle-resolved photoemission study unveils how an intense terahertz waveform accelerates topologically protected Dirac fermions on the surface of Bi_2Te_3. Spin-momentum locking enables fully ballistic, inertia-free lightwave currents over several 100 nm.

EE-3.5 MON 12:30

Excitonic Effects in Single Layer MoS2 Probed by Broadband Two-dimensional Electronic Spectroscopy

•*M. Maiuri*[1], *S. Dal Conte*[1], *M. Russo*[1], *J. Wang*[2], *G. Soavi*[2], *D. Dumcenco*[3], *A. Kis*[3], *M. Selig*[4], *S. Khun*[4], *M. Richter*[4], *A. Knorr*[4], *A.C. Ferrari*[2], *and G. Cerullo*[1]; [1]*Politecnico di Milano, Milano, Italy*; [2]*Cambridge Graphene Centre,*

ROOM 4b ICM

tute of Technology, Stockholm, Sweden

Inverse-designed compact digital nanophotonic power dividers with division ratios of 1:2, 1:3 and 1:4 are demonstrated using a modified adjoint method, which have low insertion losses and accurate division ratios over a 40-nm bandwidth.

CK-4.5 MON (Invited) 12:15

Surface Plasmon Optoelectronics on Silicon

•*P. Berini*; *University of Ottawa, Ottawa, Canada*

We discuss progress on plasmonic and metasurface optoelectronic devices on silicon. Emphasis is placed on sub-bandgap hot-carrier photodetectors, high-speed intensity modulators, and non-linear devices. Surface-normal structures are of particular interest.

ROOM 13a ICM

to a power of 4 kW under helium atmosphere using active and passive optical components to compensate for aberrations.

CA-5.5 MON 12:15

Thin-disk multipass amplifier delivering radially polarized ultrafast pulses with an average output power of 1 kW

•*A. Loescher, J.-P. Negel, C. Röcker, F. Beirow, T. Graf, and M. Abdou Ahmed*; *Institut für Strahlwerkzeuge, University of Stuttgart, Stuttgart, Germany*

We present our latest achievements on the amplification of ultrafast beams with radial/azimuthal polarization using a thin-disk multipass amplifier. Up to 1002 W of average output power could be extracted at 300 kHz repetition rate.

CA-5.6 MON 12:30

180 W single-mode laser operation of an Yb:YAG thin disk using a robust direct-bonding process

L. Deyra[1], •*R. Bello Doua*[1], *M. Jose Milla*[1], *J. Boullet*[1], *P. Heu*[2], *D. Follman*[2], *G. D. Cole*[2], *A. Saci*[3], *J.G. Brisset*[3], *and A. Courjaud*[3]; [1]*Alphanov, Talence, France*; [2]*Crystalline Mirror Solutions LLC, Santa Barbara, USA*;

ROOM 14a ICM

EH-1.2 MON 12:15

Bound states in the continuum at THz frequencies: Resonances with infinite lifetime in gold dimer arrays

•*S. ter Huurne*[1], *N. van Hoof*[1], *D.R. Abujetas*[2], *J.A. Sanchez-Gil*[2], *and J. Gómez Rivas*[1]; [1]*Eindhoven University of Technology, Eindhoven, Netherlands*; [2]*Consejo Superior de Investigaciones Científicas, Madrid, Spain*

Metasurfaces consisting of two resonators per unit-cell can support resonances with infinitely long lifetime known as bound states in the continuum. We investigate theoretically and experimentally the conditions leading to the formation of these resonances.

EH-1.3 MON 12:30

A dielectric magnetic nanoantenna designed by evolutionary optimization

•*M. Mivelle*; *CNRS, Sorbonne Université, Paris, France*

We demonstrate that evolutionary algorithms are relevant to design new dielectric photonic nanoantennas, able to increase and extract the optical magnetic field from high refractive index materials.

ROOM 14b ICM

CM-5.4 MON 12:15

Compact Femtosecond Laser Direct Written Integrated Retarders Based On Embedded Nanogratings

•*K.A. Lammers*[1], *M. Ehrhardt*[2], *J.-P. Bérubé*[3], *A. Alberucci*[1], *A. Szameit*[2], *R. Vallée*[3], *and S. Nolte*[1,4]; [1]*Institute of Applied Physics, Abbe School of Photonics, Friedrich Schiller University Jena, Jena, Germany*; [2]*Institute for Physics, Rostock University, Rostock, Germany*; [3]*Centre d'optique, photonique et laser (COPL), Université Laval, Quebec City, Canada*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Using femtosecond laser direct writing we have monolithically added embedded waveplates made of nanogratings into fused silica waveguides. Full control over orientation and retardation of these very compact integrated waveplates will be demonstrated.

CM-5.5 MON 12:30

Understanding nanogratings elastic anisotropy: A step towards femtosecond laser-written elastic meta-crystal

•*P. Vlugter and Y. Bellouard*; *Galatea Lab, STI/IMT, Ecole Polytechnique Fédérale de Lausanne (EPFL), Neuchâtel, Switzerland*

We characterize the elastic properties of femtosecond laser-written nanogratings in fused silica. These

ROOM Osterseen ICM

•*A. Jha*[1]; [1]*Faculty of Engineering, University of Leeds, Leeds, United Kingdom*; [2]*Leeds Dental School, Worsley Building, University of Leeds, Leeds, United Kingdom*; [3]*Leeds Institute of Cardiovascular and Metabolic Medicine, Faculty of Medicine and Health, University of Leeds, Leeds, United Kingdom*; [4]*SUPA, School of Physics and Astronomy, University of St Andrews, St. Andrews, United Kingdom*

A novel femto-second pulsed-laser induced densification of iron-oxide doped calcium phosphate mineral is investigated in the context of restoring damaged natural dental enamel. Clinical relevance of results on exogenous means of remineralization is discussed.

CL-1.5 MON 12:15

Few-cycle laser for the in vitro study of cellular bioenergetics during therapeutic treatment with the anticancer drug Doxorubicin in its free and liposomal nanocarrier form

R. Ferreira[1,2], *C. Maibohm*[1], *O.F. Silvestre*[1], *H. Crespo*[2,3], *R. Romero*[3,2], *and* •*J.B. Nieder*[1]; [1]*Dept. of Nanophotonics, Ultrafast Bio- and Nanophotonics group, INL-International Iberian Nanotechnology Laboratory, Braga, Portugal*; [2]*IFIMUP-IN and Dept. of Physics and Astronomy, Faculty of Sciences, University Porto, R. do Campo Alegre 697, Porto, Portugal*; [3]*Sphere Ultrafast Photonics, R. do Campo Alegre 1021, Edifício FC6, Porto, Portugal*

An ultrabroadband laser is shown to enable simultaneous study of bioenergetics and tracking of drugs/drug delivery systems in living cells during cellular therapy. The used nonlinear excitation scheme is an advantageous tool for nanomedicine research.

CL-1.6 MON 12:30

Clinical study for assessing the use of a compact VECSEL-based yellow (590 nm) laser system in

ROOM 1 Hall A1

and A. Fiore[1]; [1]*Eindhoven University of Technology, Eindhoven, Netherlands*; [2]*nanoPHAB B.V., Eindhoven, Netherlands*; [3]*Nano-Opto-Mechanical Instruments, Dept. of Optomechatronics, Netherlands Organisation for Applied Scientic Research TNO, Delft, Netherlands*

A nano-opto-electro-mechanical transducer for displacement sensing is presented. It consists of a double-membrane photonic crystal cavity integrated with electro-optical read-out and on-chip light-delivery. The operation is demonstrated by atomic force microscope actuation and photocurrent sensing.

CH-5.4 MON 12:15

Performance Parameter Decoupled High Efficiency Micro Ring Laser Cavity for Biosensing

•*L. Chang, M. de Goede, M. Dijkstra, C.I. van Emmerik, and S.M. García-Blanco*; *Optical Sciences Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*

We demonstrate a biosensing orientated micro-ring laser cavity design methodology and its preliminary experimental results. This proposed methodology dramatically improves the design optimize ability by decoupling the performance parameters into several regions in the cavity.

CH-5.5 MON 12:30

Comparing the fundamental limit of detection for interferometric and resonant biosensors with coherent phase read-out

•*J. Leuermann*[1,2], *Í. Molina-Fernández*[1,2], *A. Ortega-Moñux*[1,2], *J.G. Wangüemert-Pérez*[1,2], *and R. Halir*[1,2]; [1]*Bionand Center for Nanomedicine and Biotechnology, Málaga, Spain*; [2]*Universidad de Málaga, Dept. de Ingeniería de*

ROOM 2 Hall A1

CF-5.4 MON 12:15

Customizing supercontinuum generation via adaptive on-chip pulse splitting

•*B. Wetzel*[1,2], *M. Kues*[1,3], *P. Roztocki*[1], *C. Reimer*[1,4], *P.-L. Godin*[1], *M. Rowley*[2], *B.E. Little*[5], *S.T. Chu*[6], *E.A. Viktorov*[7], *D.J. Moss*[8], *A. Pasquazi*[2], *M. Peccianti*[2], *and R. Morandotti*[1,7,9]; [1]*Institut National de la Recherche Scientifique, Varennes, Canada*; [2]*University of Sussex, Brighton, United Kingdom*; [3]*University of Glasgow, Glasgow, United Kingdom*; [4]*Harvard University, Cambridge, USA*; [5]*Xi'an Institute of Optics and Precision Mechanics, Shaanxi, China*; [6]*City University of Hong Kong, Hong Kong, China*; [7]*ITMO University, St. Petersburg, Russia*; [8]*Swinburne University of Technology, Hawthorn, Australia*; [9]*Institute of Fundamental and Frontier Sciences, Chengdu, China*

We report on the experimental control of coherent supercontinuum: using an actively-controlled photonic chip to prepare patterns of femtosecond pulses via a genetic algorithm, we show efficient tailoring of nonlinear pulse propagation and supercontinuum properties.

CF-5.5 MON 12:30

CEP-stable generation of close to single-cycle and ultrashort UV pulses at 800 kHz repetition rate using a gas-filled hollow-core PCF

•*A. Ermolov*[1], *C. Heide*[2], *P. Dienstbier*[2], *F. Tani*[1], *F. Köttig*[1], *P. Hommelhoff*[2,1], *and P.S.J. Russell*[1,2];

ROOM 3 Hall A1

an exact description of the dynamics in tight-binding lattices. We devise a compact arrangement to quantify these additional coupling parameters and observe their influence.

CE-5.4 MON 12:15

On the Possibility of Structural Characterisation of Hollow Core Fibres using Whispering Gallery Modes Excited by Laser and Broadband Light

•*M.A. Bukshtab, H.C. Mulvad, R. Slavik, F. Poletti, and D.J. Richardson*; *Optoelectronic Research Centre, University of Southampton, SO17 1BJ, Southampton, United Kingdom*

Side-excitation of whispering gallery modes in photonic crystal fibres/preforms facilitates manifestation of resonant spectrally-banded scattering and couples light directly into the fibre internal capillary structure, therefore enabling dimensional/symmetry characterisation of that structure.

CE-5.5 MON 12:30

Record Low Loss Hollow Core Fiber for the 1μm region

•*H. Sakr, G.T. Jasion, T.D. Bradley, Y. Chen, J.R. Hayes, I.A. Davidson, H.-C. Mulvad, L. Xu, D.J. Richardson , and F. Poletti*; *Optoelectronic Research Centre, University of Southampton, Southampton, United Kingdom*

We report fabrication of Nested Antiresonant Nodeless hollow-core

ROOM 1 ICM

Glass and Ceramics Team, 35042 Rennes, France, Rennes, France
We report here on the first recording of long-wave IR luminescence of Sm3+ and Tb3+ doped Ga5Ge20Sb10Se65 chalcogenide fibers. This low-phonon energy material enable efficient radiative transitions up to 8.5 μm.

ROOM 2 ICM

[redacted]

ROOM 3 ICM

State University, Baton Rouge, USA; [3]*National Institute of Information and Communications Technology (NICT), Kobe, Japan*; [4]*Kobe University, Kobe, Japan*; [5]*NYU-ECNU Institute of Physics at NYU Shanghai, Shanghai, China*; [6]*University of Science and Technology of China, Shanghai, China*
We theoretically and experimentally investigate the optimal strategy for Long-distance device-independent quantum key distribution based on the linear optical entanglement swapping relay with photon pairs from spontaneous parametric-down conversion sources.

ROOM 4a ICM

University of Cambridge, Cambridge , United Kingdom; [3]*Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*; [4]*Technische Universität Berlin, Berlin, Germany*
We exploit two-dimensional electron spectroscopy to coherently excite the A and B excitons in monolayer MoS2. Combined with simulations, our data distinguish ultrafast bright excitons decoherence and sub-ps scattering decays to dark excitons.

ROOM 4b ICM

ROOM 13a ICM

[3]*Amplitude-Systèmes, Pessac, France*
We characterize an Yb:YAG thin disk bonded on silicon carbide using an adhesive-free, direct-bonding process. We implement it in a laser cavity to obtain 178 W of CW output power in a single TEM00 mode beam.

ROOM 1 ICM

14:15 – 15:45

CJ-6: Waveguide lasers
Chair: Patrice Camy, CIMA, Caen, France

CJ-6.1 MON (Invited) 14:15

A multiple-waveguide mode-locked chip-laser architecture
•*D.G. Lancaster*[1], *N. Bourbeau Hébert*[2], *W. Zhang*[1], *F. Piantedosi*[1], *T.M. Monro*[1], *and J. Genest*[2]; [1]*Laser Physics and Photonics Devices labs, University of South Australia, Mawson Lakes, SA, Australia*; [2]*Centre d'optique, photonique et laser, Université Laval, Québec, Canada*
We present an overview of our > GHz rep. rate ultra-fast chip lasers, and also discuss our application of these as high performance dual frequency-combs.

ROOM 4a ICM

14:15 – 15:45

EA-1: Quantum effects
Chair: Christine Silberhorn, University of Paderborn, Paderborn, Germany

EA-1.1 MON 14:15

Direct field correlation measurement on terahertz modes with few photon occupation number
•*F.F. Settembrini, I.C. Benea-Chelmus, G. Scalari, and J. Faist*; *Quantum Optoelectronics Group, ETH Zürich, Zürich, Switzerland*
We present a direct field correlation measurement on terahertz modes with few photon occupation number due to black-body radiation from the environment. We characterize the dependence of the detection bandwidth on the experimental parameters.

ROOM 4b ICM

14:15 – 15:45

CK-5: Microresonators
Chair: Stefano Pelli, CNR-IFAC, Sesto Fiorentino, Italy

CK-5.1 MON 14:15

Four-port Resonant Tunnelling Bottle Microresonator Device
•*M. Crespo-Ballesteros, Y. Yang, and M. Sumetsky*; *Aston Institute of Photonics Technologies, Birmingham, United Kingdom*
We demonstrate a four-port resonant tunnelling device fabricated of a bottle microresonator with nanoscale effective radius variation. The experimentally measured spectrogram of our device is in a good agreement with the developed theory.

ROOM 13a ICM

14:15 – 15:45

CA-6: 2 μm lasers
Chair: Martin Schellhorn, Institut franco-allemand de recherches de Saint-Louis, Saint-Louis, France

CA-6.1 MON 14:15

Mode-locked Oscillation of Cr:ZnS Laser using a Single Walled Carbon Nanotube Film with Resonant Absorption at 2.4 μm
•*D. Okazaki*[1], *H. Arai*[2], *E.I. Kauppinen*[3], *S. Chiashi*[2], *S. Maruyama*[2,4], *and S. Ashihara*[1]; [1]*Institute of Industrial Science, The University of Tokyo, 4-6-1, Komaba, Meguro-ku, Tokyo, Japan*; [2]*Departure of Mechanical Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo, Japan*; [3]*Department of Applied Physics, Aalto University School of Science, Aalto, Finland*; [4]*Energy Nano Engineering Lab., National Institute of Advanced Industrial Science and Technology (AIST), Ibaraki, Japan*
We develop a mode-locked Cr:ZnS laser emitting 50-fs pulses using a single walled carbon nanotube film with a resonant absorption around 2.4 μm, and realize the first observation of self-starting in CNT-based mode-locked Cr:ZnS lasers.

ROOM 13b ICM

14:15 – 15:45

CB-2: Semiconductor micro-lasers: Novel dynamics
Chair: Malte Gather, University of St Andrews, St Andrews, United Kingdom

CB-2.1 MON 14:15

Order of magnitude improvement in feedback stability of nanolasers by inclusion of a Fano resonance-based mirror
•*T.S. Rasmussen and J. Mork*; *Technical University of Denmark, Kgs. Lyngby, Denmark*
The recently realised photonic crystal Fano laser is analysed numerically, demonstrating extraordinary stability towards external optical feedback, exceeding that of conventional lasers by orders of magnitude, due to the properties of the Fano mirror.

ROOM 14a ICM

14:15 – 15:45

EH-2: Metasurfaces-polarimetry, chirality and photon spin
Chair: Pierre Berini, University of Ottawa, Ottawa, Ontario, Canada

EH-2.1 MON 14:15

Robust Polarimetry with a Single Metagrating
N. Pedersen, K. Wang, S. Lung, and •*A.A. Sukhorukov*; *Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National University, Canberra, ACT 2601, Australia*
We formulate a new conceptual approach for full Stokes polarization measurement with a single metagrating, and develop novel design through advanced computational optimization of individual nano-resonator properties delivering robust operation even under strong fabrication inaccuracies.

ROOM 14a ICM

ROOM 14b ICM

results contribute to the understanding of laser-modified patterns and open up doors towards new types of metamaterials with unconventional elastic properties.

ROOM Osterseen ICM

the treatment of vascular lesions

•*E. Kantola*[1], *T. Karppinen*[2], *A. Karppinen* [2], *A. Rantamäki*[1], *I. Leino*[1], *J.-P. Penttinen*[1], *S. Mordon*[3], *and M. Guina*[1]; [1]*Optoelectronics Research Centre, Physics Unit, Tampere University, Tampere, Finland*; [2]*Epilaser Oy, Lempäälä, Finland*; [3]*INSERM Unité Onco ThAI, Lille, France*

We report an 8-W yellow (590nm) laser system designed for the treatment of vascular lesions in dermatology. The system is based on VECSEL-technology and it was successfully used to treat facial telangiectasia.

ROOM 1 Hall A1

Comunicaciones, ETSI Telecomunicación, Málaga, Spain

In this work we present a method for deriving the fundamental limit of detection for coherently read-out interferometric and ring resonant integrated photonic biosensors, influenced by noise and signal attenuation, and their comparison.

ROOM 2 Hall A1

[1]*Max Planck Institute for the Science of Light , Erlangen, Germany*; [2]*Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

We demonstrated CEP-stable close to single-cycle pulses at 800 nm and ultraviolet dispersive wave generated in hollow-core PCF. The source provides up to 1 μJ energy at 800 kHz repetition rate (0.8 W average power).

ROOM 3 Hall A1

Fiber (NANF) with minimum loss of 2.5dB/km at 1100nm, the lowest loss reported at these wavelengths to the best of our knowledge, and a loss below 4dB/km over a bandwidth of 192nm.

ROOM 14b ICM

14:15 – 15:45

CM-6: 3D laser additive micromanufacturing

Chair: Peter Herman, University of Toronto, Toronto, Canada

CM-6.1 MON 14:15

3D auxetic metamaterials made using multiphoton polymerisation

I. Spanos, V. Melissinaki, and •M. Farsari; IESL-FORTH, HERAKLION, Greece

We present our latest work into the modelling and fabrication of 3D auxetic metamaterials made employing multiphoton polymerisation.These are materials that display a negative Poisson's ratio; their properties are mainly due to their architecture, rather than their chemical composition

ROOM Osterseen ICM

14:15 – 15:45

CL-2: Nano-optics, light field control and sensing

Chair: Alexander Jesacher, Medical University of Innsbruck, Innsbruck, Austria

CL-2.1 MON 14:15

Temporal control of the combination over all spatial and polarization modes propagating through a multimode fibre

•*M. Mounaix and J. Carpenter; School of ITEE, The University of Queensland, Brisbane , Australia*

We demonstrate temporal control of light through multimode fibres of the averaged impulse response over all spatial and polarization modes. We show maximizing and minimizing light transport at different delay times with a single SLM

ROOM 1 Hall A1

14:15 – 15:45

CH-6: Fibre bio- and medical sensors

Chair: Boris Mizaikoff, Ulm University, Ulm, Germany

CH-6.1 MON (Invited) 14:15

The Next Dimension of Detection: Biomechanical Analysis of Tissue using Optical Elastography

•*A. Armani*[1], *A. Hudnut*[1], *N. Trasolini*[2], *L. Lash-Rosenberg*[1], *A. Xin*[1], *G. Hatch*[2], *C. Zurita-Lopez*[3], *and Q. Wang*[1]; [1]*University of Southern California, Los Angeles, USA*; [2]*University of Southern California, Keck Medical School, Los Angeles, USA*; [3]*California State University, Los Angeles, USA*

An optical polarimetric elastography system is developed that can measure the mechanical properties of undigested living tissue. Its operation is shown on several different undigested living tissue systems including cartilage, pancreas, liver, kidney, and heart.

ROOM 2 Hall A1

14:15 – 15:45

CF-6: Characterisation of ultrashort laser pulses

Chair: David Novoa, Max Planck Institute for the Science of Light, Erlangen, Germany

CF-6.1 MON 14:15

Linear chirp instability measurement using SPIDER

•*E. Escoto*[1] *and G. Steinmeyer*[1,2]; [1]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Max-Born-Str 2A, 12489, Berlin, Germany*; [2]*Physics Department, Humboldt University, Newtonstraße 15, 12489, Berlin, Germany*

We address the case of chirp instability in ultrafast pulse trains using SPIDER, which shows remarkable sensitivity unlike autocorrelation-based techniques that do not appear overly susceptible to this type of coherence degradation.

ROOM 3 Hall A1

14:15 – 15:45

CE-6: Metamaterials and functional photonic bandgap systems

Chair: Manfred Fiebig, ETH Zurich, Zurich, Switzerland

CE-6.1 MON (Invited) 14:15

Giant broadband refraction in the visible in a nanodisordered ferroelectric perovskite

•*L. Falsi*[1,2], *F. Di Mei*[1], *M. Flammini*[1], *D. Pierangeli*[1,3], *P. Di Porto*[1], *A.J. Agranat*[4], *and E. DelRe*[1]; [1]*Department of Physics, University of Rome "La Sapienza", Rome, Italy*; [2]*S.B.A.I. Department, Physics Section, University of Rome "La Sapienza", Rome, Italy*; [3]*ICL-2DMOST, College of Optoelectronic Engineering, Shenzhen University, Shenzhen, China*; [4] *Applied Physics Department, Hebrew University of Jerusalem, Jerusalem, Israel*

We report visible white-light room-temperature refraction and diffraction experiments that demonstrate an achromatic broadband giant index of refraction (n>26) in a sample of nanodisordered KTN:Li manifesting a 3D ferroelectric domain mosaic.

NOTES

ROOM 1 ICM

CJ-6.2 MON 14:45

Laser Performance of a PLD-Grown Yb:LuAG Double-Clad Planar Waveguide

•*K. Sergey V., P. Jake J., E. Robert W., and M. Jacob I.*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

End-pumped by a diode-laser bar, we demonstrate the first crystalline double-clad Yb:LuAG planar waveguide laser. An output power of 3.3 W was obtained at 1030.7nm with a 20 % slope efficiency.

ROOM 4a ICM

EA-1.2 MON 14:30

Atomic diffraction through a pristine sheet of single-layer graphene

•*C. Brand*[1], *M. Debiossac*[1], *T. Susi*[2], *F. Aguillon*[3], *J. Kotakoski*[2], *P. Roncin*[3], *and M. Arndt*[1]; [1]*University of Vienna, Faculty of Physics, VCQ, Vienna, Austria*; [2]*University of Vienna, Faculty of Physics, PNM, Vienna, Austria*; [3]*Université Paris-Saclay, Institut des Sciences Moléculaires d'Orsay, Orsay, France*

We present the first theoretical analysis of atomic diffraction through the smallest conceivable mechanical grating, the 246 pm lattice of graphene. This realizes unprecedented large diffraction angles on the order of 50 mrad.

EA-1.3 MON 14:45

Bending the Rules: Quantum Effects in the Operation of a Microscopic Heat Engine in Diamond

•*J.N. Becker*[1], *J. Klatzow*[1], *P.M. Ledingham*[1], *C. Weinzetl*[1], *K.T. Kaczmarek*[1], *D.J. Saunders*[1], *J. Nunn*[2], *R. Uzdin*[3], *I.A. Walmsley*[1], *and E. Poem*[4]; [1]*Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, United Kingdom*; [2]*Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom*; [3]*Schulich Faculty of Chemistry, Technion Israel Institute of Technology, Haifa, Israel*; [4]*Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel*

We demonstrate that quantum coherence can be used to break the classical power bound of a microscopic heat engine, implemented using nitrogen vacancy centers in diamond - a first experimental signature of effects beyond classical thermodynamics.

ROOM 4b ICM

CK-5.2 MON 14:30

extremely efficient coupling of silica toroid microresonator to silicon chip with photonic crystal waveguide

•*Y. Zhuang*[1,2], *H. Kumazaki*[1], *S. Fujii*[1], *and T. Tanabe*[1]; [1]*keio university, yokohama, Japan*; [2]*nanjing university of posts and telecommunications, nanjing, China*

we demonstrate that high-efficient, robust and compact coupling between a high-Q silica toroid microresonator and a silicon chip is possible by using a two-dimensional silicon-based air-bridge type photonic crystal slab waveguide.

CK-5.3 MON 14:45

Enhanced Wavelength Conversion in TiO2 Microring Resonators

•*M. Fu*[1,2], *Y. Zheng*[1], *X. Guan*[1], *X. Li*[2], *and L.H. Frandsen*[1]; [1]*DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Lyngby, Denmark*; [2]*Department of Physics, National University of Defense Technology, Changsha, China*

we present FWM experiments in a high Q-value Titanium dioxide MRR and achieve an idler power enhancement of 18.6 dB on-resonance comparing to the off-resonance, which support it as an efficient platform for nonlinear OSP.

ROOM 13a ICM

CA-6.2 MON 14:30

Sub-60 fs SESAM mode-locked Tm:LuYO3 ceramic laser

•*Y. Zhao*[1], *L. Wang*[1], *Z. Pan*[1], *Y. Wang*[1], *J. Zhang*[2], *P. Liu*[3], *X. Xu*[3], *D. Shen*[3], *J. Xu*[4], *S. Suomalainen*[5], *A. Härkönen*[5], *M. Guina*[5], *P. Loiko*[6], *X. Mateos*[7], *U. Griebner*[1], *V. Petrov*[1], *and W. Chen*[1]; [1]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [2]*Key Laboratory of Transparent and Opto-Functional Inorganic Materials, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China*; [3]*Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu Normal University, Xuzhou, China*; [4]*School of Physics Science and Engineering, Institute for Advanced Study, Tongji University, Shanghai, China*; [5]*Optoelectronics Research Centre, Physics Unit, Tampere University of Technology, Tampere, Finland*; [6]*ITMO University, St. Petersburg, Russia*; [7]*Física i Cristal·lografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili (URV), Tarragona, Spain*

A SESAM mode-locked Tm:LuYO3 ceramic laser generates pulses as short as 55 fs at 2048 nm with a maximum output power of 51 mW at 78 MHz.

CA-6.3 MON 14:45

High Quality-Factor Kerr-lens Mode-locked Tm:Sc2O3 Laser Beyond the Gain Bandwidth Limitation

•*A. Suzuki*[1], *M. Tokurakawa*[1], *and C. Kränkel*[2]; [1]*Inst. for Laser Sci., Univ. of Electro-Communications, Tokyo, Japan*; [2]*Zentrum für Lasermaterialien, Leibniz-Institut für Kristallzüchtung, Berlin, Germany*

We have developed a high quality-factor cavity Kerr-lens mode-locked Tm:Sc2O3 laser in-band pumped by 1611nm fiber laser. Spectral bandwidth above 70 nm with anomalous spectral components around

ROOM 13b ICM

CB-2.2 MON 14:30

Ultrafast spin-lasers for optical data communication

•*M. Lindemann*[1], *G. Xu*[2], *T. Pusch*[3], *R. Michalzik*[3], *M.R. Hofmann*[1], *I. Zutic*[2], *and N.C. Gerhardt*[1]; [1]*Ruhr-University Bochum, Photonics and Terahertz Technology, Bochum, Germany*; [2]*University of Buffalo, Buffalo, USA*; [3]*Ulm University, Ulm, Germany*

We demonstrate ultrafast polarization dynamics in spin-lasers as an alternative to intensity modulation. We analyze their capabilities for high-speed optical data transmission and find that bitrates far beyond 200 Gbit/s per channel can be expected.

CB-2.3 MON (Invited) 14:45

Nonhermitian physics of nano-photonic molecule lasers

•*M. Khajavikhan*; *CREOL, University of Central Florida, USA*

ROOM 14a ICM

EH-2.2 MON 14:30

Semi-analytic modeling of chiral metasurface stacks

•*J. Sperrhake*[1], *M. Decker*[1], *M. Falkner*[1], *S. Fasold*[1], *T. Kaiser*[1], *I. Staude*[1], *and T. Pertsch*[1,2]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Fraunhofer Instutitut for Applied Optics and Precision Engineering, Jena, Germany*

We employ a semi-analytic stacking algorithm to analyze the anisotropic polarization response of a chiral metasurface stack, consisting of two layers of twisted nano-wires, and explain its dependence on the stacking distance.

EH-2.3 MON 14:45

Random Topological Defects-induced Spin-enabled Photonic Transport by Metasurfaces

•*B. Wang, E. Maguid, M. Yannai, V. Kleiner, and E. Hasman*; *Technion–Israel Institute of Technology, Haifa, Israel*

We presented a topological mechanism for spin-dependent photonic transport from photonic spin Hall to random Rashba effect, by creation of bound vortex pairs and unbound vortices from geometric phase metasurfaces in the near field.

ROOM 14b ICM

CM-6.2 MON 14:30

Direct Laser Writing by 4Pi Multiphoton Polymerization

•*T. Tičkūnas*[1,2], *V. Purlys*[1,2], *and R. Gadonas*[1,2]; [1]*Vilnius University, Laser Research Center, Vilnius, Lithuania*; [2]*Femtika Ltd., Vilnius, Lithuania*

The fabrication of microstructures is obtained by multiphoton polymerization (MPP) technique with 4Pi focusing conditions. Comparison of the resulting structures is presented with the conventionally fabricated ones.

CM-6.3 MON 14:45

Creation of two-photon absorption photo-polymerization induced helical microfibers

•*J. Lee*[1], *Y. Arita*[2,3], *R. Matsuo*[1], *H. Kawaguchi*[1], *K. Miyamoto*[1,2], *K. Dholakia*[2,3], *and T. Omatsu*[1,2]; [1]*Graduate School of Science and Engineering, Chiba University, Chiba, Japan*; [2]*Molecular Chirality Research Center, Chiba University, Chiba, Japan*; [3]*SUPA, School of Physics & Astronomy, University of St Andrews, St Andrews, United Kingdom*

We present the first demonstration of a sub-millimeter scale, a light-induced self-written helical fiber created by irradiation of picosecond laser through two-photon absorption photo-polymerization process.

ROOM Osterseen ICM

CL-2.2 MON 14:30

Flexible lensless endoscopy

•*H. Rigneault*[1], *E. Andresen*[2], *S. Sivankutty*[1], *V. Tsvirkun*[1], *O. Vanvincq*[2], *and G. Bouwmans*[2]; [1]*Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*; [2]*Université Lille, CNRS, UMR 8523, Laboratoire de Physique des Lasers Atomes et Molécules, Lille, France*

We present the advances to develop a multiphoton flexible lensless imaging endoscope whose diameter is reduced to the size of the multicore optical fiber itself.

CL-2.3 MON (Invited) 14:45

Optical Antenna Based Fluorescence Correlation Spectroscopy of Biomembranes

P. Winkler[1], *R. Regmi*[2], *V. Flauraud*[3], *J. Brugger*[3], *H. Rigneault*[2], *M. Garcia-Parajo*[1], *and* •*J. Wenger*[2]; [1]*ICFO - Institute of Photonic Sciences, Castelldefels, Spain*; [2]*Aix Marseille Univ - CNRS - Institut Fresnel, Marseille, France*; [3]*Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

Planar plasmonic nanogap antennas are used to investigate the diffusion properties of fluorescent lipid analog in the plasma membrane of living cells and explore their architecture at the nanoscale.

ROOM 1 Hall A1

CH-6.2 MON 14:45

Lossy Mode Resonance Fiber-Optic Biosensing Allowing Ultra-Low Detection Limit

•*F. Chiavaioli*[1], *P. Zubiate*[2], *I. Del Villar*[3], *C.R. Zamarreño*[2], *A. Giannetti*[1], *S. Tombelli*[1], *C. Trono*[1], *I.R. Matias*[3], *F.J. Arregui*[2], *and F. Baldini*[1]; [1]*Institute of Applied Physics »Nello Carrara«, National Research Council, Via Madonna del Piano 10, 50019 Sesto Fiorentino (FI), Italy*; [2]*Electrical and Electronic Engineering Department, Public University of Navarra, 31006 Pamplona, Spain*; [3]*Institute of Smart Cities, Public University of Navarra, 31006 Pamplona, Spain*

A lossy mode resonance fiber-optic biosensor enabling ultra-low detection limit is presented. By using SnO2 as nm-thick overlay, real-time biomolecular interaction analysis is attained by measuring fiber-surrounding medium changes with very high sensitivity and specificity.

ROOM 2 Hall A1

CF-6.2 MON 14:30

Common Pulse Retrieval Algorithm: a Fast and Universal Method to Retrieve Ultrashort Pulses

•*N.C. Geib*[1], *M. Zilk*[1], *T. Pertsch*[1,2,3], *and F. Eilenberger*[1,2,3]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*; [3]*Max Planck School of Photonics, Jena, Germany*

We present a common pulse retrieval algorithm that can be universally applied to pulse measurement methods, such as FROG or d-scan. It compares favorably in terms of speed and accuracy to existing approaches.

CF-6.3 MON 14:45

Video-Rate Phase Retrievals From Dispersion Scan Traces Using Artificial Neural Networks

•*S. Kleinert*[1,2], *A. Tajalli*[1,2], *T. Nagy*[3], *and U. Morgner*[1,2,4,5]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across-Disciplines), Hannover, Germany*; [3]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [4]*Laser Zentrum Hannover e.V., Hannover, Germany*; [5]*Hannoversches Zentrum für Optische Technologien, Leibniz Universiät Hannover, Hannover, Germany*

We present a method to reconstruct the spectral phase of ultrashort laser pulses from dispersion scan traces employing deep neural networks. This only takes 16 ms, enabling video-rate phase retrievals.

ROOM 3 Hall A1

CE-6.2 MON 14:45

Enhanced Quantum Nano-sources Based on Silicon-Vacancy Centers in Epitaxially Grown Diamond Nano-pyramids

•*T. Jaffe*[1], *N. Felgen*[2], *L. Gal*[1], *L. kornblum*[1], *C. Popov*[2], *J.P. Reithmaier*[2], *and M. Orenstein*[1]; [1]*Andrew & Erna Viterbi Department of Electrical Engineering, Technion - Israel Institute of Technology, Haifa, Israel*; [2]*Institute of Nanostructure Technologies and Analytics, University of Kassel, kassel, Germany*

We present a deterministic template-assisted bottom-up process for creating high-quality nanoscale diamond pyramids incorporating optically active silicon-vacancy centers. We achieved deterministic nano-localization and an extraction efficiency enhancement of 4 compared to bulk diamond.

NOTES

ROOM 1 ICM

CJ-6.3 MON 15:00

Ultrafast Laser Inscription and Laser Operation of Y-branch Splitters in Monoclinic Thulium-Doped Crystals

E. Kifle[1], •P. Loiko[2], C. Romero[3], J.R. Vázquez de Aldana[3], V. Zakharov[4], A. Veniaminov[4], U. Griebner[5], V. Petrov[5], P. Camy[2], A. Braud[2], M. Aguiló[1], F. Díaz[1], and X. Mateos[1]; [1]Universitat Rovira i Virgili (URV), Tarragona, Spain; [2]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), Normandie University, Caen, France; [3]University of Salamanca, Salamanca, Spain; [4]ITMO University, St. Petersburg, Russia; [5]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

Depressed-index Y-branch splitters are fabricated in monoclinic Tm:KLu(WO4)2 crystal by ultrafast-laser-inscription. Simultaneous CW laser operation is achieved in both branches of the Y-splitter yielding 0.46 W at ~1845 nm with a slope efficiency of 40.6%.

CJ-6.4 MON 15:15

Liquid Phase Epitaxy Growth, Spectroscopy and First Laser Operation of Yb3+:CaF2 Waveguides

•P. Loiko[1], R. Soulard[1], E. Kifle[2], L. Guillemot[1], G. Brasse[1], A. Benayad[1], J.-L. Doualan[1], A. Braud[1], M. Aguiló[2], F. Díaz[2], X. Mateos[2], and P. Camy[1]; [1]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), Normandie University, Caen, France; [2]Universitat Rovira i Virgili (URV), Tarragona, Spain

Single-crystalline Yb3+:CaF2 thin-films are grown on CaF2 substrates by Liquid Phase Epitaxy. Their spectroscopy is studied. Laser operation is demonstrated for the first time in an Yb3+:CaF2 low-loss waveguide generating 114 mW at 1037 nm.

ROOM 4a ICM

EA-1.4 MON 15:00

Quantum Temporal Imaging with Finite Time Aperture

•D. Horoshko[1,2], G. Patera[1], and M. Kolobov[1]; [1]Université de Lille, Lille, France; [2]B. I. Stepanov Institute of Physics, NASB, Minsk, Belarus

We consider quantum temporal imaging by means of an SFG-based time lens with finite time aperture, determined by the duration of the stretched pump pulse. We determine the spectrum of squeezing of the image field.

EA-1.5 MON 15:15

The influence of spacetime curvature on quantum emission in optical analogues to gravity

•M. Jacquet[1,2] and F. Koenig[2]; [1]Vienna Center for Quantum Science and Technology (VCQ), Faculty of Physics, University of Vienna, Vienna, Austria; [2]School of Physics and Astronomy, University of St Andrews, SUPA, St Andrews, United Kingdom

We use an optical analogue to gravity to investigate the influence of the spacetime curvature on quantum emission. We find that the photon number correlations transition from complex multimode to two-mode when horizons are formed.

ROOM 4b ICM

CK-5.4 MON 15:00

Thermo-opto-mechanical coupling in GaAs microdisks

•R. Benevides[1], A.G. Primo[1], N.C. Carvalho[1], M. Ménard[2], N.C. Frateschi[1], G.S. Wiederhecker[1], and T.P.M. Alegre[1]; [1]University of Campinas , Campinas, Brazil; [2]Université du Québec à Montréal, Montréal, Canada

We present a model of coupling between optomechanics and thermal relaxation of cavities. A gallium arsenide microdisk is used to show non-coventional thermo-opto-mechanical coupling which overcomes the optical spring effect.

CK-5.5 MON 15:15

Sixth-Order 2D Microring Optical Filter with Sharp Transmission Zero

•T.J. Zimmerling, Y. Ren, D. Perron, and V. Van; University of Alberta, Edmonton, Canada

We report the first experimental results for a 6th-order microring filter in a 2D coupling topology. Measured spectrum shows sharp transmission null near the passband edge caused by multipath interference of light in the lattice.

ROOM 13a ICM

2200nm-2350nm at 35 mW average power was obtained.

CA-6.4 MON 15:00

(Tm,Ho):YLF laser passively mode-locked with a graphene saturable absorber

M. Paris[1], A. Tyazhev[1], R. Soulard[2], P. Loiko[2], J.-L. Doualan[2], G. Brasse[2], A. Braud[2], T. Godin[1], P. Camy[2], and •A. Hideur[1]; [1]CORIA, CNRS-INSA-Normandie Université, Rouen, France; [2]CIMAP, CEA-CNRS-ENSICAEN-Normandie Université, Caen, France

We report advances on a passively mode-locked (Tm,Ho)-co-doped-YLF laser emitting at 2051 nm and based on a transmitting graphene saturable absorber and demonstrate improved noise performances and output powers.

CA-6.5 MON 15:15

Growth, Spectroscopy and Laser Operation of Tm,Ho:CNGG: A Promising Disordered Crystal for Mode-Locked Lasers

Z. Pan[1,2], P. Loiko[3], Y. Wang[1], Y. Zhao[1,4], H. Yuan[2], X. Dai[2], H. Cai[2], J.M. Serres[5], A. Braud[3], J.-L. Doualan[3], P. Camy[3], U. Griebner[1], V. Petrov[1], M. Aguiló[5], F. Díaz[5], and •X. Mateos[5]; [1]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany; [2]Institute of Chemical Materials, Mianyang , China; [3]Centre de recherche sur les Ions, les Matériaux et la Photonique , Caen, France; [4]Jiangsu Normal University, Xuzhou , China; [5]Universitat Rovira i Virgili , Tarragona, Spain

The growth, structural, optical and Raman spectroscopy and laser operation of the Tm,Ho:CNGG disordered garnet are presented. The diode-pumped laser delivered 413 mW at 2088 nm. A tuning range of 209.6 nm is demonstrated.

ROOM 13b ICM

CB-2.4 MON 15:15

Observation of Pump-induced Exceptional Point in Distributed Feedback Quantum Cascade Lasers

•M. Shahmohammadi, M. J. Suess, R. Peretti, F. Kapsalidis, M. Beck, and J. Faist; ETH, Zurich, Switzerland

Lasers are prototype non-Hermitian photonic systems. We present a dual-section distributed feedback (DFB) QCL, where the lasing properties of the laser are strongly affected by the exceptional point at current densities above the first threshold.

ROOM 14a ICM

EH-2.4 MON 15:00

First experimental observation of photonic spin Hall effect in hyperbolic metamaterials at visible wavelengths

•G. Puentes[1], O. Takayam[2], J. Sukham[2], R. Malureanu[2], and A. Lavrinenko[2]; [1]CONICET-IFIBA, Buenos Aires, Argentina; [2] DTU Fotonik , Lingsby, Denmark

The photonic spin Hall effect is the photonic analog of the spin Hall effect in solid-state systems. Here we present the first experimental observation of spin Hall effect of light in hyperbolic metamaterials in the visible regime.

EH-2.5 MON 15:15

The resonant behavior of a single plasmonic helix

•K. Höflich[1,2], T. Feichtner[3], E. Hansjürgen[4], C. Haverkamp[1,2], H. Kollmann[4], C. Lienau[4], and M. Silies[4]; [1]Nanoscale Structures and Microscopic Analysis, Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany; [2]Max Planck Institute for the Science of Light, Erlangen, Germany; [3]Physics Institute, University of Würzburg, Würzburg, Germany; [4]Institute of Physics, Carl von Ossietzky University Oldenburg, Oldenburg, Germany

The interaction of single plasmonic helices with circularly polarized light is investigated, both theoretically and experimentally. Our findings lead to a complete understanding of all resonant features of plasmonic helices of any geometry and material.

ROOM 14b ICM

CM-6.4 MON 15:00

Stitchless Support-Free Fabrication of Free-Form Micromechanical Structures Using Femtosecond Laser 3D Lithography

•*L. Jonušauskas*[1,2], *D. Mackevičiūtė*[1,2], *T. Baravykas*[1], *T. Gadišauskas*[1], *and V. Purlys*[1,2]; [1]*Femtika Ltd., Vilnius, Lithuania*; [2]*Vilnius University, Vilnius, Lithuania*

In this work we present efficient layerless stitch-free 3D structuring of functional micromechanic structures. It is achieved by synchronizing linear stages with galvo-scanners, varying focusing conditions and choosing appropriate SZ2080 photopolymer with hard-gel form.

CM-6.5 MON (Invited) 15:15

True 3D Additive-Manufacturing of Glass-Ceramics down to Nanoscale

•*M. Malinauskas*; *Laser Research Center at Vilnius University, Vilnius, Lithuania*

The ultrafast laser 3D nanolithography followed by calcination are employed for the fabrication of inorganic crystalline/ceramic structures with the resolution down to the nanoscale. It offers unrestricted free-form geometries, control of the fill-factor, high throughput.

ROOM Osterseen ICM

CL-2.4 MON 15:15

Mueller matrix measurement system for skin polarimetry as additional module for non-contact dermatoscopy

•*D. Fricke, M. Wollweber, and B. Roth*; *Leibniz Universität Hannover, Hannover Centre for Optical Technologies, Hannover, Germany*

A newly designed diagnostic camera system for dermatoscopy is presented, that takes overview images and zoomed images of skin areas. The system provides additional diagnostically relevant information by measuring the Mueller matrix of the skin

ROOM 1 Hall A1

CH-6.3 MON 15:00

Fast temperature sensors for fibre-optic flow measurement in interventional cardiology

•*J.M. Coote*[1,2], *C.A. Mosse*[1,2], *E. Carr*[1,2], *M.C. Finlay*[1,2,3], *and A.E. Desjardins*[1,2]; [1]*Department of Medical Physics and Biomedical Engineering, University College London, London, United Kingdom*; [2]*Wellcome/EPSRC Centre for Interventional and Surgical Sciences, University College London, London, United Kingdom*; [3]*Barts Heart Centre, St Bartholomew's Hospital and Queen Mary University of London, London, United Kingdom*

We have developed small and fast fibre-optic temperature sensors for minimally invasive blood flow measurement. Here, we describe their development and characterisation of their dynamic response, including a novel method to determine the time constant.

CH-6.4 MON 15:15

The contribution has been withdrawn.

ROOM 2 Hall A1

CF-6.4 MON 15:00

Plasma-mirror FROG using liquid-sheet water jet in ultraviolet region

•*T. Endo, M. Tsubouchi, and R. Itakura*; *Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology, Kyoto, Japan*

We have developed a plasma-mirror FROG based on reflection spectroscopy of liquid-sheet water jet. This technique enables us to characterize a UV waveform and a plasma reflectivity at high-repetition rate.

CF-6.5 MON 15:15

In-situ diagnostic of ultrashort probes based on Kerr-index transient Bragg grating

R. Meyer, C. Xie, R. Giust, C. Billet, •*B. Morel, and F. Courvoisier*; *Institut FEMTO-ST, UMR 6174 CNRS, Université de Bourgogne Franche-Comté, Besançon, France*

We generate a Kerr-index Bragg grating in dielectrics providing cross-correlation signal that we use to synchronize and characterize ultrashort probes. Straightforward compressor optimization and angular dispersion correction are experimentally demonstrated with ~30 fs probe pulses.

ROOM 3 Hall A1

CE-6.3 MON 15:00

Liquid Crystal Alignment on the Patterns produced by Nonlinear Laser Lithography

•*I. Pavlov*[1,2], *A. Rybak*[2], *A. Dobrovolskiy*[2], *Z. Kazantseva*[3], *A. Bek*[1], *O. Candemir*[1], *and I. Gvozdovskyy*[2]; [1]*Department of Physics and Center for Solar Energy Research and Application, Middle East Technical University, Ankara, Turkey*; [2]*Institute of Physics of the NAS of Ukraine, Kyiv, Ukraine*; [3]*V.E. Lashkaryov Institute of Semiconductor Physics of the NAS of Ukraine, Kyiv, Ukraine*

Controllable aligning properties of nematic liquid crystal is demonstrated on Ti surface processed by nonlinear laser lithography. Different macro-patterns of nanostructures were created for switchable phase masks with sub-100 μm resolution, including Fresnel zone plates.

CE-6.4 MON 15:15

Dispersion Measurement of Femtosecond Pulses Through Photonic Band-Gap Edges of Cholesteric Liquid Crystals

•*M. Neradovskiy*[1], *U. Bortolozzo*[1], *S. Residori*[1], *A. Jullien*[1], *A. Scarangella*[2], *and M. Mitov*[2]; [1]*Institut de Physique de Nice, CNRS, Valbonne, France*; [2]*Centre d'Elaboration de Matériaux et d'Etudes Structurales, CNRS, Toulouse, France*

We measured changes in spectral phase and intensity of femtosecond laser pulses passed through home-made cholesteric liquid crystals with different thickness and bandgap position. The Fourier-transform spectral interferometry and statistical data analysis technic were used.

NOTES

ROOM 1 ICM

CJ-6.5 MON 15:30

Zinc Indiffused Diced Ridge PPLN Waveguides for Photorefractive Damage Resistance and Spectral Engineering

•*S.A. Berry*[1], *L.G. Carpenter*[1], *J.C. Gates*[1], *P.G.R. Smith*[1,2], *and C.B.E. Gawith*[1,2]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*Covesion Ltd., Romsey, United Kingdom*

We present our latest work on zinc indiffused diced ridge PPLN waveguides. This includes: input power scaling at different temperatures, photorefraction damage response, and spectral engineering through customised poling grating apodisations.

16:15 – 17:45

CJ-7: Mode-locked fiber lasers and nonlinear amplifiers

Chair: Ammar Hideur, CORIA, Rouen, France

CJ-7.1 MON 16:15

Build-Up of Bidirectional Ultra-short Pulse Laser Generation: from Q-Switched Instabilities to Mode-Locking

•*I. Kudelin*[1], *S. Sugavanam*[1], *and M. Chernysheva*[1,2]; [1]*Aston University, Bermingham, United Kingdom*;

ROOM 4a ICM

EA-1.6 MON 15:30

Controlling symmetry and localization with artificial gauge fields in disordered quantum systems

C. Hainaut[1], *I. Manai*[1], *J.-F. Clément*[1], *J.C. Garreau*[1], *P. Szriftgiser*[1], *G. Lemarié*[2], *N. Cherroret*[3], *D. Delande*[3], *and* •*R. Chicireanu*[1]; [1]*Université de Lille, Laboratoire de Physique des Lasers Atomes et Molécules, Villeneuve d'Ascq, France*; [2]*Laboratoire de Physique Théorique, Université de Toulouse, Toulouse, France*; [3]*4Laboratoire Kastler Brossel, College de France, Paris, France*

We present the realization of synthetic gauge fields in disordered, periodically-driven (Floquet) quantum systems. We also show the first experimental observation of the Coherent Forward Scattering, a novel microscopic manifestation of the Anderson localization.

16:15 – 17:45

EA-2: Coherent atom-light interaction

Chair: Lukas Slodicka, Palacky University, Olomouc, Czech Republic

EA-2.1 MON 16:15

Interacting Rydberg ions

C. Zhang, F. Pokorny, G. Higgins, A. Pöschl, and •*M. Hennrich*; *Department of Physics, Stockholm University, Stockholm, Sweden*

We report on the observation of a Rydberg blockade between trapped

ROOM 4b ICM

CK-5.6 MON 15:30

Precisely Dispersion Tailored Crystalline Microresonator with a Q Exceeding 10^8 Fabricated by Computer-controlled Machining

•*S. Fujii*[1], *M. Fuchida*[1], *H. Amano*[2], *S. Tanaka*[1], *R. Suzuki*[1], *Y. Kakinuma*[2], *and T. Tanabe*[1]; [1]*Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, Yokohama, Japan*; [2]*Department of System Design Engineering, Faculty of Science and Technology, Keio University, Yokohama, Japan*

We fabricated a crystalline WGM microresonator employing a computer-controlled ultraprecision machining that requires no hand polishing. MgF_2 microresonators show an ultrahigh Q of 1.4×10^8, which is the highest Q obtained without a polishing process.

16:15 – 17:45

CK-6: From nano to quantum sensing

Chair: Peter Smith, University of Southampton, Southampton, United Kingdom

CK-6.1 MON 16:15

All-dielectric nanohole array for high-resolution imaging and enhanced sensitivity

•*D. Conteduca*[1], *R. Romão*[2], *E.R. Martins*[2], *and T.F. Krauss*[1]; [1]*Photonics Group, Department of Physics, University of York, York,*

ROOM 13a ICM

CA-6.6 MON 15:30

Spectroscopy, Continuous-Wave and Passively Q-switched Laser Operation of Transparent Tm:LuAG Ceramics

•*F. Yue*[1,2], *M.-T. Chen*[1,3], *L. Basyrova*[4], *P. Loiko*[4], *J.M. Serres*[1], *Y. Wang*[5], *J. Li*[6], *V. Jambunathan* [2], *A. Lucianetti*[2], *T. Mocek*[2], *S. Dai*[3], *Z. Chen*[3], *S.Y. Choi*[7], *J.E. Bae*[7], *F. Rotermund* [7], *M. Aguiló* [1], *F. Díaz* [1], *U. Griebner*[5], *V. Petrov*[5], *and X. Mateos*[1]; [1]*Física i Cristal·lografia de Materials i Nanomaterials. Universitat Rovira i Virgili (URV), Tarragona, Spain*; [2]*HiLASE Centre, IoP, Czech Academy of Sciences, Dolní Brežany, Czech Republic*; [3]*Department of Optoelectronic Engineering, Jinan University, Guangzhou, China*; [4]*ITMO University, St. Petersburg, Russia*; [5]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [6]*Key Laboratory of Transparent and Opto-Functional Inorganic Materials, CAS Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai , China*; [7]*Department of Physics, KAIST, Daejeon, South Korea*

The synthesis, spectroscopy and efficient microchip CW and PQS laser operation of Tm:LuAG transparent ceramics are presented. In CW, 3.12 W at 2021-2035 nm with η = 60.2% is achieved. SWCNTs are used for PQS.

16:15 – 17:45

CA-7: Novel laser concepts

Chair: Christian Kränkel, Leibniz-Institut für Kristallzüchtung, Berlin, Germany

CA-7.1 MON (Invited) 16:15

Titanium Sapphire: A Decade of Diode-laser Pumping

J.C.E. Coyle[1,2], *J.-M. Hopkins*[2], *A.A. Lagatsky*[2], *and* •*A.J. Kemp*[1]; [1]*Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom*; [2]*Fraunhofer Centre for*

ROOM 13b ICM

CB-2.5 MON 15:30

Collective laser emission in coupled hybrid InP-on-SOI nanocavities

•*Q. Chateiller*[1,2], *D. Sanchez*[1], *and F. Raineri*[1,2]; [1]*Centre for Nanoscience and Nanotechnology (C2N), Palaiseau, France*; [2]*Université Paris Diderot, Paris, France*

The development of nanolasers integrated within a photonic platform is crucial to develop power efficient optical links. Our group is studying the collective laser emission obtained by coupling two InP-based nanolasers through a SOI wire.

16:15 – 17:45

CB-3: Integrated semiconductor lasers and amplifiers

Chair: Dries van Thourhout, Ghent University, Ghent, Belgium

CB-3.1 MON 16:15

Monolithic master oscillator with tapered power amplifier diode laser at 1060 nm with additional control section for high power operation

•*C. Zink, M. Maiwald, H. Wenzel, B. Sumpf, and G. Tränkle*; *Ferdinand-*

ROOM 14a ICM

EH-2.6 MON 15:30

Complex-Birefringent and Chiral Waveplates with Metasurfaces

•*S. Lung, K. Wang, K.Z. Kamali, M. Rahmani, D.N. Neshev, and A.A. Sukhorukov*; *Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, ACT 2601, Australia*

We develop metasurfaces with pairwise structures realizing complex-birefringence and chirality, combining nontrivial polarization transformation with judiciously tailored and minimum necessary polarization-dependent losses. We experimentally demonstrate their unique properties in the amplification of small polarization differences.

16:15 – 17:45

EI-1: Optics of graphene and related 2D materials

Chair: Thomas Mueller, Vienna University of Technology, Vienna, Austria

EI-1.1 MON (Tutorial) 16:15

Graphene for photonics and optoelectronics

•*A. Ferrari*; *Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom*

Graphene has great potential in photonics and optoelectronics,

ROOM 14b ICM

ROOM Osterseen ICM

CL-2.5 MON 15:30

3D nanoprinted high NA ultra-compact catadioptric lens for efficient collection in forward detection configuration microscopy

•*A. Bertoncini, S.P. Laptenok, V.P. Rajamanickam , and C. Liberale; King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia*

We show the fabrication of a high-NA 3D nanoprinted lens improving the collection efficiency in forward detection microscopies. We demonstrate the removal of Cross-Phase Modulation induced background in Stimulated Raman Scattering imaging.

ROOM 1 Hall A1

CH-6.5 MON 15:30

High Sensitivity All-fibre Methane Sensor with Gas Permeable Teflon/Cryptophane-A Membrane

•*R. Ismaeel[1,2], A. Beaton[2], A. Donko[1], W. Talataisong[1], T. Lee[1], T. Brotin[3], M. Beresna[1], M. Mowlem[2], and G. Brambilla[1]; [1]Optoelectronics Research center, southampton, United Kingdom; [2]National Oceanography Center, southampton, United Kingdom; [3]Laboratoire de chimie, Univ. Lyon, Lyon, United Kingdom*

We demonstrate a simple all fibre methane sensor, with record sensitivity of 0.16 nm/ppm, composed of a D-shaped optical fibre in between two fibre Bragg gratings. The sensitive region is coated with cryptophane-A Teflon membrane.

ROOM 2 Hall A1

CF-6.6 MON 15:30

Spatial Characterization of Synthesized Infrared Sub-Cycle Pulses

•*M.A. Silva-Toledo[1,2], F. Scheiba[1,2], G.M. Rossi[1,2], R.E. Mainz[1,2], Y. Yang[1,3], G. Cirmi[1,3], and F.X. Kärtner[1,2,3]; [1]Center for Free-Electron Laser Science/Deutsches Elektronen-Synchrotron, Hamburg, Germany; [2]Physics Deparment, University of Hamburg, Hamburg, Germany; [3]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

We characterize the spatial properties of our mJ-level, two-channel infrared parametric waveform synthesizer. Channel beam profile overlap along the propagation direction and temporal synchronization via feedback loops verifies an achieved 3D coherent electric field superposition.

ROOM 3 Hall A1

CE-6.5 MON 15:30

X-Ray Imaging of Functional Three-Dimensional Photonic Nanostructures with 20-nm Resolution

D. Grishina[1], C. Harteveld[1], A. Pacureanu[2], D. Devashish[1], A. Lagendijk[1], P. Cloetens[2], and •W. Vos[1]; [1]University of Twente, Enschede, Netherlands; [2]European Synchrotron Radiation Facility (ESRF), Grenoble, France

We perform traceless X-ray tomography of 3D photonic band gap crystals made from silicon. We obtain complete 3D structures - including variations - that serve to identify the photonic functionality seen in optical experiments.

NOTES

Monday – Orals

16:15 – 17:45

CM-7: New trends on laser ablation

Chair: David Grojo, Aix-Marseille University, Marseille, France

CM-7.1 MON 16:15

Millijoule level laser system delivering 1 to 18 GHz intra-train repetition rate picosecond pulses for materials processing

J. Lhermite[1], •D. Marion[1], L. Pontagnier[1], P. Hericourt[1], G. Santarelli[2], and E. Cormier[1];

16:15 – 17:45

CL-3: Novel lasers, instruments and technology

Chair: Robert Huber, Universität of Lübeck, Lübeck, Germany

CL-3.1 MON 16:15

Time-lapse intravital imaging of biomaterials integration in tissues using a multicolor multiphoton microscope

•*D. Zalvidea, O. Castaño, S. Baker, N. Castro, E. Engel, and X. Trepat; Institute for Bioengineering of Cat-*

16:15 – 17:45

CH-7: Microstructured fibre sensors

Chair: Lantian Chang, University of Twente, Twente, The Netherlands

CH-7.1 MON 16:15

Continuous counting and sizing of airborne nanoparticles using hollow-core photonic crystal fibres

•*A. Sharma, S. Xie, R. Zeltner, and P.S.J. Russell; Max Planck Institute for the Science of Light, Erlangen,*

16:15 – 17:45

CF-7: Ultrabroadband laser sources

Chair: Valentina Shumakova, University of Ottawa, Ottawa, Canada

CF-7.1 MON (Invited) 16:15

51 W, multi-GW few-cycle laser spanning 1.2 – 2.2 μm wavelength

•*M. Gebhardt[1,2], C. Gaida[1], T. Heuermann[1,2], C. Jauregui[1], J. Antonio-Lopez[3], A. Schülzgen[3], R. Amezcua-Correa[3], J. Rothhardt[1,2,4], and J. Limpert[1,2,4]; [1]Institute of*

16:15 – 17:45

CE-7: Advances in optical fibre configurations and materials

Chair: Daniel Milanese, Politecnico di Torino, Torino, Italy

CE-7.1 MON 16:15

Fabrication and Characterization of Tapered Single-Ring Hollow-Core Photonic Crystal Fibre

•*R. Pennetta[1], M. Enders[1], M. Frosz[1], F. Tani[1], and P. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany;*

ROOM 1 ICM

[2]*Leibniz Institute of Photonics Technology, Jena, Germany*
In this work, we demonstrate the real-time evolution of temporal and spectral profile during the counter-propagating solitons formation in a bidirectional mode-locked erbium-doped fibre laser using spatio-temporal intensity measurements and the dispersive Fourier transform technique.

CJ-7.2 MON 16:30

High-Energy Ultrafast Yb-Fiber Laser System Based on a Mamyshev Regenerator

•*P. Repgen*[1], *D. Wandt*[1], *U. Morgner*[1,2], *J. Neumann*[1], *and D. Kracht*[1]; [1]*Laser Zentrum Hannover, Hannover, Germany*; [2]*Institut für Quantenoptik, Hannover, Germany*
We present the characteristics of a high-energy ultrafast Yb-fiber laser system based on a Mamyshev regenerator, its power scaling and optimization capabilities and results concerning direct amplification of its output in a power amplifier module.

CJ-7.3 MON 16:45

Square Pulse and Harmonic Ultrashort Pulse Generation in Semiconductor Optical Amplifier-Based Mamyshev Oscillator

I. Kudelin[1] *and* •*M. Chernysheva*[1,2]; [1]*Aston University, Birmingham, United Kingdom*; [2]*Leibniz institute of Photonics Technology, Jena, Germany*
We propose an original design of Mamyshev oscillator based on semi-

ROOM 4a ICM

ions. This technique promises to speed up entanglement operations between trapped ions.

EA-2.2 MON 16:30

Atomic interaction via diffractive light coupling

•*T. Ackemann*[1], *A. Costa Boquete*[1], *I. Kresic*[2], *G. Baio*[1], *G.R.M. Robb*[1], *G.-L. Oppo*[1], *P.F. Griffin*[1], *G. Labeyrie*[3], *and R. Kaiser*[3]; [1]*SUPA and Department of Physics, University of Strathclyde, Glasgow, United Kingdom*; [2]*Institute of Physics, Zagreb, Croatia*; [3]*Institut de Physique de Nice, Universite Cote d'Azur, Valbonne, France*
We discuss the spontaneous formation of ordered phases of atomic density or polar and nematic spin patterns via light induced interaction. Diffractive dephasing leads to oscillatory interactions sustaining spontaneous lattices in cavities or feedback systems.

EA-2.3 MON 16:45

Single collective excitation of atoms evanescently coupled to a nanoscale waveguide

•*J. Raskop, N. Corzo, A. Chandra, A. Sheremet, B. Gouraud, J. Berroir, and J. Laurat*; *Laboratoire Kastler Brossel (LKB), Paris, France*
Using atoms trapped along an optical nanofibre, we observe a single collective atomic excitation coupled to a nanoscale waveguide. The sub-

ROOM 4b ICM

United Kingdom; [2]*São Carlos School of Engineering, Department of Electrical and Computer Engineering, University of São Paulo, São Carlos-SP, Brazil*
We propose an all-dielectric nanohole array in amorphous silicon that provides a high Q-factor and extinction ratio combined with a high spatial resolution and enhanced surface sensitivity for resonant sensing and imaging applications

CK-6.2 MON 16:30

Fully On-Chip Single-Photon Hanbury-Brown and Twiss Experiment on a Monolithic Semiconductor–Superconductor Platform

•*S.L. Portalupi*[1], *M. Schwartz*[1], *E. Schmidt*[2], *U. Rengstl*[1], *F. Hornung*[1], *S. Hepp*[1], *K. Llin*[2], *M. Jetter*[1], *M. Siegel*[2], *and P. Michler*[1]; [1]*Institut für Halbleiteroptik und Funktionelle Grenzfiächen, Center for Integrated Quantum Science and Technology (IQST) and SCoPE, University of Stuttgart, Stuttgart, Germany*; [2]*Institute of Micro- and Nanoelectronic Systems, Karlsruhe Institute of Technology , Karlsruhe, Germany*
A fully on-chip Hanbury-Brown and Twiss experiment is conducted: the GaAs-based chip monolithically includes quantum dot-based single-photon sources, a waveguide-based 50:50 beamsplitter and two independent superconducting nanowire detectors, all required elements for on-chip quantum applications.

CK-6.3 MON 16:45

Interferometric sensing with guided-mode resonances

•*I.A. Barth and T.F. Krauss*; *University of York, York, United Kingdom*
To overcome current limitations of guided-mode resonance based biosensing, we propose common-path interferometry as robust and simple phase probing system to measure the phase shift introduced by biomolecular binding on the sen-

ROOM 13a ICM

Applied Photonics, Glasgow, United Kingdom
This presentation will review the challenges associated with diode-pumping of Ti:sapphire and the rapid recent progress made internationally in delivering diode-pumped Ti:sapphire lasers of increasing utility.

CA-7.2 MON 16:45

Efficient Tm:YAG and Tm:LuAG lasers pumped by red tapered diodes

•*E. Beyatli*[1], *B. Sumpf*[2], *G. Erbert*[2], *and U. Demirbas*[3,4]; [1]*Recep Tayyip Erdogan University, Rize, Turkey*; [2]*Ferdinand-Braun-Institut, Berlin, Germany*; [3]*Antalya Bilim University, Antalya, Turkey*; [4]*Deutsches Elektronen Synchroton , Hamburg, Germany*

ROOM 13b ICM

Braun-Institut, Berlin, Germany
The influence of the layout of 1060 nm monolithic MOPAs on the emission characteristics will be presented. The MOPAs consist of a straight or tilted MO, a control and a straight or tilted PA section.

CB-3.2 MON 16:30

High-Power III-V-on-Silicon Semiconductor Optical Amplifier (> 50 mW) for Integrated Mode-Locked Lasers

•*K. Van Gasse*[1,2], *R. Wang*[1,2], *and G. Roelkens*[1,2]; [1]*Photonics Research Group, Ghent University - imec, Gent, Belgium*; [2]*Center for Nano- and Biophotonics, Gent, Belgium*
In this work we report a III-V-on-silicon SOA integrated on a silicon waveguide circuit with a small-signal gain of 27 dB, a record CW output power exceeding 50 mW and reduced confinement in the III-V.

CB-3.3 MON 16:45

Feedback Insensitive External-cavity Semiconductor Ring Laser Utilizing a Weak Intracavity Isolator

•*T. van Schaijk, D. Lenstra, K. Williams, and E. Bente*; *Eindhoven University of Technology, Eindhoven, Netherlands*
A reduction in sensitivity by 16dB to external optical feedback of an external-cavity semiconductor ring

ROOM 14a ICM

where the combination of its unique optical and electronic properties can be fully exploited, and the absence of a bandgap can be beneficial.

ROOM 14b ICM | ROOM Osterseen ICM | ROOM 1 Hall A1 | ROOM 2 Hall A1 | ROOM 3 Hall A1 | NOTES

[1]*CELIA, Université de Bordeaux – CNRS – CEA, Talence, France*; [2]*LP2N, IOGS - CNRS - Université Bordeaux, Talence, France*
We report on a GHz laser system continuously tunable from 1 to 18GHz. The source can deliver up to 1mJ burst at a repetition rate from 20kHz to few MHz with a pulse duration around 1ps.

CM-7.2 MON 16:30

GHz-bursts and ultrafast external modulation of femtosecond fiber lasers with kW average power levels

•*S. Breitkopf*[1], *M. Kienel*[1], *A. Hoffmann*[1], *M. Müller*[2], *A. Klenke*[2,3], *T. Eidam*[1], *and J. Limpert*[1,2,3,4]; [1]*Active Fiber Systems GmbH, Jena, Germany*; [2]*Institute of Applied Physics, Jena, Germany*; [3]*Helmholtz-Institute Jena, Jena, Germany*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*
For novel ablation schemes the generation of adjustable GHz-bursts and, ideally, pulse-to-pulse amplitude control at kW-level average power is often required. We present novel solutions for these demands based on fiber-laser technology and coherent beam combination.

CM-7.3 MON 16:45

Efficiency study on single pulse, burst mode and multi pulse ultrashort pulsed ablation of pure copper

•*N. Ackerl and K. Wegener*; *ETH Zurich, Zurich, Switzerland*
A tenfold increase in the mean ablation depth of burst mode ablation with 1030nm, 1ps and 25ns time spacing is reported. The threshold fluence decreases and this finding is

alonia (IBEC), Barcelona, Spain
We designed a multiphoton multichannel system based on nonlinear photonic crystal fibers pumped with femtosecond pulses to simultaneously visualize the dynamics of nuclei, capillaries and extracellular matrix when biomaterials are immersed inside a living tissue.

CL-3.2 MON 16:30

1.6MHz FDML-MOPA Laser with 320MHz pulse repetition rate

M. Strauch, V. Lutz, J.-P. Kolb, R. Huber, and •S.'N. Karpf; Institute of Biomedical Optics, University Of Luebeck, Luebeck, Germany
We present a 1.6MHz FDML-MOPA at 1060nm, where each sweep is modulated to 200 pulses resulting in 320MHz repetition rate. It achieves multi-Watt peak powers for spectro-temporal encoded applications in sensing, spectroscopy and high-speed imaging.

CL-3.3 MON 16:45

A New Pulse-Shaped Multiphoton Single-Molecule Microscope

•*D. Nobis and S.W. Magennis*; *University of Glasgow, Glasgow, United Kingdom*
We present a new multiphoton microscope for single-molecule detection. The pulse length at the focal plane is 8fs and the signal to background ratio can be further enhanced through pulse shaping.

Germany
We report a system capable of counting and sizing airborne nanoparticles using a laser and a hollow-core photonic crystal fibre. Sizing of polystyrene particles of diameter between 625 nm to 2 μm with a resolution of 50 nm is demonstrated.

CH-7.2 MON 16:30

Detection and Tracking of Multiple Individual Nanoparticles in Antiresonant Hollow-Core Fibers

•*M. Nissen*[1], *S. Weidlich*[1,2], *R. Förster*[1], *Y. Lahini*[3], *and M.A. Schmidt*[1,4]; [1]*Leibniz Institute of Photonic Technology, Jena, Germany*; [2]*Heraeus Quarzglas GmbH & Co. KG, Hanau, Germany*; [3]*School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel*; [4]*Otto Schott Institute of Material Research, Friedrich-Schiller-Universität, Jena, Germany*
Antiresonant hollow-core fibers are applied as novel optofluidic platform for detecting and tracking of unlabeled, individual nano-objects in statistically large numbers simultaneously. This low-background elastic light scattering method gives access to fast nanoscale particle dynamics.

CH-7.3 MON 16:45

Photoreduction in Optofluidic Hollow-Core Photonic Crystal Fiber

•*P. Koehler*[1,2], *J. Neises*[1], *J. Willkomm*[2], *T. Lawson*[1,2], *D. Antón-García*[2], *M.H. Frosz*[3], *P.S.J. Russell*[3], *E. Reisner*[2], *and T.G. Euser*[1]; [1]*NanoPhotonics Centre, Cavendish Laboratory, Department of Physics, University of Cambridge, Cambridge, United Kingdom*; *Applied Physics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*CREOL, College of Optics and Photonics, University of Central Florida, Orlando, USA*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*
By combining an ultrafast Tm-doped fiber laser system with a nonlinear pulse compression stage, we have generated intense two-cycle, 130 μJ-pulses at 392 kHz repetition rate (51 W) and 1733 nm central wavelength.

CF-7.2 MON 16:45

Broadband infrared (2.7-20 μm) generation via random quasi-phase-matched intra-pulse difference-frequency generation

•*J. Zhang*[1], *K. Fritsch*[2], *Q. Wang*[1,3], *F. Krausz*[1,2], *K.F. Mak*[1], *and O. Pronin*[1]; [1]*Max-Planck-Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig-Maximilians-University Munich, Garching, Germany*; [3]*Beijing Institute of*

[2]*University of Erlangen-Nuremberg, Erlangen, Germany*
Single-ring hollow-core photonic crystal fibres with remarkably small core diameters (<6 μm) and capillary core-wall thickness (<90 nm) can be fabricated by thermal tapering. The resulting structures and their optical properties are experimentally investigated.

CE-7.2 MON 16:30

Core modal spatial-structuring in inhibited-coupling hollow-core fibers

•*J.H. Osório*[1], *M. Chafer*[1,2], *B. Debord*[1,2], *F. Giovanardi*[3], *M. Cordier*[4], *M. Maurel*[1,2], *F. Delahaye*[1,2], *F. Amrani*[1,2], *L. Vincetti*[3], *F. Gérôme*[1,2], *and F. Benabid*[1,2]; [1]*GPPMM Group, XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France*; [2]*GLOphotonics S.A.S., Limoges, France*; [3]*Department of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, Modena, Italy*; [4]*Laboratoire de Traitement et Communication de l'Information, Télécom ParisTech, Université Paris-Saclay, Paris, France*
We show that the alteration of the lattice-tubes distribution in single-ring tubular-lattice hollow-core fibers entails modifications in the fiber mode loss hierarchy. It allows the fiber to act as a mode shaper.

CE-7.3 MON 16:45

Fabrication of nanohole suspended core fibers and their dispersion properties

•*A. Hartung, J. Bierlich, A. Lorenz, J. Kobelke, and M. Jäger*; *Leibniz-Institute of Photonic Technology, Jena, Germany*
We discuss the fabrication conditions for suspended core fibers based on fused silica having a nano-sized central hole in the core. Drawn

ROOM 1 ICM

conductor optical amplifier. The oscillator operates in self-starting and stable square pulse or harmonic generation regimes tuneable by the adjustment of the spectral filter offsets.

CJ-7.4 MON 17:00

All-PM fibre laser with switchable pulsed regimes driven by electrochemically gated carbon nanotube saturable absorber

Y. Gladush[1], A. Mkrtchyan[1], D. Kopylova[1], •A. Ivanenko[2], B. Nyushkov[2,3], A. Kokhanovskiy[2], S. Kobtsev[2], and A.G. Nasibulin[1,4]; [1]Skolkovo Institute of Science and Technology, Moscow, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Novosibirsk State Technical University, Novosibirsk, Russia; [4]Aalto University, Espoo, Finland

We explored electronic control of pulse regimes in an all-PM Er-fibre laser incorporating an original electrochemically gated in-line carbon nanotube saturable absorber. Reproducible voltage-induced tuning and switching of the mode-locked and Q-switched regimes are demonstrated.

CJ-7.5 MON 17:15

Measurement of Inter-Sweep Phase Stability of an FDML Laser with a 10 kHz Tunable Ring Laser

•D. Kastner[1], T. Blömker[1], T. Pfeiffer[1], C. Grill[1], M. Schmidt[2], C. Jirauschek[2], and R. Huber[1]; [1]Institut für Biomedizinische Optik, Universität zu Lübeck, Lübeck, Germany; [2]Department of Electrical and Computer Engineering, Technische Universität München, München, Germany

First measurement of the inter-sweep phase of an FDML laser using a ring laser with line width <10kHz. The results proof a stable carrier envelope phase slip of the FDML laser over 40 consecutive sweeps.

ROOM 4a ICM

sequent read-out leads to the emission of a single photon into the guided mode.

EA-2.4 MON 17:00

Tuneable, Narrowband, Entangled Photons interfaced with Atomic Systems

•V. Prakash, L. Bianchet, N. Bruno, and M. Mitchell; ICFO- the Institute of Photonic Sciences, Barcelona, Spain

We report on a new source for correlated photon pairs, which are frequency tuneable, atom - resonant, narrowband, single mode and entangled. The photons are prepared to explore nonlinear photonics through interaction with ultracold atoms.

EA-2.5 MON (Invited) 17:15

Atomic vapor confined in a nanoscale geometry : from mesoscopic to collective effects.

•T. Peyrot[1], J. Keaveney[2], Y. Sortais[1], A. Sargsyan[3], J.J. Greffet[1], I. Hughes[2], C. Adams[2], and A. Browaeys[1]; [1]Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS,, Palaiseau, France; [2]Department of Physics, Rochester Building, Durham University, Durham University, United Kingdom; [3]Institute for Physical Research, National Academy of Sciences, Ashtarak 2,, Armenia

Spectroscopy through vapor nanocells of alkali reveals the transition between a dilute non-local to a dense collective response of the atoms to a light field.

ROOM 4b ICM

sor surface.

CK-6.4 MON 17:00

On-chip periodic arrays of optical traps based on the superposition of guided modes in silicon waveguides

•C. Pin[1,2], J.-B. Jager[2], M. Tardif[2], E. Picard[2], E. Hadji[2], F. de Fornel[1], and B. Cluzel[1]; [1]Université de Bourgogne-Franche Comté, Laboratoire Interdisciplinaire Carnot de Bourgogne U.M.R. C.N.R.S. 6303, Dijon, France; [2]Université Grenoble Alpes, C.E.A., I.N.A.C., Grenoble, France

We demonstrate on-chip parallel optical trapping and manipulation of 500 nm and 1μm dielectric particles and e. coli bacteria using near-field optical lattices at the surface of a few modes silicon waveguide.

CK-6.5 MON 17:15

Opto-mechanical ultrasound sensor based on sensitive silicon-photonic split rib-type waveguide

•W.J. Westerveld, M. Mahmud-Ul-Hasan, R. Jansen, X. Rottenberg, S. Severi, and V. Rochus; Imec, Leuven, Belgium

We propose a new opto-mechanical ultrasound sensor (OMUS) with innovative silicon photonics split rib-type waveguide. Modeling predicts a low detection limit (2.4 Pa over 15 MHz). We also report successful realization of critical processing steps.

ROOM 13a ICM

We report first 681 nm diode pumping of Tm:YAG and Tm:LuAG lasers using high-brightness tapered diodes. Slope efficiencies above 50% were achieved in continuous-wave lasing operation indicating existence of strong two-for-one cross-relaxation process.

CA-7.3 MON 17:00

Cooling effect of Tm co-doping: increase the system efficiency and prospecting to reach the 70 K cooling temperature

•G. Cittadino[1], A. Di Lieto[1,2], and M. Tonelli[1,2]; [1]Dipartimento di Fisica, Università di Pisa, Largo Bruno Pontecorvo 3, 56127 Pisa, Italy; [2]NEST-Istituto di Nanoscienze-CNR, Piazza S. Silvestro 12, 56127 Pisa, Italy

We demonstrated a 30% increasing cooling efficiency of LiYF4:10%Yb-0.0040%Tm in comparison with Yb-single-doped sample, typically used for these applications, according to the strategic interest in optical refrigeration of solids to develop a vibration-free cryo-cooler device.

CA-7.4 MON (Invited) 17:15

LED pumped transition metal lasers

P. Pichon[1,2], •F. Balembois[1], F. Druon[1], J.-P. Blanchot[2], and P. Georges[1]; [1]Laboratoire Charles Fabry, Palaiseau, France; [2]EFFILUX, Les Ulis, France

Using Ce:doped LED-pumped luminescent concentrators, we described LED-pumped lasers systems based on transition metal gain media (Alexandrite, Cr:LiSAF,Ti:Sapphire). Performance in Q-switched oscillators and in pulse amplifiers are reported.

ROOM 13b ICM

laser using 5dB intracavity isolation is demonstrated experimentally. This 11dB increase in effectiveness is in agreement with theory.

CB-3.4 MON 17:00

Narrow Linewidth InGaN Laser Diodes Based on External Cavity Fiber Bragg Grating

M. Gay[1], A. Congar[1], D. Mammez[1], L. Lablonde[2], R. Butté[3], N. Grandjean[3], P. Besnard[1], and •S. Trebaol[1]; [1]Univ Rennes, CNRS, Institut FOTON - UMR 6082, Lannion, France; [2]IxBlue, Lannion, France; [3]Institute of Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

We demonstrate single frequency operation of a Fiber Bragg Grating external cavity InGaN Laser Diode emitting at 396.9 nm and exhibiting a resolution limited linewidth of 3.2 MHz.

CB-3.5 MON 17:15

Mode-hop-free Tuning of a Chip-based Hybrid Integrated InP-Si3N4 Laser

•A. van Rees[1], D. Geskus[2], E.J. Klein[2], Y. Fan[1], P.J.M. van der Slot[1], and K.-J. Boller[1]; [1]Laser Physics and Nonlinear Optics Group, Faculty of Science and Technology, MESA+ Institute of Nanotechnology, University of Twente, Enschede, Netherlands; [2]LioniX International B.V., Enschede, Netherlands

We demonstrate a novel method for mode-hop-free tuning of a narrow linewidth hybrid integrated InP-Si3N4 laser, in which the tuning range is not limited by the laser cavity's free spectral range.

ROOM 14a ICM

EI-1.2 MON 17:15

Impact of strain on the second-harmonic generation in transition metal dichalcogenide monolayers

•L. Mennel[1], V. Smejkal[2], F. Libisch[2], and T. Mueller[1]; [1]Photonics Institute, TU Wien, Vienna, Austria; [2]Institute of Theoretical Physics, TU Wien, Vienna, Austria

We determine and model the impact of strain on the optical second-harmonic generation in transition metal dichalcogenide monolayers at different excitation wavelengths and find resonances near the C-exciton energies of the investigated materials.

ROOM 14b ICM | ROOM Osterseen ICM | ROOM 1 Hall A1 | ROOM 2 Hall A1 | ROOM 3 Hall A1 | NOTES

supported by a multi-pulse ablation study.

CM-7.4 MON 17:00

Mechanisms of pulse to pulse pattern evolution of ultrafast Laser Induced Periodic Surface Structures observed under structured illumination microscopy

•*C. Mauclair, A. Aguilar, N. Faure, J.-P. Colombier, and R. Stoian*; *Laboratoire Hubert Curien UMR 5516 CNRS, Saint-Etienne, France*

Using high-resolution microscopy, we report on pulse to pulse mechanisms that can stabilize or modify the LIPSS pattern during the ultrafast laser irradiation sequence. These mechanisms, based on optical feedback, are supported by FDTD calculations.

CM-7.5 MON 17:15

Experimental and theoretical study of ultrashort laser excitation of Nickel

•*T. Genieys*[1], *M. Petrakakis*[2,3], *G. Tsibidis*[3], *M. Sentis*[1], *and O. Utéza*[1]; [1]*Laboratoire LP3, Aix Marseille University, CNRS, Marseille, France*; [2]*Materials Science and Technology Department, University of Crete, Heraklion, Greece*; [3]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology (FORTH), Heraklion, Greece*

We present a study of femtosecond laser interaction with Nickel. Ablation threshold and reflectivity measurements are compared to simulations showing the influence of electrons out of thermal equilibrium to correctly describe electron-to-lattice energy coupling.

CL-3.4 MON 17:00

Laser Illumination Designs for Snapshot Multi-Spectral-Line Imaging

•*J. Spigulis*[1,2], *I. Oshina*[1], *and M. Matulenko*[1]; [1]*Institute of Atomic Physics and Spectroscopy, University of Latvia, Riga, Latvia*; [2]*Physics Department, Faculty of Physics, Mathematics and Optometry, University of Latvia, Riga, Latvia*

Four optical designs for providing uniform multi-laser illumination of 3-5 cm target area are discussed – optical fibre-based, with flat reflective diffuser, with reflecting side-diffuser and with coaxial transmittive diffuser. Application field – skin chromophore mapping for diagnostics.

CL-3.5 MON 17:15

In-movie, Single-frame Visualization of Shock Wave Propagation for the Studies of Laser Medical Procedures in Ophthalmology

•*T. Požar, V. Agrež, and R. Petkovšek*; *Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia*

Shock waves emitted during laser-based procedures in ophthalmology are visualized with a technique where each frame in a shadowgraph movie is illuminated by multiple short pulses, providing in-frame visualization of the propagating shock waves.

[2]*Department of Chemistry, University of Cambridge, Cambridge, United Kingdom*; [3]*Max Planck Institute for the Science of Light, Erlangen, Germany*

We utilize optofluidic hollow-core photonic crystal fibers that uniquely guide light at the centre of microfluidic channels for in-situ measurements of carbon nanodot based photoreduction processes. Our results are relevant to photocatalytic solar fuel generation.

CH-7.4 MON 17:00

Three dimensional particle tracking in microstructured graded index fiber

•*S. Jiang*[1], *J. Zhao*[1], *S. Weidlich*[1], *and M. Schmidt*[1,2]; [1]*Leibniz Institute of Photonic Technology, Jena, Germany*; [2]*Otto Schott Institute of Material Research, Jena, Germany*

Three dimensional particle tracking with high temporal and spatial resolution is initially realized in microstructured graded index fibers by combing the camera image and particle scattering light which allows straightforward nano-object analysis.

CH-7.5 MON 17:15

High-Power, Sub-Poissonian Twin-Beam Correlations at Blue and Red Wavelengths from Four-Wave Mixing in Photonic Crystal Fiber

•*J. Mueller*[1,2], *A. McMillan*[2], *J. Rarity*[1,2], *P.J. Moseley*[3], *and J. Matthews*[2]; [1]*Quantum Engineering Centre for Doctoral Training, University of Bristol, UK*; [2]*Quantum Engineering Technology Labs, University of Bristol, UK*; [3]*Centre for Photonics and Plasmonic Materials, University of Bath, UK*

We demonstrate sub-Poissonian intensity correlations of twin beams at visible wavelengths. Picowatt beams generated via four-wave mixing in photonic crystal fiber are measured with a CCD camera. Progress towards microwatt demonstration with photodiodes is discussed.

Technology, Beijing, China

We present the first infrared source based on intra-pulse difference-frequency generation under random quasi-phase-matching condition. An octave-spanning infrared continuum (2.7-20 μm) at around 20 mW of average power was obtained.

CF-7.3 MON 17:00

2.5-12 μm tunable, 2 μm pumped, ZnGeP2-based OPG/OPA System for the generation of narrowband, μJ-level pulses with sub-20 cm-1 bandwidth

•*M. Baudisch*[1], *M. Hinkelmann*[2], *D. Wandt*[2], *K. Zawilski*[3], *P. Schunemann*[3], *J. Neumann*[2], *and I. Rimke*[1]; [1]*APE Angewandte Physik & Elektronik GmbH, Haus N, Plauener Str. 163-165, 13053 Berlin, Germany*; [2]*Laser Zentrum Hannover e.V., Laser Development Department, Ultrafast Photonics Group, Hollerithallee 8, D30419 Hannover, Germany*; [3]*BAE Systems, MER15-1813, P.O. Box 868, Nashua, New Hampshire 03061, USA*

We present a MgO:PPLN- and ZnGeP2-based, picosecond OPG/OPA scheme driven by a CPA-free Ho:YLF laser at 20 kHz. The source provides mid-to-long-infrared tunable, μJ-energy pulses with sub-20 cm-1 spectral bandwidth over the full tuning range.

CF-7.4 MON 17:15

High-Power and Sub-Two-Cycle 2.5 μm Optical Parametric Chirped Pulse Amplification System

N. Bigler, J. Pupeikis, S. Hrisafov, L. Gallmann, •*C. Phillips, and U. Keller*; *ETH Zurich, Zurich, Switzerland*

We present a mid-infrared optical parametric chirped-pulse amplifier (OPCPA) delivering 12.6 W at 100 kHz centered at 2.5 μm. Through a time-gated pulse shaping scheme, the pulses were compressed to 14.4 fs (1.7 cycles).

fibers show core and hole sizes suitable for all-normal dispersion supercontinuum generation.

CE-7.4 MON 17:00

Integrated Optical Fibre - Investigating the Vibrational Response Using Optical Frequency Domain Reflectometry

•*S.L. Scholl*[1], *R.H.S. Bannermann*[1], *A. Jantzen*[1], *S.A. Berry*[1], *A.C. Gray*[1], *J.C. Gates*[1], *L.J. Boyd*[2], *P.G.R. Smith*[1], *and C. Holmes*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*Parker Aerospace, Parker Hannifin Corporation, Bristol, United Kingdom*

Integrated optical fibre is a new, highly robust, low-loss platform for multiple applications including aerospace sensors. We investigate the vibration response of the devices under realistic aerospace vibration conditions using optical frequency domain reflectometry.

CE-7.5 MON 17:15

Development of 3-D Printed Silica Preforms

•*A. Camacho-Rosales*[1], *M. Nuñez-Velázquez*[1], *X. Zhao*[2], *S. Yang*[2], *and J.K. Sahu*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*School of Engineering, University of Southampton, Southampton, United Kingdom*

3-D printed silica preforms with complex geometries were produced by a customised SLS printer. The produced porous body was sintered before fibre drawing. An optical characterisation of the fabricated fibre is presented.

ROOM 1 ICM

CJ-7.6 MON 17:30

Gain-managed nonlinear fiber amplifier

P. Sidorenko, W. Fu, and •F. Wise; School of Applied and Engineering Physics, Cornell University, Ithaca, New York 14853, USA

We demonstrate a novel pulse evolution in a fiber amplifier. We show that this pulse evolution is driven by a nonlinear attractor and paves the way toward simple, compact fiber systems producing high-energy, ~30-fs pulses.

ROOM 4a ICM

ROOM 4b ICM

CK-6.6 MON 17:30

Efficient Solid-State Single-Photon Sources Based on Diamond Colour Centers Coupled to Plasmonic Bullseye Resonators

•M. Zeitlmair[1], N. Hellerhoff[1], P. Altpeter[1], and H. Weinfurter[1,2]; [1]Ludwig-Maximilians-Universität, München, Germany; [2]Max-Planck-Institut für Quantenoptik, Garching, Germany

We present the development of a solid-state based light-matter interface based on colour centers in nanodiamond coupled to plasmonic bullseye resonators. They facilitate strong redirection of the light emission and allow for high collection efficiencies.

ROOM 13a ICM

ROOM 13b ICM

CB-3.6 MON 17:30

Compact dual-wavelength lasers on InP generic foundry platform

•R. Pawlus[1], S. Breuer[2], and M. Virte[1]; [1]Brussels Photonics (B-PHOT), Dept. of Applied Physics and Photonics, Vrije Universiteit Brussel, Pleinlaan 2, 1150 Brussels, Belgium; [2]Institute of Applied Physics, Technische Universität Darmstadt, Schlossgartenstraße 7, 64289 Darmstadt, Germany

We present different dual-wavelength laser layouts implemented into a Photonic Integrated Circuit using a generic InP MPW platform. We compare the attributes and limitations of each design and present experimental results under varying biasing conditions.

ROOM 14a ICM

EI-1.3 MON 17:30

The contribution has been withdrawn.

ROOM 1 ICM

18:00 – 19:00

PL-3: Nobel Prize Plenary Talk

Chair: Giulio Cerullo, Politecnico di Milano, Italy

PL-3.1 MON (Plenary) 18:00

A Passion for Extreme Light

•G. Mourou; Ecole polytechnique, Palaiseau, France

Extreme light is providing a vast range of high energy radiations and particles along with the highest field, highest pressure. Its applications in science and technology will be discussed.

NOTES

ROOM 14b ICM

CM-7.6 MON 17:30

Atomistic Modelling of the Single-Pulse Ablative Generation of Laser- induced Periodic Surface Structures in Vacuum and Liquid Environment

•*I. Gnilitskyi*[1,2,3], *C.-Y. Shih*[4], *M. Shugaev*[4], *and L. Zhigilei*[4]; [1]*LLC "NoviNano", Lviv, Ukraine*; [2]*Lviv Polytechnic National University, Lviv, Ukraine*; [3]*University of Modena and Reggio Emilia, Reggio Emilia, Italy*; [4]*University of Virginia, Department of Materials Science & Engineering, Charlottesville, USA*

Results of a large-scale molecular dynamics simulation aimed at providing insights into mechanisms of ablative LIPSS formation in vacuum and water are presented. The simulation performed for Cr reveals the interplay of material removal and redistribution.

ROOM Osterseen ICM

CL-3.6 MON 17:30

Optical neural network by disordered tumor spheroids

•*D. Pierangeli*[1,4], *V. Palmieri*[2], *G. Marcucci*[1,4], *C. Moriconi*[3], *G. Perini*[2], *M. de Spirito*[2], *M. Papi*[2], *and C. Conti*[1,4]; [1]*university of rome la sapienza, rome, Italy*; [2]*universita cattolica del sacro cuore, rome, Italy*; [3]*cardiff university, cardiff, United Kingdom*; [4]*institute for complex systems ISC-CNR, rome, Italy*

We employ living three-dimensional tumour brain models to demonstrate a bio-inspired optical neural network trained via image transmission to detect cancer morphodynamics inaccessible by optical imaging.

ROOM 1 Hall A1

CH-7.6 MON 17:30

Monitoring the evaporation dynamics of a water droplet inside a microcapillary with nanometre-scale precision

K. Tokmakov and •M. Sumetsky; Aston University, Birmingham, United Kingdom

We dynamically characterize the size of an evaporating water droplet positioned inside a silica microcapillary with nanoscale precision by monitoring the spectra of whispering gallery modes propagating along the microcapillary and evanescently sensing the droplet.

ROOM 2 Hall A1

CF-7.5 MON 17:30

Highly efficient broadband mid-infrared generation (2.8–12.5 μm) based on a compact Cr:ZnS laser

•*Q. Wang*[1,2], *J. Zhang*[1], *N. Nagl*[3], *V. Pervak*[3], *F. Krausz*[1,3], *O. Pronin*[1], *and K.F. Mak*[1]; [1]*Max-Planck-Institute of Quantum Optics, Garching, Germany*; [2]*Beijing Institute of Technology, Beijing, China*; [3]*Ludwig-Maximilians Universität München, Garching, Germany*

We present a highly efficient broadband intra-pulse difference-frequency generation in the mid-infrared (2.8–12.5 μm) at over 300 mW of average power using a ZGP crystal and a femtosecond Cr:ZnS laser system.

ROOM 3 Hall A1

CE-7.6 MON 17:30

Long length/small core step-index silicon core fiber fabricated by improved powder-in-tube process

•*A. Pastre*[1], *A. Passelergue*[1], *S. Rougier*[1], *A. Lecomte*[2], *M. Ordu*[1], *F. Gérôme*[1], *J.-M. Blondy*[1], *and C. Restoin*[1]; [1]*XLIM Research Institute, Limoges, France*; [2]*IRCER, Centre Européen de la Céramique, Limoges, France*

We present the fabrication of a 50 meters long step-index highly crystalline silicon-core fiber by an improved powder-in-tube process allowing releasing mechanical stresses and trapped air during the drawing process

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13:15 – 14:15

CA-P: CA Poster session

CA-P.1 MON

Quasi-three-level laser performance with Nd-doped niobate crystals

•*R. Yan*[1], *X. Li*[1], *X. Yu*[1], *F. Peng*[2], *Q. Zhang*[2], *and R. Dou*[2]; [1]*Harbin Institute of Technology, Harbin, China*; [2]*Anhui Institute of Optics and Fine Mechanics, Hefei, China*

We demonstrated LD pumped quasi-three-level lasers around 0.9 μm with Nd:GdNbO4 and Nd:GdYNbO4 crystals. The output power reaches 393 mW in Nd :GdNbO4 quasi-three-level laser while it is 420 mW for Nd:GdYNbO4 927 nm laser

CA-P.2 MON

Diode-pumped cryogenically cooled microchip alexandrite laser operating at 680.4 nm wavelength

•*M. Fibrich, J. Šulc, and H. Jelínková*; *Czech Technical University in Prague, FNSPE, Prague, Czech Republic*

Continuous-wave alexandrite microchip laser operating at the so-called R1-line (similar to ruby) at 680.4 nm is reported. Pump process was realized by 445 nm InGaN laser diode providing 3.5 W of output power.

CA-P.3 MON

567 ns pulses from passively Q-switched Er:YLF laser generating at 2.81 μm

•*R. Švejkar, J. Šulc, M. Němec, and H. Jelínková*; *Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic*

Compact CW Q-switched Er:YLF lasing at 2809 nm was tested for the first time. Using SESAM and short V-shape laser resonator the duration 567±1 ns with repetition rate 25 kHz were achieved.

CA-P.4 MON

Eye-safe Er:YAG laser Q-switched by Co:Spinel Saturable Absorber

•*M. Nemec*[1], *J. Sulc*[1], *H. Jelinkova*[1], *and K. Nejezchleb*[2]; [1]*Czech Technical University in Prague, FNSPE, Prague, Czech Republic*; [2]*Crytur, Ltd., Turnov, Czech Republic*

The utilization of Co:Spinel as saturable absorber for eye-safe Er:YAG laser generating at 1645nm wavelength pumped by 1467nm laser diode was investigated. The Q-switched 65ns long pulses with single pulse energy of 200μJ were achieved.

CA-P.5 MON

Long Runtime Investigation of an Injection Seeded Q-Switched Ho:YAG Laser without Active Stabilisation

•*G. Renz*; *German Aerospace Center, Stuttgart, Germany*

We report about a Q-switched 2.1 μm Ho:YAG injection-seeded laser running on a self-organizing operational single mode principle up to several ten minutes by just using a pre-set Piezo actuator adjusted resonator length.

CA-P.6 MON

Key technologies for the development of 100 J, 100 Hz cryogenically-cooled active-mirror amplifier

•*J. Ogino*[1], *S. Tokita*[1], *L. Zhaoyang*[1], *N. Yamaguchi*[1], *S. Motokoshi*[2], *M. Sakamoto*[1], *N. Morio*[1], *K. Tsubakimoto*[1], *H. Yoshida*[1], *K. Fujioka*[1], *and J. Kawanaka*[1]; [1]*Institute of Laser Engineering, Osaka University, 2-6 Yamadaoka, Suita, Osaka 565-0871, Japan*; [2]*Institute for Laser Technology, 1-8-4 Utsubo-honmachi, Nishi-ku, Osaka, Japan*

We are developing the 100 J, 100 Hz cryogenically-cooled active-mirror amplifier. It is necessary to develop the Key technology about cooling structure, bonding, wave front compensation. We will report a overview and currently result.

CA-P.7 MON

Gain analysis of a compact Ho:YAG slab amplifier, end-pumped by a high power Tm:YLF slab laser

D. Morris, M.E. Reilly, and •*M.J.D. Esser*; *Heriot-Watt University, Edinburgh, United Kingdom*

A compact Ho:YAG slab amplifier is demonstrated, end-pumped by a high power Tm:YLF slab laser. Numerical and experimental studies include spatial and temporal analyses of the amplifier in continuous-wave, kHz ns-pulsed and MHz ultra-short-pulse operation.

CA-P.8 MON

CPA laser system based on Yb fiber seeder and two cascade Yb:YAG amplifier for compact OPCPA pump source

•*L. Veselis*[1,2], *T. Bartulevicius*[1,2], *K. Madeikis*[1,2], *R. Danilevicius*[1,2], *N. Rusteika*[1], *and A. Michailovas*[1,2]; [1]*Ekspla Ltd., Vilnius, Lithuania*; [2]*Center for Physical Sciences and Technology, Vilnius, Lithuania*

Compact CPA system with pulse parameters 10 mJ, 1 kHz, 1 ps, M2~1.3 was demonstrated. This architecture shows potential for OPCPA systems both as a pump source for supercontinuum generation and for pumping parametrical amplifiers.

CA-P.9 MON

Cr,Fe:ZnMnSe laser excited by flash-lamp pumped Er:glass laser

•*A. Říha*[1], *H. Jelínková*[1], *M. Němec*[1], *M. Čech*[1], *M.E. Doroshenko*[2], *and N.O. Kovalenko*[3]; [1]*Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Karlovy Vary, Czech Republic*; [2]*Laser Materials and Technology Research Center, Prokhorov General Physics Institute, Moscow, Russia*; [3]*Institute for Single Crystals, National Academy of Sciences of Ukraine, Kharkiv, Ukraine*

The paper contains results obtained with the new two-ions co-doped active material of the Cr,Fe:ZnMnSe including laser output characterization by using not so common pumping wavelength of the flash-lamp pumped Er:glass laser at 1535 nm.

CA-P.10 MON

Tunable and Dual Wavelength Alexandrite Laser Using the Crystal Birefringence

•*G. Tawy and M.J. Damzen*; *Imperial College London, London, United Kingdom*

Wavelength tuning from 747 to 768nm with <30GHz linewidth and stable dual wavelength operation with 13nm separation is demonstrated from an Alexandrite laser resonator containing only the birefringent gain medium as the tuning element.

CA-P.11 MON

Population Lensing in Alexandrite Lasers

•*G. Tawy, J. Wang, and M.J. Damzen*; *Imperial College London, London, United Kingdom*

Wavefront measurement of thermal lensing in an Alexandrite laser demonstrates a weakening of the lens strength when lasing compared to non-lasing, this is attributed to the population lens effect and the mechanism for observed self-Q-switching.

CA-P.12 MON

SESAM Q-switched 1534 nm microchip lasers: pulse duration, repetition rate, and peak-power optimization for LIDAR application

•*A. Penttinen, A. Härkönen, and M. Guina*; *Tampere University, Tampere, Finland*

The output parameter combinations of 1535 nm SESAM Q-switched Er,Yb:glass microchip lasers were studied for LIDAR applications. After optimization we obtained 1.5 ns pulses at 20 kHz repetition rate and 1.8 kW peak power.

CA-P.13 MON

Zero-dispersion phase-matched extracavity parametric Raman $CaCO_3$ laser generating 3rd Stokes single 80-ps pulse at 1629 nm under nanosecond pumping at 1064 nm

S. Smetanin[1], •*M. Jelinek*[2], *D. Vyhlidal*[2], *M. Cech*[2], *and V. Kubecek*[2]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*Czech Technical University in Prague, Prague, Czech Republic*

An extracavity parametric Raman $CaCO_3$ laser generating the third Stokes single 80-ps, 30 μJ pulses at 1629 nm under 4-ns pulse pumping at 1064 nm is presented.

CA-P.14 MON

Extension of mid-IR lasing spectral region using Cr:ZnSe and Cr:CdSe combined active medium

•*M. Yumoto, N. Saito, and S. Wada*; *RIKEN, Wako, Japan*

We demonstrated extension of mid-IR lasing region using combined active medium consisted of Cr:ZnSe and Cr:CdSe. Tuning range from 2.12 to 2.91 μm and maximum output energy of 2.42 mJ at 2.45 μm were achieved,

CA-P.15 MON

860-femtosecond synchronously-pumped $GdVO_4$ Raman laser at 1228 nm with 36 picosecond 1063 nm pumping

•*M. Frank*[1], *S.N. Smetanin*[2], *M. Jelínek*[1], *D. Vyhlídal*[1], *V.E. Shukshin*[2], *P.G. Zverev*[2], *and V. Kubeček*[1]; [1]*Czech Technical University in Prague, FNSPE, Prague, Czech Republic*; [2]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*

Synchronously-pumped $GdVO_4$ Raman laser oscillation on both stretching and bending Raman modes was investigated. The strongest 42-fold self-shortening of the combined-shift 1228-nm Raman radiation pulses down to 860 fs approaching to dephasing time was achieved.

CA-P.16 MON

Spectral luminescence properties of Ho^{3+} ions in active media codoped with Tb^{3+}, Pr^{3+} and Yb^{3+} for mid IR laser development

•*P.G. Zverev, V.A. Konyushkin, A.A. Sirotkin, and S.Y. Rusanov*; *Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia*

Single-crystal fibers of Gd_2O_3, Y_2O_3 and CaF_2 crystals doped with Ho^{3+} and codoped with Tb^{3+}, Pr^{3+} and Yb^{3+} were grown and analyzed. The deactivation effects were investigated under 1150 nm and 970 nm LD excitation.

CA-P.17 MON

Synchronously-pumped picosecond Raman laser at 1169 and 1222 nm with single and combined Raman mode shifts in a $Ca_3(VO_4)_2$ crystal

•*S.N. Smetanin*[2], *M. Frank*[1], *M. Jelínek*[1], *D. Vyhlídal*[1], *L.I. Ivleva*[2], *E.E. Dunaeva*[2], *I.S. Voronina*[2], *V.E. Shukshin*[2], *P.G. Zverev*[2], *and V. Kubeček*[1]; [1]*Czech Technical University in Prague, FNSPE, Prague, Czech Republic*; [2]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*

Synchronously-pumped $Ca_3(VO_4)_2$ Raman laser is demonstrated. SRS oscillation at 1169 and 1222nm on single and combined Raman modes was achieved. Strong self-shortening of the 1222-nm pulses down to 1.2ps due to self-mode-locking was obtained.

CA-P.18 MON

Fe^{2+}:$Cd_{1-x}Mn_xTe$ (x = 0.1 – 0.76) laser generating at 5.5 – 6 μm at room temperature

•*H. Jelinkova*[1], *M. Doroshenko*[2], *M. Jelinek*[1], *J. Sulc*[1], *D. Vyhlidal*[1], *M. Cech*[1], *V. Osiko*[2], *N. Kovalenko*[3], *and A. Gerasimenko*[3]; [1]*Czech Technical University in Prague, Prague, Czech Republic*; [2]*Prokhorov General Physics Institute of Russian Academy of Sciences, Moscow, Russia*; [3]*Institute for Single Crystals, Kharkov, Ukraine*

Fe^{2+}:$Cd_{1-x}Mn_xTe$ laser generating 30-μJ, 70-ns pulses at the central wavelength from ~5540 nm (for x = 0.1) to ~5940 nm (for x = 0.76) is presented.

CA-P.19 MON

Temperature and Pumping Beam Radius Influence on Yb:YAG/Cr:YAG Microchip Laser Output

•*J. Sulc*[1], *J. Eisenschreiber*[1], *M. Nemec*[1], *H. Jelinkova*[1], *K. Nejezchleb*[2], *and V. Skoda*[2]; [1]*Czech Technical University in Prague, Prague, Czech Republic*; [2]*Crytur, Ltd. , Turnov, Czech Republic*

By optimizing of temperature and pumping beam radius 1.41 ns long pulses with energy up to 2.41 mJ were obtained directly from longitudinally diode-pumped Yb:YAG/Cr:YAG microchip laser at 1030 nm.

CA-P.20 MON

Double-ring-pumped Nd:YVO4 laser with a High-order Laguerre-Gaussian Mode (LG11) Output

•*T. Kim*[1], *D. Kim*[2], *and J. Kim*[1]; [1]*Department of Photonics and Nanoeletronics, Hanyang University ERICA, 55 Hanyangdaehak-ro,Ansan, South Korea*; [2]*Department of Physics, Hanyang University ERICA, 55 Hanyangdaehak-ro,Ansan, South Korea*

A simple method to generate a high power laser beam with the LG11 mode from a Nd:YVO4 laser is reported. The laser produced 1.0W of the LG11 mode output for 3.8W of absorbed pump power.

CA-P.21 MON

Widely tunable Tm:CaF2 laser in-band pumped by a fiber laser at 1610 nm

R. Thouroude[1], *H. Gilles*[1], *A. Tyazhev*[2], *A. Hideur*[2], •*P. Loiko*[1], *P. Camy*[1], *J.-L. Doualan*[1], *and M. Laroche*[1]; [1]*CIMAP, Caen, France*; [2]*CORIA, Rouen, France*

We demonstrate the CW and tunable laser operation of Tm:CaF2 crystal at 1775-1955 nm using in-band high-brightness pumping by an all-fiber MOPA laser system at 1610 nm.

CA-P.22 MON

Er,Yb:GdAB/Co:MALO Passively Q-switched Monolithic Laser

•*K. Gorbachenya*[1], *V. Kisel*[1], *A. Yasukevich*[1], *R. Deineka*[1], *V. Maltsev*[2], *N. Leonyuk*[2], *and N. Kuleshov*[1]; [1]*Center for Optical Materials and Technologies, Belarusian National Technical University, 65/17 Nezavisimosti Ave., Minsk, Belarus, Minsk, Belarus*; [2]*Department of Crystallography and Crystal Chemistry, Moscow State University, Moscow, Russia*

We report on optical contact bonded Er,Yb:GdAB/Co:MALO passively Q-switched monolithic laser. The maximal pulse energy of 27 μJ with pulse duration of 2.8 ns resulting in the peak power of ~10 kW was obtained.

CA-P.23 MON

Comparison of Nd:YVO4-based monolithic microchip laser resonators for single-frequency stable, CW diode-pumped laser sources

•*G. Dudzik, K. Krzempek, and K. Abramski*; *Laser and Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wroclaw, Poland*

Comparison of two monolithic microchip resonators; Nd:YVO4/YVO4/YVO4 patented configuration and very thin Nd:YVO4 host crystal-based cavity operating at 1064 nm is presented. Output powers, conversion efficiencies, resonator temperature and single-mode operation ranges were discussed.

CA-P.24 MON

Passively mode-locked self-frequency doubling Yb:LGBS laser

M. Porębski[1], •*M. Kowalczyk*[1], *L. Gheorghe*[2], *M. Greculeasa*[2], *A. Broasca*[2], *F. Voicu*[2], *and J. Sotor*[1]; [1]*Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wrocław, Poland*; [2]*National Institute for Laser, Plasma and Radiation Physics, Laboratory of Solid-State Quantum Electronics, Bucharest, Romania*

We report on a first mode-locked oscillator based on a novel self-frequency doubling Yb:LGSB crystal. The paper presents a study of the operation at both fundamental and second-harmonic wavelengths depending on the crystal cut.

CA-P.25 MON

Dual Function Thin Slab Ultrafast Amplifier Producing 240W Over a Range of Pulse Repetition Frequencies

B. Fulford, •*J. Lee, and D. Birkin*; *Rofin-Sinar UK Ltd, Kingston Upon Hull, United Kingdom*

A thin slab module, incorporating both pre- and power-amplification functions amplified a 12mW CW seed beam to >65W, and a pulse-picked seed of >100mW to 240W independent of the pulse repetition frequency from 1MHz to 40MHz.

CA-P.26 MON

Dual-Wavelength Chirped-Pulse Regenerative Amplifier Based On Yb:LuAP Crystal

•*A. Rudenkov*[1], *V. Kisel*[1], *A. Yasukevich*[1], *K. Hovhannesyan*[2], *A. Petrosyan*[2], *and N. Kuleshov*[1]; [1]*Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus*; [2]*Institute for Physical Research, National Academy of Sciences, Ashtarak-2, Armenia*

Dual-wavelength chirped pulse regenerative amplifier based on Yb:LuAP crystal demonstrated with maximum output power of 5.4W of chirped pulses and optical-to-optical efficiency of 22.5% at 1018.3 and 1041.1nm (2.9+5.2nm spectral width respectively) and 200kHz PRF.

CA-P.27 MON

Picosecond Crystal Fiber Amplifier for High Average and Peak Power Compact Lasers with Diffraction Limited Output

K. Georgiev[1], *X. Xu*[2], *J. Xu*[3], *and* •*I. Buchvarov*[1]; [1]*Department of Physics, Sofia University, 5 James Bourchier Blvd., BG-1164, Sofia, Bulgaria*; [2]*Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu Normal University, Xuzhou, China*; [3]*School of Physics Science and Engineering, Institute for Advanced Study, Tongji University, Shanghai, China*

We present an Nd:YAG microchip-oscillator/crystal fiber-amplifier single–frequency compact laser, generating 225 ps pulses with >1.2 mJ energy at 1 kHz and diffraction-limited beam

CA-P.28 MON

A novel Diode Pumped Alexandrite Ring Laser for Doppler Lidar

•*J. Höffner*[1], *J. Froh*[1], *A. Mauer*[1], *F.-J. Lübken*[1], *M. Strotkamp*[2], *A. Munk*[2], *and B. Jungblut*[2]; [1]*Leibniz Institute of Atmospheric Physcis, Kühlungsborn, Germany*; [2]*Fraunhofer Institute of Lasertechnology, Aachen, Germany*

Demonstration of a Watt level diode pumped Alexandrite ring laser for sub-MHz Doppler Lidar observations (10-100 km altitude) with advanced Ramp&Fire cavity-control for precise pulse-to-pulse GHz frequency tuning

CA-P.29 MON

A comparative study of continuous wave Ti:Sapphire, Cr:LiSAF, Cr:LiCAF and Alexandrite lasers in thin-disk geometry

•*U. Demirbas*[1,2] *and F.X. Kärtner*[2]; [1]*Antalya Bilim University, Antalya, Turkey*; [2]*Center for Free-Electron Laser Science, Hamburg, Germany*

We have numerically investigated thin-disk laser potential of selected transition-metal-doped gain-media, and have shown that Alexandrite and Cr:LiCAF might be attractive alternatives to Yb:YAG, in applications that require sub-100-fs pulses with multi-ten-watt of average power.

CA-P.30 MON

Nd,Gd:SrF2 Laser Generating 600 fs Pulses at 0.9 W of Pump Power

•*V. Kubecek*[1], *M. Jelinek*[1], *M. Cech*[1], *D. Vyhlidal*[1], *F. Ma*[2,3], *D. Jiang*[2,3], *and L. Su*[2,3]; [1]*Czech Technical University,Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic*; [2]*State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences,, Shanghai, China*; [3]*Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, , Beijing, China*

Femtosecond operation of novel Nd,Gd:SrF2 laser with threshold absorbed pump power of 340 mW is reported. For 632 mW absorbed, the total output of 40 mW was achieved with pulse duration of 600 fs.

CA-P.31 MON

Diode-pumped Tm3+-doped sesquioxide ultrashort pulse seed oscillators for Ho-amplifiers

•*N.K. Stevenson*[1,2], *C.T.A. Brown*[2], *J.-M. Hopkins*[1], *M.D. Dawson*[1,3], *and A.A. Lagatsky*[1]; [1]*Fraunhofer Centre for Applied Photonics, Fraunhofer UK, Glasgow, United Kingdom*; [2]*SUPA, School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom*; [3]*Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom*

Broadly tunable diode-pumped femtosecond Tm3+-doped sesquioxide lasers are presented. Utilizing a steeply diving birefringent filter, continuous tuning over a 91 nm range has been achieved with pulses as short as 240 fs at 2080 nm.

CA-P.32 MON

Widely-tunable dual-wavelength Tm:YLF, Tm:LuAG, and Tm:YAG lasers

•*E. Beyatli*[1] *and U. Demirbas*[2,3]; [1]*Recep Tayyip Erdogan University, Rize, Turkey*; [2]*Antalya Bilim University, Antalya, Turkey*; [3]*Deutsches Elektronen Synchroton , Hamburg, Germany*

Using an off-surface optic-axis crystal quartz birefringent tuning plate, we have obtained stable two-color continuous-wave laser operation in 11, 12 and 8 different wavelength pairs in Tm:YLF, Tm:LuAG and Tm:YAG lasers, respectively.

CA-P.33 MON

22mJ/50Hz 946nm Nd:YAG laser with bandwidth-limited 3ns pulses

•*A. Kovyarov*[2], *A. Kornev*[1,2], *and V. Pokrovskiy*[1,2]; [1]*"Lasers and Optical Systems" Co. Ltd, Saint Petersburg, Russia*; [2]*ITMO University, Saint Petersburg, Russia*

946 nm Nd:YAG laser based on regenerative amplification of 3 ns pulse sliced from CW LD radiation was developed. The regenerative amplifier output energy was 22 mJ/50 Hz. High pulse shape stability was obtained.

CA-P.34 MON

Low-Jitter, Narrow-Bandwidth, Single Longitudinal Mode Passively Q-Switched Nd:YAG Ring Laser Oscillator with External Feedback

•*J.R. Negri*[1], *F. Pirzio*[1], *and A. Agnesi*[1,2]; [1]*Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy*; [2]*Bright Solutions Srl, Cura Carpignano (PV), Italy*

We present a Nd:YAG/Cr:YAG PQS ring laser providing single longitudinal mode, 50-ns-long almost Fourier-limited pulses (13-MHz optical bandwidth) with 34-μJ pulse energy at 0.1-6 kHz repetition rate and pulse-to-pulse timing jitter standard deviation <60 ns.

CA-P.35 MON

Tm^{3+}:LuF_3-CaF_2 diode pumped laser in 1.9 μm region

•*K. Veselský*[1], *J. Šulc*[1], *H. Jelínková*[1], *M.E. Doroshenko*[2], *K.A. Pierpoint*[2], *V.A. Konyushkin*[2], *A.N. Nakladov*[2], *and V.V. Osiko*[2]; [1]*Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic*; [2]*A. M. Prokhorov General Physics institute, Russian Academy of Sciences, Moscow, Russia*

The absorption spectrum and laser properties of diode pumped laser base on new thulium doped Tm^{3+}:LuF_3-CaF_2 crystal was investigated for the first time with maximum output energy 4.2 mJ and slope efficiency 30 %.

CA-P.36 MON

Tunable Narrowband Tm:YAP Laser Using a Transversally Chirped Volume Bragg Grating

•*Q. Berthomé*[1,2], *A. Grisard*[3], *B. Faure*[1], *G. Souhaité*[1], *E. Lallier*[3], *A. Godard*[2], *V. Smirnov*[4], *and R. Vasilyeu*[4]; [1]*Teem Photonics, Meylan, France*; [2]*ONERA, Palaiseau, France*; [3]*Thales Research & Technology, Palaiseau, France*; [4]*OptiGrate Corp, Oviedo, USA*

A narrow-linewidth, wavelength-tunable Tm:YAP laser was realized. The spectrum was narrowed down to 0.2 nm and tuned from 1940 nm to 1960 nm thanks to a transversally chirped volume Bragg grating.

CA-P.37 MON

DMD-Based Excitation of Transverse Laser Modes by Spatial Pump Beam Shaping

•*F. Schepers*[1], *T. Bexter*[1], *T. Hellwig*[1], *and C. Fallnich*[1,2]; [1]*Institute of Applied Physics, University of Münster, Münster, Germany*; [2]*MESA+ Insitute of Nanotechnology, University of Twente, Enschede, Netherlands*

We present cavity-external spatial pump beam shaping based on a digital micromirror device for the selective and realignment-free excitation of nearly 1000 different single Hermite-Gaussian modes in an end-pumped $Nd:YVO_4$ laser.

CA-P.38 MON

Monolithic integration of Al2O3:Er3+ amplifiers in Si3N4 technology

•*J. Mu, M. Dijkstra, and S.M. Garcia-Blanco*; *MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*

Double-layer monolithically integrated Al2O3:Er3+ and Si3N4 optical amplifier is presented. Net gain of ~10 dB for a 5.9 cm fully integrated amplifier is obtained at 1532 nm wavelength with 976.2 nm pump.

CA-P.39 MON

Thermally diffusion bonded Yb:YAG/Sapphire composite active elements for thin disk lasers

•*I. Mukhin, I. Kuznetsov, and M. Volkov*; *Institute of Applied Physics RAS, Nizhny Novgorod, Russia*

A composite disk active elements from dissimilar materials (Yb:YAG/sapphire) has been developed for disk laser's applications. The first experiments demonstrate a good optical quality of composite AE, suppressing of ASE and imrooving of thermal effects.

CA-P.40 MON

Single shot M2 measurement for near infrared laser pulses in real-time

•*S.S. Nagisetty*[1,2], *M. Chyla*[1], *M. Smrz*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics CAS, Dolni Brezany, Czech Republic*; [2]*Czech Technical University in Prague, Prague, Czech Republic*

We present a fast, compact and cost-effective single-shot technique for instantaneous measurement and real time monitoring of laser beam quality parameter M2, focus spot size and focus position shift using photosensitive glass and imaging system.

CA-P.41 MON

New phase modulator with large stroke and high bandwidth for improved coherent coupling schemes

•*B. Ewers, R.-A. Lorbeer, and J. Speiser*; *German Aerospace Centre (DLR), Stuttgart, Germany*

A WOLIT (Wedged Optical Light Interference-filter Trap) consists of a mirror and a long pass filter. It allows compact light path folding, which we utilize to enhance mechanical phase modulation in coherent coupling

CA-P.42 MON

Mid-IR hybrid fiber/crystal laser delivering near Fourier transform limited picosecond optical pulses with fast wavelength tuning

•*A. Gognau*[1], *C.-E. Ouinten*[1], *J.-B. Lecourt*[1], *Y. Hernandez*[1], *A. Peremans*[2], *and L. Lamard*[3]; [1]*Multitel Innovation Centre, Mons, Belgium*; [2]*Centre de Recherche en Physique de la Matière et du Rayonnement (PMR), University of Namur, Namur, Belgium*; [3]*Laserspec, Malonne, Belgium*

We have developed a mid-infrared laser source based on a narrow bandwidth picosecond fiber laser with fast spectral tuning capabilities pumping a simply resonant OPO emitting around 3.3 μm with high spectral purity (0.4 cm-1)

CA-P.43 MON

Stable 1100 - 2400 nm supercontinuum in YAG with picosecond pumping for simplified OPCPA

•*P. Mackonis*[1], *A. Petrulenas*[1], *V. Girdauskas*[1], *and A.M. Rodin*[1,2]; [1]*Solid State Laser laboratory, Department of Laser Technologies, Center for Physical Sciences and Technology, Vilnius, Lithuania*; [2]*Ekspla Ltd, Vilnius, Lithuania*

The supercontinuum generated in YAG spans the wavelength range from 1100 to 2500 nm with pulse energy and beam pointing stabilities exceeding the picosecond pumping source, and simplifies the OPCPA architecture around 2 microns.

CA-P.44 MON

Highly Efficient Laser Emission from a Novel Nd:LGSB Crystal

•*C.-A. Brandus*[1,2], *C. Gheorghe*[1], *S. Hau*[1], *A. Broasca*[1], *M. Greculeasa*[1], *F. Voicu*[1], *L. Gheorghe*[1], *and N. Pavel*[1]; [1]*National Institute for Laser, Plasma and Radiation Physics, Solid-State Quantum Electronics Laboratory, Magurele 077125, Romania*; [2]*Doctoral School of Physics, Faculty of Physics, University of Bucharest, Magurele 077125, Romania*

Efficient 1062 nm laser emission is reported from a new Nd3+:LGSB crystal grown by Czochralski method. Operation with 0.67 slope efficiency in quasi-CW mode and Watt-level CW-operation with similar slope is achieved under diode-laser pumping.

CA-P.45 MON

Comparative study of the pump beam quality effect on the slope efficiency in Kerr-lens mode-locked Ti:sapphire laser

•*M.T. Jamal*[1], *A.K. Hansen*[2], *P.E. Andersen*[1], *and O.B. Jensen*[2]; [1]*DTU Sundhedsteknologi, Technical University of Denmark, Frederiksborgvej 399,, Roskilde, Denmark*; [2] *DTU Fotonik, Technical University of Denmark, Frederiksborgvej 399, Roskilde, Denmark*

We pumped a Ti:sapphire oscillator with two spectrally combined broad area diode lasers with wavelengths centred at 488 nm and 517 nm and demonstrated stable Kerr-lens mode-locking and investigated the effects of pump beam properties.

CA-P.46 MON

Tm-doping concentration influence on Tm:GGAG lasing and tunability at 2 μm spectral region

•*J. Kratochvíl*[1], *P. Boháček*[2], *J. Šulc*[1], *M. Němec*[1], *M. Fibrich*[1], *H. Jelínková*[1], *B. Trunda*[2], *L. Havlák*[2], *K. Jurek*[3], *and M. Nikl*[3]; [1]*Czech Technical University in Prague, FNSPE, Břehová 7, 115 19, Prague, Czech Republic*; [2]*Institute of physics AS CR, Division of Condensed Matter Physics, Na Slovance 2, 182 21 , Prague, Czech Republic*; [3]*Institute of physics AS CR, Division of Solid State Physics, Cukrovarnická 10, 162 53 , Prague, Czech Republic*

Thulium concentration dependence of lasing parameters and wavelength tunability of thulium-doped disordered garnet Gd3(Ga5-xAlx)O12 was investigated. Wide tunability of 1870–2057 nm and slope efficiency of 47.7 % was achieved with available samples.

CA-P.47 MON

Numerical Simulations of Amplified Spontaneous Emission in Yb:YAG Thin-Disk Amplifiers

•*J. Kruse*[1,2], *C. Vorholt*[1], *and J. Speiser*[1]; [1]*German Aerospace Center, Stuttgart, Germany*; [2]*Ludwig-Maximilians-University Munich, Garching, Germany*

Simulations of the transient nature of Yb:YAG thin-disk amplifiers are presented. The numerical model is based on local laser rate equations and includes the temperature distribution and the spatial and spectral distribution of ASE-photon flux.

CA-P.48 MON

Alignment of Higher-Order Mode Solid-State Laser Systems with Machine Learning Diagnostic Assistance

•*T. Jefferson-Brain, A. Coupe, M. Burns, W. Clarkson, and P. Shardlow*; *Optoelectronics Research Centre, Southampton, United Kingdom*

Using a trained convolutional neural network, real-world laser modal content is estimated from camera images. Accuracies of 92%, with computational times of 2 ms, are shown to provide a metric for alignment of higher-order mode lasers.

CA-P.49 MON

High-energy performance of a multi-pass Yb :YAG planar waveguide amplifier system for ultrafast pulses

•*K.E. Tkalcec, H.J. Baker, and M.J.D. Esser*; *Heriot Watt University, Edinburgh, United Kingdom*

A high-energy multi-pass planar waveguide amplifier for sub-ps pulses is presented. Suppression of amplified spontaneous emission is dependent on seed passes and seed input intensity. Pulse energies up to 8.7 μJ (seven passes) were achieved.

CA-P.50 MON

Ti:sapphire Thin-Disk Laser with Plano-Convex-Shaped Single-Crystal Diamond Heat Spreaders

•*J.-H. Wolter*[1], *A. Voss*[1], *R. Balmer*[2], *S. Ricaud*[3], *M. Antier*[3], *C. Simon-Boisson*[3], *T. Graf*[1], *and M. Abdou Ahmed*[1]; [1]*Institut für Strahlwerkzeuge, Stuttgart, Germany*; [2]*Element Six Ltd., Didcot, United Kingdom*; [3]*Thales LAS France SAS, Elancourt, France*

We report on a novel laser concept employing a Ti:sapphire thin-disk symmetrically cooled by single-crystal diamonds. Laser operation and a five times higher cooling capability than for a previously reported conventional thin-disk laser are presented.

CA-P.51 MON

Low power commissioning of an innovative laser beam circulator for high brightness inverse Compton scattering source

•*K. Cassou*[1], *C.F. Ndiaye*[1,2], *and N. Beaugérard*[3]; [1]*LAL, Univ. Paris-Sud, CNRS/IN2P3, Université Paris-Saclay, Orsay, France*; [2]*Alsyom, Tarbes, France*; [3]*SEIV, Mérignac, France*

We report on the optical commissioning of the high power laser beam circulator for the high brightness Compton Gamma-ray sources bringing interaction high power Yb:YAG laser from tens Watt-level to kiloWatt.

13:15 – 14:15

CB-P: CB Poster session

CB-P.1 MON

Performances of a Butterfly-packaged External cavity laser diode with CRIGF mirror

A. Monmayrant[1], *L. Ferrières*[2], *V. Lecocq*[2], *E. Feuillet*[2], *S. Denet*[2], •*O. Gauthier-Lafaye*[2], *and B. Faure*[3]; [1]*LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France*; [2]*Innoptics, Talence, France*; [3]*CNES, Toulouse, France*

An ECDL using a CRIGF mirror for wavelength stabilization is integrated in a medium size butterfly package. Single mode emission with > 10mW output power is achieved with low wavelength drift over time.

CB-P.2 MON

Tunable Semiconductor Laser with Two Acousto-Optic Filters in the External Cavity

L.N. Magdich[1], •*A. Chamorovskiy*[2], *V.R. Shidlovsky*[2], *M.V. Shramenko*[3], *and S.D. Yakubovich*[4]; [1]*Polyus Research Institute, Moscow, Russia*; [2]*Superlum Diodes Ltd, Cork, Ireland*; [3]*Opton Ltd., Moscow, Russia*; [4]*Moscow State Technological University (MIREA), Moscow, Russia*

Tunable external cavity semiconductor laser with two acousto-optic filters for Doppler shift compensation was studied. At 3 mW output power stationary linewidth of 25 MHz and tuning in 815-875 nm range were demonstrated.

CB-P.3 MON

Design and characterization of a next-generation MEMS based ECDL device

•*M. Hoppe*[1], *H. Rohling*[1], *S. Schmidtmann*[2], *H. Tatenguem*[1], *T. Milde*[1], *and J.R. Sacher*[1,2]; [1]*Sacher Lasertechnik GmbH, Marburg, Germany*; [2]*Sensor Photonics GmbH, Marburg, Germany*

We present our next-generation miniaturized tunable ECDL design based on a MEMS device. It includes the benefits of the current ECDL technology and allows an excellent improvement in terms of size and tunability.

CB-P.4 MON

Coherence Properties of Multi-Section Semiconductor Frequency Swept Lasers

N. Rebrova[1], *K. Grigorenko*[2], *A. Kovalev*[2], *E. Viktorov*[2], •*S. Slepneva*[1,3], *and G. Huyet*[3]; [1]*Centre for Advanced Photonics and Process Analysis & Department of Physical Sciences, Cork Institute of Technology,, Cork, Ireland*; [2]*ITMO University, Saint Petersburg, Russia*; [3]*Universite´ Cote d'Azur, CNRS, Institut de Physique de Nice, Nice, France*

We show that optical feedback can be used to phase lock the successive mode of a frequency-swept source SG-DBR laser as a means to increase the coherence length.

CB-P.5 MON

High-Q Si_3N_4 ring resonators for locking 780nm GaAs-based distributed feedback laser

•*M. Sinclair*[1], *K. Gallacher*[2], *R.W. Millar*[2], *J.C. Bayley*[1], *O. Sharp*[3], *F. Mirando*[3], *G. Ternent*[3], *G. Mills*[3], *B. Casey*[3], *S. Hild*[1], *and D.J. Paul*[2]; [1]*School of Physics and Astronomy, University of Glasgow, Glasgow, United Kingdom*; [2]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*; [3]*Kelvin Nanotechnology, Glasgow, United Kingdom*

Si_3N_4 waveguide microring resonators have demonstrated Q values ~800,000 at 780 nm, 1 million expected with top cladding. High Q resonance offers alternative to ^{87}Rb atomic transition MEMS cell for locking a distributed feedback laser.

CB-P.6 MON

Time Domain Traveling Wave Model of a hybrid laser for silicon photonics applications

•*L. Columbo and M. Gioannini*; *Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Torino, Italy*

We study the single frequency emission stability and the dynamics of an hybrid laser based on III-V semiconductor optical amplifier and silicon photonics mirror with narrow reflectivity bandwidth using a time domain traveling wave model.

CB-P.7 MON

Precise and efficient wavelength control of a widely-tunable ring-laser implemented on a generic foundry platform

•*M. Skënderas, T. Geernaert, and M. Virte*; *Brussels Photonics (B-PHOT), Dept. of Applied Physics and Photonics, Vrije Universiteit Brussel, Brussels, Belgium*

The investigated tunable ring-laser exploits a cascade of asymmetric Mach-Zender Interferometers as frequency-selective elements. This leads to erratic wavelength variations when linearly tuning the filter. We overcome this issue by developing specific command strategies.

CB-P.8 MON

Single-sideband hybrid opto-electronic oscillator

A. Thorette[1], •*M. Romanelli*[1], *S. Bouhier*[1], *F. Van Dijk*[2], *M. Alouini*[1], *and M. Vallet*[1]; [1]*Univ Rennes, CNRS, Institut FOTON - UMR 6082, Rennes, France*; [2]*III-V Lab, a joint lab of Thales Research and Technology, Nokia Bell Labs France and CEA LETI, Palaiseau, France*

We present an opto-RF oscillator, based on 1.5μm monolithic DFB lasers stabilized by the combination of optical and electronic feedback. A phase noise of -75 dBc/Hz at 1kHz from a 10 GHz carrier is reported.

CB-P.9 MON

Photonic Microwave Source Based on Laser Diodes with Filtered Optoelectronic Feedback: Switching Modulation Frequencies

•*A.V. Kovalev*[1], *M.S. Islam*[2,3], *G. Coget*[2], *D.S. Citrin*[2,3], *A. Locquet*[2,3], *and E.A. Viktorov*[1]; [1]*ITMO University, Saint Petersburg, Russia*; [2]*Georgia Tech-CNRS UMI 2958, Georgia Tech Lorraine, Metz, France*; [3]*School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, USA*

We demonstrate experimentally an abrupt switching between periodic oscillations in the dynamics of a semiconductor laser subjected to optoelectronic feedback. We reproduce the results with a model taking into account filtering effects in the feedback loop.

CB-P.10 MON

The contribution has been withdrawn.

CB-P.11 MON

GaSb-based 2.55 μm External Cavity Diode Lasers Employing Ruled Diffraction Gratings and External Silicon Photonics Vernier Reflectors

•*S.-P. Ojanen*[1], *J. Viheriälä*[1], *M. Cherchi*[2], *N. Zia*[1], *E. Koivusalo*[1], *P. Karioja*[3], *and M. Guina*[1]; [1]*Optoelectronics Research Center, Physics Unit, Tampere University, Tampere, Finland*; [2]*VTT Technical Research Centre of Finland, Espoo, Finland*; [3]*VTT Technical Research Centre of Finland, Oulu, Finland*

GaSb-based tunable external cavity diode lasers around 2.55 μm, tuned with an external ruled grating with a wide tuning range, are compared to ones tuned with a fast-tuning compact silicon photonics reflector.

CB-P.12 MON

High Brightness 2.1 μm Direct-Diode Laser Module

•*M.E. Reilly*[1], *B.K. Flemming*[2], *and M.J.D. Esser*[1]; [1]*Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Leonardo MW Ltd., Edinburgh, United Kingdom*

The development of a high brightness 6-emitter direct-diode laser module operating at 2.1 μm with nominal 5 W output power is presented along with performance analysis in atmospheric propagation conditions

CB-P.13 MON

Lyot spectral filter for polarization beam combining of high-power, broad-area diode lasers: modeling, simulations, and experiments

•*C. Bree*[1], *V. Raab*[2], *J. Montiel*[3], *G. Garre Werner*[3], *K. Staliunas*[4], *U. Bandelow*[1], *and M. Radziunas*[1]; [1]*Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany*; [2]*Raab-Photonik GmbH, Potsdam, Germany*; [3]*Monocrom S.L., Vilanova i la Geltru, Spain*; [4]*Universitat Politècnica de Catalunya, Terrassa, Spain*

We discuss a beam combining scheme for broad area

diode lasers with Lyot spectrally filtered reinjection from a common external resonator. Our scheme is insensitive to thermal wavelength drift and yields high optical coupling efficiencies.

CB-P.14 MON

High-Power AlGaInAs/InP DFB Lasers with Low Divergence Angle

•*Y. Liu*[1,2], *J. Wang*[1,2], *Y. Huang*[1,2], *R. Zhang*[1,2], *H. Zhu*[1,2], *and L. Hou*[3]; [1]*Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China*; [2]*University of Chinese Academy of Sciences, Beijing, China*; [3]*University of Glasgow, Glasgow, United Kingdom*

1.31μm AlGaInAs/InP DFB laser with high power (110mW @ 25 degree) and low divergence angle fundamental transverse mode (15.5°×23°@ 75 degree) has been successfully demonstrated.

CB-P.15 MON

State-of-the-art laser diode illuminators for automotive LIDAR

A. Laugustin, •C. Canal, and O. Rabot; *Lumibird SA, Les Ulis, France*

This paper will discuss recent advances in ultra-compact low-cost laser diode sources dedicated to solid-state lidar for ADAS. Data on the latest generation emitting μJ pulses shorter than 3ns at 1MHz will be presented.

CB-P.16 MON

Spatial filtering in Broad Area Diode Lasers using Photonic Crystals

•*S.B. Gawali*[1], *D. Gailevicius*[2,3], *V. Purlys*[2,3], *J. Trull*[1], *C. Cojocaru*[1], *and K. Staliunas*[1,4]; [1]*1Universitat Politècnica de Catalunya, Barcelona, Spain*; [2]*Vilnius University, Vilnius, Lithuania*; [3]*Femtika LTD, Vilnius, Lithuania*; [4]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

In this works, we show the spatial filtering of Broad Area Semiconductor Laser using Photonic Crystal in external cavity configuration. We demonstrate decrease in M2 factor and increase in the Brightness of the beam.

CB-P.17 MON

Characteristics of Injection Microdisk Lasers with InGaAs/GaAs Quantum Well-Dots

•*N. Kryzhanovskaya*[1], *E. Moiseev*[1], *F. Zubov*[1], *M. Maximov*[1], *N. Kalyuzhnyy*[2], *S. Mintairov*[2], *S. Blokhin*[2], *S. Rouvimov*[4], *A. Zhukov*[1], *K. Kudryavtsev*[3], *M. Kulagina*[2], *and A. Nadtochiy*[2]; [1]*St Petersburg Academic University, St.Petersburg, Russia*; [2]*Ioffe Institute, St.Petersburg, Russia*; [3]*University of Notre Dame, Notre Dame, USA*; [4]*Institute for Physics of Microstuctures of RAS, Nizhny Novgorod, Russia*

We demonstrate a high output power of 18 mW, 31 % differential efficiency and a maximum 3-dB modulation frequency of 5.9 GHz in the InGaAs/GaAs microdisk lasers with a radius below 30 μm.

CB-P.18 MON

Systematic design of photonic crystal cavities with ultra-low modal volume considering different fabrication resolutions

•*F. Wang*[1], *R.E. Christiansen*[1], *J. Mørk*[2], *and O. Sigmund*[1]; [1]*DTU FAM, Department of Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*

We design photonic crystal cavities with ultra-low modal volume considering fabrication resolutions systematically. A parameterized ring-grating cavity configuration is established for any fabrication resolution. The performance of these cavities increases as the fabrication resolution improves.

CB-P.19 MON

A simple approach, based on coupled mode theory, to study PhC lasers

M. Saldutti[1], *J. Mork*[2], *and •M. Gioannini*[1]; [1]*Politecnico di Torino, Torino, Italy*; [2]*DTU Fotonik, Department of Photonics Engineering, Lyngby, Denmark*

We calculate the coupling coefficients between guided Bloch modes of PhC passive waveguides perturbed by refractive index and/or gain. We find threshold condition of PhC lasers and optimize the threshold gain by PhC mirror design.

CB-P.20 MON

Systematically Varying the Active Material Volume in a Photonic Crystal Nanolaser

•*K.S. Mathiesen, A. Sakanas, E. Semenova, K. Yvind, and J. Mørk*; *DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*

Selectively placing gain media only in the cavity area of a photonic crystal nanolaser holds great potential. Here we experimentally investigate how varying the length of the embedded gain material impacts laser performance.

CB-P.21 MON

Submicron Size All-Semiconductor Vertical Cavities with High Q

•*A. Demir*[1], *D. Apaydın*[2], *and H. Kurt*[2]; [1]*Bilkent University, UNAM – Institute of Materials Science and Nanotechnology, Ankara, Turkey*; [2]*TOBB University of Economics and Technology, Department of Electrical and Electronics Engineering, Ankara, Turkey*

We propose a novel lithographic method providing high Q-factor resonant cavity modes for submicron diameters. It is a promising approach to create novel cavities, lasers and laser arrays.

CB-P.22 MON

A NRZ-OOK Modulated 850-nm VCSEL with 54 Gb/s Error-Free Data Transmission

•*T.-Y. Huang*[1], *J. Qiu*[2], *C.-H. Wu*[3], *H.-T. Cheng*[3], *M. Feng*[2], *H.-C. Kuo*[4], *and C.-H. Wu*[1,3]; [1]*Graduate Institute of Electro-Optical Engineering, and Department of Photonics, National Chiao Tung University, Taipei, Taiwan*; [2]*Department of Electrical and Computer Engineering and Micro and Nanotechnology Laboratory, University of Illinois at Urbana-Champaign, Urbana-Champaign, USA*; [3]*Graduate Institute of Electronics Engineering, National Taiwan University, Taipei, Taiwan*; [4]*Graduate Institute of Electro-Optical Engineering, and Department of Photonics, National Chiao Tung University, Hsinchu, Taiwan*

We report an 850 nm oxide-confined VCSEL which achieved 54 Gb/s error free data transmission with a -3dB bandwidth of 25 GHz at room temperature without the use of equalization, pre-emphasis, and forward error correction.

CB-P.23 MON

Impact of the Excited State on the Dynamics of Spin-Polarized Quantum-Dot Vertical Cavity Surface Emitting Lasers

•*P. Georgiou, G. Mourkioti, and D. Alexandropoulos*; *University of Patras, Patras, Greece*

The polarization dynamics for both Excited State and Ground State transitions for QD- spin VCSELs are presented based on bifurcation theory. It is expected that these results will be of value for neuromorphic photonics

CB-P.24 MON

29GHz-bandwidth monolithically integrated EAM-VCSEL

L. Marigo-Lombart[1], *C. Viallon*[1], *A. Rumeau*[1], *A. Arnoult*[1], *S. Calvez*[1], *A. Monmayrant*[1], *O. Gauthier-Lafaye*[1], *H. Thienpont*[2], *K. Panajotov*[2], *and •G. Almuneau*[1]; [1]*LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France*; [2]*Department of Applied Physics and Photonics, B-Phot, Vrije Universiteit Brussel (VUB), Brussels, Belgium*

We present the optical and electrical design, fabrication and modulation characteristics of an electro-absorption modulator (EAM) vertically-integrated onto an 850-nm VCSEL. 3-dB frequency bandwidths up to 29 GHz are demonstrated on EAM and EAM-VCSEL devices.

CB-P.25 MON

Satellite instabilities in Passively Mode-Locked Vertical-Cavity Surface-Emitting Lasers

•*C. Schelte*[1,2], *J. Javaloyes*[1], *and S. Gurevich*[2]; [1]*Nonlinear Wave Group, Universitat de les Illes Baleares, Palma de Mallorca, Spain*; [2]*Institute for Theoretical Physics, University of Münster, Münster, Germany*

The mode-locking of VECSELs is based upon the dynamics of coupled cavities. This has profound implications on the pulse stability. We show a new kind of instability where the pulses develop a train of satellites on their leading edge.

CB-P.26 MON

Broadband Lasers for Photo-Ionization and Trapped-Ion Operations

•*T. Fordell and T. Lindvall*; *VTT Technical Research Centre of Finland Ltd, Centre for Metrology MIKES, P.O. Box 1000, FI-02044 VTT, Finland, Espoo, Finland*

A laser for driving Doppler and naturally broadened transitions in ion traps is presented. No closed-loop frequency stabilization is needed, and the laser can be modulated electronically in a measurement cycle with sub-microsecond response times.

CB-P.27 MON

Tailoring Single-Frequency VECSELs for Quantum Technology Applications

•*J.-P. Penttinen*[1,2], *S. Burd*[3], *M. Mäki*[1,2], *E. Kantola*[1,2], *A. Wilson*[3], *S. Ranta*[1,2], *P. Hou*[3], *D. Leibfried*[3], *and M. Guina*[1,2]; [1]*Vexlum Ltd., Tampere, Finland*; [2]*Optoelectronics Research Centre, Physics Unit, Tampere University, Tampere, Finland*; [3]*Time and Frequency Division, National Institute of Standards and Technology, Boulder, CO, USA*

We present single-frequency VECSELs tailored for quantum technology applications, such as quantum information processing with trapped Be-ions requiring 235nm and 313nm radiation. High-power VECSELs can potentially replace many of the laser systems currently in use.

CB-P.28 MON

Stable DFB Ridge laser diodes at 894nm at R.T. for Cesium atomic clocks

•*M. Krakowski, P. Resneau, P.A. Roxo, C. Théveneau, A. Larrue, E. Vinet, Y. Robert, J.-P. Legoec, M. Garcia, O. Parillaud, and B. Gérard*; *III-V Lab, Palaiseau, France*

We demonstrate single frequency, single spatial mode, DFB Ridge laser diodes with low threshold current, high efficiency and the Cs D1 line (894.35nm) obtained at room temperature, with very stable optical spectra and ageing behaviour.

CB-P.29 MON

Dual-Wavelength Y-Branch DBR-RW Diode Laser at 785 nm with Adjustable Spectral Distance from 0 up to 1.6 nm

•*L.S. Theurer, M. Maiwald, J. Fricke, P. Ressel, B. Sumpf, and G. Tränkle*; *Ferdinand-Braun-Institut, Leibniz Institut für Höchstfrequenztechnik, Berlin, Germany*

We demonstrate a dual-wavelength diode laser at 785 nm with individual control of the two emission wavelengths. The laser source is suitable for different spectroscopic applications and the generation of THz radiation.

CB-P.30 MON

Performance Optimization of InGaN Based Quantum Well Structures For Chemical Sensing

F. Adel[1], •*H. Omran*[1], *M. Schneidereit*[2], *and F. Scholz*[2]; [1]*Laboratory of Micro Optics, Faculty of Information Engineering and Technology, German University in Cairo (GUC) , New Cairo, Egypt*; [2]*Institute of Functional Nanosystems, GaN-Group, Ulm University, Ulm, Germany*

In this paper, we investigate performance optimization of optically pumped InGaN based quantum well (QW) structures with purely optical read-out for chemical sensing applications. TCAD simulations estimates a better spectral shift at higher doping level.

CB-P.31 MON

Multi-frequency Diode Laser For Pumping CPT Resonances

A. Isakova[1], *K. Savinov*[1], *and* •*A. Dmitriev*[1,2]; [1]*Novosibirsk state technical university, Novosibirsk, Russia*; [2]*Institute of laser physics of SB RAS, Novosibirsk, Russia*

A method of obtaining multi-frequency optical radiation for pumping CPT resonances with microwave and RF modulation of the pump current of a diode laser is proposed and implemented.

CB-P.32 MON

Influence of spacer thickness on the optical properties of vertically stacked InP/AlGaInP quantum dot lasers at the short wavelength

•*Z. Huang, S. Hepp, R. Sittig, M. Jetter, and P. Michler*; *Institut für Halbleiteroptik und Funktionelle Grenzflächen (IHFG), University of Stuttgart, Stuttgart, Germany*

The optical properties of the double vertically stacked InP/AlGaInP quantum dot laser at the short emitting wavelength of 660 nm are investigated by changing the spacer thickness between the quantum dot layers.

CB-P.33 MON

Characteristics of QD-LD with InP(311)B Substrate on Thickness of InGaAlAs Spacer Layers

•*A. Matsumoto*[1], *I. Butler*[2], *T. Umezawa*[1], *S. Nakajima*[1], *R. Hogg*[2], *and N. Yamamoto*[1]; [1]*National Institute of Information and Communications Technology , Tokyo, Japan*; [2]*University of Glasgow, Glasgow, United Kingdom*

In this paper, we experimentally evaluated the laser characteristics by fabricating QD-LDs with changing thickness of spacer layer of QDs for optimizing the structure and investigating the influence of the thickness dependency.

CB-P.34 MON

Superluminescent diodes based on asymmetric double quantum-well heterostructures.

•*S. Ilchenko*; *Superlum ltd., Moscow, Russia*

It is shown experimentally that superluminescent diodes (SLDs) based on asymmetric double quantum-well heterostructures with ultrathin active layers have significant advantages over widely used SLDs based on a single quantum-well heterostructures.

CB-P.35 MON

Tapered Multi Section Superluminescent Diode with Tunable Spectral Asymmetry Between Narrow and Wide Facet Outputs

•*A.F. Forrest*[1,2], *M. Krakowski*[3], *P. Bardella*[4], *and M.A. Cataluna*[1,2]; [1]*Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Previously also with the School of Science and Engineering, University of Dundee, Dundee, United Kingdom*; [3]*III-V Lab, Palaiseau, France*; [4]*Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Turin, Italy*

Optical spectra from both facets of a tapered two section quantum-dot superluminescent diode were compared and found to have a tunable asymmetry, opening a potential new degree of freedom in bandwidth engineering via single device multiplexing.

CB-P.36 MON

Annealing influence on structural and luminescencent properties of ZnSe:Fe

•*A. Gladilin*[1], *O. Uvarov*[1], *N. Il'ichev*[1], *V. Chegnov*[2], *O. Chegnova*[2], *M. Chukichev*[3], *R. Rezvanov*[4], *and V. Kalinushkin*[1]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*Research Institute of Materials Science, Zelenograd, Moscow, Russia*; [3]*Faculty of Physics, M.V. Lomonosov Moscow State University, Moscow, Russia*; [4]*National Research Nuclear University 'MEPhI', Moscow, Russia*

We report the enhancement of mid-IR cathodoluminescence and edge photoluminescence after annealing. The influence of annealing process on structural and luminescent characteristics of ZnSe:Fe are discussed. Assumption about the nature of luminescence enhancement is formulated.

CB-P.37 MON

Optoelectronic Devices based on ZnO/ZnMgO

•*B. Hinkov*[1], *H.T. Hoang*[1], *D. Winter*[1], *W. Schrenk*[1], *M. Hugues*[2], *J.-M. Chauveau*[2], *and G. Strasser*[1]; [1]*Institute of Solid State Electronics, Technische Universität Wien, Vienna, Austria*; [2]*Centre de Recherche sur l'Hétéro-Epitaxie et ses Applications, Centre national de la Recherche Scientifique (CRHEA-CNRS), Valbonne, France*

We present the investiagtion of Zn(Mg)O-bassed resonant tunneling diode structures including their growth, fabrication and characterization. This work is a prerequisite for ZnO-based THz quantum cascade lasers and detectors.

CB-P.38 MON

Resonant intersubband polariton-LO phonon scattering in an optically pumped polaritonic device

•*J.-M. Manceau*[1], *N.-L. Tran*[1], *G. Biasiol*[2], *T. Laurent*[1], *I. Sagnes*[1], *G. Beaudoin*[1], *S. De Liberato*[3], *I. Carusotto*[4], *and R. Colombelli*[1]; [1]*Centre de Nanosciences et Nanotechnologies, Palaiseau, France*; [2]*Laboratorio TASC, Trieste, Italy*; [3]*University of Southampton, Southampton, United Kingdom*; [4]*INO-CNR, Trento, Italy*

We report experimental evidence of LO phonon-intersubband polariton scattering processes under resonant injection of light within two different semiconductor systems. The demonstrated scattering process is resonant with both the initial and final polaritonic states

CB-P.39 MON

Turn-on timescale quenching in two state quantum well lasers

V. Dudelev[1], *V. Mylnikov*[1], *A. Shkol'nik*[2], *K. Soboleva*[3], *V. Kuchinskii*[1], *D.A. Livshits*[2], •*G. Sokolovskii*[1], *and E. Viktorov*[4]; [1]*Ioffe Institute, Saint-Petersburg, Russia*; [2]*Innolume GmbH, Dortmund, Germany*; [3]*Peter the Great St. Petersburg Polytechnic University, Saint-Petersburg, Russia*; [4]*ITMO University, Saint-Petersburg, Russia*

We find that in a pulse pumped quantum well laser the timescale of exponential growth at the ground state laser turn-on noticeably quenches when the laser turns on at the excited state wavelength.

CB-P.40 MON

Generation of sub-nanosecond 586-nm optical pulses based on the synchronously gain-switched laser diodes with optical injection locking

•*J.-H. Hung*[1], *Y. Gao*[2], *H. Yan*[2], *K. Sato*[1], *H. Yamada*[1,2], *L.-H. Peng*[1,3], *and H. Yokoyama*[1,2]; [1]*New Industry Creation Hatchery Center, Sendai, Japan*; [2]*Graduate School of Engineering, Sendai, Japan*; [3]*Graduate Institute of Photonics and Optoelectronics, Taipei, Taiwan*

We developed a novel light source based on an advanced gain-switching operation of laser diodes. 586-nm nanosecond optical pulses were obtained by sum frequency generation of amplified laser pulses.

CB-P.41 MON

Experimental and theoretical evidences of hysteresis in passive mode-locked Quantum Dots lasers

•*L. Columbo*[1], *P. Bardella*[1], *D. Auth*[2], *C. Weber* [2], *and S. Breuer*[2]; [1]*Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Torino, Italy*; [2]*Institute of Applied Physics, Technische Universität Darmstadt, Darmstadt, Germany*

We experimentally and numerically study the bistability between pulsed solutions and laser "off" state in a two sections InAs/InGaAs QD tapered sources in regime of passive mode-locking.

CB-P.42 MON

Self-injected optical frequency comb quantum dash lasers

•*P. Fiala*[1], *D. Auth*[1], *C. Weber*[1], *Q. Gaimard*[2], *A. Ramdane*[2], *and S. Breuer*[1]; [1]*Technische Universität Darmstadt, Institute of Applied Physics, 64289 Darmstadt, Germany*; [2]*Centre de Nanosciences et Nanotechnologies, 91120 Palaiseau, France*

Mode-spacing control of self-mode-locked single-section InAs/InGaAsP quantum-dash lasers emitting optical frequency combs around 1550 nm is experimentally reported and confirmed by a stochastic time-domain model. Feedback-strength-boundaries for multiple feedback-cavity-lengths yielding full-delay tuning are identified.

CB-P.43 MON

Passively mode-locked quantum-well semiconductor laser subject to ultra-short optical self-feedback with nanometric fine-delay

•*P. Sauer*[1], *D. Auth*[1], *C. Weber*[1], *A. Klehr*[2], *A. Knigge*[2], *and S. Breuer*[1]; [1]*Technische Universität Darmstadt, Institute of Applied Physics, 64289 Darmstadt, Germany*; [2]*Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, 12489 Berlin, Germany*

Wavelength-periodic dependencies of repetition rate, emission wavelength and average optical output power of an InGaAs double-quantum-well passively mode-locked semiconductor laser at 1070 nm on sub-wavelength scale controlled fine-delay from short-cavity optical feedback are reported experimentally.

CB-P.44 MON

Symmetry Properties and Coexistence of the Mode-Locked States in Semiconductor Lasers

•*A.V. Kovalev*[1], *K. Merghem*[2], *A. Ramdane*[2], *and E.A. Viktorov*[1]; [1]*ITMO University, Saint Petersburg, Russia*; [2]*Centre de Nanosciences et de Nanotechnologies, Palaiseau, France*

We, experimentally and numerically, explore the symmetry properties of mode-locked semiconductor lasers and demonstrate coexistence, multistability and switching of translationally symmetrical mode-locked regimes which possess different repetition rates and temporal pulse profiles.

CB-P.45 MON

Superradiance as a Way to the Steady-State Multimode and Ultrashort Pulsed Lasing in CW Quantum-Dot Heterolasers

•*V. Kocharovsky*[1], *A. Mishin*[1], *V. Kocharovsky*[1,2], *E. Kocharovskaya*[1], *and A. Seleznev*[1]; [1]*Institute of Applied Physics, Russian Academy of Science, Nizhny Novgorod, Russia*; [2]*Department of Physics and Astronomy, Texas A&M University, College Station, USA*

We design the pulsed quantum-dot heterolaser based on the superradiance under CW pumping and show that a few superradiant modes will emit the sequences of ultrashort pulses and support many steady-state modes which are self-locked.

CB-P.46 MON

Self-sustained pulse oscillations in a quantum dot laser monolithically grown on germanium

Y. Zhou[1,2], *J. Duan*[2], *H. Huang*[2], *C. Cao*[3], *Q. Gong*[3], *F. Grillot*[2,4], *and* •*C. Wang*[1]; [1]*ShanghaiTech University, Shanghai, China*; [2]*Telecom ParisTech, Paris, France*; [3]*Shanghai Institute of Microsystem and Information Technology, Shanghai, China*; [4]*University of New-Mexico, New Mexico, USA*

We show that a free-running InAs/GaAs quantum dot laser monolithically grown on germanium exhibits self-sustained pulse oscillations with one, two, and three periods at different pump currents, without incorporating any saturable absorber.

CB-P.47 MON

Repetition rate locking of mutually injected monolithic passively mode-locked semiconductor quantum dot lasers

•*C. Weber*[1], *D. Auth*[1], *I. Simos*[2], *C. Simos*[3], *and S. Breuer*[1]; [1]*Technische Universität Darmstadt, Institute of Applied Physics, 64289 Darmstadt, Germany*; [2]*University of West Attica, Department of Electrical and Electronics Engineering, 12243 Athens, Greece*; [3]*Technological Educational Institute of Sterea Ellada, Department of Electronic Engineering, 35100 Lamia, Greece*

Repetition rate and emission wavelength locking of two mutually injected monolithic two-section passively mode-locked InAs/InGaAs-quantum-dot semiconductor lasers emitting at 1250 nm is experimentally demonstrated and theoretically explained for varying delay length and biasing conditions.

CB-P.48 MON

Analysis of optical frequency comb generation in gain-switched semiconductor lasers

•*A. Rosado*[1], *A. Pérez-Serrano*[1], *J.M. García Tijero*[1], *A. Valle*[2], *L. Pesquera*[2], *and I. Esquivias*[1]; [1]*CEMDATIC-E.T.S.I Telecomunicación, Universidad Politécnica de Madrid, Madrid, Spain*; [2]*Instituto de Física de Cantabria (CSIC-Universidad de Cantabria), Santander, Spain*

We have analysed experimentally and by simulations the generation of OFCs from gain-switched semiconductor lasers. The results provide an excellent guide to select the best driving conditions for specific comb characteristics

CB-P.49 MON

Quasi-Linear Displacement Measurement with Laser Feedback Interferometry

D. Choi[1], *M.J. Wishon*[1], *E.A. Viktorov*[2], *D.S. Citrin*[1], *and* •*A. Locquet*[1]; [1]*UMI 2958 Georgia Tech-CNRS , Metz, France*; [2]*ITMO University, Saint Petersburg, Russia*

We demonstrate experimentally a displacement sensor, making use of the traditional, unmodified, laser feedback interferometry setup, that leads, in the absence of any post-processing, to a minimal detectible displacement as small as 12 nm.

CB-P.50 MON

Pulse compression using chirp of transistor lasers regardless of types of fiber dispersions

C.-T. Tung[1], *S.-W. Chang*[2], *and* •*C.-H. Wu*[1,3]; [1]*Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan (R.O.C.)*; [2]*Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan (R.O.C.)*; [3]*Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, Taiwan (R.O.C.)*

We demonstrate the small-signal chirping of transistor lasers and the reshape of the optical Gaussian pulse in fibers. It shows that the pre-chirped pulse of TLs can be compressed in both normal and abnormal dispersion.

CB-P.51 MON

Tailoring localization features in passively mode-locked lasers with V-shaped cavity geometry

•*J. Hausen, S. Meinecke, and K. Lüdge*; *Institute of Theoretical Physics, TU Berlin, Berlin, Germany*

We examine the influence of the distinct cavity features of a passively mode-locked laser with V-shaped external cavity geometry on localized structures, forming from a multi-stability of the off-solution and the periodic mode-locking solutions.

CB-P.52 MON

Optical Frequency Comb Generation Using Quantum Cascade Lasers Subject to Optical Injection

B.-B. Zhao and •*C. Wang*; *ShanghaiTech University, Shanghai, China*

We propose to produce optical frequency combs using period-one dynamics of quantum cascade lasers subject to optical injection. The comb frequency is continuously tunable via fine control of injection ratio and/or detuning frequency.

CB-P.53 MON

The contribution has been withdrawn.

CB-P.54 MON

Relative Intensity Noise of 3.4 μm Interband Cascade Laser

Y. Deng, Y.-T. Gu, B.-B. Zhao, and •*C. Wang*; *ShanghaiTech University, Shanghai, China*

We experimentally show that the relative intensity noise of a continuous-wave InAs/GaSb interband cascade laser operated at room temperature reaches as low as -130 dB/Hz.

CB-P.55 MON

Modelling the spatio-temporal dynamics of quantum cascade laser frequency combs

•*N. Opačak*[1], *G. Strasser*[1,2], *and B. Schwarz*[1]; [1]*Institute of Solid State Electronics, TU Wien, Vienna, Austria*; [2]*Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*

A theoretical model which describes the intra-cavity dynamics of the QCL phase-locking process through the inclusion of optical non-linearities and group velocity dispersion is presented. The model is found to agree with recent experimental results.

CB-P.56 MON

High frequency modulation characteristics of mid-infrared ring quantum cascade lasers

•*B. Hinkov*[1], *J. Hayden*[2], *R. Szedlak*[1], *F. Pilat*[1], *P. Martin-Mateos*[3], *B. Jerez*[3], *P. Acedo*[3], *G. Strasser*[1], *and B. Lendl*[2]; [1]*Institute of Solid State Electronics, Technische Universität Wien, Vienna, Austria*; [2]*Institute of Chemical Technologies and Analytics, Technische Universität Wien, Vienna, Austria*; [3]*Electronics Technology Department, Universidad Carlos III de Madrid, Madrid, Spain*

We show the high frequency modulation and single sideband characteristics of mid-infrared emitting ring-DFB QCLs up to 800 MHz, designed for spectroscopic and data transfer applications. They are investigated and compared to identical Fabry-Pérot devices.

CB-P.57 MON

Above-Threshold Modeling of Resonant Leaky-Wave Coupled Phase-Locked Array of Quantum Cascade Lasers

N.N. Elkin[1], *A.P. Napartovich*[1], •*D.V. Vysotsky*[1], *C. Sigler*[2], *C. Boyle*[2], *J.D. Kirch*[2], *T. Earles*[3], *D. Botez*[2], *L.J. Mawst*[2], *and A. Belyanin*[4]; [1]*SRC RF TRINITI, Troitsk, Russia*; [2]*University of Wisconsin-Madison, Madison, USA*; [3]*Intraband, LLC, Madison, USA*; [4]*Texas A&M University, College Station, USA*

Phase locked quantum cascade laser array emitting at 4.7μm is an efficient source of high quality radiation. We show how theoretical model reveals the factors limiting the power of its single mode CW operation.

CB-P.58 MON

Rate Equation Modeling of Interband Cascade Lasers

Y. Deng and •*C. Wang*; *ShanghaiTech University, Shanghai, China*

We propose a rate equation model for interband cascade lasers, and theoretically demonstrate that a small gain stage number reduces the modulation bandwidth, the relative intensity noise, and the phase noise.

13:15 – 14:15

CD'-P: CD' Poster Session

CD'-P.1 MON

Brightness-Enhanced Solid-State Light Sources: From Kaleidoscope Effect to Uniform Illumination

•*J. Sathian*[1,2], *W. Lian*[1], *A. Minassian*[3], *and M. Damzen*[1]; [1]*Department of Physics, Photonics Group, Imperial College London, London, United Kingdom*; [2]*Department of Materials, Maser Group, Imperial College London, London, United Kingdom*; [3]*Unilase Ltd, London, United Kingdom*

We report a kaleidoscope effect in the output of a Ce:YAG luminescent concentrator when pumped by blue laser while LED pumping resulted in a uniform illumination distribution. Both results were verified by simulations in Zemax.

CD'-P.2 MON

Enhancing Performance of Ce:YAG Luminescent Concentrators for High Power Applications

•*J. Sathian*[1,2], *A. Minassian*[3], *N. Alford*[2], *and M. Damzen*[1]; [1]*Department of Physics, Photonics Group, Imperial College London, London, United Kingdom*; [2]*Department of Materials, Maser Group, Imperial College London, London, United Kingdom*; [3]*Unilase Ltd, London, United Kingdom*

We report the successful operation of a temperature controlled (<20°C) LED-pumped Ce:YAG luminescent concentrator. Results from three different crystal coatings were analysed and the dielectric coating was the best, producing an output power of 3.5W.

CD'-P.3 MON

Generalized Lorentz Mie Theory of reversal of optical trapping force

A. De and •*A. Devi*; *Indian Institute of Science Education and Research (IISER) Mohali, SAS Nagar, India*

For hollow-core polystyrene nanoparticles in water, we demonstrate reversal of optical trapping force/potential from repulsive to attractive due to optical nonlinearity under femtosecond pulsed excitation; this can be utilized for controlled manipulation of hollow-core nanoparticles.

13:15 – 14:15

CH-P: CH Poster Session

CH-P.1 MON

Opportunities and Challenges of Single Protein Detection with iSCAT

•*F. Nicoli*[1], *K. König*[1], *M. Dahmardeh*[1], *A. Gemeinhardt*[1], *R. Gholami*[1], *H.M. Dastjerdi*[1,2], *H. Köstler*[2], *and V. Sandoghdar*[2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Chair for System Simulation, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany*

We present the label-free detection of small proteins and their interactions with surfaces via interferometric-scattering microscopy (iSCAT). The challenges and the prospects of the technique with respect to detection limit and specificity are discussed

CH-P.2 MON

Photothermal gas detection of CO2 in an intracavity solid-state laser configuration

•*G. Dudzik, K. Abramski, and K. Krzempek*; *Laser and Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wroclaw, Poland*

A photothermal gas sensor in an novel, intracavity solid-state laser configuration is presented. The patent-pending configuration of the sensor is versatile, monolithic and miniature, thus can be an alternative for currently used gas detection techniques.

CH-P.3 MON

development of SPAD based on thermoelectrically controlled silicon carbide avalanche photodiode

•*I.-h. Bae*[1,2], *S. Park*[1], *K.s. Hong*[2], *B. Park*[3], *E. Chong*[3], *and D.-h. Lee*[1,2]; [1]*division of physical metrology, korea research institute of standards and science, daejeon, South Korea*; [2]*quantum technology institute, korea research institute of standards and science, daejeon, South Korea*; [3]*chem-bio division, agency for defense development, daejeon, South Korea*

we report on the dark count characteristics of lab-assembled SPAD as a function of reverse bias voltage, level compactor voltage, and temperature of the SiC-APD.

CH-P.4 MON

Development of Radiation Resistant Fiber Bragg Grating Sensors by Optimization of Grating Processing Conditions

•*J. Kim, H. Jung, and Y. Hwang*; *Korea Atomic Energy Research Institute (KAERI), Daejeon, South Korea*

In the present study, radiation resistance methods were developed for fiber Bragg grating sensors (FBG) for extreme environments. To improve the radiation resistance of the FBG, various specimens were prepared by varying the grating parameters.

CH-P.5 MON

Photothermal gas sensor in an intracavity mode-locked fiber laser configuration

•*K. Krzempek, G. Dudzik, and K. Abramski*; *Laser and Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wroclaw, Poland*

A unique photo-thermal gas sensor configuration employing a simple, mode-locked fiber laser is presented. The concentration of the measured gas sample was encoded in the variations of pulse repetition frequency, which can be easily demodulated.

CH-P.6 MON

Probing out-of-equilibrium optical excitations with fast electrons

•*V. Di Giulio*[1] *and F.J. García de Abajo*[1,2]; [1]*ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain*; [2]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We investigate changes in the electron energy-loss spectra triggered by electron scattering by an optical mode depending on mode statistics (bosons vs fermions) and population (coherent, Fock states, and thermal).

CH-P.7 MON

Optical fiber probe for the selective plasmonic sensing of Catechol utilizing ZnO decorated MWCNTs

•*A. Pathak and B.D. Gupta*; *Indian Institute of Technology, Delhi, NEW DELHI, India*

Fabrication and characterization of a catechol sensor has been reported based on wavelength interrogation based SPR technique. CTAB functionalized ZnO decorated CNTs have been utilized as sensing layer over the silver coated fiber probe.

CH-P.8 MON

Picosecond Widely-Tunable mid-IR Source for Gas Detection

•*F. Défossez*[1], *R. Vallon*[1], *B. Parvitte*[1], *C.-E. Ouinten*[2], *A. Gognau*[2], *J.-B. Lecourt*[2], *Y. Hernandez*[2], *and V. Zeninari*[1]; [1]*Groupe de Spectrométrie Moléculaire et Atmosphérique, Reims, France*; [2]*Multitel Innovation Center, Mons, Belgium*

We report the demonstration of gas detection by laser spectroscopy using a compact mid-infrared OPO seeded by a picosecond laser source. Preliminary results on acetone at 2970 cm-1 for concentrations down to 1% are presented.

CH-P.9 MON

Long Length fibre Fabry-Perot interferometers and their applications in fibre characterization and temperature sensing

•*M. Ding, D.J. Richardson, and R. Slavík*; *Optoelectronics Research Centre, University of Southampton, SOUTHAMPTON, United Kingdom*

We demonstrate a polarization-insensitive method to measure accurately the free spectral range of a long-length fibre Fabry Perot interferometer with a relative error of 1.5×10^(-7). 10 mK resolution in temperature has been achieved.

CH-P.10 MON

Localized Surface Plasmon Resonance Based Tapered Fiber Optic Ethanol Sensor

•*V. Semwal and B.D. Gupta*; *Indian Institute of Technology Delhi, New Delhi, India*

In present study, we have fabricated and characterized a tapered fiber optic highly selective sensor for detection of ethanol. The sensor works in the physiological range from 0 to 8 mM concentration of ethanol.

CH-P.11 MON

Pupil segmentation in microscopy with multi-actuator adaptive lens

E. Paris, D. Garoldini, M. Quintavalla, and •*S. Bonora*; *CNR-IFN, Padova, Italy*

Adaptive optics realized with transmissive deformable lenses is convenient in microscopy because of its compactness. The use of Pupil Segmentation can further reduce the complexity of the system.

CH-P.12 MON

Combining MEMS FTIR Spectrometer and Widened-Spectrum Mode-Locked Fiber Laser for Gas-Sensing

•*A.M. Othman*[1], *H.E. Kotb*[2,3], *Y.M. Sabry*[1,4], *and D. Khalil*[1,4]; [1]*Faculty of Engineering, Ain Shams University, Cairo, Egypt*; [2]*Transmission Department, National Telecommunication Institute, Cairo, Egypt*; [3]*Laboratory of Micro Optics, Faculty of Information Engineering and Technology, German University in Cairo (GUC), Cairo, Egypt*; [4]*Si-Ware Systems, Cairo, Egypt*

We report an easy method to broaden the mode-locked fiber laser spectrum using a length of a non-zero dispersion-shifted fiber and use it to measure the absorption spectrum of CO_2 gas in a gas cell.

CH-P.13 MON

Towards label-free detection of methyl-parathion pesticides in real samples by enzyme-based non-adiabatic tapered fiber biosensor

M. Arjmand[1], •*H. Saghafifar*[1], *and A. Aray*[2]; [1]*Optics and Laser Science and Technology Research Center, Malek-Ashtar University of Technology, Isfahan, Iran*; [2]*Faculty of Physics, Isfahan University of Technology, Isfahan, Iran*
Application of an enzymatic optical fiber biosensor for label free detection of methyl parathion pesticide in presence of acetylthiocholine iodide is presented. A value of 23nM for the detection limit of MPT is achieved.

CH-P.14 MON

Photoacoustic Optical Frequency Comb Spectroscopy of Radioactive Methane in the Mid-Infrared Region

J. Karhu[1], *T. Tomberg*[1], *F. Senna Viera*[1,2], *G. Genoud*[3], *V. Hänninen*[1], •*M. Vainio*[1,4], *M. Metsälä*[1], *T. Hieta*[5], *S. Bell*[6], *and L. Halonen*[1]; [1]*University of Helsinki, Helsinki, Finland*; [2]*Umeå University, Umeå, Sweden*; [3]*VTT Technical Research Centre of Finland Ltd., Espoo, Finland*; [4]*Tampere University, Tampere, Finland*; [5]*Gasera Ltd., Turku, Finland*; [6]*National Physical Laboratory, Teddington, United Kingdom*
We report the first measurement of the absorption spectrum of radioactive methane ($^{14}CH_4$) and demonstrate the most sensitive broadband photoacoustic measurement thus far. The results lay a foundation for in-situ optical detection systems for $^{14}CH_4$.

CH-P.15 MON

InP, GaSb, IC and QC Lasers used for a comparison of the spectral excitation behavior of methane by sensor applications

•*T. Milde*[1,2], *M. Hoppe*[1], *H. Tatenguem*[1], *C. Assmann*[1], *M. Honsberg*[3], *W. Schade*[2], *and J. Sacher*[1,3]; [1]*Sacher Lasertechnik GmbH, Marburg, Germany*; [2]*Technische Universität Clausthal, Clausthal, Germany*; [3]*Sensor Photonics GmbH, Marburg, Germany*
HITRAN promises better gas detection possibilities in the MIR wavelength regime than the NIR or the visible region because of the higher absorbencies. These promises are tested with different lasers on TDLAS and QEPAS applications.

CH-P.16 MON

Self-reference optical phase demodulation using narrow absorption/gain peak

•*S. Stepanov*[1], *N. Casillas*[1], *M. Ocegueda*[2], *and E. Hernandez*[1]; [1]*CICESE, Ensenada, Mexico*; [2]*UABC, Ensenada, Mexico*
Phase-to-intensity modulation transformation via passing the light through medium with narrow absorption/gain peak is considered. Confirmation experiments on detection of ns phase modulation in acetylene volume cell at mW scale of 1530nm light are reported.

CH-P.17 MON

Contaminant free end-capped acetylene PMC for sub-Doppler Spectroscopy

•*T. Billotte*[1], *M. Chafer*[1,2], *M. Maurel*[1,2], *F. Amrani*[1], *F. Gérôme*[1,2], *B. Debord*[1,2], *and F. Benabid*[1,2]; [1]*GPPMM Group, Xlim Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France*; [2]*2. GLOPhotonics SAS, 123 avenue Albert Thomas , Limoges , France*
We report on fabrication and sub-Doppler spectroscopic characterization of a contaminant-free C2H2 photonic micro-cell made with new end-capping method. This <2dB loss PMC exhibits transparency features (EIT and SA) with 17MHz width and 8% contrast.

CH-P.18 MON

Extended-Cavity-Quantum-Cascade-Laser-Voltage Intracavity Sensing and Application to Atmospheric Gas Detection

•*R. Vallon*[1], *L. Bizet*[1], *B. Parvitte*[1], *G. Maisons*[2], *M. Carras*[2], *and V. Zeninari*[1]; [1]*Groupe de Spectrométrie Moléculaire et Atmosphérique, Reims, France*; [2]*mirSense, Palaiseau, France*
We report the latest results obtained with an Extended-Cavity-Quantum-Cascade-Laser emitting from 7.4 to 7.8 μm and its application to the detectorless detection of molecules of atmospheric interest by intracavity sensing.

CH-P.19 MON

Using A CCD Camera Based Imaging Lidar To Profile Boundary Layer Aerosols and Determine Cloud Thickness

•*A. Kabir*[1], *N. Sharma*[2], *J. Barnes*[3], *C. Oville*[2], *J. Butt*[2], *and E. Knowles*[1]; [1]*University of The Bahamas, Nassau, The Bahamas*; [2]*Central Connecticut State University, New Britain, USA*; [3]*NOAA/ESRL/Global Monitoring Division, Boulder, USA*
A CCD camera based bistatic imaging lidar was utilized to profile boundary layer aerosols in Nassau, Bahamas. Top of the atmospheric boundary layer, cloud base and top heights and near ground local pollution were detected.

CH-P.20 MON

Anisotropic Fluorescence Emission at the Surface of 1D-Photonic Crystal Biochips

•*E. Sepe*[1], *A. Sinibaldi*[1], *N. Danz*[2], *P. Munzert*[2], *and F. Michelotti*[1]; [1]*SAPIENZA University of Rome, IT- 00161, Roma, Italy*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, DE- 07745, Jena, Germany*
Experiments and theoretical modelling of the fluorescent emission of dyes at the surface of one-dimensional photonic crystal biochips are reported. The results show a strong interplay between photobleaching and rotational diffusion of the emitters.

CH-P.21 MON

Following the mechanisms of a single water droplet drying by means of photonic resonant structure

•*L. Garnier*[1], *H. Lhermite*[2], *V. Vié*[1], *H. Cormerais*[2,3], *O. Pin*[3], *Q. Liddell*[3], *and B. Bêche*[1]; [1]*Université Rennes 1, CNRS, Institut de physique, Rennes, France*; [2]*Université Rennes 1, CNRS, Institut d'Electronique et de Télécommunication de Rennes, Rennes, France*; [3]*CentraleSupelec, Cesson-Sévigné, France*
We have monitored the response of a photonic resonator under a drying water droplet. We demonstrate a correlation between the speed of evaporation and the dynamics of the free spectral range of the optical mode.

CH-P.22 MON

A Hyperspectral Microscope based on a birefringent ultrastable common-Path Interferometer

A. Candeo[1], *B.E. Nogueira de Faria*[2], *G. Valentini*[1], *A. Bassi*[1], *G. Cerullo*[1], *and* •*C. Manzoni*[1]; [1]*IFN-CNR, Physics Department, Politecnico di Milano, Milan, Italy*; [2]*Departamento de Física, UFMG, Belo Horizonte, Brazil*
We introduce a Fourier-transform hyperspectral microscope based on an ultrastable birefringent interferometer. The microscope has broad spectral coverage, high resolution, high sensitivity and short acquisition time. We present two implementations, and examples in spectral imaging.

CH-P.23 MON

Loss-Induced Resonant Refractive Index Sensing Using Total Internal Reflection Phase Shift

•*M. Miller, R. Michalzik, K.J. Ebeling, and S. Menzel*; *Ulm University, Institute of Functional Nanosystems, Ulm, Germany*
We present a novel approach on resonant refractive index sensing using total internal reflection phase shift. The sensor principle that was proven in first measurements can exceed sensitivities of 500nm/RIU and achieve high spatial resolution.

CH-P.24 MON

Measurement of viscoelasticity of Sodium Alginate by Fibre Bragg Gratings

•*L. Binetti, A. Stankiewicz, and L. Alwis*; *Edinburgh Napier University, Edinburgh, United Kingdom*
A viscoelasticity sensor has been made for measuring the viscoelasticity of sodium alginate in water with the use of Fibre Bragg Grating (FBG) fibre optic sensor. The sensor offers high sensitivity and little relative error.

CH-P.25 MON

Adjustable optical path length compact spherical mirrors multipass cell optimized with genetic algorithm

•*A. Hudzikowski, A. Gluszek, K. Krzempek, and J. Sotor*; *Wroclaw University of Science and Technology, Wroclaw, Poland*
We report a compact, four-mirror multipass cell, designed and optimized with a genetic algorithm in several optical path length variants. Two of them were experimentally verified through time-of-flight measurements inside the multipass cell.

CH-P.26 MON

Viscoelasticity Measurements by an Optofluidic Micro-Rheometer

•*V. Vitali*[1], *G. Nava*[2], *G. Zanchetta*[2], *F. Bragheri*[3], *R. Osellame*[3], *T. Bellini*[2], *I. Cristiani*[1], *and P. Minzioni*[1]; [1]*Department of Electrical, Computer, and Biomedical Engineering, Università di Pavia, Pavia, Italy*; [2]*Department of Medical Biotechnology and Translational Medicine, Università di Milano, Milano, Italy*; [3]*Istituto di Fotonica e Nanotecnologie (IFN), CNR, Milano, Italy*
We present the fabrication and validation of an integrated micro-opto-fluidic system allowing to fully determine the viscoelastic properties of different materials and requiring a sample volume lower than 1 microliter.

CH-P.27 MON

Coherent Fiber Optic Sensors for Impact Feature Assessment in Glass Fiber Reinforced Plastic (GFRP)

•*I. Di Luch, M. Ferrario, M. Brunero, P. Boffi, A. Beligni, and C. Sbarufatti*; *Politecnico di Milano, MIlano, Italy*
Coherent fiber optic technology is adopted to experimentally estimate and compare features of strain signals generated by different impacting materials in Glass Fiber Reinforced Plastic structures for SHM applications.

CH-P.28 MON

Optical Fiber Distributed Static and Dynamic Strain Sensors Base on Coherent Microwave Photonic Interferometry

L. Hua, B. Cheng, S. DeWolf, L. Murdoch, and •*H. Xiao*; *Clemson University, Clemson, South Carolina, USA*
Optical fiber coherent microwave-photonic interferometry is studied for distributed sensing of static and dynamic strains. Cascaded intrinsic Fabry-Perot fiber interferometers are read in the microwave domain with high sensitivity and fast speed (20kHz).

CH-P.29 MON

Effective Coupling of a Plasmonic Nanorod to a Microsphere Resonator

•*M. Jalali and D. Erni*; *University of Duisburg-Essen Faculty of Engineering, Department of General and Theoretical Electrical Engineering (ATE), and CENIDE – Center for Nanointegration Duisburg-Essen, Duisburg, Germany*
Plasmonic-photonic coupling of a single nanorod to a

microsphere result in ultra-refractive index shift sensitivity applicable in biosensors. Nanorod orientation varies the type of coupling and hence is subjected to study to optimize the coupling.

CH-P.30 MON

Whispering gallery mode resonator sensors referenced to saturated absorption lines in rubidium atoms and a fs frequency comb

I. Brice, A. Atvars, R. Viter, and •J. Alnis; Inst. of Atomic Physics and Spectroscopy, Uni Latvia, Riga, Latvia

We develop optical whispering gallery mode (WGM) resonators for sensing applications. To improve the long term stability we reference our laser frequency scan to rubidium saturated-absorption spectroscopy lines calibrated with a femtosecond optical frequency comb.

CH-P.31 MON

Birfringence Measurment of Magnetic Fluid based on Tapered Hi-Bi Fiber in Fiber Loop Mirror

A. Layeghi, M.I. Zibaii, and •H. Latifi; Laser and Plasma research Institute,Shahid Beheshti University, Tehran, Iran

A fiber optic based on Tapered Hi-Bi fiber in fiber loop mirror was used for measuring the birefringence of magnetic fluid which birefringence was from 0 to 3.33 × 10–4 in the range of 0–50 mT.

CH-P.32 MON

Accurate and traceable determination of Raman shifts in reference material by continuous-wave stimulated Raman spectroscopy

•H. Kerdoncuff, M. Lassen, and J.C. Petersen; Danish National Metrology Institute, Kogle Alle 5, 2970 Hørsholm, Denmark

We demonstrate an accurate and traceable method for measuring Raman shifts in reference samples based on continuous-wave stimulated Raman spectroscopy with high spectral resolution and shot noise limited operation.

CH-P.33 MON

Numerical Comparison of Robustness of Multimode and Multicore Fibre Sensitivity against Fibre Bending

•M. Veettikazhy[1], A.K. Hansen[2], D. Marti[1], K. Dholakia[3], and P.E. Andersen[1]; [1]DTU Health Tech, Technical University of Denmark, Frederiksborgvej 399, 4000, Roskilde, Denmark; [2]DTU Fotonik, Technical University of Denmark, Frederiksborgvej 399, 4000, Roskilde, Denmark; [3]SUPA, School of Physics and Astronomy, University of St Andrews, Fife, KY16 9SS, Scotland, St Andrews, United Kingdom

We present a numerical simulation tool investigating electric field propagation through multimode and multicore optical fibres, with special consideration given to field propagation anomalies pertaining to fibre bending deformations.

CH-P.34 MON

Analysis of Operation of Photonic Integrated Interrogators for Fiber Optic Sensor Networks

•A. Kaźmierczak[1], M. Słowikowski[1,2], T. Osuch[3], S. Stopiński[1], and R. Piramidowicz[1]; [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland; [2]Warsaw University of Technology, Centre for Advanced Materials and Technologies CEZAMAT, Warsaw, Poland; [3] Warsaw University of Technology, Institute of Electronic Systems, Warsaw, Poland

In this work we present and discuss solutions of integrated photonic interrogators for application in FBG-based fiber-optic sensing system, dedicated to monitoring condition of a patient exposed to magnetic resonance imaging (MRI).

CH-P.35 MON

Gas Detection Using a MEMS-Based Swept Laser Source

J. Gerguis[1], Y. Sabry[1,2], •H. Omran[3], and D. Khalil[1,2]; [1]Faculty of Engineering, Ain-Shams University, Cairo, Egypt; [2]Optical MEMS Business Unit, Si-Ware Systems, Cairo, Egypt; [3]Laboratory of Micro Optics, Faculty of Information Engineering and Technology (IET), German University in Cairo (GUC), Cairo, Egypt

A MEMS swept fiber-laser is developed based on SOA, with an average resolution of 0.5 nm. The developed source is used for CO2 gas sensing over the wavelength range of 1568 to 1582 nm.

CH-P.36 MON

Ultra-Fast Single Troponine-T Molecule Sensing

•P. Melentiev[1,2], L. Son[3,4], D. Kudryavtsev[3], I. Kasheverov[3], V. Tsetlin[3], and V. Balykin[1,2]; [1]Institute of Spectroscopy, Moscow, Russia; [2]National Research University, Higher School of Economics, Moscow, Russia; [3]Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry of the RAS, Moscow, Russia; [4]Moscow Institute of Physics and Technology, Moscow, Russia

We present single-molecule-level sensing of an important coronary artery disease cardio marker - cardiac troponin-T (cTnT). The approach helps to count single cTnT molecules in a solution 1000 times faster than the known approaches.

CH-P.37 MON

Two-dimensional Electron Energy-Loss Spectroscopy

•G. Mouloudakis[1], R. Yu[1], and J.G. de Abajo[1,2]; [1]ICFO, Barcelona, Spain; [2]ICREA, Barcelona, Spain

We theoretically explore the dynamical interaction between ballistic electrons hosted by 2D materials and some neighbouring sample objects, revealing detailed information on their excitation spectra and opening exciting prospects for nanoscale imaging and sensing.

CH-P.38 MON

Optical Time Domain Reflectometer Based on Application Specific Photonic Integrated Circuit

•S. Stopiński, K. Anders, S. Szostak, and R. Piramidowicz; Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland

An optical time domain reflectometer based on an application specific photonic integrated circuit is demonstrated. The chip enables detection of pulses reflected within an optical fiber link and determination of the time delay.

CH-P.39 MON

Investigating monolayer protein-protein binding using surface enhanced IR spectroscopy

S. Korkmaz[1] and •S. Aksu[2]; [1]Erciyes University, Kayseri, Turkey; [2]Koc University, Istanbul, Turkey

In this talk I will present a novel ultra-narrow-band perfect absorber and its applications on protein binding analysis using surface enhanced vibrational spectroscopy.

CH-P.40 MON

Inline Measurement of Modal Phase Differences in Optical Fibers

•N.M. Lüpken, M. Schnack, and C. Fallnich; Institute of Applied Physics, University of Münster, Münster, Germany

We present an interference-based, inline-measurement technique for the phase difference between two transverse fiber modes. The excellent agreement of the measurements with an analytical model underlines the high accuracy of this technique.

CH-P.41 MON

Photoacoustic spectroscopy sensor with a small-gap quartz tuning fork

•Y. He[1], Y. Ma[1], Y. Tong[1], X. Yu[1], and F.K. Tittel[2]; [1]National Key Laboratory of Science and Technology on Tunable Laser, Harbin Institute of Technology, Harbin, China; [2]Department of Electrical and Computer Engineering, Rice University, Houston, USA

A highly sensitive QEPAS sensor with a custom 200 μm gap quartz tuning fork (QTF) was demonstrated. An improvement of such sensor performance was obtained when compared to a standard QTF.

CH-P.42 MON

Digital Holography at Restricted Conditions and Photon Counting Approach

•H. Skenderović[1], M. Stipčević[1], and N. Demoli[2]; [1]Institute of Physics, Bijenička cesta 46, Zagreb, Croatia; [2]Institut Rudjer Bošković, CEMS - Photonics, Zagreb, Croatia

We show how the hologram recording by scanning Photon counting detectors can improve resolution and/or signal to noise ratio. Configurations which we used to test this approach were digital holographic microscopy and time-averaged digital holography.

CH-P.43 MON

N-Matrix Jones Analysis of a Fiber-Optic Current Sensor

•A. Madaschi, M. Brunero, M. Ferrario, P. Martelli, P. Boffi, and M. Martinelli; Politecnico di Milano, Dipartimento di Elettronica Informazione e Bioingegneria, Milano, Italy

A N-matrix Jones simulator has been developed to analyze the actual performances of fiber-optic current sensors based on Faraday effect, taking into account the detrimental effect of the birefringence of the sensing fiber coil.

CH-P.44 MON

All - Fiber Evanescent Wave Sensors for the Mid-Infrared Spectroscopy of Liquids

•E. Romanova[1], S. Korsakova[1], A. Rozhnev[1], M. Sukhanov[2], A. Velmuzhov[2], T. Kotereva[2], and V. Shiryaev[2]; [1]Saratov State University, Saratov, Russia; [2]Institute of Chemistry of High Purity Substances of RAS, Nizhny Novgorod, Russia

For design and creation of chalcogenide fiber-based evanescent wave sensors for the analytical mid-infrared spectroscopy of liquid substances, a technological and material base, as well as a computational approach, have been developed.

CH-P.45 MON

Field-resolved infrared transmission spectroscopy of strongly absorbing samples

•M. Huber[1,2], W. Schweinberger[2,3], S.A. Hussain[2], M. Trubetskov[1], C. Hofer[1], M. Zigman[1,2], F. Krausz[1,2], and I. Pupeza[1,2]; [1]Max Planck Institute of Quantum Optics, Garching, Germany; [2]Ludwig Maximillian University Munich, Department of Physics, Garching, Germany; [3]King Saud University, Department of Physics and Astronomy, Riyadh, Saudi Arabia

Field-resolved spectroscopy in the mid-infrared region offers unique intensity dynamic range and detection sensitivity. We show that those properties can be exploited to obtain low limits of detection, even after passing through strongly absorbing samples.

CH-P.46 MON

Time-domain Measurement of the Complex Chiro-Optical Susceptibility by an Ultra-stable Common-path Interferometer

•*A. Perri*[1], *S. Ghosh*[1], *F. Preda*[1], *J. Réhault*[2], *C. Manzoni*[1], *J. Helbing*[3], *G. Cerullo*[1], *and D. Polli*[1]; [1]*Politecnico di Milano, Milano, Italy*; [2]*Universität Bern, Bern, Switzerland*; [3]*University of Zurich, Zurich, Switzerland*

We introduce a novel configuration for the broadband measurement of molecular optical activity, combining time-domain detection with heterodyne amplification. Our compact, low-cost setup accepts ultrashort light pulses, thus paving the way for transient optical activity.

CH-P.47 MON

Optical Gas Sensing Based on Free Carrier Absorption in Metal Oxides

•*X. Wu, X. Zhang, S. Amrehn, and T. Wagner*; *Paderborn University, Paderborn, Germany*

We demonstrate that tungsten oxide photonic crystals can be used for hydrogen sensing due to its refractive index change originating from free carrier absorption. This transducing concept can be generalized to other semiconducting metal oxides.

CH-P.48 MON

"Cartesian Light": How does Light Propagate in a 3D Superlattice of Photonic Bandgap Cavities?

S.A. Hack[1,2], *J.J.W. van der Vegt*[2], *and* •*W.L. Vos*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*Mathematics of Computational Science (MACS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*

We explore theoretically and numerically a 3D superlattice of cavities in an inverse woodpile photonic crystal. We find that light hops only in a few high-symmetry directions including the Cartesian (x,y,z) directions.

13:15 – 14:15

CL-P: CL Poster session

CL-P.1 MON

Confocal Raman Microscopy in VIS for Analysing Conformational Changes in Channel Proteins

•*A.-K. Kniggendorf*[1], *D. Schmidt*[2], *C. Zeilinger*[2], *and B. Roth*[1,3]; [1]*Leibniz Universität Hannover, Hannover Centre for Optical Technologies, Hannover, Germany*; [2]*Leibniz Universität Hannover, Naturwissenschaftliche Fakultät, Centre of Biomolecular Research (BMWZ), Schneiderberg 38, 30167 Hannover, Germany, Hannover, Germany*; [3]*Cluster of Excellence PhoenixD, Leibniz University Hannover, Welfengarten 1, 30167 Hannover, Germany, Hannover, Germany*

Confocal Raman microscopy with 532 nm excitation is used for the analysis of conformational changes induced by the gating processes in two ion channel proteins (hCx26 and KcsA) in their functional form embedded in liposomes.

CL-P.2 MON

Humans as islands of stability: A longitudinal breath study of a small healthy cohort by means of mid-infrared spectroscopy

K.S. Maiti[1], *M. Lewton*[1], *E. Fill*[2], *and* •*A. Apolonski*[1,2,3]; [1]*Max-Planck-Institut fuer Quantenoptik, Garching , Germany*; [2]*Department für Physik, Ludwig-Maximilians-Universität München, Munich, Germany*; [3]*Novosibirsk State University, Novosibirsk, Russia*

We report on 13-month breath study of a small healthy cohort by using mid-infrared FTIR spectroscopy. First, the individuals demonstrate stable breath content and second, there are effects temporally or permanently changing their stable content

CL-P.3 MON

Optical Signal Recording from Optogenetic Stimulation of Human Pulp Dental Cells Using Twin-Core Fiber Optic Biosensor Based On Mach-Zender Interoferometer

F. Akbari[1], *A. Layeghi*[1], *M.H. Seyed Nazari*[1], *A. Ghorbani*[1], *S. Chavoshi Nejad*[2], *L. Dargahi*[2], *O. Frazao*[3], *J.L. Santos*[3], *H. Latifi*[1], *and* •*M.I. Zibaii*[1]; [1]*Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran*; [2]*Neuroscience Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran*; [3]*INESC Porto, Rua do Campo Alegre, Porto, Portugal*

A fiber optic biosensor based on Mach-Zehnder interferometer by using twin-core for optical signal recording from optogenetics stimulation of ChR2 channels expressed in human pulp dental (HPD) cells was proposed.

CL-P.4 MON

Precise Optical Magnetometry in Magnetocardiography

•*I. Rodzoń* [1], *P. Włodarczyk*[1,2], *and S. Pustelny*[1]; [1]*Marian Smoluchowski Institute of Physics, Jagiellonian University in Kraków, Kraków, Poland*; [2] *AGH University of Science and Technology, Kraków, Poland*

An optical magnetometer, exploring rotating linear polarization and its application for detection and mapping of a magnetic signal generated by a heart will be presented.

CL-P.5 MON

Brownian Motion in Markov Nanocommunications's Systems Driven by Effects of Electric Potentials: The Classical Path Integral Approach

•*H. Nieto-Chaupis*; *Universidad de Ciencias y Humanidades, Lima, PERU*

We investigate the effect of electric fields on bacteria aggregation through the classic Path Integral as suggested Richard Feynman. We assume brown motion achieved by bacteria.

CL-P.6 MON

Perspective on exploring metallic gold dimers in photothermal therapy

T. Pedrosa[1], *S. Farooq*[1], *D. Rativa*[2], *J. Fontana*[3], *and* •*R. de Araujo*[1]; [1]*Federal University of Pernambuco, Recife, Brazil*; [2]*University of Pernambuco, Recife, Brazil*; [3]*Naval Research Laboratory, Washington, D.C., USA*

The use of gold dimers (nanorods linked end-to-end by a thin dielectric or by a metallic junction) on photothermal therapy was evaluated. The optical and thermal features of dimers with different junction lengths were appraised.

CL-P.7 MON

Air-cooled Thulium Fiber Laser: an efficient laser lithoclast

•*A. Pal*[1], *D. Pal*[1], *S.D. Chowdhury*[1], *R. Sen*[1], *and K. Maiti*[2]; [1]*CSIR - Central Glass and Ceramic Research Institute, Kolkata, India*; [2]*IPGMER and SSKM hospital, Kolkata, India*

A compact air-cooled diode-pumped thulium fiber laser at 1.94μm is developed to operate in CW as well as Quasi-CW mode to fragment urinary stone of any size and composition at fragmentation rate of upto 40mg/min.

CL-P.8 MON

Do infrared molecular fingerprints of individuals exist? Lessons from spectroscopic analysis of human blood

•*K.V. Kepesidis*[1], *M. Huber*[1,2], *L. Voronina*[1,2], *M. Božić*[1], *M. Trubetskov*[2], *F. Krausz*[1,2], *and M. Zigman*[1,2]; [1]*Ludwig-Maximillians-Universität München (LMU), Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik (MPQ), Garching, Germany*

We show that broadband infrared spectroscopy provides reproducible molecular fingerprints of human blood serum, which are sufficiently distinct to identify individuals and to form a base for health and treatment monitoring applications.

CL-P.9 MON

Online Detection and Sorting of Single-Unit Recording Signal for Closed Loop Optogenetics Controlling

A. Ghorbani[1], *M.H. Seyed Nazari*[1], *F. Akbari*[1], *Z. Fatahi*[2], *A. Haghparast*[2], *L. Dargahi*[2], *H. Latifi*[1], *and* •*M.I. Zibaii*[1]; [1]*Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran*; [2]*Neuroscience Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

An algorithm for online spike detection and sorting them based on wavelet transform was proposed which has high processing speed and can be used for controlling the neural network system with closed loop optogenetics technique.

CL-P.10 MON

Realistic determination of the thermal effects generated in human skin during laser-skin thermal treatment

•*J. Toumi, W. Bachir, and M. Sayem El-Daher*; *Damascus University, Damascus, Syria*

We take in-vivo measurements of the optical parameters of human skin, to couple them to a simulation model to predict heat distribution in skin during actual laser-skin treatments. The results are verified with thermal measurements.

CL-P.11 MON

Raman Spectroscopic Evaluation of Human Myocardial Infarction

•*T. Minamikawa*[1,2,3], *T. Yamamoto*[3], *Y. Harada*[3], *Y. Yamaoka*[4], *H. Tanaka*[3], *H. Yaku*[3], *and T. Takamatsu*[3]; [1]*Tokushima University, Tokushima, Japan*; [2]*PRESTO, Tokushima, Japan*; [3]*Kyoto Prefectural University of Medicine, Kyoto, Japan*; [4]*Saga University, Saga, Japan*

We propose a label-free evaluation method of myocardial infarction in patients undergoing cardiac surgery by Raman spectroscopy. We realized the discriminant sensitivity and specificity of these tissue species are 99.98% and 99.92% without any staining.

CL-P.12 MON

Photoactive Fiber-Optics Endoscope for Oncology

S. Evstropiev[1], •*K. Dukelskii*[2], *N. Nikonorov*[1], *and V. Demidov*[3]; [1]*ITMO University, Saint-Petersburg, Russia*; [2]*The Bonch-Bruevich Saint-Petersburg State University of Telecommunications, Saint-Petersburg, Russia*; [3]*JVC "RD&P Vavilov State Optical Institute", Saint-Petersburg, Russia*

New photoactive fiber-optics medical endoscope for oncology has been developed. New endoscope has photoactive transparent tip able to generate singlet oxygen under near UV radiation spreading through optical fibers.

CL-P.13 MON

Tissue Decellularization Assisted by Direct Laser Interference Lithography

•*R. Ostrowski*[1], *M. Strzelec*[1], *A. Rycyk*[1], *R. Major*[2], *P. Wilczek*[3], *and A. Mzyk*[2]; [1]*Intitute of Optoelektronics MUT, Warsaw, Poland*; [2]*Institute of Metallurgy and Material Science PAS, Cracow, Poland*; [3]*Heart Prothesis Institute, Bioengineering Laboratory, Zabrze, Poland*

Described are preliminary results of laser decellularization of aortic and pericardium animal tissues using direct laser exposure and laser interference lithography. The last method resulted in significantly improved removal of cells.

CL-P.14 MON

Avoidance of Cross-Phase Modulation in Femtosecond Stimulated Raman Scattering

•*T. Würthwein*[1], *N. Irwin*[1], *and C. Fallnich*[1,2,3]; [1]*Institute of Applied Physics, University of Münster, Münster, Germany*; [2]*MESA+ Institute of Nanotechnology, University of Twente, Enschede, Netherlands*; [3]*Cells-in-Motion Cluster of Excellence (EXC 1003 CiM), Münster, Germany*

We present the avoidance of spectral XPM artefacts in femtosecond stimulated Raman scattering, based on a systematic study varying the pump pulse duration in the high pulse energy regime.

CL-P.15 MON

Production of drug particles using pulsed laser ablation in liquid (PLAL) technique

•*E. Nagy*[1], *F. Peták*[1], *T. Szűcs*[1], *T. Smausz*[1,2], *J. Kopniczky*[1], *R. Ambrus*[3], *P. Szabó-Révész*[3], *and B. Hopp*[1]; [1]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*; [2]*MTA-SZTE Research Group on Photoacoustic Spectroscopy, University of Szeged, Szeged, Hungary*; [3]*Institute of Pharmaceutical Technology and Regulatory Affairs, University of Szeged, Szeged, Hungary*

Pulsed laser ablation in liquid is an innovative, chemical free and effective particle size reduction technique in drug formulation. After specifing ideal parameters stochimetric matching, size distribution and further investigations were done to characterize samples.

CL-P.16 MON

THz pulses stimulate the tail segment regeneration of the earthworm Eisenia Andrei

•*M. Abufadda, A. Erdélyi, G. Krizsán, J. Hebling, J. Fülöp, and L. Molnár*; *Physics , Pecs, Hungary*

THz pulses stimulate the tail segment regeneration of the earthworm Eisenia Andrei

CL-P.17 MON

Experimental evaluation of pulse 1550 nm laser system for welding of heart tissue

•*K. Litvinova*[1], *M. Chernysheva*[2], *I. Kudelin*[2], *S. Khalimanenko*[3], *and F. Leyva*[1,4]; [1]*Aston Medical Research Institute, Aston University, Birmingham, United Kingdom*; [2]*Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*; [3]*First Moscow State Medical University (Sechenov University), Moscow, Russia*; [4]*Cardiology Department, Queen Elizabeth Hospital, Birmingham, United Kingdom*

Laser welding is an effective method for wound closure and healing without sutures. Heart wall dissections were successfully welded using pulse 1550 nm laser. Autofluorescence demonstrated the molecular changes in tissues after the heat treatment.

CL-P.18 MON

Perfusion measurement on skin model with LASCA affected by static and mixed scattering

•*T. Smausz*[1,2] *and B. Kondász*[2]; [1]*MTA-SZTE Research Group on Photoacoustic Spectroscopy, University of Szeged, Szeged, Hungary*; [2]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*

LASCA measurements were performed on skin models consisting of microsphere emulsion and scattering layers. Exposure time-contrast dependence was studied to estimate the effect of static, dynamic and mixed scattering on the measured perfusion values.

CL-P.19 MON

Production and characterization of Ibuprofen Particle Layer generated by Pulsed Laser Deposition (PLD)

T. Gera[1], *T. Smausz*[1,2], *J. Kopniczky*[1], *R. Ambrus*[3], *P. Szabó-Révész*[3], *and* •*B. Hopp*[1]; [1]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*; [2]*MTA-SZTE Research Group on Photoacoustic Spectroscopy, Szeged, Hungary*; [3]*Institute of Pharmaceutical Technology and Regulatory Affairs, University of Szeged, Szeged, Hungary*

Ibuprofen particle layers were prepared by Pulsed Laser Deposition (PLD) at various pressures by the application of nanosecond and femtosecond laser pulses. We studied the chemical composition and the crystal structure of the deposited films.

CL-P.20 MON

LASCA perfusion histogram on tissue phantoms composed of bimodal speed distribution scattering centers

•*B. Kondász*[1], *B. Hopp*[1], *and T. Smausz*[1,2]; [1]*Department. of Optics and Quantum Electronics, University of Szeged, Dóm tér 9., H-6720 Szeged, Hungary*; [2]*MTA-SZTE Research Group of Photoacoustic Spectroscopy, University of Szeged, Dóm tér 9., H-6720 Szeged, Hungary*

Tissue phantom with bimodal particle speed distribution was produced from mixture of different sizes microsphere suspensions. Histograms of the inverse correlation time measured by Laser Speckle Contrast Analysis (LASCA) was compared to the unimodal cases.

CL-P.21 MON

Label-free Optical Readout of Bacteria Density in Nanoliter Droplets

•*J. Bogusławski, N. Pacocha, M. Horka, Y. Promovych, P. Garstecki, and M. Wojtkowski*; *Institute of Physical Chemistry, Warsaw, Poland*

Optofluidic platform for label-free screening of bacteria growth in nanoliter droplets is presented. We show that based on droplet's scattering properties we can perform a reliable readout and verify it by simultaneous recording of fluorescence.

CL-P.22 MON

Fast multiphoton microscope based on polymer ulenses array using a 3D printed mold

•*D. Zalvidea*[1], *X. Trepat*[1], *and E. Rebollo*[2]; [1]*Institute of Bioengineering of Catalonia (IBEC), Barcelona, Spain*; [2]*Molecular Biology Institute of Barcelona-CSIC, Barcelona, Spain*

We have designed and built a fast multiphoton microscope that allowed for deep imaging of fluorescently labeled drosophila embryos and fast measuring of fluorescent spheres injected in the blood stream of the chicken embryo.

CL-P.23 MON

Point Spread Function measurement of a home-made structured illumination microscope using non-fluorescent large object imaging

M. Chartab Jabbari, A.H. Baradaran Ghasemi, M. Ghandi Monfared, and •*H. Latifi*; *Shahid Beheshti University, Tehran, Iran*

In this research, the point spread function (PSF) of a home-made structured illumination (SI) microscope are measured by an experimental and analytical method using the maximum likelihood estimation algorithm with a non-fluorescent large particle.

CL-P.24 MON

Impact of presowing laser irradiation on germination and sowing qualities of coniferous seeds

•*A. Iakovlev*; *St. Petersburg State Forestry University named after S.M. Kirov , St. Petersburg, Russia*

The research of seed sowing qualities demonstrates the considerable influence of laser irradiation on seeds of different species that are essential for the forestry.

CL-P.25 MON

280 nm Picosecond Laser for High Speed Lifetime Measurement of Proteins like Human Serum Albumin

•*T. Schönau, D. Klemme, G. Delpont, K. Lauritsen, and R. Erdmann*; *PicoQuant GmbH, Berlin, Germany*

We present a picosecond laser source at 280 or 295 nm which can be triggered up to 80 MHz and compare the results of lifetime measurement of HSA obtained with a 280 nm pulsed LED.

CL-P.26 MON

Ultrashort pulsed laser resection for colorectal cancer treatment

•*R. Beck*[1], *I. Bitharas*[1], *T. Maisey*[2], *M. Shires*[3], *A. Moore*[1], *D. Jayne*[2], *and J. Shephard*[1]; [1]*Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Leeds Institute of Medical Research, University of Leeds, Leeds, United Kingdom*; [3]*Leeds Institute of Cancer and Pathology, University of Leeds, Leeds, United Kingdom*

Picosecond laser resection is presented on cancerous and healthy ex-vivo colon tissue. The impact of the process parameters and strategies for cavities with a well-defined depth and minimal thermal damage to the surrounding tissue are discussed including high-speed imaging.

CL-P.27 MON

Persistent luminescence materials at various sizes and their applications

•*B. Viana*; *PSL Research University, Chimie ParisTech, CNRS, Institut de Recherche de Chimie Paris, , Paris, France*

In the persistent luminescence materials, the emission could last several hours after the end of the excitation. Bioimaging is a recent application at nanosize, but innovative and property-enhanced materials by sizing effects could be envisioned

13:15 – 14:15

CM-P: CM Poster session

CM-P.1 MON

Generation of Vector Bessel Beams and Their Application for Laser Microprocessing of Transparent Materials

•*J. Bltrukonis*[1,2], *O. Ulčinas*[1,2], *T. Gertus*[1,2], *V. Jukna*[1], *and S. Orlov*[1]; [1]*Center for Physical Sciences and Technology, Industrial Laboratory for Photonic Technologies, Vilnius, Lithuania*; [2]*Workshop of Photonics, Altechna R&D, Vilnius, Lithuania*

In this work we present generation of Vector Bessel Beams using an s-plate (radial polarization converter) together with an axicon and application of generated beam and its transverse components for laser microprocessing of transparent materials.

CM-P.2 MON

Double pulse experiment with dielectrics: From basic mechanisms to enhanced ablation efficiency

•*S. Guizard*; *Laboratoire Interactions Dynamiques Lasers, Gif Sur Yvette, France*

A double pulse scheme allows to better understand laser dielectric (SiO2) interaction, by controlling independently plasma density and temperature. The setup was extended to demonstrate IR assisted direct ablation in the VUV, at 32nm.

CM-P.3 MON

Wavelength and Energy Scaling of Deposited Energy Density During Microstructuring of Transparent Materials

•*E. Migal*[1], *E. Mareev*[1], *E. Smetanina*[2,3], *G. Duchateau*[3], *and F. Potemkin*[1]; [1]*Faculty of Physics and International Laser Center M.V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Department of Physics, University of Gothenburg, Gothenburg, Sweden*; [3]*University of Bordeaux - CNRS - CEA, Centre Lasers Intenses et Applications, Talence, France*

We present detailed measurements of deposited energy density under femtosecond microstructuring of bulk fused silica for different wavelengths and energies. The comparison of initial ionization mechanisms and the influence of avalanche ionization are also given.

CM-P.4 MON

Macroscopic electron-hole distribution calculated by the time-dependent density functional theory and Maxwell equation

•*T. Otobe*; *Kansai Photon Science Institute, QST, Kyoto, Japan*

Macroscopic electron-hole distribution around the surface of the Si and 4H-SiC are calculated by using the program SALMON. Although the quasi-temperatures are damped exponentially at the surface, they have finite value in deeper region.

CM-P.5 MON

Nonlinear Optical Dynamics in Femtosecond Laser Processing of Nd:YAG Waveguides

F. Arteaga-Sierra[1], *T. Feng*[1], *C. Dorrer*[1], *and* •*J. Qiao*[2]; [1]*Aktiwave LLC, Rochester , USA*; [2]*Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology, Rochester , USA*

We study the propagation of tightly focused femtosecond laser pulses in Nd:YAG for direct laser writing of waveguides, demonstrating the impact and interplay of linear diffraction, nonlinear self-focusing, and plasma formation with different laser parameters.

CM-P.6 MON

Improvements on characterization of the threshold and productivity in femtosecond laser ablation of bone

•*M. Rico*[1], *M. Jubera*[1], *A. San Blas*[1], *L. Roso*[1], *A. Lazkoz*[2], *and J. Arregui*[2]; [1]*Centro de Láseres Pulsados (CLPU), Salamanca, Spain*; [2]*Deneb Medical, Donostia-San Sebastián, Spain*

Ablation rate has been measured for Ti:Sapphire and Yb:KGW lasers, maximum values obtained in each case are 0.7 mm3/min and 3.2 mm3/min respectively. Although less fluence used with Yb:KGW laser, higher ablation rate have been observed.

CM-P.7 MON

Temperature evolution in the thin silica film on industrial glass due to treatment with ns UV laser.

•*D. Guerfa*[1,2], *C. Chazot*[1], *I. Gozhyk*[1], *E. Burov*[1], *M. Lancry*[2], *and B. Poumellec*[2]; [1]*Saint Gobain Recherche, Aubervilliers, France*; [2]*Institut de Chimie Moléculaire des Matériaux d'Orsay, Orsay, France*

We report a numerical study of laser-induced evolution of sample temperature and experimental validation through the actual laser treatment. Substrate temperature can locally reach values higher than the glass transition temperature.

CM-P.8 MON

In situ diagnostic for multi pulse processing of transparent materials

•*F. Zimmermann*[1], *M. Jenne*[1], *S. Hecker*[2], *D. Flamm*[1], *M. Kaiser*[1], *J. Kleiner*[1], *and M. Schäfer* [1]; [1]*TRUMPF Laser- und Systemtechnik GmbH, Ditzingen, Germany*; [2]*TRUMPF Laser GmbH, Schramberg, Germany*

In situ pump-probe diagnostic of ultrashort pulse induced modifications is presented. To develop industrial applications under high throughput advanced process strategies such as alternative beam shapes and temporally modulated laser parameters are studied.

CM-P.9 MON

New Type Metal-Azides for Low Threshold Laser Initiation

•*A.M. Rodin*[1,4], *J. Sarlauskas*[2], *J. Tamuliene*[3], *and E. Kuodys*[1]; [1]*Center for Physical Sciences and Technology, Vilnius, Lithuania*; [2]*Vilnius University, Life Science Centre, Institute of Biochemistry, Vilnius, Lithuania*; [3]*Vilnius University, Institute of Theoretical Physics and Astronomy, Vilnius, Lithuania*; [4]*Ekspla Ltd, Vilnius, Lithuania*

Nontrivial and well-known energetic materials based on azides were synthesized and investigated to reduce the threshold of laser initiation. Critical laser parameters were determined and reliable initiation with a threshold below 0.4mJ was demonstrated.

CM-P.10 MON

Laser patterning of electrode-electrolyte interfaces of Solid Oxide Fuel Cells (SOFCs)

•*R. Lahoz*[1], *J.A. Cebollero*[2], *J. Silva*[2], *M.A. Laguna-Bercero*[2], *and A. Larrea*[2]; [1]*Centro de Química y Materiales de Aragón (CEQMA), University of Zaragoza-CSIC, Zaragoza, Spain*; [2]*Instituto de Ciencia de Materiales de Aragón (ICMA), University of Zaragoza-CSIC, Zaragoza, Spain*

Laser tailoring has been used for increasing the active area of the yttria stabilised zircona (YSZ) electrolyte interface in solid oxide fuel cells to reduce the polarisation losses and improve the cell electrochemical performance.

CM-P.11 MON

Femtosecond Laser Deposited Er^{3+}-Doped Zinc-Sodium Tellurite Glass Films

•*T. Mann*[1], *E. Barimah*[1], *R. Mathieson*[1], *M. Murray*[1], *B. Richards*[1], *Z. Ikonic*[2], *P. Steenson*[2], *C. Russell*[2], *and G. Jose*[1]; [1]*School of Chemical and Process Engineering, University of Leeds, Leeds, United Kingdom*; [2]*School of Electronic and Electrical Engineering, University of Leeds, Leeds, United Kingdom*

The physical and optical properties of fluorescent films deposited on silicon substrates via femtosecond laser (40 fs, 800 nm) ablation of Er^{3+}-doped zinc-sodium tellurite glass in dependence of laser fluence is presented.

CM-P.12 MON

Spectroscopic and Structural Properties of Yb3+-Doped and Undoped 2D-MoS2 Thin Films for Optoelectronic and Photonic Device Applications

•*A. Jha*[1], *C. Maddi*[1], *A.J. Scott*[1], *J.R. Ashwin*[2], *and K.V. Adarsh*[2]; [1]*Faculty of Engineering, University of Leeds, Leeds, United Kingdom*; [2]*2Department of Physics, Indian Institute of Science Education and Research (IISER), Bhopal, India*

The structural, spectroscopic and nonlinear optical properties of liquid phase epitaxial, and femto-second pulsed laser deposited Yb3+-doped and undoped MoS2 on silica substrates were analysed for engineering 2D-optoelectronic and photonic devices.

CM-P.13 MON

Lean-Mixture Operation of a Passenger Car Gasoline Engine Ignited by Passively Q-switched Nd:YAG/Cr4+:YAG Laser Spark Plugs

•*N. Pavel*[1], *R. Chiriac*[2], *A. Birtas*[3], *N. Boicea*[3], *F. Draghici*[4], *G. Croitoru*[1], *and M. Dinca*[1]; [1]*National Institute for Laser, Plasma and Radiation Physics, Solid-State Quantum Electronics Laboratory, Magurele 077125, Romania*; [2]*University Politehnica of Bucharest, Faculty of Mechanical Engineering, Bucharest 060042, Romania*; [3]*Renault Technologie Roumanie, Voluntari 077190, Ilfov, Romania*; [4]*University Politehnica of Bucharest, Faculty of Electronics, Telecommunications and Information Technology, Bucharest 060042, Romania*

Passively Q-switched Nd:YAG/Cr4+:YAG laser spark plugs were used to operate a passenger-car gasoline engine showing improved performances in power, efficiency and combustion stability at lean-mixture operation (lambda~1.25) in comparison with classical electrical spark plugs ignition.

CM-P.14 MON

Femtosecond Laser Microfabrication of Pancharatnam-Berry Phase Elements for the Formation of Optical Needles in Transparent Materials

P. Gotovski[1], •*S. Orlov*[1], *T. Gertus*[1,2], *and O. Ulčinas*[1,2]; [1]*Center for Physical Sciences and Technology, Industrial Laboratory for Photonic Technologies, Vilnius, Lithuania*; [2]*Workshop of Photonics, Altechna R&D, Vilnius, Lithuania*

Vectorial geometrical phase elements with independent amplitudes are designed and implemented using nanogratings inscribed in the glass. We encode vector phase masks for generation of an optical needle with given axial profile.

CM-P.15 MON

Humidity sensor using polyimide carbonization with a UV pulse laser

•*J.-U. Lee*[1], *Y.-w. Ma*[2], *S.-y. Jeong*[2], *and B.-s. Ma*[1]; [1]*Department of Cogno Mechatronics Engineering, Busan, South Korea*; [2]*Department for Advanced Innovative Manufacturing Engineering, Busan, South Korea*

patterns can be fabricated using 2-D CAD and depth can be controlled by laser power and speed.it is applied this pattern to fabricate the humidity sensor.

CM-P.16 MON

A flexible and high sensitive strain sensor with carbonized polyimide film via ultraviolet laser

•*S.-Y. Jeong*[1], *C.-H. Park*[2], *Y.-W. Ma*[1], *J.-U. Lee*[2], *and B.-S. Shin*[2]; [1]*Interdisciplinary Department for Advanced Innovative Manufacturing Engineering, Pusan National University, Pusan, South Korea*; [2]*Department of Optics and Mechatronics Engineering, Pusan National University, Pusan, South Korea*

The sensor was fabricated by embedding a carbonized patterned-polyimide(PI) irradiating a laser on the Polydimethylsiloxane(PDMS). The minimum sheet resistance is 250 Ω/square. We fabricated a wearable device capable of measuring joint motion.

CM-P.17 MON

Ultrafast laser filament - assisted microstructuring of polymers

•*B. Stępak*[1], *A. Antończak*[1], *and U. Klotzbach*[2]; [1]*Wrocław University of Science and Technology, Wrocław, Poland*; [2]*Fraunhofer Institute IWS Dresden, Dresden, Germany*

We applied ultrafast laser filamentation for fabrication of microchannels in PMMA and PLLA polymers. The influence of laser parameters on microstructure length was investigated. The possibility of thermal properties control of biodegradable PLLA is presented.

CM-P.18 MON

Structural reproducibility enhancement of optical resonance arrays produced by two-photon polymerization

•*A. Saetchnikov*[1,2], *V. Saetchnikov*[2], *E. Tcherniavskaia*[2], *and A. Ostendorf*[1]; [1]*Ruhr University Bochum, Bochum, Germany*; [2]*Belarussian State University, Minsk, Belarus*

In the work an approach to enhance structural reproducibility of the optical resonance arrays produced in the modified illumination scheme of two-photon polymerization is discussed and verified via numerical simulations and experimental results.

CM-P.19 MON

Direct Laser Writing of Large Scale Photonic Crystal Spatial Filters in Glass Using Bessel Beams

•*V. Purlys*[1,2], *D. Gailevičius*[1,2], *and K. Staliunas*[3,4]; [1]*Vilnius University Laser Research Center, Vilnius, Lithuania*; [2]*UAB "Femtika", Vilnius, Lithuania*; [3]*Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Terrassa, Spain*; [4]*Institucio Catalana de Reserca i Estudis Avançats (ICREA), Barcelona, Spain*

We demonstrate how Bessel beam direct laser writing enables fabrication of large scale photonic crystals in glass for spatial light filtering applications. Such filters can replace filtering with pinholes especially in miniatiure devices.

CM-P.20 MON

Talbot effect in embedded gratings inscribed with femtosecond laser in transparent media

•*J.J. Azkona*[1,2], *M. Martínez-Calderon*[1,2], *M. Gómez*[1,2], *A. Rodríguez*[1,2], *and S.M. Olaizola*[1,2]; [1]*Ceit-ik4, Donostia/San Sebastián, Spain*; [2]*University of Navarra, Tecnun, Donostia/San Sebastián, Spain*

The femtosecond laser fabrication of an embedded optical device that generates a high contrast Talbot effect is presented. The dependence of the intensity profiles of the self-images on the laser processing conditions is demonstrated.

CM-P.21 MON

Femtosecond writing of waveguides and waveguide network components.

•*D. Perevoznik*[1,2] *and U. Morgner*[1,2,3,4]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering -Innovation AcrossDisciplines), Hannover, Germany*; [3]*Laser Zentrum Hannover e.V ., Hannover, Germany*; [4]*Hannoversches Zentrum für Optische Technologien, Leibniz Universität Hannover, Hannover, Germany*

In this work we present different geometries of waveguides in polymers such as surface sensitive or Y-splitters. They have a great potential of being implemented in waveguide networks or sensing applications.

CM-P.22 MON

A study of laser-engraving surfaces portability on polymer for the automotive industry

•*A. Bouland*[1,2], *P. Durand*[2], *D. Farcage*[3], *M. Géléoc*[4], *P. Manscour*[2], *and J.-P. Renault*[1]; [1]*NIMBE, CEA, CNRS, Université Paris-Saclay, Gif sur Yvette, France*; [2]*Renault S.A.S, Guyancourt, France*; [3]*DEN – SEARS, CEA, Université Paris-Saclay, Gif sur Yvette, France*; [4]*LIDYL, CEA, CNRS, Université Paris-Saclay, Gif sur Yvette, France*

Laser-engraving's for decorative application in the automotive industry will emerge as an innovative technology. However, It can't be applied on the cost of quality. This Study begin to answer which engraving parameters are important.

CM-P.23 MON

Additive Fiber Optic Probe Technology for Precise Trimming of High-performance Lithium Niobate Photonic Integrated Circuits

•*A. Tronev*[1,2], *M. Parfenov*[1,3], *P. Agruzov*[1], *I. Ilichev*[1], *and A. Shamrai*[1]; [1]*Ioffe Institute, St. Petersburg, Russia*; [2]*ITMO University, St. Petersburg, Russia*; [3]*Peter the Great Saint-Petersburg Polytechnic University, St. Petersburg, Russia*

Laser micro-machining of metal nano-film on the top of optical waveguides were used for improvement characteristics photonic integrated circuits. The increasing Mach-Zehnder modulator extinction ratio from 30 to 47 dB demonstrated efficiency of the method.

CM-P.24 MON

Femtosecond Laser Induced Surface Micro-Structure Building by Material Ejection and Ablation on Cu and Al

X. Sedao[1,2], *M. Lenci*[3], *A. Rudenko*[1], *A. Pascale-Hamri*[2], *J.-P. Colombier*[1], *and* •*C. Mauclair*[1,2]; [1]*Laboratoire Hubert Curien UMR 5516 CNRS, Saint-Etienne, France*; [2]*GIE Manutech-USD, Saint-Etienne, France*; [3]*Univ Lyon, IMT Mines Saint-Etienne, Saint-Etienne, France*

We report on the generation of microstructures built from the redeposited material during surface ablation with scanned ultrafast laser pulses. Experimental realisations relying on the scanning strategy are achieved and analyzed on Cu and Al.

CM-P.25 MON

Ultrafast Laser Texturing on Si with Burst-mode Picosecond Laser Pulses

•*I. Gnilitskyi*[1,2,3], *V. Gruzdev*[4], *and L. Orazi*[3]; [1]*LLC "NoviNano", Lviv, Ukraine*; [2]*Lviv Polytechnic National University, Lviv, Ukraine*; [3]*University of Modena and Reggio Emilia, Reggio Emilia, Italy*; [4]*Department of Physics and Astronomy, University of New Mexico, Albuquerque, USA*

In this paper, picosecond-LIPSS were imprinted on Si surface in regime of strong ablation partially using method HR-LIPSS. Moreover, regimes of uniform and burst-mode were investigated and discussed in terms of chemical, morphological and mechanical properties.

CM-P.26 MON

Ultrafast treatment of Si Surface by Femtosecond Laser Pulses for Feasible Cooling Application

•*V. Kurylo*[1], *A. Rota*[2], *I. Bobitski*[3,4], *A.P. Serro*[5,6], *L. Orazi*[2], *and I. Gnilitskyi*[1,2,3]; [1]*LLC »NoviNano Lab«, Lviv, Ukraine*; [2]*Department of Physics, Computer Science and Mathematics, University of Modena and Reggio Emilia, Modena, Italy*; [3]*Department of photonics, Lviv polytechnic National University, Lviv, Ukraine*; [4]*Department of Mechatronics and Automation University of Rzeszow, Rzeszow, Poland*; [5]*- Centro de Química Estrutural, Instituto Superior Técnico, University of Lisbon, Lisbon, Portugal*; [6]*Centro de investigacao interdisciplinar Egas Moniz, Instituto Superior de Ciências da Saúde Egas Moniz, Almada, Portugal*

The capability of HR-LIPSS method to selectively generate superhydrophilic tracks on Si surface was demonstrated. Moreover, it was shown possibility to control dynamic movement of water drops by drawn with HR-LIPSS complex optical path.

CM-P.27 MON

An Increase in Refractive Index Contrast in A Waveguide Inscribed in Tellurite Glass by Means of Sub-Nanosecond Bursts of Femtosecond Pulses

•*A. Okhrimchuk*[1,2], *M. Smayev*[1], *A. Gladishev*[1,2], *and V. Dorofeev*[1,3]; [1]*D. Mendeleev University of Chemical Technology of Russia, Moscow, Russia*; [2]*Fiber Optics Research Center of RAS, Mloscow, Russia*; [3]*G.G. Devyatykh Institute of Chemistry of High-Purity Substances of RAS, Nizhny Novgorod , Russia*

It is found that burst of femtosecond IR pulses with a sub-nanosecond inter-pulse interval is a tool for direct laser writing of depressed cladding waveguides with refractive index contrast increased in comparison with ordinary writing.

CM-P.28 MON

The contribution has been withdrawn.

CM-P.29 MON

Fabrication of tuned LIPSS-based metallic polarization gratings

•*A. San Blas*[1,2], *N. Casquero*[1,2], *M. Martínez-Calderón*[1,2], *J. Buencuerpo*[3], *L.M. Sánchez-Brea*[3], *J. del Hoyo*[3], *S.M. Olaizola*[1,2], *A. Rodríguez*[1,2], *and M. Gómez-Arandazi*[1,2]; [1]*CEIT-Ik4, San Sebastián, Spain*; [2]*Universidad de Navarra, San Sebastián, Spain*; [3]*Universidad Complutense de Madrid, Madrid, Spain*

We report the fabrication of polarization gratings based on LIPSS in metallic surfaces. Their application as reflective waveplates is demonstrated from the relation between LIPSS geometry and properties of the reflected light.

CM-P.30 MON

The contribution has been withdrawn.

CM-P.31 MON

Faster femtosecond laser processing using a dual-focus SLM emulated lens

L. Barber, J. Low, S. Ashforth, •*C. Aguergaray, and C.M. Simpson*; *The Photon Factory, the University of Auckland, Auckland, New Zealand*

The dual-focus lens emulated using our SLM is configured to adjust the distance between two focal spots enabling efficient top&bottom surface ablation along the propagation axis of the light to mimic physical dual-focus lenses.

CM-P.32 MON

Influence of pressure history on jet dynamics in LIFT processes: simulation and experimental analysis

J.J. Moreno Labella, •*M. Morales Furió, D. Muñoz Martín, A. Márquez, and C. Molpeceres Álvarez*; *Centro Láser*

UPM, Universidad Politécnica de Madrid, Madrid, Spain
The complexity of the physics involved in LIFT processes induces secondary phenomena after the first ejection for both Newtonian and non-Newtonian fluids. In this study, some fluid dynamics observed in experimental pictures is simulated.

CM-P.33 MON

Effect of front-contact laser texturing in thin-film solar cells

D. Canteli[1], I. Torres[2], S. Fernández[2], J.D. Santos[2], M. Morales[1], and •C. Molpeceres[1]; [1]Centro Láser, Universidad Politécnica de Madrid, Madrid, Spain; [2]División de Energías Renovables, Energía Solar Fotovoltaica, CIEMAT, Madrid, Spain
Laser texturing of aluminum-doped zinc oxide films using a nanosecond pulsed laser. Light scattering of the textured films is studied. Thin-film solar cells with textured front-contact show an increment of 15% in the short-circuit current.

CM-P.34 MON

Laser lift-off of GaN LEDs from their sapphire substrates with ultrashort laser pulses

•S. Bornemann[1], N. Yulianto[1], T. Meyer[2], H.S. Wasisto[1], M. Seibt[2], and A. Waag[1]; [1]Institute of Semiconductor Technology (IHT) and Laboratory for Emerging Nanometrology (LENA), Technische Universität Braunschweig, Braunschweig, Germany; [2]IV. Physikalisches Institut, Georg-August-Universität Göttingen, Göttingen, Germany
A new approach to lift GaN-based LEDs from their sapphire growth substrates applying ultrashort laser pulses is demonstrated and discussed. Additionally, two-photon absorption in GaN and AlGaN samples is investigated.

CM-P.35 MON

Increasing Two-Photon Polymerization Fabrication Speed of 3D Structures for Cell Interaction Studies

•C. Maibohm[1], O.F. Silvestre[1], J. Borme[2], M. Sinou[3], K. Heggarty[3], and J.B. Nieder[1]; [1]Department of Nanophotonics, Ultrafast Bio- and Nanophotonics, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal; [2]Department of Quantum Energy Materials, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal; [3]Departement d'Optique, IMT-Atlantique, Technopole Brest-Iroise, Brest, France
We demonstrate reduced fabrication time of large area interconnected high aspect ratio 3D bio-compatible polymer structures ideal for cell motility studies and tissue engineering using parallelized multi-beam writing enabled by a diffraction optical element.

CM-P.36 MON

Laser Slicing™ process for GaN-on-GaN Technology

•V. Voronenkov[1,2], N. Bochkareva[2], R. Gorbunov[1,2], A. Zubrilov[1,2], V. Kogotkov[1], P. Latyshev[1], Y. Lelikov[1,2], A. Leonidov[1], and Y. Shreter[1,2]; [1]Trinitri-Technology LLC, St Petersburg, Russia; [2]Ioffe Institute, St Petersburg, Russia
Laser Slicing™ process was developed to lift-off thin GaN film with epitaxial device structure from a bulk GaN substrate, that allows reusing the expensive bulk GaN substrate many times.

CM-P.37 MON

Stitch-Free Fabrication of Microoptical Elements Employing Femtosecond Laser 3D Lithography

D. Mackevičiūtė[1,2], •L. Jonušauskas[1,2], T. Baravykas[1], T. Gadišauskas[1], D. Gailevičius[1,2], and M. Malinauskas[2]; [1]Femtika Ltd., Vilnius, Lithuania; [2]Laser Research Center, Vilnius University, Vilnius, Lithuania
In this work we present an approach of synchronizing linear stages and galvo-scanners for rapid and stitch-free 3D printing of functional microoptics with overall size up to mm and precision down to nm.

CM-P.38 MON

Two beam initiation threshold measurements of photo-initiators for laser writing of biocompatible 3D structures

D. Ladika[1,2], M. Farsari[1], and •D. Gray[1]; [1]IESL-FORTH, Heraklion, Greece; [2]Department of Physics, University of Crete, Heraklion, Greece
We present our latest work on the investigation of new photo-initiator materials using two beam initiation threshold (2-BIT). Their suitability for biocompatible 3D structures is also investigated primarily with direct laser writing.

13:15 – 14:15

EH-P: EH Poster session

EH-P.1 MON

Raman spaser

•V. Shishkov[1,2,3], E. Andrianov[1,2], A. Pukhov[1,2,3], A. Vinogradov[1,2,3], and A. Lisyansky[4,5]; [1]Dukhov Research Institute of Automatics (VNIIA), Moscow, Russia; [2]Moscow Institute of Physics and Technology, Dolgoprudny , Russia; [3]Institute for Theoretical and Applied Electromagnetics, Moscow , Russia; [4]Queens College of the City University of New York, New York , USA; [5]Graduate Center of the City University of New York, New York, USA
We purpose the Raman spaser that utilizes the Raman active molecules and coherent light. We show that the lasing in the Raman spaser is followed by the coherent molecular vibration generation in the molecules.

EH-P.2 MON

Plasmonic Enhancement of Graphene Long-Wave Infrared Photodetectors via Bull's Eye Concentrator, Optical Cavity and Nanoantennas

•N. Sefidmooye Azar[1], V.R. Shrestha[2], and K.B. Crozier[1,2]; [1]Department of Electrical and Electronic Engineering, University of Melbourne, Melbourne, Australia; [2]School of Physics, University of Melbourne, Melbourne, Australia
Low light absorption in two-dimensional (2D) materials hampers their widespread use in photodetectors. Herein, we present a hybrid plasmonic structure to overcome this issue in the long-wave infrared (LWIR) region.

EH-P.3 MON

Novel Mid-infrared Multiple Coherent Emissions for Gas Sensing

Y. Abubakar[1], •K. Li[1,2], N. Copner[1], D. Qiao[1], and Y. Gong[3]; [1]Faculty of Computing, Engineering and Science, University of South Wales, Pontypridd, United Kingdom; [2]Foshan Huikang Optoelectronics Ltd., Foshan, China; [3]School of Physics and Astronomy, Cardiff University, Cardiff, United Kingdom
In this letter, we demonstrate that multiple coherent emissions can be achieved in mid-infrared by the novel design of metallic grating with narrow air slit on Bragg grating.

EH-P.4 MON

Generation of broadband deep-ultraviolet light source by rectangular plasmonic nanoholes with multi-resonances

•L. Shi[1,2], E. Almeida[4], U. Morgner[1,2,3], and M. Kovacev[1,2]; [1]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany; [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovation Across Disciplines), Hannover, Germany; [3]Hannover Centre for Optical Technologies, Hannover, Germany; [4]Department of Physics, Queens College of the City University of New York, New York, USA
We utilize rectangular plasmonic nanoholes with multi-resonances to boost third harmonic generation of a Ti:sapphir oscillator. Simultaneous excitation of two modes results in elliptically polarized and ultrabroadband harmonic generation in deep-ultraviolet.

EH-P.5 MON

Intracavity Spectroscopy and Sensorics with Plasmonic Nanolaser

•P. Melentiev[1,2], A. Kalmykov[1,2], A. Gritchenko[1,2], V. Balykin[1,2], A. Baburin[3,4], E. Ryzhova[3,4], I. Fillipov[3,4], I. Rodionov[3,4], I. Nechepurenko[4,5], A. Dorofeenko[4,5], I. Ryzhikov[5], A. Vinogradov[4,5], A. Zyablovsky[4,5], E. Andrianov[4,5], and A. Lisyansky[6]; [1]Institute of Spectroscopy, Moscow, Russia; [2]National Research University, Moscow, Russia; [3]Bauman Moscow State Technical University, Moscow, Russia; [4]Dukhov Institute of Automatics, Moscow, Russia; [5]Institute for Theoretical and Applied Electromagnetics RAS, Moscow, Russia; [6]Queens College of the City University of New York, Department of Physicsy, Moscow, Russia
We present intracavity plasmonic laser spectroscopy using a plasmonic distributed feedback laser created from a periodically-perforated silver film with a liquid gain medium. We demonstrate intracavity detection of an absorptive dye at a 70 ppb level.

EH-P.6 MON

Mode cooperation in plasmonic lasers

•A. Zyablovsky[1], N. Nefedkin[1], E. Andrianov[1], A. Pukhov[2], and A. Vinogradov[2]; [1]Dukhov Research Institute of Automatics, Moscow, Russia; [2]Institute for Theoretical and Applied Electromagnetics RAS, Moscow, Russia
Mode cooperation is a new effect that takes place in multimode lasers with inhomogeneous spatial distribution of active medium. It consists in decrease of lasing threshold of modes due to their interaction with each other.

EH-P.7 MON

Dramatic decrease of the Joule losses in the coupling between a crystalline gold film colloidal and single CdSe/CdS nanocrystals at 4K

•A. Coste[1], S. Buil[1], X. Quélin[1], G. Colas des Francs[2], L. Moreaud[3], E. Dujardin[3], and J.-P. Hermier[1]; [1]Groupe d'Etude de la Matière Condensée (GEMaC), Université de Versailles Saint-Quentin-en-Yvelines, CNRS UMR 8635, Université Paris-Saclay, Versailles, France; [2]Laboratoire Interdisciplinaire Carnot de Bourgogne (ICB), UMR 6303 CNRS, Université Bourgogne Franche-Comté, Dijon, France; [3]. CEMES CNRS UPR 8011 and Université de Toulouse, Toulouse, France

We show that the optical losses observed in the coupling between colloidal thick-shell CdSe/CdS nanocrystals and a flat gold film can be strongly reduced by using crystalline gold and by operating at 4K.

EH-P.8 MON

Plasmonic optical trapping combined with time-resolved fluorescence microscopy

Q. Jiang, J.-B. Claude, and •J. Wenger; Aix Marseille Univ, CNRS, Institut Fresnel, Marseille, France

We combine a fluorescence microscope with an optical trapping system. This approach offers the advantage of having a better signal to background ratio due to the near-zero background on the fluorescence channel.

EH-P.9 MON

Shaping the emission pattern of organic light emitting diodes by using plasmonic Ag nanoparticles arrays

•s. Hamdad; Laboratoire de Physique des Lasers CNRS UMR 7538, Université Paris 13, Sorbonne Paris Cité, Villetaneuse, France

This work concerns the utilization of plasmonic periodic nano-ordered structures to model the emission pattern, and enhance the properties of organic light emitting diode devices in terms of emission rate, efficiency and directionality.

EH-P.10 MON

Evaluation of plamsonic enhancement and quenching of Ag nanoparticles in organic light-emitting diode

•A. Thierno Diallo[1], M. Chakaroun[1], S. Hamdad[1], S. Khadir[1], J. Esparza-Villa[2], A. Maître[2], and A. Boudrioua[1]; [1]Laboratoire de Physique de Lasers CNRS UMR 7538, Université Paris 13, Sorbonne Paris Cité, Villetaneuse, France; [2]Sorbonne Université, Faculté des Sciences, Institut des Nanosciences de Paris, Paris, France

We analyze the effect of the distance between of Ag nanoparticles and the emitting layer of an OLED. A figure of merit is suggested, which includes LSPR, electrical and optical effects of nanoparticles.

EH-P.11 MON

Amplifying SP-enhanced SHG with NLO polymers grown on Ag films

•A. Sugita, K. Mochizuki, K. Kikuchi, A. Ono, W. Inami, and Y. Kawata; Shizuoka University, Hamamatsu, Japan

35-fold amplifications of SP-enhanced SHG were gained with NLO polymer layer grown on Ag films in Kretschmann geometry. Degree of amplifications was determined by balances between nonlinear interaction length and multiple reflections inside polymer layers.

EH-P.12 MON

Synthesis of gold nanodroplets with field enhancement of 10^5 at their tips using a simple wet-chemical method

•P. Ghosh[1], G. Joshi[2], A.L. Chakraborty[1], R. Hegde[1], and S. Khatua[2]; [1]Electrical Engineering, Indian Institute of Gandhinagar, GANDHINAGAR, India; [2]Chemistry, Indian Institute of Gandhinagar, GANDHINAGAR, India

We report the synthesis of gold nanodroplets, a new nanostructure that has a sharp tip and a spherical base. The longitudinal plasmon resonance is tunable and numerical simulations show field intensity enhancement of 10^5.

EH-P.13 MON

Investigation of the Lower Limit of the Applicability of Effective Medium Approximation for Hyperbolic Metamaterials

J. Sukham[1], O. Takayama[1], M. Mahmoodi[2], S. Sychev[3], A. Bogdanov[3], S.H. Tavassoli[2], A. Lavrinenko[1], and •R. Malureanu[1]; [1]Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark; [2]Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran; [3]Saint Petersburg National Research University of Information Technologies, Mechanics and Optics, St. Petersburg, Russia

We theoretically and experimentally investigate the limits of the effective medium theory with respect to the minimum number of periods and its dimensions. We show that this limit is high, even for very small structures.

EH-P.14 MON

Magnetic Near-field enhancement in THz Multilayer Fano Metamaterial

S. Karmakar[1], •R.K. Varshney[1], and D. Roy Chowdhury[2]; [1]Indian Institute of Technology Delhi, Delhi, india; [2]Mahindra Ecole Centrale Hyderabad, Hyderabad, India

We report a highly localized magnetic field enhancement in Fano resonance based multilayered metamaterial in THz frequency domain. Nearly two order of magnitude enhancement has been obtained at Fano resonance frequency.

EH-P.15 MON

All optical manipulation of photonic metasurfaces in microfluidic environments

•A. Di Falco; SUPA, School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom

We discuss the all optical trapping and manipulation of holographic photonic metasurfaces in microfluidic environments for sensing and bio-photonics applications.

EH-P.16 MON

Multilattice Structures for Dynamic Beam Forming and Steering

A.N.M.S. Hossain and •I. Tsukerman; The University of Akron, Akron, Ohio, USA

The novel feature of our tunable metaguide/surface is two or more resonating lattices in a host medium. Changing the index of the host, one activates a particular lattice, which produces radiation at the corresponding angle.

EH-P.17 MON

VO2 phase change control of Au nanorod emission enhancement of magnetic dipolar emitters

•E. Petronijevic[1], M. Centini[1], T. Cesca[2], G. Mattei[2], and C. Sibilia[1]; [1]SBAI Department,Sapienza University of Rome, Rome, Italy; [2]Physics and Astronomy Department, University of Padova, Padova, Italy

We investigate the emission control of dipoles sandwitched between Au nanorods and a thin phase change material VO2, which changes from semiconductor to metallic state. This work could lead to tunable efficient integrable nanosource applications.

EH-P.18 MON

Light Manipulation with Plasmonic Structures using Phase Change Materials

•S. Cunningham, J.J. Gough, S.B. Porter, P. Stamenov, C. Hrelescu, and A.L. Bradley; School of Physics, CRANN and AMBER, Trinity College Dublin, Dublin, Ireland

Here, we report on the reversible manipulation of plasmonic and photoluminescence properties of hybrid nanostructures, consisting of quantum emitters and gold nanorod arrays on vanadium dioxide (VO2), through the phase change of VO2.

EH-P.19 MON

Waveguide stopped light mediated by mode transitions

•P. Pujol-Closa[1], J. Gomis-Bresco[1,3], J.S. Gómez-Díaz[2], and D. Artigas[1,3]; [1]ICFO - The Institute of Photonic Sciences, Castelldefels, Spain; [2]University of California Davis, Davis, USA; [3]Universitat Politecnica de Catalunya, Barcelona, Spain

We show that symmetric three layer waveguides with Type II hyperbolic metamaterials lack cut-off. Instead, modes transit from parallel to orthogonal propagation with respect to the optical axis. This transition process results in stopped light.

EH-P.20 MON

Landau damping in plasmonic nanoantennas behind quasistatic approximation: broadening of quadrupole resonance

•A. Uskov[1], R. Ikhsanov[2], and I. Protsenko[1]; [1]P. N. Lebedev Physical Institute, Russian Academy of Sciences, Moscow, Russia; [2]National Research University Higher School of Economics, Moscow, Russia

We develop theory of Landau damping in spherical plasmonic nanoparticles behind quasistatic approximation. In particular, we firstly consider Landau damping of quadrupole plasmonic resonance and show that it can be substantial.

EH-P.21 MON

The Optical Properties of AuZr Intermetallic Alloys

•H. Littlehailes, W. Hendren, S. Drakeley, R. Bowman, and F. Huang; School of Mathematics and Physics, Queens University Belfast, Belfast, United Kingdom

Intermetallic alloys are increasingly attracting attention as alternative plasmonic materials, owing to their refractory properties. Presented are the detailed studies of the synthesis of high quality Au3Zr and the rigorous characterisation of its optical properties.

NOTES

ROOM 1 ICM

8:30 – 10:00

CJ-8: Nonlinear frequency conversion and 2 μm fiber lasers

Chair: Grzegorz Sobon, Wroclaw University of Science and Technology, Wroclaw, Poland

CJ-8.1 TUE 8:30

All-fiber source for generation of tunable broadband fceo-free mid-IR pulses for laser spectroscopy applications

•*K. Krzempek*[1], *A. Gluszek*[1], *D. Tomaszewska*[1], *T. Martynkien*[2], *P. Mergo*[3], *J. Sotor*[1], *and G. Sobon*[1]; [1]*Laser and Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wroclaw, Poland*; [2]*Faculty of Fundamental Problems of Technology, Wrocław University of Science and Technology, Wroclaw, Poland*; [3]*Laboratory of Optical Fiber Technology, Maria Curie-Skłodowska University, Lublin, Poland*

We report an fully-fiberized, carrier-envelope-offset-free frequency comb source covering the ~8 μm spectral region, based on difference frequency generation, driven by an Er-doped fiber oscillator. Non-complex pulse repetition tuning enables using the source in Vernier gas spectrometers.

CJ-8.2 TUE 8:45

Noise evolution in all-normal dispersion supercontinuum generation

•*E. Genier*[1], *P. Bowen*[1], *T. Sylvestre*[2], *J.M. Dudley*[2], *P.M. Moselund*[1], *and O. Bang*[1,3]; [1]*NKT Photonics, Birkerød, Denmark*; [2]*FEMTO-ST, Besançon, France*; [3]*DTU Fotonik, Lyngby, Denmark*

We demonstrate numerically how all-normal supercontinuum generation is affected when realistic laser pulse duration and amplitude noise contributions are considered either individually or combined. Correlation between spectrum and noise along the propagation is also shown.

CJ-8.3 TUE 9:00

Millisecond wavelength tuning across hundreds of nanometers of a fiber optical parametric oscillator

•*T. Hellwig*[1,2], *M. Brinkmann*[1,2], *and C. Fallnich*[1,2]; [1]*Institute of Applied Physics,*

ROOM 4a ICM

8:30 – 10:00

EA-3: Quantum optomechanics

Chair: Tracy Northup, Universität Innsbruck, Innsbruck, Austria

EA-3.1 TUE 8:30

Cold damping of a levitated nanoparticle

F. Tebbenjohanns, •*M. Frimmer, A. Militaru, V. Jain, and L. Novotny*; *Photonics Laboratory, ETH Zurich, Zurich, Switzerland*

We present a cold damping scheme to cool the motion of an optically levitated nanoparticle to the micro-Kelvin regime. We determine the imprecision-backaction product of our system and outline the prospects for ground-state cooling.

EA-3.2 TUE 8:45

Levitation and Optical Interrogation of a Feedback-Cooled Nitrogen Vacancy Center in a Paul Trap

•*A.W. Schell*[1,2], *G.P. Conangla*[1], *R.A. Rica*[1,3], *and R. Quidant*[1,4]; [1]*ICFO-Institut de Ciencies Fotoniques, Castelldefels, Spain*; [2]*Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic*; [3]*Department of Applied Physics, School of Sciences, University of Granada, Granada, Spain*; [4]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We demonstrate levitation of a nanodiamond containing a single nitrogen vacancy center in high vacuum. Further, feed-back cooling of its center of mass motion is applied.

EA-3.3 TUE 9:00

Observation of Brillouin optomechanical strong coupling with an 11 GHz mechanical mode

G. Enzian[1], *M. Szczykulska*[1], *J. Silver*[2], *L. Del Bino*[2], *S. Zhang*[2], *I.A. Walmsley*[1], *P.*

ROOM 4b ICM

8:30 – 10:00

EI-2: Exciton/polariton physics in 2D materials

Chair: Dmitry Efetov, ICFO, Castelldefels, Spain

EI-2.1 TUE (Invited) 8:30

Condensation and expansion of cavity polaritons based on two-dimensional crystals

•*C. Schneider*[1], *M. Waldherr*[1], *N. Lundt*[1], *M. Klaas*[1], *L. Dusanovski*[1], *A. Kavokin*[2], *and S. Höfling*[1]; [1]*Technische Physik, University of Würzburg, Germany, Wuerzburg, Germany*; [2]*WIAS, Shilongshan Road, Cloud Town, Hangzhou, China, Hangzhou, China*

We discuss the formation of a bosonic condensate driven by excitons hosted in an atomically thin layer of MoSe2. Furthermore, we discuss the observation of the anomalous Hall effect of monolayer-based exciton-polaritons.

EI-2.2 TUE 9:00

MoSe2 and WSe2 embedded in Bragg-Cavities with high Q-factors enabling strong exciton-polariton coupling in 2D-systems

•*H. Knopf*[1,2,3], *C. Ruprecht*[4], *U. Schulz*[2], *C. Schneider*[4], *and F. Eilenberger*[1,2,3]; [1]*Institute of Applied Physics, Friedrich-Schiller-University, Jena, Germany*; [2]*Fraunhofer Institute of Applied Optics and Precision Engineering IOF, Jena, Germany*; [3]*Max Planck School of Photonics, Jena, Germany*; [4]*Department of Technical Physics,*

ROOM 13a ICM

8:30 – 10:00

CB-4: Superluminescent diodes and semiconductor optical amplifiers

Chair: Mircea Guina, Tampere University of Technology, Tampere, Finland

CB-4.1 TUE 8:30

Record-High Power Spectral Density CW Tapered Quantum-Dot Superluminescent Diode

•*A.F. Forrest*[1,2], *M. Krakowski*[3], *P. Bardella*[4], *and M.A. Cataluna*[1,2]; [1]*Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Previously also with the School of Science and Engineering, University of Dundee, Dundee, United Kingdom*; [3]*III-V Lab, Palaiseau, France*; [4]*Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Turin, Italy*

We present a CW, two-section, tapered, chirped quantum-dot SLD which achieved a record-high power spectral density (6.5 mW/nm) as well as a record high output power (137.5 mW) in the 1.15 – 1.35 μm spectral region.

CB-4.2 TUE 8:45

Surface-emitting superluminescent diode arrays

•*B. Jentzsch*[1,2], *A. Gomez-Iglesias*[2], *A. Tonkikh*[2], *and B. Witzigmann*[1]; [1]*Universität Kassel, Kassel, Germany*; [2]*OSRAM Opto Semiconductors, Regensburg, Germany*

We present novel surface-emitting IR-SLEDs completely fabricated on wafer-level as arrays with significant advantages over conventional edge-emitters. In our approach, a radial arrangement results in very symmetric far fields with FWHM <15° in all directions.

CB-4.3 TUE 9:00

Blue Superluminescent Diode on c-Plane GaN Beyond Gigahertz Modulation Bandwidth for Visible Light Communication

•*A.A. Alatawi*[1,2], *J.A. Holguin-Lerma*[1], *C. Hong Kang*[1], *C. Shen*[1], *A.M. Albadri*[2], *A.Y.*

ROOM 13b ICM

8:30 – 10:00

CA-8: Ytterbium doped laser materials

Chair: Thomas Südmeyer, University of Neuchâtel, Neuchâtel, Switzerland

CA-8.1 TUE 8:30

Joule-class 500 Hz cryogenic Yb:YAG Chirped Pulse Amplifier

L.E. Zapata[1], *S. Schweisthal*[1], *J. Thesinga*[1], *C. Zapata*[1], *M. Schust*[1], *L. Yizhou*[1], *A.-L. Calendron*[1], •*M. Pergament*[1], *and F.X. Kaertner*[1,2]; [1]*Center for Free-Electron Laser Science, Deutsches Elektronen Synchrotron, Hamburg, Germany*; [2]*Department of Physics & The Hamburg Center for Ultrafast Imaging, , Hamburg, Germany*

A cryogenic Yb:YAG composite-thin-disk laser driver has demonstrated long-term stable operation with 1-joule, 1/2-ns chirped pulse output at 500 Hz. Data will be presented. The output pulses (FWHM 0.35nm) may be compressed to <5ps.

CA-8.2 TUE 8:45

Multi-Watt Multi-Pass Amplification in a 42-mm-long Yb:LuLiF$_4$ Single Crystal Fiber Grown by the Micro-Pulling-Down Method

F. Pirzio[1], *S. Jun*[2,3], •*S. Tacchini*[1], *G. Piccinno*[4], *A. Di Lieto*[2], *M. Tonelli*[2], *and A. Agnesi*[1,4]; [1]*Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy*; [2]*NEST Istituto Nanoscienze-CNR and Dipartimento di Fisica, Università di Pisa, Pisa, Italy*; [3]*Gemmological Institute, China University of Geosciences, Wuhan, China*; [4]*Bright Solutions Srl, Cura Carpignano (PV), Italy*

We present a 100-W cw-pumped, 1-W-seeded, 4-passes amplifier based on a 42-mm-long, 2%-Yb^{3+}:$LuLiF_4$ birefringent crystal fiber grown for the first time by the micro-pulling-down method. Small-signal gain G_0 = 35 and 8.4-W output power (M^2 = 1.1) were obtained.

CA-8.3 TUE 9:00

Diode - pumped Efficient Cryogenic Yb:Y2O3 Transparent Ceramic Laser

•*S. Paul David, V. Jambunathan, F. Yue, A. Lucianetti, and T. Mocek*; *HiLASE Center, Institute of Physics Czech Academy of Sciences,*

ROOM 14a ICM

8:30 – 10:00

CK-7: Metasurface

Chair: Olivier Gauthier-Lafaye, LAAS-CNRS, Toulouse, France

CK-7.1 TUE (Invited) 8:30

Towards semiconductor-based Metasurfaces

G. Briere[1], S. Héron[1], P. Ni[1], S. Vézian[1], V. Brandli[1], B. Damilano[1], J.Y. Duboz[1], M. Iwanaga[2], and •P. Genevet[1]; [1]CRHEA, CNRS, Sophia antipolis, France; [2]National Institute for Materials Science (NIMS), Tsukuba , Japan

We present etching-free fabrication process for the realization of semiconductor-based light emitting metasurfaces and propose hybrid refractive-metasurface devices to mitigate material dispersion of conventional refractive components.

CK-7.2 TUE 9:00

Integrated Plasmonic Nanoantenna Gratings for Large Area Coherent Optical Source

B. Leroy[1], G. Magno[1], D. Barat[2], L. Pradere[2], and •B. Dagens[1]; [1]Centre de Nanosciences

ROOM Osterseen ICM

8:30 – 10:00

CL-4: Chip-based methods and cellular sensing

Chair: Varpu Marjomäki, University of Jyväskylä, Jyväskylä, Finland

CL-4.1 TUE 8:30

Dual-color fluorescent microscope on chip for 3D imaging of single cells

•F. Sala[1,2], P. Paiè[1], R. Memeo[2], R. Osellame[1,2], A. Farina[1], A. Zippo[3], T. Vaccari[4], A. Bassi[2], and F. Bragheri[1]; [1]Institute for Photonics and Nanotechnologies, IFN-CNR, Milan, Italy; [2]Department of Physics, Politecnico of Milan, Milan, Italy; [3]CIBIO, University of Trento, Trento, Italy; [4]Department of Bioscience, University of Milan, Milan, Italy

We propose a dual-color fluorescence microscope fabricated by femtosecond laser micromachining on a glass chip. The device allows high throughput three dimensional imaging of single breast cancer cells with high resolution.

CL-4.2 TUE 8:45

Optical Control in a 3D Flow-Focusing Microfluidic Sorting System

•Y. Lyu, A. Glidle, and H. Yin; University of Glasgow, Glasgow, United Kingdom

Here we implement an optical sensing strategy for hybrid plug-and-play microfluidic devices that couples events in a 3D-hydrodynamic focusing module to those in a downstream sorting module, so triggering the actuation required to sort cells/beads.

CL-4.3 TUE 9:00

Optical routing of nanospheres on plasmonic rails

•S. Yin, F. He, N.G. Green, and X. Fang; School of Electronics and Computer Science, University of Southampton, Southampton,

ROOM 1 Hall A1

8:30 – 10:00

CH-8: Nanostructured sensors

Chair: Crina Cojocaru, Universitat Politècnica de Catalunya, Barcelona, Spain

CH-8.1 TUE 8:30

Room temperature magnetic field learning with optically readout single NV-centers

•A.A. Gentile[1], R. Santagati[1], S. Knauer[1,2], S. Schmitt[3], S. Paesani[1], C. Granade[4], N. Wiebe[4], C. Osterkamp[3], L.P. McGuinness[3], J. Wang[1], M.G. Thompson[1], J.G. Rarity[1], F. Jelezko[3], and A. Laing[1]; [1]Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom; [2]Centre of Excellence for Quantum Computation and Communication Technology, School of Physics, University of New South Wales, Sydney, Australia; [3]Institute of Quantum Optics, Ulm University, Ulm, Germany; [4]Quantum Architectures and Computation Group, Microsoft Research, Redmond, USA

Combining Bayesian machine-learning and room-temperature magnetometry with single NV-centers, we show sensitivities comparable to those achieved with cryogenics setups, simultaneous estimation of T_2^*, and potential for online tracking at the nanoscale of time-varying magnetic fields.

CH-8.2 TUE 8:45

Picometre Resolution Measurement of Plasmonic Dynamics in Metal Nanostructures using Frequency Comb

D.A. Nguyen, B.J. Chun, and •Y.-J. Kim; School of Mechanical and Aerospace Engineering, Nanyang Technological University (NTU), Singapore, Singapore

We report that frequency-comb-referenced plasmonic phase spectroscopy provides high speed, high resolution, and traceability to time standards. A 1.94-Å dynamic motion of plasmonic nanohole array was measured thereby with a 1.67 pm resolution.

CH-8.3 TUE 9:00

ZnGa2O4:Cr3+ nanophosphors for thermometry at nanoscale

E. Glais[1,2], C. Chaneac[1], and •B. Viana[2]; [1]LCMCP, Sorbonne Université, UPMC Univ Paris 06, CNRS, Collège de France, Paris,

ROOM 2 Hall A1

8:30 – 10:00

CF-8: Generation and characterisation of ultraviolet pulses

Chair: Ming-Chang Chen, National Tsing-Hua University, Hsinchu, Taiwan

CF-8.1 TUE 8:30

Harmonic Concatenation of 1.5-Femtosecond-Pulses in the Deep Ultraviolet

•J. Reislöhner, C. Leithold, and A.N. Pfeiffer; Institute of Optics and Quantum Electronics, Abbe Center of Photonics, Friedrich Schiller University, Max-Wien-Platz 1, 07743, Jena, Germany

A method for the synthesis of ultrashort pulses in the deep UV is demonstrated, which utilizes the temporal and spatial harmonics that are generated by two non-collinear IR-VIS pulses in a thin MgF_2 plate.

CF-8.2 TUE 8:45

Generation of ultrabroadband phase-locked pulse pairs in the ultraviolet by achromatic SHG

•P. Malevich[1,4], R. Borrego-Varillas[2], L. Ganzer[2], C. Manzoni[2], P.J. Kabacinski[2], E. Riedle[3], and J. Hauer[1,4]; [1]Technical University of Vienna, Wien, Austria; [2]IFN-CNR, Physics Department, Politecnico di Milano, Milan, Italy; [3]Lehrstuhl fuer BioMolekulare Optik, Ludwig-Maximilians-Universitaet Muenchen, Munich, Germany; [4]Dynamic spectroscopies, Technische Universitaet Muenchen, Munich, Germany

We combine broadband Achromatic Second Harmonic Generation with an ultrastable, birefringent interferometer to generate ultrabroad UV phase-locked pulse pairs in the 260-310 nm range. We obtain UV pulse pairs with transform-limited duration of 8.2 fs.

CF-8.3 TUE 9:00

Characterization of 8 fs Deep-UV Pulses Using XPW Dispersion Scan

A. Tajalli [1,2], T.K. Kalousdian[3], M. Kretschmar[3], S. Kleinert[1,2], U. Morgner[1,2,4,5], and •T. Nagy[3]; [1]Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany; [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across-

ROOM 3 Hall A1

8:30 – 10:00

CE-8: High performance bragg gratings and mirrors

Chair: Chris Holmes, ORC University of Southampton, Southampton, UK

CE-8.1 TUE 8:30

High-Performance Mid-Infrared Crystalline Bragg Mirrors at 4.5 μm

G. Winkler[1], •L. Perner[1], G.-W. Truong[2], D. Bachmann[3], A.S. Mayer[1], J. Fellinger[1], T. Zederbauer[3], D. Follman[2], C. Deutsch[3], G.D. Cole[2,3], and O.H. Heckl[1]; [1]Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna, Vienna, Austria; [2]Crystalline Mirror Solutions LLC, Santa Barbara, USA; [3]Crystalline Mirror Solutions GmbH, Vienna, Austria

We present state-of-the-art mid-IR high-reflectivity low-loss mirrors at 4.5 μm based on substrate-transferred crystalline coatings. We demonstrate losses of 150 ppm (transmission) and <50 ppm (excess) via cavity-ringdown, direct transmission and photothermal absorption measurements.

CE-8.2 TUE 8:45

Direct femtosecond laser inscription of highly reflective and low loss mid-infrared fiber Bragg gratings

•G. Bharathan, T.T. Fernandez, M. Ams, R. Woodward, D. Hudson, and A. Fuerbach; MQ Photonics Research Centre, Faculty of Science and Engineering, Macquarie University, New South Wales, Sydney, Australia

We introduce novel techniques for the femtosecond laser direct inscription of temperature stable mid-infrared fiber Bragg gratings in fluoride fibers and demonstrate FBGs that feature the highest coupling coefficients and lowest transmission losses to date.

CE-8.3 TUE 9:00

Propagation Loss Measurement using Ultra-Broadband Chirped Bragg Gratings in Integrated UV Written Waveguides

•R.H.S. Bannerman, P.L. Mennea, D.H. Smith, P.G.R. Smith, and J.C. Gates; Univer-

ROOM 1 ICM

University of Münster, Münster, Germany; [2]*Refined Laser Systems, Exist-FT 03EFLNW192, Münster, Germany*

We present a mechanical delay-free tuning concept for optical parametric oscillators and demonstrate tuning of the signal from 750 to 980 nm and the idler from 1150 to 1600 nm in less than 5 ms.

CJ-8.4 TUE 9:15

UV-Grade Silica-based Photonic Crystal Fibers for broadband UV generation over 350-395 nm

•*S. Perret*[1], *A.N. Ghosh*[1], *G. Fanjoux*[1], *L. Provino*[2], *T. Taunay*[2], *A. Monteville*[2], *D. Landais*[2], *J.M. Dudley*[1], *and T. Sylvestre*[1]; [1]*Institut Femto-ST, Besançon, France*; [2]*Perfos, Lannion, France*

We report the fabrication of highly nonlinear photonic crystal fiber from UV-grade glass and experimentally demonstrate nonlinear frequency conversion over 350-395 nm by pumping at 355 nm with picosecond pulses.

CJ-8.5 TUE 9:30

790nm Diode Pumped Thulium Sensitized Holmium-doped Fibre Laser Operating Beyond 2100nm

•*N.J. Ramírez-Martínez, M. Núñez-Velázquez , and J.K. Sahu*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We report Tm:Ho doped aluminosilicate fibre fabricated by a novel hybrid gas phase-solution doping technique in combination with MCVD process that shows laser efficiency of 56% at 2105nm when cladding pumped at 790nm.

ROOM 4a ICM

Del'Haye[2], *and •M.R. Vanner*[1,3]; [1]*Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, United Kingdom*; [2]*National Physical Laboratory (NPL), Teddington, London, United Kingdom*; [3]*QOLS, Blackett Laboratory, Imperial College London, London, United Kingdom*

We report the observation of Brillouin-optomechanical strong coupling. This work unites several advantages and overcomes current challenges to achieve strong coupling with high frequency phonons, paving the way for quantum control with light and sound.

EA-3.4 TUE 9:15

Gigahertz Quantum Dot Optomechanics in the Resolved Sideband-Regime

•*M. Weiß*[1], *M. Nägele*[1], *K. Müller*[2], *J.J. Finley*[2], *and H.J. Krenner*[1,2]; [1]*Institut für Physik, Universität Augsburg, 86159 Augsburg, Germany*; [2]*Walter Schottky Institut, TU München, 85748 Garching, Germany*

Here we present the parametric excitation of a single quantum dot dynamically strained by a surface acoustic wave (SAW) in the resolved sideband regime.

EA-3.5 TUE 9:30

Towards the generation of nonclassical mechanical states using quantum electromechanics

•*T. Capelle*[1], *E. Ivanov*[1], *R. Lescanne*[3,4], *E. Flurin*[2], *S. Deléglise*[1], *Z. Leghtas*[3,4,5], *T. Jacqmin*[1], *T. Briant*[1], *and A. Heidmann*[1]; [1]*Laboratoire Kastler Brossel, Sorbonne Université, Paris, France*; [2]*Quantronics, CEA, Saclay, France*; [3]*Laboratoire Pierre Aigrain, ENS, PSL, Paris, France*; [4]*Quantic, Inria, Paris, France*; [5]*Mines Paristech, PSL, Paris, France*

Using a electromechanical cavity, we try to engineer nonclassical mechanical states by entangling a resonator in its ground state and a microwave bath, then heralding the resulting microwave photon with a single photon microwave detector.

ROOM 4b ICM

Julius-Maximilians-Universität, Würzburg, Germany

We demonstrate the integration of sensitive 2D-materials into high-Q, robust and flexible micro-cavities providing an ideal environment for the study of exciton-polariton dynamics. In photoluminescence experiments, we see strong coupling, verified by Zeeman-splitting of exciton-polaritons.

EI-2.3 TUE 9:15

Spin-Layer- and Spin-Valley-Locking due to Symmetry in Differently-Stacked Tungsten Disulfide Bilayers

•*L.M. Schneider*[1], *J. Kuhnert*[1], *S. Schmitt*[1], *U. Huttner*[1], *L. Meckbach*[1], *T. Stroucken*[1], *S.W. Koch*[1], *W. Heimbrodt*[1], *S. Fu*[2], *X. Wang*[2], *K. Kang*[2], *E.-H. Yang*[2], *and A. Rahimi-Iman*[1]; [1]*Department of Physics and Materials Sciences Center, Philipps-Universität Marburg, 35032 Marburg, Germany*; [2]*Department of Mechanical Engineering, Stevens Institute of Technology, Hoboken, NJ 07030, USA*

Ab-inito calculations predict a spin-valley locking for the AB-stacked WS2 bilayer and a spin-layer locking for the AA' configuration. This, and a lifting of layer degeneracy, could be proven experimentally by reflection-contrast and polarization-resolved photoluminescence.

EI-2.4 TUE 9:30

Direct optical evidence of free excitons in a monolayer quantum material and effective-mass measurements

L.M. Schneider[1], *S. Esdaille*[2], *D. Rhodes*[2], *K. Barmak*[2], *J. Hone*[2], *and •A. Rahimi-Iman*[1]; [1]*Philipps-Universität Marburg, Marburg, Germany*; [2]*Columbia University, New York, USA*

We demonstrate a direct evidence of free excitons and access their effective mass, for the first time, using a purely optical method. Density- and temperature-dependencies of the energy-momentum dispersion of monolayer-WSe2 excitonic photoluminescence are investigated.

ROOM 13a ICM

Alyamani[2], *T. Khee Ng*[1], *and B.S. Ooi*[1]; [1]*Photonics Laboratory, King Abdullah University of Science & Technology (KAUST), Thuwal, Saudi Arabia*; [2]*National Center for Nanotechnology, King Abdulaziz City for Science and Technology (KACST), Riyadh, Saudi Arabia*

We demonstrated a c-plane GaN-superluminescent-diode with high modulation bandwidth of over 1GHz based on 12-degree tilted facet waveguide. The device emits at 442 nm with a 7 nm linewidth at 1 A of injection current.

CB-4.4 TUE 9:15

Determination of the residual amplified spontaneous emission in single-mode semiconductor optical amplifiers

•*B. Arar, C. Kürbis, H. Wenzel, and A. Wicht*; *Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

We determine the coherent and the residual amplified spontaneous emission optical powers of saturated ridge-waveguide optical amplifiers. The experimental data are compared with those calculated by using a microscopic model of the optical amplifier.

CB-4.5 TUE 9:30

Widely tunable Watt-level MOPA systems emitting at 976 nm

•*M. Tawfieq, J. Fricke, A. Müller, P. Della Casa, O. Brox, H. Wenzel, B. Sumpf, and G. Tränkel*; *Ferdinand-Braun-Institut, Berlin, Germany*

Compact MOPA systems at 976 nm will be presented. Different concepts will be described, providing up to 23.5 nm of wavelength tuning, narrow spectral linewidth, Watt-level output powers from nearly diffraction limited beam quality.

ROOM 13b ICM

Prague, Czech Republic

Cryogenic laser performance of Yb:Y2O3 pumped by VBG stabilized fiber coupled diode laser at 976 nm is presented. A maximum output power of 11 W with a slope efficiency of 75% at 100K is achieved.

CA-8.4 TUE 9:15

Yb Doped (Luxy(1-X))2o3 Mixed Sesquioxide Ceramics: Fabrication, Spectroscopy and Laser Emission

G. Toci[1], *•A. Pirri*[2], *B. Patrizi*[1], *R.N. Maksimov*[3,4], *V.V. Osipov*[3], *V.A. Shitov*[3], *A.S. Yurovskikh*[4], *and M. Vannini*[1]; [1]*Istituto di Ottica, INO-CNR, Sesto Fiorentino (Florence), Italy*; [2]*Istituto di Fisica Applicata "Carrara", IFAC-CNR, Sesto Fiorentino (Florence), Italy*; [3]*Electrophysics UrB RAS, Ekaterinburg, Russia*; [4]*Ural Federal University named after the first President of Russia B.N. Yeltsin,, Ekaterinburg, Russia*

We investigated the spectroscopic properties and the laser performances of Yb:(LuxY(1-x)Zr0.04)2O3 ceramics with different Y/Lu balances.

CA-8.5 TUE 9:30

Yb:YAB Crystal Based Chirped Pulse Regenerative Amplifier

•*A. Rudenkov*[1], *V. Kisel*[1], *K. Gorbachenya*[1], *A. Yasukevich*[1], *V. Maltsev*[2], *N. Leonyuk*[2], *and N. Kuleshov*[1]; [1]*Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus*; [2]*Department of Crystallography and Crystal Chemistry, Moscow State University, Moscow, Russia*

Chirped pulse regenerative amplifier based on Yb:YAB crystal demonstrated with maximum output power of 4.6W (6W of chirped pulses and optical-to-optical efficiency of 25%) and 695fs pulse duration at 1038.6nm and 100kHz PRF.

ROOM 14a ICM

et de Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay, C2N, Palaiseau, France; [2]*Groupe PSA, Direction Scientifique, Centre technique de Vélizy, Villacoublay, France*
Plasmonic nanoantenna chains gratings are integrated near silicon nitride waveguides to extract and emit light beam with full control of the directivity and optical power. Numerical demonstration and first experimental validation are presented.

CK-7.3 TUE 9:15

Projecting Free-Space Light with Arbitrary Polarization by a Photonic Chip Integrated with a Metasurface
•*A. Yulaev*[1,2], *W. Zhu*[1,2], *C. Zhang*[1,2], *D.A. Westly*[1], *H.J. Lezec*[1], *A. Agrawal*[1,2], *and V. Aksyuk*[1]; [1]*Physical Measurement Laboratory, National Institute of Standards and Technology, Gaithersburg, MD, USA*; [2]*Maryland Nanocenter, University of Maryland, College Park, MD, USA*
We demonstrate single-mode photonics coupling to free-space radiation with arbitrarily engineered light phase and polarization. The photonic-to-free-space coupling is realized by integrating a photonic chip expanding waveguide modes into wide collimated beams and a planar metasurface.

CK-7.4 TUE 9:30

360° on chip optical beam steering based on superposition of planar spiral orbital angular momentum waves
•*S. Zeng*[1], *Y. Zhang*[1], *J. Zhu*[2], *Z. Wu*[1], *Y. Chen*[1], *and S. Yu*[1,2]; [1]*Sun Yat-sen University, Guangzhou, China*; [2]*University of Bristol, Bristol, United Kingdom*
We report an integrated optical phased array consisting of concentric micro-ring orbital angular momentum emitters. The device is capable of 360-degree beam scanning and beam-shaping for potential applications in optical communications and Lidar.

ROOM Osterseen ICM

United Kingdom
We demonstrate plasmonic nanoparticle routers that can guide and route nanospheres in a microfluidic channel in response to incident light. The results suggest a new method for next-generation microfabrication and sensing.

CL-4.4 TUE 9:15

Autonomous Photonic Biosensor based on Guided Mode Resonance
•*A. Drayton, C. Reardon, and T. F. Krauss* ; *Physics Department, University of York, York, United Kingdom*
We present a cost-effective and autonomous biosensor with a refractive index sensitivity of 4 × 10-5 RIU based on Chirped Guided Mode Resonance with fully enclosed source and detector.

CL-4.5 TUE 9:30

Breath signatures of cerebral palsy patients revealed with mid-infrared FTIR spectroscopy
•*K.S. Maiti*[1,2], *S. Roy*[3], *R. Lampe*[3,4], *and A. Aplonski*[1,2,5]; [1]*Max Planck Institute of Quantum Optics, D-85748 Garching, Germany*; [2]*Ludwig Maximilian University Munich, Chair of Experimental Physics – Laser Physics, Faculty of Physics, Am Coulombwall 1, D-85748 Garching, Germany*; [3]*Research Unit of the Buhl-Strohmaier Foundation for Cerebral Palsy and Paediatric Neuroorthopaedics, Orthopaedic Department, Klinikum rechts der Isar, Technical University of Munich, D-81675 München, Germany*; [4]*Markus Würth Professorship, Technical University of Munich, D-81675 München, Germany*; [5]*International Centre for Photonics, Novosibirsk State University, 630090 Novosibirsk, Russia*
In a small pilot study, we found a way of accurately distinguishing between the cohort of cerebral palsy patients and a healthy cohort by means of mid-infrared FTIR spectroscopy.

ROOM 1 Hall A1

France; [2]*PSL Research University, Chimie ParisTech, CNRS, Institut de Recherche de Chimie Paris,, Paris, , France*
Nanothermometry in ZnGa2O4:Cr3+ nanophosphors can be envisioned thanks to measurements of long lifetimes occurring in such persistent materials or short lifetimes variation with temperature. In addition, gold nanoheaters efficiently transfer thermal load to the nanothermometers

CH-8.4 TUE 9:15

Imprinted polymer inverse opals for the detection of nanoparticles
S. Gam Derouich[2], *C. Bourdillon*[1], *S. Lakhdar Chaouche*[1], *L. Coolen*[1], *A. Maitre*[1], *C. Mangeney*[3], *and* •*C. Schwob*[1]; [1]*Institut des NanoSciences de Paris, Paris, France*; [2]*ITODYS, Paris, France*; [3]*LCBPT, Paris, France*
We developed a highly selective and sensitive optical sensor for the detection of nanoparticles. The sensor associates for the first time the concept of imprinted polymer and photonic crystal to detect nanoparticles dispersed in water.

CH-8.5 TUE 9:30

Mobile Based In situ Detection of Live/Dead and Antibiotic Resistant Bacteria by Silver Nanorods Array Sensor Fabricated by Glancing Angle Deposition
•*S. Gahlaut*[1], *N. Kalyani* [2], *C. Sharan*[1], *P. Mishra*[2], *and J. Singh*[1]; [1]*Department of Physics, Indian Institute of Technology Delhi, Delhi, India*; [2]*Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, , Delhi, India*
Here we report a facile, rapid dual mode in-situ detection of viability and antibiotic resistance in different bacteria targeting color and wetting properties of Ag nanorods array fabricated by glancing angle deposition technique.

ROOM 2 Hall A1

Disciplines), Hannover, Germany; [3]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [4]*Laser Zentrum Hannover e.V., Hannover, Germany*; [5]*Hannoversches Zentrum f´ur Optische Technologien, Leibniz Universität Hannover, Hannover, Germany*
We show for the first time the characterization of 8 fs Deep-UV pulses using dispersion scan technique relying on cross-polarized wave generation nonlinearity.

CF-8.4 TUE 9:15

Dual self-diffraction dispersion-scan and its application to the simultaneous measurement of two ultrashort ultraviolet pulses produced by a spatially inhomogeneous multiplate continuum
•*M. Canhota*[1], *R. Weigand*[2], *and H. Crespo* [1]; [1]*IFIMUP-IN and Dep. de Física e Astronomia, Fac. de Ciências, Univ. do Porto, R. do Campo Alegre 687, 4169-007, Porto, Portugal*; [2]*Departamento de Óptica, Fac. de Ciencias Físicas, Avda. Complutense s/n, Universidad Complutense de Madrid, 28040, Madrid, Spain*
We present the first simultaneous measurement of two ultrashort ultraviolet pulses produced by multiplate continuum using the new dual self-diffraction dispersion-scan, which enables measuring inhomogeneous beams and can be extended to the deep-ultraviolet range.

CF-8.5 TUE 9:30

Soliton Self-Compression and UV Dispersive Wave Emission in Compact Hollow Capillary Systems
•*C. Brahms, T. Grigorova, F. Belli, and J.C. Travers*; *School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*
We demonstrate that by using short (5-7 fs) driving pulses, optical soliton dynamics can be obtained in hollow capillary fibres less than 35 cm in length, generating μJ-level ultrafast UV pulses with high efficiency.

ROOM 3 Hall A1

sity of Southampton, Sotuhampton, United Kingdom
We present our technique using chirped Bragg gratings to measure propagation loss in integrated direct UV-written waveguides in silica-on-silicon. We achieve this using rapid chirp rates of up to 13 nm/mm in 15 mm long gratings.

CE-8.4 TUE 9:15

Laser-based Fabrication of Micromechanical Diaphragms for Pressure Sensing Using Bragg Gratings
•*A. Jantzen*[1], *P.C. Gow*[1], *S.L. Scholl*[1], *L.J. Boyd*[2], *P.G.R. Smith*[1], *and C. Holmes*[1]; [1]*University of Southampton, Southampton, United Kingdom*; [2]*Parker Hannifin Corporation, Bristol, United Kingdom*
A rapid and low cost laser-based fabrication technique for the patterning of thick silicon-dioxide to mask silicon for subsequent deep etching is demonstrated and a comparison with traditional micromechanical cleanroom fabrication will be made.

CE-8.5 TUE 9:30

Light and slow-neutron diffraction properties of holographic nanodiamond composite gratings
•*Y. Tomita*[1], *A. Kageyama*[1], *Y. Iso*[1], *K. Umemoto*[2], *J. Klepp*[3], *C. Pruner*[4], *and M. Fally*[3]; [1]*Department of Engineering Science, University of Electro-Communications, Tokyo, Japan*; [2]*Central Research Center, Daicel Corp., Hyogo, Japan*; [3]*Faculty of Physics,, University of Vienna, Vienna, Austria*; [4]*Department of Material Science and Physics, University of Salzburg, Salzburg, Austria*
We report on efficient control of light and slow-neutron beams by newly developed holographic nanodiamond composite gratings. Diffraction efficiencies near 100% and 22% at readout wavelengths of 633 and 4.5 nm, respectively, are demonstrated successfully.

ROOM 1 ICM

CJ-8.6 TUE 9:45

Multi-Watt Operation of a Holmium Doped Silica Fibre Laser at 2.2 μm

•*L.G. Holmen[1,2,3], P.C. Shardlow[1], P. Barua[1], J.K. Sahu[1], N. Simakov[4], A. Hemming[4], and W.A. Clarkson[1]; [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2]Norwegian Defence Research Establishment (FFI), Kjeller, Norway; [3]Department of Technology Systems, University of Oslo, Kjeller, Norway; [4]Directed Energy Technologies and Effects, WCSD, Defence Science and Technology, Edinburgh, Australia*

We present a tuneable Holmium-doped fibre laser optimised for efficient long wavelength operation between 2.15-2.2 μm and report for the first time watt-level (4.1 W) output from a silica fibre laser at 2200 nm.

ROOM 4a ICM

EA-3.6 TUE 9:45

Single atomic ion thermometry

•*V. Tugaye, J.-P. Likforman, S. Guibal, and L. Guidoni; Université Paris Diderot, Sorbonne Paris Cité, Paris, France*

We describe and experimentally implement a single trapped-ion local thermometry technique with absolute sensitivity adaptable to all laser-cooled atomic ion species.

ROOM 4b ICM

EI-2.5 TUE 9:45

Gate-tunable exciton and trion dynamics in a MoS2 monolayer

•*P. Altmann[1], Z. Wang[1], M. Paur[2], T. Müller[2], S. Dal Conte[1], and G. Cerullo[1,3]; [1]Politecnico di Milano, Milan, Italy; [2]TU Vienna, Vienna, Austria; [3]IFN-CNR, Milan, Italy*

We report static and dynamic absorption measurements on a gated MoS2 monolayer. A transition from uncharged to charged excitons is observed with increasing electron density. With an optical pump, the charged exciton is always present.

ROOM 13a ICM

CB-4.6 TUE 9:45

Coherent superposition of pulsed high-brightness tapered amplifiers

•*P. Albrodt[1], J. Hamperl[1], M. Niemeyer[2], P. Crump[2], P. Georges[1], and G. Lucas-Leclin[1]; [1]Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Université Paris Saclay, PARIS, France; [2]Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

We demonstrated coherent combining of tapered amplifiers in pulsed regime. We reached 13 W peak power in a nearly diffraction-limited beam with >70% combining efficiency. Additionally, dynamics in the μs and ms-regime are investigated.

ROOM 13b ICM

CA-8.6 TUE 9:45

Towards a kW-class picosecond laser at 1 kHz

•*S. Petit, C. Feral, M.-C. Nadeau, P. Balcou, J. Brandam, D. Descamps, J. Lhermite, and D. Marion; Université de Bordeaux-CNRS-CEA, CELIA, Talence, France*

We report on the different state-of-the-art laser technologies such as divided pulse amplification, thin disk and liquid-cooled disks and original new designs explored in HORIZON to reach with Yb:YAG the new frontier 1J-1ps-1kHz.

ROOM 1 ICM

10:30 – 12:30

PL-4: 2019 EQEC Plenary Talk and Award Ceremony

Chair: Stephan Götzinger, Max Planck Institute for the Science of Light, Erlangen, Germany

This session will feature a plenary talk presented together with a series of prize and award ceremonies. **Consult the separate brochure on these prizes and awards.**

PL-4.1 TUE (Plenary)

Photonic Entanglement: from Foundations to Applications

•*A. Zeilinger; Vienna Center for Quantum Science and Technology University of Vienna, Vienna, Austria; Institute for Quantum Optics and Quantum Information, Vienna, Austria*

Entangled photons have become an essential workhorse for experiments on the foundations of quantum mechanics. Tests of Bell's Inequality (cf. the Einstein-Podolsky-Rosen Paradox) have with increasing sophistication ruled out more and more alternative views to quantum mechanics.

Prize and Award Ceremonies

(2) EPS Quantum Electronics Prizes

The 2019 prize for fundamental aspects of Quantum Electronics and Optics is awarded to **Anne L'Huillier**, *Lund University, Sweden*. The prize is awarded to Anne L'Huillier in recognition of her **pioneering experimental and theoretical contributions to attosecond pulse trains using high harmonics, which form the basis of today's successful field of attosecond science**.

The 2019 prize for applied aspects of Quantum Electronics and Optics is awarded to **Govind P. Agrawal**, *University of Rochester, USA*. The prize is awarded to Govind P. Agrawal for **pioneering and groundbreaking research that underpins a wide range of current photonic technologies in the fields of semiconductor lasers, nonlinear fiber optics and optical communication systems**.

(2) EPS Fresnel Prizes

The 2019 Fresnel prize for fundamental aspects is awarded to **Carlos Hernández-García**, *University of Salamanca, Spain*. The prize is awarded to Carlos Hernández-García for **pioneering contributions to the theory of high harmonic generation, uncovering new regimes of attosecond and zeptosecond waveforms and designer beams with orbital and spin angular momentum**.

The 2019 Fresnel prize for applied aspects is awarded to **Matteo Lucchini**, *Politecnico di Milano, Italy*. The prize is awarded to Matteo Lucchini for **outstanding contributions in the field of attosecond science. In particular for seminal contribution in the investigation of attosecond electron dynamics in solid state materials**.

(4) EPS-QEOD Thesis Prizes

The 2019 Thesis prize for fundamental aspects is awarded to **Ileana-Cristina Benea-Chelmus**, *Harvard University, Cambridge, USA*, for **Terahertz quantum optics with ultra-short pulses**.

The 2019 Thesis prize for fundamental aspects is awarded to **Fabian Langer**, *Lund University, Sweden*, for **Lightwave-driven quasiparticle acceleration**.

The 2019 Thesis prize for applied aspects is awarded to **Armin Feist**, *University of Göttingen, Germany*, for **next-generation ultrafast transmission electron microscopy – Development and applications**.

The 2019 Thesis prize for applied aspects is awarded to **Mathieu Massicote**, *University of Sherbrooke, Canada*, for **ultrafast optoelectronics in 2D materials and their heterostructures**.

2019 EPS-QEOD & EPS Young Minds Travel Grant Student Awards

The Quantum Electronics and Optics Division and Young Minds Committee of the European Physical Society offered ten travel student grants to PhD students wishing to attend CLEO®/Europe-EQEC 2019. The selection committee is happy to announce the names of the ten laureates and the title of their contribution to the conference:

Emil Vosmar Denning, *DTU Fotonik, Technical University of Denmark, Lyngby, Denmark*, **A nuclear quantum memory enabled by strain** (Wednesday, EA/EB-2.1, 16:00-16:15, room 14b ICM)

Vinícius C. Ferreira, *Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*, **Thermal analysis of new ionic liquids by EZ-scan technique** (Sunday, CE-P.33, 13:00-14:00, Hall B0)

Xin Jin, *Institut National de la Recherche Scientifique – Energie, Matériaux et Télécommunications (INRS-EMT), Varennes, Canada*, **Modifying the optical phonon response of nanocrystals inside Terahertz plasmonic nanocavities** (Thursday, EG-6.3, 16:30-16:45, room 14a ICM)

Aleksandrs Leitis, *Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*, **All-dielectric High-Q metasurfaces for infrared absorption spectroscopy applications** (Sunday, CH-4.2, 18:30-18:45, room 1 Hall A1)

Ziqi Li, *School of Physics, State Key Laboratory of Crystal Materials, Shandong University, Jinan, China*, **Generation of multi-gigahertz laser pulses in optical lattice-like cladding waveguides with PdSe2 as a new saturable absorber** (Sunday, CJ-P.45, 13:00-14:00, Hall B0)

Paulius Mackonis, *Solid State Laser laboratory, Department of Laser Technologies, Center for Physical Sciences and Technology, Vilnius, Lithuania*, **Shaping of picosecond pump pulses by SHG depletion for wide-bandwidth TW-class NOPCPA** (Wednesday, CA-11.4, 16:45-17:00, room 13a ICM)

Ahmed Othman, *Faculty of Engineering, Ain Shams University, Cairo, Egypt*, **Combining MEMS FTIR spectrometer and widened-spectrum mode-locked fiber laser for gas-sensing** (Monday, CH-P.12, 13:15-14:15, Hall B0)

Dmitrii Pushkarev, *Lomonosov Moscow State University, Moscow, Russia*, **Superfilament spatial dynamics and energy deposition under various focusing conditions** (Tuesday, EE-4.5, 15:00-15:15, room 4b ICM)

ROOM 14a ICM

CK-7.5 TUE 9:45

Three-dimensional Vectorial Holography

•*H. Ren*; *Chair in Hybrid Nanosystems, Nanoinstitute Munich, Faculty of Physics, Ludwig Maximilian University of Munich, Munich, Germany*

Three-dimensional vectorial holography for the reconstruction of an arbitrary 3D vectorial holographic image with an ultrawide viewing angle, which is achieved from machine-learning inverse design based on multilayer-perception artificial neural networks.

ROOM Osterseen ICM

CL-4.6 TUE 9:45

Writing in Photorefractive crystals by bio-lenses

•*L. Miccio*[1], *J. Behal*[2], *M. Mugnano*[1], *S. Grilli*[1], *F. Merola*[1], *B. Mandracchia*[1], *P. Memmolo*[1], *and P. Ferraro*[1]; [1]*Institute of Applied Sciences and Intelligent Systems ISASI-CNR, Pozzuoli, Italy*; [2]*Department of Optics, Palacký University, Olomouc, Czech Republic*

Optical bio-lenses are exploited for lithographic printing into photorefractive material. Wavefront shaping thorough Red Blood Cells is investigated to locally change the refractive index in Lithium Niobate crystals.

ROOM 1 Hall A1

CH-8.6 TUE 9:45

Toward strong coupling between free electrons and confined optical modes

•*V. Di Giulio*[1], *V. Mkhitaryan*[1], *and F.J. García de Abajo*[1,2]; [1]*ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain*; [2]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We study fundamental aspects of the interaction of fast electrons with optical modes and unveil a universal scaling in the interaction strength, depending on electron energy, spatial extension of the optical mode, and optical frequency.

ROOM 2 Hall A1

CF-8.6 TUE 9:45

20-W ultraviolet femtosecond GHz burst laser

•*G. Bonamis*[1,2], *J. Sanabria*[1], *E. Audouard*[1], *E. Mottay*[1], *C. Hönninger*[1], *J. Lopez*[2], *and I. Manek-Hönninger*[2]; [1]*Amplitude Systèmes, Pessac, France*; [2]*CELIA, Université de Bordeaux, Talence, France*

We present a 20-W GHz-burst femtosecond laser at 343nm wavelength. The unprecedented performance in femtosecond UV has been obtained by third harmonic generation of a 100-W, 2-mJ GHz femtosecond laser at 1030nm.

ROOM 3 Hall A1

CE-8.6 TUE 9:45

Numerical and Experimental Study on the IR Femtosecond Laser and Phase Mask-Based Grating Inscription in Photonic Crystal Fibers

•*T. Baghdasaryan*[1], *T. Geernaert*[1], *A. Morana*[2], *E. Marin*[2], *S. Girard*[2], *M. Makara*[3], *P. Mergo*[3], *H. Thienpont*[1], *and F. Berghmans*[1]; [1]*Vrije Universiteit Brussel (VUB), Brussels, Belgium*; [2] *Université Jean Monnet, Saint-Etienne, France*; [3]*Maria Curie-Skłodowska University, Lublin, Poland*

Phase mask-based infrared femtosecond pulsed laser fiber Bragg grating inscription in photonic crystal fibers with a short focal length cylindrical lens with dedicated focusing conditions leads to 4dB strong gratings in 4 seconds

ROOM 1 ICM

Jérémy Raskop, *Laboratoire Kastler Brossel (LKB), Paris, France*, **Single collective excitation of atoms evanescently coupled to a nanoscale waveguide** (Monday, EA-2.3, 16:45-17:00, room 4a ICM)

Varun Sharma, *Physical Research Laboratory, Ahmedabad; Indian Institute of Technology-Gandhinagar, Ahmedabad, India*, **Optical vortex generation from an anti-resonant-ring picosecond optical parametric oscillator**, (Wednesday, CD-8.5, 17:15-17:30, room 13b ICM)

OSA Awards and Honours

The Optical Society (OSA) will recognize newly elected Fellow Members, present the 2019 Herbert Walther Award and the 2019 Emmett N. Leith Medal during the Awards Ceremony.

OSA fellow members:

Saša Bajt, *DESY, Germany*
Daniele Faccio, *University of Glasgow, United Kingdom*
Lukas Gallmann, *ETH Zurich, Switzerland*
Mircea Guina, *Tampere University, Finland*
Rupert Huber, *University of Regensburg, Germany*
Animesh Jha, *University of Leeds, United Kingdom*
Zhongping Lee, *University of Massachusetts Boston, United States*
Uli Lemmer, *Karlsruhe Institute of Technology, Germany*
Ion N. Mihailescu, *National Institute for Laser, Plasma, and Radiation Physics, Romania*
Roberto Osellame, *CNR– Istituto di Fotonica e Nanotecnologie, Italy*
Ekmel Ozbay, *Bilkent Universitesi, Turkey*
Francesco Saverio Pavone, *University of Florence, Italy*
Concita Sibilia, *Università degli Studi di Roma La Sapienza, Italy*
Christine Silberhorn, *Universität Paderborn, Germany*
Adrian Stern, *Ben Gurion University of the Negev, Israel*
Yan Zhang, *Capital Normal University, China*

Herbert Walther Award

The award commemorates Max Planck Institute of Quantum Physics Professor Herbert Walther's groundbreaking innovations in quantum optics and atomic physics as well as other wide-ranging contributions to the scientific community. The Herbert Walther Award, administered jointly by OSA and DPG, recognizes distinguished contributions in quantum optics and atomic physics as well as leadership in the international scientific community.

The Optical Society (OSA) and the Deutsche Physikalische Gesellschaft (DPG) have named Sir Professor **Peter Knight**, *Kavli Royal Society International Centre, United Kingdom*, the 2019 recipient of the Herbert Walther Award. Knight is recognized **for remarkable and varied contributions to quantum optics and quantum information science, ranging from foundations to applications**.

2019 Emmett N. Leith Medal

The Medal, established in 2006 in honour of Emmett N. Leith, a world-renowned scientist in holography and optical information processing, recognizes seminal contributions to the field of optical information processing, including sensing and analog signal processing as well as computing (classical and quantum) and optical storage.

The Optical Society (OSA) will present the 2019 Emmett N. Leith Medal to **Wolfgang Osten**, *Universität Stuttgart, Germany*, **for extending the limits of optical metrology by integrating digital image processing with modern optical measurement techniques**.

2019 Advocate of Optics

The Advocate of Optics is an annual recognition by the Public Policy Council of The Optical Society. Each year, the council evaluates and selects an outstanding public official from any country who demonstrates leadership and support for the advancement of optics and photonics. The recipient is evaluated on criteria such as his/her enthusiasm for science and science policy, level of familiarity with optics and photonics, level of interaction with OSA and our members in the past year, and record of consistent support of science, optics and photonics.

The Optical Society (OSA) will recognize **Aram V. Papoyan**, Director of the *Institute for Physical Research of the National Academy of Sciences of Armenia* as the 2019 Advocate of Optics for his **leadership in the integration of the Institute for Physical Research into the European Research Area**.

C17 Awards

IUPAP Young Scientist Prizes (YSP) will be remitted during the CLEO®/Europe-EQEC 2019 Award Ceremony to take place on Tuesday morning 25 June 2019.

Commission 17 (C17) on "Laser Physics and Photonics" of the International Union of Pure and Applied Physics (IUPAP) chaired by Tsuneyuki Ozaki, INRS-EMT, Montreal, Canada, is happy to announce the remittance of its 2019 prizes. C17 commission awards these prizes every two years to excellent young researchers in laser physics and photonics in recognition of their outstanding contribution.

C17 is pleased to announce the award of IUPAP Young Scientist Prizes in Laser Physics and Photonics to **Sergey Kruk**, **Alireza Marandi** and **Jinyang Liang**, in recognition of their **outstanding contribution to the areas of physics within the remit of the Commission**. Further information available at http://iupap.org/commissions/c17-laser-physics-and-photonics/c17-news/

Consult the separate brochure on these Prizes and Awards.

ROOM 1 ICM

14:00 – 15:30

EA-4: Quantum control

Chair: Markus Hennrich, Stockholm University, Stockholm, Sweden

EA-4.1 TUE (Invited) 14:00

The Journey From Manipulating Single Quantum Systems to Quantum Information Processing

•*P. Knight*; *Imperial College , London, United Kingdom*

Great progress has been made in characterizing nonclassical single quantum states, but detecting a single photon without absorbing it remains a challenge. We present a cavity- free scheme for nondestructive single-photon detection.

ROOM 4a ICM

14:00 – 15:30

CI-5: Phase and spectrum manipulation for photonic devices

Chair: Alessandro Tonello, Université de Limoges, Limoges, France

CI-5.1 TUE 14:00

Electro-optic Frequency Comb Generation in Lithium Niobate Whispering Gallery Mode Resonators

A. Rueda[1,2], *F. Sedlmeir*[3,4], *G. Leuchs*[3,4,5], •*M. Kumari*[1,6], *and H.G.L. Schwefel*[1,6]; [1]*Department of Physics, University of Otago, Dunedin, New Zealand*; [2]*Institute of Science and Technology Austria, Klosterneuberg, Austria*; [3]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [4]*Institute for Optics, Information and Photonics, University Erlangen-Nuernberg, Erlangen, Germany*; [5]*Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia*; [6]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand*

We demonstrate electro-optic frequency comb generation in a whispering gallery mode disk resonator made of lithium niobate. The comb has more than 180 lines with a spacing of 8.9 GHz centred at 193.5 THz.

CI-5.2 TUE 14:15

Widely tunable regenerative Talbot laser

•*V. Billault*[1,2], *V. Crozatier*[1], *M. Schwarz*[1], *G. Feugnet*[1], *G. Baili*[1], *P. Nouchi*[1], *D. Dolfi*[1], *and H. Guillet de Chatellus*[2]; [1]*Thales Research and Technology, Palaiseau, France*; [2]*Université Grenoble Alpes, CNRS, LIPhy, Grenoble, France*

A novel architecture of high purity oscillator based on the Talbot effect is proposed and demonstrated. This simple set-up produces high repetition rate pulse trains (>GHz) with mW power, low phase noise and broadband tunability.

ROOM 4b ICM

14:00 – 15:30

EE-4: Interaction between ultrafast sources and matter

Chair: Janos Hebling, University of Pécs, Pécs, Hungary

EE-4.1 TUE 14:00

Detecting and quantifying pulse train instabilities with d-scan

•*E. Escoto*[1], *D. Gerth*[2], *B. Hofmann*[2], *and G. Steinmeyer*[1,3]; [1]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Max-Born-Str 2A, 12489, Berlin, Germany*; [2]*Chemnitz University of Technology, Faculty of Mathematics, 09107, Chemnitz, Germany*; [3]*Physics Department, Humboldt University, Newtonstraße 15, 12489, Berlin, Germany*

We present different ways on how dispersion scan can be used not only for ultrashort optical pulse shape measurement but also to safely detect pulse train instabilities and even quantify the degree of instability present.

EE-4.2 TUE 14:15

Exciton relaxation pathways in CdSe nanorods revealed by two-dimensional electronic spectroscopy

•*F.V.A. Camargo*[1], *T. Nagahara*[1,2], *Y. Ben-Shahar*[3], *M. Russo*[1], *U. Banin*[3], *and G. Cerullo*[1]; [1]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Kyoto Institute of Technology, Department of Chemistry and Materials Technology, Kyoto, Japan*; [3]*The Hebrew University of Jerusalem, Jerusalem, Israel*

We study the exciton relaxation pathways in CdSe nanorods with two-dimensional electronic spectroscopy. Global analysis reveals a two-stage process, with the high energy excitons relaxing through the intermediate ones before reaching the low-energy bandgap states.

ROOM 13a ICM

14:00 – 15:30

CB-5: High-power semiconductor lasers

Chair: Michel Krakowski, III-V Lab, Palaiseau, France

CB-5.1 TUE 14:00

High Peak Power Laser Diodes for Eye Safe LIDAR with Integrated Wavelength Locking Element

•*J. Viheriälä*[1], *A.T. Aho*[2], *H. Virtanen*[2], *J. Reuna*[2], *J. Lyytikäinen*[2], *and M. Guina*[2]; [1]*Faculty of Science and Engineering, Tampere University, Tampere, Finland*; [2]*Optoelectronics Research Center, Physics Unit, Tampere University, Tampere, Finland*

We present high power wavelength stabilized laser diodes operating at 1.5 μm eye-safe wavelength band. Demonstrated wavelength stabilization enable efficient filtering of ambient light from LIDAR signal without reducing other performance merits of the laser.

CB-5.2 TUE 14:15

Wavelength stabilized 905 nm diode lasers in the 100 W class for automotive LiDAR

•*A. Knigge, A. Klehr, A. Liero, J. Fricke, A. Maaßdorf, A. Zeghuzi, H. Wenzel, and G. Traenkle*; *Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik, Berlin, Germany*

The development of diode lasers with internal Bragg gratings for a low wavelength shift with temperature used for automotive LiDAR systems will be reported. The nanosecond pulses have peak powers >30W (single-emitter) or >200W (8-emitter-chip).

ROOM 13b ICM

14:00 – 15:30

CD-5: Nonlinear nano materials

Chair: Roberto Li Voti, Sapienza Università di Roma, Rome, Italy

CD-5.1 TUE (Invited) 14:00

Nonlinear Optics with Nanomaterials

•*Z. Sun*; *Aalto University, Espoo, Finland*

I will present our recent nonlinear optical experiments (e.g., quantum emitters, wavelength converters, ultrafast lasers) with one-dimensional (e.g., carbon nanotubes, nanowires), two-dimensional (e.g., graphene, MoS2,phosphorene) nanomaterials and their hybrid structures (e.g.,heterostructures, plasmonic structures, silicon/fibre integrated structures).

ROOM 14a ICM

14:00 – 15:30

EF-1: Nonlinear nano-optics and plasmonics

Chair: Alex Solntsev, University of Technology, Sydney, Australia

EF-1.1 TUE 14:00

Highly polarized optical harmonic generation into zero-order diffraction from gradient semiconductor metasurfaces

•*G. Marino*[1], *C. Gigli* [1], *D. Rocco* [2], *I. Favero*[1], *A. Lemaître* [3], *C. De Angelis* [2], *and G. Leo*[1]; [1]*Matériaux et Phénomènes Quantiques, Université Paris Diderot & CNRS, Paris , France*; [2]*Dept. of Information Engineering, Università degli Studi di Brescia & INO-CNR, Brescia, Italy*; [3]*Centre de Nanosciences et de Nanotechnologies, CNRS - Université Paris-Saclay, Palaiseau, France*

We demonstrate highly linear polarized zero-order second harmonic generation and diffraction from AlGaAs polarization-gradient metasurfaces. SH radiation diagram and polarizations are engineered in terms of perturbation of Mie resonances via Bragg diffraction.

EF-1.2 TUE 14:15

Second-Harmonic Generation in Lithium Niobate Metasurfaces

•*A. Fedotova*[1], *M. Younesi*[1], *J. Sautter*[1], *R. Geiss*[1], *T. Pertsch*[1,2], *I. Staude*[1], *and F. Setzpfandt*[1]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Here we show, that metasurfaces consisting from lithium niobate nanoresonators exhibit electric and magnetic dipole resonances. We experimentally realize a lithium niobate metasurface and demonstrate second-harmonic generation as well as nonlinear diffraction.

ROOM 14b ICM

14:00 – 15:30

CK-8: Novel nano and micro fabrication techniques

Chair: Béatrice Dagens, C2N-CNRS, Orsay, France

CK-8.1 TUE 14:00

Elastic Interconnection of Optical Fibers Using Self-Written Waveguides

•*G. Violakis*[1], *A. Bogris*[1,2], *S. Pispas*[3], *B. Loppinet*[1], *and S. Pissadakis*[1]; [1]*Foundation for Research and Technology Hellas (FORTH), Institute of Electronic Structure and Laser (IESL), N. Plastira 100, 70013, Heraklion, Greece*; [2]*Department of Materials Science and Technology, University of Crete, 70013 Heraklion, Crete, Greece*; [3]*N.H.R.F, Theoretical and Physical Chemistry Institute, 11635 Athens, Greece*

A self-written waveguide has been produced using polyisoprene solutions to elastically connect two single mode optical fibers. After the waveguide formation, the baseline signal increase between the two fibers was of the order of 3.4dB.

CK-8.2 TUE 14:15

Towards femtosecond laser writting of non-conventional waveguide Bragg gratings in silver-containing glasses

•*R. Laberdesque*[1], *Y. Petit*[1,2], *H. Fares*[2], *A. Abou-Khalil*[1], *S. Danto*[2], *I. Manek-Honninger*[1], *T. Cardinal*[2], *and L. Canioni*[1]; [1]*University of Bordeaux, CNRS, CEA, CELIA, UMR 5107, Talence, France*; [2]*University of Bordeaux, CNRS, ICMCB, UPR 9048, Pessac, France*

New type of Direct Laser Writing allows to form silver clusters (inner features around 100 nm) embedded in glass matrix. Challenging waveguide Bragg gratings have been fabricated for the visible range: demonstration is under study.

ROOM Osterseen ICM

14:00 – 15:30

CL-5: Label-free imaging and sensing

Chair: Robert Huber, Universität of Lübeck, Lübeck, Germany

CL-5.1 TUE (Invited) 14:00

Label-free phytoplankton analysis by high-throughput quantitative phase imaging cytometry and machine learning

•*Q.T.K. Lai, K.C.M. Lee, K.K.Y. Wong, and K.K. Tsia*; *The University of Hong Kong, Hong Kong, China*

We report a new type of high-throughput (>10,000 cells/sec) quantitative phase imaging cytometry for high-dimensional label-free (>100 features) phytoplankton analysis assisted by machine learning, showing promises in large-scale taxonomic analysis and lipid-content screening of phytoplankton.

ROOM 1 Hall A1

14:00 – 15:30

ED-1: Frequency metrology and transfer

Chair: Thomas Udem, Max-Planck Institute of Quantum Optics, Garching, Germany

ED-1.1 TUE (Keynote) 14:00

Magic conditions for optical lattice clocks to operate at 10^{-19} uncertainty

•*H. Katori*; *The University of Tokyo, Tokyo, Japan*

We report recent progress of optical lattice clocks in our group, which includes investigation of operational magic intensity for strontium atoms, transportable clocks, and determination of the magic wavelength for cadmium.

ROOM 2 Hall A1

14:00 – 15:30

CG-1: Strong-field and high-power sources and interactions

Chair: Andrius Baltuska, Technical University of Vienna, Vienna, Austria

CG-1.1 TUE 14:00

DeLLight: Deflection of light by light in vacuum

•*S.J. Robertson*[1], *X. Sarazin*[2], *and F. Couchot*[2]; [1]*Laboratoire de Physique Théorique (UMR 8627), CNRS, Univ. Paris-Sud, Université Paris-Saclay, Orsay, France*; [2]*Laboratoire de l'Accélérateur Linéaire (UMR 8607), IN2P3/CNRS, Univ. Paris-Sud, Université Paris-Saclay, Orsay, France*

Using an effective medium description of strong laser pulses in vacuum, we propose an experiment to detect the deflection of a probe wave by the induced refractive index change, and numerically investigate its expected results.

CG-1.2 TUE 14:15

Amplification of Intense Light Fields by Nearly Free Electrons

M. Matthews[1], *F. Morales*[2], *A. Patas*[3], *A. Lindinger*[3], *J. Gateau*[1], *N. Berti*[1], *S. Hermelin*[1], *J. Kasparian*[1], •*M. Richter*[2,4], *T. Bredtmann*[2], *O. Smirnova*[2], *J.-P. Wolf*[1], *and M. Ivanov*[2,5]; [1]*GAP, University of Geneva, Geneva, Switzerland*; [2]*Max-Born-Institut, Berlin, Germany*; [3]*Inst. für Exp. Physik, Freie Universität Berlin, Berlin, Germany*; [4]*Departamento de Química, Módulo 13, Universidad Autónoma de Madrid, Madrid, Spain*; [5]*Blackett Laboratory, Imperial College London, London, United Kingdom*

We present new opportunities for enhancing and controlling lasing inside laser filaments. The novel, general mechanism relies on laser-dressed states in neutral atoms and uses shaped laser pulses to control their population and seed gain.

ROOM 3 Hall A1

14:00 – 15:30

CC-1: THz time-domain spectroscopy

Chair: Giacomo Scalari, ETH Zurich, Zurich, Switzerland

CC-1.1 TUE 14:00

Ge-based photoconductive emitters producing gapless broadband THz spectra

A. Singh, A. Pashkin, •*S. Winnerl, M. Helm, and H. Schneider*; *Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany*

We present photoconductive emitters based on Ge featuring gapless broadband spectra up to 13 THz. Thus they can fill the gap in the 5 – 10 THz range and can be excited with fiber lasers.

CC-1.2 TUE 14:15

Multi-pixel interdigitated photoconductive devices for terahertz polarization control and imaging

•*C. Mosley, M. Staniforth, A. Hernandez Serrano, E. Pickwell MacPherson, and J. Lloyd-Hughes*; *University of Warwick, Coventry, United Kingdom*

Interdigitated photoconductive devices with multiple pixels were used to generate broadband THz radiation at arbitrary polarization angles. This rapid polarization modulation will find application in THz ellipsometry and THz anisotropy spectroscopy.

NOTES

ROOM 1 ICM

EA-4.2 TUE (Invited) 14:30

Shaping of coherent state superpositions via deterministically created Schrödinger-cat states

•*S. Daiss, B. Hacker, S. Welte, A. Shaukat, S. Ritter, L. Li, and G. Rempe*; *Max-Planck-Institut für Quantenoptik, Garching, Germany*

We report the deterministic creation of Schrödinger-cat states where one atom is entangled with a coherent laser field. We use atomic state manipulation and detection to shape a plethora of optical coherent-state superpositions.

ROOM 4a ICM

CI-5.3 TUE 14:30

Versatile Amplitude and Phase Filtering in an Optical Tapped Delay Line Structure

•*J. Hu*[1], *S.J. Fabbri*[1], *C.-B. Huang*[2,3], *and C.-S. Brès*[1]; [1]*Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*National Tsing-Hua University, Hsinchu, Taiwan*; [3]*Academia Sinica, Taipei, Taiwan*

We demonstrate that the optical tapped delay line structure can implement temporal Talbot effect and combined amplitude and phase filtering schemes. The temporal Talbot operation is confirmed by a proof-of-concept experiment using delay line interferometer.

CI-5.4 TUE 14:45

Analysis of external CW optical injection for timing jitter reduction of actively mode-locked lasers

•*V. Billault*[1,2], *V. Crozatier*[1], *G. Baili*[1], *P. Nouchi*[1], *D. Dolfi*[1], *and H. Guillet de Chatellus*[2]; [1]*Thales Research and Technology, Palaiseau, France*; [2]*Université Grenoble Alpes, CNRS, LIPhy, Grenoble, France*

We present a parametric study of actively mode locked lasers while injected by an external laser for timing jitter reduction. We show that the noise reduction is limited by gain saturation and cavity finesse.

ROOM 4b ICM

EE-4.3 TUE 14:30

Conical intersection dynamics of pyrimidine nucleosides tracked with sub-20-fs UV pulses

•*R. Borrego-Varillas*[1], *A. Nenov*[2], *L. Ganzer*[1], *I. Conti*[2], *A. Oriana*[1], *I. Delfino*[3], *C. Manzoni*[1], *M. Garavelli*[2], *and G. Cerullo*[1]; [1]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Dipartimento di Chimica Industriale, Università di Bologna, Bologna, Italy*; [3]*Dipartimento di Scienze Ecologiche e Biologiche, Università della Tuscia, Viterbo, Italy*

By combining transient absorption spectroscopy with sub-20-fs UV pulses and ab initio numerical simulations we identify the ultrafast deactivation mechanism in pyrimidine nucleosides and visualize the passage through conical intersections presiding excited state deactivation.

EE-4.4 TUE 14:45

Effect of point mutations on the ultrafast photo-isomerization of Anabaena Sensory Rhodopsin

D. Agathangelou[1], *Y. Orozco-Gonzalez*[1], *M. del Carmen Marin Perez*[2], *J. Brazard*[1], *H. Kandori*[3], *K. Jung*[4], *J. Léonard*[1], *M. Olivucci*[2], •*S. Haacke*[1], *and N. Ferré*[5]; [1]*University of Strasbourg -CNRS, IPCMS, Strasbourg, France*; [2]*Department of Biotechnology, Chemistry and Pharmacy, University of Siena, Siena, Italy*; [3]*Department of Frontier Materials, Nagoya Institute of Technology, Nagoya, Japan*; [4]*Department of Life Science and Institute of Biological Interfaces, Sogang University, Seoul, South Korea*; [5]*Aix-Marseille Université, CNRS, ICR, , Marseille, France*

We report experimental results on the ultrafast photo-isomerization of the ASRs -PSBR where point mutations lead to an up to 5-fold increase of the photo-isomerization speed, due to electrostatic modifications of the retinal binding pocket.

ROOM 13a ICM

CB-5.3 TUE 14:30

Efficient Narrow Stripe Ridge Waveguide Lasers for Single-Spatial Mode Oeration up to 2.5 W

•*M. Wilkens, G. Erbert, H. Wenzel, A. Maaßdorf, J. Fricke, P. Ressel, A. Knigge, and P. Crump*; *Ferdinand-Braun-Institut Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

We present results of ridge waveguide lasers at 970 nm with optimized vertical and lateral waveguide structures for single-spatial mode operation up to 2.5 W output power with 55% conversion efficiency and low lateral divergence.

CB-5.4 TUE 14:45

Narrower Far Field and Higher Efficiency in 1 kW Diode-Laser Bars Using Improved Lateral Structuring

•*M.M. Karow, D. Martin, P. Della Casa, G. Erbert, and P. Crump*; *Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

930 nm diode-laser bars that emit 1 kW in QCW mode with higher conversion efficiency (65%) and narrower far field (8.8°, 95% power) are demonstrated, based on improved lateral structuring (high fill-factor, deep implantation).

ROOM 13b ICM

CD-5.2 TUE 14:30

Hot electrons modulation of third harmonic generation in graphene

•*G. Soavi*[1], *G. Wang*[2], *H. Rostami*[3], *A. Tomadin*[4], *O. Balci*[2], *I. Paradisanos*[2], *E.A.A. Pogna*[5], *G. Cerullo*[5], *E. Lidorikis*[6], *M. Polini*[7], *and A.C. Ferrari*[2]; [1]*Institut für Festkörperphysik, Friedrich Schiller Universität, Jena, Germany*; [2]*Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom*; [3]*Nordita, KTH Royal Institute of Technology and Stockholm University, Stockholm, Sweden*; [4]*Department of Physics, Lancaster University, Lancaster, United Kingdom*; [5]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [6]*Department of Materials Science and Engineering, University of Ioannina, Ioannina, Greece*; [7]*Istituto Italiano di Tecnologia, Graphene Labs, Genova, Italy*

We perform power-dependent third harmonic generation (THG) measurements on gated single layer graphene (SLG). Hot-electrons modulate significantly the nonlinear optical response of SLG inducing a large deviation from the cubic power-law expected for THG.

CD-5.3 TUE 14:45

Thermally-induced nonlinear spatial shaping of infrared femtosecond pulses in nematic liquid crystals.

•*V.M. di Pietro*[1,2], *A. Jullien*[1], *U. Bortolozzo*[1], *N. Forget*[2], *and S. Residori*[1]; [1]*Inphyni, Valbonne, France*; [2]*Fastlite, Antibes, France*

Optically-induced thermal nonlinear effects in a thin nematic liquid-crystal result from light absorption by the ITO coating of an infrared femtosecond laser. Subsequent spatial shaping characterises the thermal gradient, up to the isotropic phase transition.

ROOM 14a ICM

EF-1.3 TUE (Invited) 14:30

Nonlinear Mie-resonant meta-optics and metasurfaces

•*Y. Kivshar*; *Australian National University, Canberra, Australia*

We review the recent advances in the field of nonlinear meta-optics and metasurfaces based high-index dielectric nanostructures. We discuss the emerged field of nonlinear topological photonics with applications to nonlinear imaging of topological edge states.

ROOM 14b ICM

CK-8.3 TUE 14:30

Integrated waveguides and Bragg gratings UV written with 213nm light

•*P.C. Gow, R.H.S. Bannerman, J.C. Gates, P.L. Mennea, C. Holmes, A. Jantzen, and P.G.R. Smith*; *University of Southampton, Southampton, United Kingdom*

We present the first example of planar devices UV written with 213nm light, achieving an index change sufficient to produce single-mode waveguides and simultaneously defined Bragg gratings without hydrogenation.

CK-8.4 TUE 14:45

Periodic Poling with Short Period for Thin Film Lithium Niobate Waveguides

•*M. Younesi*[1], *P. Kumar*[1], *B.J. Stanicki*[2], *R. Geiss*[1], *W.-K. Chang*[3], *Y.-H. Chen*[4,5], *F. Setzpfandt*[1], *and T. Pertsch*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany*; [2]*Empa, Dübendorf, Switzerland*; [3]*Brain Research Center, National Tsinghua University, Hsinchu, Taiwan*; [4]*Department of Optics and Photonics, National Central University, Jhongli, Taiwan*; [5]*Center for Astronautical Physics and Engineering, National Central University, Jhongli, Taiwan*

We realize short-period quasi-phase-matching structures by electric-field poling of thin-film lithium niobate suitable for fabricating nanowaveguides. Using optimized poling pulses, we reach poling periods down to 1 μm with high quality of the poling pattern.

ROOM Osterseen ICM

CL-5.2 TUE 14:30

The role of autofluorescence in label-free flow cytometry for fast antibiotic susceptibility testing

•*S. Dixneuf*[1], *A.-C. Chareire*[2], *and P. Mahé*[3]; [1]*BIOASTER, Lyon, France*; [2]*bioMérieux, La Balme-les-Grottes, France*; [3]*bioMérieux, Grenoble, France*

Respiration-related autofluorescence is used for determining bacterial susceptibility/resistance to antibiotic treatment in label-free analysis, complementing morphologico-structural parameters classically measured in flow cytometry. Large data are treated and analyzed and appropriate treatment dose identified.

CL-5.3 TUE 14:45

Pockels linear electro-optic microscopy (PLEOM) for cell biology

•*P. Didier*[1], *B. Hajj*[2], *R. Ghasemi*[1], *F. André*[3], *J. Zyss*[1], *I. Ledoux*[1], *and C. Lafargue*[1]; [1]*Quantum and Molecular Photonics Laboratory (LPQM), Ecole Normale Supérieure Paris Saclay, Cachan, France*; [2]*Vectorology and anti-cancerous therapeutics (UMR 8203), Villejuif, France*; [3]*Institute Curie (UMR 168), Paris, France*

Electro-optic microscopy is adapted to image cell membranes with a contrast mechanism linked to the membrane potential. Possible applications in neurophysiology or cell treatments are considered.

ROOM 1 Hall A1

ED-1.2 TUE 14:45

A 1880 km Long Interferometric Optical Fibre Link PTB–MPQ–PTB for Chronometric Levelling with a Transportable Optical Clock

•*A. Kuhl*[1], *G. Vishnyakova*[2,3], *T. Waterholter*[1], *S. Koke*[1], *R. Holzwarth*[1], *and G. Grosche*[1]; [1]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [2]*Max Planck Institute of Quantum Optics, Garching, Germany*; [3]*P. N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia*

For a chronometric levelling experiment, we connected a stationary and a transportable optical Strontium clock via a 2 × 940 km interferometric fibre link between Braunschweig and Garching spanning a geographical distance of 450 km.

ROOM 2 Hall A1

CG-1.3 TUE 14:30

Spectral broadening of a 500W, 5mJ femtosecond laser

•*S. Hädrich*[1], *P. Simon*[2], *T. Nagy*[3], *A. Blumenstein*[2], *R. Klas*[4,5], *J. Buldt*[4], *L.-H. Stark*[4], *S. Breitkopf*[1], *P. Jójárt*[6], *Z. Várallyay*[6], *K. Osvay*[6], *T. Eidam*[1], *and J. Limpert*[1,3,4,5,7]; [1]*Active Fiber Systems GmbH, Jena, Germany*; [2]*Laser-Laboratorium Göttingen e.V, Göttingen, Germany*; [3]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [4]*Institute of Applied Physics, Jena, Germany*; [5]*Helmholtz-Institute Jena, Jena, Germany*; [6]*ELI-ALPS, ELI-HU Non-Profit Ltd., Szeged, Hungary*; [7]*7. Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

In this contribution, we present a significant up-scaling of the average-power of stretched hollow-core-fibers by spectrally broaden 5mJ, 500W, 280fs pulses in a 4m long, 450μm inner-diameter fiber to a bandwidth supporting sub-17fs pulses.

CG-1.4 TUE 14:45

Post-Compression of pulses from an Yb Amplifier to 25fs at 40mJ

•*G. Fan*[1], *P. Carpeggiani*[1], *Z. Tao*[2], *E. Kaksis*[1], *T. Balciunas*[1,3], *G. Coccia*[1,4], *V. Cardin*[5], *F. Légaré*[5], *B.E. Schmidt*[6], *and A. Baltuska*[1]; [1]*Institute of Photonics, TU Wien, Vienna, Austria*; [2]*Department of Physics, Fudan University, Shanghai, China*; [3]*GAP-Biophotonics, Université de Genève, Geneva, Switzerland*; [4]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [5]*Institut National de la Recherche Scientifique, Quebec, Canada*; [6]*Few-Cycle Inc, Quebec, Canada*

The combination of Yb amplifier with a stretched, hollow-core fiber, results in the generation and post-compression of laser pulses to reach 25fs at the energy record of 40mJ, corresponding to a peak power of 1.5 TW.

ROOM 3 Hall A1

CC-1.3 TUE 14:30

DSTMS-Based Ultrabroadband Terahertz Time-Domain Spectroscopy

•*U. Puc*[1], *T. Bach*[1,2], *V. Michel*[1], *C. Medrano*[2], *M. Zgonik*[3], *and M. Jazbinsek*[1]; [1]*Institute of Computational Physics, Zurich University of Applied Sciences (ZHAW), Winterthur, Switzerland*; [2]*Rainbow Photonics AG, Zurich, Switzerland*; [3]*Faculty of Mathematics and Physics, University of Ljubljana, Ljubljana, Slovenia*

We demonstrate a compact THz time-domain system based on DSTMS organic crystals as both THz-wave generator and detector. The system achieves frequencies up to 20 THz and signal-to-noise ratio above 60 dB.

CC-1.4 TUE 14:45

Enhancing THz emission using a shallow-bounce configuration

R. Li, Y. Zheng, D. Spence, H. Pask, and •A. Lee; *Macquarie University, North Ryde, Australia*

We demonstrate enhanced THz emission and extended frequency tuning range from a frequency-tunable THz polariton laser based on stimulated polariton scattering, which uses a shallow-bounce configuration, in comparison to conventional linear and surface-emitting configurations.

NOTES

ROOM 1 ICM

EA-4.3 TUE 15:00

Upper Bound on the Duration of Quantum Jumps

M. Seidler[1], R. Gutiérrez-Jáuregui[1], A. Cerè[2], R. Jáuregui[3], and •C. Kurtsiefer[1,4]; [1]Centre for Quantum Technologies, National University of Singapore, Singapore, Singapore; [2]Institute for Quantum Science and Engineering, Texas A&M University, College Station, USA; [3] Instituto de Física, Universidad Nacional Autónoma de México, México, Mexico; [4]Department of Physics, National University of Singapore, Singapore, Singapore

We estimate the time scale of quantum jumps from the time correlation of photon pairs generated from a cascade decay in a cold cloud of 87Rb. We find an upper bound of 21 ± 11 ps.

EA-4.4 TUE 15:15

Atomic qubits protected from decoherence by strong coupling to a fiber-based optical cavity

M. Baghdad, P.-A. Bourdel, F. Ferri, A. La Rooij, •S. Schwartz, J. Reichel, and R. Long; Laboratoire Kastler-Brossel, Paris, France

We report the first observation of narrow transmission peaks in a Fabry-Perot cavity strongly coupled to atomic qubits in spite of a much larger distribution of the qubit parameters, with possible applications to quantum memories.

ROOM 4a ICM

CI-5.5 TUE 15:00

Polarization Dependance Engineering of Chalcogenide Optical Fiber Couplers

•M. Rezaei and M. Rochette; McGill University, Montreal, Canada

We experimentally investigate the polarization properties of chalcogenide single-mode optical fiber couplers. The polarization dependence is adjustable from zero to high with a proper engineering of the fused coupler geometry.

CI-5.6 TUE 15:15

Investigation of grating assisted mode-selective few-mode fused fiber couplers

•K. Bremer[1], S. Schlangen[1], S. Böhm[2], F. Wellmann[2], M. Steinke[2], J. Neumann[2], B. Roth[1,3], and L. Overmeyer[1,2,3]; [1]Hannover Centre for Optical Technologies, Hannover, Germany; [2]Laser Zentrum Hannover e.V, Hannover, Germany; [3]Cluster of Excellence PhoenixD, Hannover, Germany

We will present our latest work towards the development of grating assisted mode-selective fused fiber couplers that can be applied for mode division multiplexing in few-mode fiber optic communication links.

ROOM 4b ICM

EE-4.5 TUE 15:00

Superfilament spatial dynamics and energy deposition under various focusing conditions

•D. Pushkarev[1], E. Mitina[1], D. Uryupina[1], N. Zhidovtsev[1], G. Gospodinov[1], R. Volkov[1,2], O. Kosareva[1,2], and A. Savel'ev[1,2]; [1]Physics Department, Lomonosov Moscow State University, Moscow, Russia; [2]International Laser Center of Lomonosov Moscow State University, Moscow, Russia

We conducted a comprehensive study of superfilament evolution using a wide range of techniques, tracing all stages of superfilament evolution. We showed the large increase in energy deposition within superfilaments and revealed optimal additional focusing conditions for effective superfilament formation.

EE-4.6 TUE 15:15

Wavelength scaling of THz emissions by two-color filaments in air

•L. Bergé[1], A. Nguyen[1], K. Kaltenecker[2], J.-C. Delagnes[3], B. Zhou[2], E. Cormier[3], N. Fedorov[3], R. Bouillaud[3], D. Descamps[3], I. Thiele[4], S. Skupin[5], and P.U. Jepsen[2]; [1]CEA-DAM, DIF,, Arpajon, France; [2]DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Lyngby, Denmark; [3]Univ. Bordeaux - CNRS - CEA, Centre Lasers Intenses et Applications, Talence, France; [4]Department of Physics, Chalmers University of Technology, Göteborg, Sweden; [5]Institut Lumière Matière, Université Lyon 1 - CNRS, Villeurbanne, France

We report impressive growths in the terahertz energies supplied by air plasmas created by two-color laser pulses whose fundamental wavelength is increased. Comprehensive 3D simulations reveal the crucial role of the two-color relative phase.

ROOM 13a ICM

CB-5.5 TUE 15:00

Efficient, High Power Pumps for Mid-IR Solid State Lasers Enabled by 200 K Operation of 808 nm Diode Lasers

•P. Crump, C. Frevert, A. Maaßdorf, S. Knigge, G. Erbert, and G. Tränkle; Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

TM-polarized 808nm diode lasers cooled to 200K operate at 780nm, with 64% efficiency at 14W output power. They are promising pumps for high power Tm:YAG lasers with performance much improved over conventional 298K sources.

CB-5.6 TUE 15:15

Optimization of 808 nm DBR RW Laser Bars for Operation at Low Noise and High Reliability

•K. Häusler, H. Wenzel, J. Fricke, S. Kreutzmann, and A. Knigge; Ferdinand-Braun-Institut f. Höchstfrequenztechnik, Gustav-Kirchhoff-Str. 4, 12489 Berlin, Germany

DBR lasers to pump Nd:YAG-lasers for communications between space satellites were optimized for reliable continuous operation and low noise. Stable operation with relative intensity noise smaller than 0.5% at 45°C is predicted for 15 years.

ROOM 13b ICM

CD-5.4 TUE (Invited) 15:00

Optically engineered nonlinear photonic structures in ferroelectrics

•K. Switkowski[1], S. Liu[2], W. Krolikowski[2,3], and Y. Sheng[3]; [1]Warsaw University of Technology, Warsaw, Poland; [2]Australian National University, Canberra, Australia; [3]Texas A&M University at Qatar, Doha, Qatar

We introduce a novel all-optical technique to engineer quadratic nonlinearity in ferroelectric crystals. We demonstrate its application for fabrication of 2- and 3-dimensional nonlinear photonic crystals and wave-front shaping in frequency conversion process.

ROOM 14a ICM

EF-1.4 TUE 15:00

Engineering the enhancement of nonlinear optical properties of 2D structures

•Á. Rodríguez Echarri[1], J. D. Cox[1], R. Yu[1], and F.J. García de Abajo[1,2]; [1]ICFO – Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain; [2]ICREA – Institució Catalana de Recerca i Estudis Avançats, Passeig Lluís Companys 23, 08010 Barcelona (Spain), Barcelona, Spain

We introduce a material-independent scheme for quantifying the enhancement of the nonlinear response in 2D strcutures assisted by proximal metallic or dielectric nanoresonators.

EF-1.5 TUE 15:15

Efficient nonlinear metasurfaces using multiresonant high-*Q* plasmonic arrays

•M.J. Huttunen[1], O. Reshef[2], T. Stolt[1], K. Dolgaleva[2,3], R.W. Boyd[2,3,4], and M. Kauranen[2,3,4]; [1]Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland; [2]Department of Physics, University of Ottawa, Ottawa, Ottawa, Canada; [3]School of Electrical Engineering and Computer Science, University of Ottawa, Ottawa, Canada; [4]The Institute of Optics and Department of Physics and Astronomy, University of Rochester, Rochester, USA

We numerically investigate second-harmonic generation (SHG) from plasmonic metasurfaces simultaneously supporting two high-quality-factor surface lattice resonances. We estimate that an over million-fold enhancement of the emitted SHG intensity is possible with doubly-resonant conditions.

ROOM 14b ICM

CK-8.5 TUE 15:00

Bloch-surface-waves controlling devices fabricated by two-photon polymerization

•*K. Safronov, D. Gulkin, I. Antropov, K. Abrashitova, V. Bessonov, and A. Fedyanin*; *Quantum electronic department and Quantum technology center, Faculty of Physics, Lomonosov Moscow State University, Moscow, Russia*

We demonstrate photonic 2D and 3D devices for controlling of Bloch surface waves in 1D photonic crystals. Waveguides for studying multimode interference, Mach-Zender interferometers and microprisms implementing Otto configuration are fabricated by two-photon polymerization.

CK-8.6 TUE 15:15

Silicon Microcavity in the Visible Range Enabled by Curved Slotted Micromirrors

M.S. Abdallah[1], •*H. Omran*[1], *Y. Sabry*[2,3], *F. Marty*[4], *and T. Bourouina*[4]; [1]*German University in Cairo, New Cairo, Egypt*; [2]*Ain Shams University, Cairo, Egypt*; [3]*Si-Ware Systems, Cairo, Egypt*; [4]*Université Paris-Est, ESIEE Paris, Marne-la-Vallée, France*

In this paper, we report silicon microcavity in the visible range enabled by curved slotted micromirrors. The cavity is fabricated using deep reactive ion etching on a silicon wafer with input and output fiber grooves.

ROOM Osterseen ICM

CL-5.4 TUE 15:00

Two-Color Suppression of Stimulated Raman Scattering

•*T. Würthwein*[1], *N. Irwin*[1], *and C. Fallnich*[1,2,3]; [1]*Institute of Applied Physics, University of Muenster, Muenster, Germany*; [2]*MESA+ Institute of Nanotechnology, University of Twente, Enschede, Netherlands*; [3]*Cells-in-Motion Cluster of Excellence (EXC 1003 CiM), Münster, Germany*

We present a technique for the suppression of stimulated Raman scattering using probe depletion in a two-color three-beam setup toward label-free sub-diffraction limited imaging. A Raman suppression up to 79% could be shown.

CL-5.5 TUE 15:15

Label-free multiphoton microscopy in human tissue enabled by an Er:fiber-laser based tunable source

•*H.-Y. Chung*[1], *R. Greinert*[2], *M. Glatzel*[3], *F.X. Kärtner*[1,4,5], *and G. Chang*[6]; [1]*Physics Department, Universität Hamburg, Hamburg, Germany*; [2]*Skin Cancer Center Buxtehude, Buxtehude, Germany*; [3]*Institute of Neuropathology, University Medical Center Hamburg-Ependorf, Hamburg, Germany*; [4]*Center for Free-Electron Laser Science, DESY, Hamburg, Germany*; [5]*The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany*; [6]*Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing, China*

We demonstrate label-free multiphoton microscopy in human brain and skin tissues. Tunable femtosecond pulses for such an application are generated from an Er:fiber laser followed by self-phase modulation enabled spectral selection.

ROOM 1 Hall A1

ED-1.3 TUE 15:00

10-20 Level of Accuracy for Optical Frequency Ratio Measurements

•*M. Giunta*[1,2], *W. Hänsel*[1], *M. Lezius*[1], *M. Fischer*[1], *T. Udem*[2], *and R. Holzwarth*[1,2]; [1]*Menlo Systems GmbH, Martinsried, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We report on a feed-forward method for compensating phase drifts occurring in multi-branch frequency combs. Tracking the optical phase and compensating the drifts, we demonstrate comb accuracy and stability below 10-19 in less than 100s.

ED-1.4 TUE 15:15

Polarization-insensitive coherent receiving in optical fiber links for frequency metrology

•*S. Paracchino*[1], *C. Clivati*[1], *P. Savio*[2], *V. Curri*[3], *R. Gaudino*[3], *and D. Calonico*[1]; [1]*Quantum metrology and nanotechnologies Division, INRiM, Turin, Italy*; [2]*Applied Photonics, LINKS Foundation, Turin, Italy*; [3]*Politecnico di Torino, Dipartimento di Elettronica e Telecomunicazioni (DET), Turin, Italy*

Frequency dissemination via optical fiber is assuming a central role in Frequency Metrology. We developed an innovative system based on Digital Signal Processing for coherent detection of ultrastable lasers which is insensitive to polarization changes

ROOM 2 Hall A1

CG-1.5 TUE 15:00

CEP-stable 100 kHz nonlinearly compressed YDFA source for HHG

•*M. Natile*[1,2], *L. Lavenu* [1,3], *F. Guichard*[1], *M. Hanna*[3], *Y. Zaouter*[1], *R. Chiche*[4], *X. Chen*[1], *J.-F. Hergott*[2], *W. Boutu*[2], *H. Merdji*[2], *and P. Georges*[3]; [1]*Amplitude Laser Group, Palaiseau , France*; [2]*LIDYL, UMR 922, CEA , C.N.R.S., Gif-sur-Yvette, France*; [3]*Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Palaiseau , France*; [4]*Laboratoire de l'Accélérateur Linéaire, IN2P3, CNRS, Orsay , France*

We report on a CEP-stable YDFA with an energy of 30μJ at 100kHz, and a pulsewidth <100fs. Long term in-loop and out-of-loop CEP measurement reveals a CEP stability < 400 mrad over > 1h.

CG-1.6 TUE 15:15

Generation and characterization of isolated attosecond pulses at 100 kHz repetition rate for coincidence spectroscopy

•*T. Witting*[1], *F. Furch*[1], *M. Osolodkow*[1], *F. Schell*[1], *C. Menoni*[2], *C.P. Schulz*[1], *and M.J. Vrakking*[1]; [1]*Max-Born-Institute, Berlin, Germany*; [2]*Department of Electrical and Computer Engineering, Colorado State University, Fort Collins, USA*

We show an attosecond pump-probe beamline operating at 100 kHz repetition rate coupled to a reaction microscope. The attosecond pulses are characterized using attosecond streaking.

ROOM 3 Hall A1

CC-1.5 TUE 15:00

Coherent Reconstruction of Ultra-broadband THz Pulses in a Silicon Nitride-based Solid-state Device

•*A. Tomasino*[1,2], *R. Piccoli*[1], *Y. Jestin*[1], *S. Delprat*[1], *M. Chaker*[1], *M. Peccianti*[3], *M. Clerici*[4], *A. Busacca*[2], *L. Razzari*[1], *and R. Morandotti*[1,5,6]; [1]*INRS-EMT, Varennes, Canada*; [2]*DEIM, University of Palermo, Palermo, Italy*; [3]*Department of Physics and Astronomy, University of Sussex, Brighton, United Kingdom*; [4]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*; [5]*ITMO University, St. Petersburg , Russia*; [6]*Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, China*

We demonstrate the exact reconstruction of ultra-broadband terahertz pulses via the silicon-nitride solid-state biased coherent detection technique, performed by employing few tens of volts bias voltages, which enable a low-noise, fast-switching rate operation

CC-1.6 TUE 15:15

Terahertz frequency domain spectroscopy using Hilbert transformation

•*D. Vogt, M. Erkintalo, and R. Leonhardt*; *The University of Auckland, Auckland, New Zealand*

We show that the Hilbert transformation allows for high-resolution interrogation of narrow resonance features in coherent terahertz frequency-domain spectroscopy. By referring to the causality of physical systems, we establish the universal validity of the scheme.

NOTES

ROOM 1 ICM

16:00 – 17:30

CJ-9: Multimode nonlinear fiber optics

Chair: Serguey Babin, IAE - Novosibirsk University, Novosibirsk, Russia

CJ-9.1 TUE (Keynote) 16:00

Nonlinear optics exploiting the spatial dimension

•*S. Ramachandran*; *Boston University, Boston, USA*

Nonlinear optics with spatial modes requires conservation of spin and orbital angular momentum in addition to linear momentum (i.e. propagating phase). We review the principles of, and unique applications afforded by, this emerging platform.

ROOM 4a ICM

16:00 – 17:30

EA-5: Long-range interactions

Chair: Christian Kurtsiefer, National University of Singapore, Singapore

EA-5.1 TUE 16:00

Photon mediated long-range interaction and self-bound droplets in quantum gases

•*Y. Zhang, V. Walther, and T. Pohl*; *Aarhus University, Aarhus, Denmark*

By placing a quasi-2D Bose-Einstein condensate (BEC) in front of a single mirror, we propose a simple scheme to generate unusual long-range atom-atom interaction and show that this interaction can support quantum droplets with various structures.

EA-5.2 TUE 16:15

Optical shielding of ultracold 39K-Cs collision

T. Xie[1], *A. Orban*[2], *O. Dulieu*[1], *and* •*N. Bouloufa-Maafa*[1]; [1]*Laboratoire Aimé Cotton, CNRS/ Université Paris-Sud/ ENS Cachan, Orsay, France*; [2]*Institute for Nuclear Research, Hungarian Academy of Sciences (ATOMKI), Debrecen, Hungary*

Our theoretical work aims to find ways to suppress inelastic or reactive processes between colliding particles in ultracold quantum gases, using laser field detuned to the blue of a relevant transition .

ROOM 4b ICM

16:00 – 17:30

EE-5: Ultrafast processes in fibers

Chair: Daniele Faccio, Heriot-Watt University, Edinburgh, United Kingdom

EE-5.1 TUE 16:00

Ultrafast Deep and Vacuum Ultraviolet Gas-Filled Hollow-Core Fibre Sources for Time-Resolved Photoelectron Spectroscopy

•*F. Belli*[1], *N. Kotsina*[1], *S.-f. Gao*[2], *Y.-y. Wang*[2], *P. Wang*[2], *J. Travers*[1], *and D. Townsend*[1,3]; [1]*School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Beijing Engineering Research Centre of Laser Technology, Institute of Laser Engineering, Beijing University of Technology, Bejing, China*; [3]*Institute of Chemical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*

We demonstrate time-resolved photoelectron velocity-map imaging using tunable DUV pulses generated through resonant dispersive-wave emission in gas-filled photonic-crystal fibres, and explain the potential of this source for time-resolved ultraviolet spectroscopy of molecules and condensed-matter physics.

EE-5.2 TUE 16:15

Influence of Different Gases on Ionisation-Induced Refractive Index Changes in Gas-Filled Hollow-Core PCF

•*J.R. Koehler*[1], *F. Köttig*[1], *F. Tani*[1], *and P.S.J. Russell*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

Long-lived ionisation-related index changes, caused by self-compressed femtosecond pulses in gas-filled hollow-core photonic crystal fibre, are monitored interferometrically by a counter-propagating probe beam. The system is used to study the response of argon and neon.

ROOM 13a ICM

16:00 – 17:30

CB-6: Long wavelength semiconductor lasers

Chair: Jérôme Faist, ETH, Zürich, Switzerland

CB-6.1 TUE (Invited) 16:00

GaSb-based Swept-Wavelength Lasers for Spectroscopic Sensing Applications in the 1.7-2.5 micron Spectral Range

•*A. Vizbaras*[1], *I. Šimonytė*[1], *A. Trinkūnas*[1], *A. Miasojedovas*[1], *T. Bučiūnas*[1], *A. De Groote*[2], *M. Greibus*[1], *G. Naujokaitė*[1], *V. Andrulis*[1], *D. Martens*[2], *S. Droz*[3], *N. Torcheboeuf*[3], *D. Boiko*[3], *Ž. Dambrauskas*[4], *A. Gulbinas*[4], *and K. Vizbaras*[1]; [1]*Brolis Semiconductors UAB, Vilnius, Lithuania*; [2]*Brolis Semiconductors BVBA, Ghent, Belgium*; [3]*Centre Suisse d'Electronique et de Microtechnique SA (CSEM, Neuchatel, Switzerland*; [4]*. Institute for Digestive Research, Medical Academy, Lithuanian University of Health Sciences,, Kaunas, Lithuania*

In this work we present recent development of the GaSb-based swept-wavelength laser technology for spectroscopic sensing applications of critical biomolecules – glucose, urea, lactates, serum albumin - in the entire physiologically relevant concentration level dynamic range.

ROOM 13b ICM

16:00 – 17:30

CD-6: Micro-resonators

Chair: Thomas Mayerhoefer, Friedrich-Schiller-Universität Jena, Jena, Germany

CD-6.1 TUE 16:00

Dynamic Tuning of the Nonlinear Efficiency in a Bichromatic Photonic Crystal Microcavity

•*G. Marty*[1,2], *S. Combrié*[2], *F. Raineri*[1,3], *and A. de Rossi*[2]; [1]*C2N , CNRS, Palaiseau, France*; [2]*Thales research and technology, Palaiseau, France*; [3]*Université Paris Diderot, Paris, France*

We report the highest wavelength conversion efficiency of -6dB in a photonic crystal cavity. We use the spatial non-uniformity of the resonant modes to dynamically control the cavity dispersion and reach the theoretical efficiency maximum.

CD-6.2 TUE 16:15

All-optical switching in microresonators using the Kerr nonreciprocity

•*L. Del Bino*[1,2], *N. Moroney*[1,3], *M.T.M. Woodley*[1,2], *F. Copie*[1], *J.M. Silver*[1,4], *S. Zhang*[1], *and P. Del'Haye*[1]; [1]*National Physical Laboratory, Teddington, United Kingdom*; [2]*CDT in Applied Photonics, Heriot-Watt University, Edinburgh, United Kingdom*; [3]*Imperial College London, London, United Kingdom*; [4]*City, University of London, London, United Kingdom*

We study the dynamics of the interaction of counter-propagating light in microresonators via the Kerr-effect. Our work enables all-optical memories and logic gates at bitrates of 10 Gbps and power levels down to 1 μW.

ROOM 14a ICM

16:00 – 17:30

EF-2: Mode locking and spatio-temporal localization

Chair: Gian-Luca Oppo, University of Strathclyde, Glasgow, United Kingdom

EF-2.1 TUE 16:00

Third Order Dispersion in Optical Time Delayed Systems: The case of Mode-Locked Vertical External-Cavity Surface-Emitting Lasers

C. Schelte[1,5], P. Camelin[2], G. Huyet[2], M. Marconi[2], M. Giudici[2], I. Sagnes[3], G. Beaudoin[3], A. Garnache[4], •J. Javaloyes[1], and S. Gurevich[5]; [1]Nonlinear Wave Group, Universitat de les Illes Baleares, Palma de Mallorca, Spain; [2]Université Côte d'Azur, CNRS, Institut de Physique de Nice, Valbonne, France; [3]Centre de Nanosciences et de Nanotechnologies, C2N UMR 9001, CNRS, Université Paris Sud, Université Paris-Saclay, 91120 Palaiseau, Paris, France; [4]Institut d'Electronique et des Systèmes, UMR5214, CNRS, University of Montpellier, Montpellier, France; [5]Institute for Theoretical Physics, University of Münster, Münster, Germany

We demonstrate experimentally and theoretically that third order dispersion in the dynamics of passively mode-locked coupled micro-cavities such as VECSELs induce a new kind of instability for the pulse train.

EF-2.2 TUE 16:15

Dark pulses in a long ring laser

•S. Slepneva[1,2,3], U. Munivenkatappa[1,2,3], A. Pimenov[4], E. Viktorov[5], A. Vladimirov[4,6], and G. Huyet[1]; [1]Universite Cote dAzur, CNRS, Institut de Physique de Nice, Nice, France; [2]Centre for Advanced Photonics and Process Analysis & Department of Physical Sciences, Cork Institute of Technology, Cork, Ireland; [3]Tyndall National Institute, University College Cork, Cork, Ireland; [4]Weierstrass Institute, Berlin, Germany; [5]ITMO University, Saint Petersburg, Russia; [6]Lobachevsky State University , Nizhny Novgorod, Russia

We analysed, both experimentally and numerically, the appearance of periodic dark pulses in a long laser and show that they are closely connected to Nozaki-Bekki holes reported in the complex Ginzburg Landau equation.

ROOM 14b ICM

16:00 – 17:30

CK-9: Frequency combs

Chair: Antoine Monmayrant, LAAS-CNRS, Toulouse, France

CK-9.1 TUE (Invited) 16:00

Frequency Combs in Synchronously-Driven Optical Microresonators

E. Obrzud[1,2], V. Brasch[1], S. Lecomte[1], and •T. Herr[1]; [1]CSEM, Neuchatel, Switzerland; [2]Geneva Observatory, Versoix, Switzerland

Synchronously-driven nonlinear optical microresonators can generate dissipative solitons with femtosecond pulse duration and > 10 GHz repetition rate. These low-noise solitons are suitable for metrological application, deterministically generated, all-optically controlled and operate with high conversion-efficiency.

ROOM 1 Hall A1

16:00 – 17:30

ED-2: Precision spectroscopy

Chair: Aleksandra Foltynowicz, Umeå Universitet, Umeå, Sweden

ED-2.1 TUE 16:00

Tests of Fundamental Physics using Ramsey-Comb Spectroscopy on the Hydrogen Molecule

•C. Roth, L.S. Dreissen, E.L. Gründeman, J.J. Krauth, M. Favier, E.J. Salumbides, W. Ubachs, and K.S.E. Eikema; LaserLaB, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

We aim to improve the measurements of the EF-X Q_1 and Q_0 transitions in molecular hydrogen as well as the fundamental ground tone to an accuracy level of 10 kHz with Ramsey-comb spectroscopy for fundamental tests.

ED-2.2 TUE 16:15

Stimulated Raman Spectroscopy of H2 with absolute frequency calibration

•M. Lamperti[1], L. Rutkowski[1], H. Jozwiak[3], S. Wojtewicz[3], D. Gatti[1], P. Wcislo[3], F. Thibault[2], R. Gotti[1], P. Maslowski[3], G. Cerullo[1], D. Polli[1], and M. Marangoni[1]; [1]Dipartimento di Fisica - Politecnico di Milano and IFN-CNR, lecco, Italy; [2]Univ Rennes, CNRS, IPR (Institut de Physique de Rennes), rennes, France; [3]Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, torun, Poland

A comb-calibrated Coherent Raman spectrometer is for the first time presented and applied to measure the Q(1) transition of pure H2 at 4155.25 cm-1, with sub-MHz accuracy and resolution.

ROOM 2 Hall A1

16:00 – 17:30

CG-2: Strong-field processes in atoms and molecules

Chair: Markus Kitzler, Technical University of Vienna, Vienna, Austria

CG-2.1 TUE 16:00

Imaging Rydberg States of Atoms and Molecules with a Weak DC Field

S. Larimian[1], X. Gong[2], W. Zhang[2], A. Baltuška[1], M. Kitzler[1], H. Zeng[2], J. Wu[2], and •X. Xie[1]; [1]Photonics Institute, Technische Universität Wien, Vienna, Austria; [2]State Key Laboratory of Precision Spectroscopy, East China Normal University, Shanghai, China

We demonstrate experimental imaging of high-lying electron wave-packets produced through electron trapping after strong laser field interaction with Ar and N_2, which exhibits a dominate density distribution along the perpendicular direction of the laser field.

CG-2.2 TUE 16:15

Sub-cycle Separation of Ionization Bursts in the Double Ionization of H_2

•V. Hanus[1], S. Kangaparambil[1], M. Kirchner[1], S. Larimian[1], X. Xie[1], M. Schöffler[2], A. Staudte[3], G. Paulus[4], A. Baltuska[1], and M. Kitzler[1]; [1]Photonics Institute, Technische Universität Wien, Wien, Austria; [2]Institut für Kernphysik, J.W. Goethe-Universität, Frankfurt am Main, Germany; [3]Joint Attosecond Science Lab. of the National Research Council and the University of Ottawa, Ottawa, Canada; [4]Friedrich-Schiller-Universität Jena, Jena, Germany

Exploiting a technique of molecular atto-clock we demonstrate how CEP can influence the directions of momenta of two sequentially emitted electrons. A separation of the first and second emitted electron in opposite hemispheres is achievable.

ROOM 3 Hall A1

16:00 – 17:30

CC-2: THz QCL-broadband operation and modelling

Chair: Jérôme Faist, ETH, Zürich, Switzerland

CC-2.1 TUE 16:00

Heterogeneous THz quantum cascade lasers: Spectrally resolved gain recovery dynamics

•C.G. Derntl[1], G. Scalari[2], M. Beck[2], J. Faist[2], K. Unterrainer[1], and J. Darmo[1]; [1]Photonics Institute, TU Wien, Vienna, Austria; [2]Institute of Quantum Electronics, ETH Zürich, Zurich, Switzerland

We employed terahertz-pump terahertz-probe time domain spectroscopy to study the spectrally resolved gain recovery dynamics of individual stacks of a heterogeneous terahertz quantum cascade laser and the influence of their interaction on laser stability.

CC-2.2 TUE 16:15

Homogeneous, bound-to-continuum THz QCL Active Region design featuring 1.65 THz emission bandwidth in CW

•A. Forrer, D. Stark, M. Franckié, T. Olariu, M. Beck, J. Faist, and G. Scalari; ETH Zurich, Institute of Quantum Electronics, Auguste-Piccard-Hof 1, Zürich, Switzerland

We present a homogeneous, metal-metal quantum cascade laser with CW emission bandwidth of 1.65 THz in a bi-stable regime when voltage driven and 1 THz bandwidth with a kHz linewidth beatnote indicating comb operation.

ROOM 1 ICM

CJ-9.2 TUE 16:45

Singlemode Kilowatt Fibre Laser with Adjustable Beam Profile and M2

•*N. Vukovic*[1], *J. Chan*[1], *C. Codemard*[1,2], *M. Zervas*[1,2], *S. Keen*[2], *V. Ruseva*[2], *R. Jesset*[2], *I. Botheroyd*[2], *and M. Greenwood*[2]; [1]*Advanced Laser Laboratory, Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*SPI Lasers UK Ltd, Southampton, United Kingdom*

We report on a kW-class fibre laser with singlemode output from a multimode delivery fibre with adjustable beam profile using a dynamic mode coupler. The M2 of the output beam varies from 1.12 to 7.

ROOM 4a ICM

EA-5.3 TUE (Invited) 16:30

Solitons and droplets in two-component Bose-Einstein condensates

C.R. Cabrera, J. Sanz, A. Frölian, C. Chisholm, P. Thomas, B. Naylor, L. Tanzi, P. Cheiney, and •L. Tarruell; ICFO-The Institute of Photonic Sciences, Castelldefels, Spain

Self-bound states result from a balance between attractive and repulsive forces. We experimentally explore two types of self-bound states, stemming from repulsive forces of different origins, in two-component Bose-Einstein condensates: bright solitons and liquid droplets.

ROOM 4b ICM

EE-5.3 TUE 16:30

Soliton-plasma Interactions and Dispersive-wave Emission Beyond Two-photon Resonances in Gas-filled Hollow Capillary Fibres

•*T. Grigorova, C. Brahms, F. Belli, and J. Travers; School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*

We demonstrate soliton self-compression and VUV dispersive-wave emission in argon- and krypton-filled hollow capillary fibre. We observe plasma-related frequency shifts in the dispersive wave as well as VUV generation, even below two-photon resonances.

EE-5.4 TUE 16:45

Single-Shot Time-Resolved Phase and Intensity Measurement of Breathers in the Nonlinear Stage of Modulation Instability

A. Lebel, A. Tikan, S. Randoux, P. Suret, and •F. Copie; University of Lille, CNRS, UMR 8523 - Physique des Lasers Atomes et Molécules (PhLAM), Lille, France

We present single-shot measurements of ultra-fast nonlinear structures generated by the modulation instability in fiber optics. Our improved temporal imaging setup enables recording of both intensity and phase of the field, allowing its detailed analysis.

ROOM 13a ICM

CB-6.2 TUE 16:30

Design strategies for power scaling of GaSb-based superluminescent diodes for 2 – 3 μm wavelength range

•*N. Zia, J. Viheriälä, E. Koivusalo, A. Antti Aho, and M. Guina; Tampere University, Tampere, Finland*

We demonstrate a double-pass GaSb-based superluminescent diode emitting output power as high as 120 mW around 2 μm and having 40 nm spectral width. The performance is benchmarked against design involving single-pass.

CB-6.3 TUE 16:45

Ring Interband Cascade Lasers for Environmental Monitoring

•*H. Knötig*[1], *B. Hinkov*[1], *M. Holzbauer*[1], *R. Szedlak*[1], *H. Detz*[2], *R. Weih*[3], *S. Höfling*[3,4], *W. Schrenk*[2], *J. Koeth*[3], *J.P. Waclawek*[5], *B. Lendl*[5], *and G. Strasser*[1]; [1]*Institute of Solid State Electronics and Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*; [2]*Austrian Academy of Sciences, Vienna, Austria*; [3]*nanoplus Nanosystems and Technologies GmbH, Gerbrunn, Germany*; [4]*Physikalisches Institut and Wilhelm Conrad Röntgen-Research Center for Complex Material Systems, University Würzburg, Würzburg, Germany*; [5]*Institute of Chemical Technologies and Analytics, TU Wien, Vienna, Austria*

We present latest results on ring-shaped interband cascade lasers with a second order distributed feedback grating for substrate emission. They are designed for better heat transport and suppression of higher order lateral modes.

ROOM 13b ICM

CD-6.3 TUE 16:30

Third Harmonic Generation in Highly-doped Silica Glass Micro Ring Resonator

•*Y. Li*[1], *J. Zhao*[2], *R. Davidson*[3], *L. Wang*[4], *S. Wang*[5], *B. Little*[6], *and S. Chu*[7]; [1]*Department of Physics, City University of Hong Kong, Hong Kong, China*; [2]*QXP Technology Inc., Xi'an, China*; [3]*QXP Technology Inc., Xi'an, China*; [4]*State Key Laboratory of Transient Optics and Photonics, XIOPM, CAS, Xi'an, China*; [5]*Department of Microelectronics Science and Technology, Fuzhou University, Qi Shan Campus, Fuzhou, China*; [6]*State Key Laboratory of Transient Optics and Photonics, XIOPM, CAS, Xi'an, China*; [7]*Department of Physics, City University of Hong Kong, Hong Kong, China*

Third harmonic generation (THG) was demonstrated experimentally using a 200GHz microring resonator on the platform of high-index-silica glass for the first time. Effects of temperature and fundamental pump wavelength tuning on THG intensity were studied.

CD-6.4 TUE 16:45

Critical Dynamics of a Nonlinear Enhanced Microresonator Gyroscope

•*J. Silver*[1,2], *L. Del Bino*[1,3], *M. Woodley*[1,3], *S. Zhang*[1], *A. Svela*[1,4], *G. Ghalanos*[1,4], *N. Moroney*[1,4], *and P. Del'Haye*[1]; [1]*National Physical Laboratory, London, United Kingdom*; [2]*City, University of London, London, United Kingdom*; [3]*Heriot-Watt University, Edinburgh, United Kingdom*; [4]*Imperial College London, London, United Kingdom*

We measure the dynamical response of a nonlinear enhanced optical microresonator gyroscope operating close to the critical point of symmetry breaking between counterpropagating light. We compare the results to simulations based on a theoretical model.

ROOM 14a ICM

EF-2.3 TUE 16:30

Symmetry breaking: balancing asymmetries

•*B. Garbin*[1,2], *J. Fatome*[3], *G.-L. Oppo*[4], *S.G. Murdoch*[1,2], *M. Erkintalo*[1,2], *and S. Coen*[1,2]; [1]*Department of Physics, University of Auckland, Auckland, New Zealand*; [2]*The DoddWalls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*; [3]*Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR6303 CNRS-UBFC, Dijon, France*; [4]*SUPA and Department of Physics, University of Strathclyde, Glasgow, United Kingdom*

The robustness of spontaneous symmetry breaking against controlled asymmetries is experimentally investigated in a fibre Kerr resonator. We remarkably find that different asymmetries can balance each other, resulting in the restoration of symmetry breaking phenomena.

EF-2.4 TUE 16:45

Experimental Observation of Chimera-like States in a Passive Kerr Resonator

•*A.U. Nielsen*[1,2], *M. Ferré*[3], *M.G. Clerc*[3], *S. Coen*[1,2], *S.G. Murdoch*[1,2], *and M. Erkintalo*[1,2]; [1]*Department of Physics, University of Auckland, Auckland 1010, New Zealand*; [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*; [3]*Departamento de Física and Millenium Institute for Research in Optics, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Casilla 487-3, Santiago, Chile*

We report on the first experimental observation of chimera-like states in a passive Kerr fiber ring resonator. The states can simultaneously and independently be excited and erased at will.

ROOM 14b ICM

CK-9.2 TUE 16:30

Photonic Integrated Microwave Oscillator Based on Silicon Nitride Soliton Microcomb

•*J. Liu, J. He, E. Lucas, A.S. Raja, R.N. Wang, M. Karpov, H. Guo, R. Bouchand, and T.J. Kippenberg*; *EPFL, Lausanne, Switzerland*

Using photonic integrated silicon nitride microresonators of quality factor exceeding 22 million, we demonstrate 19-GHz-repetition-rate single soliton with 35 mW optical power, and characterize the phase noise of the repetition rate in the K-band microwave regime.

CK-9.3 TUE 16:45

Integrated Echelle Gratings as Compact Spectrometer for VIS and NIR Astronomy

Y. Wang[1,2], *J. Luo*[1], *K. Sun*[1], *B. Roth*[2], *and* •*Z. Zhang*[3,4]; [1]*innoFSPEC, Leibniz-Institute for Astrophysics Potsdam (AIP), Potsdam, Germany*; [2]*Hannover Centre for Optical Technologies (HOT), Leibniz University Hannover, Hannover, Germany*; [3]*School of Engineering, Westlake University, Hangzhou, China*; [4]*Institute of Advanced Technology, Westlake Institute for Advanced Study, Hangzhou, China*

In this work, several integrated Echelle gratings are developed on a 'silica on silicon' platform that is transparent for the spectral range from 450 nm to ~ 2 μm.

ROOM 1 Hall A1

ED-2.3 TUE 16:30

High-precision widely tuneable SI-traceable optical frequency comb-based mid-infrared molecular spectroscopy

D.B.A. Tran[1], *M. Manceau*[1], *A. Cournol*[1], *L. Lecordier*[1], *R. Santagata*[1], *B. Argence*[1], *O. Lopez*[1], *S.K. Tokunaga*[1], *F. Wiotte*[1], *H. Mouhamad*[1], *A. Goncharov*[1], *M. Abgrall*[2], *Y. Le Coq*[2], *H. Alvarez-Martinez*[2], *R. Le Targat*[2], *W.-K. Lee*[2], *D. Xu*[2], *P.-E. Pottie*[2], *A. Amy-Klein*[1], *and* •*B. Darquié*[1]; [1]*Laboratoire de Physique des Lasers, Université Paris 13, Sorbonne Paris Cité, CNRS, Villetaneuse, France*; [2]*LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, Paris, France*

We report measurements of absolute frequencies of various polyatomic species around 10 μm, at level of accuracies ranging from 10 Hz to 10 kHz, using a widely tuneable SI-traceable optical frequency comb-stabilized quantum cascade laser.

ED-2.4 TUE 16:45

Comb-Locked Frequency-Swept Spectroscopy

R. Gotti[1], •*T. Puppe*[2], *Y. Mayzlin*[2], *J. Robinson-Tait*[2], *S. Wojtewicz*[3], *D. Gatti*[1], *B. Alsaif*[4], *M. Lamperti*[1], *P. Laporta*[1], *F. Rohde*[2], *R. Wilk*[2], *P. Leisching*[2], *W.G. Kaenders*[2], *and M. Marangoni*[1]; [1]*Dipartimento di Fisica - Politecnico di Milano and IFN-CNR, Lecco, Italy*; [2]*TOPTICA Photonics AG, Gräfelfing, Germany*; [3]*Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Torun, Poland*; [4]*Clean Combustion Research Center, King Abdullah University for Science and Technology, Thuwal, Saudi Arabia*

Comb-locked frequency-swept spectroscopy (CLFSS) is enabled by a cw-laser phase-locked to an endlessly shifting frequency comb. It combines the multi-THz spectral coverage provided by direct-comb spectroscopy (DCS) with kHz-level accuracy achievable with comb-assisted spectroscopy (CAS).

ROOM 2 Hall A1

CG-2.3 TUE (Invited) 16:30

Spin and angular momentum in strong-field ionization

S. Eckart, D. Trabert, M. Kunitski, K. Fehre, A. Hartung, M. Schöffler, T. Jahnke, and •*R. Dörner*; *University Frankfurt, Frankfurt, Germany*

We will show that the electron emission probability and momentum distribution of the ejected electrons in atomic strong field ionization depends on the angular momentum of the bound state and as a consequence yields spin polarized electrons.

ROOM 3 Hall A1

CC-2.3 TUE 16:30

Observation of self mode-locking in terahertz quantum cascade lasers through intra-cavity self-detection

H. Li[1], *W. Wan*[1], *Z. Li*[1], *J.C. Cao*[1], *S. Lepillet*[2], *J.-F. Lampin*[2], *and* •*S. Barbieri*[2]; [1]*Key Laboratory of Terahertz Solid State Technology, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China*; [2]*Laboratoire IEMN, CNRS and Université de Lille, Villeneuve d'Ascq, France*

We report the observation of self mode-locking in a 4.2THz quantum cascade laser by exploiting an intra-cavity self-detection technique.

CC-2.4 TUE 16:45

A Broadband Polarization-Rotating Vivaldi Antenna for Beam Focusing of Terahertz Quantum Cascade Lasers

•*U. Senica, E. Mavrona, T. Olariu, A. Forrer, M. Beck, J. Faist, and G. Scalari*; *ETH Zurich, Institute of Quantum Electronics, Zurich, Switzerland*

We present a broadband and narrow beam Vivaldi Antenna improving the far-field of a double metal waveguide THz QCL, designed to work over two octaves (1.5-4.5 THz), with a measured beamwidth of 25 degrees.

ROOM 1 ICM

CJ-9.3 TUE 17:00

Kilowatt-level parametric wavelength exchange using OAM modes

•*E.N. Christensen*[1,2], *X. Liu*[1], *K. Rottwitt*[2], *and S. Ramachandran*[1]; [1]*Boston University , 8 St. Mary's St. Boston, USA*; [2]*Technical University of Denmark, Oersteds Plads, Building 343 Kgs. Lyngby, Denmark*

Nonlinear interactions between OAM modes are a hitherto less-explored territory. Here, we demonstrate the first intermodal parametric wavelength conversion (888.8–1326 nm), at kW peak-power levels, using the unique attributes of OAM fiber modes.

CJ-9.4 TUE 17:15

Reconstruction of Guided Helical Bloch Modes in Twisted Coreless Photonic Crystal Fibre using Bessel Beams

•*P. Roth*[1], *G.K.L. Wong*[1], *M.H. Frosz*[1], *G. Ahmed*[1], *and P.S.J. Russell*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Department of Physics, University of Erlangen-Nueremberg, Erlangen, Germany*

The helical Bloch modes guided in chirally twisted coreless photonic crystal fibres can be reconstructed using Bessel beams, enabling full characterisation of the orbital angular momentum states with a fidelity greater than 95%.

ROOM 4a ICM

EA-5.4 TUE 17:00

Towards quantum simulations with circular Rydberg atoms

R. Cortinas, •*B. Ravon, P. Mehaignerie, T. Cantat-Moltrecht, J.-M. Raimond, and C. Sayrin*; *Laboratoire Kastler Brossel, Paris, France*

My presentation will focus on our recent experiment that prepares and characterizes circular Rydberg atoms in a cryogenic environment. I will also present early results of laser-trapping of these atoms towards realization of quantum simulations.

EA-5.5 TUE 17:15

Adiabatic preparation of magnetically ordered and entangled states with cold atoms in optical lattices

•*A. Venegas-Gomez*[1], *W. Ketterle*[2], *and A.J. Daley*[1]; [1]*University of Strathclyde, Glasgow, United Kingdom*; [2]*MIT-Harvard Center for Ultracold Atoms, Cambridge, USA*

We propose and explore new protocols to prepare quantum states with a very low entropy using adiabatic state preparation, modelling these techniques for realistic experimental parameters using numerical methods based on tensor networks.

ROOM 4b ICM

EE-5.5 TUE 17:00

Single Color Event Horizon in a Photonic Crystal Fibre

•*S. Bose*[1,2], *O. Melchert*[1,2,3], *I. Babushkin*[1,2], *M. Pal*[4], *G. Steinmeyer*[5], *U. Morgner*[1,2], *and A. Demircan*[1,2,3]; [1]*Institute of Quantum Optics, Leibniz University, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovations Across Discipline), Hannover, Germany*; [3]*Hannover Centre for Optical Technologies, Hannover, Germany*; [4]*Fiber Optics and Photonics Division, CSIR-Central Glass and Ceramic Research Institute, Kolkata, India*; [5]*Max-Born-Institute, Berlin, Germany*

We propose a simple scheme for the direct creation of an optical event horizon via single color pumping, enabling large interaction lengths. The method is investigated both, theoretically and experimentally and shows robustness against perturbations.

EE-5.6 TUE 17:15

Extreme Events Prediction in Optical Fibre Modulation Instability Using Machine Learning

•*L. Salmela*[1], *M. Närhi*[1], *J. Toivonen*[1], *C. Lapre*[2], *C. Billet*[2], *J.M. Dudley*[2], *and G. Genty*[1]; [1]*Photonics Laboratory, Physics Unit, Tampere University, 33014 Tampere, Finland*; [2]*Institut FEMTO-ST, Université Bourgogne Franche-Comté CNRS UMR 6174, 25000 Besançon, France*

We apply techniques of machine learning to predict the emergence of extreme rogue waves in ultrafast modulation instability from high dynamic range single-shot spectral intensity measurements.

ROOM 13a ICM

CB-6.4 TUE 17:00

Activated Auger Processes and their Wavelength Dependence in Type-I Mid-Infrared Laser Diodes

T.D. Eales[1], *M.-C. Amann*[2], *I.P. Marko*[1], *B.A. Ikyo*[1], •*A.R. Adams*[1], *A. Andrejew*[2], *K. Vizbaras*[2,3], *L. Shterengas*[4], *G. Belenky*[4], *I. Vurgaftman*[5], *J.R. Meyer*[5], *and S.J. Sweeney*[1]; [1]*Advanced Technology Institute and Department of Physics, University of Surrey, Guildford, United Kingdom*; [2]*Walter Schottky Institut, Technische Universität München, Am Coulombwall 3, 85748, Garching, Germany*; [3]*Brolis Semiconductors UAB, Moletu pl. 73, Vilnius, Lithuania*; [4]*Department of Electrical and Computer Engineering, State University of New York at Stony Brook, New York, USA*; [5]*US Naval Research Laboratory, 4555 Overlook Avenue SW, Washington DC, USA*

To determine whether an activated or thresholdless Auger process controls mid-infrared lasers we investigated their variation with temperature and high-pressure. Below 2 μm the CHSH process dominates while above 2 μm an activated CHCC Auger process dominates.

CB-6.5 TUE 17:15

Thermal Conductivity for Different Barrier Compositions of Terahertz Quantum Cascade Lasers

•*M.A. Kainz*[1,2], *S. Schönhuber*[1,2], *B. Limbacher*[1,2], *A.M. Andrews*[2,3], *H. Detz*[2,4], *G. Strasser*[2,3], *and K. Unterrainer*[1,2]; [1]*Photonics Institute, TU Wien, Vienna, Austria*; [2]*Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*; [3]*Institute of Solid State Electronics, TU Wien, Vienna, Austria*; [4]*Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic*

The temperature dependent cross-plane thermal conductivity for different aluminum concentrations of GaAs/$Al_xGa_{1-x}As$ terahertz quantum cascade lasers with identical layer sequence is studied. First results show a decreasing thermal conductivity for higher aluminum concentrations.

ROOM 13b ICM

CD-6.5 TUE 17:00

Femtosecond-Driven Up-Conversion in a Radially Poled LiNbO3 Microresonator

•*M. Roiz*[1], *C.S. Werner*[2], *I. Breunig*[2,3], *and M. Vainio*[1,4]; [1]*Department of Chemistry, University of Helsinki, Helsinki, Finland*; [2]*Laboratory for Optical Systems, Department of Microsystems Engineering, University of Freiburg , Freiburg, Germany*; [3]*Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany*; [4]*Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland*

We present a new method for parametric up-conversion of optical frequency combs using a microresonator made of radially poled second order nonlinear material. We demonstrate a detailed experimental characterization of the system.

CD-6.6 TUE 17:15

Radially-Poled Stoichiometric Lithium Tantalate Microresonators for Nonlinear-Optical Applications

•*M. Uluda*[1], *J. Szabados*[1], *I. Breunig*[1,2], *and K. Buse*[1,2]; [1]*Laboratory for Optical Systems, Department of Microsystems Engineering-IMTEK, University of Freiburg, Freiburg im Breisgau, Germany*; [2]*Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg im Breisgau, Germany*

We report on successful generation of radially-poled quasi-phase-matching structures in stoichiometric lithium tantalate crystals employing calligraphic poling. Whispering-gallery-resonators are fabricated out of such structures, and quality factors as well as the nonlinear-optical performance are evaluated.

ROOM 14a ICM

EF-2.5 TUE (Invited) 17:00

Light bullets in Passively Mode-Locked Lasers: Dynamics and Instabilities

•*S. Gurevich*; *Institute for Theoretical Physics, University of Münster, Münster, Germany*

Light Bullets (LBs) are pulses simultaneously confined in the transverse and the propagation directions. We present a review of recent theoretical and modelling studies regarding the analysis of LBs in semiconductor passively mode-locked lasers.

ROOM 14b ICM

CK-9.4 TUE (Invited) 17:00

Nanophotonic supercontinuum based mid-infrared dual-comb spectroscopy

•*H. Guo*[1,2], *W. Weng*[1], *J. Liu*[1], *F. Yang*[3], *W. Hansel*[4], *C.-S. Bres*[5], *L. Thevenaz*[3], *R. Holzwarth*[4], *and T. Kippenberg*[1]; [1]*LPQM, EPFL, Lausanne, Switzerland*; [2]*Shanghai University, Shanghai, China*; [3]*GFO, EPFL, Lausanne, Switzerland*; [4]*Menlo Systems GmbH, Martinsried, Germany*; [5]*PHOSL, EPFL, Lausanne, Switzerland*

We demonstrate a broadband mid-infrared dual-comb spectrometer for parallel gas-phase detection in the functional group region from 2800 – 3600 cm^{-1}, using dispersion engineered silicon nitride dual-core waveguides which produce broadband, intensity-enhanced and coherent mid-infrared frequency combs.

ROOM 1 Hall A1

ED-2.5 TUE 17:00

Double-heterodyne detection of spectral hole in rare earth doped crystal for laser frequency stabilization and opto-mechanical sensing

•*N. Galland*[1,2], *N. Lucic*[2], *H. Alvarez-Martinez*[2], *S. Zhang*[2], *B. Fang*[2], *R. Le Targat*[2], *A. Ferrier*[3,4], *P. Goldner*[3], *S. Seidelin*[1,5], *and Y. Le Coq*[2]; [1]*Université Grenoble Alpes and CNRS, Institut NEEL, Grenoble, France*; [2]*LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, 61 avenue de l'Observatoire, Paris, France*; [3]*Université PSL, Chimie ParisTech, CNRS, Institut de Recherche de Chimie Paris, Paris, France*; [4]*Sorbonne Université, Paris, France*; [5]*Institut Universitaire de France, Paris, France*

Spectral holes in rare earth doped crystal absorption spectrum are used to stabilize a laser's frequency and a first evaluation of its sensitivity (in center frequency and width) to uniaxial mechanical constraints has been made.

ED-2.6 TUE 17:15

Measurement of molecular transition frequencies with the uncertainties lower than 10-17

•*M. Kajita*; *National Institute of Information and Communications Technology, Koganei, Japan*

It was theoretically estimated that Q(0) or Q(1/2) vibrational transition frequencies of cold molecules trapped in a Lamb-Dicke region (molecular ion or neutral molecules) can be measured with uncertainties lower than 10-17.

ROOM 2 Hall A1

CG-2.4 TUE 17:00

Heteronuclear Limit of Strong-Field Ionization: Laser-induced Fragmentation of HeH^+

•*P. Wustelt*[1,2], *F. Oppermann*[3], *L. Yue*[4], *M. Möller*[1,2], *T. Stöhlker*[1,2], *M. Lein*[3], *S. Gräfe*[4], *A.M. Sayler*[1,2], *and G.G. Paulus*[1,2]; [1]*Institute of Optics and Quantum Electronics, Friedrich Schiller University Jena, Jena, Germany*; [2]*Helmholtz Institute Jena, Jena, Germany*; [3]*Institut für Theoretische Physik,Leibniz Universität Hannover,, Hannover, Germany*; [4]*Institute of Physical Chemistry, Friedrich Schiller University Jena, Jena, Germany*

The laser-induced fragmentation dynamics of the most fundamental polar molecule HeH^+ are measured using an ion beam of helium hydride and an isotopologue at various wavelengths giving a valuable new insight in heteronuclear systems.

CG-2.5 TUE 17:15

Optical attoclock using terahertz radiation

•*I. Babushkin*[1,2,3], *Á.J. Galán*[3], *V. Vaičaitis*[4], *A. Husakou*[3], *F. Morales*[3], *A. Demircan*[1,2,5], *J.R. C. Andrade*[1,2,5], *U. Morgner*[1,2,5], *and M. Ivanov*[3]; [1]*Institute of Quantum Optics, Leibniz University, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering Innovation Across Disciplines), Hannover, Germany*; [3]*Max Born Institute, Berlin, Germany*; [4]*Laser Research Center, Vilnius University, Vilnius, Lithuania*; [5]*Hannover Centre for Optical Technologies, Hannover, Germany*

We show that the polarization of the terahertz radiation from 2-color ionizing field allows to access ionization-induced attosecond-long delays. Further information about the ionization dynamics can be obtained from the 3rd harmonic.

ROOM 3 Hall A1

CC-2.5 TUE 17:00

Modeling Self-Starting Harmonic Mode Locking in Terahertz Quantum Cascade Lasers

•*M. Riesch*[1], *V. Pistore*[2], *F. Wang*[2], *S. Dhillon*[2], *and C. Jirauschek*[1]; [1]*Technical University of Munich, Munich, Germany*; [2]*Laboratoire de Physique de l'Ecole normale supérieure (ENS), Paris, France*

We investigate self-starting harmonic mode locking in terahertz quantum cascade lasers using Maxwell-Bloch simulations. We demonstrate that our theoretical model could provide a plausible explanation of the harmonic behavior discovered in recent experiments.

CC-2.6 TUE 17:15

Non-equilibrium Green's function simulation of group-IV terahertz quantum cascade lasers

•*T. Grange*[1], *D. Stark*[2], *G. Scalari*[2], *J. Faist*[2], *L. Persichetti*[3], *L. Di Gaspare*[3], *M. De Seta*[3], *G. Cappelini*[4], *D. Paul*[5], *M. Ortolani*[6], *S. Birner*[1], *and M. Virgilio*[7]; [1]*nextnano GmbH, Garching b. München, Germany*; [2]*ETH Zurich, Zurich, Switzerland*; [3]*Università di Roma Tre, Roma, Italy*; [4]*IHP, Frankfurt (Oder), Germany*; [5]*University of Glasgow, Glasgow, United Kingdom*; [6]*Università di Roma La Sapienza, Roma, Italy*; [7]*Università di Pisa, Pisa, Italy*

We theoretically investigate the performances of a Germanium-based terahertz (THz) quantum cascade laser (QCL) using non-equilibrium Green's functions (NEGF). The Ge-based THz QCL is found to be much more robust to temperature increase compared to an equivalent GaAs/AlGaAs design.

13:00 – 14:00

CC-P: CC Poster Session

CC-P.1 TUE

Optical Pump - THz Probe Study of SI-GaAs:Cr with Long Charge Carrier Lifetime

•*I. Kolesnikova, D. Kobtsev, S. Sarkisov, R. Redkin, O. Tolbanov, A. Tyazhev, and A. Zarubin*; *Tomsk State University, Tomsk, Russia*

The obtained results indicate the possibility of applying the optical pump-terahertz probe technique to determine the charge carrier lifetimes in semiconductor crystals intended for the manufacturing of electronic devices.

CC-P.2 TUE

Frequency conversion of broadband mid-IR carbon monoxide laser radiation into THz range

A. Ionin, •I. Kinyaevskiy, Y. Klimachev, Y. Mityagin, A. Sagitova, S. Savinov, and D. Sinitsyn; *P.N.Lebedev Physical Institute of Russian Academy of Sciences, Moscow, Russia*

Numerical and experimental study of non-selective multi-line CO laser frequency conversion to the THz range by means of difference frequency generation in a ZnGeP2 crystal was carried out (RFBR 18-52-16019)

CC-P.3 TUE

On the role of the phase in field-resolved spectroscopy of molecular vibrations

•*M. Trubetskov*[1], *M. Huber*[1,2], *M. Zigman*[1,2], *F. Krausz*[1,2], *and I. Pupeza*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig-Maximilians-Universität, Munchen, Germany*

Quality and robustness of class separation are improved due to the presence of phase information in field-resolved spectroscopy measurements. Numerical simulations and two experiments: serum spiking and sugar mixture in water are discussed.

CC-P.4 TUE

A Comparison of Photoconductive Semiconductors with Long and Short Charge Carrier Lifetimes for Pulsed and CW Terahertz Generation and Detection

•*D. Kobtsev, I. Kolesnikova, R. Redkin, and S. Sarkisov*; *Tomsk State University, Tomsk, Russia*

This work presents research results of photoconductive dipole antennas based on LT-GaAs and SI-GaAs:Cr for generation and detection of terahertz radiation, as vell as influence of the semiconductor base parameters to the emission and detection ability.

CC-P.5 TUE

Design of a THz-based Sub-100-fs Electron Source

•*S. Turnár*[1], *B. Kovács*[1], *J.A. Fülöp*[2,3], *G. Almási*[1,3], *J. Hebling*[1,2,3], *and Z. Tibai*[1]; [1]*Institute of Physics, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*

Electron bunch acceleration by focused THz pulses has been investigated in our numerical simulations. The post-acceleration and modulation of electron bunch by two pairs of focused THz pulses has also been investigated.

CC-P.6 TUE

Dual-lasing Channel of a High-Temperature Terahertz Quantum Cascade Laser

•*M.A. Kainz*[1,2], *S. Schönhuber*[1,2], *B. Limbacher*[1,2], *A.M. Andrews*[2,3], *H. Detz*[2,4], *G. Strasser*[2,3], *and K. Unterrainer*[1,2]; [1]*Photonics Institute, TU Wien, Vienna, Austria*; [2]*Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*; [3]*Institute of Solid State Electronics, TU Wien, Vienna, Austria*; [4]*Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic*

A high-temperature (T_{max} = 196 K) terahertz quantum cascade laser with to lasing channels at 3.4 THz and 3.8 THz is investigated. Temperature dependent mode switching at different operation points is presented.

CC-P.7 TUE

Polarization Characterization by the Longitudinal Component of a Focused Terahertz Field

•*X. Wang, Y. Shang, and Y. Zhang*; *Capital Normal University, Beijing, China*

Based on analyzing the longitudinal field of a converging terahertz wave, a polarization determination method is proposed. Utilizing the method, the arbitrary polarization state of a terahertz field can be identified in a single measurement.

CC-P.8 TUE

Active metasurface devices for terahertz wave front modulation

•*Y. Zhang, J. Guo, T. Wang, and X. Wang*; *Department of Physics, Capital Normal University, Beijing, China*

An approach for dynamically generating arbitrary wavefronts of a THz beam is proposed by creating metasurface structures through illuminating a silicon wafer with femtosecond laser. Experiments demonstrate the validity of the proposed method.

CC-P.9 TUE

Spatial Structure of Focused Modes of Terahertz Laser Resonator

A. Degtyarev[1], •*M. Dubinin*[2], *V. Maslov*[3], *and K. Muntean*[4]; [1]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [2]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [3]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [4]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*

For the first time, the physical features of the spatial-energy characteristics were established with moderate and sharp focusing in free space of radiation beams with different spatial polarization of the field.

CC-P.10 TUE

Ensuring the Robustness of Terahertz Ellipsometry by Bootstrapping

A. Degtyarev[1], •*M. Dubinin*[2], *V. Maslov*[3], *and K. Muntean*[4]; [1]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [2]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [3]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [4]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*

The non-parametric algorithm for processing a data array of photoelectric terahertz ellipsometry, which provides a significant reduction in the influence of anomalous data on the uncertainty of the measurement result, is presented.

CC-P.11 TUE

Chemical Sensing using Terahertz Time Domain Spectroscopy

•*K. Singh*[1], *A. Sengupta*[1], *and A. Bandyopadhyay*[2]; [1]*Department of Physics, Indian Institute of Technology Delhi, New Delhi, India*; [2]*DRDO-JATC, Indian Institute of Technology Delhi, New Delhi, India*

In this work, THz TDS has been used to systematically investigate the THz active rotational and vibrational modes present in chemicals like ethanol, acetone, glycerin and high energetic nitro-glycerin, in different forms.

CC-P.12 TUE

Optical pump-terahertz probe studies on silicon and organic solar cells

•*P. Han, X. Wang, T. Chen, H. Zhang, and Y. Zhang*; *Capital Normal University, Beijing, China*

Optical pump-terahertz probe measurements are performed to study the effects of surface nanostructure and additional acceptor materials on the ultrafast dynamical processes of photo-excited carries in silicon and organic solar cells, respectively.

CC-P.13 TUE

Cherenkov generation of wideband terahertz radiation using a sub-micron LiNbO3 slab waveguide

•*B. Carnio and A. Elezzabi*; *University of Alberta, Edmonton, Canada*

A sub-micron SiO2-LiNbO3-SiO2 slab waveguide is investigated for the generation of terahertz radiation, which is emitted as Cherenkov waves. The sub-wavelength LiNbO3 core minimizes phonon mode losses, allowing for the generation of wideband terahertz radiation.

CC-P.14 TUE

Numerical simulations of THz generation with two-color mid-infrared laser pulse and relative phase control

•*R. Flender*[1,2], *A. Borzsonyi*[1,2], *B. Kiss*[1], *and V. Chikan*[1,3]; [1]*ELI-ALPS, Szeged, Hungary*; [2]*University of Szeged, Szeged, Hungary*; [3]*Kansas State University, Manhattan, USA*

We examined in theory the THz generation from MIR two-color laser pulse induced gas plasma in the spectral range between 2.5μm and 4.0μm and the relative phase control with a single common thin plate.

CC-P.15 TUE

Theoretical investigation of the optimal nonlinear crystal thickness for THz generation from two-color laser pulse ionized gas under different laser pulse parameters

•*R. Flender*[1,2], *A. Borzsonyi*[1,2], *and V. Chikan*[1,3]; [1]*ELI-ALPS, Szeged, Hungary*; [2]*University of Szeged, Szeged, Hungary*; [3]*Kansas State University, Manhattan, USA*

We examined the nonlinear crystal thickness effect on the THz generation from two-color laser pulse induced gas plasma. It was found the at a given pulse parameters there is an optimal thickness.

CC-P.16 TUE

Surface-Field Terahertz Emission Enhancement via 2D-materials

•*L. Peters*[1], *J. Tunesi*[1], *S. Ogilvie*[2], *J.S. Totero Gongora*[1], *M. Large*[2], *A. Pasquazi*[1], *A. Dalton*[2], *and M. Peccianti*[1]; [1]*Emergent Photonics, University of Sussex, Brighton, United Kingdom*; [2]*Material Physics Group, University of Sussex, Brighton, United Kingdom*

We explore the role of graphene in the enhancement of surface Terahertz emission. Upon contact the surface-potential of the semiconductor is changed, resulting in an enhancement of the band-bending in proximity of the surface.

CC-P.17 TUE

Generation of Few- and Subcycle Radiation at Combination Frequencies of Ultrashort Multicolor Ionizing Laser Pulse

V. Kostin[1,2] *and* •*N. Vvedenskii*[1,2]; [1]*Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia*; [2]*University of Nizhny Novgorod, Nizhny Novgorod, Russia*

Ionization-induced generation of strong few- and subcycle radiation in a broad spectral range (from terahertz to ultraviolet) at combination frequencies during plasma

production by multicolor femtosecond pulses is studied analytically and numerically.

CC-P.18 TUE

THz Generation in Superlattice Multipliers

•*M. Fernandes Pereira and A. Apsotolakis*; *Institute of Physics of the Academy of Sciences of Czech Republic, Prague, Czech Republic*

This paper addresses power-conversion efficiency of harmonic generation in irradiated semiconductor superlattices. Good agreement is obtained for odd harmonics and the design of even harmonic output power by controlling the interface quality is demonstrated.

CC-P.19 TUE

THz Time-Domain Reflection Spectroscopy of $KTiOPO_4$

•*K.M. Mølster*[1,2], *H. Laurell*[3], *T. Sørgård*[4], *C. Canalias*[2], *V. Pasiskevicius*[2], *F. Laurell*[2], *and U. Österberg*[1,2]; [1]*Department of Electronic Systems, Norwegian University of Natural Science and Technology, Trondheim, Norway*; [2]*Department of Applied Physics, Royal Institute of Technology, KTH, Stockholm, Sweden*; [3]*Division of Atomic Physics at the Faculty of Engineering (LTH), Lund University, Lund, Sweden*; [4]*Department of Physics, Norwegian University of Science and Technology, Trondheim, Norway*

Time-domain reflection measurement of the frequency dependent absorption and refractive index of $KTiOPO_4$ between 0.5 to 7 THz is reported. The data show promise for the development of high-field THz sources and functional metasurfaces.

CC-P.20 TUE

Optically-Induced Dynamic Terahertz Metamaterials

•*J. Tunesi*[1], *L. Peters*[1], *J.S. Totero Gongora*[1,2], *A. Pasquazi*[1], *A. Fratalocchi*[2], *and M. Peccianti*[1]; [1]*Emergent Photonics Lab, University of Sussex, Brighton, United Kingdom*; [2]*PRIMALIGHT, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia*

Plasmonic metamaterials enable access to extremely nonlinear regimes with a broad array of applications. We experimentally investigate how a semiconducting nanostructure exhibits a controllable and dynamic plasmonic response upon photo-excitation by an external pump pulse.

CC-P.21 TUE

Novel self-referencing time-domain THz ellipsometer for measurement of samples in aqueous environments

S. Smith, E. Rohwer, and •*P. Neethling*; *Stellenbosch University, Stellenbosch, South Africa*

We demonstrate initial measurements from a novel, broadband self-referencing time domain THz ellipsometer for material characterization, enabling the measurement of samples in aqueous environments. We describe the setup and show proof of principle measurements.

CC-P.22 TUE

Semiconductors as Highly Efficient Single and Multicycle Terahertz Sources

•*G. Krizsán*[1,2], *N.M. Mbithi*[1,2], *G. Polónyi*[1,2], *G. Tóth*[1], *M. Mechler*[1], *J. Hebling*[1,2,4], *and J.A. Fülöp*[2,3,4]; [1]*University of Pécs, Pécs, Hungary*; [2]*Szentágothai Research Centre, Pécs, Hungary*; [3]*ELI-ALPS, Szeged, Hungary*; [4]*MTA-PTE High-Field Terahertz Research Groupe, Pécs, Hungary*

We will discuss the prospects and design of semiconductor terahertz sources pumped beyond the three-photon absorption wavelength including optimal pumping, phase-matching condition and contact-grating designs for single and multicycle THz pulse generation.

CC-P.23 TUE

CW Terahertz Laser Emitting Beams with Azimuthal Polarization

O. Gurin[1], •*M. Dubinin*[2], *M. Legenkiy*[3], *V. Ryabykh*[4], *and V. Senyuta*[5]; [1]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [2]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [3]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [4]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*; [5]*V. N. Karazin Kharkiv National University, Kharkiv , Ukraine*

We report about azimuthal polarized laser beams in cw operation generating by integrating polarization-selective diffraction gratings as reflective large-scale or partly transmissive small-scale mirrors in an optically pumped waveguide HCOOH laser setup.

CC-P.24 TUE

Generation of ellipsoidal laser pulses with periodic intensity modulation for photoinjectors

•*I. Kuzmin*[1], *E. Gacheva*[1], *S. Mironov*[1], *A. Potemkin*[1], *E. Khazanov*[1], *M. Krasilnikov*[2], *and F. Stephan*[2]; [1]*Federal Research Center Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [2]*Deutsches Elektronen-Synchrotron, Zeuthen, Germany*

The possibility of generation of ellipsoidal laser pulses with periodic intensity modulation is demonstrated. Modulation of the laser pulses is performed by a spatial light modulator (SLM).

CC-P.25 TUE

Single-layered Metasurfaces as Spectrally Tunable Terahertz Half- and Quarter-waveplates

•*W.T. Kim*[1], *S. Lee*[2,4], *J.-H. Kang*[3], *B.J. Kang*[1], *Q.-H. Park*[2], *and F. Rotermund*[1]; [1]*Department of Physics, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea*; [2]*Department of Physics, Korea University, Seoul, South Korea*; [3]*Department of Physics and Astronomy, Seoul national University, Seoul, South Korea*; [4]*Department of Mechnical engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea*

We proposed single-layered metasurfaces as spectrally tunable terahertz (THz) half- and quarter-waveplates, in which the phase retardation and the spectral tunability can be controlled by tight coupling of the elementary ring resonators.

CC-P.26 TUE

THz Based Electron Acceleration Using the Combination of Metallic Horn-gun and Dielectric Laser Accelerator

•*B. Kovács*[1], *S. Turnár*[1], *J.A. Fülöp*[2,3], *G. Almási*[1,3], *J. Hebling*[1,2,3], *and Z. Tibai*[1]; [1]*Institute of Physics, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*

We simulate a THz pulse driven accelerator setup combining metallic horn-gun and dielectric structure. Applying 2x1 mJ THz energy we can achieve 20% energy gain from 1 MeV initial energy in case of one electron.

CC-P.27 TUE

Spurious-Free THz Frequency Measurement Using Modulator-Based Optical Comb Source

•*I. Morohashi, N. Sekine, A. Kasamatsu, and I. Hosako*; *National Institute of Information and Communications Technology, Tokyo, Japan*

we report on comparison of detection bandwidths in the THz frequency measurement between two cases: one is using a Mach-Zehnder-modulator-based flat comb generator and the other is using a mode-locked fiber laser.

CC-P.28 TUE

Frequency-domain terahertz spectrometer based on a comb-locked optical synthesizer

•*J. Robinson-Tait, Y. Mayzlin, K. Dutzi, R. Wilk, and T. Puppe*; *TOPTICA Photonics AG, Gräfelfing, Germany*

The optical synthesizer consist of a tuneable laser phase-locked to a frequency-shifting comb spectrum. Combined with a fixed laser it produces comb-referenced difference frequencies 0-3 THz at scan-rates >300 GHz/s driving a high-precision frequency-domain terahertz spectrometer.

CC-P.29 TUE

Terahertz Time-Domain Spectroscopy of healthy and carious dental tissues

D. Lopes[1,2], *W. Souza*[3,4], *R. Araujo* [4], *and* •*A. Gomes*[1,5]; [1]*Graduate Program in Dentistry, Federal University of Pernambuco, Recife, Brazil*; [2]*University of Pernambuco, Arcoverde Campus, Arcoverde, Brazil*; [3]*Federal Institute of Education, Science and Technology of Sertão Pernambucano, Salgueiro, Brazil*; [4]*Laboratory of Biomedical Optics and Imaging, Federal University of Pernambuco, Recife , Brazil*; [5]*Department of Physics, Federal University of Pernambuco, Recife, Brazil*

Healthy and carious human teeth samples were evaluated using Terahertz Time-Domain Spectroscopy system, in a transmission mode setup. Absorption coefficient and the refractive index of dry and wet samples were determined.

CC-P.30 TUE

Terahertz generation setups using segmented tilted-pulse-front excitation

G. Tóth[1], *L. Pálfalvi*[1], *J.A. Fülöp*[2,3,4], *L. Tokodi*[1], *G. Krizsán*[1,3], *N.H. Matlis*[5], *G. Almási*[1,3], *and* •*J. Hebling*[1,2,3]; [1]*Institute of Physics, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*; [4]*ELI-ALPS, ELI-Hu Nonprofit Ltd., Szeged, Hungary*; [5]*Center for Free-Electron Laser Science, Deutsches Elektronen Synchrotron, Hamburg, Germany*

Nonlinear-echellon-slab based energy scalable lithium-niobate terahertz sources were simulated. These sources generate mJ-level THz pulses with excellent beam quality. The efficiency of both the plane-parallel and the imaging-free configurations make possible overcoming earlier serious limitations.

CC-P.31 TUE

Design of a Waveguide Structure-based Electron Source Using THz Pulses

•*S. Turnár*[1], *B. Kovács*[1], *J.A. Fülöp*[2,3], *G. Almási*[1,3], *J. Hebling*[1,2,3], *and Z. Tibai*[1]; [1]*Institute of Physics, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*

We propose an electron acceleration setup for producing ultrashort (100 fs) electron bunches using single-cycle THz pulses. We show that THz pulses with around 100 μJ energy are sufficient to generate relativistic electron bunches.

CC-P.32 TUE

Terahertz Supercontinuum in the Biatomic Photonic Crystal Fiber

V. Kumar, •*R. Varshney, and S. Kumar*; *Indian Institute of Technology Delhi, Delhi, India*

We have reported generation of Terahertz supercontinuum in the photonic crystal fibers. We consider two de-

sign configurations and shown that efficient supercontinuum can be produced with radially biatomic photonic crystal fibers.

CC-P.33 TUE

Terahertz for Non-Destructive Quality Control of Laser Assisted Plastics-Metal Joints

•*D. Nguyen*[1], *A. Henrottin*[2], *J. Patars*[2], *and Y. Hernandez*[1]; [1]*Multitel A.S.B.L, Mons, Belgium*; [2]*Lasea S.A, Liège, Belgium*

Hybrid plastic-metal joint is the structures of choice for reducing energy consumption. Its fabrication process involves a large number of steps. This paper presents THz application for quality control of Lasers assisted plastics-metal joining products.

CC-P.34 TUE

Single-shot Measurement of THz pulses at Megahertz Rates Using Photonic Time-Stretch

E. Roussel[1], •*C. Szwaj*[1], *C. Evain*[1], *M. Le Parquier*[1], *S. Bielawski*[1], *T. Jiang*[2,3], *C. Lonappan*[2], *and B. Jalali*[2]; [1]*PhLAM, UMR CNRS 8523, Lille University, Villeneuve d'Ascq, France*; [2]*1. Department of Electrical and Computer Engineering, University of California, Los Angeles, USA*; [3]*State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, Beijing, China*

We present a method allowing THz pulses to be recorded in single-shot at tens of MHz repetition rates and long record lengths, using a combination of the time-stretch data acquisition and electro-optic sampling techniques.

CC-P.35 TUE

High-Transmittance 2 Pi Electrically Tunable Terahertz Phase Shifter Based on Silicon Electrodes

•*C.-S. Yang*[1], *H.-W. Zhang*[2], *C.-T. Wang*[2], *T.-H. Lin*[2], *and C.-K. Lee*[2]; [1] *Institute of Electo-Optical Science and Technology, National Taiwan Normal University, Taipei, Taiwan*; [2]*Department of Photonics, National Sun Yet-sen University, Kaohsiung, Taiwan*

By applying Si as substrates, the electrically controlled 2 Pi THz phase shifter was demonstrated.This is the first time that Si can be used to fabricate THz phase shifter without transparent conductive film as electrodes.

CC-P.36 TUE

Intense Broadband Terahertz Generation from Organic Crystal and Near Infrared Pump

•*L. Zhang*[1], *H. Zhao*[2], *Y. Zhang*[1], *G. Steinfeld*[3], *C. Zhang*[1], *and M. Shalaby*[1]; [1]*Key Laboratory of Terahertz Optoelectronics, Beijing Advanced Innovation Center for Imaging Technology CNU, Beijing, China*; [2]*Beijing Key Laboratory for Precision Optoelectronic Measurement Instrument and Technology, School of Optics and Photonics, Beijing Institute of Technology, Beijing, China*; [3]*Swiss Terahertz Research-Zurich, Technopark , Zurich, Switzerland*

We used BNA organic crystal for THz generation. We found that using pump wavelength in the 1150-1250 leads to very broad spectrum (up to 7 THz) which ideally suits generation upscaling with Cr.Frosterite lasers.

CC-P.37 TUE

Broadband Terahertz Generation from Mid-Infrared 3.9 μm OPCPA and Organic Crystals

•*C. Gollner*[1], *E. Kaksis*[1], *C. Brodeur*[2], *V. Shumakova*[1], *A. Baltuska*[1,3], *A. Pugzlys*[1,3], *and M. Shalaby*[2,4]; [1]*Photonics Institute, Vienna, Austria*; [2]*Swiss Terahertz Research-Zurich, Zurich, Switzerland*; [3]*Center for Physical Sciences & Technology, Vilnius, Lithuania*; [4]*Key Lab. of Terahertz Optoelectronics, Beijing, China*

We report on broadband terahertz generation using organic crystals pumped by an OPCPA at 3.9 μm. Compared to conventional pump schemes, we found an order of magnitude increase in the damage and optical-THz conversion saturation thresholds

CC-P.38 TUE

Low-voltage tuning of the terahertz passband transmission using a tungsten-doped VO2-based metamaterial

•*S.-P. Han*[1], *J.-H. Shin*[2], *M. Song*[1], *S. Kim*[1], *and M. Song*[1]; [1]*Electronics and Telecommunications Research Institute, Daejeon, South Korea*; [2]*Kyungpook National University, Daegu, South Korea*

We demonstrate that the 1.2 at.% W-doped VO2 thin film-based square-loop metamaterial can precisely control and continuously tune the amplitude in the range of 0.3–0.6 THz at low voltages below 2 V.

CC-P.39 TUE

Ultra-Thin Terahertz Spatial Phase Modulator Based on Metamaterial-Enhanced Liquid-Crystal Cell

•*O. Buchnev*[1], *N. Podoliak*[1], *K. Kaltenecker*[2], *M. Walther*[3], *M. Kaczmarek*[1], *and V. Fedotov*[1]; [1]*University of Southampton, Southampton, United Kingdom*; [2]*Technical University of Denmark, Lyngby, Denmark*; [3]*University of Freiburg, Freiburg, Germany*

We demonstrate experimentally a thin THz spatial phase modulator based on planar metamaterials hybridysed with a liquid-crystal cell. Our approach enables a new family of LC-enabled compact THz devices for efficient control of THz wavefronts.

13:00 – 14:00

CG-P: CG Poster session

CG-P.1 TUE

High efficiency, high energy few-cycle driver at 1μm

•*F. Guichard*[1], *L. Lavenu*[1], *M. Natile*[1], *X. Délen*[2], *Y. Zaouter*[1], *M. Hanna*[2], *and P. Georges*[2]; [1]*Amplitude Laser Group, Pessac, France*; [2]*Laboratoire Charles Fabry, Palaiseau, France*

We demonstrate a hybrid dual-stage nonlinear compression scheme allowing to compress 330 fs-pulses generated from a high-energy fiber amplifier down to 6.8 fs pulse duration, with an overall transmission of 61%.

CG-P.2 TUE

Multi-Scale Symmetries and Selection Rules in High Harmonic Generation

•*G. Lerner*[1], *L. Hareli*[2], *G. Shoulga*[2], *O. Neufeld*[1], *E. Bordo*[1], *A. Bahabad*[2], *and O. Cohen*[2]; [1]*Physics Department and Solid State Institute, Technion – Israel Institute of Technology, Haifa, Israel*; [2]*Department of Physical Electronics, School of Electrical Engineering, Tel-Aviv University, Tel-Aviv, Israel*

We formulate a general theory and demonstrate experimentally selection rules by multi-scale dynamical symmetries, involving both microscopic and macroscopic symmetries. This theory is applicable to harmonic generation of polychromatic, twisted, vector beams in structured media.

CG-P.3 TUE

Multiple plate continuum and dispersion compensation driven by optical parametric chirp pulse amplifier at 1.55 μm

•*C.-L. Tsai*[1], *Y.-H. Tseng*[1], *A.-Y. Liang*[1], *J.-Y. Guo*[1], *M.-W. Lin*[2], *S.-D. Yang*[1], *and M.-C. Chen*[1]; [1]*Institute of Photonics and Technologies, National Tsing Hua University, Hsinchu, Taiwan*; [2]*Institute of Nuclear Engineering and Science, National Tsing Hua University, Hsinchu, Taiwan*

We demonstrate multiple plate continuum (MPC) and dispersion compensation at 1.55 μm by using a home-built optical parametric chirp pulse amplifier. To the best of knowledge, it is the first MPC compression at 1.55 μm.

CG-P.4 TUE

VEGA Petawatt laser: influence of large Ti:Sapphire crystal quality in final laser energy distribution

•*C. Méndez, E. García, O. Varela, I. Hernández, J.D. Pisonero, J. García, J.L. Sagredo, M. Olivar, and L. Roso*; *Centro de Láseres Pulsados, Villamayor / Salamanca, Spain*

Beam profile modulation due to inhomogeneous large Ti:Sapphire doping is a key element for safely operating PW infrastructures. In this work we analyze profile amplification results obtained using different crystals' combination in VEGA3 Petawatt amplifier.

CG-P.5 TUE

VEGA Petawatt laser facility: current system capabilities and near future beamlines management

•*C. Méndez, O. Varela, I. Hernández, J.D. Pisonero, E. García, J. García, J.L. Sagredo, M. Olivar, and L. Roso*; *Centro de Láseres Pulsados, Villamayor / Salamanca, Spain*

A detailed description of VEGA user laser facility at the CLPU laser Centre in Spain together with key parameters for efficient and reproducible performance are presented. Highlights for future laser outputs reorganization are also addressed

CG-P.6 TUE

Usage of the Hartemann-Kerman Theory to Describe Nonlinear Photon-Photon Interactions in a GeV Photon Collider

•*H. Nieto-Chaupis*; *Universidad de Ciencias y Humanidades, Lima, PERU*

We describe photon-photon cross sections inside of the Hartemann-Kerman theory to perform predictions in a photon collider working in the high intensity scale and GeV scale.

CG-P.7 TUE

Forced Quantization and Possible Misinterpretation of the Dirac-Delta Function in Intense-Field Electrodynamics

•*H. Nieto-Chaupis*; *Universidad de Ciencia y Humanidades, Lima, PERU*

We demonstrate that the interpretation of field quantization in the argument of the Dirac-delta function is also obtained in fully classical electrodynamics. As example we take the the classic Compton Scattering through the Hartemann-Kerman formalism.

CG-P.8 TUE

Commissioning of the 3-PW, 1Hz ATLAS-3000 Ti:Sa laser at the Centre for Advanced Laser Application (CALA), Garching

•*S. Karsch*[1,2], *H. Ding*[1], *L. Doyle*[1], *M. Förster*[1], *J. Gebhardt*[1], *M. Giljohann*[1], *J. Götzfried*[1], *D. Haffa*[1], *J. Hartmann*[1], *O. Jahn*[1], *F. Krausz*[1,2], *G. Schilling*[1], *S. Schindler*[1], *M. Speicher*[1], *and J. Schreiber*[1]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Inst. f. Quantenoptik, Garching, Germany*

We present the status of Germany's most powerful high-intensity laser system ATLAS-3000, which is currently under commissioning the the Centre for Advanced Laser Applications (CALA).We will give performance data, and depending on the commissioning status, also present first application results.

CG-P.9 TUE

Tailoring caustics in high-harmonic generation with phase-controlled multi-colour fields

•*S. Mitra*[1,2], *S. Biswas*[1,2], *J. Schötz*[1,2], *B. Förg*[1,2], *W. Okell*[1,2], *G.A. Kavuri*[3], *M. Högner*[1,2], *I. Pupeza*[1], *P. Wnuk*[1,2], *and M.F. Kling*[1,2]; [1]*Max-Planck-Institute of Quantum Optics, Garching, Germany*; [2]*Department of Physics, Ludwig-Maximilians-University, Garching, Germany*; [3]*Indian Instititue of Science, Bangalore, India*

Strong modulation in the spectral density of neon's high harmonic spectra are experimentally observed, being driven by strongly shaped two-colour laser fields. They reveal intricate interference features that are not observed in the existing literature.

CG-P.10 TUE

Filamentation-Based Transient Dynamic Studies via Third-Harmonic Generation in Gases

•*C. Jusko*[1,2], *L. Shi*[1,2], *A. Sridhar*[1,2], *E. Appi*[1,2], *U. Morgner*[1,2,3,4], *and M. Kovacev*[1,2]; [1]*Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (PhotonicsOptics, and Engineering – Innovation Across Disciplines), Hannover, Germany*; [3]*Laser Zentrum Hannover e.V., Hannover, Germany*; [4]*Hannoversches Zentrum für Optische Technologien, Leibniz Universität Hannover, Hannover, Germany*

We present a new experimental scheme which is able to measure ultrafast plasma-related dynamics in the temporal and spectral domain. We report on new findings about plasma evolution after the strong field interaction.

CG-P.11 TUE

Low noise tunable integrated semiconductor laser: dynamic instability and route to single frequency operation

B. Chomet[1], *M. Seghilani*[1], *M. Myara*[1], *S. Blin*[1], *G. Beaudoin*[2], *L. Legratiet*[2], *I. Sagnes*[2], *L. Ferrieres*[3], *V. Lecocq*[3], *S. Denet*[3], *P. Lalanne*[4], *and* •*A. Garnache*[1]; [1]*IES CNRS, Univ. Montpellier, Montpellier, France*; [2]*C2N CNRS, Marcoussis, France*; [3]*INNOPTICS SAS, Talence, France*; [4]*LP2N - IOGS, Talence, France*

We report on industry ready packaged tunable low noise single frequency VECSEL. Flat photonics technology allows emission of new coherent light states. A fundamental study of the non-linear multimode laser dynamics showed the route to robust single mode operation

CG-P.12 TUE

Imaging the Natural and Laser-Controlled Non-Adiabatic Dynamics at the $^2A_1/^2B_2$ Conical Intersection of NO_2

•*M. Richter*[1,2], *J. González-Vázquez*[1], *Z. Masin*[2], *D.S. Brambila*[2], *A.G. Harvey*[2], *F. Morales*[2], *and F. Martín*[1]; [1]*Departamento de Química, Módulo 13, Universidad Autónoma de Madrid, Madrid, Spain*; [2]*Max-Born-Institut, Berlin, Germany*

We show that time-/energy-resolved anisotropy parameters of photoelectron angular distributions provide a clear mapping of both the ultrafast natural dynamics at the conical intersection of NO_2 and its modifications induced by an ultrashort control pulse.

CG-P.13 TUE

Attosecond soft x-ray beamline for dispersive absorption spectroscopy of solid-state systems

•*D.E. Rivas*[1,2], *N. Di Palo*[1], *T.P.H. Sidiropoulos*[1], *S. Severino*[1], *M. Reduzzi*[1], *T. Danz*[3], *M. Valdivares*[4], *P. Gargiani*[4], *E. Pellegrin*[4], *and J. Biegert*[1,5]; [1]*ICFO - The Institute of Photonic Sciences, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain*; [2]*European XFEL GmbH, Schenefeld, Germany*; [3]*4th Physical Institute - Solids and Nanostructures, University of Göttingen, Göttingen,, Germany*; [4]*ALBA synchrotron, Cerdanyola del Vallés (Barcelona), Spain*; [5]*ICREA, Barcelona, Spain*

In this work we explore the capabilities of a soft x-ray attosecond beamline for time-resolved absorption spectroscopy of condensed matter. We provide novel examples of static and time-resolved measurements with signal levels on the few-percent.

CG-P.14 TUE

Photoelectron Circular Dichroism at the Few-cycle Limit in the Tunnel Ionization Regime

•*V. Hanus, S. Kangaparambil , M. Kirchner , S. Larimian , X. Xie , A. Baltuska , and M. Kitzler* ; *1. Photonics Institute, Technische Universität Wien, Wien, Austria*

Dependence of photoelectron circular dichroism parameter on the electron energy was demonstrated for two intensity regimes. This can be manifestation of scattering of electron trajectories on chiral potential as expected in the tunnel ionization regime.

CG-P.15 TUE

Reducing spectral fluctuations of high-harmonics with indirect balanced detection scheme

•*M. Volkov, J. Pupeikis, C.R. Phillips, F. Schlaepfer, L. Gallmann, and U. Keller*; *Department of Physics, ETH Zurich, Zurich, Switzerland*

We demonstrate a new technique for improving signal-to-noise ratio in attosecond spectroscopy, which is analogous to balanced detection. Further, we identify the microscopic mechanisms that couple fluctuations of the laser intensity with its high-harmonic spectra.

CG-P.16 TUE

Chirped pulse parametric amplifier producing 5-TW, 2.1-cycle, CEP-stable pulses at 1 kHz repetition rate

•*T. Stanislauskas*[1], *I. Balčiūnas*[1], *R. Budriūnas*[1], *G. Veitas*[1], *D. Gadonas*[1], *J. Adamonis*[2], *A. Michailovas*[2], *A. Börzsönyi*[3], *S. Tóth*[3], *J. Csontos*[3], *and K. Osvay*[3]; [1]*Light Conversion Ltd., Vilnius, Lithuania*; [2]*Ekspla Ltd., Vilnius, Lithuania*; [3]*ELI-ALPS, Szeged, Hungary*

We demonstrate a high peak- and average- power OPCPA system producing 2.1-cycle pulses at 875nm. Short pulse duration is achieved by using amplification stages with different nonlinear crystals and different noncollinearity and phase matching angles.

CG-P.17 TUE

Efficient excitation and control of atomic systems with unipolar half-cycle XUV attosecond pulses

•*R. Arkhipov*[1,2], *A. Pakhomov*[2], *M. Arkhipov*[1,2], *I. Babushkin*[3,4,5], *A. Demircan*[3,4], *U. Morgner*[3,4], *and N. Rosanov*[2,6,7]; [1]*St. Petersburg State University, St. Petersburg, Russia*; [2]*ITMO University, St. Petersburg, Russia*; [3]*Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany*; [4]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany*; [5]*Max Born Institute, Berlin, Germany*; [6]*Vavilov State Optical Institute, St. Petersburg, Russia*; [7]*Ioffe Institute, St. Petersburg, Russia*

Based on solution of TDSE interaction of half-cycle attosecond pulse with quantum systems is studied. Level populations are governed by electric pulse area. Quasi-unipolar pulse provide effective nonresonant excitation with respect to bipolar single-cycle pulses.

CG-P.18 TUE

Two-Color High-Harmonic Spectroscopy of Liquids

•*Z. Yin, T.T. Luu, and H.J. Wörner*; *ETH Zürich, Zürich, Switzerland*

In this work we report on two color HHG measurements of bio-relevant solvants and aqueous solutions in the liquid phase. Our results shows distinctivly different HHG behavior for liquids compared to the gas counterpart.

CG-P.19 TUE

Nanophotonics in the Relativistic Realm

•*L. Veisz*[1,2], *D. Cardenas*[2,3], *L. Di Lucchio*[4], *T. Ostermayr*[2,3], *L. Hofmann*[2,3], *M. Kling*[2,3], *J. Schreiber*[2,3], *and P. Gibbon*[4,5]; [1]*Department of Physics, Umea University, Umea, Sweden*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [3]*Ludwig-Maximilian-Universität München, Garching, Germany*; [4]*Forschungszentrum Jülich GmbH, Jülich Supercomputing Centre, Jülich , Germany*; [5]*Department of Mathematics, KU Leuven, Heverlee, Belgium*

We generate multi-MeV energy electron beams via the interaction of sub-5-fs ultra-relativistic laser pulses with nanometer-sized targets. We demonstrate acceleration with the strongest electric fields beyond TV/m, waveform dependent electron parameters, and vacuum laser acceleration.

CG-P.20 TUE

CPA-free high repetition rate few-cycle OPCPA

•*T. Binhammer*[1], *O. Puncken*[1], *B. Schulz*[1], *S. Rausch*[1], *M. Frede*[1], *and U. Morgner*[2,3]; [1]*Neolase GmbH, Hannover, Germany*; [2]*Institut für Quantenoptik, Universität Hannover, Hannover, Germany*; [3]*Cluster of Excellence PhoenixD , Hannover, Germany*

We present a compact few-cycle CPA-free OPCPA system using a newly developed Yb:YAG solid-state amplifier as pump source which delivers an average power > 50 W and a pulse duration of < 600 fs.

CG-P.21 TUE

High-Harmonic Probe for Relativistic Laser–Matter Interactions Driven by Ultrashort Pulses in the Mid-Infrared

D.A. Sidorov-Biryukov[1,2,4], •*A.V. Mitrofanov*[1,2,4,5], *E.A. Stepanov*[1,2], *A.A. Voronin*[1,2], *M.V. Rozhko*[1,2], *P.B. Glek*[1], *S.V. Ryabchuk*[2], *A. Shutov*[2,3], *A.B. Fedotov*[1,2], *and A.M. Zheltikov*[1,2,3,4]; [1]*Physics Department, International Laser Center, M.V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Russian Quantum Center, Skolkovo, Moscow region, Russia*; [3]*Department of Physics and Astronomy, Texas A&M University, College Station TX , USA*; [4]*National Research Center "Kurchatov Institute", Moscow, Russia*; [5]*Institute on Laser and Information Technologies, Branch of Federal Scientific Research Center "Crystallography and Photonics", Russian Academy of Science, Shatura, Moscow region, Russia*

High-order harmonics generated by relativistic-intensity ultrashort pulses in the mid-infrared are shown to provide a sensitive probe for relativistic laser–matter interactions driven by these pulses, suggesting the routes toward new regimes of relativistic optics.

CG-P.22 TUE

Modeling femtosecond laser-induced electron dynamics in dielectrics by means of Optical Bloch Equations

•*E. Smetanina*[1,2], *P. Gonzalez de Alaiza Martinez*[1], *I. Thiele*[1,3], *B. Chimier*[1], *A. Bourgeade*[1], *and G. Duchateau*[1]; [1]*University of Bordeaux - CNRS - CEA, Centre Lasers Intenses et Applications, UMR 5107, 33405,*

Talence, France; [2]*Department of Physics, University of Gothenburg, SE-412 96, Göteborg, Sweden*; [3]*Department of Physics, Chalmers University of Technology, SE-412 , Göteborg, Sweden*
We develop an Optical Bloch Equations-based model of laser matter-interaction which includes field-induced ionization, impact ionization and relaxation processes in dielectrics. The model is applied to describe the electron dynamics induced by intense femtosecond pulses.

CG-P.23 TUE

Light-waveform-sensitive multiphoton absorption in solids

M. Qasim [1] *and* •*V.S. Yakovlev*[1,2]; [1]*Max-Planck-Institut für Quantenoptik, Garching b. Muenchen, Germany*; [2]*Ludwig-Maximilians-Universität, Munich, Germany*
Studying how strong-field absorption of few-cycle laser pulses in a transparent solid depends on the carrier-envelope phase, we observed unexpected interference patterns, which reveal interference between carrier-injection events within neighboring half-cycles of the optical field.

CG-P.24 TUE

Theoretical Investigation of Resonant High-Harmonic Generation in Transition Metal Plasma

I.S. Wahyutama[1], *T. Sato*[1,2,3], *and* •*K.L. Ishikawa*[1,2,3]; [1]*Department of Nuclear Engineering and Management, School of Engineering, The University of Tokyo, Tokyo, Japan*; [2]*Photon Science Center, School of Engineering, The University of Tokyo, Tokyo, Japan*; [3]*Research Institute for Photon Science and Laser Technology, The University of Tokyo, Tokyo, Japan*
We theoretically investigate resonant HHG using TD-CASSCF and TD-ORMAS methods on manganese plasma. We successfully reproduce the enhancement at 51 eV and find that the enhancement is a result of constructive interference between 3p-3d transitions.

CG-P.25 TUE

Angularly Resolved RABBITT at 2ω : Attosecond Pulses Measurement & Attosecond Signature in the 1s3p Resonance of Helium

•*V. Loriot, A. Marciniak, G. Karras, M. Hervé, A. Scognamiglio, E. Constant, and F. Lépine*; *Institute of Light and Matter, Lyon, France*
Angularly resolved RABBITT method dressed by a 2ω field provides a similar information as the original RABBITT method. The attosecond pulse train is measured and macroscopic effects around the 1s3p resonance of Helium are highlighted.

CG-P.26 TUE

High-Harmonic Generation from Crystalline Solids under Carrier Envelope Phase Controlled Pulse

•*Y. Shinohara*[1], *S. Yamamura*[2], *and K.L. Ishikawa*[1,3]; [1]*School of engineering, the University of Tokyo, Tokyo, Japan*; [2]*Faculty of engineering, The University of Tokyo, Tokyo, Japan*; [3]*Research Institute for Photon Science and Laser Technology, The University of Tokyo, Tokyo, Japan*
We study carrier-envelope-phase dependent high-harmonic spectra by solving the time-dependent Schrödinger equation for a one-dimensional model crystal. A trajectory analysis in the momentum space explains the spectral features from field shapes and the band structure.

CG-P.27 TUE

Quasi-Phase Matching in High Harmonic Generation Using Structured Plasmas

M. Wöstmann[1], *V. Kärcher*[1], *and* •*H. Zacharias*[1,2]; [1]*Center for Nanotechnology, Münster, Germany*; [2]*Center for Soft Nanoscience, Münster, Germany*
Quasi-phase matching in high harmonic generation is controlled by carefully adjusting the structure of a laser-produced plasma. Thereby phase-matching is tailored for different regions of the harmonic spectrum with the overall efficiency optimized.

CG-P.28 TUE

Strong-field-driven dynamics and high-harmonic generation in interacting 1D systems

•*S. de Vega*[1], *J.D. Cox*[1], *F. Sols*[2], *and F.J. García de Abajo*[1,3]; [1]*ICFO - Institut de Ciencies Fotoniques, Castelldefels, Spain*; [2]*Departamento de Física de Materiales, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, Madrid, Spain*; [3]*ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*
We elucidate the roles of electronic structure and collective excitations in the optical response of linear atomic chains driven by intense optical fields, emphasizing extreme optical nonlinearities associated with high-harmonic generation.

CG-P.29 TUE

Decryption of harmonics: how spectral interferometry reveals the structure of XUV pulse trains

•*D. Kormin*[1,2], *G. Ma*[3,4], *I. Földes*[5], *and L. Veisz*[2,6]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [3]*Shenzhen SoC Key Laboratory, Peking University Shenzhen Institute & PKU-HKUST Shenzhen-Hong Kong Institution, Shenzhen, China*; [4]*Center for Free-Electron Laser Science, DESY, Hamburg, Germany*; [5]*Wigner Research Centre for Physics, Hungarian Academy of Sciences, Budapest, Hungary*; [6]*Department of Physics, Umeå University, Umeå, Sweden*
We apply a modified spectral interferometry method to high-order harmonics generated from relativistic solid surfaces. This procedure identifies isolated attosecond pulses for the first time from relativistic plasmas and provides information about their generation mechanism.

CG-P.30 TUE

High vacuum compatible wave front sensor for focal spot diagnostics and optimization

•*I. Doudet*[1], *B. Wattellier*[1], *and L. Meignien*[2]; [1]*Phasics, Saint-Aubin, France*; [2]*Luli, Palaiseau, France*
Experiments done on laser facilities require to characterize and optimize the laser at the target level as close as possible than final environmental conditions. For this, we developed a high vacuum compatible wave front sensor.

CG-P.31 TUE

Polarization control of high-harmonic pulses generated in gapless graphene

•*R. Boyero-Garcia*[1], *O. Zurron-Cifuentes*[1], *C. Hernandez-Garcia*[1], *A. Picon*[2], *and L. Plaja*[1]; [1]*University of Salamanca, Salamanca, Spain*; [2]*Universidad Autonoma de Madrid, Madrid, Spain*
We disentangle the photon-spin conversion rules of high harmonic generation in single-layer graphene, showing a novel control of the polarization of high-order harmonics with rather simple configurations, driven by linear-to-eliptically polarized infrared pulses.

CG-P.32 TUE

Real-Time Observation of Electron and Nuclear Dynamics in Nitric Oxide with High Harmonics in the Water Window

•*N. Saito, H. Sannohe, N. Ishii, T. Kanai, and J. Itatani*; *the Institute for Solid State Physics, the University of Tokyo, Kashiwa, Chiba, Japan*
We report on time-resolved soft X-ray absorption spectroscopy of nitric oxide using high harmonics in the water window. Both electron and nuclear dynamics are imprinted in the observed absorption spectra.

CG-P.33 TUE

Optical lasing during laser filamentation in the Nitrogen molecular ion: ro-vibrational inversion

•*F. Morales*[1], *M. Lytova*[2], *M. Spanner*[2], *M. Richter*[1], *O. Smirnova*[1], *and M. Ivanov*[1,3]; [1]*Max-Born-Institut, Berlin, Germany*; [2]*National Research Council of Canada, Ottawa, Canada*; [3]*Blackett Laboratory, Imperial College London, London, United Kingdom*
We present a theoretical study of the mechanisms that lead to lasing of filaments in air at the 391 nm and 428 nm lines (nitrogen ion), based on the interplay of several physical effects.

CG-P.34 TUE

Simple route to enhancement of soft X-ray high harmonic generation sources

•*B. Bruner*[1], *T. Arusi-Parpar*[1,2], *M. Krüger*[1], *and N. Dudovich*[1]; [1]*Weizmann Institute of Science, Rehovot, Israel*; [2]*NRC Soreq, Yavne, Israel*
We demonstrate up to two orders of magnitude enhancements in high harmonic generation efficiency in the soft x-ray region. The enhancement spans over a 250 eV bandwidth with pulse energies reaching the pJ level.

CG-P.35 TUE

Single-shot Carrier-envelope Phase (CEP) Measurements and the Focal Phase Effect in Strong-field Ionization

•*Y. Zhang*[1,2], *D. Zille*[1,2], *D. Hoff*[1,2], *P. Wustelt*[1,2], *S. Skruszewicz*[1,2], *A.M. Sayler*[1,2], *and G.G. Paulus*[1,2]; [1]*Institute of Optics and Quantum Electronics, Jena, Germany*; [2]*Helmholtz Institute Jena, Jena, Germany*
We demonstrate significant phase averaging effects in strong-field ionization due to the focal phase of few-cycle pulses. This is of practical relevance for pulse duration measurement with a carrier-envelope phasemeter(CEPM).

13:00 – 14:00

EE-P: EE Poster Session

EE-P.1 TUE

Extreme events generation via cascaded stimulated Brillouin scattering in self-pulsing fiber lasers

•*D. Boukhaoui*[1], *D. Mallek*[1], *H. Kellou*[1], *H. Leblond*[2], *F. Sanchez*[2], *T. Godin*[3], *and A. Hideur*[3]; [1]*Laboratoire d'Electronique Quantique, Université H. Boumediene, Alger, Algeria*; [2]*Laboratoire de Photonique d'Angers, Université d'Angers, Angers, France*; [3]*CORIA, CNRS-INSA-Université de Rouen Normandie, Rouen, France*

We propose a numerical model for self-pulsing fiber lasers taking into account the effect of cascaded stimulated Brillouin scattering and we study their impact on the dynamics, which exhibits extreme behaviors.

EE-P.2 TUE

Ion Energy and Charge State Distribution in Pico- and Femtosecond Laser-produced Plasmas

•*T. de Faria Pinto*[1,2], *A. Bayerle*[1], *J. Matthijssen*[1,2], *D. Kurilovich*[1,2], *A. Stodolna*[1,2], *O. Versolato*[1], *K. Eikema*[1,2], *and S. Witte*[1,2]; [1]*Advanced Research Centre for Nanolithography, Amsterdam, Netherlands*; [2]*Vrije Universiteit, Amsterdam, Netherlands*

We present our latest results on ion distributions and droplet deformation of tin micro-droplets irradiated by a high-energy ultrafast mid-infrared OPCPA system. This work provides insight into the initial stages of laser-produced plasma formation.

EE-P.3 TUE

Efficient ultrafast THz modulators based on negative photoconductivity in controllably doped carbon nanotubes

•*M. Burdanova*[1], *A. Tsapenko*[2], *D. Satco*[2], *R. Kashtiban*[1], *C. Mosley*[1], *M. Monti*[1], *M. Staniforth*[1], *J. Sloan*[1], *Y. Gladush*[2], *A. Nasibulin*[2,3], *and J. Lloyd-Hughes*[1]; [1]*University of Warwick, Coventry, United Kingdom*; [2]*Skolkovo Institute of Science and Technology, Moscow, Russia*; [3]*Aalto University, Espoo, Finland*

We report a giant negative THz photoconductivity for controllably-doped carbon nanotubes. Photoexcitation lowers the overall conductivity of the carbon nanotube network, by many-particle interactions, offering prospects for ultrafast THz devices including modulators.

EE-P.4 TUE

Quantum Coherent Control of Slow Electron Wave Packets with Light

•*N. Talebi*[1] *and C. Lienau*[2]; [1]*Max Planck Institute for Solid State Research, Stuttgart, Germany*; [2]*Carl von Ossietzky Universität Oldenburg, Stuttgart, Germany*

Coherent control is a method for controlling the shape of a wave packet using quantum path interferometry. Here, we discuss the interferences in quantum paths in interaction of free-space electron wave packets with light and localized photonic states.

EE-P.5 TUE

Mapping mid-infrared dispersion landscape onto near-infrared and visible through filamentation of laser pulses at 3.9um in air

•*P. Polynkin*[1], *C. Gollner*[2], *V. Shumakova*[2], *A. Pugzlys*[2], *and A. Baltuska*[2]; [1]*University of Arizona, Tucson, USA*; [2]*Photonics Institute, Vienna University of Technology, Vienna, Austria*

We record angularly-resolved spectra of odd harmonics generated through filamentation of ultrashort laser pulses at 3.9um in air. Morphology of these spectra carry information about the 4.2um anomalous dispersion edge due to the CO2 content.

EE-P.6 TUE

Femtosecond dynamics in excited NO_2: A theoretical study

•*T. Schnappinger and R. de Vivie-Riedle*; *Department of Chemistry, LMU Munich, Munich, Germany*

In this work we want to simulate the quantum dynamics of NO_2 after photoexcitation in the $^2B_2$ state and control the relaxation process via several conical intersections also including the electronic motion.

EE-P.7 TUE

Shedding light on the nature of excited states in a hydrogen generating supramolecular RuPt catalyst by ultrafast x-ray spectroscopy

•*A. Huijser*[1], *Q. Pan*[1], *D. Van Duinen*[1], *M. Laursen*[2], *A. El Nahas*[3], *P. Chabera*[3], *Q. Kong*[4], *X. Zhang*[4], *K. Haldrup*[2], *W. Browne*[5], *G. Smolentsev*[6], *and J. Uhlig*[3]; [1]*University of Twente, Enschede, Netherlands*; [2]*Technical University of Denmark, Copenhagen, Denmark*; [3]*Lund University, Lund, Sweden*; [4]*Argonne National Laboratory, Chicago, USA*; [5]*University of Groningen, Groningen, Netherlands*; [6]*Paul Scherrer Institute, Villingen, Switzerland*

Photoinduced electronic and structural changes of a hydrogen generating supramolecular RuPt photocatalyst are studied by ultrafast optical and x-ray spectroscopy. This work focuses in particular on the processes at the catalytic Pt moiety.

EE-P.8 TUE

Intersystem crossing in thiobases proceeds by a dark intermediate state

R. Borrego-Varillas[1], *D.C. Teles-Ferreira*[2], *A. Nenov*[3], *I. Conti*[3], •*L. Ganzer*[1], *C. Manzoni*[1], *A.M. de Paula*[2], *M. Garavelli*[3], *and G. Cerullo*[1]; [1]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Departamento de Fisica, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil*; [3]*Dipartimento di Chimica Industriale, Università di Bologna, Bologna, Italy*

We present transient absorption spectroscopy measurements of 4-thiouracil with sub-20 fs UV pulse and ab initio simulations evidencing that the photoexcited electron relaxation pathways for intersystem crossing originate from a dark intermedium state.

EE-P.9 TUE

Spatio-temporal characterization of the electric field of breathers in an optical fiber

•*C. Naveau*[1], *P. Szriftgiser*[1], *A. Kudlinski*[1], *M. Conforti*[1], *S. Trillo*[2], *and A. Mussot*[1]; [1]*University of Lille, CNRS, UMR 8523 - PhLAM, Lille, France*; [2]*Department of Engineering, University of Ferrara, Ferrara, Italy*

We report the full-field longitudinal characterization in an optical fiber of breather dynamics in the time domain via non-destructive distributed measurements in phase and intensity of their main frequency components.

EE-P.10 TUE

Tracking Homogeneous and Heterogeneous Carrier Multiplication via Singlet Fission in Solution

•*N. Wollscheid*[1,2], *J.L. Perez Lustres*[1,2], *O. Kefer*[1], *T. Buckup*[1,2], *and M. Motzkus*[1,2]; [1]*Physikalisch-Chemisches Institut, Universität Heidelberg, Heidelberg, Germany*; [2]*Centre for Advanced Materials, Heidelberg, Germany*

A sequential singlet fission mechanism in solution is unravelled by time resolved spectroscopy, where oxygen takes part as catalyst in the initial energy transfer as well as in the final heterogeneous singlet fission.

EE-P.11 TUE

Isomerization Dynamics of Wild Type and Mutated Anabaena Sensory Rhodopsin Mapped by Time-Resolved Coherent Raman Spectroscopy

P.P. Roy[1], *R. Abe-Yoshizumi*[2], *Y. Kato*[2], *H. Kandori*[2], *and* •*T. Buckup*[1]; [1]*Physikalisch-Chemisches Institut, Ruprecht-Karls Universitat Heidelberg, Heidelberg, Germany*; [2]*Department of Life Science and Applied Chemistry, Nagoya Institute of Technology, Nagoya, Japan*

The excited-state evolution of the vibrational modes of retinal chromophore was mapped by impulsive vibrational spectroscopy. Pre-distortion in the ground-state structure was found to play a major role in the acceleration of the isomerization dynamics.

EE-P.12 TUE

Generation of single-cycle pulses in mode-locked laser with sub-terahertz repetition rate

•*R. Arkhipov*[1,2], *M. Arkhipov*[1,2], *I. Babushkin*[3,4,5], *and N. Rosanov*[2,6,7]; [1]*St. Petersburg State University, St. Petersburg, Russia*; [2]*ITMO University, St. Petersburg, Russia*; [3]*Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany*; [4]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany*; [5]*Max Born Institute, Berlin, Germany*; [6]*Vavilov State Optical Institute, St. Petersburg, Russia*; [7]*Ioffe Institute, St. Petersburg, Russia*

In this talk, passive mode-locking based on coherent-light matter interactions in a laser is investigated theoretically. We predict single-cycle pulse generation with sub-terahertz repetition rate provided by an extremely small cavity length.

EE-P.13 TUE

The contribution has been withdrawn.

EE-P.14 TUE

Pressure Optimization of Strong Field Low Order Harmonics Generated in Xenon Microplasma in Tight Focusing Regime

•*E. Migal, F. Potemkin, and V. Gordienko*; *Faculty of Physics and International Laser Center M.V. Lomonosov Moscow State University, Moscow, Russia*

Generation of the third (413 nm) and fifth (248 nm) harmonics in tight focusing regime (NA = 0.1) is considered experimentally and theoretically. Efficiency as high as 1.1x10-3 and 4.4x10-4 in xenon is demonstrated.

EE-P.15 TUE

Molecular Mechanism Of Non-Photochemical Quenching In LHCSR3 Protein Of Chlamydomonas Reindhartii

•*G.J. de la Cruz Valbuena*[1,2], *F. Valduga De Almeida Camargo*[1], *R. Borrego Varillas*[1], *F. Perozeni*[3], *C. D'Andrea*[1,2], *M. Ballottari*[3], *and G. Cerullo*[1]; [1]*Politecnico di Milano, Dipartimento di Fisica, Milano, Italy*; [2]*Center for Nano Science and Technology, Istituto Italiano di Tecnologia, Milano, Italy*; [3]*Universita di Verona, Dipartimento di Biotecnologia, Verona, Italy*

The fastest short-term photoprotection mechanism in Chlamydomonas Reinhardtii called non-photochemical quenching was studied in an in vitro stress-related protein, LHCSR3, using a combination of time-resolved photoluminescence and transient absorption techniques.

EE-P.16 TUE

Interferometric delay tracking for mechanically chopped Mach-Zehnder interferometers

•*W. Schweinberger*[1,2], *L. Vamos*[3,4], *J. Xu*[3], *S.A. Hussain*[1,3], *C. Baune*[5], *S. Rode*[5], *and I. Pupeza*[1,3]; [1]*Ludwig-Maximilians-Universität München, Garching,*

Germany; [2]*King Saud University, Department of Physics and Astronom, Riyadh, Saudi Arabia*; [3]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [4]*ICFO -The Institute of Photonic Sciences, Barcelona, Spain*; [5]*SmarAct GmbH, Oldenburg, Germany*

Interferometic delay tracking demonstrates sub-attosecond, and for single mechanical scans sub ten attoseconds, repeatability for a 1-meter-long Mach-Zehnder interferometer (1 meter). This precision is maintained when chopping one arm, allowing the combination with lockin amplification.

EE-P.17 TUE

Spins dynamics across metal-insulator transition in Fe3O4 films

•*J. Panigrahi*[1], *E. Terrier*[1], *S. Cho*[2], *and V. Halté*[1]; [1]*IPCMS-CNRS Université de Strasbourg 23 rue du Loess BP 43 67034, strasbourg cedex, France*; [2]*Physics Department, Ulsan University, Ulsan, South Korea*

We explore Verwey transition (Tv) in magnetite films through ultrafast spins and charges dynamics. Both show non-trivial behaviors of their main temporal features across Tv, correlated to a transient mixed phase induced by ultrashort pulses.

EE-P.18 TUE

Sub-bandgap states in lead-halide perovskites revealed by two-dimensional electronic spectroscopy

•*F.V.A. Camargo*[1], *T. Nagahara*[1,2], *J.M. Richter*[3], *R.H. Friend*[3], *G. Cerullo*[1], *and F. Deschler*[3]; [1]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Kyoto Institute of Technology, Department of Chemistry and Materials Technology, Kyoto, Japan*; [3]*Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*

Lead-halide perovskites seem to have surprisingly few defects. We discuss how two-dimensional electronic spectroscopy can be used to study traps and report data revealing sub-bandgap states on high-quality bromide and iodide perovskites.

EE-P.19 TUE

Relationship between photoionization of chiral molecules and interband transitions in topological solids

•*A.F. Ordonez* [1,2] *and O. Smirnova*[1,2]; [1]*Max-Born-Institut, Berlin, Germany*; [2]*Technische Universität Berlin, Berlin, Germany*

We show the mapping between photoelectron circular dichroism in photoionization of chiral molecules and Berry-curvature induced circular photogalvanic effect in topological solids.

EE-P.20 TUE

Pressure waves generated by various pulsed lasers in water

•*S. Albert, V. Jukna, B. Mahieu, A. Mysyrowicz, and A. Houard*; *Laboratoire d'Optique Appliquée, ENSTA ParisTech, Ecole Polytechnique, CNRS, Palaiseau, France*

We investigate energy deposition and pressure wave generation in water through laser energy deposition of different pulse duration. We determine the best laser parameters for acoustic applications.

EE-P.21 TUE

Dependence of Filamentation in Air upon Femtosecond Laser Repetition Rate

•*P. Walch*[1], *B. Mahieu*[1], *T. Produit*[2], *G. Schimmel*[2], *J. Kasparian*[2,3], *J.-P. Wolf*[2], *A. Mysyrowicz*[1,4], *and A. Houard*[1]; [1]*LOA, ENSTA ParisTech, Ecole Polytechnique, CNRS, Palaiseau, France*; [2]*Groupe de Physique Appliquée, Université de Genève, Geneva, Switzerland*; [3]*Institute for Environmental Sciences, Université de Genève, Geneva, Switzerland*; [4]*André Mysyrowicz Consultants, Versailles, France*

We study the properties of filamentation induced by femtosecond laser pulses at different repetition rates between 100 Hz and 2.5 kHz. Thermally induced beam wandering is observed.

EE-P.22 TUE

Ultrafast photoswitching of a chiral Fe(II) complex studied by time resolved second harmonic generation

A. Ould Hamouda[1], *F. Dutin*[1], *M. Tondusson*[1], *J. Degert*[1], *P. Rosa*[2], *and* •*E. Freysz*[1]; [1]*Univ. Bordeaux, CNRS, LOMA UMR5798, Talence, France*; [2]*Univ. Bordeaux, CNRS, UMR 5026, Pessac, France*

Using time resolved second harmonic generation, we reveal the ultrafast switching of the spin state of a Fe(II) spin crossover complex and evaluate the $\chi^{(2)}$ of the different excited states involved in this process.

EE-P.23 TUE

Spatial-temporal splitting and localization of femtosecond pulse under filamentation in LiF.

•*S. Chekalin*[1], *V. Kompanets*[1], *A. Dormidonov*[1,2], *and V. Kandidov*[1,2]; [1]*Institute of Spectroscopy, Russian Academy of Sciences, Troitsk, Moscow 108840, Russia*; [2]*Faculty of Physics, Moscow State University, Moscow, 119991 , Russia*

Filamentation of a single femtosecond pulses with intensities from filamentation threshold to multiple filamentation start, investigated by laser coloration in LiF, revealed unusial beam splitting at 800 nm and a single cycle light bullet formation at 3000 nm.

EE-P.24 TUE

A comparative study on ionization-induced dissociation of Methane by 800 nm and 400 nm laser fields

•*L. Varvarezos*[1], *A. Achner*[2], *R. Wagner*[2], *D. Rivas*[2], *J. Costello*[1], *M. Meyer*[2], *and P. Grychtol*[2]; [1]*Dublin City University, Dublin, Ireland*; [2]*European XFEL GmbH, Schenefeld, Germany*

In this work, we report a comparative study on the ionization-induced dissociation of Methane irradiated by laser fields at 800 nm and the second harmonic at 400 nm.

EE-P.25 TUE

Characterization of thin metal films by ultrafast laser induced ultrasound

•*H. Zhang*[1,3], *A. Antoncecchi*[1,3], *S. Edward*[1,2], *P. Planken*[1,2], *and S. Witte*[1,3]; [1]*Advanced Research Center for Nanolithography, Amsterdam, Netherlands*; [2]*Universiteit van Amsterdam, Amsterdam, Netherlands*; [3]*Vrije Universiteit, Amsterdam, Netherlands*

By a combined theoretical and experimental effort, we demonstrate quantitative extraction of multiple electronic and acoustic properties of thin metal films by ultrafast laser induced ultrasound and least-squares model fitting.

13:00 – 14:00

EF-P: EF Poster session

EF-P.1 TUE

Dynamics and Control of Pulse Trains in a Microcavity Laser with Delayed Optical Feedback

•*S. Barbay*[1], *A. Pammi*[1], *R. Braive*[1], *I. Sagnes*[1], *G. Beaudoin*[1], *S. Terrien*[2], *N.G.R. Broderick*[2], *and B. Krauskopf*[2]; [1]*Centre de Nanosciences et de Nanotechnologies, Palaiseau, France*; [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*

We study experimentally and theoretically the dynamics of regenerative pulse trains in micropillar lasers with delayed optical feedback. We analyze pulse attraction and repulsion and demonstrate full control of spike trains with single optical pulses.

EF-P.2 TUE

Phase and power experimental study of seeded modulation instability in passive fiber ring cavities

•*F. Bessin, C. Naveau, M. Conforti, P. Szriftgiser, A. Kudlinski, and A. Mussot*; *University of Lille, Lille, France*

We show that transient dynamics of seeded modulation instability in passive fiber ring cavities depends on relative phase of input seeds/pump. Particularly under specific values of this one, modulation instability signal power can vanish.

EF-P.3 TUE

Dark Frequency Comb Formation in Thin Silicon Nitride Normal Dispersion Microresonator

•*S. Sabouri, R. Riaz, M. Catuneanu, and K. Jamshidi*; *Technische Universität Dresden, Dresden, Germany*

The formation of frequency combs in a thin SiN microring for a single-mode waveguide in normal GVD regime is studied. Waveform and optical spectrum of the soliton, breather, and complex soliton pulses have been analyzed.

EF-P.4 TUE

Highly Birefringent Microstructured Silica Fibers for Broadband Soliton Self-Frequency Shift

T. Martynkien[1], *K. Stefańska*[1], *F. Senna Vieira*[2], *C. Lu*[2], *A. Foltynowicz*[2], *P. Mergo*[3], *J. Sotor*[4], *and* •*G. Soboń*[4]; [1]*Faculty of Fundamental Problems of Technology, Wrocław University of Science and Technology, Wrocław, Poland*; [2]*Department of Physics, Umeå University, Umeå , Sweden*; [3]*Laboratory of Optical Fiber Technology, Maria Curie-Skłodowska University, Lublin, Poland*; [4]*Laser & Fiber Electronics Group, Faculty of Electronics, Wrocław University of Science and Technology, Wrocław, Poland*

We report a new polarization maintaining, microstructured silica fiber for soliton self-frequency shift, suitable for pumping with ultrashort pulses at 1.05 and 1.55 μm wavelengths. Efficient shifts up to 2 μm wavelength were achieved.

EF-P.5 TUE

Coexistence of Intensity Pattern Types in Broadband Fourier Domain Mode Locked (FDML) Lasers

•*M. Schmidt*[1], *T. Pfeiffer*[2], *C. Grill*[2], *R. Huber*[2], *and C. Jirauschek*[1]; [1]*Technical University of Munich, Munich, Germany*; [2]*Universität zu Lübeck, Lübeck, Germany*

Based on a master equation approach which accurately

reproduces experimental data we investigate the formation of patterns in broadband and rapidly swept Fourier domain mode locked (FDML) lasers which are of great fundamental as well as practical relevance.

EF-P.6 TUE

Raman response induces moving cavity solitons in optical resonators

•*M. Tlidi*[1], *S. Coulibaly*[2], *and M. Clerc*[3]; [1]*Université Libre de Bruxelles, Bruxelles, Belgium*; [2]*Université de Lille, Lille, France*; [3]*Universidad de Chile, Santiago, Chile*

We shown analytically and numerically that the non-instantaneous Raman response stabilizes traveling cavity solitons. We illustrate this mechanism on Kerr optical resonators and on a generic bistable model.

EF-P.7 TUE

Generating novel waveguides for stimulated Brillouin scattering with genetic algorithms

•*J. Håkansson*[1,2] *and D. Van Thourhout*[1,2]; [1]*Ghent University, Gent, Belgium*; [2]*Center for Nano and Biophotonics, Gent, Belgium*

Designing waveguides for stimulated Brillouin scattering is difficult because one must combine good mechanical and optical properties with a strong coupling between them. Using genetic algorithms we have found several novel and competitive waveguide designs.

EF-P.8 TUE

Spontaneous Symmetry Breaking and Nonlinear Population Inversion Grating in a Low-Q CW Laser

•*V. Kocharovsky*[1], *I. Koryukin*[1], *E. Kocharovskaya*[1], *V. Kocharovsky*[1,2], *I. Ryabinin*[1], *and S. Tarasov*[1]; [1]*Institute of Applied Physics, Russian Academy of Science, Nizhny Novgorod, Russia*; [2]*Department of Physics and Astronomy, Texas A&M University, College Station, USA*

We find a new effect of superradiant lasing in a low-Q symmetric cavity, namely, the asymmetry of counter-propagating waves and the profiles of the field, polarization and population inversion owing to the nonlinear population inversion grating.

EF-P.9 TUE

Polarization properties of cavity solitons in Kerr resonators

E. Averland[1], *K. Panajotov*[2,3], *and* •*M. Tlidi*[1]; [1]*Université Libre de Bruxelles, Bruxelles, Belgium*; [2]*Vrije Universiteit Brussel, Brussels, Belgium*; [3]*Institute of Solid State Physics, Sofia, Bulgaria*

We theoretically investigate a weakly birefringent all-fiber cavity subject to linearly polarized optical injection. We show that vector cavity solitons exhibit multistability involving different polarization states with different energies.

EF-P.10 TUE

Random Mode Coupling Assists Kerr Beam Self-Cleaning in a Graded-Index Multimode Optical Fiber

•*O.S. Sidelnikov*[1], *E.V. Podivilov*[1,2], *M.P. Fedoruk*[1,3], *and S. Wabnitz*[1,4]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [3]*Institute of Computational Technologies SB RAS, Novosibirsk, Russia*; [4]*Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Università di Roma, Roma, Italy*

In this paper, we numerically investigate the process of beam self-cleaning in graded-index multimode optical fibers using the coupled-mode model. The results of numerical investigations are in complete agreement with our experimental data.

EF-P.11 TUE

Delay-induced dynamics of pinned cavity soliton in an inhomogeneous Kerr resonator

F. Tabbert[1], *S. Gurevich*[1], *K. Panajotov*[2,3], *and* •*M. Tlidi*[4]; [1]*University of Munster, Munster, Germany*; [2]*Vrije Universiteit Brussel, Brussels, Belgium*; [3]*Institute of Solid State Physics, Sofia, Bulgaria*; [4]*Université Libre de Bruxelles, Bruxelles, Belgium*

The influence of inhomogeneity and time-delayed feedback on cavity solitons is investigated. Depending on the strength of the inhomogeneity, a single cavity soliton can undergo either an Andronov-Hopf bifurcation or escape from the defect.

EF-P.12 TUE

Spectral properties of cascaded second-order nonlinear processes induced by high-gain parametric down-conversion

•*D.A. Kopylov*[1], *K.Y. Spasibko*[2,3], *A.V. Rasputnyi*[1], *T.V. Murzina*[1], *and M.V. Chekhova*[2,3,1]; [1]*M.V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [3]*University of Erlangen-Nürnberg, Erlangen, Germany*

We study, experimentally and theoretically, the spectral properties of visible radiation generated through cascaded second-order nonlinear processes that are induced by bright squeezed vacuum.

EF-P.13 TUE

Generation of rogue-like pulses via stimulated soliton collision in dispersion oscillating optical fiber

•*A. Koniukhov*[1], *A. Sysoliatin*[2], *and L. Melnikov*[3]; [1]*Saratov State University, Saratov, Russia*; [2]*Prokhorov General Physics Institute, Moscow, Russia*; [3]*Saratov State Technical University, Saratov, Russia*

An approach for the generation of high-intensity pulses via inelastic collision of solitons in dispersion variable fiber is proposed. The rogue-like pulse arises due to stimulated soliton collisions and non-adiabatic variation of the fiber dispersion.

EF-P.14 TUE

Effect of Initial Chirp on Soliton Pulse Compression in the Ionization Regime

•*Y. Wan and W. Chang*; *Nanyang Technological University, Singapore, Singapore*

We investigate the effect of initial chirp on soliton pulse compression in the ionization regime in a gas-filled hollow-core fiber. A positively-chirped pump undergoes a stronger effect of the ionization caused by the enhanced compression.

EF-P.15 TUE

Swift-Hohenberg equation with third order dispersion for optical resonators

M. Tlidi[1], •*B. Kostet*[1], *A. Hariz*[2], *L. Bahloul*[2], *L. Cherbi*[2], *M. Clerc*[3], *M. Ferré*[3], *and K. Panajotov*[4,5]; [1]*Université Libre de Bruxelles, Bruxelles, Belgium*; [2]*Université des Sciences et de la Technologie Houari Boumediene , Bab Ezzouar, Algeria*; [3]*Universidad de Chile, Santiago, Chile*; [4]*Vrije Universiteit Brussel, Brussels, Belgium*; [5]*Institute of Solid State Physics, Sofia, Bulgaria*

A generalized Swift-Hohenberg equation with a third order dispersion is derived for the photonic crystal fiber resonators. Moving temporal localized structures often called cavity solitons and their speed are analyzed numerically and analytically.

EF-P.16 TUE

Controlling the temporal trajectory of solitons in silver nanoparticle doped fibre

•*S. Bose*[1,2], *G. Steinmeyer*[3], *U. Morgner*[1,2], *and A. Demircan*[1,2,4]; [1]*Institute of Quantum Optics, Leibniz University, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovations Across Discipline), Hannover, Germany*; [3]*Max-Born-Institute , Berlin, Germany*; [4]*Hannover Centre for Optical Technologies, Hannover, Germany*

We investigate different regimes of soliton propagation dynamics in fibres containing a variable zero-nonlinearity point, allowing control of the soliton trajectories during supercontinuum generation process.

EF-P.17 TUE

Nonlinear Fourier Transform for Analysis of Coherent Structures in Dissipative Systems

•*I.S. Chekhovskoy*[1,2], *O.V. Shtyrina*[1,2], *M.P. Fedoruk*[1,2], *S.B. Medvedev*[1,2], *and S.K. Turitsyn*[1,3]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Computational Technologies, SB RAS, Novosibirsk, Russia*; [3]*Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*

Using the example of the cubic Ginzburg-Landau equation, we show how the nonlinear Fourier transform can be used to characterize coherent structures in dissipative nonlinear systems and reduce the number of effective degrees of freedom.

EF-P.18 TUE

Nonlinear Sculpturing of Optical Pulses in Fibre Systems

S. Boscolo[1], *I. Gukov*[2], •*A. Tonello*[3], *and C. Finot*[4]; [1]*Aston Institute of Photonic Technologies, School of Engineering and Applied Science, Aston University, Birmingham, United Kingdom*; [2]*Moscow Institute of Physics and Technology & Skolkovo Institute of Science and Technology, Moscow, Russia*; [3]*Laboratoire XLIM, UMR 7252 CNRS - Universite' de Limoges, Limoges, France*; [4]*Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS - Universite' Bourgogne Franche-Comte', Dijon, France*

We present a general method for the design of fibre-based nonlinear pulse shaping. By combining direct numerical simulations with machine-learning strategies, we efficiently identify the optimal working parameters for achieving a given pulse target.

EF-P.19 TUE

Tunable self-pulsations in a quantum-dot external-cavity laser emitting across the excited state

S. White[1,2] *and* •*M.A. Cataluna*[2,3]; [1]*IOP Publishing, Bristol, United Kingdom*; [2]*Previously also with the School of Science and Engineering, University of Dundee, Dundee, United Kingdom*; [3]*Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*

Self-sustained optical pulsations were observed from a tunable external-cavity quantum dot laser using a single-section amplifier, emitting solely in the excited state. The pulsations were tunable both in wavelength (1160-1196 nm) and frequency (3.76-3.82 GHz).

EF-P.20 TUE

Phase evolution of Peregrine-like solitons in nonlinear fiber optics

•*G. Xu*[1], *K. Hammani*[1], *A. Chabchoub*[2], *J. Dudley*[3], *B. Kibler*[1], *and C. Finot*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [2]*The University of Sydney, Sydney, Australia*; [3]*Institut FEMTO-ST, Besançon, France*

We report the longitudinal evolution of the temporal phase profile of Peregrine-like solitons in optical fibers. The experimental results reveal the phase difference between the central part of the pulse and the continuous background.

EF-P.21 TUE

Impact of higher-order dispersion on geometric parametric instability in GRIN multimode fibers

•*A. Kudlinski, A. Bendahmane, O. Vanvincq, C. Mas Arabi, A. Mussot, and M. Conforti*; *University of Lille, Lille, France*

We show that geometric parametric instability in multimode fibers is strongly influenced by higher-order dispersion. By measuring the output spectrum for different core radii, we distinguish peaks generated by GPI from other nonlinear phenomena.

EF-P.22 TUE

Multimode Solitons in Hollow-Core Fibres: Dynamics and Features

•*B. López Zubieta, A. Crego, E. Conejero Jarque, Í.J. Sola, and J. San Roman* ; *Grupo de Investigación en Aplicaciones del Láser y Fotónica, Departamento de Física Aplicada, University of Salamanca, Salamanca, Spain*

A new type of multimode soliton is observed in the nonlinear propagation of a laser pulse in hollow-core fibers, showing an ultrashort temporal self-compression supported by an ultra-broadband spectrum (from the ultraviolet to the infrared).

EF-P.23 TUE

Radially and angularly accelerating optical wave-packets

A. Brimis[1,3], *K. Makris*[3], *and* •*D. Papazoglou*[1,2]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas, Heraklion, Greece*; [2]*Materials Science and Technology Department, University of Crete, Heraklion, Greece*; [3]*Physics Department, University of Crete, Heraklion, Greece*

Light that twists and accelerates both over the radial and the angular dimension is generated by superimposing vortex ring-Airy beams that are tuned to abruptly autofocus at overlapping focal regions while following distinct trajectories

EF-P.24 TUE

Space-time evolution of noise-driven modulation instability in optical fibers experiments

•*A. Kraych*[1], *D.S. Agafontsev*[2], *S. Randoux*[1], *and P. Suret*[1]; [1]*University of Lille, CNRS, UMR 8523 - Physique des Lasers Atomes et Molecules (PHLAM), Lille, France*; [2]*P.P. Shirshov Institute of Oceanology, Moscow, Russia*

We investigate noise-driven modulation instability in optical fibers. By using a recirculating fiber loop, we report the first experimental recording of the space-time dynamics. Experiments also reveal the quasi-periodic transient regime of the statistical properties.

EF-P.25 TUE

Two dimensional experimental Airy beam propagation behavior in biased photorefractive medium

•*T. Bouchet*[1,2], *N. Marsal*[1,2], *M. Sciamanna*[1,2], *and D. Wolfersberger*[1,2]; [1]*Chaire Photonique, LMOPS EA-4423 Laboratory, CentraleSupélec, Université Paris-Saclay, Metz, France*; [2]*Chaire Photonique, LMOPS EA-4423 Laboratory, CentraleSupélec, Université de Lorraine, Metz, France*

We investigate experimentally the behavior of 2D Airy beam propagation in a biased nonlinear medium - a photorefractive crystal. We obtain distinct propagation behaviors for different values of applied external electric field and beam power.

EF-P.26 TUE

Kerr frequency comb generation and soliton dynamics caused by forward-backward wave interaction in WGM microresonators

•*N. Kondratiev, A. Cherenkov, and V. Lobanov*; *Russian Quantum Center, Moscow, Russia*

We demonstrate that forward-backward wave coupling in optical microresonators may affect Kerr frequency comb generation and dynamics. It may influence soliton repetition rate at anomalous group velocity dispersion and provide comb generation at normal dispersion.

EF-P.27 TUE

Spatial Kerr-beam self-cleaning in Yb-doped multimode fiber taper

•*A. Niang*[1], *T. Mansuryan*[2], *K. Krupa*[3,1], *A. Tonello*[2], *M. Fabert*[2], *P. Leproux*[2], *D. Modotto*[1], *G. Millot*[3], *V. Couderc*[2], *and S. Wabnitz*[4]; [1]*Dipartimento di Ingegneria dell'Informazione, Università degli Studi di Brescia,via Branze 38, 25123, Brescia, Italy, Brescia, Italy*; [2]*Université de Limoges, XLIM, UMR CNRS 7252, 123 Avenue A. Thomas, 87060 Limoges, France, Limoges, France*; [3]*Université Bourgogne Franche-Comté, ICB, UMR CNRS 6303, 9 Avenue A. Savary, 21078 Dijon, France, Dijon, France*; [4]*DIET, Sapienza Università di Roma, via Eudossiana 18, 00184 Rome, Italy, Rome, Italy*

We experimentally demonstrate self-cleaning in a long doped multimode fiber taper in both passive (without gain) and active configurations. Supercontinuum generation with a spectral domain extending from the visible to mid-infrared is obtained.

EF-P.28 TUE

Giant pulse at 2 μm in polarization maintaining silica step-index fiber

•*P. Morin*[1], *S. Boivinet*[1], *J.-P. Yehoussi*[1], *T. Berberian*[2,3], *F. Druon*[2], *S. Vidal*[1], *G. Machinet*[1], *Y. Zaouter*[3], *and J. Boullet*[1]; [1]*ALPhANOV, Talence, France*; [2]*Laboratoire Charles Fabry, IOGS, Palaiseau, France*; [3]*Amplitude Laser Group, Pessac, France*

We demonstrate experimentally the formation of a giant pulse based on the interaction between two Raman solitons in polarization maintaining silica step-index fiber at 2 μm

EF-P.29 TUE

Direct Measurement of Cross-Phase Modulation in Microresonators

•*G.N. Ghalanos*[1,2], *J.M. Silver*[1,3], *L. Del Bino*[1,4], *N.P. Moroney*[1,2], *M.T.M. Woodley*[1,4], *A. Svela*[1,2], *S. Zhang*[1], *and P. Del'Haye*[1]; [1]*National Physical Laboratory (NPL), Teddington, United Kingdom*; [2]*Imperial College London, London, United Kingdom*; [3]*City, University of London, London, United Kingdom*; [4]*Heriot-Watt University, Edinburgh, United Kingdom*

We developed a new spectroscopy method to directly measure cross-phase-modulation (XPM) in ultra-high-Q microresonators. This provides a basis for understanding phenomena including nonlinear interaction of solitons and symmetry breaking of counterpropagating light in whispering-gallery microresonators.

EF-P.30 TUE

Experimental evidences of non-hermitian mode-locking in fibre laser

A. Kuznetsov[1], *I. Vatnik*[1,2], *A. Perego*[3], *D. Churkin*[1,2], *and* •*K. Staliunas*[4,5]; [1]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Aston University, Birmingham, United Kingdom*; [4]*Institucio Catalana de Reserca i Estudis Avancats (ICREA), Barcelona, Spain*; [5]*Universitat Politecnica Catalunya (UPC), Barcelona, Terrassa, Spain*

We propose and realize experimentally the nonhermitian active mode-locking of fiber laser, via the dephased amplitude- and phase modulation of the laser resonator

EF-P.31 TUE

Soliton combs generation due to parametric up and down conversion in a microring resonator with quadratic nonlinearity

•*A. Villois and D.V. Skryabin*; *Department of Physics, University of Bath, Bath, United Kingdom*

We report existence of the soliton and quasi-soliton frequency combs in a ring microresonator with quadratic nonlinearity operating in the regimes of the second harmonic generation and parametric down conversion.

EF-P.32 TUE

Localized structures in dispersive doubly resonant optical parametric oscillators

•*P. Parra-Rivas*[1,2], *L. Gelens*[2], *and F. Leo*[1]; [1]*OPERA-photonics, Université libre de Bruxelles, 50 Avenue F. D. Roosevelt, CP 194/5, B-1050, Brussels, Belgium*; [2]*Laboratory of Dynamics in Biological Systems, KU Leuven Department of Cellular and Molecular Medicine, University of Leuven, B-3000, Leuven, Belgium*

In this work we study the formation and bifurcation structure of localized dissipative structures in dispersive optical parametric oscillators. We show that these states undergo collapsed snaking and characterize their dynamics.

EF-P.33 TUE

Symmetry breaking of optical vortex in bacteriorhodopsin suspensions

•*K. Masuda*[1], *T. Yoshizawa*[1], *T. Akiyama*[1], *Y. Okada-Shudo*[2], *T. Murata*[1,3], *K. Toyoda*[1,3], *K. Miyamoto*[1,3], *and T. Omatsu*[1,3]; [1]*Graduate School of Advanced Integration Science, Chiba University, Chiba, Japan*; [2]*Department of Electronic Engineering, The University of Electro-Communications, Chofu, Japan*; [3]*Molecular Chirality Research Center, Chiba University, Chiba, Japan*

We discover that bacteriorhodopsin suspensions enable the breaking of a right-handed (left-handed) optical vortex mode into a clockwise (anti- clockwise)-rotating twin mode with two bright spots.

EF-P.34 TUE

Impact of High-Order Effects on Soliton Explosions in the Complex Cubic-Quintic Ginzburg-Landau Equation

•*S. Gurevich*[1], *C. Schelte*[1,2], *and J. Javaloyes*[2]; [1]*Institute for Theoretical Physics, University of Münster, Münster, Germany*; [2]*Nonlinear Wave Group, Universitat de les Illes Baleares , Palma de Mallorca, Spain*

In this work we employ path-continuation techniques and show how third-order dispersion, self-steepening and self-frequency shift impact the onset of soliton explosions in the complex cubic quintic Ginzburg-Landau equation.

EF-P.35 TUE

Surface and bulk harmonic generation in the opaque region of GaAs

L. Suñé[1], *J. Trull*[1], *M. Scalora*[2], *R. Vilaseca*[1], *and* •*C. Cojocaru*[1]; [1]*Universitat Politecnica de Catalunya, Physics Department, Barcelona, Spain*; [2]*Charles M. Bowden Research Center, AMRDEC, RDECOM, Redstone Arsenal, Huntsville, USA*

We demonstrate harmonic generation in the opaque region of GaAs in reflection and transmission. Our experiments, contrasted with detailed numerical simulations, account for different nonlinear sources describing surface and bulk contributions to the harmonic generation.

EF-P.36 TUE

Kerr beam self-cleaning in the telecom band

•*Y. Leventoux*[1], *G. Granger*[1], *A. Parriaux*[2], *M. Jossent*[3], *L. Lavoute*[3], *D. Gaponov*[3], *A. Tonello*[1], *K. Krupa*[2], *M. Fabert*[1], *G. Millot*[2], *S. Février*[1], *S. Wabnitz*[4], *and V. Couderc*[1]; [1]*Université de Limoges, XLIM, UMR CNRS 7252, Limoges, France*; [2]*Université de Bourgogne Franche-Comté, ICB, UMR CNRS 6303, Dijon, France*; [3]*Novae, Aixe-sur-Vienne, France*; [4]*DIET, Sapienza Università di Roma, Rome, Italy*

We demonstrated efficient Kerr-beam self-cleaning in the anomalous dispersion regime of a GRIN-MMF. The power threshold for mode cleaning is found to be more than one order of magnitude lower than the one reported previously.

EF-P.37 TUE

Pure-quartic solitons from a dispersion managed fibre laser

•*A.F.J. Runge*[1], *D.D. Hudson*[2], *C.M. de Sterke*[1,3], *and A. Blanco-Redondo*[1,3]; [1]*Institute of Photonics and Optical Science (IPOS), School of Physics, The University of Sydney, Sydney, Australia*; [2]*MQ Photonics, Department of Physics and Astronomy, Macquarie University, Sydney, Australia*; [3]*The University of Sydney Nano Institute (Sydney Nano), The University of Sydney, Sydney, Australia*

We report the observation of pure-quartic solitons emitted by a fibre laser. Quartic cavity dispersion is achieved by an intracavity programmable pulse-shaper. The pulses are characterised through spectral intensity measurements and resonant dispersive wave analysis.

EF-P.38 TUE

Observation of Soliton Explosions in an Anomalous-Dispersion Fibre Laser

Z.-W. Wei, M. Liu, S.-X. Ming, A.-P. Luo, W.-C. Xu, and •*Z.-C. Luo*; *South China Normal University, Guangzhou, China*

We reported the first experimental evidence of coherent soliton explosion in a fiber laser with anomalous dispersion. These results will be attractive to the communities dealing with ultrafast lasers and nonlinear optics.

EF-P.39 TUE

Multiple switchable generation between noise-like pulse and dissipative soliton in an Er-doped fiber laser based on nonlinear polarization rotation

•*X. Cheng*[1], *Q. Huang*[1], *C. Zou*[1], *C. Mou*[1], *B. Qin*[2], *Z. Yan*[2], *and L. Zhang*[3]; [1]*Shanghai University, Shanghai, China*; [2]*Huazhong University of Science and Technology, Wuhan, China*; [3]*Aston University, Birmingham, UK*

The multiple switchable generation between noise-like pulse and dissipative soliton only by increasing pump power in a nonlinear polarization rotation mode-locked Er-doped fiber laser is firstly experimentally investigated.

EF-P.40 TUE

Threshold effects and metastability in solitary refractive index wells

•*O. Melchert*[1,2,3], *I. Babushkin*[1,2], *U. Morgner*[1,2], *and A. Demircan*[1,2,3]; [1]*Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across Disciplines), Hannover, Germany*; [3]*Hannover Centre for Optical Technologies, Hannover, Germany*

We demonstrate threshold effects, akin to transmission anomalies in quantum mechanics, and a novel mechanism for generating optical metastable states with controllable decay times within the refractive index well formed by a soliton.

EF-P.41 TUE

Reversible and Irreversible Transformations of 3D-Tangle Laser Solitons

•*N.N. Rosanov*[1,2,3], *S.V. Fedorov*[1,2], *and N.A. Veretenov*[1,2]; [1]*Vavilov State Optical Institute, St. Petersburg, Russia*; [2]*ITMO University, St. Petersburg, Russia*; [3]*Ioffe Institute, St. Petersburg, Russia*

Coexisting of different types of 3D-topological solitons in lasers with saturable absorption enables various transformations of their internal structure. We present such transformations due to slow variations of medium gain and due to their collisions.

EF-P.42 TUE

Desynchronization of Pulsed Driving in the Formation of Soliton Kerr Frequency Combs

•*I. Hendry*[1,2], *B. Garbin*[1,2], *S. Coen*[1,2], *and M. Erkintalo*[1,2]; [1]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*; [2]*Department of Physics, The University of Auckland, Auckland, New Zealand*

We have numerically investigated pump-cavity desynchronization in soliton based Kerr frequency combs. We find that desynchronization can be leveraged to ensure single-soliton operation, and we present a theoretical formula for the soliton locking range.

EF-P.43 TUE

Spontaneous Symmetry Breaking, Oscillations, and Chaotic Regimes in Bidirectionally-Pumped Ring Resonators

•*M.T.M. Woodley*[1,2], *J.M. Silver*[1,3], *L. Hill*[4], *F. Copie*[1], *L. Del Bino*[1,2], *S. Zhang*[1], *G.-L. Oppo*[4], *and P. Del'Haye*[1]; [1]*National Physical Laboratory, Teddington, United Kingdom*; [2]*Heriot-Watt University, Edinburgh, United Kingdom*; [3]*City, University of London, London, United Kingdom*; [4]*University of Strathclyde, Glasgow, United Kingdom*

We present a model for the nonlinear Kerr behaviour of counter-propagating light in ring resonators, predicting rich pheonomena, including chaotic regimes. This will be useful for many future devices, including all-optical oscillators and soliton microcombs.

NOTES

ROOM 4a ICM

8:30 – 10:00

ED-3: Direct comb spectroscopy I

Chair: Piotr Maslowski, Nicolaus Copernicus University, Torun, Poland

ED-3.1 WED (Invited) 8:30

Infrared electric-field sampled frequency comb spectroscopy

•*S. Diddams*; *National Institute of Standards and Technology (NIST), Boulder, USA*; *Department of Physics, University of Colorado, Boulder, USA*

We describe spectroscopy across the entire mid-infrared (3-25 microns) where detection is performed via dual-comb electro-optic sampling.

ROOM 4b ICM

8:30 – 10:00

EI-3: Optical spectroscopy of 2D materials

Chair: Alexander Holleitner, Technical University of Münich, Münich, Germany

EI-3.1 WED 8:30

Determination of the dipole orientation of a single defect in hexagonal boron nitride using vector beam

•*H. Takashima*[1], *K. Ishihara*[1], *H. Maruya*[1], *T. Tashima*[1], *A.W. Schell*[2], *T.T. Tran*[3], *I. Aharonovich*[3], *and S. Takeuchi*[1]; [1]*Kyoto University, Kyoto, Japan*; [2]*Central European Institute of Technology, Brno, Czech Republic*; [3]*University of Technology Sydney, Sydney, Australia*

We report on the three-dimensional determination of the orientation of the single defects in hexagonal boron nitride using a vector beam

EI-3.2 WED 8:45

Investigation of the Spectroscopic Properties of Single Defects in Hexagonal Boron Nitride

•*A.W. Schell*[1,2,3], *H. Takashima*[2], *T.T. Tran*[4], *I. Aharonovich*[4], *M. Svedendahl*[3,5], *R. Quidant*[3], *and S. Takeuchi*[5]; [1]*Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic*; [2]*Department of Electronic Science and Engineering, Kyoto University, Kyoto, Japan*; [3]*ICFO-Institut de Ciencies Fotoniques, Castelldefels, Spain*; [4]*School of Mathematical and Physical Sciences, University of Technology Sydney, Sydney, Australia*; [5]*KTH Royal Institute of Technology, Stockholm, Sweden*

We investigate the optical properties of recently found emitters in hexagonal boron nitride. For this, we perform multiphoton excitation on single defects and vary the excitation wavelength finding a wavelength dependent quantum efficiency.

ROOM 13a ICM

8:30 – 10:00

CB-7: Wavelength control of QCLs

Chair: Augustinas Vizbaras, Brolis Semiconductors UAB, Vilnius, Lithuania

CB-7.1 WED (Invited) 8:30

Large Area Surface-Emitting Photonic Crystal Quantum Cascade Laser

•*Z. Wang*[1], *Y. Liang*[1], *B. Meng*[1], *Y. Sun*[2], *G. Omanakuttan*[2], *E. Gini*[3], *M. Beck*[1], *I. Sergachev*[4], *S. Lourdudoss*[2], *J. Faist*[1], *and G. Scalari*[1]; [1]*ETH Zurich, Institute for Quantum Electronics, Zurich, Switzerland*; [2]*KTH-Royal Institute of Technology, Department of Applied Physics, Stockholm, Sweden*; [3]*FIRST laboratory ETH Zurich, Zurich, Switzerland*; [4]*Wyss Zurich, Zurich, Switzerland*

We present a large-area (1.5 mm × 1.5 mm) photonic crystal quantum cascade laser, with 1 W surface-emitting peak power at room temperature (289 K), and narrow beam shape.

ROOM 13b ICM

8:30 – 10:00

CK-10: Plasmonics and antennas

Chair: Corin Gawith, University of Southampton, Southampton, United Kingdom

CK-10.1 WED (Invited) 8:30

Plasmonic Doppler Grating and Photoluminescence-driven Broadband Directional Optical Nanoantennas

•*J.-S. Huang*[1,2,3,4], *K.-M. See*[2], *F.-C. Lin*[2], *T.-Y. Chen*[2], *Y.-X. Huang*[2], *C.-H. Huang*[2], *and A.T.M. Yeşilyurt*[1]; [1]*Leibniz Institute of Photonic Technology , Jena, Germany*; [2]*Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan*; [3]*Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan*; [4]*Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan*

We present the design of azimutal angle-dependent plasmonic Doppler grating and it application in sensing. We also demonstrate broadband directional emission from photoluminescence-driven plasmonic directional nanoantennas.

ROOM 14a ICM

8:30 – 10:00

EF-3: Photon fluids and Hawking-like effect

Chair: Peter Banzer, Max Planck Institute for the Science of Light, Erlangen, Germany

EF-3.1 WED 8:30

Analog Hawking like effect enhanced by 4th-order dispersion phase matching

S.J. Robertson[1], *C. Ciret*[2], *S.-P. Gorza*[3], •*S. Massar*[4], *and R. Parentani*[1]; [1]*Laboratoire de Physique Théorique (UMR 8627), CNRS, Université Paris-Sud, Université Paris-Saclay, 91405 Orsay, France*; [2]*Laboratoire de Photonique d'Angers EA 4464, Université d'Angers, 2 Bd. Lavoisier, 49000 Angers, France*; [3]*OPERA-Photonique CP 194/5, Université libre de Bruxelles (ULB), Av. F. D. Roosevelt 50, 1050 Bruxelles, Belgium*; [4]*Laboratoire d'Information Quantique CP224, Université libre de Bruxelles (ULB), Av. F. D. Roosevelt 50, 1050 Bruxelles, Belgium*

We show numerically that the analog Hawking radiation emitted by a soliton propagating in a silicon nitride waveguide is dramatically enhanced by 4th-order dispersion phase matching, thereby rendering its experimental observation much more achievable.

EF-3.2 WED 8:45

Observation of Branched Flow of light

•*A. Patsyk*[1], *M. Bandres*[2], *U. Sivan*[1], *and M. Segev*[1]; [1]*Physics Department and Solid State Institute, Technion-Israel Institute of Technology, Haifa, Israel*; [2]*College of Optics & Photonics-CREOL, University of Central Florida, Orlando, USA*

We present the first study of optical branched flow. As light propagates in thin dielectric films it experiences scattering from inhomogeneities, forming bundles displaying the features and statistics of the phenomenon known as branched flow.

ROOM 14b ICM

8:30 – 10:00

CM-8: Microfluidics and novel applications of laser micromachining

Chair: Mangirdas Malinauskas, Vilnius University, Vilnius, Lithuania

CM-8.1 WED 8:30

Buried microchannels in alumino-borosilicate glass by femtosecond laser pulses and chemical etching

•*A. Crespi*[1,2], *R. Osellame*[2,1], *and F. Bragheri*[2]; [1]*Dipartimento di Fisica - Politecnico di Milano, Milano, Italy*; [2]*Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy*

We show that femtosecond laser irradiation followed by chemical etching allows to produce buried microchannels in EagleXG (Corning) alumino-borosilicate glass. This will enable quick fabrication of microfluidic devices, directly interfaced with complex low-loss photonic circuits.

CM-8.2 WED 8:45

Non-volatile Microfluidics Controlled Switch Fabricated in Fused Silica by Femtosecond Laser Inscription

•*A. Radosavljević*[1,2], *A. Desmet*[2], *J. Missinne*[2], *S. Tuccio*[3], *V. Panapakkam*[3], *K. Saurav*[3], *C. Lerma Arce*[3], *J. Watté*[3], *D. Van Thourhout*[1], *and G. Van Steenberge*[2]; [1]*Ghent University - IMEC, Department of Information Technology, Photonics Research Group, Ghent, Belgium*; [2]*Ghent University - IMEC, Department of Electronics and Information Systems, Centre for Microsystems Technology, Ghent, Belgium*; [3]*Commscope Connectivity Belgium, Kessel LO, Belgium*

Femtosecond laser written cross-bar optical switch in fused silica is demonstrated. The switch combines crossed waveguides and a microfluidic channel at the waveguide crossing. The switching is controlled by changing fluid in the channel.

ROOM 1 Hall A1

8:30 – 10:00

EA-6: Integrated quantum photonics

Chair: Mohamed Bourennane, Stockholm University, Stockholm, Sweden

EA-6.1 WED 8:30

A Reconfigurable Silicon Generator of Four-Photon Entangled States

•*C. Vigliar, J.C. Adcock, R. Santagati, J.W. Silverstone, and M.G. Thompson*; *Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom*

We show a programmable quantum silicon photonic chip able to create all the existing four-qubit graph state classes. For the first time, four on-chip generated photons are used to encode information, showing computational capabilities.

EA-6.2 WED 8:45

Silicon Quantum Photonics in the Short-Wave Infrared: A New Platform for Big Quantum Optics

•*J.W. Silverstone, L.M. Rosenfeld, D.A. Sulway, B.D.J. Sayers, J. Biele, G.F. Sinclair, D. Sahin, L. Kling, J.C.F. Matthews, M.G. Thompson, and J.G. Rarity*; *Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom*

Silicon photonics is the best hope for large-scale quantum technology with photons, but at 1.55 μm it has fundamental limitations. We show how silicon in the 2.1-μm short-wave infrared could unlock big quantum optics.

ROOM 2 Hall A1

8:30 – 10:00

CG-3: Twisted light fields

Chair: Tobias Witting, Max-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

CG-3.1 WED (Invited) 8:30

Transfer of orbital angular momentum in high harmonic generation using two driving beams

•*T. Ruchon*[1], *C. Chappuis*[1], *R. Géneaux*[1,2], *D. Bresteau*[1], *O. Gobert*[1], *G. De Ninno*[3,4], *D. Gauthier*[3], *and T. Auguste*[1]; [1]*LIDYL, CEA, CNRS, Université Paris-Saclay, Gif Sur Yvette, France*; [2]*Department of Physics, University of California, Berkeley, Berkeley, USA*; [3]*Elettra-Sincrotrone Trieste, Trieste, Italy*; [4]*Laboratory of Quantum Optics, University of Nova Gorica, Nova Gorica, Slovenia*

XUV femtosecond beams with controllable orbital angular momentum were generated through high order harmonic generation driven by two crossing beams. The experimental data is in excellent agreement with a theoretical description using an active grating.

ROOM 3 Hall A1

8:30 – 10:00

CC-3: THz QCL and THz imaging

Chair: Stefano Barbieri, IEMN, Lille, France

CC-3.1 WED 8:30

Optimization and Fabrication of Two-Quantum Well THz QCLs Operating Above 200 K

•*M. Franckie, L. Bosco, M. Beck, E. Mavrona, and J. Faist*; *Institute for Quantum Electronics, ETH Zürich , Zürich, Switzerland*

We present the first THz quantum cascade laser operating above 200 K. The design is based on two quantum wells per period and was optimized using a non-equilibrium Green's function model.

CC-3.2 WED 8:45

Optically Tunable Terahertz Quantum Cascade Random Lasers

•*S. Schönhuber*[1,2], *B. Limbacher*[1,2], *M.A. Kainz*[1,2], *A.M. Andrews*[2,3], *H. Detz*[2,4], *G. Strasser*[2,3], *J. Darmo*[1,2], *and K. Unterrainer*[1,2]; [1]*Photonics Institute, Vienna, Austria*; [2]*Center for Micro and Nanostructures, Vienna, Austria*; [3]*Institute of Solid State Electronics, Vienna, Austria*; [4]*Central European Institute of Technology, Brno, Czech Republic*

We demonstrate optical tuneability of terahertz quantum cascade random lasers by illumination with an additional, external 813 nm source. Our results pave the way towards a continuosly tuneable terahertz light source.

NOTES

ROOM 4a ICM

ED-3.2 WED 9:00

Dual-comb spectroscopy of acetylene with a single, free-running MIXSEL generating two frequency combs

•*J. Nürnberg*[1], *C.G.E. Alfieri*[1], *Z. Chen*[2], *D. Waldburger*[1], *M. Golling*[1], *N. Picqué*[2], *and U. Keller*[1]; [1]*Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland*; [2]*Max-Planck Institute of Quantum Optics, Garching, Germany*

We present dual-comb spectroscopy of acetylene with a single, free-running dual-comb MIXSEL at 1030 nm (290 THz). The laser provides more than 10 nm of optical bandwidth usable for spectroscopic interrogations with a resolution of 2.73 GHz.

ED-3.3 WED 9:15

Computational High-resolution Dual-comb Spectroscopy with a Free-running All-fiber Laser

•*L. Sterczewski*[1], *A. Przewloka*[2], *W. Kaszub*[2], *and J. Sotor*[1]; [1]*Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology, Wroclaw, Poland*; [2]*Institute of Electronic Materials Technology, Wroclaw, Poland*

We present an ultra-simple all-fiber dual-comb laser for Doppler-limited free-running dual-comb spectroscopy with computational phase correction around 1560 nm. We measure low pressure hydrogen cyanide with 1% precision in 1 THz bandwidth within 200 ms.

ROOM 4b ICM

EI-3.3 WED 9:00

Intravalley spin-flip relaxation dynamics in single-Layer WS_2

•*Z. Wang*[1], *A. Molina-Sańchez*[2], *P. Altmann*[1], *D. Sangalli*[3], *D. De Fazio*[4], *G. Soavi*[4], *U. Sassi*[4], *F. Bottegoni*[1], *F. Ciccacci*[1], *M. Finazzi*[1], *L. Wirtz*[5], *A. C. Ferrari*[4], *A. Marini*[3], *G. Cerullo*[1,6], *and S. Dal Conte*[1]; [1]*Department of Physics, Politecnico di Milano, Milano, Italy*; [2]*Institute of Materials Science(ICMUV), University of Valencia, Valencia, Spain*; [3]*CNR-ISM, Division of Ultrafast Process in Materials (FLASHit), Monterotondo Scalo, Italy*; [4]*Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom*; [5]*Université du Luxembourg, Luxembourg City, Luxembourg*; [6]*IFN-CNR, Milano, Italy*

We use two-color helicity-resolved pump-probe spectroscopy to track intravalley scattering dynamics in monolayer WS_2. Results show that spin-polarized carriers scatter within the valley by reversing their spin orientation on a sub-ps timescale.

EI-3.4 WED 9:15

Nanostructured MoS_2 Monolayers for Spatial Control of Second-harmonic Generation

•*F.J.F. Löchner*[1], *R. Mupparapu*[1], *M. Steinert*[1], *A. George*[2], *A. Turchanin*[2], *T. Pertsch*[1,3], *I. Staude*[1], *and F. Setzpfandt*[1]; [1]*Institute of Applied Physics, Friedrich Schiller University Jena, Jena, Germany*; [2]*Institute of Physical Chemistry, Friedrich Schiller University Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We realize one-dimensional gratings in MoS_2 monolayers by focused-ion-beam milling and observe second-harmonic generation and nonlinear diffraction. Our results demonstrate that atomically thin semiconductors are a promising platform for the realization of functional nonlinear surfaces.

ROOM 13a ICM

CB-7.2 WED 9:00

Sub-10-kHz Linewidth of a Quantum Cascade Laser achieved by Stabilization to a short Free-Space Delay Line

•*A. Shehzad, P. Brochard, R. Matthey, T. Südmeyer, and S. Schilt*; *Laboratoire Temps-Fréquence, Université de Neuchâtel, Neuchatel, Switzerland*

We demonstrate almost 40-dB reduction of the frequency noise of a mid-infrared quantum cascade laser at low Fourier frequencies achieved by stabilization to a short free-space delay line, corresponding to sub-10-kHz linewidth at 1-s integration time.

CB-7.3 WED 9:15

Quantum-cascade lasers with U-shaped resonator: single frequency generation at room temperature

V. Dudelev[1], *A. Babichev*[1], *D. Mikhailov*[1], *A. Gladyshev*[2], *S. Losev*[1], *E. Kognovitskaya*[1], *I. Novikov*[2], *S. Slipchenko*[1], *A. Lyutetskiy*[1], *N. Pikhtin*[1], *L. Karachinsky*[2], *A. Egorov*[3], *and •G. Sokolovskii*[1]; [1]*Ioffe Institute, Saint-Petersburg, Russia*; [2]*Connector Optics LLC, Saint-Petersburg, Russia*; [3]*ITMO University, Saint-Petersburg, Russia*

In this paper, we demonstrate the room-temperature generation of the quantum cascade lasers with U-shaped resonator and present the approach for realization of the continuous frequency-swept light source in the mid-infrared range.

ROOM 13b ICM

CK-10.2 WED 9:00

Controlling Light Polarization from Helical Travelling-wave Nanoantennas

•*M. Wang*[1], *R. Salut*[1], *H. Lu*[2], *M.A. Suarez*[1], *N. Martin*[1], *and T. Grosjean*[1]; [1]*FEMTO-ST Institute, UMR CNRS 6174, Besançon, France*; [2]*Jinan University, Guangzhou, China*

Based on the optical spin-orbit interaction, we introduce and demonstrate the concept of a non-resonant helical traveling-wave nanoantenna. It is used as a new element to manipulate light polarization at small scale.

CK-10.3 WED 9:15

Integrated plasmonic tweezers for efficient nanoparticle trapping

A. Ecarnot, G. Magno, X. Leroux, B. Dagens, and •V. Yam; *Centre de Nanosciences et Nanotechnologies, Palaiseau, France*

We show numerically and experimentally that integrated plasmonic tweezers enable ultra-efficient trapping of dielectric nanobeads thanks to the existence of a strong coupling between gold nanoparticle chain with a monomode SOI waveguide.

ROOM 14a ICM

EF-3.3 WED 9:00

Rotating spacetime and wave amplification in superfluids of light

•*M.C. Braidotti*[1], *R. Prizia*[1,2], *C. Maitland*[1,2], *A. Prain*[1,2], *F. Marino*[3,4], *and D. Faccio*[1]; [1]*School of Physics and Astronomy, University of Glasgow, Glasgow, United Kingdom*; [2]*Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [3]*CNR-Istituto Nazionale di Ottica, Firenze, Italy*; [4]*INFN, Sez. di Firenze, Sesto Fiorentino, Italy*

Fluids of light in defocusing media can be used to mimic curved spacetimes. We present theoretical and numerical studies of Penrose superradiance, i.e. the amplification of waves from a vortex spacetime, indicating the experimental feasibility.

EF-3.4 WED 9:15

Observation of the Bogoliubov dispersion relation in a fluid of light

•*Q. Fontaine, T. Bienaimé, S. Pigeon, E. Giacobino, A. Bramati, and Q. Glorieux*; *Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-PSL Research University, Collège de France, Paris, France*

We measure a Bogoliubov-like dispersion of density waves for a fluid of light in propagating geometry. Our system (a hot ^{85}Rb vapor pumped near resonance) is a highly tunable platform to observe superfluidity of light.

ROOM 14b ICM

CM-8.3 WED 9:00

Laser inscription of microfluidic devices in the bulk of fused silica

•*A.N. Giakoumaki*[1,2], *V. Bharadwaj*[1], *R. Ramponi*[1,2], *G. Bergamini*[3], *and S.M. Eaton*[1]; [1]*CNR-IFN, Milan, Italy*; [2]*Politecnico di Milano, Milan, Italy*; [3]*University of Bologna , Bologna, Italy*

We present the fabrication and functionalization of buried glass microfluidic devices made by femtosecond laser inscription. The devices enable the interface, interaction and separation of two fluids with minimum mixing for applications in chemistry.

CM-8.4 WED 9:15

High Performance Thermal Emitters Based on Laser Engineered Surfaces

•*S. Zolotovskaya*[1], *S. Wackerow*[1], *H. Neupert*[2], *M. Barnes*[2], *L. V. Cid*[2], *B. Teissandier*[2], *and A. Abdolvand*[1]; [1]*University of Dundee, Dundee, United Kingdom*; [2]*CERN, Geneva, Switzerland*

We demonstrate a substantial increase in emissivity of metal surfaces following surface structuring. Emissivity values exceeding 0.9 were achieved after nanosecond pulse laser structuring of steel in the 2.5-12 um spectral region.

ROOM 1 Hall A1

EA-6.3 WED (Invited) 9:00

Nonlinear Quantum Devices

•*C. Silberhorn*; *Paderborn University, Paderborn, Germany*

Non-linear waveguide structures allow the realization of quantum devices with multiple functionalities, including efficient photon pair generation and electro-optical elements such as a controllabe time delay. Here we present our latest progress in this field.

ROOM 2 Hall A1

CG-3.2 WED 9:00

Polarization and vortex control of extreme-ultraviolet attosecond pulses through simultaneous control of spin and orbital angular momentum

K.M. Dorney[1], *L. Rego*[2], *E. Pisanty*[3], *N.J. Brooks*[1], *J. San Roman*[2], *C.-T. Liao*[1], *J. Ellis*[1], *D. Zusin*[1], *C. Gentry*[1], *Q. Nguyen*[1], *J.M. Shaw*[4], *M. Lewenstein*[3], *A. Picon*[5], *L. Plaja*[2], *H.C. Kapteyn*[1], *M.M. Murnane*[1], *and* •*C. Hernandez-Garcia*[2]; [1]*JILA - University of Colorado, Boulder, USA*; [2]*University of Salamanca, Salamanca, Spain*; [3]*National Institute of Standards and Technology, Boulder, USA*; [4]*ICFO, Institut de Ciencies Fotoniques, Castelldefels, Spain*; [5]*Universidad Autónoma de Madrid, Madrid, Spain*

Extreme-ultraviolet beams with simultaneously controlled spin and orbital angular momentum are generated for the first time. The novel angular momentum conservation rules allow for harnessing the polarization, divergence and vortex charge of high-harmonic attosecond pulses.

CG-3.3 WED 9:15

Topological strong field physics on sub-laser cycle timescale

R. Silva[1,2], •*Á. Jiménez-Galán*[1], *B. Amorim*[3], *O. Smirnova*[1,4], *and M. Ivanov*[1,5,6]; [1]*Max Born Institute, Berlin, Germany*; [2]*Universidad Autónoma de Madrid, Madrid, Spain*; [3]*Universidade de Lisboa, Lisbon, Portugal*; [4]*Technische Universität, Berlin, Germany*; [5]*Humboldt University, Berlin, Germany*; [6]*Imperial College London, London, United Kingdom*

Topological state is linked with dynamics, as manifested via chiral-edge currents. But is there an inherent timescale, associated with topology? We address this question using unique properties of primary electronic response to strong optical fields.

ROOM 3 Hall A1

CC-3.3 WED 9:00

n-type Ge/SiGe quantum cascade heterostructures for THz emission

•*D. Stark*[1], *L. Persichetti*[2], *M. Montanari*[2], *C. Ciano*[2], *L. Di Gaspare*[2], *M. De Seta*[2], *M. Zoellner*[3], *O. Skibitzki*[3], *G. Capellini*[2,3], *M. Ortolani*[4], *L. Baldassarre*[4], *M. Virgilio*[5], *T. Grange*[6], *S. Birner*[6], *K. Rew*[7], *D.J. Paul*[7], *J. Faist*[1], *and G. Scalari*[1]; [1]*ETH Zurich, Institute of Quantum Electronics, Zurich, Switzerland*; [2]*Dipartimento di Scienze, Universita Roma Tre, Rome, Italy*; [3]*IHP-Leibniz-Institut fur innovative Mikroelektronik, Frankfurt, Germany*; [4]*Dipartimento di Fisica, Universita di Roma "La Sapienza", Rome, Italy*; [5]*Dipartimento di Fisica "E. Fermi", Universita di Pisa, Pisa, Italy*; [6]*nextnano GmbH, München, Germany*; [7]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*

We present low temperature transport and magneto-transport measurement on Ge/SiGe UHv-CVD grown THz quantum cascade laser structures.

CC-3.4 WED 9:15

Hyperspectral single-pixel reconstruction at THz frequencies using Time-Resolved Nonlinear Ghost Imaging

•*L. Olivieri, J.S. Totero Gongora, V. Cecconi, R. Tucker, A. Pasquazi, and M. Peccianti*; *University of Sussex, Brighton, United Kingdom*

We propose an innovative time-space nonlinear Ghost-Imaging combining nonlinear pattern generation with time-resolved single-pixel measurements at THz frequencies. Our approach allows to reconstruct the morphology and local spectrum of the sample with deeply subwavelength resolution.

NOTES

ROOM 4a ICM

ED-3.4 WED 9:30

Static and dynamic measurements in an electrical discharge using mid-infrared dual-comb spectroscopy

•*M.A. Abbas, A. Khodabakhsh, J. Mandon, Q. Pan, and F.J.M. Harren*; *Institute of Molecules and Materials, Radboud University, Nijmegen, Netherlands*

We use mid-infrared dual-comb spectroscopy for time-resolved monitoring of the products of methane under discharge, as well as measuring the collisional relaxation of three molecular excited states of methane with microsecond time resolution.

ED-3.5 WED 9:45

Direct Frequency Comb Spectroscopy with an Immersion Grating

•*K. Iwakuni*[1], *T. Bui*[1], *J. Niedermeyer*[1], *T. Sukegawa*[2], *and J. Ye*[1]; [1] *JILA, National Institute of Standards and Technology and University of Colorado, and Department of Physics, University of Colorado, Boulder, USA*; [2]*Canon Inc., Utsunomiya, Japan*

We developed a new dispersive spectrometer with using an immersion grating for direct frequency comb spectroscopy at 8-10μm. We carefully characterized its performance and achieved highest frequency resolution of 460 MHz in this wavelength region.

ROOM 4b ICM

EI-3.5 WED 9:30

Nonlinear microscopy of lead iodide nanosheets

•*J. Yan*[1], *Q. Ou*[2], *Q. Bao*[2], *and D.N. Neshev*[1]; [1]*Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, ACT, Australia*; [2]*Department of Materials Science and Engineering, ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET), Monash University, Victoria, Australia*

We demonstrate nonlinear microscopy of PbI2 nanosheets. By using the polarization and thickness dependence of the nonlinear harmonic emissions, we can precisely determine their thickness and crystalline orientation with a non-invasive optical technique.

EI-3.6 WED 9:45

Coupling 2D Materials to an Elastomer Waveguide

F. Auksztol[1], *D. Vella*[2], *I. Verzhbitskiy*[2], *K.F. Ng*[1], *Y.W. Ho*[2,3], •*J.A. Grieve*[1], *J. Viana-Gomes*[2,3], *G. Eda*[2,3,4], *and A. Ling*[1,2]; [1]*Centre for Quantum Technologies, Singapore, Singapore*; [2]*Department of Physics, National University of Singapore, Singapore, Singapore*; [3]*Centre for Advanced 2D Materials, Singapore, Singapore*; [4]*Department of Chemistry, National University of Singapore, Singapore, Singapore*

We demonstrate the coupling of a MoS_2 monolayer to a single-mode optical waveguide. The monolayer is encapsulated within a flexible elastomer chip, simplifying the handling and addressing of an otherwise fragile material.

ROOM 13a ICM

CB-7.4 WED 9:30

Wavelength stabilized External Cavity Quantum Cascade Lasers using Cavity Resonator Integrated Grating Filters

•*A. Monmayrant*[1], *S. Augé*[1], *S. Gluchko*[2], *A.-L. Fehrembach*[3], *E. Popov*[3], *T. Antoni*[4], *S. Pelloquin*[1], *A. Arnoult*[1], *G. Maisons*[5], *and O. Gauthier-Lafaye*[1]; [1]*LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France*; [2]*Institute of Industrial Science and LIMS/CNRS, The University of Tokyo, Tokyo, Japan*; [3]*Aix-Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*; [4]*Laboratoire de Photonique Quantique et Moléculaire, CentraleSupélec, Ecole Normale Supérieure Paris-Saclay, Université Paris-Saclay, Gif-sur-Yvette, France*; [5]*mirSense, Palaiseau, France*

An external cavity with a QCL and a Cavity-Resonator-Integrated-Grating-Filter (CRIGF) shows single mode operation with 20mW output power at 4.65 μm. Standard active layer in the QCL allows tunability with CRIGF period over 70 cm-1.

CB-7.5 WED 9:45

Advances in MOEMS-based External Cavity QCLs

•*Y.V. Flores*[1], *M. Haertelt*[1], *S. Hugger*[1], *L. Butschek*[1], *C. Schilling*[1], *A. Merten*[2], *M. Schwarzenberg*[2], *A. Dreyhaupt*[2], *J. Grahmann*[2], *M. Rattunde*[1], *and R. Ostendorf*[1]; [1]*Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany*; [2]*Fraunhofer Institute for Photonic Microsystems, Dresden, Germany*

We present miniaturized MOEMS-based external-cavity QCLs for mid-IR spectroscopy: A non-resonant, versatile version for setting arbitrary emission wavelengths and a fast, resonant variant with cavity length control for real time measurements with high spectral resolution.

ROOM 13b ICM

CK-10.4 WED 9:30

Multiphoton photoemission from plasmonic nanostars driven by continuous-wave laser excitation

•*M. Sivis*[1], *N. Pazos-Perez*[2], *R. Yu*[4], *R.A. Alvarez-Puebla*[2,3], *J. García de Abajo*[3,4], *and C. Ropers*[1]; [1]*4th Physical Institute - Solids and Nanostructures, Georg-August University, Göttingen, Germany*; [2]*Department of Physical Chemistry and EMas, Universitat Rovira i Virgili, Tarragona, Spain*; [3]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*; [4]*ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain*

Here, we demonstrate localized 3-photon photoemission from resonant gold nanostars using low-power continuous-wave illumination. Intensity- and polarization-dependent measurements confirm nonlinear photoemission from the nanostar tips exhibiting 5-nm feature sizes.

CK-10.5 WED 9:45

Antenna Tapering Strategy for Near-Field Enhancement Optimization in Terahertz Gold Nanocavities

•*V. Aglieri*[1,2,3], *X. Jin*[1], *A. Rovere*[1], *R. Piccoli*[1], *R. Morandotti*[1,4,5], *R. Macaluso*[2], *A. Toma*[3], *and L. Razzari*[1]; [1]*INRS - Énergie, Matériaux et Télécommunications, 1650 Blvd Lionel Boulet, J3X 1S2 Varennes (Québec), Canada*; [2]*Università degli Studi di Palermo - Dipartimento di Ingegneria, Viale delle Scienze, Ed. 9, 90128, Palermo, Italy*; [3]*Istituto Italiano di Tecnologia, Via Morego 30, 16163, Genoa, Italy*; [4]*ITMO University, 199034 St. Petersburg, Russia*; [5]*Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, 610054 Sichuan, China*

In this work, we present the simulation, fabrication and characterization of gold tapered nanoantennas, whose structure is optimized to improve terahertz near-field enhancement.

ROOM 14a ICM

EF-3.5 WED 9:30

Dynamics of photon fluid flows driven by optical pistons

•*A. Bendahmane*[1], *G. Xu*[1], *M. Conforti*[1], *A. Kudlinski*[1], *A. Mussot*[1], *and S. Trillo*[2]; [1]*Lille University, Lille, France*; [2]*University of Ferrara, Ferrara, Italy*

We investigate the optical analogous of the piston shock problem in gas dynamics. Using fast temporal measurements, we recorded dispersive shock waves formed by the propagation of a bi-chromatic photon fluid along an optical fiber.

EF-3.6 WED 9:45

Turbulent flow and soliton interaction in resonantly-driven polaritons superfluids

•*S. Pigeon, A. Maitre, G. Lerario, E. Giocobino, Q. Glorieux, and A. Bramati*; *Laboratoire Kastler Brossel, Sorbonne University, CNRS, Paris, France*

An all-optical method is presented overcoming typical limitations of polariton superfluids resonantly driven. Its experimental implementation is reported showing a turbulent stream of polariton and interacting solitons over more than 100μm.

ROOM 14b ICM

CM-8.5 WED 9:30

Achievement of very smooth cavity sidewalls by UV picosecond laser micromachining

•*M. Sentis, A. Sikora, G. Coustillier, and T. Sarnet*; *LP3 - CNRS- AMU, Marseille, France*

The effects of the laser pulse overlap, focal spot size and fluence on the roughness of ps laser micromachined cavity sidewalls are investigated experimentally and theoretically. Roughness lower than 40 nm is demonstrated.

CM-8.6 WED 9:45

Laser engineered surface structures for custom design of secondary electron yield

•*D. Bajek*[1], *S. Wackerow*[1], *M. Stiko*[2], *S. Calatroni*[2], *B. Di Girolamo*[2], *and A. Abdolvand*[1]; [1]*University of Dundee, Dundee, United Kingdom*; [2]*CERN, Geneva, Switzerland*

We devise a method which can not only reduce, but finely control the levels of secondary electron yield of metal surfaces, paving the way for reduction in noise and increased signal detection in electronic devices.

ROOM 1 Hall A1

EA-6.4 WED 9:30

Photon-pair source working in a silicon-based detector wavelength range using micro/nanofibers.

•*J.-H. KIm, Y.S. Ihn, H. Shin, and Y.-H. Kim*; *Department of physics, Pohang University of Science and Technology, Pohang, South Korea*

We report the generation of near-IR nondegenerate correlated photon pairs in a 13-cm-long optical nano-fiber. The coincidence-to-accidental ratio (CAR), 400 has been achieved at average pump power of 70 μW.

EA-6.5 WED 9:45

A modular source of entangled photon pairs in femtosecond-laser written waveguide circuits

S. Atzeni[1,2], *A.S. Rab*[3], *G. Corrielli*[2,1], *E. Polino*[3], *M. Valeri*[3], *P. Mataloni*[3], *N. Spagnolo*[3], •*A. Crespi*[1,2], *F. Sciarrino*[3], *and R. Osellame*[2,1]; [1]*Dipartimento di Fisica - Politecnico di Milano, Milano, Italy*; [2]*Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy*; [3]*Dipartimento di Fisica - Sapienza Università di Roma, Roma, Italy*

We demonstrate an on-chip source of single-photon pairs, based on femtosecond laser written waveguides on hybrid substrates. Different combinations of optical chips can be cascaded, to generate either separable states or polarization entangled ones.

ROOM 2 Hall A1

CG-3.4 WED 9:30

Locally and globally chiral fields for ultimate control of chiral light matter interaction

•*D. Ayuso*[1], *O. Neufeld*[2], *A. Ordoñez*[1], *P. Decleva*[3], *G. Lerner*[2], *O. Cohen*[2], *M. Ivanov*[1,4,5], *and O. Smirnova*[1,6]; [1]*Max-Born-Institut, Berlin, Germany*; [2]*Università degli Studi di Trieste, Trieste, Italy*; [3]*Israel Institute of Technology, Haifa, Israel*; [4]*Humboldt Universität, Berlin, Germany*; [5]*Imperial College, London, United Kingdom*; [6]*Technische Universität, Berlin, Germany*

We introduce locally and globally chiral fields and demonstrate the highest possible degree of control over nonlinear chiroptical response, fully suppressing high harmonic emission in a desired enantiomer while enhancing it in its mirror twin.

CG-3.5 WED 9:45

Electric-Dipole based Chiral Sensitivity in High Harmonic Generation by Dynamical Symmetry Breaking Spectroscopy

•*O. Neufeld*[1], *D. Ayosu*[2], *P. Decleva*[3], *M. Ivanov*[2,4,5], *O. Smirnova*[2,6], *and O. Cohen*[1]; [1]*Physics Department and Solid State Institute, Technion - Israel Institute of Technology, Haifa, Israel*; [2]*Max-Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [3]*Dipartimento di Scienze Chimiche e Farmaceutiche, Università degli Studi di Trieste, Trieste, Italy*; [4]*Department of Physics, Imperial College London, London, United Kingdom*; [5]*Institute of Physics, Humboldt University Berlin, Berlin, Germany*; [6]*Technische Universität Berlin, Berlin, Germany*

Using group-theory dynamical symmetry considerations, we propose and numerically demonstrate a new ultrafast chirality spectroscopy technique based on non-collinear high harmonic generation, which relies only on electric-dipole interactions, and leads to a huge chiral response.

ROOM 3 Hall A1

CC-3.5 WED 9:30

Single-shot 2-D burst ultrafast THz imaging utilizing SF-STAMP

•*K. Takasawa*[1], *Y. Yamaguchi*[1], *H. Nemoto*[1], *T. Suzuki*[1], *M. Tani*[2], *H. Kitahara*[2], *D.S. Bulgarevich*[2], *and F. Kannari*[1]; [1]*Keio University, Yokohama, Japan*; [2]*University of Fukui, Fukui, Japan*

Ultrafast single-shot THz 2-D burst imaging is achieved for the first time. We capture EO sampling images with a frequency chirped 800-nm laser pulses and utilize SF-STAMP scheme to transfer the multi-spectral images.

CC-3.6 WED 9:45

High speed THz imaging using atomic vapour

L. Downes, A. MacKellar, D. Whiting, C. Bourgenot, C. Adams, and •*K. Weatherill*; *Durham University, Department of Physics, South Road , Durham, United Kingdom*

We present a sensitive technique for full-field THz imaging that operates at high speed at room temperature. By using atomic vapour as a THz-to-optical convertor we achieve a 100-fold improvement over the current state-of-the-art.

NOTES

ROOM 4a ICM

10:30 – 12:00

ED-4: Direct comb spectroscopy II

Chair: Markus Arndt, University of Vienna, Vienna, Austria

ED-4.1 WED 10:30

First Demonstration of VUV Ramsey-Comb Excitation Based on HHG; Towards 1S-2S He^+ Excitation

•*E.L. Gründeman, L.S. Dreissen, C. Roth, J.J. Krauth, M. Favier, and K.S.E. Eikema; Laser-LaB, Vrije Universiteit Amsterdam, Amsterdam, Netherlands*

We demonstrate Ramsey-comb spectroscopy on xenon in the VUV based on HHG for the first time. This is an important step towards measuring the 1S-2S transition in He^+ for tests of fundamental physics.

ED-4.2 WED 10:45

Direct frequency-comb-driven Raman spectroscopy of the 3d $^2D_{3/2}$ - 3d $^2D_{5/2}$ transition in Ca^+ ions: isotope shifts and the search for new physics beyond the Standard Model

•*C. Solaro, S. Meyer, K. Fisher, M.V. DePalatis, and M. Drewsen; Department of Physics and Astronomy, Aarhus University, DK-8000 Aarhus C, Denmark*

I present high-resolution frequency-comb-driven Raman spectroscopy of a terahertz transition in five calcium isotopes. These measurements together with precise measurements of the clock transition allow for improved bounds on new physics beyond the standard model.

ROOM 4b ICM

10:30 – 12:00

EI-4: Hot electrons and nonlinear dynamics in 2D materials

Chair: Alexander Holleitner, Technical University of Münich, Münich, Germany

EI-4.1 WED (Invited) 10:30

Hybrid van der Waals Hetero-Structures for Quantum Sensing

•*D. Efetov; ICFO, Castelldefels, Spain*

We present a hot-electron bolometer based on Johnson noise readout of graphene. At 5 K, we obtain a NEP of 10pWHz–1/2, a thermal relaxation time <35ps, and an improved light absorption at telecom wavelengths.

ROOM 13a ICM

10:30 – 12:00

CA-9: Laser amplifier systems

Chair: Hiroki Tanaka, Leibniz-Institut für Kristallzüchtung, Berlin, Germany

CA-9.1 WED 10:30

Efficient Extraction From a Multi-Pass Yb:YAG Amplifier Via Multi-Pulse Amplification

M. Hemmer[1], •H. Olgun[1], Ü. Demirbas[1,2], Y. Hua[3], A.-L. Calendron[1,4], H. Çankaya[1,3,4], and F. Kärtner[1,3,4]; [1]Deutsches Elektronen Synchrotron, Hamburg, Germany; [2]Antalya Bilim University, Antalya, Turkey; [3]University of Hamburg, Hamburg, Germany; [4]The Hamburg Center for Ultrafast Imaging, Hamburg, Germany

We report a method to efficiently extract energy from gain-media with high saturation fluence. Using this method, we demonstrate sub-ps duration, >100 mJ extraction from a compact, room-temperature Yb:YAG amplifier in a two-pulse sequence format.

CA-9.2 WED 10:45

Efficient Operation of a High Energy Yb:YAG DPSSL Amplifier

•*P. Mason, S. Banerjee, J. Smith, T. Butcher, J. Phillips, K. Ertel, S. Tomlinson, M. De Vido, M. Tyldesley, C. Hernandez-Gomez, C. Edwards, and J. Collier; STFC Rutherford Appleton Laboratory, Didcot, United Kingdom*

We report operation of a cryogenic Yb:YAG DPSSL amplifier at 130K delivering 120 J, 10 ns pulses at 1 Hz for a pump energy of 360 J, corresponding to a pump-to-output conversion efficiency of 33%.

ROOM 13b ICM

10:30 – 12:00

CK-11: Novel materials and their characterisation

Chair: James Gates, University of Southampton, Southampton, United Kingdom

CK-11.1 WED 10:30

Erbium doped Nanoparticle-Polymer Composite Thin Films for Integrated Photonics

•*E. Kumi Barimah[1], S. Rahayu[1], M. Ziarko[2], N. Bamiedakis[2], I. White[2], R. Penty[2], G. Kale[1], and G. Jose[1]; [1]University of Leeds, Leeds, United Kingdom; [2]University of Cambridge, Cambridge, United Kingdom*

A novel technique of synthesising polymer-Er3+-doped ceria nanocomposite thin films with strong Er3+ ions photoluminescence (PL) emission and long lifetime at 1534 nm for applications in optical sensing and waveguide are presented.

CK-11.2 WED 10:45

TPA Free $Ga_xIn_{1-x}P$ Optomechanical Crystal

•*I. Ghorbel[1], F. Swiadek[1], R. Zhu[2], A. Martin[1], L. Morvan[1], D. Dolfi[1], G. Lehoucq[1], G. Moille[1], R. Braive[2], S. Combrié[1], and A. De Rossi[1]; [1]Thales Research and Technology, Palaiseau, France; [2]Center of Nanosciences and Nanotechnology, Palaiseau, France*

We report on the first GaInP bichromatic 1D optomechanical crystal. Self-sustained oscillations are observed with extremely low linewidth and low threshold.

ROOM 14a ICM

10:30 – 12:00

EF-4: Nonlinear integrated photonics

Chair: Rachel Grange, ETH, Zürich, Switzerland

EF-4.1 WED (Keynote) 10:30

A renaissance in Stimulated Brillouin Scattering

•*B. Eggleton; University of Sydney, Sydney, Australia*

There has been a recent renaissance in Brillouin scattering research, driven by the maturity in new photonic integration platforms and possibilities offered by exotic nanophotonic systems, leading to a diversity of new systems with distinct and complementary capabilities.

ROOM 14b ICM

10:30 – 12:00

CH-9: Microscopy I

Chair: Jianjang Huang, National Taiwan University, Taipei, Taiwan

CH-9.1 WED (Invited) 10:30

A Hyperspectral Camera based on a Birefringent Ultrastable common-Path Interferometer

A. Perri[1,2], B.E. Nogueira de Faria[3], D.C. Teles Ferreira[3], F. Preda[1,2], D. Polli[1,2], A.M. de Paula[3], D. Comelli[1], G. Valentini[1], G. Cerullo[1,2], and •C. Manzoni[1]; [1]IFN-CNR, Physics Department, Politecnico di Milano, Milan, Italy; [2]NIREOS S.R.L., Milan, Italy; [3]Departamento de Física, UFMG, Belo Horizonte, Brazil

We introduce a compact Fourier-transform hyperspectral camera based on an ultra-stable birefringent interferometer. The camera has broad spectral coverage and resolution, wide angular acceptance, high sensitivity and short acquisition time. Example spectral images are presented.

ROOM Osterseen ICM

10:30 – 12:00

EJ-1: Theoretical and computational photonics methods

Chair: Evangelos Siminos, University of Gothenburg, Gothenburg, Sweden

EJ-1.1 WED 10:30

A Functional Mapping for Passively Mode-Locked Semiconductor Lasers

•C. Schelte[1,2], J. Javaloyes[1], and S. Gurevich[2]; [1]Nonlinear Wave Group, Universitat de les Illes Baleares, Palma de Mallorca, Spain; [2]Institute for Theoretical Physics, University of Münster, Münster, Germany

We present a new approach to analyze passively mode-locked lasers allowing for efficient parameter sweeps and time jitter studies. It bridges the divide between phenomenological pulse iterative models and first principle descriptions relying on delayed equations.

EJ-1.2 WED 10:45

Bifurcation structure of localized patterns and spikes in dispersive Kerr cavities

•P. Parra-Rivas[1,2], D. Gomila[3], L. Gelens[2], and E. Knobloch[4]; [1]OPERA-photonics, Université libre de Bruxelles, 50 Avenue F. D. Roosevelt, CP 194/5, B-1050 , Brussels, Belgium; [2]Laboratory of Dynamics in Biological Systems, KU Leuven Department of Cellular and Molecular Medicine, University of Leuven, B-3000, Leuven, Belgium; [3]Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC (CSIC-UIB), Campus Universitat de les Illes Balears, E-07122, Palma de Mallorca, Spain; [4]Department of Physics, University of California, Berkeley CA 94720, Berkeley, USA

In this work we study the bifurcation structure of localized dissipative states arising in driven nonlinear Kerr cavities using the well known Lugiato-Lefever model.

ROOM 1 Hall A1

10:30 – 12:00

EA-7: Nanoclassical light

Chair: John Rarity, University of Bristol, Bristol, United Kingdom

EA-7.1 WED 10:30

Semiconductor-Superconductor Quantum Optoelectronics

D. Panna, S. Bouscher, K. Balasubramanian, S. Cohen, D. Ritter, and •A. Hayat; Department of Electrical Engineering, Technion, Haifa, Israel

We demonstrated experimentally Cooper-pair injection and enhanced light emission in super-semiconductor structures, proposed by us for enhanced two-photon gain, electrically-driven entangled-photon generation and Bell state analyzers. We also demonstrated high-Tc superconductor-semiconductor devices

EA-7.2 WED 10:45

Hectometer Revivals of Quantum Interference

M. Rambach[1,4], •W.Y.S. Lau[1], S. Laibacher[2], V. Tamma[3,2], A. White[1], and T. Weinhold[1]; [1]ARC Centre for Engineered Quantum Systems, School of Mathematics and Physics, Brisbane, Australia; [2] Institut für Quantenphysik and Center for Integrated Quantum Science and Technology (IQST), Universität Ulm, Ulm, Germany; [3]Faculty of Science, SEES and Institute of Cosmology & Gravitation, University of Portsmouth, Portsmouth, United Kingdom; [4]Institute of Photonics and Quantum Sciences, SUPA, Heriot-Watt University, Edinburgh, United Kingdom

We present the creation and characterisation of exceptionally narrowband and bright single photons from SPDC. The unique combination of bandwidth and mode-locked emission is highlighted by showing Hong-Ou-Mandel interference of photons delayed by >100m.

ROOM 2 Hall A1

10:30 – 12:00

CG-4: Attosecond dynamics in bulk solids

Chair: Matteo Lucchini, Politecnico di Milano, Milano, Italy

CG-4.1 WED 10:30

Attosecond soft X-ray absorption spectroscopy in graphite

•N. Di Palo[1], T.P.H. Sidiropoulos[1], D.E. Rivas[1,2], S. Severino[1], M. Reduzzi[1], B. Buades[1], T. Danz[3], E. Pellegrin[4], C. Ropers[3], and J. Biegert[1,5]; [1]ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain; [2]European XFEL GmbH, Schenefeld, Germany; [3]4th Physical Institute-Solids and Nanostructures, University of Göttingen, Göttingen, Germany; [4]ALBA Synchrotron Light Source, Cerdanyola del Vallés, Spain; [5]ICREA, Barcelona, Spain

We exploit temporal resolution and spectral sensitivity of attosecond soft X-ray spectroscopy to access the electronic and lattice structure in graphite and follow light-induced ultrafast dynamics involving both degrees of freedom with time resolved measurements.

CG-4.2 WED 10:45

Attosecond field measurement and charge control in solids

•D.A. Zimin[1,2], S. Sederberg[1], S. Keiber[1,2], F. Siegrist[1,2], M. Wismer[1,2], V.S. Yakovlev[1,2], I. Floss[3], C. Lemell[3], J. Burgdörfer[3], M. Schultze[1], F. Krausz[1,2], and N. Karpowicz[1]; [1]Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Straße 1, D-85748, Garching, Germany; [2]Department für Physik, Ludwig-Maximilians-Universität, Am Coulombwall 1, D-85748, Garching, Germany; [3]Institute for Theoretical Physics, Vienna University of Technology, Wiedner Hauptstraße 8-10, 1040, Vienna, Austria

We show that the non-linear excitation in dielectrics provides an attosecond temporal gate for the optical pulse waveform sampling and for the study of charge dynamics in solids with a petahertz-bandwidth detection and ambient conditions.

ROOM 3 Hall A1

10:30 – 12:00

CC-4: THz quantum optics and spintronics

Chair: Kavi Unterrainer, Technical University of Wien, Vienna, Austria

CC-4.1 WED (Invited) 10:30

Spatial and temporal field correlation measurements on the quantum ground state of electromagnetic radiation

•I.C. Benea Chelmus, F.F. Settembrini, G. Scalari, and J. Faist; Quantum Optoelectronics Group, ETHZ, Zurich, Switzerland

We measure, in time-domain, the electric field correlation on the ground state of electromagnetic radiation with sub-cycle temporal resolution using non-destructive electro-optic detection. We retrieve the spectrum of vacuum fields and their spatial and temporal coherence.

ROOM 4a ICM

ED-4.3 WED 11:00

Precise Comb-Based Fourier Transform Spectroscopy for Line Parameter Retrieval

A.C. Johansson[1], L. Rutkowski[1,2], P. Maslowski[3], A. Filipsson[1], T. Hausmanninger[1], G. Zhao[1], O. Axner[1], and •A. Foltynowicz[1]; [1]Department of Physics, Umeå University, Umeå, Sweden; [2] Univ Rennes, CNRS, IPR (Institut de Physique de Rennes)-UMR 6251, Rennes, France; [3] Institute of Physics, Nicolaus Copernicus University in Torun, Torun, Poland

We perform high-precision measurements of entire molecular bands using direct and cavity-enhanced optical frequency comb Fourier transform spectroscopy and retrieve absorption line parameters with precision beyond the Voigt profile.

ED-4.4 WED 11:15

Broadband Optical Cavity Mode Measurements at Hz-Level Precision With a Comb-Based VIPA Spectrometer

G. Kowzan, D. Charczun, A. Cygan, R.S. Trawiński, D. Lisak, and •P. Masłowski; Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University in Torun, Torun, Poland

We present cavity mode width and frequency measurements over 60-cm-1 range at Hz-level precision. We utilize a near-infrared frequency comb and a VIPA spectrometer to retrieve absorption and dispersion of a CO-N2 sample in a high-finesse cavity.

ROOM 4b ICM

EI-4.2 WED 11:00

Hot Electron Transfer In Graphene/WS2 Heterostructures

•C. Trovatello[1], G. Piccinini[2,3], S. Forti[2,3], F. Fabbri[2,3,4], C. Coletti[2,3,4], G. Cerullo[1,5], and S. Dal Conte[1]; [1]Politecnico di Milano, Milan, Italy; [2]Center for Nanotechnology Innovation @ NEST, Istituto Italiano di Tecnologia, Pisa, Italy; [3]NEST - Scuola Normale Superiore, Pisa, Italy; [4]Graphene Labs, Istituto Italiano di Tecnologia, Genova, Italy; [5]IFN-CNR, Milan, Italy

We use broadband transient reflection spectroscopy to investigate the ultrafast hot electron/hole transfer dynamics in graphene/WS2 heterostructures. The extracted timescale for this process is faster than 20 fs.

EI-4.3 WED 11:15

Cavity enhanced light-matter interaction in a graphene photodetector

•S. Schuler[1], D. Van Thourhout[2], A. Montanaro[3], S. Marconi[3], V. Sorianello[3], M. Romagnoli[3], S. Wachter[1], K. Watanabe[4], T. Taniguchi[4], and T. Mueller[1]; [1]Technical University of Vienna, Institute of Photonics, Vienna, Austria; [2]Ghent University-IMEC, Photonics Research Group, Gent, Belgium; [3]Consorzio Nazionale per le Telecomunicazioni, Photonic Networks and Technologies National Lab, Pisa, Italy; [4]National Institute for Materials Science, Tsukuba, Japan

The integration of graphene onto a ring resonator gives rise to a temperature of several hundred kelvin of the photo-excited carriers, resulting in a strong photoresponse due to the photo-thermoelectric effect.

ROOM 13a ICM

CA-9.3 WED 11:00

160-mJ Cryogenically-Cooled Yb:YLF Amplifier System at 1019 nm

•H. Cankaya[1,2,3], U. Demirbas[1,4], M. Pergament[1], M. Hemmer[1], Y. Hua[1,2], L.E. Zapata[1], and F.X. Kärtner[1,2,3]; [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany; [2]Physics Department, University of Hamburg, Hamburg, Germany; [3]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany; [4]Laser Technology Laboratory, Antalya Bilim University, Antalya, Turkey

We demonstrate 160-mJ pulses from a cryogenically cooled Yb:YLF amplifier system at 10Hz. The spectrum supports sub-ps pulses around 1019nm. The amplifier consist of an Yb:fiber front-end, a regenerative amplifier and two four-pass amplifiers.

CA-9.4 WED 11:15

High average power, multiterawatt femtosecond laser chain enabling 10.19 W/cm2 at 100 Hz

•R. Clady, L. Charmasson, A. Ferre, O. Uteza, and M. Sentis; Aix-Marseille Université, CNRS, Marseille, France

We present the characterization of a high average power (>22W), high peak power (>9TW) laser chain. A control of the thermally induced distortions allows to reach peak intensities above 10.19W/cm2 on target at 100 Hz.

ROOM 13b ICM

CK-11.3 WED 11:00

Observation of elastic anisotropy in strained optical nanofibers using Brillouin spectroscopy

•A. Godet, J. Chrétien, T. Sylvestre, J.-C. Beugnot, and K. Phan Huy; Institut FEMTO-ST, Besançon, France

We investigate both theoretically and experimentally Brillouin light scattering in silica optical nanofibers under tensile strain and show that the fundamental elastic properties of silica dramatically change due to elastic anisotropy.

CK-11.4 WED 11:15

Tunnelling and free propagation of slow whispering gallery modes near the cutoff wavelength of an optical fibre

•Y. Yang and M. Sumetsky; Aston Institute of Photonics Techologies, Birmingham, United Kingdom

We present the first experimental demonstration of slow propagation and tunnelling of whispering gallery modes near the cutoff wavelength of an optical fibre. The results of measurements are in good agreement with the developed theory.

ROOM 14a ICM

EF-4.2 WED 11:15

Experimental Observation of Second Harmonic Generation Enabled by Longitudinal Components in Indium Gallium Phosphide Nanowires

•N. Poulvellarie[1,2], U. Dave[3], K. Alexander[2], C. Ciret[4], S.-P. Gorza[1], F. Raineri[5], S. Combrié[6], A. De Rossi[6], G. Roelkens[2], B. Kuyken[2], and F. Leo[1]; [1]OPERA-Photonics ,Université libre de Bruxelles, Brussels, Belgium; [2]Photonics Research Group, Department of Information Technology, Ghent University-IMEC, Ghent, Belgium; [3]Department of Electrical Engineering, Columbia University, New York, USA; [4]Laboratoire de Photonique d'Angers, Angers, France; [5]Laboratoire de Photonique et de Nanostructures, CNRS, Marcoussis, France; [6]Thales Research and Technology, Palaiseau, France

We demonstrate second harmonic generation in Indium Gallium Phosphide waveguides through the mixing of transverse and longitudinal components of the electric field. We confirm the excitation of an antisymmetric second harmonic mode through modal imaging.

ROOM 14b ICM

CH-9.2 WED 11:00

Hyperspectral imaging of bio-inspired tilted cholesteric liquid crystal structures

•*A. JULLIEN*[1], *A. Scarangella*[2], *U. Bortolozzo*[1], *S. Residori*[1], *and M. Mitov*[2]; [1]*Institut de Physique de Nice, Valbonne, France*; [2]*Centre d'Elaboration de Matériaux et d'Etudes Structurales, Toulouse, France*

We demonstrate the fine tunability of the bandgap of a cholesteric liquid-crystal structure for which the orientation of the helix axis is spatially changing. Hyperspectral imaging made possible a correlation between spectral shift (6nm resolution) and spatial twist

CH-9.3 WED 11:15

Sub-Nanosecond Pulsed Fiber Laser for 532nm Two-Photon Excitation Fluorescence (TPEF) Microscopy of UV transitions

•*D. Weng*[1], *H. Hakert*[1], *T. Blömker*[1], *J.P. Kolb*[1], *M. Strauch*[1], *S. Karpf*[1], *M. Eibl*[2], *P. Lamminger*[1], *and R. Huber*[1]; [1]*Institut für Biomedizinische Optik, Universität zu Lübeck, Lübeck, Germany*; [2]*Carl Zeiss Jena AG, Jena, Germany*

We present a frequency-doubled fiber MOPA for two-photon microscopy with 500W peak powers at 532nm, 1MHz repetition rate and 100ps pulse length. First imaging results using UV-enhanced detection are presented and possible in-vivo applications discussed.

ROOM Osterseen ICM

EJ-1.3 WED 11:00

Disorder-induced acceleration of condensation in multimode fibers

•*A. Fusaro*[1], *J. Ganier*[2], *K. Krupa*[1,3], *G. Millot*[1], *and A. Picozzi*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS, Université Bourgogne Franche-Comté, Dijon, France*; [2]*Centre de Mathematiques Appliquées, Ecole Polytechnique, Palaiseau, France*; [3]*Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Brescia, Italy*

We show that disorder in multimode fibers is responsible for a dramatic acceleration of optical condensation, which explain the effect of spatial beam self-cleaning. Our experiments report the observation of the transition to light condensation.

EJ-1.4 WED 11:15

Observation of Local Symmetry in a Photonic System

•*N. Schmitt*[1], *S. Weimann*[1], *C. Morfonios*[2], *M. Röntgen*[2], *M. Heinrich*[1], *P. Schmelcher*[2,3], *and A. Szameit*[1]; [1]*Institute of Physics, University of Rostock, Rostock, Germany*; [2]*Centre for Optical Quantum Technologies, University of Hamburg, Hamburg, Germany*; [3]*The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany*

We demonstrate how local symmetries are encoded into the dynamics of laser-written photonic waveguide arrays. A non-local continuity equation allows us to readily distinguish between the three cases of globally, locally and fully non-symmetric configurations.

ROOM 1 Hall A1

EA-7.3 WED 11:00

Frequency-domain Linear Interferometer with Spectrally Shaped Photons

A. Hosaka[1], *M. Tomita*[1], *Y. Tsujimoto*[2], •*S. Niimura*[1], *A. Omi*[1], *K. Wakui*[2], *M. Fujiwara*[2], *Y. Shikano*[3,4], *M. Takeoka*[2], *and F. Kannari*[1,3]; [1]*Department of Electronics and Electrical Engineering, Keio University, Yokohama, Japan*; [2]*Advanced ICT Research Institute, National Institute of Information and Communications Technology (NICT), Tokyo, Japan*; [3]*Quantum Computing Center, Keio University, Yokohama, Japan*; [4]*Institute for Quantum Studies, Chapman University, Orange, USA*

We report the experimental demonstration of a frequency domain Hong-Ou-Mandel interference between photons with orthogonal spectra. We also report the programmability of our frequency-domain beam splitter applicable of changing transmittance (reflectance) arbitrarily.

EA-7.4 WED 11:15

Single-photon induced correlation with integrated quantum frequency combs

Y. ZHANG[1], •*M. Kues*[2,3], *P. Roztocki*[1], *C. Reimer*[1,4], *B. Fischer*[1], *B. MacLellan*[1], *L. Caspani*[5], *B. Little*[6], *S. Chu*[7], *D. Moss*[8], *and R. Morandotti*[9,10]; [1]*INRS-EMT, Montreal, Canada*; [2]*School of Engineering, University of Glasgow, Glasgow , United Kingdom*; [3]*Department of Engineering, Aarhus University, Aarhus, Denmark*; [4]*HyperLight Corporation, Cambridge, USA*; [5]*Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom*; [6]*Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, Xi'an, China*; [7]*City University of Hong Kong, Hongkong, China*; [8]*Centre for Micro Photonics, Swinburne University of Technology, Victoria, Australia*; [9]*ITMO University, St. Petersburg, Russia*; [10]*University of Electronic Science and Technology of China, Chengdu, China*

We demonstrate single-photon induced correlation through exploiting orthogonal polarization modes in an integrated device, allowing two different four-wave mixing processes to occur simultaneously with the same signal frequency mode but different idler frequency modes.

ROOM 2 Hall A1

CG-4.3 WED 11:00

Attosecond electron localization and screening dynamics in metals

•*M. Volkov*[1], *S.A. Sato*[2], *F. Schlaepfer*[1], *L. Kasmi*[1], *N. Hartmann*[1], *M. Lucchini*[1], *L. Gallmann*[1], *A. Rubio*[2,3], *and U. Keller*[1]; [1]*Department of Physics, ETH Zurich, Zürich, Switzerland*; [2]*Max Planck Institute for the Structure and Dynamics of Matter and Center for Free-Electron Laser Science, Hamburg, Germany*; [3]*Center for Computational Quantum Physics (CCQ), The Flatiron Institute, New York, USA*

We experimentally investigate electron dynamics in transition metals with attosecond transient absorption spectroscopy. With ab-initio simulations, we find that light-induced electron localization induces ultrafast modification of optical properties by changing electronic screening properties.

CG-4.4 WED 11:15

Optically driven attosecond electron dynamics in III-V semiconductors

•*F. Schlaepfer*[1], *M. Lucchini*[1], *S.A. Sato*[2], *M. Volkov*[1], *L. Kasmi*[1], *N. Hartmann*[1], *A. Rubio*[2], *L. Gallmann*[1], *and U. Keller*[1]; [1]*ETH Zurich, Zurich, Switzerland*; [2]*Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany*

We present measurements of attosecond electron dynamics in single-crystalline gallium arsenide induced by a resonant optical light pulse. Our results, supported by ab-initio simulations, demonstrate a complex electronic response involving intra- and inter-band transitions.

ROOM 3 Hall A1

CC-4.2 WED (Invited) 11:00

Spintronics with terahertz radiation: Insights and applications for spin dynamics and terahertz photonics

•*T. Kampfrath*; *Freie Universität, Berlin, Germany*; *FHI/Max Planck Society, Berlin, Germany*

Terahertz emission spectroscopy is a powerful tool to measure photoinduced spin transport. It allows one to reveal the first steps of current formation, to characterize materials and to construct efficient emitters of broadband terahertz pulses.

ROOM 4a ICM

ED-4.5 WED 11:30

Frequency Comb Generation at 2 μm with Electro-Optic Modulators for Spectroscopic Applications

•*A. Parriaux, K. Hammani, and G. Millot*; *Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS-Université Bourgogne Franche Comté, Dijon, France*

We experimentally demonstrate two ways of generating frequency combs around 2 μm. Based on the electro-optic modulation of a continuous wave laser, we show the advantages of each techniques for spectroscopic applications.

ED-4.6 WED 11:45

Gas sensing over plasmonic nanostructures based on a frequency comb

•*Y.-J. Kim*[1], *D.A. Nguyen*[1], *B.J. Chum*[1], *and S. Kim*[2]; [1]*Nanyang Technological University, Singapore, Singapore*; [2]*Pusan National University, Busan, South Korea*

We report that a frequency comb can be utilized for highly sensitive gas detection over plasmonic metal nanostructures with a high update rate.

ROOM 4b ICM

EI-4.4 WED 11:30

Efficient electrical detection of mid-infrared graphene plasmons at room temperature

Q. Guo[1], •*R. Yu*[2], *C. Li*[1], *S. Yuan*[1], *B. Deng*[1], *J. Gacía de Abajo*[2,3], *and F. Xia*[1]; [1]*Department of Electrical Engineering, Yale University, New Haven, USA*; [2]*ICFO-Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain*; [3]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We demonstrate an efficient mid-infrared graphene photodetector consisting arrays of plasmonic resonators interconnected by quasi-one-dimensional nanoribbons, representing an essential step towards the realization of an on-chip graphene mid-infrared detector array appealing for mass production.

EI-4.5 WED 11:45

Thermoelectric Terahertz Detectors Based on Layered Two-Dimensional Materials

•*L. Viti*[1], *D.G. Purdie*[2], *A. Politano*[3], *A. Lombardo*[2], *X. Yang*[4], *A. Vorobiev*[4], *A.C. Ferrari*[2], *and M.S. Vitiello*[1]; [1]*NEST, Istituto Nanoscienze - CNR and Scuola Normale Superiore, Piazza San Silvestro 12, 56127 , Pisa, Italy*; [2]*Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom*; [3]*Department of Physical and Chemical Sciences, University of L'Aquila, via Vetoio, 67100 , L'Aquila, Italy*; [4]*Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden*

We report on the recent progresses on room temperature terahertz detectors realized with layered two dimensional materials and operating via the photo-thermoelectric effect. The cases of selenium-doped black phosphorus and hBN encapsulated graphene are presented.

ROOM 13a ICM

CA-9.5 WED 11:30

Ho:YAG amplifier with dispersion control and spectral shaping in a single volume Bragg grating

•*I. Astrauskas*[1], *T. Flöry*[1], *A. Pugžlys*[1,2], *and A. Baltuška*[1,2]; [1]*Photonics Institute, TU Wien, Vienna, Austria*; [2]*Center for Physical Sciences & Technology, Vilnius, Lithuania*

We present a high-performance 3.2-ps, 1.6-mJ, 16-W Ho:YAG chirped pulse amplifier with a simple and robust dispersion and bandwidth management and demonstrate advantages of long wavelength, short pulse lasers in processing of certain materials.

CA-9.6 WED 11:45

High repetition rate, wavelength-tunable mid-IR source driven by ps-pulses from a Ho:YLF amplifier at 2 μm

•*M. Hinkelmann*[1], *D. Wandt*[1], *U. Morgner*[1,2], *J. Neumann*[1], *K. Zawilski*[3], *P. Schunemann*[3], *and D. Kracht*[1]; [1]*Laser Zentrum Hannover e.V., Laser Development Department, Ultrafast Photonics Group, Hannover, Germany*; [2]*Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany*; [3]*BAE Systems, Nashua, USA*

We present a ZGP-based OPG/OPA tandem, which generates μJ-level, sub-10 ps pulses at pulse repetition rates up to 100 kHz covering the mid-IR spectral range. This compact laser source exhibits a remarkably simple experimental scheme.

ROOM 13b ICM

CK-11.5 WED 11:30

Coupling Ideality Optimization of High-Q Deuterated Silicon Nitride Microresonator

•*Z. Xu*[1], *Z. Wu*[1], *Y. Chen*[1], *Y. Zhang*[1], *and S. Yu*[1,2]; [1]*Sun Yat-sen University, Guangzhou, China*; [2]*University of Bristol, Bristol, United Kingdom*

We perform coupling ideality optimization of the high-Q deuterated silicon nitride microresonators with varying bus waveguide's geometry and coupling gaps. A high coupling ideality can be achieved with a proper coupling region design.

CK-11.6 WED 11:45

Demonstration of Suspended Aluminium Nitride-on-Silicon Subwavelength Waveguides for Near-Infrared Operation

•*M.S. Mohamed*[1], *D. Jaeger*[2], *and R. Houdré*[1]; [1]*1 Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*; [2]*Evatec AG, Trübbach, Switzerland*

We present the design and characterization of aluminium nitride subwavelength waveguides operating in the near-infrared wavelength range, utilizing sputter-deposited layers on silicon. Propagation losses below 0.5 dB/mm are measured.

ROOM 14a ICM

EF-4.3 WED (Invited) 11:30

Generation and manipulation of quantum frequency states of light with AlGaAs chips

S. Francesconi[1], *G. Maltese*[1], *F. Appas*[1], *A. Lemaître*[2], *F. Baboux*[1], *M.I. Amanti*[1], *and* •*S. Ducci*[1]; [1]*Laboratoire Matériaux et Phénomènes Quantiques, Université Paris Diderot, Sorbonne Paris Cité, Paris, France*; [2]*Centre de Nanosciences et de Nanotechnologies, CNRS/Université Paris Sud, Palaiseau, France*

We present our results on frequency quantum states of light generated with AlGaAs chips; the manipulation of the wavefunction symmetry allows to obtain both bosonic and fermionic behaviors opening the way to a large variety of applications.

ROOM 14b ICM

CH-9.4 WED 11:30

Multiphoton Microscope with a Rapid Broadband CARS Modality

•*F. Sinjab*[1], *K. Hashimoto*[1,2], *V.R. Badarla*[1], *Y. Nagashima*[3], *and T. Ideguchi*[1,4]; [1]*Department of Physics, University of Tokyo, Tokyo, Japan*; [2]*Japan Aerospace Exploration Agency, Tokyo, Japan*; [3]*Department of Neurology, University of Tokyo, Tokyo, Japan*; [4]*PRESTO Japan Science and Technology Agency, Tokyo, Japan*

We present a microscope based around a single mode-locked 10 femtosecond Ti:Sapphire laser source, capable of imaging multi-photon fluorescence, second- and third-harmonic generation, and high-resolution broadband coherent anti-Stokes Raman spectroscopy with sub-millisecond dwell times.

CH-9.5 WED 11:45

Fluorescence-based sensors and preconcentration techniques for buried explosives detection

R. Gillanders[1], *J. Glackin*[1], *J. Filipi*[2], *N. Kezic*[3], *I. Samuel*[1], *and* •*G. Turnbull*[1]; [1]*University of St Andrews, St Andrews, United Kingdom*; [2]*University of Zadar, Zadar, Croatia*; [3]*HCR CTRO, Zagreb, Croatia*

We present the development of fluorescent polymer sensors combined with polymer preconcentrators for buried explosives detection, which have nanogram sensitivity to nitroaromatics. Initial test minefield trials are presented, to detect explosives collected by foraging honeybees.

ROOM Osterseen ICM

EJ-1.5 WED 11:30

Directionality Fields generated by a Local Hilbert Transform in Optics

•*K. Staliunas*[1,2], *W. Ahmed*[3], *R. Herrero*[2], *M. Botey*[2], *Z. Hayran*[4], *and H. Kurt*[4]; [1]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*; [2]*Universitat Politecnica Catalunya (UPC), Barcelona, Spain*; [3]*King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia*; [4]*TOBB University of Economics and Technology, Ankara, Turkey*

We derive the local Hilbert transform to generate directionality fields of desired shapes and topologies, and we apply the idea to regularize the light fields in the emission of broad area lasers

EJ-1.6 WED 11:45

Structuring the three electric field components of light

•*F. Maucher*[1], *S. Skupin*[2], *S.A. Gardiner*[3], *and I.G. Hughes*[3]; [1]*Department of Physics and Astronomy, Aarhus University, Aarhus, Denmark*; [2]*Univ. Lyon, Université Claude Bernard Lyon 1, CNRS, Institut Lumière Matière, Villeurbanne, France*; [3]*Joint Quantum Centre (JQC) Durham-Newcastle, Department of Physics, Durham University, Durham, United Kingdom*

We present a systematic algorithm to construct numerically exact vector beams. Our approach reveals the interplay between transverse and longitudinal electric field components in a transparent fashion, and allows intuitive interpretations of tightly focused beams.

ROOM 1 Hall A1

EA-7.5 WED 11:30

Entanglement generation by delocalized single-photon addition

•*N. Biagi*[1,2], *L.S. Costanzo*[1,2], *M. Bellini*[1,2], *and A. Zavatta*[1,2]; [1]*Istituto Nazionale di Ottica (CNR-INO), Florence, Italy*; [2]*LENS and Department of Physics & Astronomy, Florence, Italy*

We experimentally demonstrate the generation of nonclassical correlations between two optical systems containing macroscopic mean photon numbers. The robustness of the produced entanglement allows to investigate the role of quantum mechanics in the macroscopic domain.

EA-7.6 WED 11:45

Controllable Photon-Pair Spectral Correlations

•*M. Cordier*[1], *B. Debord*[2], *F. Gérome*[2], *P. Delaye*[3], *F. Benabid*[2], *and I. Zaquine*[1]; [1]*Télécom ParisTech, Paris, France*; [2]*XLIM, Limoges, France*; [3]*Charles Fabry Laboratory, Paris, France*

We report on a photon-pair source whose states can be controlled from separable to spectrally correlated. The source is based on four-wave mixing nonlinear effect within a gas-filled hollow-core photonic crystal fiber.

ROOM 2 Hall A1

CG-4.5 WED (Invited) 11:30

Petahertz Magnetization Dynamics

•*J.A. Gessner*[1,2], *F. Siegrist*[1,2], *M. Ossiander*[1], *C. Denker*[3], *Y.-P. Chang*[1,2], *M.C. Schröder*[1,2], *A. Guggenmos*[1,2], *Y. Cui*[2], *J. Walowski*[3], *U. Martens*[3], *J.K. Dewhurst*[4], *U. Kleineberg*[1,2], *M. Münzenberg*[3], *S. Sharma*[5], *and M. Schultze*[1,2]; [1]*Max-Planck-Institute of Quantum Optics, Garching, Germany*; [2]*Fakultät für Physik, Ludwig-Maximilians-Universität München, Garching, Germany*; [3]*Institut für Physik, Universität Greifswald, Greifswald, Germany*; [4]*Max-Planck-Institute of Microstructure Physics, Halle (Saale), Germany*; [5]*Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*

We experimentally demonstrate direct optical control and switching of magnetization in solids with unprecedented sub-femtosecond time resolution. The reported results open the doors to a new generation of Petahertz spintronic devices.

ROOM 3 Hall A1

CC-4.3 WED 11:30

Experimental Observation of Ultrafast THz Absorption Modulation in a Graphene-Based Metasurface

•*A.D. Koulouklidis*[1], *A.C. Tasolamprou*[1], *C. Daskalaki*[1], *C.P. Mavidis*[1,2], *G. Kenanakis*[1], *G. Deligeorgis*[1], *Z. Viskadourakis*[1], *P. Kuzhir*[3,4], *M. Kafesaki*[1,2], *E.N. Economou*[1,6], *C.M. Soukoulis*[1,7], *and S. Tzortzakis*[1,2,5]; [1]*Institute of Electronic Structure and Laser, FORTH, Heraklion, Greece*; [2]*Department of Materials Science and Technology, University of Crete, Heraklion, Greece*; [3]*Institute for Nuclear Problems, Belarusian State University, Minsk, Belarus*; [4]*Tomsk State University, Tomsk , Russia*; [5]*Science Program, Texas A&M University at Qatar, Doha, Qatar*; [6]*Department of Physics, University of Crete, Heraklion, Greece*; [7]*Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, USA*

We demonstrate ultrafast THz amplitude modulation of a graphene based ultra-thin absorber induced by optical photoexcitation. The underlying mechanism is found to be the negative dynamics of the THz photoconductivity in the graphene sheet.

CC-4.4 WED 11:45

THz energy level spacing in encapsulated graphene quantum dots

•*E. Riccardi, S. Massabeau, F. Valmorra, M. Rosticher, J. Tignon, T. Kontos, S. Dhillon, R. Ferreira, and J. Mangeney*; *Laboratoire de Physique de l'Ecole normale supérieure, ENS, Université PSL, CNRS, Sorbonne Université, Université Paris-Diderot, Sorbonne Paris Cité, Paris, France*

We report high-quality encapsulated graphene quantum dots that possess energy level spacing at THz frequencies. Encapsulating graphene with hBN layers provides reduced disorder opening the way to achieve low doping regimes at THz frequency.

ROOM 1 ICM

14:00 – 15:30

CJ-10: Ultrafast 2μm fiber laser systems

Chair: Franck Wise, Cornell University, New York, United States

CJ-10.1 WED (Invited) 14:00

High performance ultrafast thulium-doped fiber lasers

•*J. Limpert*[1,2,3], *M. Gebhardt*[1,2], *C. Gaida*[1], *T. Heuermann*[1,2], *Z. Wang*[1], *and C. Jauregui*[1]; [1]*Institute of Applied Physics, FSU Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering , Jena, Germany*

2-μm fiber laser systems can generate kW-class average power or multi-GW peak power with only 100 fs pulse duration. We report on the current status of this laser technology and review its performance scaling prospects.

ROOM 4a ICM

14:00 – 15:30

EH-3: Plasmonics and metamaterials with 2D-materials

Chair: Dragomir Neshev, Australian National University, Canberra, Australia

EH-3.1 WED (Invited) 14:00

Control of light-matter interaction in two-dimensional materials

•*V. Menon*; *City College & Graduate Center of CUNY, New York, USA*

We will discuss the control of light-matter interaction in two-dimensional materials using photonic structures ranging from microcavities to metasurfaces. Realization of strongly coupled exciton polaritons in these systems will be presented.

ROOM 4b ICM

14:00 – 15:30

EF-5: Modulation instabilities and recurrence phenomena

Chair: Svetlana Gurevich, University of Münster, Münster, Germany

EF-5.1 WED 14:00

Spatial Akhmediev Breathers in Slab Waveguides

•*R. Schiek*[1] *and F. Baronio*[2]; [1]*Ostbayerische Technische Hochschule Regensburg, Regensburg, Germany*; [2]*Universita di Brescia, Brescia, Italy*

An optical film waveguide served as new platform for the investigation of Akhmediev Breathers. Using the interplay between third-order and cascaded second-order optical nonlinearities breathers in a wide nonlinearity regime were characterized.

EF-5.2 WED 14:15

Experimental validation in optical fibers of multiple Fermi-Pasta-Ulam-Tsingou recurrences theory

•*C. Naveau*[1], *P. Szriftgiser*[1], *A. Kudlinski*[1], *M. Conforti*[1], *S. Trillo*[2], *and A. Mussot*[1]; [1]*University of Lille, CNRS, UMR 8523 - PhLAM, Lille, France*; [2]*Department of Engineering, University of Ferrara, Ferrara, Italy*

Characterization of Fermi-Pasta-Ulam-Tsingou recurrences dependency on the initial modulation via distributed measurements in phase and intensity of the pump and signal is reported. Comparison with recent theoretical model gives a good agreement.

ROOM 13a ICM

14:00 – 15:30

CA-10: Mid-infrared lasers

Chair: Pavel Loiko, University of Caen Normandy, Caen, France

CA-10.1 WED 14:00

High-efficiency high-repetition-rate gain-switched operation around 3 μm in Cr2+:CdSe single-crystal laser pumped by fiber-laser-pumped Ho3+:YAG laser at 2.1 μm

•*O. Antipov*[1], *I. Eranov*[1], *M. Frolov*[2], *Y. Korostelin*[2], *V. Kozlovsky*[2], *and Y. Skasyrsky*[2]; [1]*Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [2]*P.N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia*

Efficient gain-switched Cr2+:CdSe single-crystal laser operating around 3 μm and pumped by a 2.1-μm repertitevely-pulsed Ho3+:YAG laser was created. Average power of up to 6 W with optical-to-optical efficiency of 67% was achieved.

CA-10.2 WED 14:15

Growth and characterization of high-melting sesquioxides for 3 μm lasers

•*A. Uvarova*[1], *C. Guguschev*[2], *and C. Kränkel*[1]; [1]*Center for Laser Materials, Leibniz-Institut für Kristallzüchtung, Max-Born-Straße 2, 12489, Berlin, Germany*; [2]*Department of Dielectrics & Wide Bandgap Materials, Leibniz-Institut für Kristallzüchtung, Max-Born-Straße 2, 12489, Berlin, Germany*

We report the using of crucible free-floating zone technic (OFZ) for growing high melting point Er-doped sesquioxides. This growth method allows for cost-reduced high crystalline quality gain media for 3μm laser operation.

ROOM 13b ICM

14:00 – 15:30

CD-7: Micro-comb-resonators

Chair: Miro Erkintalo, University of Auckland, Auckland, New Zealand

CD-7.1 WED 14:00

Integrated Self-Injection Locked Soliton Microcomb Source

•*A. Voloshin*[1], *A. Raja*[2], *S. Agafonova*[1,3], *H. Guo*[2], *J. Liu*[2], *A. Gorodnitskiy*[1,3], *M. Karpov*[2], *N. Pavlov*[1,3], *E. Lucas*[2], *N. Kondratiev*[1], *A. Shitikov*[1,4], *J. Jost*[2], *M. Gorodetsky*[1,4], *and T. Kippenberg*[2]; [1]*Russian Quantum Center, Moscow, Russia*; [2]*École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*; [3]*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*; [4]*Faculty of Physics, Lomonosov Moscow State University, Moscow, Russia*

Self-injection locked laser diode to a high-Q Si3N4 microresonator using butt-coupling technique allows developing an ultra-compact current-initiated soliton microcomb source. This approach paves the way for a fully integrated microcomb source for high-volume applications.

CD-7.2 WED 14:15

Adiabatic Frequency Conversion in Non-Centrosymmetric High-Q Optical Microresonators

•*Y. Minet*[1], *L. Reis*[1], *K. Buse*[1,2], *and I. Breunig*[1,2]; [1]*Laboratory for Optical Systems, Department of Microsystems Engineering – IMTEK, University of Freiburg, Freiburg, Germany*; [2]*Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany*

We present adiabatic frequency conversion by employing the Pockels effect in high-Q-whispering-gallery-microresonators made of lithium niobate. Compared with previously published configurations, our approach is considerably simpler. Tuning of several tens of GHz is feasible.

ROOM 14a ICM

14:00 – 15:30

EG-1: Engineering of complex electromagnetic fields

Chair: Christoph Lienau, University of Oldenburg, Oldenburg, Germany

EG-1.1 WED 14:00

Enhancing Magnetic light emission with optical nanoantennas

•*M. Mivelle*; *CNRS, Sorbonne Université, Paris, France*

We experimentally demonstrate that properly designed photonic nanoantennas can selectively manipulate the magnetic versus electric emission of luminescent nanocrystals.

EG-1.2 WED 14:15

Mapping Complex Polarization States of Light on a Solid

M. Alameer, A. Jain, •*M. Rahimian, H. Larocque, P. Corkum, E. Karimi, and R. Bhardwaj*; *University of Ottawa, Ottawa, Canada*

We permanently imprint complex polarization patterns designed by superposition of vector vortex beams onto a solid surface. Based on our method, production of sub-wavelength periodic nanostructures oriented parallel to the laser polarization is realized.

ROOM 14b ICM

14:00 – 15:30

EA/EB-1: Quantum memories I

Chair: Wenjamin Rosenfeld, Ludwig-Maximilians-Universität München, Munich, Germany

EA/EB-1.1 WED 14:00

Quantum storage of frequency-multiplexed heralded single photons

•*A. Seri*[1], *D. Lago-Rivera*[1], *G. Corrielli*[2], *A. Lenhard*[1], *R. Osellame*[2], *M. Mazzera*[1], *and H. de Riedmatten*[1,3]; [1]*ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Technology, Castelldefels, Spain*; [2]*Istituto di Fotonica e Nanotecnologie (IFN) - CNR and Dipartimento di Fisica - Politecnico di Milano, Milano, Italy*; [3]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We demonstrate for the first time the quantum storage of frequency-multiplexed heralded single photons, using a rare-earth doped waveguide. Our results open prospects for massively multiplexed integrated quantum memories for single photons.

EA/EB-1.2 WED 14:15

High Efficiency Quantum Memory in Multiplexed Large-OD Cold Atomic Ensemble

•*M. Cao, F. Hoffet, K. Huang, P. Vernaz-Gris, A. Sheremet, and J. Laurat*; *Laboratoire Kastler Brossel, Sorbonne Université, Paris, France*

We report on a quantum memory for polarization qubits with efficiency of 68%, thereby demonstrating a reversible qubit mapping where more information is retrieved than lost. We recently pushed this number to about 85% at the single photon level.

ROOM Osterseen ICM

14:00 – 15:30

EJ-2: Computational quantum optics, plasmonics and metamaterials

Chair: Luc Bergé, CEA-DAM, DIF, Arpajon, France

EJ-2.1 WED (Invited) 14:00

Quantum phenomena in the electrodynamics of nanoplasmonic structures

•*N.A. Mortensen*; *Center for Nano Optics, University of Southern Denmark, Odense, Denmark*

Plasmonics is commonly explored within local-response classical electrodynamics, while increasing surface-to-volume ratios serve to promote quantum phenomena. Means to include quantum corrections range from semiclassical hydrodynamics to Feibelman corrections determined by ab-initio accounts.

ROOM 1 Hall A1

14:00 – 15:30

ED-5: Frequency combs: Sources and characterization I

Chair: Marco Marangoni, Politecnico di Milano, Milano, Italy

ED-5.1 WED 14:00

FOKUS II – space flight of a vacuum compatible dual frequency comb system

•*M. Lezius, B. Proebster, O. Mandel, M. Giunta, and R. Holzwarth*; *Menlo Systems GmbH, Martinsried, Germany*

We report on the sounding rocket flight of a compact and vacuum compatible dual comb system. During the flights' 6 min of microgravity the optical frequency of an Iodine referenced cw-laser was characterized.

ED-5.2 WED 14:15

Ultra-low Phase Noise Microwave Synthesis with a Kerr Frequency Comb used as Transfer Oscillator

•*p. brochard*[1], *e. lucas*[2], *r. bouchand*[2], *s. schilt*[1], *t. kippenberg*[2], *and t. südmeyer*[1]; [1]*Laboratoire Temps Fréquence, Neuchâtel, Switzerland*; [2]*IPHYS EPFL, Lausanne, Switzerland*

We perform frequency division of an ultra-stable laser using a crystalline-based Kerr-comb as transfer-oscillator providing broadband noise division using only slow stabilizations. We demonstrate phase noise of -90dBc/Hz at 10-Hz offset from a 14-GHz carrier.

ROOM 2 Hall A1

14:00 – 15:30

CG-5: Ultrafast dynamics in molecules

Chair: Tiago Buckup, University of Heidelberg, Heidelberg, Germany

CG-5.1 WED 14:00

Dissociation of Laser-Induced Highly-Excited CO_2^+

•*H. Hu*[1], *S. Larimian*[1], *S. Erattupuzha*[1], *J. Wen*[2], *A. Baltuška*[1], *M. Kitzler*[1], *and X. Xie*[1]; [1]*Photonics Institute, Technische Universität Wien, Vienna, Austria*; [2]*Institute of Organic Chemistry and Biochemistry, AS CR, Prague, Czech Republic*

We report on study of electron trapping and localization dynamics in frustrated dissociative double ionization of CO_2 in strong laser fields with a reaction microscope. Accompanying quantum chemical simulations are performed to interpret experimental observations.

CG-5.2 WED 14:15

Observation of Ultrafast Dynamics in CO_2 Highly Excited States

M. Lucchini[1,2], •*M. Murari*[1,2], *G.D. Lucarelli*[1], *F. Frassetto*[3], *L. Poletto*[3], *T. Schnappinger*[4], *R. de Vivie-Riedle*[4], *and M. Nisoli*[1,2]; [1]*Department of Physics, Politecnico di Milano, Milano, Italy*; [2]*Institute for Photonics and Nanotechnologies,IFN-CNR, Milano, Italy*; [3]*Institute for Photonics and Nanotechnologies, IFN-CNR, Padova, Italy*; [4]*Department of Chemistry, LMU, Munich, Germany*

High excited states of carbon dioxide are studied by time-resolved photoelectron spectroscopy exploiting few-femtoseconds EUV pulses. The rich transient features observed in the time-dependent photoelectron yield give access to ultrafast non-adiabatic dynamics never observed before.

ROOM 3 Hall A1

14:00 – 15:15

CE-9: Rare earth, polymers, ceramics, fibres and beyond

Chair: Maurizion Ferrari, IFN-CNR, Trento, Italy

CE-9.1 WED 14:00

Low NA Yb-Doped Nanostructured Fibers Using The Material System Al, F, Yb:SiO2

•*J. Nold*[1], *C. Hupel*[1], *S. Kuhn*[1], *S. Schulze*[1], *S. Hein*[1], *N. Haarlammert*[1], *T. Schreiber*[1], *R. Eberhardt*[1], *and A. Tünnermann*[1,2]; [1]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*; [2]*Friedrich-Schiller-University Jena, Institute of Applied Physics, Jena, Germany*

Low NA fibers are fabricated by several "stack and draw" procedures resulting in nanostructured homogenous refractive index profiles of the core material. Characterisation and experimental results on their performance are discussed.

CE-9.2 WED 14:15

Near-infrared Wavelength Dependence of Verdet Constant in Tb2Zr2O7 Transparent Ceramics

•*R. Yasuhara*[1,2] *and A. Ikesue*[3]; [1]*National Institutes of Natural Sciences, National Institute for Fusion Science, Toki, Japan*; [2]*SOKENDAI (The Graduate University for Advanced Studies), Toki, Japan*; [3]*World–Lab. Co., Ltd, Nagoya, Japan*

Near-infrared Verdet constant in Tb2Zr2O7 pyrochlore transparent ceramics was evaluated as the first time. The value at 1064 nm was 1.4 times higher than that of TGG, It shows a great potential for high-power lasers

NOTES

ROOM 1 ICM

CJ-10.2 WED 14:30

Ultrafast Holmium-doped Fiber Laser with Metallic Carbon Nanotube-based Saturable Absorbers

•*M. Pawliszewska*[1], *A. Dużyńska*[2], *M. Zdrojek*[2], *and J. Sotor*[1]; [1]*Laser & Fiber Electronics Group, Faculty of Electronics, Wrocław University of Science and Technology, Wrocław, Poland*; [2]*Faculty of Physics, Warsaw University of Technology, Warsaw, Poland*

We demonstrate an ultrafast holmium-doped fiber laser based on metallic carbon nanotube saturable absorber. In stretched-pulse dispersion regime the generated 212 fs pulses centered at 2058 nm reach energy of 3.79 nJ.

CJ-10.3 WED 14:45

Tm-doped nonlinear fiber amplifier emitting 50 fs pulses and 20 W of average power at 2 μm wavelength

•*T. Heuermann*[1,2], *M. Gebhardt*[1,2], *C. Gaida*[1], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Helmholtz Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

In this Contribution we present an optimized nonlinear amplification scheme driven by a Thulium doped fiber laser emitting 50fs pulses at 80MHz repetition rate and 20W of average power with exceptional pulse quality.

ROOM 4a ICM

EH-3.2 WED 14:30

Acoustic plasmons in atomically-thin heterostructures

•*Á. Rodríguez Echarri*[1], *J. D. Cox*[1], *and F.J. García de Abajo*[1,2]; [1]*ICFO – Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain*; [2]*ICREA – Institució Catalana de Recerca i Estudis Avançats, Passeig Lluís Companys 23, 08010 Barcelona (Spain), Barcelona, Spain*

We reveal quantum and finite-size effects in hybrid systems consisting of graphene and few-atomic-layer noble metals, based on a quantum description that captures the electronic band structure of these materials.

EH-3.3 WED 14:45

Nonlinear Enhancement with Graphene Heterostructures

•*I. Alonso Calafell*[1], *L.A. Rozema*[1], *D. Alcaraz Iranzo*[2], *A. Trenti*[1], *F.H.L. Koppens*[2], *and P. Walther*[1]; [1]*University of Vienna, Vienna, Austria*; [2]*ICFO, Castelldefels, Spain*

Nonlinear nanoplasmonics provides precise control and manipulation of light. Graphene sustains electrically tunable and long-lived plasmons. By combining these platforms, we observe a 10^2 enhancement in the third-harmonic generation in graphene heterostructures.

ROOM 4b ICM

EF-5.3 WED 14:30

Fermi-Pasta-Ulam-Tsingou recurrence in spatial optical dynamics

•*d. pierangeli*[1,2], *m. flammini*[2], *l. zhang*[1], *g. marcucci*[2], *a.j. agranat*[3], *p.g. grinevich*[4], *p.m. santini*[2], *c. conti*[2,5], *and e. delre*[2]; [1]*ICL-2DMOST shenzhen university, shenzhen, China*; [2]*university of rome la sapienza, rome, Italy*; [3]*hebrew university of jerusalem, jerusalem, Israel*; [4]*landau institute for theoretical physics, chernogolovka, Russia*; [5]*institute for complex systems, rome, Italy*

We report the observation of more than three Fermi-Pasta-Ulam-Tsingou recurrences for nonlinear optical spatial waves and provide evidence that the recurrent behavior is governed by the exact solution of the nonlinear Schrödinger integrable dynamics.

EF-5.4 WED 14:45

Modulational instability of a plane wave in the presence of localized perturbations: Experiments in nonlinear fiber optics

A.E. Kraych[1], *P. Suret*[1], *G. El*[2], *and •S. Randoux*[1]; [1]*Univ. Lille, CNRS, UMR 8523 - PhLAM, Lille, France*; [2]*Department of Mathematics, Physics and Electrical Engineering, Northumbria University, Newcastle upon Tyne, United Kingdom*

We report an optical fiber experiment in which we study modulational instability of a plane wave in the presence of a localized perturbation. We observe the expansion of nonlinear oscillatory structures exhibiting some universal characteristics.

ROOM 13a ICM

CA-10.3 WED (Invited) 14:30

Rare-earth doped sesquioxide ceramics for highly efficient mid-infrared lasers

J. Wang[1], *D. Yin*[1], *P. Liu*[2], *J. Ma*[2], *Y. Wang*[2], *and •D. Tang*[1]; [1]*Nanyang Technological University, Singapore, Singapore*; [2]*Jiangsu Key Laboratory of Advanced laser Materials and Devices, Jiangsu Normal University , XuZhou , China*

High quality rare-earth doped Y2O3 and Lu2O3 ceramics were fabricated using a high temperature vacuum sintering plus hot isostatic pressing method. Highly efficient laser operation of the fabricated ceramics at different wavelngths was experimentally demonstrated.

ROOM 13b ICM

CD-7.3 WED 14:30

Thermo-optical pulsing in a resonator-based laser

•*M. Rowley*[1], *B. Wetzel*[1,2], *L. Di Lauro*[1], *J.S. Totero Gongora*[1], *H. Bao*[1], *J. Silver*[3], *L. Del Bino*[3], *P. Del' Haye*[3], *M. Peccianti*[1], *and A. Pasquazi* [1]; [1]*University of Sussex, Brighton, United Kingdom*; [2]*Xlim Research Institute , Limoges, France*; [3]*National Physical Laboratory, Teddington, United Kingdom*

We demonstrate a micro-second pulsed laser operation from a micro-resonator nested in an external amplifying fibre-loop. Results show pulse dynamics are driven by complex interactions between the nonlinear thermo-optical effect and non-instantaneous gain response.

CD-7.4 WED 14:45

Photonic Chip-based Soliton Microcomb Driven by a Compact Ultra-low-noise Laser

•*A.S. Raja*[1], *J. Liu*[1], *N. Volet*[2], *R.N. Wang*[1], *J. He*[1], *E. Lucas*[1], *R. Bouchand*[1], *P. Morton*[3], *J. Bowers*[2], *and T.J. Kippenberg*[1]; [1]*Ecole Polytechnique Federale de Lausanne (EPFL), CH-1015, Lausanne, Switzerland*; [2]*University of California, Santa Barbara (UCSB), CA 93106,, California, USA*; [3]*Morton Photonics, 3301 Velvet Valley Drive, West Friendship, MD 21794, Maryland, USA*

A photonic chip-based 100-GHz soliton microcomb is demonstrated in a high-Q Si3N4 microresonator using an ultra-compact, high-power and low-frequency-noise semiconductor-based laser. The soliton is accessed reliably by simple tuning of the laser diode current.

ROOM 14a ICM

EG-1.3 WED (Invited) 14:30

Colour Engineering: form nature to applications

•*S. Vignolini*; *Chemistry Department University of Cambridge , Cambridge , United Kingdom*

Here I will discuss complex optical response form some striking example of natural photonic structures and review our recent advances on the fabrication of photonic material using biopolymers.

ROOM 14b ICM

EA/EB-1.3 WED 14:30

Fast photon storage in a fiber-based atom-cavity system

•*D. Pandey, T. Macha, E. Uruñuela, H. Pfeifer, W. Alt, and D. Meschede; Institut für Angewandte Physik, Universität Bonn, Wegelerstraße 8, 53115, Bonn, Germany*

We report on deterministic generation and storage of fast photons (pulse width < atomic excited state lifetime) in a single-photon single-atom interface consisting of a ^{87}Rb atom strongly coupled to an optical fiber resonator.

EA/EB-1.4 WED 14:45

Spatial spin-wave modulator in multimode cold rubidium quantum memory

•*A. Leszczyński[1,2], M. Lipka[1,2], M. Mazelanik[1,2], M. Parniak[1,2], M. Dąbrowski[1,2], and W. Wasilewski[1,2]; [1]Centre for Quantum Optical Technologies IRAU, Centre of New Technologies, University of Warsaw, Warsaw, Poland; [2]Faculty of Physics, University of Warsaw, Warsaw, Poland*

We want to present a spatial spin-wave modulator (SSM), based on ac-Stark effect, allowing engineering of a spatial phase of spin-waves stored in a cold rubidium quantum memory.

ROOM Osterseen ICM

EJ-2.2 WED 14:30

Analytical Modeling of Graphene Plasmons

•*R. Yu[1], J. Cox[1], J. Saavedra[1], and J. García de Abajo[1,2]; [1]ICFO-Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain; [2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We present an analytical formalism describing a broad range of 2D polaritonic behavior. Closed-form expressions are provided for their extinction spectra, involving only two real parameters for each plasmon mode and graphene morphology.

EJ-2.3 WED 14:45

Computational Modelling of Metasurfaces

J. Martínez-Llinàs, C. Henry, D. Andrén, R. Verre, M. Käll, and •P. Tassin; Chalmers University of Technology, Göteborg, Sweden

We show the computational tools required to simulate and design large metasurfaces manipulating light beams with strongly curved wave fronts. We then use these tools to design a retroreflector with short focal length.

ROOM 1 Hall A1

ED-5.3 WED 14:30

Phase locking of a tunable OEO to an optical frequency comb for microwave synthesis from an optical reference

•*A. Rolland[1], N. Kuse[1], and M. Fermann[2]; [1]Boulder Research Laboratory, IMRA America, Inc., Longmont, USA; [2]IMRA America, Inc., Ann Arbor, USA*

We present the stabilization of a tunable optoelectronic oscillator to a chosen harmonic of a photodetected pulse train generated by a femtosecond oscillator. Phase locking of the OEO exhibits frequency instability lower than 10^{-16}.

ED-5.4 WED 14:45

Retrieving the phase relation of a quantum cascade laser frequency comb and reconstructing its emission profile

•*F. Cappelli[1], L. Consolino[1], G. Campo[1], I. Galli[1,2], D. Mazzotti[1,2], A. Campa[1], M. Siciliani de Cumis[3], P. Cancio Pastor[1,2], R. Eramo[1], M. Rösch[4], M. Beck[4], G. Scalari[4], J. Faist[4], P. De Natale[1], and S. Bartalini[1,2]; [1]CNR-INO - Istituto Nazionale di Ottica, Firenze, Italy; [2]ppqSense Srl, Campi Bisenzio, Italy; [3]ASI - Agenzia Spaziale Italiana, Matera, Italy; [4]ETH Zurich - Institute for Quantum Electronics, Zurich, Switzerland*

We demonstrate the possibility of monitoring the phases of the modes of a quantum cascade laser frequency comb. With the obtained frequencies, amplitudes and phases the emission profile has been reconstructed.

ROOM 2 Hall A1

CG-5.3 WED 14:30

Unexpected long-lived highly excited PAHs following XUV excitation

•*M. Hervé[1], V. Despré[2], P. Castellanos[3], G. Karras[1], A. Marciniak[1], V. Loriot[1], E. Constant[1], A.G.G.M. Tielens[3], A.I. Kuleff[2], and F. Lépine[1]; [1]University of Lyon, Université Claude Bernard Lyon 1, CNRS, Institut Lumière Matière, F-69622 Villeurbanne, France; [2]Physikalisch-Chemisches Institut, Universität Heidelberg, Im Neuenheimer Feld 229, Heidelberg 69120, Germany; [3]Leiden Observatory, Leiden University, P.O. Box 9513, 2300 RA Leiden, Netherlands*

XUV excitation of Polycyclic Aromatic Hydrocarbons (PAHs) produces highly excited cationic states. Their strong many-body (electronic and nuclear) character is probed by subsequent femtosecond dynamics in small and large PAHs, revealing unexpected long-lived lifetimes.

CG-5.4 WED 14:45

Ultrafast Relaxation Processes in Ethylene Cation Investigated by sub-15-fs Extreme-Ultraviolet Pulses

•*M. Lucchini[1,2], M. Murari[1,2], G.D. Lucarelli[1], F. Frassetto[3], L. Poletto[3], D. Mendive-Tapia[4], H. Köppel[4], and M. Nisoli[1,2]; [1]Department of Physics, Politecnico di Milano, Milano, Italy; [2]Institute for Photonics and Nanotechnologies, IFN-CNR, Milano, Italy; [3]Institute for Photonics and Nanotechnologies, IFN-CNR, Padova, Italy; [4]Physikalisch-Chemisches Institut, Universität Heidelberg, Heidelberg, Germany*

Ultrafast internal relaxation processes in ethylene cation are investigated with sub-15-fs extreme-ultraviolet pulses. Selective excitation of the first four cationic states and the use of numerical simulations gave unprecedented access to the entangled energy-conversion mechanisms.

ROOM 3 Hall A1

CE-9.3 WED 14:30

Deep red and near infrared persistent luminescence in Yb3+,Cr3+ co-doped ZnGa2O4 nano glass-ceramics

•*V. Castaing[1], A.D. Sontakke[1], A.J. Fernández Carrión[2], M. Allix[2], and B. Viana[1]; [1]IRCP - UMR8247 CNRS, Paris, France; [2]CEMHTI - UPR3079 CNRS, Orléans, France*

Aiming at developing and evaluating new persistent luminescence nanoparticles, we elaborated ZnGa2O4:Cr3+,Yb3+ nano glass-ceramics. Outstanding persistent luminescence is observed both in the deep red and near infrared ranges, in two biological windows.

CE-9.4 WED 14:45

A Novel Saturable Absorber: Transparent Glass-Ceramics Based on Co2+:Li(Al,Ga)5O8 Spinel Nanocrystals

O. Dymshits[1], •P. Loiko[2], V. Vitkin[2], I. Alekseeva[1], M. Tsenter[1], A. Khubetsov[1], A. Polishchuk[2], A. Volokitina[2], J.M. Serres[3], X. Mateos[3], and A. Zhilin[1]; [1]Vavilov State Optical Institute, St. Petersburg, Russia; [2]ITMO University, St. Petersburg, Russia; [3]Universitat Rovira i Virgili (URV), Tarragona, Spain

Transparent glass-ceramics based on Co2+:Li(Al,Ga)5O8 spinel nanocrystals exhibit low saturation intensity at 1.54 μm (0.5 J/cm2) and high laser-induced damage threshold. An Er,Yb:glass laser passively Q-switched by glass-ceramic-based saturable absorber generated 7.4 ns/1.34 mJ pulses.

NOTES

ROOM 1 ICM

CJ-10.4 WED 15:00

Ultrafast Tm-doped fiber amplifier with 1 kW average output power

•*C. Gaida*[1], *M. Gebhardt*[1,2], *T. Heuermann*[1,2], *Z. Wang*[1], *F. Stutzki*[1,3], *C. Jauregui*[1], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Helmholtz Institute, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present a thulium-doped fiber amplifier with 1150 W average-output power. After pulse compression to 260 fs duration, the system delivers 1060 W average-output power with diffraction-limited beam quality and high stability (RIN<0.4%).

CJ-10.5 WED 15:15

Compact thulium FCPA system delivering 11 MW, 530 fs pulses

•*D. Gaponov*[1], *L. Lavoute*[1], *N. Ducros*[1], *M. Paris*[2], *A. Hideur*[2], *and S. Février*[3]; [1]*NOVAE, Aixe-sur-Vienne, France*; [2]*CORIA CNRS UMR 6614, St Etienne du Rouvray, France*; [3]*XLIM CNRS UMR 7252, Limoges, France*

We report on a compact thulium fiber CPA system providing 530 fs pulse with 10.4 μJ of total energy at 100 kHz repetition rate. The corresponding peak power of 11 MW was retrieved.

ROOM 4a ICM

EH-3.4 WED 15:00

Terahertz polarisation modulator by electronic control of graphene loaded chiral metamaterial device

•*N. Almond*[1], *S. Kindness*[1], *W. Michailow*[1], *B. Wei*[1], *L. Jakob*[1], *P. Braeuninger-Weimer*[2], *S. Hofmann*[2], *H. Beere*[1], *D. Ritchie*[1], *and R. Degl'Innocenti*[3]; [1]*Cavendish Laboratory, University of Cambridge, Cambridge, UK*; [2]*Department of Engineering, University of Cambridge, Cambridge, UK*; [3]*Department of Engineering, University of Lancaster Bailrigg, Lancaster, UK*

A terahertz polarisation modulator was realised by integrating a chiral metamaterial array with graphene, demonstrating 20 degrees linear polarisation rotation at 1.75 THz, with ellipticity below 0.1 and reconfiguration speed > 5 MHz.

EH-3.5 WED 15:15

Losses and fundamental interaction properties of THz meta-atoms strongly coupled to intersubband transitions

•*M. Wenclawiak*[1], *A.M. Andrews*[2], *G. Strasser*[2], *K. Unterrainer*[1], *and J. Darmo*[1]; [1]*Institut für Photonik, TU Wien, Vienna, Austria*; [2]*Institut für Festkörperelektronik, TU Wien, Vienna, Austria*

In this contribution, we study the fundamental interaction mechanisms in semiconductor heterostructures with respect to the interaction volume, influences of lattice modes and the transition from the strong to the weak coupling regime.

ROOM 4b ICM

EF-5.5 WED 15:00

Multiscale Dissipative Structures Driven by Modulation and Polarization Instabilities

H. Kbashi, M. Zajnulina, A. Garcia, and •S. Sergeyev; Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom

Using Erbium-doped fiber laser mode-locked with carbon nanotubes, for the first time we demonstrate experimentally Akhmediev breathers, Peregrine and chaotic solitons driven by modulation and a new type of multimode instability –vector resonance multimode instability.

EF-5.6 WED 15:15

Brightness enhancement in Non-Hermitian VCSELs

W.W. Ahmed[1], *R. Herrero*[2], *M. Botey*[2], *Y. Wu*[1], *and •K. Staliunas*[2,3]; [1]*Division of Computer, Electrical and Mathematical Sciences and Engineering, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia*; [2]*Departament de Física, Universitat Politècnica de Catalunya (UPC), Terrassa, Spain*; [3]*Institució Catalana de Recerca i Estudis Avançats (ICREA) , Barcelona, Spain*

We propose a novel regularization mechanism of the output radiation of broad-area VCSELs. The idea relies on an axisymmetric non-Hermitian potential which efficiently concentrates the light at the center due to unidirectional-inward radial mode coupling.

ROOM 13a ICM

CA-10.4 WED 15:00

Passively mode-locked high-repetition rate Er:YLF laser at 2.81 μm generating 72 ps pulses

•*R. Švejkar, J. Šulc, M. Němec, and H. Jelínková; Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic*

Compact passively mode-locked Er:YLF lasing at 2.81 μm was tested for the first time. Using SESAM and short V-shape laser resonator the duration 72±4 ps with repetition rate 1.41 GHz were achieved.

CA-10.5 WED 15:15

Passively Q-switched Er:YAP Single Crystal Laser at 2.92 μm using Graphene Saturable Absorber

•*H. Kawase*[1], *H. Uehara*[2], *and R. Yasuhara*[1,3]; [1]*SOKENDAI (The Graduate University for Advanced Studies), Toki, Japan*; [2]*Institute of Laser Engineering, Osaka University, Suita, Japan*; [3]*National Institutes of Natural Sciences, National Institute for Fusion Science, Toki, Japan*

A passively Q-switched 2.92 μm Er:YAP laser using graphene saturable absorber was demonstrated. The pulse-energy of 4.6 μJ and the peak-power of 10 W were achieved in 460 ns pulse duration at Q-switched operation.

ROOM 13b ICM

CD-7.5 WED 15:00

Frequency Comb Generation and Conversion in Non-Centrosymmetric Optical Microresonators

•*J. Szabados*[1], *I. Breunig*[1,2], *and K. Buse*[1,2]; [1]*Laboratory for Optical Systems, Department of Microsystems Engineering - IMTEK, University of Freiburg, Freiburg, Germany*; [2]*Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany*

We present a pathway to convert near-infrared high-repetition-rate frequency combs to the ultraviolet, visible and mid-infrared using synchronously pumped high-Q $\chi(2)$ microresonators. Furthermore, first results towards achieving combs based purely on $\chi(2)$ nonlinearities are discussed.

CD-7.6 WED 15:15

Experimental Observation of Optical Frequency Combs in Doubly Resonant Second Harmonic Generation

•*I. Ricciardi*[1], *S. Mosca*[1], *M. Parisi*[1], *P. Maddaloni*[1], *P. De Natale*[2], *M. Erkintalo*[3], *F. Leo*[4], *T. Hansson*[5], *A. Arie*[6], *S. Wabnitz*[1,7], *and M. De Rosa*[1]; [1]*CNR-INO, Istituto Nazionale di Ottica, Pozzuoli (NA), Italy*; [2]*CNR-INO, Istituto Nazionale di Ottica, Firenze, Italy*; [3]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Department of Physics, The University of Auckland, Auckland, New Zealand*; [4]*OPERA-Photonics, Université libre de Bruxelles, Bruxelles, Belgium*; [5]*Department of Physics, Chemistry and Biology, Linköping University, Linköping, Sweden*; [6]*School of Electrical Engineering, Iby and Aladar Fleischman Faculty of Engineering, Tel-Aviv University, Tel-Aviv, Israel*; [7]*Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Università di Roma, Roma, Italy*

We report on frequency comb for-

ROOM 14a ICM

EG-1.4 WED 15:00

Field-resolved response of plasmonic antennas

M.P. Fischer[1], •*N. Maccaferri*[2], *K. Gallacher*[3], *J. Frigerio*[4], *G. Pellegrini*[5], *G. Isella*[4], *A. Leitenstorfer*[1], *D.J. Paul*[3], *P. Biagioni*[5], *and D. Brida*[1,2]; [1]*Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*; [2]*Physics and Materials Science Research Unit, Université du Luxembourg, Luxembourg, Luxembourg*; [3]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*; [4]*L-NESS, Dipartimento di Fisica del Politecnico di Milano, Como, Italy*; [5]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*

We introduce a new experimental strategy to investigate the transient resonant behavior of plasmonic nanostructures. Our approach allows to access their full-time field-resolved response in amplitude and phase.

EG-1.5 WED 15:15

All-dielectric and magnetoplasmonic nanoantenna surfaces for the dynamic chiroptics

•*E. Smetanina*[1], *I. Zubritskaya*[1,2], *E. Pedrueza Villalmanzo*[1], *N. Maccaferri*[3], *P. Vavassori*[4,5], *and A. Dmitriev*[1]; [1]*Department of Physics, University of Gothenburg, SE-412 96 Gothenburg, Sweden*; [2]*Geballe Laboratory for Advanced Materials, Stanford University, California 94305-4045 Stanford, USA*; [3]*Physics and Materials Science Research Unit, University of Luxembourg, L-1511 Luxembourg, Luxembourg*; [4]*CIC nanoGUNE, 20018 Donostia–San Sebastian, Spain*; [5]*IKERBASQUE, Basque Foundation for Science, 48013 Bilbao, Spain*

We demonstrate the use of hybrid magnetoplasmonic and all-dielectric nanoantennas in magnetically-controlled transparent chiroptics with tunability of the circular differential transmittance

ROOM 14b ICM

EA/EB-1.5 WED 15:00

Noise Suppression via Atomic Absorption in a Raman Quantum Memory

•*T.M. Hird*[1,2], *S.E. Thomas*[1,3], *J.H.D. Munns*[1,3], *B. Brecht*[1,4], *D.J. Saunders*[1], *J. Nunn*[1,5], *I.A. Walmsley*[1,3], *and P.M. Ledingham*[1]; [1]*University of Oxford, Oxford, UK*; [2]*University College London, London, UK*; [3]*Imperial College London, London, UK*; [4]*Paderborn University, Paderborn, Germany*; [5]*University of Bath, Bath, UK*

We propose and demonstrate a scheme to strongly suppress four-wave mixing noise on the output of a Raman quantum optical memory. We show that heralded single-photon states can be recalled non-classically using our device.

EA/EB-1.6 WED 15:15

Towards storage of sub-megahertz single photons in Gradient Echo Memory

•*W.Y.S. Lau*[1], *A.C. Leung*[2], *K.V. Paul*[2], *A.D. Tranter*[2], *G.T. Campbell*[2], *T.J. Weinhold*[1], *P.K. Lam*[2], *A.G. White*[1], *and B.C. Buchler*[2]; [1]*ARC Centre of Excellence for Engineered Quantum Systems, School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [2]*ARC Centre of Excellence for Computation and Communication Technology, Department of Quantum Science, The Australian National University, Canberra, Australia*

We report on the integration of a sub-megahertz single photons source with the Gradient Echo Memory protocol using ^{87}Rb atoms. Technical challenges, initial results and future directions will be discussed.

ROOM Osterseen ICM

EJ-2.4 WED 15:00

Completely Positive Trace Preserving Numerical Methods for Long-Term Generalized Maxwell-Bloch Simulations

•*M. Riesch and C. Jirauschek*; *Technical University of Munich, Munich, Germany*

We evaluate numerical methods for the generalized Maxwell-Bloch equations with respect to performance. Here, we focus on completely positive trace preserving methods that are suitable for long-term simulations of the quantum cascade laser dynamics.

EJ-2.5 WED 15:15

Inverse photonic design of functional elements that focus Bloch surface waves

Y. Augenstein[1], *A. Vetter*[2,3], *B.V. Lahijani*[4], *H.P. Herzig*[4], *M.-S. Kim*[4], *and* •*C. Rockstuhl*[1,2]; [1]*Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology, Karlsruhe, Germany*; [2]*Institute of Nanotechnology, Karlsruhe Institute of Technology, Karlsruhe, Germany*; [3]*SUSS MicroOptics SA, Hauterive, Switzerland*; [4]*Optics & Photonics Technology Laboratory, Ecole Polytechnique Fédérale de Lausanne , Lausanne, Switzerland*

We present a computational strategy to design functional elements that focus Bloch surface waves. Sub-wavelength focusing is predicted while exploiting near-field effects. Optimised structures are fabricated and their functionality is experimentally proven.

ROOM 1 Hall A1

ED-5.5 WED 15:00

Coherent control of quantum cascade laser frequency combs via electrical injection locking

•*J. Hillbrand*[1], *A.M. Andrews*[2], *H. Detz*[3], *G. Strasser*[1], *and B. Schwarz*[1]; [1]*Institute of Solid State Electronics, TU Wien, Vienna, Austria*; [2]*Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*; [3]*CEITEC, Brno University of Technology,, Brno, Czech Republic*

Coherent electrical injection-locking allows to reference the repetition frequency of quantum cacade laser frequency combs to an external RF oscillator. We investigate the dynamics of the injection-locked QCL comb and demonstrate its applications in dual-comb spectroscopy.

ED-5.6 WED 15:15

Frequency noise and phase-locking of a quantum cascade laser-pumped, 1.073 terahertz molecular laser using a 1560nm frequency comb

•*S. Barbieri*[1], *J.-F. Lampin*[1], *G. Santarelli*[2], *A. Pagies*[1], *S. Eliet*[1], *J. Hesler*[3], *W. Hansel*[4], *and R. Holzwarth*[4]; [1]*Laboratoire IEMN, CNRS, Université de Lille, Villeneuve d'Ascq, France*; [2]*Institut d'Optique Graduate School, CNRS, Université de Bordeaux, Talence, France*; [3]*Virginia Diodes Inc., Charlottesville, USA*; [4]*Menlo Systems GmbH, Martinsried, Germany*

We report the measurement of the frequency noise power spectral density of a quantum cascade laser-pumped 1.073THz molecular laser, and demonstrate its phase-locking to the harmonic of the repetition rate of a 1560nm frequency comb

ROOM 2 Hall A1

CG-5.5 WED 15:00

Time-Resolved Photoelectron and Photoion Imaging of Molecular Dynamics Using Low-Order Harmonic Generation

V. Svoboda[1], •*C. Wang*[1,2], *M.A. Silva-Toledo*[1], *and H.J. Wörner*[1]; [1]*Laboratory of Physical Chemistry, ETH Zurich, Zurich, Switzerland*; [2]*Institution of Atomic and Molecular Physics, Jilin University, Changchun, China*

Using femtosecond deep VUV pump UV probe scheme to reveal the different time scale of Rydberg state dynamics and population redistribution between them for ammonia, and also the ultrafast dissociative ionization dynamics from SF6+.

CG-5.6 WED 15:15

Probing molecular influence on photoemission delays

•*S. Biswas*[1,2], *B. Förg*[1,2], *J. Schötz*[1,2], *W. Schweinberger*[1,3], *L. Ortmann*[4], *T. Zimmermann*[5], *L.-W. Pi*[4], *D. Baykusheva*[6], *H. Masood*[3], *I. Liontos*[3], *A. Kamal*[3], *N. Kling*[1], *A. Alharbi*[7], *M. Alharbi*[3], *A. Azzeer*[3], *H.-J. Wörner*[6], *A. Landsman*[4], *and M. Kling*[1,2]; [1]*Physics Department, Ludwig Maximilians Universität, Munich, Germany*; [2]*Max Planck Institute for Quantum Optics, Munich, Germany*; [3]*Attosecond Science Laboratory, Physics and Astronomy Department, King Saud University, Riyadh, Saudi Arabia*; [4]*Max Planck Institute for the Physics of Complex Systems, Dresden, Germany*; [5]*Department of Mathematics, ETH Zurich, Zurich, Switzerland*; [6]*Laboratory of Physical Chemistry, ETH Zurich, Zurich, Switzerland*; [7]*King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia*

Molecular photoemission delay includes contributions from electron birth process and its subsequent propagation within the molecular

ROOM 3 Hall A1

CE-9.5 WED 15:00

Rare-earths activated polymer composite fibers - technology and characterization

•*R. Piramidowicz*[1], *A. Jusza*[1], *K. Anders*[1], *L. Lipińska*[2], *and P. Mergo*[3]; [1]*Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland*; [2]*Institute of Electronic Materials Technoogy, Warsaw, Poland*; [3]*Faculty of Chemistry, Maria Curie-Sklodowska University, Lublin, Poland*

In this work, we present the results of research on PMMA-based composites and first polymer composite fibers activated with rare-earth ions, discussing main technological problems and challenges as well as the results achieved so far.

NOTES

ROOM 1 ICM

16:00 – 17:30

JSVI-1: 50 Years of integrated optics I

Chair: Valdas Pasiskevicius, KTH Stockholm, Sweden

JSVI-1.1 WED (Tutorial) 16:00

Quantum Dot Lasers Epitaxially Grown on Si

•*J. Bowers*; *University of California, Santa Barbara, Santa Barbara, USA*

InAs quantum dot lasers epitaxially grown on Si show promise for achieving lower threshold, higher temperature, reduced reflection sensitivity and lower cost. Optimization of the buffer layers on Si reduces dislocation densities and improves lifetimes.

ROOM 4a ICM

16:00 – 17:30

EH-4: Metasurfaces and metadevices

Chair: Rupert Oulton, Imperial College London, London, United Kingdom

EH-4.1 WED 16:00

High-Efficiency, All-dielectric Metasurfaces down to the Deep Ultraviolet

•*C. Zhang*[1,2], *S. Divitt*[1,2], *Q. Fan*[3], *W. Zhu*[1,2], *A. Agrawal*[1,2], *T. Xu*[3], *and H.J. Lezec*[1]; [1]*Physical Measurement Laboratory, National Institute of Standards and Technology, Gaithersburg, USA*; [2]*Maryland Nanocenter, University of Maryland, College Park, USA*; [3]*College of Engineering and Applied Sciences, Nanjing University, Nanjing, China*

We demonstrate an assortment of low-loss all-dielectric metasurfaces operating down to a record-short deep-UV wavelength of 266 nm, with efficiencies up to 75%.

EH-4.2 WED 16:15

Ultra-thin Plasmonic Metasurfaces Based on Carbon Nanomembranes

•*Y.D. Sırmacı*[1,2], *S. Fasold*[1,2], *C. Neumann*[3], *Z. Tang*[3], *T. Pertsch*[1,2,4], *A. Turchanin*[2,3,5], *and I. Staude*[1,2]; [1]*Institute of Applied Physics, Friedrich Schiller University Jena, Jena, Germany*; [2]*Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany*; [3]*Institute*

ROOM 4b ICM

16:00 – 17:30

EF-6: Soliton molecules

Chair: Miro Erkintalo, University of Auckland, Auckland, New Zealand

EF-6.1 WED 16:00

Optical Soliton Molecular Complexes in Ultrafast Fiber Lasers

•*N. Kanagaraj*[1,2], *Z. Wang*[1,3], *A. Coillet*[1], *P.T. Dinda*[1], *and P. Grelu*[1]; [1]*Laboratoire ICB, UMR 6303 CNRS, Université Bourgogne – Franche-Comté, Dijon, France*; [2]*UFE Institute of Photonics and Electronics,, Prague, Czech Republic*; [3]*Nanjing University of Posts and Telecommunications, Nanjing, China*

Optical soliton molecular complexes formed in fiber laser are characterized through real-time spectral interferometry measurements. Ultrafast internal dynamics are revealed, reflecting the existence of different soliton bond strengths within the self-organized structure.

EF-6.2 WED 16:15

Theoretical and experimental studies of breather wave molecules

•*G. Xu*[1], *A. Gelash*[2,3], *A. Chabchoub*[4], *V. Zakharov*[5,6], *and B. Kibler*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Institute of Thermophysics, Novosibirsk, Russia*; [4]*The University of*

ROOM 13a ICM

16:00 – 17:30

CA-11: Nonlinear frequency conversion

Chair: Valentin Petrov, Max-Born-Institut, Berlin, Germany

CA-11.1 WED 16:00

High-Power Single-Frequency 620 nm Laser Based on Diamond Raman and Intracavity Frequency Doubling

•*X. Yang*[1,2,3], *O. Kitzler*[1], *D.J. Spence*[1], *R.J. Williams*[1], *Z. Bai*[1], *S. Sarang*[1], *L. Zhang*[2], *Y. Feng*[2,3], *and R.P. Mildren*[1]; [1]*Macquarie University, Sydney, Australia*; [2]*Shanghai Institute of Optics and Fine Mechanics,Chinese Academy of Sciences, Shanghai, China*; [3]*Center of Materials Science and Optoelectronics Engineering, University of the Chinese Academy of Sciences, Beijing, China*

A 38 W single-frequency 620 nm laser is firstly demonstrated in diamond laser resonator pumped by multi-longitudinal mode laser. The combination of intracavity harmonic mixing and the spatial-hole-burning-free gain medium greatly increases neighboring mode suppression.

CA-11.2 WED 16:15

9 W average power, 150 kHz repetition rate diamond Raman laser at 1519 nm, pumped by a Yb fibre amplifier

•*L. Dziechciarczyk*[1], *Z. Huang*[2], *G. Demetriou*[1], *D. Cheng*[2], *S. Pidishety*[2], *Y. Feng*[2], *Y. Feng*[2], *G. Wang*[2], *H. Lin*[2], *S. Zhu*[2], *D. Lin*[2], *T.W. Hawkins*[3], *L. Dong*[3], *A. Kemp*[1], *J. Nilsson*[2], *and V. Savitski*[1]; [1]*Institute of Photonics, Dept. of*

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mation in doubly resonant cavity second harmonic generation. We observed a large variety of stable comb regimes, with different teeth spacing and spectral span, depending on input power and detuning.

16:00 – 17:30

CD-8: Spatio-temporal manipulation of light

Chair: Mikko Huttunen, Tampere University of Technology, Tampere, Finland

CD-8.1 WED (Invited) 16:00

Phase manipulation with nonlinear metasurfaces

N. Pholchai[1] *and* •*T. Zentgraf*[2]; [1]*Department of Industrial Physics and Medical Instrumentation, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand*; [2]*University of Paderborn, Department of Physics, Paderborn, Germany*

Tailoring the nonlinear optical phase of the frequency converted light at spatially distributed meta-atoms, we will demonstrate nonlinear metasurface holograms and nonlinear imaging with metalenses. The concept can be used for nonlinear functional surfaces.

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above 3% at its spectral maximum and above 20% at its lower values.

16:00 – 17:30

EG-2: Ultrafast and strong field nano-optics

Chair: Silvia Vignolini, Cambridge University, Cambridge, United Kingdom and Mathieu Mivelle, Institut des Nanosciences Paris, France

EG-2.1 WED 16:00

Revisiting the Photon-Drag Effect in Metal Films

J.H. Strait, G. Holland, W. Zhu, C. Zhang, A. Agrawal, D. Pacifici, and •*H.J. Lezec*; *National Institute of Standards and Technology, Gaithersburg, MD, USA*

We demonstrate that the sign of the photon-drag effect in smooth gold films is crucially dependent on the surface environment and contrary to the prevailing intuitive model of direct momentum transfer to free electrons.

EG-2.2 WED 16:15

Towards Photoemission Electron Microscopy Using a 200 kHz High-order Harmonic Source

•*J. Vogelsang*[1], *L. Wittenbecher*[1], *S. Mikaelsson*[1], *C. Guo*[1], *D. Wang*[2], *I. Sytsevich*[1], *F. Langer*[1], *C.L. Arnold*[1], *A. L'Huillier*[1], *and A. Mikkelsen*[1]; [1]*Department of Physics, Lund University, Lund, Sweden*; [2]*TU Ilmenau, Institut für Werkstofftechnik und Institut für Mikro- und Nanotechnolo-*

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16:00 – 17:30

EA/EB-2: Quantum memories II

Chair: Mingtao Cao, Sorbonne Université, Laboratoire Kastler Brossel, Paris, France

EA/EB-2.1 WED 16:00

A nuclear quantum memory enabled by strain

•*E. Denning*[1,2], *D. Gangloff*[2], *G. Éthier-Majcher*[2], *C. Lang*[2], *J. Bodey*[2], *D. Jackson*[2], *J. Mørk*[1], *C. Le Gall*[2], *and M. Atatüre*[2]; [1]*Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*

We demonstrate coherent manipulation of the mesoscopic nuclear spin ensemble in a semiconductor quantum dot mediated by a single electron. From these experimental results, we propose a novel scheme for a nuclear quantum memory.

EA/EB-2.2 WED 16:15

Storage of a single photon in a highly non-linear medium based on Rydberg atoms

•*A. Padrón-Brito*[1], *P. Farrera*[1], *E. Distante*[1], *D. Paredes-Barato*[1], *G. Heinze*[1], *and H. de Riedmatten*[1,2]; [1]*ICFO - Institut de Ciències Fotòniques, Castelldefels, Spain*; [2]*ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

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16:00 – 17:30

EJ-3: Application-driven computational photonics modeling

Chair: Fabian Maucher, Aarhus University, Aarhus, Denmark

EJ-3.1 WED (Invited) 16:00

THz emission driven by ionization pressure in relativistic plasmas

•*L. Bergé and J. Déchard*; *CEA-DAM, DIF, Arpajon, France*

Terahertz generation by ultra-intense CO_2 (10.6 μm) laser fields is studied using PIC simulations. Photoionization is shown to catastrophically enhance relativistic plasma wakefields, causing a net downshift in the optical spectrum through stimulated Raman scattering.

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16:00 – 17:30

ED-6: Frequency combs: Sources and characterization II

Chair: Pascal Del'Haye, National Physical Laboratory, Teddington, United Kingdom

ED-6.1 WED 16:00

Ultimate quantum noise limit of frequency comb measurements

R. Liao[1], *Y. Song*[2], *and* •*G. Steinmeyer*[1]; [1]*Max-Born-Institut, Berlin, Germany*; [2]*Tianjin University, Tianjin, China*

Precision frequency comb measurements typically rely on the optical clockwork, e.g., of an f-$2f$ interferometer. We discuss a previously unrecognized limitation of this frequency transfer mechanism imposed by Schawlow-Townes noise.

ED-6.2 WED 16:15

Train of ultrashort mid-infrared pulses with sub-mrad carrier-envelope phase stability

•*S.A. Hussain*[1,2], *W. Schweinberger*[1,2,3], *T. Buberl*[1], *C. Hofer*[1], *and I. Pupeza*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig-Maximilians-Universität München, Garching, Germany*; [3]*King Saud University, Riyadh, Saudi Arabia*

We present a new method for broadband measurement of carrier-envelope-phase (CEP) jitter of ultrashort-pulse trains, based on interferometrically-tracked electro-optic sampling, and report

ROOM 2 Hall A1

environment. Here attosecond streaking spectroscopy enabled disentangling these contributions facilitating to understand the influence of molecular environment on it.

16:00 – 17:30

CG-6: Interferometry and imaging

Chair: Thierry Ruchon, CEA-LIDyL, Gif-sur-Yvette, France

CG-6.1 WED 16:00

Controlled Asymmetric Photoelectron Emission Using Electron Wavepacket Interference

•*S. Mikaelsson, Y.-C. Cheng, S. Nandi, L. Rämisch, C. Guo, A. Harth, J. Vogelsang, M. Miranda, C.L. Arnold, A. L'Huillier, and M. Gisselbrecht*; *Department of Physics, Lund University, Lund, Sweden*

We demonstrate control of two-color photoionization asymmetry, without changing the delay of the few-cycle dressing infrared probe field, by modulating a short attosecond pulse train.

CG-6.2 WED 16:15

Interferometric attosecond lock-in measurement of extreme ultraviolet circular dichroism

•*O. Kneller*[1], *D. Azoury*[1], *M. Krueger*[1], *B.D. Brunner*[1], *O. Cohen*[2], *Y. Mairesse*[3], *and N. Dudovich*[1]; [1]*Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel*; [2]*Solid State Institute and Physics department, Technion, Haifa, Israel*;

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16:00 – 17:30

CE-10: Advanced layered materials for photonics

Chair: Angela Seddon, Nottingham University, Nottingham, UK

CE-10.1 WED 16:00

Direct Laser Synthesis of Two-Dimensional Transition Metal Dichalcogenides

•*O.A. Abbas*[1], *A.H. Lewis*[1], *N. Aspiotis*[1], *C.-C. Huang*[1], *I. Zeimpekis*[1], *D. Hewak*[1], *P. Sazio*[1], *and S. Mailis*[2]; [1]*Optoelectronics Research Centre, University of Southampton, SO17 1BJ, Southampton, United Kingdom*; [2]*Skolkovo Institute of Science and Technology Novaya St., 100, Skolkovo 143025, Moscow, Russia*

We present the spatially selective synthesis, patterning and characterization of two dimensional MoS2 and WS2 layers using laser irradiation of single source precursors under ambient conditions.

CE-10.2 WED 16:15

Si/SiO2 dispersive optics paves the way to ultrafast mid-infrared lasers

V. Pervak[1], •*T. Amotchkina*[1], *Q. Wang*[2], *O. Pronin*[1], *K.F. Mak*[2], *and M. Trubetskov*[2]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

Si/SiO2 dispersive multilayer spans

NOTES

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of Physical Chemistry, Friedrich Schiller University Jena, Jena, Germany; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*; [5]*Jena Center for Soft Matter (JCSM), Jena, Germany*

We demonstrate a new platform based on Carbon Nanomembranes (CNMs) to form 'genuine' flat optical devices. Nanometer-thick, carbon-based membranes are fabricated and utilized as a support of a square array of U-shaped gold nanoresonator metasurface.

EH-4.3 WED 16:30

Far-field wavefront optimization of the optical near-field in nanoscale disordered plasmonic metasurfaces

•G. Roubaud[1], *S. Bidault*[1], *S. Gigan*[2], *and S. Gresillon*[1]; [1]*Institut Langevin, ESPCI Paris, CNRS, PSL University, Sorbonne Université, Paris, France*; [2]*Laboratoire Kastler Brossel, ENS, CNRS, Sorbonne Université, PSL University, Paris, France*

By randomly shaping the phase of a femtosecond laser, we enhance the two-photon luminescence at any chosen position of a disordered plasmonic metasurface; indicating a far-field wavefront optimization of the optical near-field.

EH-4.4 WED 16:45

Metasurfaces Can Sense Spatial Coherence of Light

T. Frank, O. Buchnev, T. Cookson, M. Kaczmarek, P. Lagoudakis, and •V. Fedotov; *University of Southampton, Southampton, United Kingdom*

We report on a discovery that homogeneous metallic non-diffracting metasurfaces of a certain type respond differently to spatially coherent and incoherent light, enabling

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Sydney, Sydney, Australia; [5]*Landau Institute for Theoretical Physics, Chernogolovka, Russia*; [6]*University of Arizona, Tucson, USA*

We present both theoretical description and experimental observation of breather wave molecules obtained through the nonlinear mutual interaction between a pair of co-propagative breathers in the framework of the focusing one-dimensional nonlinear Schrödinger equation.

EF-6.3 WED 16:30

Active Control of Femtosecond Soliton Molecules

•F. Kurtz[1], *C. Ropers*[1], *and G. Herink*[2]; [1]*IV. Physical Institute, University of Göttingen,, Göttingen, Germany*; [2]*Experimental Physics VIII, University of Bayreuth, Bayreuth, Germany*

Bound states of femtosecond solitons are generated and controlled in a commercial kerr-lens mode-locked oscillator. Using real-time time-stretch interferometry, we resolve the resonance of vibrating soliton molecules and demonstrate all-optical switching between stable doublet states.

EF-6.4 WED 16:45

Heteronuclear soliton molecules in optical microresonators

•W. Weng[1], *R. Bouchand*[1], *E. Lucas*[1], *E. Obrzud*[2,3], *T. Herr*[2], *and T. Kippenberg*[1]; [1]*EPFL, Lausanne, Switzerland*; [2]*Swiss Center for Electronics and Microtechnology, Neuchatel, Switzerland*; [3]*Geneva Observatory, University of Geneva, Versoix, Switzerland*

We enter the multi-stability regime

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Physics, University of Strathclyde, Glasgow, G1 1RD, United Kingdom; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, United Kingdom*; [3]*ECE/COMSET, Clemson University, AMRL Building, 91 Technology Drive, Anderson, South Carolina 29625, USA*

A pulsed diamond Raman laser at 1.519 μm was pumped by a 50W average power Yb:fibre amplifier. 9W average power in 7ns pulses was achieved at 150kHz repetition rate and 29% conversion efficiency

CA-11.3 WED 16:30

All Passive KGW/ Tm:YAP Raman Laser

E. Perez[1], *U. Sheintop*[1], *G. Marcus*[2], *and •S. Noach*[1]; [1] *Jerusalem College of Technology, Jerusalem, Israel*; [2]*The Hebrew University of Jerusalem, Jerusalem, Israel*

All Passive External cavity Raman laser based on KGW/ Tm:Yap crystals emitting at 2270nm and 2350nm is presented. The efficient use of KGW for 2μm region is demonstrated. Maximum energy of 0.18mJ was achieved.

CA-11.4 WED 16:45

Shaping of Picosecond Pump Pulses by SHG Depletion for Wide-Bandwidth TW-class NOPCPA

•P. Mackonis[1], *A.M. Rodin*[1,2], *A. Petrulenas*[1], *and V. Girdauskas*[1]; [1]*Solid State Laser laboratory, Department of Laser Technologies, Center for Physical Sciences and Technology, Vilnius, Lithuania*; [2]*Ekspla Ltd, VIlnius, Lithuania*

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CD-8.2 WED 16:30

Learning Spatiotemporal Nonlinearities in Graded-index Multimode Fibers with Deep Neural Networks

•U. Tegin[1,2], *B. Rahmani*[1], *E. Kakkava*[2], *N. Borhani*[2], *C. Moser*[1], *and D. Psaltis*[2]; [1]*Laboratory of Applied Photonics Devices, Ecole polytechnique federale de Lausanne, Lausanne, Switzerland*; [2]*Optics Laboratory, Ecole polytechnique federale de Lausanne, Lausanne, Switzerland*

We investigate the spatiotemporal nonlinear effects in graded-index multimode fibers with a machine learning approach. The effect of the initial modal excitation to supercontinuum formation is experimentally studied by employing a deep neural network.

CD-8.3 WED 16:45

All-Optical Temporal and Spatial Shaping in an Inline Two-Mode Fiber Interferometer

•N.M. Lüpken, M. Schnack, and C. Fallnich; *Institute of Applied Physics, University of Münster, Münster, Germany*

Intermodal cross-phase modulation experiments enable all-optical pulse shaping in fibers. Accompanying numerical simulations demon-

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gien, Ilmenau, Germany

We combine photoemission electron microscopy (PEEM) with few-cycle laser pulses to investigate the spatio-temporal dynamics of randomly localized light in a single gold nanosponge. First results towards attosecond XUV-IR pump-probe PEEM experiments are shown.

EG-2.3 WED 16:30

Probing Nanoscale Optical Fields and Phase-Shaping Electron Beams by Inelastic Electron Light-Scattering

•A. Feist[1], *T. Rittmann*[1], *T. Harvey*[1], *K.E. Priebe*[1], *C. Rathje*[1,2], *O. Kfir*[1], *J.-W. Henke*[1], *S.V. Yalunin*[1], *S. Schäfer*[1,2], *and C. Ropers*[1]; [1]*4th Physical Institute, University of Göttingen, Göttingen, Germany*; [2]*Institute of Physics, University of Oldenburg, Oldenburg, Germany*

We employ the inelastic scattering of free electrons in optical near-fields for the quantitative mapping of the polarization-dependent local optical response in tailored nanostructures. Furthermore, sequential phase-locked interactions facilitate the generation of attosecond pulse trains.

EG-2.4 WED 16:45

Ultrafast dynamics through a conical intersection in an organic photovoltaic thin film probed by two-dimensional electronic spectroscopy

E. Sommer[1], *X.T. Nguyen*[1], *L. Gross*[2], *T. Frauenheim*[2], *E. Mena-Osteritz*[3], *P. Bäuerle*[3], *•C. Lienau*[1], *and A. De Sio*[1]; [1]*Institut für Physik, Universität Oldenburg, Oldenburg, Germany*; [2]*Bremen Center for*

ROOM 14b ICM | ROOM Osterseen ICM | ROOM 1 Hall A1 | ROOM 2 Hall A1 | ROOM 3 Hall A1 | NOTES

We demonstrate a medium with single-photon non-linearity based on cold Rydberg atoms, suitable for the mapping of a paired single photon. This opens the door to quantum interactions between single photons.

EA/EB-2.3 WED 16:30

Energy-time entanglement between a photon and a spin-wave in a multimode solid-state quantum memory

K. Kutluer[1], •E. Distante[1], B. Casabone[1], S. Duranti[1], M. Mazzera[1], and H. de Riedmatten[1,2]; [1]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain; [2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We present the direct generation of entanglement between a photon and a collective spin excitation using rare earth ion doped crystals. Entanglement is demonstrated by violating a Bell inequality by more than two standard deviations.

EA/EB-2.4 WED 16:45

Interfacing Quantum Dot Emission with Alkali Ensembles: Optimal Coherent Filtering for Single Photons

•P.M. Ledingham[1], S. Gao[1], C. Weinzetl[1], O. Lazo-Arjona[1], B. Brecht[1,2], K.T. Kaczmarek[1], T. Weinhold[3], J. Becker[1], S.E. Thomas[1,4], J. Nunn[5], D. Saunders[1], and I.A. Walmsley[1,4]; [1]Clarendon Laboratory, University of Oxford,

EJ-3.2 WED 16:30

Generation of isolated CEP-tunable intense sub-cycle pulses in laser-driven wakefields

•I. Thiele[1] and E. Siminos[2]; [1]Department of Physics, Chalmers University of Technology, Göteborg, Sweden; [2]Department of Physics, University of Gothenburg, Göteborg, Sweden

We propose a novel scheme for generation of intense sub-cycle pulses in laser-driven wakefields. The scheme ensures their CEP-tunability without requiring CEP-stable high-intensity laser driver and allows for tunability from mid-IR to extreme UV.

EJ-3.3 WED 16:45

New simple composite algorithm for solving multidimensional two-fluid plasma equations

•B. Morel, R. Giust, K. Ardaneh, R. Meyer, and F. Courvoisier; FEMTO-ST Institute, CNRS and Universite Bourgogne Franche-Comte, Besancon, France

We developed a new method to build a 3D hydrodynamic code solving the complex two-fluid plasma

sub-mrad CEP noise for a train of pulses obtained via intrapulse difference-frequency generation.

ED-6.3 WED 16:30

Broadband Laser Frequency Comb based on Electro-Optic Modulation for Astronomical Spectrograph Calibration

•E. Obrzud[1,2], M. Rainer[3,6], A. Harutyunyan[4], B. Chazelas[2], M. Cecconi[4], A. Ghedina[4], E. Molinari[4,5], S. Kundermann[1], V. Brasch[1], S. Lecomte[1], F. Pepe[2], F. Wildi[2], F. Bouchy[2], and T. Herr[1]; [1]Centre Suisse d'Electronique et de Microtechnique (CSEM), Neuchâtel, Switzerland; [2]Observatoire de Genève, Université de Genève, Versoix, Switzerland; [3]National Institute of Astrophysics (INAF), Astronomical Observatory of Brera, Milano, Italy; [4]National Institute of Astrophysics (INAF), Fundación Galileo Galilei, Breña Baja, Santa Cruz de Tenerife, Spain; [5]National Institute of Astrophysics (INAF), Osservatorio Astronomico di Cagliari, Selargius, Italy; [6]National Institute of Astrophysics (INAF), Arcetri Astrophysical Observatory, Florence, Italy

We present a 14.5 GHz repetition-rate near-infrared laser frequency comb based on electro-optic modulation for astronomical spectrograph calibration. The alignment-free, all-fibre system achieves absolute radial velocity calibration with < 10cm/s precision on the GIANO-B spectrograph.

ED-6.4 WED 16:45

Towards a Visible to Mid-Infrared Astrocomb for the Extremely Large Telescope

•Y.S. Cheng[1], D. Xiao[2], R.A. McCracken[1], and D.T. Reid[1]; [1]Scottish Universities Physics Alliance (SUPA), Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh EH14 4AS, United Kingdom; [2] CAS [3]Universite de Bordeaux - CNRS - CEA, CELIA, Talence, France

We establish an extreme ultraviolet lock-in detection scheme, allowing the isolation and amplification of weak chiral signals, by achieving a direct time-domain polarization control. We demonstrate it by a phase-resolved measurement of magnetic circular dichroism.

CG-6.3 WED 16:30

Polarization-resolved High Harmonic Spectroscopy of Interlocked Attosecond Bursts

•E. Bordo[1], O. Kfir[2], S. Zayko[2], O. Neufeld[1], A. Fleischer[3], C. Ropers[2], and O. Cohen[1]; [1]Solid State Institute and Physics Department, Haifa, Israel; [2]4th Physical Institute, University of Göttingen, Göttingen, Germany; [3]Raymond and Beverly Sackler Faculty of Exact Science, School of Chemistry, Tel Aviv University, Tel Aviv, Israel

We discovered theoretically and experimentally a novel high-harmonic generation geometry for chiral spectroscopy, where the harmonics ellipticities (linear to circular) are mapped analytically to optically-induced attosecond time delays between pairs of interlocked attosecond pulse trains.

CG-6.4 WED 16:45

XUV coherence tomography with nanoscale resolution driven by high harmonic generation

•S. Fuchs[1,2], M. Wünsche[1,2], J. Nathanael[1,2], J.J. Abel[1], J. Reinhard[1,2], F. Wiesner[1,2], S. Skruszewicz[1], C. Rödel[1,2], and G.G. Paulus[1,2]; [1]Institute of Optics and Quantum Electronics, Friedrich Schiller University Jena, Jena, Germany; [2]Helmholtz Institute Jena,

the range of 2-3.2 um and provides the group delay dispersion of (-200 fs2). Unprecedented reflectance exceeding 99.6% allows applications of the coating inside the Cr:ZnS/Cr:ZnSe femtosecond lasers.

CE-10.3 WED 16:30

Nonlinear Refraction and Nonlinear Absorption in Layered Transition Metals Dichalcogenides

•L. Menezes[1], M. Neto[2], M. Maldonado[1], C. Araújo[1], A. Jawaid[3], A. Ritter[3], R. Vaia[3], and A. Gomes[1]; [1]Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil; [2]Graduate Program in Materials Science, Universidade Federal de Pernambuco, Recife-PE, Brazil; [3]Materials and Manufacturing Directorate, Air Force Research Laboratory, Dayton, USA

We study the nonlinear optical behavior of transition metal dichalcogenides MoS2, WS2, NbS2 and ZrTe2 using Z-Scan technique (femtosecond regime). Novel ZrTe2 material shows positive third-order response and NL absorption was only observed for NbS2.

CE-10.4 WED 16:45

Study of Tm-doped Aluminosilicate for Integration of Lasers on a SOI Silicon Photonics Platform

•C. Mitchell, A. Tong, J. Wilkinson, and J. Mackenzie; University of Southampton, Southampton, United Kingdom

Fabrication and characterisation of Tm:aluminosilicate waveguides on a Silicon Photonics platform are presented. Spectroscopic evaluation of

ROOM 1 ICM

JSVI-1.2 WED (Invited) 17:00

Photonic chipscale soliton frequency combs

•*T.J. Kippenberg; EPFL, Lausanne, Switzerland*

In the past decade a new generation of optical frequency combs based on nonlinear frequency conversion based on integrated optical microresonators has emerged. I will review the underlying principles of such "micro-combs" that synthesise dissipative Kerr solitons (DKS).

ROOM 4a ICM

robust speckle-free discrimination between different degrees of coherence.

EH-4.5 WED 17:00

Continuous beam steering via controlling light with light on a dielectric metasurface

•*F. He[1], K.F. MacDonald[2], and X. Fang[1]; [1]School of Electronics and Computer Science, University of Southampton, Southampton, United Kingdom; [2]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom*

We demonstrate using two coherent light beams to dynamically control the output angle of light from a silicon metasurface. Continuous tuning of ~10o is observed, suggesting potential applications in Lidar and facial recognition.

ROOM 4b ICM

of an optical microresonator to generate heteronuclear soliton molecules. Ultrafast electro-optical sampling reveals the bound structures of such soliton molecules, despite comprising solitons of dissimilar amplitudes, durations and frequencies.

EF-6.5 WED 17:00

Perfect soliton crystals in optical microresonators

•*M. Karpov, M.H.P. Pfeiffer, H. Guo, J. Liu, W. Weng, and T.J. Kippenberg; Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland*

We demonstrate the existence of perfect soliton crystal states and develop the deterministic procedure for their excitation in Si_3N_4 microresonators. We show that despite exceptional symmetrical properties, their behavior is strongly linked to the chaotic regimes of the microresonator.

ROOM 13a ICM

Almost lossless spectral bandwidth is achieved by shaping of depleted ps pump pulses after the SHG and NOPA stages, while energy recycling also increases pump-to-signal conversion efficiency in a compact TW-class VIS-IR wavelength range NOPCPA.

CA-11.5 WED 17:00

Dual-frequency laser for the generation of rapidly tunable high purity radiofrequency signals

•*V. Crozatier[1], B. Steinhausser[2], L. Ménager[3], L. Morvan[1], P. Nouchi[1], and D. Dolfi[1]; [1]Thales Research and Technology, Palaiseau, France; [2]Thales Land and Air Systems, Elancourt, France; [3]Thales Defense Mission Systems, Elancourt, France*

We report on recent advances on optical generation of tunable radiofrequency signals based on a 1.5-μm solid-state dual-frequency laser. The architecture includes intensity noise cancellation, and fast tuning capability of 10 μs over 10 GHz.

ROOM 13b ICM

strate temporal, spatial, and spatio-temporal shaping of pulses inside a novel two-mode, inline Mach-Zehnder interferometer.

CD-8.4 WED 17:00

Adaptive Kerr-assisted transverse mode selection in multimode fibers

•*E. Deliancourt[1], M. Fabert[1], A. Tonello[1], K. Krupa[2,4], A. Desfarges-Berthelemot[1], V. Kermene[1], A. Barthélémy[1], D. Modotto[2], G. Millot[4], S. Wabnitz[3], and V. Couderc[1]; [1]Xlim, Université de Limoges, Limoges, France; [2]Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Brescia, Italy; [3]Dipartimento di Ingegneria dell'Informazione, Sapienza Università di Roma, Rome, Italy; [4]ICB, Université Bourgogne Franche-Compté, Dijon, France*

Adaptive input wavefront shaping, assisted by Kerr beam self-cleaning, leads in a multimode GRIN fiber to highly efficient and versatile selections of a low order output mode at high power

ROOM 14a ICM

Computational Materials Science, Universität Bremen, Bremen, Germany; [3]Institut für organische Chemie II und neue Materialien, Universität Ulm, Ulm, Germany

Two-dimensional electronic spectroscopy, with sub-10-fs time resolution, reveals vibronic coupling and wavepacket motion through a conical intersection in the intermolecular energy transfer dynamics of an oligomer thin film for organic photovoltaics

EG-2.5 WED 17:00

Ultrafast All-Optical Tuning of Fano Resonant Halide Perovskite Nanoparticles

•*L. Carletti[1,2], P. Franceschini[3], A. Perri[4], F. Preda[4], D. Polli[4], A. Tognazzi[2], C. De Angelis[2,5], F. Banfi[3,6], S. Pagliara[3], G. Ferrini[3], A.P. Pushkarev[7], S.V. Makarov[7], and C. Giannetti[3]; [1]Department of Information Engineering, University of Padova, Padova, Italy; [2]Department of Information Engineering, University of Brescia, Brescia, Italy; [3]Department of Physics, Università Cattolica del Sacro Cuore, Brescia, Italy; [4]IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy; [5]National Institute of Optics (INO), Consiglio Nazionale delle Ricerche (CNR), Brescia, Italy; [6]FemtoNanoOptics group, Université de Lyon Institut Lumière Matière (iLM), Université Lyon 1 and CNRS, Lyon, France; [7]ITMO University, Saint Petersburg, Russia*

We report the first experimental observation of ultrafast modulation of Fano resonant halide perovskite nanoparticles. Our measurements and numerical models show that their temporal dynamics can be thoroughly controlled by engineering of the nanoparticle size.

ROOM 14b ICM

Oxford, UK; [2]*Integrated Quantum Optics, Universitat Paderborn, Paderborn, Germany*; [3]*ARC Centre for Engineered Quantum Systems, and ARC Centre for Quantum Computation and Communication Technology, and School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [4]*QOLS, Blackett Laboratory, Imperial College London, London, UK*; [5]*5 Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, UK*
We propose a strategy to optimally filter temporal-spectral modes of single photon sources. We theoretically show that using a Cs vapour, an increase of indistinguishably with minimal loss of brightness can be achieved.

EA/EB-2.5 WED 17:00

Rb vapor cell quantum memory for single photons
•*J. Wolters*[1], *G. Buser*[1], *R. Mottola*[1], *C. Müller*[2], *T. Kroh*[2], *R. Warburton*[1], *O. Benson*[2], *and P. Treutlein*[1]; [1]*Universität Basel, Basel, Switzerland*; [2]*Humboldt-Universität zu Berlin, Berlin, Germany*
We implemented a broadband optical quantum memory for single photons in hot Rb vapor.

ROOM Osterseen ICM

model equations for plasmonics or laser-plasma interaction. This robust but simple code gives excellent results against difficult test problems.

EJ-3.4 WED 17:00

A 3D full-vector finite element model for waveguide-based plasmonic sensors in the infrared
•*G. Renversez and G. Demésy*; *Aix-Marseille Univ, CNRS, Institut Fresnel, Marseille, France*
We propose a new full vector 3D model based on the finite element method taking into account the real input propagating mode. This model is used to design an efficient fully integrated plasmonic sensor for the infrared.

ROOM 1 Hall A1

Key Laboratory of Astronomical Optics & Technology, Nanjing Institute of Astronomical Optics & Technology, National Astronomical Observatories, Nanjing 210042, China
A nearly-gap-free 1-GHz frequency comb spanning 500–2200 nm is generated from dual supercontinua pumped by a Ti:sapphire laser and phase-coherent degenerate OPO, representing an important precursor to a multi-GHz astrocomb calibrator for the ELT.

ED-6.5 WED 17:00

Hot-Cavity Spectroscopy of Dark Pulse Kerr Combs in Microresonators
•*E. Nazemosadat*[1], *A. Fülöp*[1], *Ó.B. Helgason*[1], *P.-H. Wang*[2], *Y. Xuan*[2], *D.E. Leaird*[2], *M. Qi*[2], *E. Silvestre*[3], *A.M. Weiner*[2], *and V. Torres-Company*[1]; [1]*Photonics Laboratory, Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Göteborg, Sweden*; [2]*School of Electrical and Computer Engineering, Purdue University, IN 47907-2035, West Lafayette, USA*; [3]*Department of Optics-ICMUV, University of Valencia, Valencia, Spain*
Dark-pulse comb dynamics in silicon nitride microresonators is investigated. Our measurements show that the formation of these combs is associated with the appearance of an extra resonance, attributed to the intensity-dependent Kerr phase shift.

ROOM 2 Hall A1

Jena, Germany
We present the novel cross-sectional imaging technique XUV Coherence Tomography (XCT) driven by high-harmonic generation (HHG) sources. By exploiting the broad bandwidth of the HHG radiation XCT achieves an axial resolution of a few nanometers.

CG-6.5 WED 17:00

Spatiotemporal coupling of attosecond pulses
•*C.L. Arnold*[1], *H. Wikmark*[1], *C. Guo*[1], *P.W. Smorenburg*[2], *H. Coudert-Alteirac*[1], *J. Lahl*[1], *J. Peschel*[1], *P. Rudawski*[1], *H. Dacasa*[1], *S. Carlström*[3], *S. Maclot*[1], *M.B. Gaarde*[4], *P. Johnsson*[1], *and A. L'Huillier*[1]; [1]*Physics Department, Lund University, Lund, Sweden*; [2]*ASML Netherlands B.V., Veldhoven, Netherlands*; [3]*Max Born Institute, Berlin, Germany*; [4]*Department of Physics and Astronomy, Louisiana State University, Baton Rouge, USA*
We present a Gaussian optics model to study spatiotemporal couplings of attosecond pulses produced via high harmonic generation. Understanding those couplings is crucial for applications relying on focusing to small spot size and high intensity.

ROOM 3 Hall A1

the Tm-ions (3, 7, & 10 wt% concentrations) highlight the potential for 2-micron on-chip lasers with further process optimisation.

CE-10.5 WED 17:00

Integration of Metal- GaAs -Metal Photodetectors on Si using Thin Ge Buffer Layers for Applications in Visible Photonics
•*G. Dushaq and M. Rasras*; *New York University, Abu Dhabi, UAE*
This paper presents metal- GaAs -metal photodetector integrated on Si by MOCVD. The device architecture is based on GaAs active layer grown on Si via thin, low temperature and direct growth of Ge buffer layers on Si.

NOTES

ROOM 1 ICM

[redacted]

ROOM 4a ICM

EH-4.6 WED 17:15

Experimental demonstration of edge detection by dielectric metasurfaces

•*A. Komar*[1], *L. Xu*[2], *R. Aoni*[1], *M. Rahmani*[1], *A. Miroshnichenko*[2], *and D. Neshev*[1]; [1]*Australian National University, Canberra, Australia*; [2]*University of New South Wales, Canberra, Australia*

We demonstrate experimentally optical image processing in the form of edge detection by a single dielectric metasurface. We utilise the metasurface spatial dispersion when operating at the wavelength of the magnetic Mie-type resonance.

ROOM 4b ICM

EF-6.6 WED 17:15

Stochastic Soliton Quantization in Mode-locked Fibre Laser

•*H.J. Kbashi and S.V. Sergeyev*; *Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*

Soliton quantization is a self-localized pulses formation in nonlinear systems; it has many potential applications from communications to data storage. Here, we report a quantized temporal separation of stochastic soliton in mode-locked fiber laser.

ROOM 13a ICM

CA-11.6 WED 17:15

characterization of supercontinuum pulses generated using a 2μm thulium-based regenerative amplifier

•*S.A. Rezvani*[1], *K. Ogawa*[2], *Y. Nomura*[1], *and T. Fuji*[1]; [1]*center for mesoscopic sciences, institute for molecular science, 38 nishigonaka, myodaiji, okazaki, Japan*; [2]*fiberlabs inc., kddi laboratories, 2-1-15 Ohara, fujimino, Japan*

applying 2 μm pulses from a thulium-based regenerative amplifier, supercontinuum has been achieved and characterized, in both bulk YAG and, for the first time, in polarization-maintained ZBLAN fiber. characterization has been done using XFROG.

ROOM 13b ICM

CD-8.5 WED 17:15

Optical vortex generation from an anti-resonant-ring picosecond optical parametric oscillator

•*V. Sharma*[1,2], *S.C. Kumar*[3,4], *G.K. Samanta*[1], *and M. Ebrahim-Zadeh*[3,4,5]; [1]*Physical Research Laboratory, Ahmedabad, India*; [2]*Indian Institute of Technology Gandhinagar, Gandhinagar, India*; [3]*Radiantis Polígon Camí Ral, Barcelona, Spain*; [4]*ICFO-Institut de Ciencies Fotoniques The Barcelona Institute of Science and Technology, Barcelona, Spain*; [5]*Institucio Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain*

We report on the generation of optical vortices through mode conversion of output from an anti-resonant-ring synchronously-pumped picosecond optical parametric oscillator. Generated optical vortices are tunable across 1457-1647 nm with maximum power of 538 mW.

ROOM 14a ICM

EG-2.6 WED 17:15

Ultraintense femtosecond magnetic nanoprobes driven by azimuthally polarized laser beams

M. Blanco[1], *F. Cambronero*[1], *M.T. Flores-Arias*[1], *E. Conejero Jarque*[2], *L. Plaja*[2], *and* •*C. Hernández-García*[2]; [1]*Universidade de Santiago de Compostela, Santiago de Compostela, Spain*; [2]*University of Salamanca, Salamanca, Spain*

We report a novel technique to generate Tesla-scale femtosecond magnetic fields from an azimuthally polarized laser beam. Remarkably, a magnetic nanoprobe is generated isolated from the electric field, opening promising scenarios to study femtomagnetism.

ROOM 13a ICM

19:00 – 20:30

PD-1: Postdeadline 1

Chair: Jörg Schreiber, Ludwig-Maximilians-Universität and Max Planck Institute for Quantum Optics, Garching, Germany

PD-1.1 WED 19:00

27-fs, 166-MW pulses at 98 W average power from highly efficient thin-disk oscillator driven nonlinear compressor

•*C.-L. Tsai*[1], *F. Meyer*[2], *A. Omar*[2], *Y. Wang*[2], *A.-Y. Liang*[1], *C.-H. Lu*[1], *S.-D. Yang*[1], *and C.J. Saraceno*[2]; [1]*National Tsing Hua University, Hsinchu, Taiwan*; [2]*Ruhr University Bochum, Bochum, Germany*

We demonstrate efficient nonlinear compression of a high-power thin-disk oscillator based on a two-stage (multi-pass-cell and multiple-plate) compression setup. We achieve 98W average power with 27fs pulses at 13.4MHz, resulting in 166MW peak power.

PD-1.2 WED 19:10

10 PetaWatt Laser System for Extreme Light Physics

•*F. Lureau*[1], *G. Matras*[1], *S. Laux*[1], *C. Radier*[1], *O. Chalus*[1], *O. Casagrande*[1], *C. Derycke*[1], *S. Ricaud*[1], *L. Boudjemaa*[1], *C. Simon-Boisson*[1], *F. Jipa*[2], *L. Neagu*[2], *D. Ursescu*[2], *and I. Dancus*[2]; [1]*Thales LAS, Elancourt, France*; [2]*Horia Holubei Institute of Nuclear Physics, Magurele, Romania*

We report first 10 PW light from the ELI-NP laser. We have obtained at 1 shot/min pulses with 332 J energy before compression and 22.3 fs duration leading to a peak power of 10.9 PW

PD-1.3 WED 19:20

Generation of 0.3-TW few-cycle driver pulses via efficient cascaded Raman frequency down conversion

•*P.A. CARPEGGIANI and G. FAN*; *PHOTONIK - TU WIEN, WIEN, Austria*

We demonstrate a single-stage, SRS-enabled cascaded frequency down-conversion enebling generation of high-energy, few-cycle, shortwave-IR pulses. 10mJ, 220fs pulses at 1030nm are red-shifted to 1230nm in a 5.5m-long waveguide with 82.5% efficiency, and subsequently compressed to 19fs.

PD-1.4 WED 19:30

Milliwatt-Class MHz Repetition-Rate THz Source Driven by a sub-100 fs High-Power Thin-Disk Laser

•*F. Meyer, N. Hekmat, T. Vogel, A. Omar, S. Mansourzadeh, F. Fobbe, M. Hoffmann, Y. Wang, and C. Saraceno*; *Ruhr-University Bochum, Bochum, Germany*

We demonstrate optical rectification in GaP, driven by a 100 W-class thin-disk oscillator, nonlinearly compressed to sub-100 fs. We measure a record-high average power of 1.35 mW for a table-top, single-cycle THz source at MHz repetition rate.

PD-1.5 WED 19:40

Fully Phase Stabilized Quantum Cascade Laser Frequency Comb

•*S. Bartalini*[1,4], *L. Consolino*[1], *M. Hafa*[1], *F. Cappelli*[1], *K. Giarrasi*[2], *F.P. Mezzapesa*[2], *M.S. Vitiello*[2], *L. Li*[3], *A.G. Davies*[3], *E.H. Linfield*[3], *and P. De Natale*[1,4]; [1]*CNR - Istituto Nazionale di Ottica and LENS, Sesto Fiorentino, Italy*; [2]*NEST, CNR - Istituto Nanoscienze and Scuola Normale Superiore, Pisa, Italy*; [3]*School of Electronics and Electrical Engineering, Leeds, United Kingdom*; [4]*ppqSense S.r.l., Campi Bisenzio, Italy*

We present for the first time the full phase stabilization and independent control of the two comb degrees of freedom (offset and spacing) of a mode-locked multi-frequency THz QCL, finally proving its true comb nature.

PD-1.6 WED 19:50

Mid-Infrared Frequency Comb from a Ring Quantum Cascade Laser

•*B. Meng, M. Beck, and J. Faist*; *ETH, Zurich, Switzerland*

Mid-infrared frequency comb from ring cavity quantum cascade laser has been demonstrated. Both intermode beatnoting (less than 1 kHz linewidth) and multiheterodyne spectra verify the frequency comb nature of the device.

PD-1.7 WED 20:00

Birefringent Surface Gratings for Ultrafast Spin-VCSELs

•*T. Pusch*[1], *P. Debernardi*[2], *M. Lindemann*[3], *N.C. Gerhardt*[3], *M.R. Hofmann*[3], *and R. Michalzik*[1]; [1]*Functional Nanosystems, Ulm, Germany*; [2]*IEIIT, Turin, Italy*; [3]*Photonics and Terahertz Technology, Bochum, Germany*

We present the first truly integrated approach for incorporating birefringence in a VCSEL cavity to enable spin-based ultrafast optical communications. Up to 98 GHz polarization mode splitting is achieved using a tailored surface grating.

ROOM 14b ICM

EA/EB-2.6 WED 17:15

Trapping a Free-propagating single photon in an atomic ensemble

•*U.-S. Kim, Y.S. Ihn, C.H. Lee, and Y.-H. Kim; Department of Physics, Pohang University of Science and Technology (POSTECH), Pohang, South Korea*

First experimental demonstration of trapping free-propagating single photon in an atomic ensemble is presented. Heralded single photons from SFWM process are trapped while maintaining its photonic part leading strong confinement into the atomic ensemble.

ROOM Osterseen ICM

EJ-3.5 WED 17:15

Rapid and accurate calculation of vector photonic band-structure in regular arrays of coupled waveguides

•*Y. Chen[1] and P. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg , Erlangen, Germany*

The photonic band structure of the modes guided in a graphene lattice of anisotropic stripe waveguides is calculated analytically using vector coupled mode theory. Rapid and quite precise, the approach offers advantages over numerical techniques.

ROOM 1 Hall A1

ED-6.6 WED 17:15

Advanced dispersion engineering of dispersive waves in Si_3N_4 microresonators

•*A. Lukashchuk, F. Gremion, M. Karpov, J. Liu, and T. Kippenberg; Ecole Polytechnique Federale de Lausanne (EPFL), 1015-Lausanne, Switzerland*

We experimentally demonstrate the possibility of dispersive wave tuning via ad- vanced dispersion engineering. We utilize hybridized modes of concentric coupled resonators for precise control of the dispersion profile.

ROOM 2 Hall A1

CG-6.6 WED 17:15

Tracing the Phase of Focused Broadband Laser Pulses

•*D. Hoff[1], M. Krüger[2], L. Maisenbacher[3], A.M. Sayler[1], G.G. Paulus[1], and P. Hommelhoff[4]; [1]Helmholtz-Institut Jena and Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel; [3]Max-Planck-Institut für Quantenoptik, Garching, Germany; [4]Department Physik, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany*

We present a spatially resolved measurement of the local carrier-envelope phase in a focused, broadband, few-cycle, pulsed Gaussian laser beam and find strong deviations from the monochromatic Gouy phase, which impacts ultrafast light matter interactions.

ROOM 3 Hall A1

CE-10.6 WED 17:15

Low-cost fabrication of polymer based micro-optical devices for application in illumination, sensing, and optical interconnects

•*M.S. Khan[1], M. Rahlves[1], R. Lachmayer[2,3], and B. Roth[1,3]; [1]Hannover Centre for Optical Technologies, Leibniz University Hannover , Hannover, Germany; [2]Institut für Produktentwicklung und Gerätebau, Leibniz University Hannover, Hannover, Germany; [3]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany*

We report on low cost fabrication of micro optical devices. Fabrication is done using maskless lithography, and replication using hot embossing and doctor blading. The devices are characterized for diffraction efficiencies and propagation losses.

NOTES

ROOM 13a ICM

PD-1.8 WED 20:10

Quantitative phase microscopy with molecular vibrational sensitivity

•*M. Tamamitsu[1], K. Toda[1], R. Horisaki[2,3], and T. Ideguchi[3,4]; [1]Department of Physics, The University of Tokyo, Tokyo, Japan; [2]Graduate School of Information Science and Technology, Osaka University, Osaka, Japan; [3]PRESTO, Japan Science and Technology Agency, Saitama, Japan; [4]Institute for Photon Science and Technology, The University of Tokyo, Tokyo, Japan*

We propose and demonstrate quantitative phase imaging method that yields label-free molecular-vibrational spectroscopic contrasts in the molecular-fingerprint region, which works by measuring the optical-phase-delay change induced upon molecular-vibrational absorption of a mid-infrared optical pulse.

PD-1.9 WED 20:20

A silicon photonic design concept for a chip-to-fibre orbital angular momentum mode-division multiplexer

•*J.M. Baumann, K. Ingerslev, Y. Ding, L.H. Frandsen, L.K. Oxenløwe, and T. Morioka; DTU Fotonik, Technical University of Denmark, Lyngby, Denmark*

A chip is presented for multiplexing to orbital angular momentum modes in air hole fibres in the C-band. The coupling to modes with topological charges of L = 5, 6 and 7 is demonstrated.

ROOM 13b ICM

19:00 – 20:30

PD-2: Postdeadline 2

Chair: Olivier Dulieu, Laboratoire Aimé Cotton, Orsay, France

PD-2.1 WED 19:00

Demonstration of chip-to-chip quantum teleportation

•*Y. Ding[1], D. Llewellyn[2], I. Faruque[2], S. Paesani[2], D. Bacco[1], R. Santagati[2], Y.-J. Qian[3], Y. Li[3], Y.-F. Xiao[3,4], M. Huber[5], M. Malik[6], G. Sinclair[2], X. Zhou[7], K. Rottwitt[1], J. O'Brien[2], J. Rarity[2], Q. Gong[3,4], L. Oxenlowe[1], J. Wang[2,3,4], and M. Thompson[2]; [1]Technical University of Denmark, Copenhagen, Denmark; [2]University of Bristol, Bristol, United Kingdom; [3]Peking University, Beijing, China; [4]Academy of Quantum Information Sciences, Beijing, China; [5]Austrian Academy of Sciences, Vienna, Austria; [6]Heriot-Watt University, Edinburgh, United Kingdom; [7]Sun Yat-sen University, Guangzhou, China*

We report the first experimental demonstration of chip-to-chip teleportation of quantum states of light. Integrated quantum transceivers in silicon are able to prepare, manipulate, distribute and transceive quantum photonic states with high fidelity.

PD-2.2 WED 19:10

The First Quantum Interference in the Mid-infrared is on a Silicon Chip

•*L.M. Rosenfeld, D.A. Sulway, M.G. Thompson, J.G. Rarity, and J.W. Silverstone; Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, Universityof Bristol, BS8 1FD, UK, Bristol, United Kingdom*

In quantum optics, loss of a single photon is a loss of irreplaceable quantum information. We report the first measurement of quantum interference in the low-loss mid-infrared, pointing towards truly scalable quantum photonics.

PD-2.3 WED 19:20

Birefringent cavities: effects and applications of a new paradigm in CQED

•*T.D. Barrett, T.H. Doherty, B. Yuen, and A. Kuhn; University of Oxford, Oxford, United Kingdom*

Novel intra-cavity polarisation dynamics engender the first observation of single photons with time-dependent polarisation state, emitted from an atom coupled to a birefringent cavity. This offers a route to surpassing previous limitations of Purcell-enhanced emission.

ROOM 13a ICM

PD-2.4 WED 19:30

Topological lasers generating and multiplexing orbital angular momenta on demand

•*B. Kante*; *University of California Berkeley, Berkeley, USA*

We report the first room temperature integrated topological lasers directly generating and multiplexing coherent beams carrying arbitrarily large orbital angular momenta (OAM).

PD-2.5 WED 19:40

Harper-Hofstadter Topological Laser with Frequency-Dependent Gain

•*M. Secli*[1] *and I. Carusotto*[2]; [1]*International School for Advanced Studies (SISSA), Trieste, Italy*; [2]*INO-CNR BEC Center and Dipartimento di Fisica, Università di Trento, Trento, Italy*

We numerically demonstrate how to obtain topological lasing from a uniformly pumped topological array of optical cavities, by exploiting the naturally frequency-dependent gain that stems from light-matter interaction on a single site.

PD-2.6 WED 19:50

Chip-scale optical standard with $2\times10^{-12}\tau^{-1/2}$ stability

•*Z. Newman*[1], *V. Maurice*[1], *M. Hummon*[1], *J. Kitching*[1], *S. Dickerson*[2], *M. Mescher*[2], *and C. Johnson*[2]; [1]*National Institute of Standards and Technology, Boulder, USA*; [2]*Charles Stark Draper Laboratories, Cambridge, USA*

We report on the development of a compact optical standard using the rubidium two-photon transition. The physics package has a volume of 35cm^3, consumes ~500mW of power and demonstrates a fractional frequency instability of 1×10^{-13}.

PD-2.7 WED 20:00

PT-symmetry in Two Synthetic Dimensions

•*A.L. Marques Muniz*[1], *M. Wimmer*[1], *A. Bisianov*[1], *R. Morandotti*[2], *and U. Peschel*[1]; [1]*Institute of Solid-State Physics and Optics, Friedrich Schiller University Jena, Jena, Germany*; [2]*Institut National de la Recherche Scientifique–EMT, Montreal, Canada*

Using standard telecommunication equipment, we implement Parity-Time symmetry in a two-dimensional synthetic lattice with tunable gain, loss and phase structure. The fiber nonlinearity enables dissipative PT solitons and an amplified, self-accelerating nonlinear wave packet.

PD-2.8 WED 20:10

Multistability-Enabled Composite Soliton and Soliton Collision in a Bichromatically-Pumped Microresonator

•*W. Weng, R. Bouchand, and T. Kippenberg*; *Swiss Federal Institute of Technology Lausanne, Lausanne, Switzerland*

We enter a dual-pumped multistability regime in a microresonator to observe the breaking down of soliton lattice traps and the emergence of novel dissipative Kerr soliton dynamics, including composite soliton and soliton collision.

PD-2.9 WED 20:20

Observation of exceptional points in passive plasmonic nanostructures

•*B. Kante, J. Park, and A. Ndao*; *University of California Berkeley, Berkeley, USA*

We propose a novel approach to exceptional points (EPs) and report their first observation in plasmonics at room temperature. The new platform is shown to enable attomolar immuno-assay nanosensing.

Hall B0

Wednesday – Posters

13:00 – 14:00

CK-P: CK Poster session

CK-P.1 WED

Generating Quantum States of Surface Plasmon-Polariton Pairs with a Nonlinear Nanoparticle

N. Olekhno[1], *M. Petrov*[1], *I. Iorsh*[1], *A. Sukhorukov*[2], *and* •*A. Solntsev*[3]; [1]*ITMO University, Saint Petersburg, Russia*; [2]*The Australian National University, Canberra, Australia*; [3]*University of Technology Sydney, Sydney, Australia*

We theoretically explore the generation of surface plasmon-polariton pairs in the process of spontaneous parametric down-conversion of light by a $chi^{(2)}$ nanoparticle located near the metal-dielectric interface and demonstrate a N00N-state.

CK-P.2 WED

Ordered microarrays of silicon nanopillars with the axial p-n junction for photonic devices

•*L. Basalaeva*[1], *Y. Nastaushev*[1], *N. Kryzhanovskaya*[2], *F. Dultsev*[1], *and A. Lyamkina*[1,3]; [1]*Institute of Semiconductor Physics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia*; [2]*St. Petersburg National Research Academic University of the Russian Academy of Sciences, St. Petersburg, Russia*; [3]*Technical University of Munich Walter Schottky Institute, Garching bei München, Germany*

Silicon nanopillar (Si NP) arrays with the axial p-n junction were formed and investigated. The optical-reflection spectra of microarrays of Si NP are studied in the visible and near-IR regions. High photosensitivity of Si NP arrays was discovered

CK-P.3 WED

Hybrid metal-polystyrene metasurfaces: circular dichroism evidenced by means of photo-acoustic technique

•*E. Petronijevic*[1], *G. Leahu*[1], *R. Li Voti*[1], *A. Belardini*[1], *C. Scian*[2], *N. Michieli*[2], *T. Cesca*[2], *G. Mattei*[2], *and C. Sibilia*[1]; [1]*Sapienza Università di Roma, Roma, Italy*; [2]*University of Padova, Padova, Italy*

It is possible to finely tuning the optical response of nanostructures by playing with different geometrical and materials parameters. Here we investigate the circular dichroic response of a metal-dielectric hybrid metasurface by using photoacoustic technique.

CK-P.4 WED

Amplified Spontaneous Emission (ASE) from Ultra-Large Peptide-Based Structures Filled with Gain Media

•*P. Didier*[1], *N. Lapshina*[2], *J. Zyss*[1], *T. Ellenbogen*[2], *and C. Lafargue*[1]; [1]*Quantum and Molecular Photonics Laboratory (LPQM, UMR CNRS 8537) Ecole Normale Supérieure de Paris-Saclay, Université Paris-Saclay, Paris, France*; [2]*Department of Physical Electronics, Fleischman Faculty of Engineering, Tel-Aviv University, Tel Aviv, Israel*

Microfibers made of short peptides, auto-assembled with an empty core, can be filled for various applications such as drug delivery. We inserted a gain medium and observed Amplified Stimulated Emission.

CK-P.5 WED

Transverse Period Modulated Photonic Crystals for Super-Collimation

•*D. Gailevičius*[1,2], *V. Purlys*[1,2], *R. Lymarenko*[3], *V. Taranenko*[3], *M. Peckus*[1], *R. Gadonas*[1], *and K. Staliunas*[4,5]; [1]*Laser Research Center, Vilnius University, Vilnius, Lithuania*; [2]*Femtika LTD, Vilnius, Lithuania*; [3]*International center "Institute of Applied Optics" NAS of Ukraine, Kyiv, Ukraine*; [4]*Institució Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain*; [5]*Universitat Politècnica de Catalunya (UPC), Barcelona, Spain*

Efficient spatial filtering and efficient beam collimation by axisymmetric photonic crystals (PhCs) in a chirped configuration are shown. The numerically designed PhCs have been direct-laser-written in glass. Strong enhancement beam collimation is reported.

CK-P.6 WED

Plasmon Generation through Electron Tunneling in Double-Layer- Graphene and Metal-Insulator-Graphene Systems

•*S. de Vega*[1] *and F.J. García de Abajo*[1,2]; [1]*ICFO - Institut de Ciencies Fotoniques, Castelldefels, Spain*; [2]*ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We demonstrate through realistic theoretical simulations that graphene plasmons can be efficiently excited via electron tunneling in planar heterostructures of graphene, hBN and metals.

CK-P.7 WED

Effects of Scattering by Inhomogeneous Media on the Performance of Integrated Grating Couplers

•*R. Marchetti, G. Raccone, I. Cristiani, and P. Minzioni*; *Department of Electrical, Computer, and Biomedical Engineering, Università di Pavia, Pavia, Italy*

We report on the analysis, using 2D-FDTD simulations, of the scattering effects caused by an inhomogeneous medium (human skin) on the coupling efficiency of SOI-based diffractive grating couplers, as a function of the skin depth.

CK-P.8 WED

Complete localization of light and tunable bottle microresonators introduced by bending of an optical fiber

•*D. Bochek*[1], *I. Vatnik*[1], *D. Churkin*[1], *and M. Sumetsky*[2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2] *Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*

We experimentally demonstrate that strong bending of the optical fiber causes the nanometer-scale variation of its local effective radius and leads to the complete localization of whispering gallery modes and formation of a bottle microresonator.

CK-P.9 WED

Enhanced direct optical excitation of an NV center via Nanofiber Bragg-cavity: A numerical simulation

•*T. Tashima, H. Takashima, and S. Takeuchi*; *Kyoto University, Kyoto, Japan*

We propose to harness the nanofiber Bragg cavity to use direct optical excitation of a nitrogen-vacancy center in nanodiamond by light via a nanofiber, alternative to the use of conventional confocal laser microscope systems.

CK-P.10 WED

Design Algorithm for Adiabatic Photonic Components using a Constant Coupling Approach

•*I. Abdo, A. Boes, T. Nguyen, G. Ren, and A. Mitchell*; *School of Engineering, RMIT University, Melbourne, Australia*

We present a design algorithm for adiabatic photonic devices using a constant coupling approach. We utilized the algorithm to design a compact adiabatic TM0/TE1 mode converter in the silicon-on-insulator (SOI) platform with high efficiency.

CK-P.11 WED

Microwave power dependent resonance shifts in Silicon ring modulators for continuous wavelength tuning and bandwidth scaling of on-chip, electro-optic, optical frequency combs

•*K.P. Nagarjun, P. Raj, V. Jeyaselvan, S.K. Selvaraja, and V.R. Supradeepa*; *Indian Institute of Science, Bangalore, Bengaluru, India*

We demonstrate continuous centre frequency tuneability of optical frequency combs generated in silicon ring-modulators using microwave power induced resonance shifts. Using this effect we further accomplish bandwidth-scaling of the combs by cascading two ring-modulators

CK-P.12 WED

Hyperuniformity and Local Self-Uniformity in Photonic Networks

•*M. Florescu*[1], *S. Sellers*[1], *C. Wan*[1], *and W. Man*[2]; [1]*Advanced Technology Institute and Department of Physics, University of Surrey, GUILDFORD, United Kingdom*; [2]*. Department of Physics and Astronomy, San Francisco State University, San Francisco, USA*

The hyperuniformity and local-self uniformity establish a fundamental link between geometrical, topological and photonic properties of dielectric networks and provide novel design strategies for advanced photonic functionalities including photonic band gaps, localisation, and photon transport.

CK-P.13 WED

Reconfigurable Dielectric Metasurface-based Spatial Light Modulator

•*S.-Q. Li, X. Xu, R. Veetil, V. Valuckas, R. Dominguez, and A. Kuznetsov*; *Institute of Materials Research and Engineering, A*STAR(Agency for Science, Technology and Research), Singapore, Singapore*

We design and fabricate a phase-only spatial light modulator with tunable metasurfaces achieving dynamically controllable beam steering with a 36% beam deflection efficiency and a FOV of 22°, corresponding to a pixel size as small as 1.14 microns.

CK-P.14 WED

Optical resonances in a 3D superlattice of cavities in a 3D photonic band gap

•*M. Adhikary*[1], *R. Uppu*[1,2], *S.A. Hack*[1], *C.A.M. Harteveld*[1], *and W.L. Vos*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*Niels Bohr Institute, Københavns Universitet, Copenhagen, Denmark*

We study silicon three-dimensional (3D) photonic band gap crystals containing a 3D superlattice of cavities. In reflectivity and lateral scattering, we observe resonances that are interpreted as novel hopping modes on the superlattice.

CK-P.15 WED

An optical probe of a 3D photonic band gap

•*M. Adhikary*[1], *R. Uppu*[1,2], *C.A.M. Harteveld*[1], *and W.L. Vos*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*Niels Bohr Institute, Københavns Universitet, Copenhagen, Denmark*

We perform wide-angle-averaged polarization resolved reflectivity measurements on silicon inverse woodpile 3D photonic crystals. It is verified that the measured stopband is the photonic band gap, with excellent agreement with theory.

CK-P.16 WED

Tunneling of waves in the gap of a photonic crystal

•*R. Uppu*[1,2], *M. Adhikary*[1], *C.A.M. Harteveld*[1], *A. Lagendijk*[1], *and W.L. Vos*[1]; [1]*Complex Photonic Systems, MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*Center for Hybrid Quantum Networks, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark*

We perform optical wavefront shaping of telecom light in the gap of a 2D silicon photonic crystal. We observe that light can controllably tunnel up to 8 Bragg lengths into the medium.

CK-P.17 WED

Whispering gallery microlaser fabrication using Er3+ doped silica based on dip coating

Z. Chenari[1], *H. Navvab*[2], *and •H. Latifi*[1]; [1]*Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran*; [2]*Science department, Islamic Azad University (Science and Research Branch), Tehran, Iran*

we propose a microlaser based on the Er3+ ion-doped microsphere cavity, which can avoid the conventional sol-gel method drawbacks for surface coating of active media on silica and exhibit excellent performance.

CK-P.18 WED

Adiabatic transitions between supersymmetric structures as a tool to design integrated photonic devices

•*G. Queraltó, V. Ahufinger, and J. Mompart*; *Departament de Física, Universitat Autònoma de Barcelona, E-08193 Bellaterra, Spain*

We introduce adiabatic transitions between supersymmetric structures as a systematic way to engineer efficient and robust integrated photonic devices by modifying the refractive index profile along the propagation direction.

CK-P.19 WED

A Solvable Quantum Model of Dynamic Nuclear Polarization in Optically Driven Quantum Dots

•*T. Nutz*[1], *E. Barnes*[2], *and S.E. Economou*[2]; [1]*Imperial College London, London, United Kingdom*; [2]*Virginia Tech, Blacksburg, USA*

We present a model of dynamic nuclear polarization in quantum dots induced by continuous wave laser driving. The model captures experimentally observed linedragging behaviour and predicts a novel nuclear polarization effect.

CK-P.20 WED

Electron multi-injector: a strategy for improving quantum efficiency of infrared photodetectors

•*S. Bianconi and H. Mohseni*; *Northwestern University, Evanston, USA*

We demonstrate a novel detector architecture that allows for a 2-fold increase the fill factor, at no apparent costs for the responsivity and speed of the devices, thanks to the modest increase in electronic area.

CK-P.21 WED

Magneto-plasmonic effects for non-reciprocal waveguides

•*S. Abadian*; *Centre de Nanosciences et de Nanotechnologies (C2N), Palaiseau , France*

Our numerical work has shown that when a TE mode magneto-optical Bismuth Iron Garnet waveguide is coupled to a neighboring gold grating, surface plasmon polaritons can enhance the transverse magneto-optical Kerr effect achieving non-reciprocal transmission.

CK-P.22 WED

Large Q-factors in small WGM resonators

N. Acharyya[1,2] *and •G. Kozyreff*[2]; [1]*Max-Born-Institut fur Nichtlineare Optik und Kurzzeitspektroskopie, Berlin, Germany*; [2]*Optique Nonlineaire Theorique, Universite Libre de Bruxelles (U.L.B.), CP 231, Campus de la Plaine, Bruxelles, Belgium*

We propose a cavity design that is compatible with existing technologies and that can suppress radiation by WGM resonators. Material-limited Q could be achieved with much lower volume, thus drastically increasing the ratio Q/V.

CK-P.23 WED

Electrical control of lifetime-limited quantum emitters using 2D materials

•*C. Ciancico*; *ICFO – The Institute of Photonic Sciences, Castelldefels (Barcelona), Spain*

Integrating single photon sources with nanophotonic elements is one of the main interests of quantum nanophotonics. I will present results obtained on a tunable hybrid device which integrates lifetime-limited single emitters and 2D materials at sub-wavelength separation.

CK-P.24 WED

Anomalous Transparency in Photonic Crystals and its Dependence on the Refractive Index Difference

•*T. Baghdasaryan, T. Geernaert, H. Thienpont, and F. Berghmans*; *Vrije Universiteit Brussel (VUB), Brussels, Belgium*

We identify photonic crystals that behave as isotropic and transparent material for TE polarized light above the first band gap region, where the wavelength starts to be comparable with the features of the lattice

CK-P.25 WED

Optical pulses propagating within SNAP microresonators on the surface of optical fibers

Z. Han[1], *E. Klotz*[2], *•I. Vatnik*[1], *and D. Churkin*[1]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institut d'Optique Graduate School, Paris, France*

We experimentally demonstrated transmittion of optical pulses within whispering gallery modes as far as several millimeters along the fiber axis, and also utilized the pulses for time domain reflectometry.

CK-P.26 WED

Laser Written Nano-Antenna and Waveguides devoted to Stationary Wave Sampling in Integrated Optic Spectrometers for the Near Infrared

•*M. Bonduelle*[1], *G. Martin*[1], *A. Morand*[2], *G. Zhang*[4],

G. Cheng[4], C. d'Amico[3], and R. Stoian[3]; [1]IPAG CNRS, Grenoble, France; [2]IMEP-LAHC INP CNRS, Grenoble, France; [3]LabHC CNRS, St Etienne, France; [4]State Key Laboratory of Transient Optics and Photonics, Xi'an, China

A novel stationary wave spectrometer in the near infrared is presented, based on ultrafast laser written waveguides and nano-scattering centers. We study flux extraction efficiency as a function of number and distance to the waveguide.

CK-P.27 WED

Surface plasmons in metamaterial heterostructures

•*T. Gric[1,2], O. Hess[3], and E. Rafailov[4]; [1]Department of Electronic Systems, Vilnius Gediminas Technical University, Vilnius, Lithuania; [2]Semiconductor Physics Institute, Center for Physical Sciences and Technology, Vilnius, Lithuania; [3]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom; [4]Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*

We identify the key factors influencing dispersion, propagation length of surface plasmon polaritons at the boundary of metamaterial heterostructures along with the absorption enhancement highly desirable in design of terahertz photoconductive antennas.

CK-P.28 WED

Laser Induced Quantum Dots generation

L. Orazi[1], F. Antolini[2], B. Reggiani[3], and •I. Gnilitskyi[4]; [1]University of Modena and Reggio Emilia, Department of Sciences and Methods for Engineering, Reggio Emilia, Italy; [2]ENEA, Fusion and Nuclear Security Department, Photonics Micro and Nanostructures Laboratory, Frascati (Rome), Italy; [3]ENEA, Fusion and Nuclear Security Department, Photonics Micro and Nanostructures Laboratory, Frascati (Rome), Italy; [4]LLC 'NoviNano Lab', Lviv, Ukraine

The present work will deal with the formation of the micro Quantum Dots in polymer films for photonics applications by nano-, pico- and femtosecond laser pulses.

CK-P.29 WED

Photonic Crystal Spatial Filters fabricated by Physical Vapour Deposition

•*D. Gailevičius[1,2], L. Grinevičiūtė[3], C. Babayigit[4], E. Bor[4,5], M. Turduev[5], V. Purlys[1,2], T. Tolenis[3], H. Kurt[4], and K. Staliunas[6,7]; [1]Laser Research Center, Vilnius University, Vilnius, Lithuania; [2]Femtika LTD, Vilnius, Lithuania; [3]Center for Physical Sciences and Technology, Vilnius, Lithuania; [4]Department of Electrical and Electronic Engineering TOBB University of Economics and Technology, Ankara, Turkey; [5]Department of Electrical and Electronic Engineering TED University, Ankara, Turkey; [6]Institució Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain; [7]Universitat Politècnica de Catalunya (UPC), Barcelona, Spain*

Here we present a new type of photonic crystal based on sub-wavelength conformal multilayer structure. A numerical analysis is presented with an experimental demonstration on how to build such structures using physical vapour deposition.

CK-P.30 WED

Anti-Stokes Cryoluminescence in Nanomaterials

•*A. Kudryavtseva[1], A. Belyanin[2], V. Borisov[3], M. Karpov[4], N. Tcherniega[1], and K. Zemskov[1]; [1]P.N. Lebedev Physical Institute of the RAS, Moscow, Russia; [2]CNITI Technomash, Moscow, Russia; [3]Scobeltsyn Institute of Nuclear Physics, Moscow, Russia; [4]FSUE VNIIA, Moscow, Russia*

Strong electromagnetic emission in nanomaterials under ruby laser excitation was registered in a wide spectral range (from green-blue till soft X-ray). For visible light two types of temporal dependence of intensity were detected.

CK-P.31 WED

Zero-Birefringence Silicon Slot Waveguides with L-Rails

•*S.A. Samad and S. Talabattula; Indian Institute of Science, Bengaluru, India*

High index contrast, narrow cross section photonic waveguides are prone to high birefringence. We present the design of a novel sub-micron silicon slot waveguide with L-rails optimized for zero-birefringence and greater tolerance to sidewall modulation.

CK-P.32 WED

Intermodal group delay in multimode waveguides on LNOI and SOI for Optical Interconnects

•*A. Kaushalram and S. Talabattula; Indian Institute of Science, Bengaluru, India*

Intermodal group delay is crucial to the performance of multimode waveguides as optical interconnects employing on-chip mode-division-multiplexing. This parameter is numerically evaluated for multimode waveguides in lithium niobate on insulator (LNOI) and SOI photonic platforms.

CK-P.33 WED

Strong FRET effect in colloidal semiconductor nanocrystal superparticles

•*A. Coste[1], V. Blondot[1], C. Arnold[1], S. Buil[1], X. Quélin[1], A. Bogicevic[2], T. Pons[2], N. Lequeux[2], J.-J. Greffet[3], and J.-P. Hermier[1]; [1]Groupe d'Etude de la Matière Condensée (GEMaC), Université de Versailles Saint-Quentin-en-Yvelines, CNRS UMR 8635, Université Paris-Saclay, Versailles, France; [2]Laboratoire de Physique et d'Etude des matériaux, ESPCI-ParisTech, PSL Research University, CNRS UMR 8213, Sorbonne Université, UPMC, Paris, France; [3]Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Université Paris-Saclay, Palaiseau, France*

We synthesize photostable superparticles consisting in aggregates of CdSe/CdS/CdZnS/ZnS core/multishell colloidal nanocrystals. The photoluminescence is analyzed through an effective medium model and an enhanced FRET is demonstrated.

CK-P.34 WED

Short Pulse Dynamics in Dispersive Quasi-PT-Symmetric Medium

D. Tsvetkov[1], V. Bushuev[1], V. Konotop[2], and •B. Mantsyzov[1]; [1]Department of Physics, M. V. Lomonosov Moscow State University, Moscow, Russia; [2]Centro de Fisica Teorica e Computacional and Departamento de Fisica, Faculdade de Ciencias, Universidade de Lisboa, Lisboa, Portugal

Using spectral method we study analytically short broadband pulse dynamics in quasi-PT-symmetric dispersive medium. As example, we described the several quasi-PT-symmetric optical phenomena for picosecond spatially localized optical pulse propagating in quasi-PT-symmetric photonic crystal with material dispersion.

CK-P.35 WED

Nanocellulose-based random laser

•*G.C.M. Germano[1], Y.D. Machado[1], L. Martinho[1], G.K.B. Costa[2], S.N. Fernandes[3], M.H. Godinho[3], J. Fontana[4], A.S.L. Gomes[5], and I.C.S. Carvalho[1]; [1]Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil; [2]Federal Rural University of Rio de Janeiro, Rio de Janeiro, Brazil; [3]Universidade NOVA de Lisboa, Lisboa, Portugal; [4]Naval Research Laboratory, Washington, USA; [5]Federal University of Pernambuco, Recife, Brazil*

We investigated the random laser action spectral analysis of the composite rhodamine6G in ethylene glycol solution with cellulose nanocrystals as scatters. Another architecture places the composite on a glass slide substrate presenting lower laser threshold.

CK-P.36 WED

The contribution has been withdrawn.

CK-P.37 WED

Integrated Single Photon Source of InAs Quantum Dot with Silicon-based Photonic Circuits

•*Y.-H. Ko[1], W.S. Han[1], K.-J. Kim[1], B.-S. Choi[1], K.Y. Kim[2], J.-H. Kim[2], C.J. Youn[1], J.-H. Kim[1], and J.J. Ju[1]; [1]Electronics and Telecommunications Research Institute (ETRI), Daejeon, South Korea; [2]Ulsan National Institute of Science and Technology (UNIST), Ulsan, South Korea*

The integrated single photon source with silicon photonic circuit was fabricated. The single photon emission from site-controlled InAs quantum dot in nano waveguide was integrated with silicon waveguides through micro-transfer technique with high coupling efficiency.

CK-P.38 WED

Thermo-refractive noise in silicon nitride based microresonators

•*G. Huang[1], E. Lucas[1], J. Liu[1], A. Raja[1], G. Lihachev[2,3], M.L. Gorodetsky[2,3], N.J. Engelsen[1], and T.J. Kippenberg[1]; [1]Institute of Physics (IPHYS), École Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland; [2]Faculty of Physics, M.V. Lomonosov Moscow State University , 119991 Moscow, Russia; [3]Russian Quantum Centre, 143025 Skolkovo, Russia*

Thermodynamic noises limit the frequency stability of resonators. Here, we present the characterization of thermo-refractive noise in Si_3N_4 microresonators. The measurements are in good agreement with theoretical analysis and FEM simulation of the structures.

CK-P.39 WED

On chip Sub-Wavelength Grating Fabry-Perot cavity, toward integrated cavity optomechanics applications

•*B. Taurel, P. Labeye, J.-M. Fedeli, and L. Duraffourg; Univ. Grenoble Alpes, CEA, LETI, Grenoble, France*

We present the theoretical modelization, technological realization and optical characterisation of a suspended Fabry-Perot cavity with a middle Sub-Wavelength Grating waveguide. We believe this structure can be used for cavity optomechanics applications.

CK-P.40 WED

Properties of Broadband Soliton Microcombs in Pulse-Driven Integrated Microresonators

•*M. Anderson[1], R. Bouchand[1], J. Liu[1], E. Obrzud[2,3], T. Herr[2], and T. Kippenberg[1]; [1]Institute of Physics (IPHYS), Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland; [2]Swiss Center for Electronics and Microtechnology (CSEM), Time and frequency, Neuchatel, Switzerland; [3]Geneva Observatory/PlanetS, Department of Astronomy, University of Geneva, Geneva, Switzerland*

Broadband single-soliton based frequency combs, with a detectable comb spacing of 28 GHz, are generated through pulse-driving of a chip-based Si_3N_4 microresonator. We observe an influence of the pulse-driving rate on the comb mode linewidth.

CK-P.41 WED

Micro-/Nanostructure-Stabilized Liquid-Crystalline Blue-Phase

•*Y.-L.D. Ho*[1], *M.P.C. Taverne*[1], *P. Jiang*[2], *S.-A. Jiang*[3], *J.-D. Lin*[3], *C.-R. Lee*[3], *and J.G. Rarity*[1]; [1]*Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom*; [2]*H H Wills Physics Laboratory, University of Bristol, Bristol, United Kingdom*; [3]*Department of Photonics, National Cheng Kung University, Tainan, Taiwan*

We create ideal single-crystals of blue phase liquid crystals, stable over a 40°C range using nano-structured 3D templates fabricated by direct laser writing. Polarisation microscopy results illustrate the stability and future display applications.

CK-P.42 WED

Large-parameter-space optimization of photonic crystal slab cavities

•*J.P. Vasco and V. Savona*; *Institute of Physics, École Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland*

We optimize the L3 cavity in a large parameter space by means of a hybrid stochastic-global optimization approach and obtain quality factors in the 80 and 10 million range for the silicon-on-air and Si/SiO_2 cavities, respectively.

CK-P.43 WED

Structural Design for Broadband Light Management In a Biological Example

•*B. Schwind*[1], *H.-O. Fabritius*[2], *and X. Wu*[1]; [1]*Paderborn University, Paderborn, Germany*; [2]*Max-Planck-Institut für Eisenforschung GmbG, Düsseldorf, Germany*

We reveal that the structure of the setae of the Saharan silver ant is adapted to its optical functions for broadband light management, which is inspiring for the design of artificial structures facing similar problems.

CK-P.44 WED

Investigation of low-index waveguiding in inverse rod-connected diamond photonic crystals

•*M.P.C. Taverne, Y.-L.D. Ho, C.-H. Fang, X. Zheng, L. Chen, and J.G. Rarity*; *Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom*

We investigate low-index waveguides in 3D direct rod-connected diamond photonic crystals, exploiting the hexagonal symmetry of their $\Gamma - L$ planes to transfer existing waveguide designs from 2D to 3D.

CK-P.45 WED

Spatiotemporal stabilization of PT-symmetric BAS Lasers

•*J. Medina Pardell*[1], *R. Herrero*[1], *M. Botey*[1], *and K. Staliunas*[1,2]; [1]*Departament de Física, Universitat Politècnica de Catalunya (UPC), Barcelona, Spain*; [2]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

PT-symmetry with a central symmetry axis induces spatio-temporal stabilization of broad area semiconductor lasers, leading to a bright, narrow and stable emission. The scheme is achieved by spatially shifted pump and refractive index particular modulations.

CK-P.46 WED

Femtosecond Laser Assisted Fabrication of Visible Wavelength All-dielectric Nano-membrane Metasurfaces

•*M. Beresna*[1], *B. Gholipour*[1,2], *T. Lee*[1], *K. MacDonald*[1], *N. Zheludev*[1,3], *and G. Brambilla*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada*; [3]*Centre for Disruptive Photonic Technologies, SPMS & TPI, Singapore, Singapore*

We report on the first proof of principle demonstration of high-quality factor all-dielectric metasurfaces operating across visible frequencies realized through laser machining of silicon nitride nano-membranes

CK-P.47 WED

Spectral Properties of Vacuum Energy and Spontaneous Emission in Fabry-Perot Micro-/Nano-Resonators

•*D. Repp and M. Pollnau*; *Advanced Technology Institute, Guildford, United Kingdom*

We show that vacuum energy inside a resonator is usually white light, triggering spontaneous emission that assumes the spectral mode properties. In nano-size resonators, vacuum energy assumes the spectral mode properties, triggering narrower spontaneous emission.

13:00 – 14:00

EA-P: EA Poster session

EA-P.1 WED

Periodic revival of frustrated two-photon creation via interference

•*D.-G. Im, Y. Kim, and Y.-H. Kim*; *Pohang University of Science and Technology, Pohang, South Korea*

We demonstrate how the properties of the pump laser can be used to modify the process of spontaneous two-photon emission by observing periodic revival of frustrated two-photon creation pumped by a continuous-wave multi-mode laser.

EA-P.2 WED

Photon-pair parasites: Menace or nuisance?

•*J.G. Koefoed, J.B. Christensen, and K. Rottwitt*; *Fotonik, Copenhagen, Denmark*

Four-wave-mixing-based photon-pair sources suffer from a number of parasitic effects. We study the importance of these effects in two schemes and show that a stark difference exists in their sensitivity to such effects.

EA-P.3 WED

Hyper-entanglement in time and frequency

•*P. Roztocki*[1], *C. Reimer*[1,2], *S. Sciara*[1,3], *M. Islam*[1], *L. Romero Cortés*[1], *Y. Zhang*[1], *B. Fischer*[1], *S. Loranger*[4,5], *R. Kashyap*[4,6], *A. Cino*[3], *S.T. Chu*[7], *B.E. Little*[8], *D.J. Moss*[9], *L. Caspani*[10], *W.J. Munro*[11,12], *J. Azaña*[1], *M. Kues*[1,13], *and R. Morandotti*[1,14,15]; [1]*INRS-EMT, Varennes, Canada*; [2]*HyperLight Corporation, Cambridge, USA*; [3]*University of Palermo, Palermo, Italy*; [4]*Polytechnique Montreal, Montreal , Canada*; [5]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [6]*Polytechnique Montreal, Montreal , Canada*; [7]*City University of Hong Kong, Hong Kong, China*; [8]*Chinese Academy of Science, Xi'an, China*; [9]*Swinburne University of Technology, Hawthorn, Australia*; [10]*University of Strathclyde, Glasgow , United Kingdom*; [11]*NTT Corporation, Kanagawa, Japan*; [12]*National Institute of Informatics, Tokyo, Japan*; [13]*University of Glasgow, Glasgow , United Kingdom*; [14]*University of Electronic Science and Technology of China, Chengdu , China*; [15]*ITMO University, St Petersburg, Russia*

We generate genuine multi-partite hyper-entangled states by using two discrete forms of energy-time entanglement, with a time-frequency product far exceeding the Heisenberg uncertainty limit such that the degrees of freedom are effectively independent.

EA-P.4 WED

Short-wave infrared correlated photons from silicon waveguides

•*L.M. Rosenfeld, D.A. Sulway, M.G. Thompson, J.G. Rarity, and J.W. Silverstone*; *Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom*

The short-wave infrared band allows classical and quantum nonlinear silicon photonics to escape deleterious nonlinear absorption. We report the first observation of correlated photons generated on-chip, with wavelengths beyond 2 microns.

EA-P.5 WED

Highly correlated photon-pair generation from a silicon waveguide integrated with on-chip pump-rejection filters

•*J.-M. Lee, W.-J. Lee, M.-S. Kim, and J.J. Ju*; *Electronics & Telecommunications Research Institute, DAEJEON, South Korea*

We demonstrate the photon-pair generation through a silicon waveguide spiral followed by on-chip cascaded Mach-Zehnder interferometers for a pump-rejection on a single chip. The coincidence-to-accidental-ratio of the photon pairs is enhanced up to 700.

EA-P.6 WED

Time-Energy Entangled Photon Pairs from Doppler-Broadened Atomic Ensemble via Collective Two-Photon Coherence

J. Park, T. Jeong, H. Kim, and •*H.S. Moon*; *Department of Physics, Pusan National University, Busan, South Korea*

We experimentally demonstrate two-photon interference of a time-energy entangled photon pair generated via collective two-photon coherence in Doppler-broadened cascade-type 87Rb atoms. The two photons originally proposed by J. D. Franson are realized as a photon pair due to collective effect.

EA-P.7 WED

Electromagnetically induced transparency of a single frequency comb mode

M. Kruljac[1], *I. Krešić*[1,2], *D. Aumiler*[1], *and* •*T. Ban*[1]; [1]*Institute of Physics, Zagreb, Croatia*; [2]*Institute for Theoretical Physics, Vienna University of Technology, Vienna, Austria*

We study electromagnetically induced transparency of a single optical frequency comb line interacting with a cold rubidium atoms. Our results could find application in realization of multimode quantum memories for quantum communication.

EA-P.8 WED

Entangled Photon Pairs Generated from Atomic Three-Level Systems and their Cross Correlation Functions

•*K.J. Ahn*; *Ajou University, Suwon, South Korea*

We theoretically studied temporal dynamics of the cross correlation function of two photons generated by elec-

tronic transitions in a ladder-type atomic three-level system, depending on the degree of spectral entanglement of two photons.

EA-P.9 WED

Coupling distant quantum dots using a photonic crystal Fano structure

•*Y. Yu*; *École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; *Technical University of Denmark, Kgs. Lyngby, Denmark*

A photonic crystal cavity-waveguide structure is proposed where two well-separated nanocavities are efficiently coupled through Fano interference effects, leading to an optical mode that facilitates distant coupling between two quantum dots in the cavities.

EA-P.10 WED

Enhanced Light-Matter Interactions in Ordered Arrays of Diamond Nitrogen-Vacancy Centres

•*M. Nicolle*[1,2], *J.N. Becker*[1], *P.M. Ledingham*[1], *J. Nunn*[3], *and I.A. Walsmley*[1]; [1]*University of Oxford, Oxford, United Kingdom*; [2]*University of Bristol, Bristol, United Kingdom*; [3]*University of Bath, Bath, United Kingdom*

We here theoretically investigate an enhanced light-matter interface based on collective effects in an ordered array of diamond nitrogen-vacancy centres coupled to a photonic waveguide, and discuss potential applications to magnetic field sensing.

EA-P.11 WED

3D Laser Writing around Lifetime-Limited Quantum Emitters

•*M. Colautti*[1,2], *P. Lombardi*[1,3], *S. Pazzagli*[3], *S. Nocentini*[1], *D. Wiersma*[1,2,4], *F. Cataliotti*[1,2], *and C. Toninelli*[3]; [1]*European Laboratory for Non-Linear Spectroscopy (LENS), Sesto Fiorentino (FI), Italy*; [2]*Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Sesto Fiorentino (FI), Italy*; [3]*National Institute of Optics (CNR-INO), Firenze, Italy*; [4]*Istituto Nazionale di Ricerca Metrologica (INRiM), Torino, Italy*

We demonstrate the potential of 3D laser writing combined with single organic molecules as quantum light sources for the integration in 3dimensional polymeric structures of single quantum emitters close to life-time limit.

EA-P.12 WED

Quantum States of Heralded Photons

•*D. Horoshko*[1,2], *S. De Bièvre*[1], *G. Patera*[1], *and M. Kolobov*[1]; [1]*Université de Lille, Lille, France*; [2]*B. I. Stepanov Institute of Physics, NASB, Minsk, Belarus*

We find the conditional state of a heralded photon in a form of difference of two density operators of thermal states. We show that its Glauber-Sudarshan P-function takes negative values, a signature of nonclassicality.

EA-P.13 WED

Photon correlations in PT-symmetric waveguide systems

•*F. Klauck, L. Teuber, M. Ornigotti, M. Heinrich, S. Scheel, and A. Szameit*; *University of Rostock, Institute of physics, Rostock, Germany*

We investigate quantum interference in a PT-symmetric system by measuring a Hong-Ou-Mandel-Dip in waveguide couplers. The nontrivial loss distribution giving rise to PT-symmetry systematically displaces photon bunching with respect to the Hermitian case.

EA-P.14 WED

Spatially separated generalized two-mode squeezed vacuum states in lossy coupled resonator optical waveguides

•*H. Seifoory*[1], *L.G. Helt*[1], *J.E. Sipe*[2], *and M.M. Dignam*[1]; [1]*Department of Physics, Engineering Physics and Astronomy, Queen's University, Kingston, Canada*; [2]*Department of Physics and Institute for Optical Sciences, University of Toronto, Toronto, Canada*

We present an integrated source of counterpropagating entangled state based on vertically-pumped coupled resonator optical waveguides and investigate theoretically the generation and propagation of continuous variable entangled states in such a system.

EA-P.15 WED

Ge-on-Si High Efficiency SPADs at 1310 nm

•*D.C.S. Dumas*[1], *J. Kirdoda*[1], *P. Vines*[2], *K. Kuzmenko*[2], *R.W. Millar*[1], *G.S. Buller*[2], *and D.J. Paul*[1]; [1]*University of Glasgow, Glasgow, UK*; [2]*Heriot-Watt, Edinburgh, UK*

High efficiency Ge-on-Si single photon detectors have been fabricated which demonstrate a detection efficiency of 38 % at 1310 nm. Devices show operation at up to 175 K and detection wavelengths up to 1550 nm.

EA-P.16 WED

Optical Quantum Technologies based on Quantum Zeno dynamics

•*H.V. Do and F.S. Cataliotti*; *LENS, Universita di Firenze, Sesto Fiorentino (FI), Italy*

Quantum phase gate, noise sensor, and Berry phase demonstration based on the realization of the Quantum Zeno regime on a Bose-Einstein condensate using either a strong Raman laser coupling or a laser-induced fluorescence

EA-P.17 WED

Experimental observation of a quantum Cheshire cat using a weak measuring device

•*Y. Kim*[1], *D.-G. Im*[1], *Y.-S. Kim*[2], *S.-Y. Lee*[2], *S.-W. Han*[2], *S. Moon*[2], *Y.-H. Kim*[1], *and Y.-W. Cho*[2]; [1]*Department of Physics, Pohang University of Science and Technology (POSTECH), Pohang, South Korea*; [2]*Center for Quantum Information, Korea Institute of Science and Technology (KIST), Seoul, South Korea*

We experimentally observe a disembodied polarization from a single photon, known as the quantum Cheshire cat effect. We probe the location of the photon and its polarization simultaneously using a weak measuring device.

EA-P.18 WED

The Role of Detector Position in Quantum Ghost Diffraction

•*A. Vega*[1], *E. Santos*[1], *S. Saravi*[1], *T. Pertsch*[1,2], *and F. Setzpfandt*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Quantum Ghost Diffraction is studied theoretically. We show, that the position of the single detector measuring the transmitted photons has a profound effect on which object features can be identified in its measured diffraction pattern.

EA-P.19 WED

The contribution has been withdrawn.

EA-P.20 WED

Nonlinear Quantum Spectroscopy Enhanced by Parity-Time Symmetry

•*P. Kumar*[1,2], *S. Saravi*[1], *T. Pertsch*[1], *F. Setzpfandt*[1], *and A.A. Sukhorukov*[2]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, Australia*

We reveal strongly enhanced detection of absorption by samples placed at one arm of parity-time symmetric waveguide coupler, by incorporating in a nonlinear photon-pair interferometer for broadband quantum spectroscopy through simple one-color photon counting.

EA-P.21 WED

Tuning the temporal coherence of polariton condensates

•*A. Askitopoulos*[1], *L. Pickup*[2], *S. Alyatkin*[1], *A. Zasedatelev*[2], *W. Langbein*[3], *and P. Lagoudakis*[1]; [1]*Skolkovo institute of Science and Technology, Moscow, Russia*; [2]*Southampton University, Southampton, United Kingdom*; [3]*University of Cardiff, Cardiff, United Kingdom*

The temporal coherence and number fluctuations of polariton condensates are investigated, revealing a regime where the coherence time of the system is increased 40-fold. We use existing quantum matter-wave laser models to interpret our results.

EA-P.22 WED

Optomechanical self-structuring of cold atoms with structured light

•*G. Baio, G. Robb, A. Yao, and G.-L. Oppo*; *University of Strathclyde, Glasgow, United Kingdom*

We study density self-organization of cold atoms in a ring cavity in the presence of structured phase. We observe dynamical behaviour resulting in coupled light intensity and atomic density transverse patterns carrying orbital angular momentum.

EA-P.23 WED

An Archimedes' spiral for cold atoms

•*V.E. Lembessis*[1], *A. Al Rsheed*[1], *A. Lyras*[1], *and O.M. Aldossary*[1,2]; [1]*Quantum Technology Group, Department of Physics and Astronomy, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Kingdom of Saudi Arabia*; [2]*The National Center for Applied Physics, KACST, P.O. Box 6086, Riyadh 11442, Kingdom of Saudi Arabia*

We show how a configuration of two counter-propagating optical vortex beams with opposite windings can be used for the creation of an Archimedes' spiral for atoms.

EA-P.24 WED

Towards Quantum Many-Body Physics with Strontium in Optical Lattices

•*A. Heinz*[1], *A. Park*[1], *J. Trautmann*[1], *R. Haindl*[1], *E. Staub*[1], *N. Santic*[1], *J. Dalibard*[2], *I. Bloch*[1], *and S. Blatt*[1]; [1]*Max-Planck Institute for Quantum Optics, Garching, Germany*; [2]*Laboratoire Kastler Brossel, Collège de France, ENS-PSL Research University, CNRS, UPMC-Sorbonne Universités, Paris, France*

We present progress towards a Sr quantum gas microscope using large, homogeneous, state-dependent optical lattices based on red light. To reach the required laser intensity, we developed a stable in-vacuum buildup cavity.

EA-P.25 WED

Deep laser cooling of atoms on narrow-line optical transitions in polarized fields: scaling law

•*R. Ilenkov*[1,2], *O. Prudnikov*[1,2], *A. Taichenachev*[1,2], *and V. Yudin*[1,2,3]; [1]*Institute of Laser Physics SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Novosibirsk Technical State University, Novosibirsk, Russia*

The work is devoted to the study of laser cooling of atoms at narrow optical transitions. The existence of the scaling law is shown, the optimal configurations of laser cooling of atoms are determined.

EA-P.26 WED

Development and qualification of miniaturized, UHV-compatible optical systems for integrated atomic quantum sensors

•*M. Christ*[1,2], *A. Wicht*[1], *and M. Krutzik*[1,2]; [1]*Humboldt-Universität, Berlin, Germany*; [2]*Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

Field-compatible, compact atomic quantum sensors require miniaturized optical systems, which are integrated close to the atomic source. We present the current status of our 1064nm in-vacuum optical dipole trap and our versatile UHV qualification apparatus.

EA-P.27 WED

Telecom Laser Lock On Acetylene Line For Applications In Cold Atoms Experiments

•*A. Hilico*[1], *V. Mancois*[1], *R. Veyron*[1], *F. Benabid*[2], *P. Bouyer*[1], *and S. Bernon* [1]; [1]*Laboratoire Photonique, Numérique et Nanosciences, CNRS, Universités de Bordeaux, Institut d'Optique,, Talence, France*; [2]*. GPPMM Group, XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France*

Telecom lasers are interesting for cold atoms applications due to the possibility to reach targeted wavelengths by frequency doubling. Locking systems in the infra-red are needed, we propose to use a vibrational transition of acetylene.

13:00 – 14:00

ED-P: ED Poster session

ED-P.1 WED

Development of an XUV frequency comb for precision spectroscopy of highly charged ions

•*J.-H. Oelmann*[1,2], *J. Nauta*[1,2], *A. Ackermann*[1], *P. Knauer*[1], *R. Pappenberger*[1], *S. Kühn*[1,2], *J. Stark*[1,2], *J.R. Crespo López-Urrutia*[1], *and T. Pfeifer*[1]; [1]*Max-Planck-Institute for Nuclear Physics, Heidelberg, Germany*; [2]*Heidelberg Graduate School of Fundamental Physics, Heidelberg, Germany*

We report on the recent progress in the development of an extreme ultraviolet frequency comb based on intra-cavity high harmonic generation for precision spectroscopy of cold highly charged ions.

ED-P.2 WED

Optical Transitions of the Molecular Iodine for Probing Variations of Fundamental Constants

•*F.L. Constantin*; *Laboratoire PhLAM, CNRS UMR 8523, Villeneuve d'Ascq, France*

The optical transitions of the molecular iodine may probe the standard model extensions in the electron sector. A time-variation of the proton-electron mass ratio may be constrained with laboratory experiments at the 10^(-16)/year level.

ED-P.3 WED

Optical Frequency Standard Based on Ultracold Magnesium Atoms: Current Status and Future Prospects

•*M. Tropnikov*[1], *A. Bonert*[1], *A. Goncharov*[1,2], *S. Kuznetsov*[1], *V. Baraulya*[1], *D. Brazhnikov*[1,2], *O. Prudnikov*[1,2], *A. Taichenachev*[1,2], *and S. Bagayev*[1,2]; [1]*Institute of Laser Physics SB RAS, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*

We present experimental studies on developing a magnesium optical frequency standard. The frequency stability of the clock laser system stabilized by Ramsey–Bordé fringes is $3 \cdot 10^{-15}$ at averaging time $\tau = 1000\ s$.

ED-P.4 WED

Development of a Fibre-Based Acetylene Optical Frequency Standard at 1.54 μm

•*K. Manamanni, V. Roncin, F. Du Burck, and m. Sahni*; *laboratoire de physique des lasers, Villetaneuse, France*

Optical frequency standards are essential for various applications in metrology. We present a compact frequency laser stabilized on a Doppler-free acetylene absorption at 1542nm, using standard fibre-optic components. frequency stability of 4.10-13 at 4000s is achieved.

ED-P.5 WED

Fisher Information with Continuous Variable Quantum Resources

•*G.S. Atkinson*[1,2], *E.J. Allen*[1,2], *G. Ferranti*[2], *and J.C.F. Matthews*[2]; [1]*Quantum Engineering Centre for Doctoral Training, Bristol, United Kingdom*; [2]*Quantum Engineering Technology Labs, Bristol, United Kingdom*

We present an experimentally applicable model of the Fisher information on a loss parameter estimated using squeezed light as a probe, providing new insight into the practicality of continuous variable quantum resources in metrology.

ED-P.6 WED

Laser cooling of atoms with an optical frequency comb

•*D. Aumiler, N. Šantić, D. Buhin, D. Kovačić, I. Krešić, and T. Ban*; *Institute of Physics, Zagreb, Croatia*

We present results of Doppler cooling of neutral rubidium atoms on a single-photon transition using a frequency comb, and investigate theoretically 1D comb cooling beyond the Doppler limit.

ED-P.7 WED

Highly Flat Optical Frequency Comb Based on the Time Lens Principle

•*T.T. Tran*[1,2], *M. Song*[2], *M. Song*[2], *and D. Seo*[1]; [1]*Myongji University, Yongin, South Korea*; [2]*Electronics and Telecommunications Research Institute, Daejeon, South Korea*

We investigate the nonlinear effects depending on the pulse width under the sinusoidal phase modulation. The proposed scheme achieves the spectral flatness within 1 dB for 38 taps using an intensity and two phase modulators.

ED-P.8 WED

Improvement of the stabilization loops performances of a DF–VECSEL dedicated to cesium CPT clocks application by fully-correlated multi-mode pumping

•*G. Gredat*[1], *H. Liu*[1], *G. Baili*[2], *F. Gutty*[2], *I. Sagnes*[3], *F. Goldfarb*[1], *and F. Bretenaker*[1]; [1]*Laboratoire Aimé Cotton, Université Paris-Sud, ENS Paris-Saclay, CNRS, Université Paris-Saclay, Orsay, France*; [2]*Thales Research & Technology, 1 avenue Augustin Fresnel, Palaiseau, France*; [3]*Centre de Nanosciences et Nanotechnologie (C2N), CNRS, Université Paris-Sud, Université Paris-Saclay, Marcoussis, France*

A dual-frequency VECSEL, providing an optically-carried RF-signal designed for the coherent-population-trapping of Cs atoms in an atomic-clock, is stabilized in two pumping-configurations for which we compare the noises contributions to the clock stability.

ED-P.9 WED

Extension of the Ion Optical Clock to Multi-Ion Systems

•*K. Hayasaka*; *National Institute of Information and Communications Technology, Kobe, Japan*

The methods for extending the single-ion optical clock to multi-ion systems are presented. We show that ion chains with equal ion-ion spacings can operate as a clock with enhanced stability and as a superradiant clock.

ED-P.10 WED

Optimization of acousto-optic frequency combs

•*K. Nithyanandan*[1], *L. Djevarhidjian*[1], *V. Duran*[2], *C. Schnébelin*[1], *and H. Guillet de Chatellus*[1]; [1]*Université Grenoble Alpes, CNRS, LIPhy, Grenoble, France*; [2]*GROC-UJI, Institute of New Imaging Technologies (INIT), Universitat Jaume I, Castellon, Spain*

Acousto-optic frequency combs provide more than 1000 mutually-coherent lines, and are a valuable tool for multi-heterodyne coherent spectroscopy. We present and validate a simple model of acousto-optic frequency combs, and discuss their limitations.

ED-P.11 WED

Iodine-Stabilized 633 nm Diode Lasers for Metrology and Interferometry

•*F. Krause*[1], *U. Sterr*[1], *E. Benkler*[1], *C. Nölleke*[2], *and P. Leisching*[2]; [1]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [2]*TOPTICA Photonics AG, Graefelfing, Germany*

An extended cavity 633-nm diode laser system (ECDL) is stabilized to iodine using the NICE-OHMS method. We achieve 3.2×10^{-12} instability at 1 s averaging time, better than iodine stabilized helium-neon lasers.

ED-P.12 WED

Suppression of the Field-Induced Shifts in Atomic Clocks Based on Ramsey Spectroscopy and Combined Error Signal

V. Yudin[1,2,3], •*M. Basalaev*[1,2,3], *A. Taichenachev*[1,2], *T. Zanon-Willette*[4], *T. Mehlstäubler*[5], *R. Boudot*[6,7], *J. Pollock*[6], *M. Shuker*[6], *E. Donley*[6], *and J. Kitching*[6]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Laser Physics SB RAS, Novosibirsk, Russia*; [3]*Novosibirsk State Technical University, Novosibirsk, Russia*; [4]*Sorbonne Université, Paris, France*; [5]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [6]*National Institute of Standards and Technology, Boulder, USA*; [7]*FEMTO-ST, Besancon, France*

We develop a method to generate the reference signal for the stabilization of atomic clocks based on interrogation scheme with two different Ramsey periods and a specially constructed combined error signal.

ED-P.13 WED

Development of a high power infra-red laser system for condensation of Rb atoms

•*M. Jain*[1], *G. Rosi*[1], *L. Cacciapuoti*[2], *and G. Tino*[1]; [1]*INFN Sezione di Firenze, Dipartimento di Fisica e Astronomia & LENS, Universita di Firenze, via Sansone 1, I - 50019 Sesto Fiorentino (FI), Firenze, Italy*; [2]*European Space Agency, Keplerlaan 1, PO Box 299, 2200 AG, Noordwijk, Netherlands*

Using optical setup for 1064nm laser to create an optical-dipole trap will result in temperatures lower than 4μK for Rb-87 atoms. Creation of a BEC from cooling and com-

pression techniques for metrological measurements are planned.

ED-P.14 WED

Comb-based Fourier-Transform Spectrometry for Broadband Measurements of Absorption and Dispersion

D. Charczun, G. Kowzan, A. Nishiyama, P. Staniszewski, A. Cygan, D. Lisak, R.S. Trawiński, and •P. Masłowski; Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University in Torun, Torun, Poland

We performed broadband measurements of cavity finesse, dispersion and measurements of molecular transitions using a Fourier-transform spectrometer with direct use of an optical frequency comb. The method is fast, multimodal and offers superb spectral resolution.

ED-P.15 WED

Beam Pointing Detection by Interference with a Frequency-Shifted Higher-Order Mode

•F. Schepers, T. Brüggenkamp, T. Hellwig, and C. Fallnich; Institute of Applied Physics, University of Münster, Münster, Germany

We present the beam pointing detection of a fundamental mode by a superposition with a frequency-shifted higher-order Hermite-Gaussian mode and experimentally demonstrate its applicability by a beam pointing stabilization.

ED-P.16 WED

Development of polarization-sensitive dual-comb spectroscopy for anisotropic materials

•K.A. Sumihara[1,2], S. Okubo[2], K. Oguchi[1], H. Inaba[2], and S. Watanabe[1]; [1]Keio University, Yokohama, Japan; [2]NMIJ, AIST, Tsukuba, Japan

We are developing polarization-sensitive dual-comb spectroscopy based on electro-optic modulator which can precisely measure amplitude, phase, and polarization changes induced by the sample. Using this method, determination of anisotropic complex refractive index will be possible.

ED-P.17 WED

Kapitza pendulum effect with overclocked Raman comb solitons in a microring resonato

•D.N. Puzyrev[1], N.V. Alexeeva[2], I.V. Barashenkov[2], B.A. Malomed[3], C. Milián[4], and D.V. Skryabin[1]; [1]Department of Physics, University of Bath, Bath, United Kingdom; [2]Department of Mathematics, University of Cape Town, Cape Town, South Africa; [3]Department of Physical Electronics, Tel-Aviv University, Tel-Aviv, Israel; [4]ICFO – Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain

We report a 'Kapitza pendulum'-like effect accompanying frequency comb generation in microring resonators with Kerr and Raman nonlinearities, which leads to stabilisation of the usually unstable lower soliton branch and destabilisation of the upper one.

ED-P.18 WED

Ultra-stable optical oscillator transfer to the UV for primary thermometry

•A. Sorgi[1,2], R. Eramo[1,2], and P. Cancio Pastor[1,2]; [1]INO, Istituto Nazionale di Ottica-CNR, Florence I-50125, Italy; [2]LENS, European Laboratory for Nonlinear Spectroscopy, Sesto Fiorentino (Florence) I-50019, Italy

We present a slave-master frequency control scheme to transfer, in the deep UV region, the spectral requirements of linewidth, stability, tunability and absolute traceability, for high precision measurements, using an OFC as a bridge.

ED-P.19 WED

High-Power Broadband Midinfrared Dual Comb Spectroscopy

•K.F. Lee[1], G. Zhou[2], G.C. Kerber[2], M. Cassinerio[1], J. Jiang[1], M.E. Fermann[1], and S.T. Cundiff[2]; [1]IMRA America, Inc., Ann Arbor, USA; [2]University of Michigan, Ann Arbor, USA

We implement dual comb spectroscopy in the 7-10 micron spectral region with a single measurement using two midinfrared frequency combs with 60 mW total power.

ED-P.20 WED

Thermally stabilized, energy efficient, all-fiber optical frequency comb

•A. Głuszek, Z. Łaszczych, A. Hudzikowski, J. Sotor, and G. Soboń; Wroclaw University of Science and Technology, Wroclaw, Poland

We report 125 MHz repetition rate, Er-doped, all fiber, mode locked laser, utilizing graphene as a saturable absorber with tunable repetition frequency by a custom piezo-electric transducer (0-2.9 kHz) and thermally stabilized plate (0-17 kHz).

ED-P.21 WED

Spectral interleaving with quantum cascade laser frequency combs

•M. Gianella[1], A. Nataraj[1], B. Tuzson[1], F. Kapsalidis[2], S. Schilt[3], T. Südmeyer[3], J. Faist[2], and L. Emmenegger[1]; [1]Laboratory for Air Pollution / Environmental Technology, Empa, Dübendorf, Switzerland; [2]Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland; [3]Laboratoire Temps-Fréquence, Université de Neuchâtel, Neuchâtel, Switzerland

The spectral interleaving technique applied to dual quantum cascade laser frequency comb spectroscopy overcomes the problem of large comb spacing inherent to these short devices and allows lineshape measurements of Doppler-broadened transitions.

ED-P.22 WED

Optical frequency comb generation induced by gain-through-losses modulation instability in passive optical cavities

F. Bessin[1], •A.M. Perego[2], K. Staliunas[3,4], S.K. Turitsyn[2,5], A. Kudlinski[1], M. Conforti[1], and A. Mussot[1]; [1]Université de Lille, Lille, France; [2]AIPT-Aston University, Birmingham, United Kingdom; [3]ICREA, Barcelona, Spain; [4]UPC, Barcelona, Spain; [5]Novosibirsk State University, Novosibirsk, Russia

We present the experimental demonstration of a novel method for optical frequency comb generation, with 100 GHz tuneability of the repetition rate, in normal dispersion driven Kerr resonators based on the gain-through-losses modulation instability

ED-P.23 WED

Monolithically Integrated On-Chip Dual Mode-Locked Lasers in InP-Based Generic Foundry Platform

M.-C. Lo, R. Guzmán, J. Cesar, M. Ali, A. Zarzuelo, and •G. Carpintero; Universidad Carlos III de Madrid, Leganés, Spain

We propose and experimentally demonstrated the chip-scale dual mode-locked lasers. The repetition rates are 12.420 GHz and 12.423 GHz, respectively, with the narrow RF linewidths (< 200 kHz) and the controllable relative repetition rate.

ED-P.24 WED

An Iodine-Stabilized Laser Using a 1542-nm Light Source

•K. Ikeda[1,2,3], C. Chen[1,3], K. Yoshii[1,3], S. Okubo[2,3], K. Kashiwagi[2,3], M. Wada[1,2,3], H. Inaba[2,3], and F.-L. Hong[1,3]; [1]Department of Physics, Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan; [2]National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, 1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan; [3]JST, ERATO, MINOSHIMA Intelligent Optical Synthesizer Project, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan

We have developed an iodine-stabilized laser at 1542 nm by using a dual-pitch PPLN waveguide for third-harmonic generation. Frequency stabilization is based on saturation spectroscopy of the R(73)46-0 transition of molecular iodine.

ED-P.25 WED

Scrutinizing the equidistance of frequency comb sources

E. Escoto and •G. Steinmeyer; Max-Born-Institut, Berlin, Germany

We propose and demonstrate a novel experimental test for the equidistance and coherence of frequency combs. This test is based on Fourier spectroscopy and can also disambiguate coherent artifacts in the characterization of mode-locked lasers.

ED-P.26 WED

Characterization of a robust Er:fiber-based Difference Frequency Comb at 200 MHz repetition rate

•A. Seer, C. Tresp, R. Herda, T. Puppe, P. Thoumany, S. Müller, F. Rohde, and R. Wilk; TOPTICA Photonics AG, Graefelfing / Munich, Germany

We report on a robust, inherently fCEO phase-stable difference frequency generation comb at a repetition rate of 200 MHz. Its performance under optical-lock conditions is characterized by means of a comb-comb comparison.

ED-P.27 WED

Scanning of a dissipative Kerr-microresonator soliton comb for direct optical frequency comb spectroscopy

N. Kuse[1], T. Tetsumoto[1], and •M. Fermann[2]; [1]IMRA America Inc., Boulder Research Labs, Longmont, USA; [2]IMRA America Inc, Ann Arbor, USA

We propose and demonstrate a novel technique for continuous and autonomous scanning of a dissipative Kerr-microresonator soliton comb facilitated by Pound-Drever-Hall locking.

ED-P.28 WED

Robust offset locking of laser frequency with electronically tunable LC circuits for sub-millihertz uncertainty

•T. Hasegawa and Y. Seishu; Keio University, Yokohama, Japan

Laser frequency offset locking introduced in Opt. Express, **25**, 2752 (2017) has been improved. By employing this scheme with optical phase lock loop, robust and precise laser frequency stabilization is achieved even in noisy circumstances.

13:00 – 14:00

EF'-P: EF' Poster Session

EF'-P.1 WED

Second harmonic generation in a phase-matched sub-micron SiO2-LiNbO3-air slab waveguide

•*B. Carnio and A. Elezzabi*; *University of Alberta, Edmonton, Canada*

Second harmonic generation measurements are performed on a SiO2-LiNbO3-air slab waveguide having a sub-micron core. Enhanced generation is observed at 392 nm and 399 nm, which agrees with the preformed phase-matching and modal overlap analyses.

13:00 – 14:00

EI-P: EI Poster session

EI-P.1 WED

Gate-tunable ultrafast optical response of single-layer graphene

•*E.A.A. Pogna*[1,2], *O. Balci*[3], *P. Pedrinazzi*[2], *M. Guizzardi*[2], *A. Tomadin*[4], *G. Soavi*[3], *M. Polini*[4], *A.C. Ferrari*[3], *and G. Cerullo*[2]; [1]*NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy*; [2]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [3]*Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom*; [4]*Istituto Italiano di Tecnologia, Graphene Labs, Genova, Italy*

The ultrafast optical response of single-layer graphene is studied as function of the Fermi level. The modification of the optical phonon emission rate and the appearance of photo-induced absorption are discussed as function of doping.

EI-P.2 WED

Local and macroscopic electromagnetic fields in bilayer crystals

•*M. Merano*; *Dipartimento di Fisica e Astronomia G. Galilei, Università degli studi di Padova, Padova, Italy*

I present a complete theory for the optical response of bilayer crystals. First a microscopic approach computes the local fields. Then I derives the macroscopic fields for a direct comparison with the experimental data.

EI-P.3 WED

Nanoscale Optical Diagnostics of 2D TMDs

•*S. Psilodimitrakopoulos*[1], *L. Mouchliadis*[1], *I. Paradisanos*[1,2], *A. Lemonis*[1], *G. Kioseoglou*[1,3], *and E. Stratakis*[1,2,3]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas (FORTH), Heraklion, Crete, Greece*; [2]*Department of Physics, University of Crete, Heraklion, Crete, Greece*; [3]*Department of Materials Science and Technology, University of Crete, Heraklion, Crete, Greece*

P-SHG imaging revealed the crystal orientation, thickness inhomogeneities and grain boundaries. By calculating the mean orientational average of crystal angle distributions in specific ROIs we defined the corresponding std as a figure-of-merit for the 2D crystal quality.

EI-P.4 WED

Exfoliation of Centimetre-sized Transition Metal Dichalcogenide Monolayers

M. Velicky, G. Donnelly, W. Hendren, D. Scullian, E. Santos, R. Bowman, and •F. Huang; *Queen's University Belfast, Belfast, United Kingdom*

Mediated by the strong physisorption of smooth and clean Au surfaces, extraordinarily large-size transition metal dichalcogenide monolayers up to centimetre scale are exfoliated using scotch tape method, including MoS2, WS2, MoSe2, WSe2, MoTe2 and WTe2.

EI-P.5 WED

Control of Nonlinear Optical Properties of the Carbon Nanotubes Saturable Absorber with Electrochemical Gating

•*Y. Gladush*[1], *A. Mkrtchyan*[1], *D. Kopylova*[1], *A. Ivanenko*[2], *B. Nyushkov*[2], *S. Kobtsev*[2], *A. Khegai*[3], *M. Melkumov*[3], *M. Burdanova*[4], *M. Staniforth*[4], *J. Lloyd-Hughes*[4], *and A. Nasibulin*[1,5]; [1]*Skolkovo Institute of Science and Technology, Moscow, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*; [3]*Fiber Optic Research Center, Moscow, Russia*; [4]*University of Warwick, Coventry, United Kingdom*; [5]*Aalto University, Espoo, Finland*

We demonstrate the ability to control the nonlinear optical properties of carbon nanotube saturable absorber by electrochemical gating. The tuning capability of the gated absorber was explored by pump-probe spectroscopy and tested in lasers.

EI-P.6 WED

Wave Mixing in Graphene Nonlinear Resonators Utilizing Coupled-Mode Theory

•*T. Christopoulos*[1], *O. Tsilipakos*[2], *G. Sinatkas*[1], *and E.E. Kriezis*[1]; [1]*School of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece*; [2]*Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas, Heraklion, Crete, Greece*

A strict mathematical framework for analyzing wave mixing in nonlinear resonators comprising graphene is presented. The proposed framework is used to model degenerate four-wave mixing in THz graphene nanoribbon resonators supporting surface plasmon polariton waves.

EI-P.7 WED

Wideband Graphene Electro-optic Modulator on 1D Photonic Crystal Cavity

•*T. Wood, J. Lhuillier, P. Demongodin, M. Kemiche, B. Vilquin, P. Rojo Romeo, A. Belarouci, S. Callard, and C. Monat*; *Université de Lyon, Institut des Nanotechnologies de Lyon (INL), CNRS, UMR 5270, École Centrale de Lyon, Ecully, France*

A wideband electro-optic modulator is demonstrated, featuring relative modulation depths of 20% or more over a ~400nm wavelength window in the near-infrared spectral region. Design, fabrication, electro-optical characterisation and multi-physics modelling of behaviour are described.

EI-P.8 WED

Graphene Nanoribbons: From photophysical properties towards devices

•*S.K. Alavi*[1,2], *B.V. Senkovskiy*[3], *M. Pfeiffer*[1], *D. Haberer*[4], *F.R. Fischer*[5,6], *K. Meerholz*[1], *Y. Ando*[3], *A. Grüneis*[3], *and K. Lindfors*[1]; [1]*Department für Chemie, Universität zu Köln, Luxemburger Strasse 116, 50939, Köln, Germany*; [2]*Institut für Angewandte Physik der Universität Bonn, Wegeler Strasse 8, 53115, Bonn, Germany*; [3]*II. Physikalisches Institut, Universität zu Köln, Zülpicher Strasse 77, 50937, Köln, Germany*; [4]*Department of Chemistry, University of California at Berkeley, Tan Hall, CA 94720, Berkeley, USA*; [5]*Materials Sciences Division, Lawrence Berkeley National Laboratory, CA 94720, Berkeley, USA*; [6]*Kavli Energy NanoSciences Institute at the University of California Berkeley and the Lawrence Berkeley National Laboratory, CA94720, Berkeley, USA*

Armchair graphene nanoribbons (AGNRs) are novel material for optoelectronics. We investigate the process of fluorescence brightening due to defect formation in AGNRs. We also demonstrate a nanoscale photodetector based on nanoribbons.

EI-P.9 WED

Ultrafast charge transfer and valley dynamics in WSe2/MoSe2 heterostructure

•*S. Dal Conte*[1], *Z. Wang*[1], *P. Altmann*[1], *W. Li*[2], *L. Ghirardini*[1], *M. Celebrano*[1], *S. De Silvestri*[1,3], *D. Akinwande*[2], *and G. Cerullo*[1,3]; [1]*Politecnico di Milano, Milan, Italy*; [2]*Microelectronics Research Centre, The University of Texas at Austin, Austin, USA*; [3]*IFN-CNR, Milan, Italy*

We use two-color pump-probe spectroscopy to study the charge transfer dynamics in type II WSe2/MoSe2 heterostructure. We find that photoexcited holes selectively injected in MoSe2 quickly scatter into the WSe2 layer on a sub-ps timescale.

EI-P.10 WED

Single-Layer MoS2 Grown on Exposed-Core Optical Fibers: a new Approach to Waveguide Transition Metal Dichalcogenide Photonics

•*R.T.K. Schock*[1], *A. George*[2], *C. Neumann*[2], *B. Doherty*[3], *S. Warren-Smith*[4], *A. Turchanin*[2], *H. Ebendorff-Heidepriem*[4], *M.A. Schmidt*[3], *and F. Eilenberger*[1,5,6]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany*; [2]*Institute of Physical Chemistry, Abbe Center of Photonics, Friedrich Schiller University , Jena, Germany*; [3]*Leibniz Institute for Photonics Technologies, Jena, Germany*; [4]*ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP), Institute for Photonics and Advanced Sensing, School of Physical Sciences, University of Adelaide, Adelida, Australia*; [5]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*; [6]*Max Planck School of Photonics, Jena, Germany*

We show that 2D-Transition-Metal-Dichalcogenides such as MoS2 can be grown directly on exposed core optical fibers and present results of photoluminescence and nonlinear effects in this fibers.

EI-P.11 WED

The contribution has been withdrawn.

EI-P.12 WED

Probing the orientation of fluorescent nanoplatelets for vertical orientation

F. Feng[1], *L.T. Nguyen*[1], *M. Nasilowski*[2], *C. Lethiec*[1], *B. Dubertret*[2], *L. Coolen*[1], *and •A. Maitre*[1]; [1]*Institut des Nanosciences, Sorbonne Universite, Paris, France*; [2]*Laboratoire Photon et Matière, ESPCI, Paris, France*

We determine nature and orientation of emtting dipoles for single colloidal CdSe/CdS nanoplatelets by polarimetric method. We show that the emission of rectangular nanoplatelets is polarized although the emission of square ones is not.

EI-P.13 WED

Strong Exciton-Coherent Phonon Coupling In Single-Layer MoS2

•*C. Trovatello*[1], *H.P.C. Miranda*[2], *A. Molina-Sánchez*[3], *R. Borrego Varillas*[1], *L. Moretti*[1], *L. Ganzer*[1], *M. Maiuri*[1], *G. Soavi*[4], *A.C. Ferrari*[4], *A. Marini*[5], *L. Wirtz*[6], *G. Cerullo*[1,7], *D. Sangalli*[5], *and S. Dal Conte*[1]; [1]*Politecnico di Milano, Milan, Italy*; [2]*Universite catholique de Louvain, Louvain, Belgium*; [3]*University of Valencia, Valencia, Spain*; [4]*University of Cambridge, Cambridge, United Kingdom*; [5]*CNR-ISM, Rome, Italy*; [6]*Universite du Luxembourg, Luxembourg, Luxembourg*; [7]*IFN-CNR, Milan, Italy*

We use broadband pump-probe spectroscopy to study coherent optical phonons in 1L-MoS2. We detect a strong coupling with the A'1 mode, which is enhanced around the C-exciton peak. Ab-initio calculations of the phonon-induced band structure variation fully confirm this result.

EI-P.14 WED

Vector helical Bloch modes in N-fold rotationally symmetric waveguiding structures: spin and azimuthal order

•*P. Russell*[1,2], *Y. Chen*[1], *P. Roth*[1], *and G. Wong*[1]; [1]*MPI Science of Light, Erlangen, Germany*; [2]*Depart of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

Vectorial coupled mode theory is used to analyse helical Bloch modes (hBMs) in N-fold rotationally symmetric waveguide arrays. The hBMs carry azimuthal momentum and are circularly polarized, except near the Brillouin zone centre and edges.

EI-P.15 WED

Dynamical mean field theory study of the metal-insulator transition in piezoresistive thin film rare-earth compounds in contact with metal electrodes

•*E. Plekhanov*[1], *D. Banerjee*[1,2], *A. Droghetti*[3], *D. Newns*[4], *G. Martyna*[4], *K. Refson*[5], *C. Weber*[1], *and I. Rungger*[2]; [1]*Department of Physics, King's College London, London, United Kingdom*; [2]*National Physical Laboratory, London, United Kingdom*; [3]*University of the Basque Country, San Sebastian, Spain*; [4]*IBM Thomas J Watson Research Center, Yorktown Heights, USA*; [5] *Royal Holloway, Egham, United Kingdom*

By using DFT+DMFT, we analyze bulk and quantum transport calculations of SmX, (X=S,Se,Te). These materials are key for piezoelectric transistors, acting as switches and memories. Our results are in good agreement with experiment.

EI-P.16 WED

Continuous Wave Amplified Spontaneous Emission in Phase-Stable Triple Cation Lead Halide Perovskite Thin Films

•*I. Allegro*[1], *P. Brenner*[1], *O. Bar-On*[2], *M. Jakoby*[3], *B.S. Richards*[1,3], *U.W. Paetzold*[1,3], *I.A. Howard*[1,3], *J. Scheuer*[2], *and U. Lemmer*[1,3]; [1]*Light Technology Institute, Karlsruhe Institute of Technology, Karlsruhe, Germany*; [2]*Department of Physical Electronics, Tel-Aviv University, Tel-Aviv, Israel*; [3]*Institute of Microstructure Technology, Karlsruhe Institute of Technology, Eggenstein- Leopoldshafen, Germany*

Amplified spontaneous emission under continuous wave (CW) pumping is demonstrated in phase-stable lead halide perovskites at temperatures up to 130K. This constitutes a major step towards practical CW, and eventually electrically pumped, perovskite lasers.

EI-P.17 WED

Growth of Large-Area, Uniform, Few-Layer Tungsten Disulphide by Thermal Decomposition of Ammonium Tetrathiotungstate

•*O.A. Abbas*[1], *H. Wang*[2], *A.H. Lewis*[1], *N. Sessions*[1], *N. Aspiotis*[1], *C.-C. Huang*[1], *I. Zeimpekis*[1], *D. Hewak*[1], *S. Mailis*[3], *and P. Sazio*[1]; [1]*Optoelectronics Research Centre, University of Southampton, SO17 1BJ, Southampton, United Kingdom*; [2]*National Centre for Advanced Tribology, University of Southampton, Southampton, United Kingdom*; [3]*Skolkovo Institute of Science and Technology Novaya St., 100, Skolkovo 143025, Moscow, Russia*

We propose a solution-based single source precursor method that allows large area growth of highly uniform 2D Tungsten disulphide films. We present results on the synthesis and characterization of the material.

EI-P.18 WED

Investigation of Photoluminescence Properties of 2D-Nanoparticles to be used as Fluorescence Markers in Microscopy

•*A. Kuppadakkath*[1], *H. Knopf*[1,2,3], *T. Bucher*[1], *I. Staude*[1], *T. Pertsch*[1,3], *and F. Eilenberger*[1,2,3]; [1]*Institute of Applied Physics, Friedrich-Schiller-University , Jena, Germany*; [2]*Fraunhofer-Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*; [3]*Max Planck School of Photonics, Jena, Germany*

The strong photoluminescence of monolayer TMDs makes them a possible substitute for fluorescent dyes in some modes of fluorescence imaging, as it doesn't suffer from photo-bleaching and phototoxicity, as is known from fluorescent dyes.

EI-P.19 WED

Novel Sturable Absorber Based on 2D Nanomaterial, MXene Solution

•*K. Lee, J.J. Kim, and C.M. Koo*; *Korea Institute of Science and Technology, Seoul, South Korea*

Our proposed Ti3C2 MXene solution-based SA has advantages of good heat dissipation, long-term stability, and easy fabrication, which indicates that it has a great potential for nonlinear photonic applications.

13:00 – 14:00

EJ-P: EJ Poster session

EJ-P.1 WED

Relativistic solitary wave generation and amplification in laser-plasma interaction

•*E. Siminos*; *Department of Physics, University of Gothenburg, Gothenburg, Sweden*

A method is presented for the controllable excitation and amplification of relativistic-intensity solitary waves in plasmas. It relies on the interaction of two weakly-relativistic laser pulses with a near-critical density plasma.

EJ-P.2 WED

Enhanced energy density and optical absorption in a 3D photonic band gap cavity with finite support

D. Devashish[1,2,3], *O.S. Ojambati*[1,4], *S.B. Hasan*[1,3], *J.J.W.v.d. Vegt*[2], *and* •*W.L. Vos*[1]; [1]*Complex Photonics Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands*; [2]*Mathematics of Computational Science (MACS), University of Twente, Enschede, Netherlands*; [3]*ASML, Veldhoven, Netherlands*; [4]*Cavendish Laboratory, Dept. of Physics, NanoPhotonics Centre, University of Cambridge, Cambridge, United Kingdom*

We study numerically the transport of light in a silicon inverse woodpile 3D photonic crystal with an embedded resonant cavity. The cavity sustains 5 quadrupolar resonances with high quality factors and strong energy enhancement.

EJ-P.3 WED

Slow and stopped light in a time-dependent Moiré grating

•*T.E. Maybour and P. Horak*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We investigate numerically the generation of slow light with low dispersion using double-period Bragg gratings. Time-dependent coupling strengths are shown to allow for the controlled trapping and release of light pulses in optical control systems.

EJ-P.4 WED

Constant intensity waves in disordered media

•*I. Kresic*[1,2], *A. Brandstotter*[1], *K. Makris*[3], *and S. Rotter*[1]; [1]*Institute of Theoretical Physics, Vienna, Austria*; [2]*Institute of Physics, Zagreb, Croatia*; [3]*Department of Physics, Heraklion, Greece*

We study a class of waves with constant intensity inside and perfect transmission through a disordered scattering potential. A proposal for experimental observation of these waves in optical fibers is given.

EJ-P.5 WED

Control of space-time trajectories of noise-driven optical extreme events in metamaterial waveguides

•*G. Xu*[1], *J. McNiff*[2,3], *A. Boardman*[3], *and B. Kibler*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [2]*Original Perspectives Ltd, Tewkesbury, UK*; [3]*University of Salford, Manchester, UK*

We report theoretical and numerical studies on the spontaneous generation of noise-driven optical extreme events in metamaterial waveguides. We also demonstrate the control of space-time trajectories of localized waves by means of the magnetooptic effect.

EJ-P.6 WED

Conical Refraction with Laguerre-Gaussian beams: from Raman spot to 'anti-Raman' doughnut distribution

V. Mylnikov[1,2], *E. Rafailov*[3], *and* •*G. Sokolovskii*[1]; [1]*Ioffe Institute, Saint-Petersburg, Russia*; [2]*Peter the Great St. Petersburg Polytechnic University, Saint-Petersburg, Russia*; [3]*School of Engineering and Applied Science, Aston University, AIPT, Aston Triangle, Birmingham, United Kingdom*

We discuss conical refraction of the Laguerre-Gaussian beams within the dual-cone model. Application of this formalism enables visualization of the Raman spot transformation into the 'anti-Raman' doughnut distribution for the non-zeroth order Laguerre-Gaussian input beams.

EJ-P.7 WED

Genetically optimized photonic crystal for spatial filtering of reinjection into broad-area diode lasers

•*C. Bree*[1], *V. Raab*[2], *D. Gailevicius*[3], *V. Purlys*[3], *J. Montiel*[4], *G. Garre Werner*[4], *K. Staliunas*[5], *A. Rathsfeld*[1], *U. Bandelow*[1], *and M. Radziunas*[1]; [1]*Weierstrass Institute*

for Applied Analysis and Stochastics, Berlin, Germany; [2]*Raab-Photonik GmbH, Potsdam, Germany*; [3]*Laser Research Center, Vilnius, Lithuania*; [4]*Monocrom S.L., Vilanova i la Geltru, Spain*; [5]*Universitat Politècnica de Catalunya, Terrassa, Spain*

We discuss theoretical modeling and simulations of a broad-area diode laser subject to spatially filtered optical feedback. Tailored spatial filtering profiles are achieved by using genetically optimized, chirped photonic crystals.

EJ-P.8 WED

Laser-induced breakdown in dielectrics: Strong electron superheating

•*O.A. Louchev and S. Wada*; *RIKEN, Wako, Japan*

We report computational results of laser-induced breakdown in dielectrics with dynamics of strong electron superheating above the critical ionization energy fed during additional kinetic time that the free electrons have before producing the ionizing impacts.

EJ-P.9 WED

Homogenization of Layered Media: The Role of Magnetoelectric Coupling

A.N.M.S. Hossain[1], •*I. Tsukerman*[1], *and Y.D. Chong*[2]; [1]*The University of Akron, Akron, Ohio, USA*; [2]*Nanyang Technological University, Singapore, Singapore*

Our homogenization procedure yields an effective tensor with magnetoelectric coupling, which produces correct symmetry breaking for periodic structures. Reflection coefficients for illumination from two opposite sides differ but are approximated accurately via the same effective tensor.

EJ-P.10 WED

Inverse Design of Orbital Angular Momentum Mode Demultiplexer by Combining Wavefront Matching Method and Gradient Descent Algorithm

•*Z. Lin*[1], *Y. Wen*[1], *Y. Chen*[1], *Y. Zhang*[1], *and S. Yu*[1,2]; [1]*Sun Yat-sen University, Guangzhou, China*; [2]*University of Bristol, Bristol, United Kingdom*

We design an OAM demultiplexer inversely by combining the wavefront matching method and the gradient descent algorithm. The crosstalk of the device is -21.1 dB, with a 5.6-dB improvement resulting from the gradient descent optimization.

EJ-P.11 WED

Structured Auxiliary Mesh (SAM) algorithm for opto-thermal simulation of laser-based lighting systems

•*E. Chatzizyrli*[1], *A. Wienke*[1], *R. Lachmayer*[1,2], *J. Neumann*[1], *and D. Kracht*[1]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*Institut für Gerätebau und Produktenwicklung (IPeG), Hannover, Germany*

The optical properties of materials, here phosphors, heavily depend on temperature, which requires opto-thermal analysis. The proposed SAM algorithm enables this coupling by using the optical mesh for point location in the unstructured FEM mesh.

EJ-P.12 WED

Electromagnetic Approach in Design of the Fiber-Based Evanescent Wave Sensors for the Mid-Infrared Spectroscopy

•*S. Korsakova, E. Vinogradova, E. Romanova, and A. Rozhnev*; *Saratov State University, Saratov, Russia*

A novel theoretical approach based on electromagnetic theory of optical fibers has been developed for analysis, design and optimisation of chalcogenide sensing elements of the fiber-based evanescent wave sensors for the mid-IR spectroscopy.

EJ-P.13 WED

Design of nonparaxial accelerating beams based on Wigner distribution function

•*Z. Liu*[1], *S. Lin*[1], *Y. Wen*[1], *Y. Chen*[1], *Y. Zhang*[1], *and S. Yu*[1,2]; [1]*Sun Yat-sen University, Guangzhou, China*; [2]*University of Bristol, Bristol, United Kingdom*

We generalize the design of accelerating beams to the nonparaxial situation (for example, parabola beam and circle beam) by a new form of constructed Wigner distribution function.

EJ-P.14 WED

Scattering of Electromagnetic Waves by Cantor Screens: Rayleigh-Sommerfeld Integrals on Complex Domains

•*J. Christian and H. Middleton-Spencer*; *University of Salford, Greater Manchester, United Kingdom*

We consider the problem of electromagnetic scattering by pre-fractal iterations of a Cantor screen. The formulation for calculating electric and magnetic field components is based on Rayleigh-Sommerfeld integrals, going beyond (scalar) Fresnel and Fraunhofer approximations.

EJ-P.15 WED

Stability Condition Prediction of Integrated Opto-Mechanical Phaseshifters Using Finite Element Analysis

•*M. Ashour*[1], *E.M. Weig*[2], *and J.N. Caspers*[1]; [1]*Robert Bosch GmbH, Renningen, Germany*; [2]*University of Konstanz, Konstanz, Germany*

We present an FEM analysis of a opto-mechanical optical phaseshifter stability. Our method provides a more realistic prediction of such a device by accounting for internal restoration forces of suspended waveguides and avoiding opto-mechanical force linearization.

EJ-P.16 WED

Dynamics of temperature field of ultrashort laser pulse with gaussian and tubular form in metal

•*A. Fedotov, Y. Okrut, and Y. Tsitavets*; *Belarusian State University, Minsk, Belarus*

Propagation of fs laser heat field in gold film caused by pulses with different spatial shapes- gaussian and tubular is numerically studied with FD and FE methods

EJ-P.17 WED

Propagation of laser beams by decomposition into Gaussian beamlets

•*A.-M. Talposi*[1,2] *and D. Ursescu*[1,2]; [1]*Horia Hulubei National Institute for Physics and Nuclear Engineering, Extreme Light Infrastructure - Nuclear Physics (ELI-NP), Magurele, Romania*; [2]*University of Bucharest, Physics Department, Magurele, Romania*

We propose and benchmark a beam propagation method based on decomposing the initial field into a sum of Gaussians beamlets. The total field after an optical system is determined by all Gaussian beamlets contributions.

EJ-P.18 WED

Optimization of subband electron temperature effect on a quantum cascade laser characteristics

•*C. Peng*[1], *Y. Sun*[1,2], *T. Chen*[1], *and Z. Li*[1]; [1]*Institue of Fluid Physics, China Academy of Engineering Physics, Mianyang, China*; [2]*Chongqing University, Chongqing, China*

The electron temperature of each subband is the key to understanding the QCL characteristics. We show herein a method based on the particle swarm optimization algorithm to obtain the electron temperature of QCLs.

EJ-P.19 WED

Tailoring elegant Gaussian modes for generating high-gain confocal resonators eigenmodes

•*A. Jaimes-Najera*[1], *J. Gomez-Correa*[2], *S. Luo*[3], *J. Pu*[3], *and S. Chavez-Cerda*[1]; [1]*INAOE, Puebla, Mexico*; [2]*CONACYT-CICESE, Monterrey, Mexico*; [3]*Huaqiao University, Huaqiao, China*

In this work we present a new family of confocal resonator modes. We demonstrate that a suitable finite superposition of elegant Laguerre-Gaussian beams can create high gain elegant eigenmodes of confocal resonators

EJ-P.20 WED

Electromagnetic Diffraction by Fractal Dusts, Triangles and Carpets: A Kirchhoff Approach to Circulation

•*J. Christian and H. Middleton-Spencer*; *University of Salford, Greater Manchester, United Kingdom*

We present an analysis of plane waves diffracted by three families of fractal screens based on structures with zero measure. The scattered field is represented by a Kirchhoff circulation integral around the constituent domain boundaries.

EJ-P.21 WED

Contrast of visibility in water and air

•*Z. Lee*[1] *and S. Shang*[2]; [1]*School for the Environment, University of Massachusetts Boston, Boston, Massachusetts, USA*; [2]*State Key Laboratory of Marine Environmental Science, Xiamen University, Xiamen, China*

Here we present a general relationship for the Law of Contrast Reduction based on radiative transfer, which is the key to deduce visibility in both air and water.

NOTES

ROOM 1 ICM

8:30 – 10:00

CJ-11: Spatiotemporal effects in multimode fiber lasers

Chair: Jens Limpert, University of Jena, Jena, Germany

CJ-11.1 THU 8:30

All-fiber All-normal-dispersion Femtosecond Laser with Nonlinear Multimodal Interference-based Saturable Absorber

U. Teğin[1,2] and •B. Ortaç[1]; [1]National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Ankara, Turkey; [2]Optics Laboratory and Laboratory of Applied Photonics Devices, Lausanne, Switzerland

We demonstrate the first all-fiber integrated all-normal-dispersion Yb-doped oscillator with the nonlinear multimodal interference based saturable absorber capable of generating femtosecond pulses.

CJ-11.2 THU 8:45

Delivering Transverse-mode Switching based on All-fiber Femtosecond Laser

•F. Shi, J. Lu, P. Cheng, and X. Zeng; Shanghai University, Shanghai, China

Ultrafast transverse-mode switching between LP11 and LP21 mode is achieved from all-fiber laser.

ROOM 4a ICM

8:30 – 10:00

JSIII-1: Light management for photovoltaics

Chair: Jan Christoph Goldschmidt, Fraunhofer ISE, Freiburg, Germany

JSIII-1.1 THU (Invited) 8:30

Tailored Disorder for the Light Management in Photovoltaics

S. Nanz[1], A. Abass[2], E. Slivina[2], P.M. Piechulla[3], A. Sprafke[3], R.B. Wehrspohn[3,4], and •C. Rockstuhl[1,2]; [1]Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology, Karlsruhe, Germany; [2]Institute of Nanotechnology, Karlsruhe Institute of Technology, Karlsruhe, Germany; [3]Institute of Physics, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany; [4]Fraunhofer Institute for Microstructure of Materials and Systems, Halle (Saale), Germany

We develop the notion of tailored disorder and show that it unifies aspects of periodic and random structures for the light management. Theoretical developments are complemented by experiments concerning the fabrication and characterisation of structures.

ROOM 4b ICM

8:30 – 10:00

EF-7: Quantum and random systems

Chair: Julien Javaloyes, University of Balearic Island, Palma, Illes Baleares

EF-7.1 THU 8:30

Simultaneous Observation of Turbulence and Spin Glass in a Photonic System: Theory and Experiment

•A. Gomes[1], L. Menezes[1], I. González[2], E. Raposo[2], and A. Macêdo[2]; [1]Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil; [2]Laboratório de Física Teórica e Computacional, Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil

Two of the most challenging behaviors of complex systems, turbulence and spin glass, are experimentally and theoretically shown to coexist in a photonic system, namely in a random fiber laser.

EF-7.2 THU 8:45

A Random Anti-Laser Implemented by Coherent Perfect Absorption in a Disordered Medium

K. Pichler[1], M. Kühmayer[1], J. Böhm[2], A. Brandstötter[1], P. Ambichl[1], U. Kuhl[2], and •S. Rotter[1]; [1]Institute for Theoretical Physics, TU Wien, Vienna, Austria; [2]Institut de Physique de Nice, Université Côte d'Azur, Nice, France

We report the first experimental implementation of coherent perfect absorption in a disordered medium. We thereby realize a "random anti-laser", which gives rise to the time-reversed process of random lasing at threshold.

ROOM 5 ICM

8:30 – 10:00

JSVI-2: 50 Years of integrated optics II

Chair: Trevor Benson, University of Nottingham, Nottingham, United Kingdom

JSVI-2.1 THU (Invited) 8:30

Glass Integrated Optics: 50 Years and Still Growing Strong

•G.C. Righini[1,2], S. Berneschi[1], A. Chiappini[3], A. Chiasera[3], M. Ferrari[3,2], G. Nunzi Conti[1,2], and S. Pelli[1,2]; [1]IFAC-CNR, Institute of Applied Physics "N. Carrara", Firenze, Italy; [2]Enrico Fermi Center, Roma, Italy; [3]IFN-CNR, Institute of Photonics & Nanotechnologies, Trento, Italy

Glass played a fundamental ingredient in the development of optical waveguides and integrated optical circuits. Here, a brief summary of the achievements in more than 50 years will be provided; prospects will be discussed, too.

ROOM 13a ICM

8:30 – 10:00

CB-8: Short pulse generation from semiconductor lasers

Chair: Maria Ana Cataluna, Heriot-Watt University, Edimburg, United Kingdom

CB-8.1 THU 8:30

Pulse timing and amplitude stability of a monolithic passively mode-locked quantum dot laser at 1310 nm directly grown on silicon

•D. Auth[1], S. Liu[2], J.E. Bowers[2], and S. Breuer[1]; [1]Technische Universität Darmstadt, Institute of Applied Physics, 64289 Darmstadt, Germany; [2]University of California Santa Barbara, Department of Electrical and Computer Engineering, California 93106 Santa Barbara, USA

Ultra-stable optical pulse train generation by a monolithic passively mode-locked InAs/InGaAs-quantum-dot laser emitting at 1310 nm directly grown on silicon with 1.7 ps short pulses and 400 Hz repetition rate line-width is reported.

CB-8.2 THU 8:45

Pulse Shaping in Multi-Section Tapered Semiconductor Quantum-Dot Passively Mode-Locked Lasers

•S. Meinecke[1], L. Drzewietzki[2], C. Weber[2], B. Lingnau[1], S. Breuer[2], and K. Lüdge[1]; [1] Institut für Theoretische Physik, Technische Universität Berlin, Berlin, Germany; [2]Institut für Angewandte Physik, Technische Universität Darmstadt, Darmstadt, Germany

We numerically and theoretically investigate a three section tapered semiconductor quantum dot mode-locked laser and report an uncommon pulse-shaping mechanism that leads to ultra-short high power pulses.

ROOM 13b ICM

8:30 – 10:00

EC-1: Novel systems for topological photonics I

Chair: Alberto Amo, Université de Lille, Lille, France

EC-1.1 THU (Keynote) 8:30

Topological Photonics

•M.(. Segev; Physics Department, Technion, Haifa, Israel

The fundamentals of the new area called Topological Photonics will be reviewed, along with exciting applications such as topological insulator lasers, new ideas related to topology in synthetic dimensions, current challenges and open questions.

ROOM 14a ICM

8:30 – 10:00

EG-3: Nanoscale imaging and spectroscopy

Chair: Michele Celebrano, Politecnico di Milano, Milan, Italy

EG-3.1 THU (Invited) 8:30

The contribution has been withdrawn.

ROOM 14b ICM

8:30 – 10:00

CH-10: Microscopy II

Chair: Cristian Manzoni, IFN-CNR Politecnico di Milano, Milano, Italy

CH-10.1 THU 8:30

High-resolution, three-dimensional investigation of protein diffusion and trafficking in the live HeLa cell via interferometric scattering microscopy (iSCAT)

•*R. Taylor*[1,2], *R. Gholami Mahmoodabadi*[1,2], *A. Schambony*[3], *and V. Sandoghdar*[1,2,4]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Max-Planck-Zentrum fuer Physik und Medizin, Erlangen, Germany*; [3]*Department of Biology, Friedrich Alexander University Erlangen-Nuremberg, Erlangen, Germany*; [4]*Department of Physics, Friedrich Alexander University, Erlangen, Germany*

Through interferometric scattering microscopy (iSCAT) the mobility of individual proteins within the living cell is tracked to nanometric precision and microsecond speeds, revealing unseen dynamics of the protein across its life cycle with the membrane.

CH-10.2 THU 8:45

Laser-scanning Optical-Frequency-Comb Spectromicroscopy

•*S. Nakano*[1,2], *T. Minamikawa*[1,2,3], *E. Hase*[1,2,4], *A. Asahara*[2,5], *T. Mizuno*[1,2], *H. Yamamoto*[2,6], *K. Minoshima*[2,5], *and T. Yasui*[1,2]; [1]*Tokushima University, 2-1 Minami-Jyousanjima, Tokushima, Tokushima, Japan*; [2]*ERATO Minoshima Intelligent Optical Synthesizer Project, Japan Science and Technology Agency, 1-5-1 Chofugaoka, Chofu, Tokyo, Japan*; [3]*PRESTO, Japan Science and Technology Agency, 2-1 Minami-Jyousanjima, Tokushima, Tokushima, Japan*; [4]*Japan Synchrotron Radiation Research Institute, 1-1-1 Kouto, Sayo,*

ROOM Osterseen ICM

8:30 – 10:00

CD-9: Spectral broadening

Chair: Concita Sibilia, Sapienza Università di Roma, Roma, Italy

CD-9.1 THU 8:30

Sign-Alternating Dispersion Patterning for Supercontinuum Generation

•*H. Zia*[1], *N.M. Lüpken*[2], *T. Hellwig*[2], *C. Fallnich*[2,1], *and K.-J. Boller*[1,2]; [1]*Universiteit Twente, Enschede, Netherlands*; [2]*Westfälische Wilhelms-Universität Münster, Münster, Germany*

We present a new concept for increasing the spectral bandwidth and power efficiency in supercontinuum generation, wherein we bypass spectral stagnation mechanisms via repeatedly alternating the sign of higher order dispersion during nonlinear generation.

CD-9.2 THU 8:45

Multipass spectral broadening with tens of millijoule pulse energy

•*M. Kaumanns*[1], *V. Pervak*[1], *D. Kormin*[1], *V. Leshchenko*[1,2], *A. Kessel*[1,2], *Y. Chen*[2], *and T. Nubbemeyer*[1]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We present the spectral broadening of 1.3 ps pulses to a Fourier limit below 40 fs using noble gas filled multipass cells. Output energies close to 40 mJ could be reached in first experiments.

ROOM 1 Hall A1

8:30 – 10:00

CC-5: THz applications

Chair: József Fülöp, University of Pécs, Pécs, Hungary

CC-5.1 THU (Keynote) 8:30

Wireless Terahertz Communications

•*W. Freude*[1], *T. Harter*[1], *S. Ummethala*[1], *S. Muehlbrandt*[1], *M. Blaicher*[1], *S. Wolf*[1], *M. Weber*[1], *F. Boes*[1], *H. Massler*[2], *A. Tessmann*[2], *Y. Kutuvantavida*[1], *J.N. Kemal*[1], *S. Nellen*[3], *L. Hahn*[1], *B. Globisch*[3], *M. Walther*[2], *T. Zwick*[1], *S. Randel*[1], *and C. Koos*[1]; [1]*Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*; [2]*Fraunhofer Institute for Applied Solid State Physics (IAF), Freiburg, Germany*; [3]*Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI), Berlin, Germany*

T-waves ranging from 0.1 THz to 1 THz become increasingly important as carriers for wireless high-speed data transmission. Data rates of 100 Gbit/s were achieved, and distances of 100 m to 1 km are targeted.

ROOM 2 Hall A1

8:30 – 10:00

CF-9: Generation of few-cycle pulses

Chair: Ming-Chang Chen, National Tsing Hua University, Taiwan

CF-9.1 THU 8:30

10 W CEP-stable few-cycle source at 2 μm with 100 kHz repetition rate

•*M. Neuhaus*[1], *H. Fuest*[1,2], *M. Seeger*[1,2], *J. Schötz*[1,2], *M. Trubetskov*[2], *P. Russbueldt*[3], *H.-D. Hoffmann*[3], *E. Riedle*[4], *Z. Major*[5], *V. Pervak*[1], *M.F. Kling*[1,2], *and P. Wnuk*[1,2]; [1]*Physics Department, LMU Munich, Garching, Germany*; [2]*Max Plank Institute of Quantum Optics, Garching, Germany*; [3]*Fraunhofer Institute for Laser Technology, Aachen, Germany*; [4]*Lehrstuhl für BioMolekulare Optik, LMU München, München, Germany*; [5]*GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany*

We present a passively CEP-stable few cycle source from 1600-2400 nm with 17 fs pulse duration and 10 W output power. High power OPCPA - crystals and our innovative compression and CEP - stabilisation scheme are discussed.

CF-9.2 THU 8:45

High-Power Single-Cycle Mid-Infrared Transients Generated via Intra-Pulse Difference-Frequency Mixing at 2 μm

•*T.P. Butler*[1], *D. Gerz*[1,2], *C. Hofer*[1,2], *J. Xu*[1], *C. Gaida*[3], *T. Heuermann*[3,4], *M. Gebhardt*[3,4], *L. Vamos*[2], *W. Schweinberger*[2,5], *J.A. Gessner*[1,2], *T. Siefke*[3,6], *M. Heusinger*[3], *U. Zeitner*[3,7], *A. Apolonskiy*[1,2], *N. Karpowicz*[1], *J. Limpert*[3,4,7], *F. Krausz*[1,2], *and I. Pupeza*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig Maximillian University, Garching, Germany*; [3]*Friedrich Schiller University, Jena, Germany*; [4]*Helmholtz-Institute Jena, Jena, Germany*; [5]*King Saud University,*

ROOM 3 Hall A1

8:30 – 10:00

CE-11: Micro resonators and diffractive optics

Chair: Peter Horak, ORC University of Southampton, Southampton, United Kingdom

CE-11.1 THU 8:30

Fabrication and Characterization of High-Quality Factor Silicon WGM Microresonators

•*A. Shitikov*[1,2], *N. Kondratiev*[1], *V. Lobanov*[1], *A. Voloshin*[1], *and I. Bilenko*[1,2]; [1]*Russian Quantum Center, Skolkovo, Russia*; [2]*Faculty of Physics, Lomonosov Moscow State University, Moscow, Russia*

Quality factor above billion was obtained experimentally for WGM in crystalline silicon microresonators at 1550 nm wavelength for the first time. Original silicon hemispherical coupler with efficiency of 35% was demonstrated. Numerous applications are discussed.

CE-11.2 THU 8:45

Analysis of various approaches for the fabrication of Diffractive Optical Elements

•*A. Bourgade*[1], *J. Le Meur*[2], *Y.-E. Pigeon*[2], *K. Heggarty*[2], *T. Begou*[1], *and J. Lumeau*[1]; [1]*Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France*; [2]*Optics Department, Telecom Bretagne, Institut Mines-Telecom, Brest, France*

We present a comparative study of Diffractive Optical Elements based on thickness and refractive index change. Various kinds of elements are fabricated and their efficiency compared showing that both methods allow fabricating high performance elements

ROOM 1 ICM

CJ-11.3 THU (Invited) 9:00

Spatiotemporal Mode-Locking in Multimode Fiber Lasers

•*F. Wise*; *Cornell University, Ithaca, NY, USA*

Initial demonstrations of spatiotemporal mode-locking in fiber lasers will be summarized. Current and future research directions will be described.

ROOM 4a ICM

JSIII-1.2 THU 9:00

Rapid hot carrier relaxation and mobility increase in Sn- and Pb-containing halide perovskite semiconductors

•*M. Monti*[1], *J. Woolley*[2], *E. Butler-Caddle*[1], *M. Staniforth*[1,2], *A. Wijesekara*[2], *C. Bandara*[3], *I. Jayawardena*[3], *R. Silva*[3], *R. Hatton*[2], *and J. Lloyd-Hughes*[1]; [1]*University of Warwick, Department of Physics, Coventry, United Kingdom*; [2]*University of Warwick, Department of Chemistry, Coventry, United Kingdom*; [3]*Advanced Technology Institute, University of Surrey, Guildford, United Kingdom*

Hot carrier energy relaxation times were assessed in tin- and lead-containing halide perovskite semiconductors via ultrafast THz spectroscopy and visible pump-probe methods. The faster energy relaxation in Pb-containing perovskites was attributed to enhanced electron-phonon coupling.

JSIII-1.3 THU 9:15

Experimental Study of the Spectral and Angular Solar Irradiance

•*S. Pal and R. Saive*; *University of Twente, Enschede, Netherlands*

We developed an efficient and convenient experimental set-up and procedure to measure spectral and angular solar irradiance, which allows for 360° light capture, to accurately predict and optimize bifacial solar power plant performance and simulations.

ROOM 4b ICM

EF-7.3 THU 9:00

Direct measurement of nonlinear transmission matrices of random scattering media

A. Fleming[1], *C. Conti*[2], *and* •*A. Di Falco*[1]; [1]*SUPA, School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom*; [2]*Department of Physics, University Sapienza, Rome, Italy*

With a series of pump probe experiments we characterize the transmission matrices of a nonlinear scattering medium, demonstrating that pumping creates new light channels, which can be described by the dephasing of the matrices.

EF-7.4 THU 9:15

Optical control of coupling in phase-locked polariton dyads

•*S. Alyatkin*[1], *J. Töpfer*[2], *A. Askitopoulos*[1,2], *W. Langbein*[3], *and P. Lagoudakis*[1,2]; [1]*Skolkovo Insitute of Science and Technology, Moscow, Russia*; [2]*University of Southampton, Southampton, United Kingdom*; [3]*Cardiff University, Cardiff, United Kingdom*

We demonstrate optical control of the coupling strength between polariton condensates in dyad by an effective barrier. Tuning the barrier height allows for switching the phase configuration of the system.

ROOM 5 ICM

JSVI-2.2 THU (Invited) 9:00

Numerical Techniques for Modelling Integrated Optical Circuits

•*F. Prudenzano*; *Department of Electrical and Information Engineering, Polytechnic University of Bari, BARI, Italy*

A few simulations of integrated optical devices as an optical thermometer, non-linear devices based on cascade of second order nonlinearity, rare earth doped amplifiers and lasers, are described.

ROOM 13a ICM

CB-8.3 THU 9:00

Stabilized Mode-Locked Tapered Monolithic Laser Diode with 200pJ Pulse Energy for Space Metrology Applications

•*N. Torcheboeuf*[1], *S. Kundermann*[1], *M. Krakowski*[2], *P. Resneau*[2], *M. Garcia*[2], *E. Vinet*[2], *Y. Robert*[2], *C. Theveneau*[2], *M. Lecomte*[2], *O. Parillaud*[2], *B. Gerard*[2], *and D.L. Boiko*[1]; [1]*2Centre Suisse d'Electronique et de Microtechnique SA (CSEM), Neuchâtel, Switzerland*; [2]*III-V Lab, Palaiseau, France*

We demonstrate the first mode-locked laser diode producing picosecond pulses of 200pJ energy without amplifier. It operates at low pulse repetition frequency (PRF) of 2.9 GHz in a very-long (13.5mm) monolithic tapered cavity.

CB-8.4 THU 9:15

A micro-integrated mode-locked extended-cavity diode laser emitting in the wavelength range around 780 nm

•*H. Christopher*[1], *A. Wicht*[1], *A. Peters*[1,2], *and G. Tränkle*[1]; [1]*Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*; [2]*Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany*

We present a micro-integrated passively mode-locked ECDL module featuring a spectral bandwidth exceeding 15 nm (20 dBc) at around 780 nm and a free-running RF linewidth of less than 10 kHz (FWHM) at 3.4 GHz.

ROOM 13b ICM

EC-1.2 THU 9:15

Realization of a Photonic Topological $\mathbb{Z}_2$-Insulator

•*L. Maczewsky*[1], *B. Höckendorf*[2], *M. Kremer*[1], *T. Biesenthal*[1], *M. Heinrich*[1], *A. Alvermann*[2], *H. Fehske*[2], *and A. Szameit*[1]; [1]*Universität Rostock, Institute of Physics, Rostock, Germany*; [2]*Universität Greifswald, Institute of Physics, Greifswald, Germany*

We introduce a photonic topological Floquet Z2-insulator with fermionic time reversal symmetry (TRS). Our experiments demonstrate the characteristic protected counter-propagating edge modes and unequivocally prove the presence of fermionic TRS in this bosonic system.

ROOM 14a ICM

EG-3.2 THU 9:00

Mapping the near-field interaction of silicon nanodisc arrays by automated dual-tip scanning near-field optical microscopy

•*N. Abbasirad*[1], *D. Arslan*[1], *J. Berzins*[1,2], *S. Fasold*[1], *I. Staude*[1], *F. Setzpfandt*[1], *and T. Pertsch*[1,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany*; [2]*The Netherlands Organization for Applied Scientific Research (TNO), Delft, Netherlands*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We used dual-tip scanning near-field optical microscopy to map the local field response of resonant silicon nanodisc arrays. We show, that the intensity of in-plane scattering differs for on- and off-resonant excitation wavelengths.

EG-3.3 THU 9:15

Near-Field THz Photocurrent Nanoscopy of InAs Nanowires FET

•*E.A.A. Pogna, L. Viti, M.C. Giordano, K. Garrasi, S. Biasco, D. Ercolani, L. Sorba, and M.S. Vitiello*; *NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy*

The carrier density distribution in single InAs nanowires is spatially resolved after illumination with THz-radiation from quantum cascade laser by means of near-field photocurrent nanoscopy shading light onto the excitation mechanisms dominating the THz-response.

ROOM 14b ICM

Hyogo, Japan; [5]*The University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo, Japan*; [6]*Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi, Japan*

We developed laser scanning optical-frequency-comb spectromicroscopy. It can acquire spectroscopic informations of light amplitude and phase simultaneously with high sensitivity measurement by focusing a laser beam.

CH-10.3 THU 9:00

Quantitative Phase Imaging using a Frequency Comb for Speckle-less Cellular Motion Measurement

J. Boonruangkan[1], *H. Farrokhi*[1], *S. Kwok*[2], *T. Carney*[2], *and* •*Y.-J. Kim*[1]; [1]*School of Mechanical and Aerospace Engineering, Nanyang technological university, Singapore, Singapore*; [2]*Lee Kong Chian, School of Medicine, Nanyang Technological University, Singapore, Singapore*

A frequency comb was employed as a light source in quantitative phase microscopy. This technique provided speckle-less phase images of cellular motions in a live zebrafish by spatio-temporal coherence control.

CH-10.4 THU 9:15

The contribution has been withdrawn.

ROOM Osterseen ICM

CD-9.3 THU 9:00

Post Processing Dispersion Trimming for On-Chip Mid-Infrared Supercontinuum Generation

•*A. Della Torre*[1], *M. Sinobad*[1,2], *B. Luther-Davies*[3], *P. Ma*[3], *S. Madden*[3], *S. Debbarma*[3], *K. Vu*[3], *D.J. Moss*[4], *A. Mitchell*[2], *J.-M. Hartmann*[5], *J.-M. Fedeli*[5], *C. Monat*[1], *and C. Grillet*[1]; [1]*Université de Lyon, Insitut des Nanotechnologies de Lyon cite ECL, Ecully, France*; [2]*School of Engineering, RMIT University, Melbourne, Australia*; [3]*Laser Physics Center, Australian National University, Canberra, Australia*; [4]*Centre for Microphotonics, Swinburne University of Technology, Hawthorn, Australia*; [5]*Université Grenoble Alpes,CEA-Leti, Grenoble, France*

We report anomalous to normal dispersion shift of a mid-infrared supercontinuum in a hybrid chalcogenide/silicon-germanium waveguide. We show that the waveguide's dispersion can be precisely tuned by controlling the thickness of a chalcogenide cladding layer.

CD-9.4 THU 9:15

Tailorable supercontinuum generation in liquid-composite-core fibers

•*M. Chemnitz*[1,2], *N. Walther*[1], *R. Scheibinger*[1,2], *K. Schaarschmidt*[1,2], *and M.A. Schmidt*[1,2,3]; [1]*Leibniz Institute of Photonic Technology, Jena, Germany*; [2]*Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany*; [3]*Otto Schott Institute of Material Research, Friedrich-Schiller-Universität, Jena, Germany*

We demonstrate accurate dispersion control in easy-to-fabricate liquid/silica step-index fibers via the liquid core composition, finally opening the cost-effective and technology-rich telecom window for tailorable soliton-mediated supercontinuum generation.

ROOM 1 Hall A1

CC-5.2 THU 9:15

Investigation of Nanoparticle-assisted Laser Tissue Soldering by Terahertz Radiation

•*J. Dong*[1], *H. Breitenborn*[1], *D. Caraffini*[1], *R. Piccoli*[1], *A.O. Govorov*[2], *L. Razzari*[1], *R. Naccache*[3], *F. Vetrone*[1], *and R. Morandotti*[1,2,4]; [1]*INRS-EMT, Varennes, Canada*; [2]*University of Electronic Science and Technology of China, Chengdu, China*; [3]*Concordia University, Montreal, Canada*; [4]*ITMO University, St Petersburg , Russia*

Terahertz reflective imaging was applied to characterize the process of laser tissue soldering using photothermal nanoparticles. Our results demonstrate the capability of terahertz imaging for investigating the thermal-induced tissue damage in three dimensions.

ROOM 2 Hall A1

Riyadh, Saudi Arabia; [6]*Physikalisch-Technische Bundestalt, Braunshweig, Germany*; [7]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present a high-power source of waveform-stable mid-infrared pulses at 50 MHz based on a 2-μm thulium-fiber amplifier, and perform electro-optic-sampling to investigate the single-cycle nature of the pulses through measurement of the electric field.

CF-9.3 THU 9:00

Towards a sub-9 fs, 3 mJ, CEP-stable Multipass Ti:Sapphire Amplifier

•*M. Musheghyan*[1], *F. Lücking*[2], *Z. Cheng*[3], *H. Frei*[1], *and A. Assion*[1]; [1]*High Q Laser GmbH (Standort Wien), Vienna, Austria*; [2]*XARION Laser Acoustics GmbH, Vienna, Austria*; [3]*Laboratoire d'Optique Apliqu'ee, Palaiseau, France*

We present a 1kHz Ti:sapphire amplifier system generating <13fs, 3mJ laser pulses with excellent carrier-envelope phase stability. By means of a simple nonlinear compression scheme, the pulse duration can be further reduced to sub-9fs.

CF-9.4 THU 9:15

All-ytterbium frontend for high-energy field synthesizers

•*A. Alismail*[1,2], *H. Wang*[1,3], *G. Barbiero*[1,3], *and H. Fattahi*[3]; [1]*Ludwig-Maximilians-Universität München, Fakultät für Physik, Munich, Germany*; [2]*Physics and Astronomy Department, King Saud University, Riyadh, Saudi Arabia*; [3]*Max-Planck-Institut für Quantenoptik, Munich, Germany*

An all-ytterbium frontend suitable for generating high-energy, high-power light transients is presented. We demonstrate that the temporal jitter in this scheme is only limited to long-term drift, allowing for stable light transient generation.

ROOM 3 Hall A1

CE-11.3 THU 9:00

Silicon Nitride Ring Resonators with 0.123 dB/m Loss and Q-Factors of 216 Million for Nonlinear Optical Applications

•*M. Puckett*[1], *J. Wang*[2], *D. Bose*[2], *G. Brodnik*[2], *J. Wu*[1], *K. Nelson*[1], *and D. Blumenthal*[2]; [1]*Honeywell International, Morris Plains, USA*; [2]*Department of Electrical and Computer Engineering, University of California, Santa Barbara, Santa Barbara, USA*

A silicon nitride ring resonator is measured to possess a propagation loss coefficient of 0.123 dB/m at a wavelength of 1563 nm. This is the lowest loss reported in a chip-scale waveguide at this wavelength.

CE-11.4 THU 9:15

3D μ-printed polymer whispering-gallery-mode microcavity laser sensor array

•*X. Ouyang, Y. Zhang, J. He, Z. Liang, A.P. Zhang, and H.-Y. Tam*; *Photonics Research Centre, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong SAR, China*

Sensor array based on polymer whispering-gallery-mode (WGM) microcavity lasers is presented. 3D mushroom-like optical WGM microcavities with gain and sensing films were printed and experimentally demonstrated for humidity sensing.

ROOM 1 ICM

CJ-11.4 THU 9:30

High Power Supercontinuum Generation in Graded-Index Multimode Fibers

U. Teğin[1,2] and •B. Ortaç[1]; [1]National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Ankara, Turkey; [2]Optics Laboratory and Laboratory of Applied Photonics Devices, Lausanne, Switzerland

We demonstrate cascaded Raman scattering based novel method to generate octave-spanning high power (3.96 W) and high repetition rate (MHz level) supercontinua in graded-index multimode fibers.

CJ-11.5 THU 9:45

Fiber laser pump reflector based on volume Bragg grating

•L. Talbot, T. Boilard, and M. Bernier; Centre d'Optique, Photonique et Laser (COPL), Quebec City, Canada

We report the femtosecond writing of a VBG in the pure-silica cladding of an erbium-doped fiber that acts like a pump reflector in a cladding-pumped laser. Once annealed, it reflects 71% of unabsorbed pump power.

ROOM 4a ICM

JSIII-1.4 THU 9:30

Up-conversion threshold under concentrated sunlight

•G.E. Arnaoutakis[1], J.M. Gordon[1], E.A. Katz[1], D. Busko[2], and B.S. Richards[2]; [1]Dept. of Solar Energy and Environmental Physics, J. Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Midreshet Ben-Gurion, 84990, Israel, Midreshet Ben-Gurion, Israel; [2]Institute of Microstructure Technology, Karlsruhe Institute of Technology, Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany, Karlsruhe, Germany

We investigate the two-photon threshold of rare-earth up-conversion under concentrated sunlight, in a solar furnace that generates an irradiance of up to 2606 suns on the samples.

JSIII-1.5 THU 9:45

Luminescent Solar Power – Quantum separation between free-energy and heat for cost-effective base-load solar energy generation

•S. Haviv, N. Revivo, N. Kruger, and C. Rotschild; Technion, Haifa, Israel

Luminescent-solar-power spatially separates solar photon's heat from free-energy for parallel harvesting of both. While heat from a photoluminescent-absorber runs a turbine, its narrow emission matches the PV's band-edge thus enabling cost-effective base-load solar energy generation.

ROOM 4b ICM

EF-7.5 THU 9:30

Spiral bandwidth of four-wave mixing in rubidium vapour

•R.F. Offer[1], D. Stulga[1], E. Riis[1], S. Franke-Arnold[2], and A.S. Arnold[1]; [1]Department of Physics, SUPA, University of Strathclyde, Glasgow, United Kingdom; [2]School of Physics and Astronomy, SUPA, University of Glasgow, Glasgow, United Kingdom

We study orbital angular momentum (OAM) transfer between fields involved in an atomic vapour four-wave mixing scheme. Quantitative analysis indicates an OAM-entangled state is generated, with a spiral bandwidth that increases with increasing pump OAM.

EF-7.6 THU 9:45

Inversion symmetry breaking in cold atomic spin patterns

•I. Kresic[1,2], G. Robb[1], G. Labeyrie[3], G.-L. Oppo[1], R. Kaiser[3], and T. Ackemann[1]; [1]University of Strathclyde, Glasgow, United Kingdom; [2]Institute of Physics, Zagreb, Croatia; [3]Institut de Physique de Nice, Nice, France

We study magnetically induced inversion symmetry breaking in cold atomic spin magnetization patterns. Our model includes both dipole and quadrupole magnetization moments and goes beyond the usual spin-1/2 treatment.

ROOM 5 ICM

JSVI-2.3 THU (Invited) 9:30

Challenges in the miniaturization of Mid-IR sensors fully integrated on Si

•S. Nicoletti, J.-M. Fédéli, M. Fournier, P. Labeye, P. Barritault, A. Marchant, A. Glière, A. Teulle, J.G. Coutard, and L. Duraffourg; Univ. Grenoble Alpes, CEA, LETI, DOPT, SNAP/LCO, Grenoble, France

This talk reviews recent achievements in the miniaturization of photonics devices to address cost, size and power consumption. We will present Si-based components allowing the integration of the main building blocks required for chemical sensing

ROOM 13a ICM

CB-8.5 THU 9:30

All-optical control of self-mode-locked quantum dash lasers for improved RF linewidth, timing jitter and environmental sensitivity

•H. Asghar[1,2,3], E. Sooudi[1], and J. McInerney[1,4]; [1]Department of Physics and Tyndall National Institute, University College Cork, Western Road, Cork, Ireland, Cork, Ireland; [2]Atomic and Molecular Physics Laboratory, Quaid-i-Azam University, Islamabad, Pakistan; [3]National Center for Physics, Quaid-i-Azam University Campus, Islamabad, Pakistan; [4]College of Optical Sciences, University of Arizona, Tucson, Arizona 85721, Arizona, USA

We report stabilization of self-mode-locked quantum-dash lasers over wider delay detuning using simultaneous optical feedback and optical injection. This combination yields 1 kHz linewidth, which was >2x lower than feedback alone and >100x than free-running.

CB-8.6 THU 9:45

Optical frequency comb generation from semiconductor lasers using Optical Injection and pulsed Gain Switching

•A. Rosado[1], A. Pérez-Serrano[1], J.M. García Tijero[1], A. Valle[2], L. Pesquera[2], and I. Esquivias[1]; [1]CEMDATIC-E.T.S.I Telecomunicación, Universidad Politécnica de Madrid, Madrid, Spain; [2]Instituto de Física de Cantabria (CSIC-Universidad de Cantabria), Santander, Spain

We have demonstrated the generation of very broad and flat OFCs at low repetition rates ($\lesssim$ 1 GHz) from optically injected semiconductor lasers by using pulsed gain switching instead of sinusoidal-like electrical excitation.

ROOM 13b ICM

EC-1.3 THU 9:30

Direct Observation of Topological Edge States in Silicon Photonic Crystals

•N. Parappurath[1], F. Alpeggiani[2], L. Kuipers[2], and E. Verhagen[1]; [1]AMOLF, Amsterdam, Netherlands; [2]TU Delft, Delft, Netherlands

We directly observe the states of topological photonic crystals at telecom wavelengths. Using the states' intrinsic radiation, we measure dispersion, loss, pseudospin, and spin-spin scattering. We image spin-selective unidirectional propagation around sharp corners and junctions.

EC-1.4 THU 9:45

Disorder-resistant helical waveguiding in one dimension

•J.-y. Han[1,2], C. Gneiting[3], and D. Leykam[1]; [1]Center for Theoretical Physics of Complex Systems, Institute for Basic Science (IBS), Daejeon 34126, South Korea; [2]Basic Science Program, University of Science and Technology (UST), Daejeon 34113, South Korea; [3]Theoretical Quantum Physics Laboratory, RIKEN Cluster for Pioneering Research, Wako-shi, Saitama 351-0198, Japan

We propose a quasi one-dimensional coupled ring resonator waveguide exhibiting disorder-resistant helical transport. Disorder resistance is efficiently achieved by directly designing spin-momentum locking of bulk modes, rather than using edge modes of larger two-dimensional structures.

ROOM 14a ICM

EG-3.4 THU 9:30

Nanoscale mid-infrared near-field tomography of topological insulator surfaces

F. Mooshammer[1], •F. Sandner[1], M.A. Huber[1], M. Zizlsperger[1], H. Weigand[1], M. Plankl[1], C. Weyrich[2], M. Lanius[2], J. Kampmeier[2], G. Mussler[2], D. Grützmacher[2], J.L. Boland[1], T.L. Cocker[3], and R. Huber[1]; [1]University of Regensburg, Regensburg, Germany; [2]Forschungszentrum Jülich, Jülich, Germany; [3]Michigan State University, Michigan, USA

Employing mid-infrared near-field tomography on a three-dimensional topological insulator, we retrieve the local dielectric function of a few-nm thick surface layer, suggesting the coexistence of a massive electron gas and the topologically protected surface states.

EG-3.5 THU 9:45

Single-Molecule Excitation-Emission Spectroscopy at Room Temperature based on a Common-Path Interferometer

•A. Perri[1], F. Preda[1], E. Thyrhaug[2], S. Krause[3], G. Cerullo[1], T. Vosh[3], J. Hauer[2], and D. Polli[1]; [1]IFN-CNR and Dipartimento di Fisica, Politecnico di Milano, Milano, Italy; [2]Dynamical Spectroscopy, Department of Chemistry, Technical University Munich, Munich, Germany; [3]Department of Chemistry and NanoScience Center, University of Copenhagen, Copenhagen, Denmark

We demonstrate simultaneous collection of single molecule fluorescence emission and excitation spectra using a compact common-path interferometer and broadband excitation, which is implemented as an extension of a standard single-molecule spectroscopy microscope.

ROOM 14b ICM

CH-10.5 THU 9:30

Exploiting the optical reflection matrix for OCT signal enhancement

•J. Kanngiesser, M. Rahlves, and B. Roth; Hannoversches Zentrum für Optische Technologien, Leibniz Universität Hannover, Hannover, Germany

We demonstrate OCT signal enhancement through manipulation of the optical wavefront incident to the sample. The technique is based on the acquisition of the sample's complex-valued reflection matrix and subsequent optical phase conjugation.

CH-10.6 THU 9:45

In flow manipulation and characterization of cancer cells by coherent computational microscopy

L. Miccio[1], V. Bianco[1], P. Memmolo[1], F. Merola[1], M. Mugnano[1], M. Villone[2], P.L. Maffettone[2], and •P. Ferraro[1]; [1]Institute of Applied Sciences and Intelligent Systems (ISASI-CNR), Pozzuoli, Italy; [2]Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, University of Naples "Federico II",, Napoli, Italy

We show the recent advances of in-flow holographic tomography, which exploits an induced rotation of the sample to probe it from different view angles. Its application to the characterization of cancer cells will be reported.

ROOM Osterseen ICM

CD-9.5 THU 9:30

Higher-Order Mode Temperature-Tunable Supercontinuum Generation in Liquid-Core Optical Fibers

•R. Scheibinger[1,2], M. Chemnitz[1,2], K. Schaarschmidt[1,2], and M.A. Schmidt[1,2,3]; [1]Leibniz-Institute of Photonic Technology, Jena, Germany; [2]Abbe School of Photonics and Faculty of Physics, Friedrich-Schiller University Jena, Jena, Germany; [3]Otto-Schott-Institute of Material Research, Friedrich-Schiller University Jena, Jena, Germany

We experimentally demonstrate temperature-tuning of supercontinuum generation within a TM01-mode in a liquid CS2-core step-index fiber. Our optimized dispersion design enables generating two temperature-tunable dispersive waves in the near and short-wave infrared.

CD-9.6 THU 9:45

Multi-octave light source with tunable spectral profile: from supercontinuum to Raman comb spectral-structure

•D. Kergoustin, F. Amrani, B. Debord, F. Gérôme, and F. Benabid; GPPMM group - Xlim research institute UMR CNRS 7252, Limoges, France

We present a several octave wide light source spanning from 370 nm to 2600 nm which spectral structure can be tuned, by just changing the pump pulse duration, from a comb to a supercontinuum spectral-structure.

ROOM 1 Hall A1

CC-5.3 THU 9:30

Local non-invasive (photo)conductivity measurements of metallic and semiconductor devices

•N. van Hoof[1], S. ter Huurne[1], M. Parente[2], E. Fadaly[1], and J. Gomez-Rivas[1]; [1]Eindhoven University of Technology, Eindhoven, Netherlands; [2]Dutch Institute For Fundamental Energy Research, Eindhoven, Netherlands

We demonstrate a proof-of-concept system that is capable of measuring Time-Resolved Terahertz spectroscopy with sub-diffraction spatial resolution and sub-ps temporal resolution.

CC-5.4 THU 9:45

Two-colour Surface Optical Rectification: Route to All-optical Control of Terahertz Emission from Quasi-2D structures

•J.S. Totero Gongora[1], L. Peters[1], J. Tunesi[1], M. Clerici[2], A. Pasquazi[1], and M. Peccianti[1]; [1]Emergent Photonics Lab (EPic), Dept. of Physics and Astronomy, University of Sussex, Brighton, United Kingdom; [2]Ultrafast Nonlinear Optics Lab (UNO), School of Engineering, University of Glasgow, Glasgow, United Kingdom

We investigate the all-optical generation and control of Terahertz waves from two-colour excitation of a semiconductor surface. Such process is enabled by the tight confinement of the interacting fields in a quasi-2D region.

ROOM 2 Hall A1

CF-9.5 THU 9:30

Dispersion control of an over-octave spanning shortwave infrared spectrum for the amplification of single-cycle pulses

•Y.-C. Lin, Y. Nabekawa, and K. Midorikawa; Attosecond Science Research Team, RIKEN, Saitama, Japan

A new experimental scheme is reported to control the dispersion of an over-octave bandwidth spectrum for the amplification of monocycle shortwave infrared pulses.

CF-9.6 THU 9:45

Few-cycle Midwave-IR OPCPA with 32 GW Peak Power at a 1 kHz Repetition Rate

•L. von Grafenstein, M. Bock, U. Griebner, and T. Elsaesser; Max Born Institute, Berlin, Germany

We present a 5 μm OPCPA driven by a 45 mJ picosecond 2 μm pump source. Sub-70 fs idler pulses with 2.5 mJ energy are generated in the 1 kHz pulse train.

ROOM 3 Hall A1

CE-11.5 THU 9:30

Brillouin Gain Characterization by Cavity Ringdown Spectroscopy

A. Sebastian, •S. Trebaol, and P. Besnard; Univ Rennes, CNRS, Institut FOTON - UMR 6082, Lannion, France

We report a technique based on cavity ringdown spectroscopy allowing to determine gain coefficient in high-Q resonator based Brillouin lasers. The method is applied to a model cavity composed of of silica fiber.

CE-11.6 THU 9:45

Permanent Optimization of Large-FSR Dual-Microring Bandpass Filters

•T. Lipka, I. Gomberg, and H.K. Trieu; Institute of Micro System Technology, Hamburg University of Technology, Hamburg, Germany

We present large-FSR dual-microring bandpass filters manufactured with multilayer compatible deposited silicon. Fabrication tolerances are compensated by a permanent post-fabrication correction method and the possibility to set the filters to prespecified wavelength channels is demonstrated.

ROOM 1 ICM

10:30 – 12:00

CJ-12: Single frequency and tunable lasers

Chair: Jaroslaw Sotor, Wroclaw University of Science and Technology, Wroclaw, Poland

CJ-12.1 THU 10:30

Single-Frequency Sub-kW-Peak-Power Combined Er/Er-Yb-Fibers Amplifier with a High Pump-to-Signal Conversion Efficiency.

•*M.M. Khudyakov*[1,2], *D.S. Lipatov*[3], *A.N. Gur'yanov*[3], *M.M. Bubnov*[2], *and M.E. Likhachev*[2]; [1]*Moscow Institute of Physics and Technology (State University), Moscow, Russia*; [2]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [3]*.Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Nizhnii Novgorod, Russia*

Fiber amplifier for 1.55 um spectral range based on simultaneous utilization of Er-doped (Yb-free) and Er-Yb-doped fibers was developed to achieve sub-kW peak power in single-frequency pulses and a high pump-to-signal conversion efficiency.

CJ-12.2 THU 10:45

Up-scaling the power of pulsed single frequency fibre amplifiers for coherent LIDAR applications

•*F. Gustave, P. Bourdon, J. Le Gouët, A. Durécu, L. Lombard, H. Jacqmin, and A. Dolfi-Bouteyre*; *DOTA, ONERA, Université Paris Saclay, F-91123 Palaiseau, France*

We report on various developments of pulsed single frequency laser amplifiers with increased Stimulated Brillouin Scattering threshold, based on common MOPFA architecture. These laser sources are designed for long range coherent LIDARs.

ROOM 4a ICM

10:30 – 12:00

JSIII-2: Thermo-photonics, materials and energy efficiency

Chair: Concita Sibilia, Sapienza Università di Roma, Roma, Italy

JSIII-2.1 THU (Invited) 10:30

Control of Thermo-Photonic Energy Flows with Nano-Structured and 2D Materials

•*O. Ilic* ; *Caltech, Pasadena, USA*

We discuss how nano-structured materials can manipulate thermal electromagnetic fields in unprecedented ways, including engineered thermal emitters for heat-to-electricity energy conversion, active modulation of thermal radiation with gate-tunable graphene plasmons, and strategies for efficient solar spectrum splitting.

ROOM 4b ICM

10:30 – 12:00

EF-8: Solitons in micro-cavities

Chair: Thorsten Ackemann, University of Strathclyde, Glasgow, United Kingdom

EF-8.1 THU 10:30

Dynamics of Optically Injected Kerr Gires-Tournois Interferometers

•*J. Javaloyes*[1], *C. Schelte*[1,2], *and S. Gurevich*[2]; [1]*Nonlinear Wave Group, Universitat de les Illes Baleares, Palma de Mallorca, Spain*; [2]*Institute for Theoretical Physics, University of Münster, Münster, Germany*

We demonstrate theoretically that a high finesse Fabry-Perot microcavity containing a Kerr medium, coupled to a external cavity and in presence of Optical injection can give rise to phase-locked, dispersive, temporal Localized Structures (LSs).

EF-8.2 THU 10:45

Cherenkov radiation-induced soliton repetition rate splitting in a monochromatically driven optical microresonator

•*R. Bouchand, W. Weng, E. Lucas, and T. Kippenberg*; *EPFL, Lausanne, Switzerland*

We develop a dual-comb system based on a single crystalline microresonator by monochromatically pumping counter-propagating solitons in the same spatial mode with equal powers and unveil the role of soliton Cherenkov radiations interference in the process.

ROOM 5 ICM

10:30 – 12:00

EB-6: Quantum state characterization and foundation

Chair: Till Weinhold, University of Queensland, Saint Lucia, Australia

EB-6.1 THU 10:30

Universal multipartite d-level entanglement witnesses for realistic measurement settings

•*S. Sciara*[1,2], *C. Reimer*[1,3], *M. Kues*[1,4], *P. Roztocki*[1], *A. Cino*[2], *D.J. Moss*[5], *L. Caspani*[6], *W.J. Munro*[7,8], *and R. Morandotti*[1,9,10]; [1]*Institut national de la recherche scientifique (INRS-EMT), Varennes, Canada*; [2]*University of Palermo, Palermo, Italy*; [3]*HyperLight Corporation, Cambridge, USA*; [4]*University of Glasgow, Glasgow, United Kingdom*; [5]*Swinburne University of Technology, Hawthorn, Australia*; [6]*University of Strathclyde, Glasgow, United Kingdom*; [7]*NTT Basic Research Laboratories and NTT Corporation, Kanagawa, Japan*; [8]*National Institute of Informatics, Tokyo, Japan*; [9]*University of Electronic Science and Technology of China, Chengdu, China*; [10]*ITMO University, St Petersburg, Russia*

We derive experimentally-optimal witness operators to detect entanglement in any arbitrarily-complex quantum state that are customizable towards experimental restrictions or accessible measurement settings. We measure the witness expectation value for four-partite three-level optical cluster states.

EB-6.2 THU 10:45

A multi-copy approach to quantum entanglement characterization

•*R. Hošák, R. Stárek, R. Filip, and M. Ježek*; *Palacky University Olomouc, Olomouc, Czech Republic*

In this work we show that for sources of high-quality entanglement, an ensemble of its output qubits must be considered to yield precise predictions of its real-life performance in quantum protocols.

ROOM 13a ICM

10:30 – 12:00

CB-9: Optical frequency combs in semiconductor lasers

Chair: Stefan Breuer, Technical University, Darmstadt, Germany

CB-9.1 THU 10:30

Spectrum collapse and Kerr frequency comb generation with multi-frequency laser diodes self-injection locked to high-Q optical microresonator

•*R. Galiev*[1,2], *N. Pavlov*[1,3], *N. Kondratiev*[1], *V. Lobanov*[1], *A. Voloshin*[1], *A. Gorodnitskiy*[1,3], *S. Koptyaev*[4], *I. Bilenko*[1,2], *and M. Gorodetsky*[1,2]; [1]*Russian Quantum Center, Skolkovo, Russia*; [2]*Faculty of Physics, Lomonosov Moscow State Univ., Moscow, Russia*; [3]*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*; [4]*Samsung R&D Institute Russia, SAIT-Russia Laboratory, Moscow, Russia*

We demonstrated experimentally and described analytically effect of transformation of multifrequency laser diode emission spectrum into single frequency one via self-injection locking to high-Q optical microresonator and simultaneous dissipative Kerr soliton generation in this microresonator.

CB-9.2 THU 10:45

Tailored Optical Frequency Combs by Harmonic Frequency and Amplitude Locking in an Optically Injected Laser

K. Shortiss[1,2], •*B. Lingnau*[1,2,3], *F. Dubois*[1,2], *F.H. Peters*[1,2], *and B. Kelleher*[1,2]; [1]*Department of Physics, University College Cork, Cork, Ireland*; [2]*Tyndall National Institute, Cork, Ireland*; [3]*Institut für Theoretische Physik, TU Berlin, Germany*

We study the resonance structure in semiconductor laser injected by an optical frequency comb. The nonlinear laser dynamics enables the generation of a new frequency comb with tunable frequency offset and variable comb spacing.

ROOM 13b ICM

10:30 – 12:00

EC-2: Novel systems for topological photonics II

Chair: Miguel Bandres, University of Central Florida, Orlando, USA

EC-2.1 THU (Invited) 10:30

Exploring Topological Photonics in Synthetic Dimensions

•*H.M. Price*[1], *T. Ozawa*[2], *N. Goldman*[3], *O. Zilberberg*[4], *and I. Carusotto*[5]; [1]*University of Birmingham, Birmingham, United Kingdom*; [2]*Interdisciplinary Theoretical and Mathematical Sciences Program (iTHEMS), RIKEN, Saitama, Japan*; [3]*Universite Libre de Bruxelles, Brussels, Belgium*; [4]*ETH Zurich, Zurich, Switzerland*; [5]*INO-CNR BEC Center, Trento, Italy*

"Synthetic dimensions" provide a powerful way to realise topological physics in different platforms, and to even effectively explore higher spatial dimensions. We report on proposals and prospects in this emerging research direction.

ROOM 14a ICM

10:30 – 12:00

EG-4: Nonlinear nano-optics

Chair: Christoph Lienau, University of Oldenburg, Oldenburg, Germany

EG-4.1 THU 10:30

Unidirectional launching of femtosecond surface plasmon pulses by second harmonic generation

•*S. G Rodrigo*; *Centro Universitario de la Defensa, Ctra. de Huesca s/n, E-50090, Zaragoza, Spain*; *Instituto de Ciencia de Materiales de Aragón and Departamento de Física de la Materia Condensada, CSIC-Universidad de Zaragoza, E- 50009, Zaragoza, Spain*

We demonstrate unidirectional launching of surface plasmon pulses as short as ~ 20 fs, all-optically controlled by Second Harmonic Generation. We design an ultra-narrow bandwidth surface plasmon frequency comb based on this approach.

EG-4.2 THU 10:45

All-optical Ultrafast Control of Second Harmonic Generation in AlGaAs Nanopillars

•*M. Celebrano*[1], *E.A.A. Pogna*[1], *L. Ghirardini*[1], *F. Rusconi*[1], *P. Biagioni*[1], *A. Mazzanti*[1], *G. Della Valle*[1], *L. Duò*[1], *L. Carletti*[2], *D. Rocco*[2], *C. Gigli*[3], *G. Marino*[3], *G. Leo*[3], *C. De Angelis*[2], *G. Cerullo*[1], *and M. Finazzi*[1]; [1]*Politecnico di Milano, Milano, Italy*; [2]*University of Brescia, Brescia, Italy*; [3]*Université Paris Diderot, Paris, France*

We demonstrate efficient and ultrafast all-optical modulation of the second harmonic generation (SHG) from AlGaAs nanoantennas pumped in the telecom range (1554 nm). We achieve this by simultaneously irradiating the nanostructures above bandgap (405 nm).

ROOM 14b ICM

10:30 – 12:00

CH-11: Infrared gas sensing

Chair: Anderson Gomes, Federal University of Pernambuco, Recife, Brazil

CH-11.1 THU 10:30

Broadband Multi-species Trace Gas Detection by Up-Converting Mid-Infrared Supercontinuum Light into the Near-Infrared

•*K. Eslami Jahromi, Q. Pan, A. Khodabakhsh, and F. Harren*; *Trace gas research group, Department of Molecular and Laser Physics, Radboud University, Nijmegen, Netherlands*

We report a mid-infrared supercontinuum based multi-species trace gas sensor (coverage > 600 cm-1) in combination with sum-frequency up-conversion allowing sub-ppmv detection, with a 5 cm-1 spectral resolution.

CH-11.2 THU 10:45

Open-Path Mid-Infrared Remote Sensing of Atmospheric Gases Using a Broadband Optical Parametric Oscillator

•*O. Kara*[1], *F. Sweeney*[1], *M. Rutkauskas*[1], *C. Farrell*[2], *C. Leburn*[2], *and D. Reid*[1]; [1]*Heriot Watt University, Edinburgh, United Kingdom*; [2]*Chromacity Ltd, Edinburgh, United Kingdom*

Using active Fourier-transform spectroscopy with a mid-infrared ultrafast optical parametric oscillator we demonstrate quantitative, open-path, simultaneous concentration measurements of water, methane and ethane at over 30-m range with a simple target.

ROOM Osterseen ICM

10:30 – 12:00

CD-10: Novel approaches in nonlinear optics

Chair: Stefan Haacke, CNRS, IPCMS, Strasbourg, France

CD-10.1 THU 10:30

Mid-Infrared Photon Counting by Intra-Cavity Up-Conversion for LIDAR

•*M. Widarsson*[1], *M. Henriksson*[2], *P. Mutter*[1], *C. Canalias*[1], *V. Pasiskevicius*[1], *and F. Laurell*[1]; [1]*Royal Institute of Technology, KTH, Stockholm, Sweden*; [2]*Swedish Defence Research Agency, FOI, Linköping, Sweden*

High timing resolution (140 ps) mid-infrared pulse detection based on intra-cavity sum-frequency up-conversion and a single-photon avalanche diode suitable for LIDAR applications is demonstrated. Utilisation of intra-cavity PPRKTP provides high conversion efficiency and selectable wavelength.

CD-10.2 THU 10:45

Type I Quasi-Phase Matching in a Periodically Poled Rb-doped $KTiOPO_4$ Ridge Waveguide

•*C.C. Kores, P. Mutter, H. Kianirad, C. Canalias, and F. Laurell*; *Royal Institute of Technology (KTH), Stockholm, Sweden*

Ridge waveguides were fabricated by diamond dicing of a Rb-ion exchanged periodically poled Rubidium-doped KTP sample. Blue light at 468.8 nm was generated through first order Type I quasi-phase matched second-harmonic generation.

ROOM 1 Hall A1

10:30 – 12:00

CC-6: High power THz pulse generation

Chair: Stephan Winnerl, Helmholtz Zentrum, Dresden, Germany

CC-6.1 THU 10:30

Demonstration of a Tilted-Pulse-Front Pumped Plane-Parallel Slab Terahertz Source

•*P.S. Nugraha*[1,2], *G. Krizsán*[1], *C. Lombosi*[1], *L. Pálfalvi*[3], *G. Tóth*[3], *G. Almási*[3], *J.A. Fülöp*[1,2,4], *and J. Hebling*[1,2,3]; [1]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*Institute of Physics, University of Pécs, Pécs, Hungary*; [4]*ELI-ALPS, ELI-Hu Nonprofit Ltd, Szeged, Hungary*

A new type of tilted-pulse-front pumped terahertz source has been demonstrated, which utilizes a plane-parallel LN slab with an echelon structure, single-cycle pulses of 1 μJ energy and 0.30 THz central frequency with 5.1×10–4 efficiency have been generated.

CC-6.2 THU 10:45

THz Pulse Generation Emitted From Slant-Stripe-Type PPLN Via Optical Rectification Effect

•*J. Hamazaki, Y. Ogawa, N. Sekine, A. Kasamatsu, and I. Hosako*; *National Institute of Information and Communications Technology, Tokyo, Japan*

To obtain multi-cycled THz pulse efficiently by preventing material absorption of the generated THz wave, slant-stripe-type PPLN crystal is fabricated. THz wave generation from side surface of slanted PPLN pumped by femto-second pulse is demonstrated.

ROOM 2 Hall A1

10:30 – 12:00

CF-10: Methods for CEP-stable sources

Chair: Markus Kitzler, Technical University of Vienna, Vienna, Austria

CF-10.1 THU 10:30

Influence of the Doppler effect on the carrier-envelope phase

•*T. Feng*[1,3], *P. Rustige*[1,4], *and G. Steinmeyer*[1,2]; [1]*Max-Born-Institut, Max-Born-Straße 2a, 12489, berlin, Germany*; [2]*Institute of Physics, Humboldt-Universität zu Berlin, Newtonstraße 15, 12489, berlin, Germany*; [3]*School of Information Science and Enjineering, Shandong University, 266237, qingdao, China*; [4]*Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, Einsteinufer 37, 10587, berlin, Germany*

The influence of the optical Doppler effect on the carrier-envelope phase (CEP) of a Kerr-lens mode-locked few-cycle Ti: sapphire laser is investigated, which shows a potential application on CEP control of laser oscillators and amplifiers.

CF-10.2 THU 10:45

Sub-20 fs - 10.5 W visible pulse generation from Yb-doped fiber laser

•*D. Descamps*[1], *F. Guichard*[2], *S. Petit*[1], *A. Comby*[1], *L. Lavenu*[2], *and Y. Zaouter*[2]; [1]*Université de Bordeaux - CNRS - CEA, CELIA , Talence, France*; [2]*Amplitude Laser Group, Pessac, France*

We report on the generation of 10.5 W sub-20 fs visible pulses based on the post-compression in a krypton-filled capillary of high power second harmonic Yb:fiber laser.

ROOM 3 Hall A1

10:30 – 12:00

CG-7: Generation and applications of attosecond pulses

Chair: Lukas Gallmann, ETH, Zürich, Switzerland

CG-7.1 THU (Tutorial) 10:30

An Introduction to Attosecond Pulses and Attosecond Physics

•*A. L'Huillier*; *Lund University, Lund, Sweden*

This tutorial will discuss the physics behind the generation of attosecond pulses, their temporal and spatial properties, including spatio-temporal couplings, and their application to study the dynamics of resonant and non-resonant photoionization.

ROOM 1 ICM

CJ-12.3 THU 11:00

Dual-polarization DFB fiber laser stabilized by frequency-shifted feedback

•*M. Guionie*[1], *A. Thorette*[1], *M. Romanelli*[1], *E. Pinsard*[2], *L. Lablonde*[2], *B. Cadier*[2], *M. Vallet*[1], *and M. Brunel*[1]; [1]*Univ Rennes, CNRS, Institut FOTON - UMR 6082, Rennes, France*; [2]*iXBlue Photonics, Lannion, France*

The beat frequency of 1.5 μm dual polarization DFB fiber lasers is shown to be stabilized by means of an optical frequency-shifted feedback loop. It leads to an optically carried RF source with sub-Hz linewidth.

CJ-12.4 THU 11:15

Lasing and Gain Properties of Multicomponent Optical Fibers with Heavily Er-doped Phosphate Core and Silica Cladding

B. Denker[1], *B. Galagan*[1], *V. Kamynin*[1], •*A. Ponosova*[1], *S. Sverchkov*[1], *S. Semjonov*[2], *and V. Tsvetkov*[1,3]; [1]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [2]*Fiber Optics Research Center of the Russian Academy of Sciences, Moscow, Russia*; [3]*National Research Nuclear University MEPhI, Moscow, Russia*

We present investigation of fibre light sources based on novel multicomponent fibre with 3wt.% Er-doped phosphate core and silica cladding. EDFA, CW fibre laser, ASE light source and ultra-short pulsed fibre laser are demonstrated.

ROOM 4a ICM

JSIII-2.2 THU 11:00

Graphene metamaterial for high absorption of unpolarized light over more than three octaves of bandwidth

H. Lin[1], *B. Sturmberg*[2], *K.-T. Lin*[1], *Y. Yang*[1], *X. Zheng*[1], *T. Chong*[3], •*M. de Sterke*[2], *and B. Jia*[2]; [1]*Swinburne University of Technology, Melbourne, Australia*; [2]*University of Sydney, Sydney, Australia*; [3]*Australian National University, Canberra, Australia*

We report a 90 nm thick graphene-based metamaterial with 12.5 cm2 area, that strongly absorbs (>80%) unpolarised 300-2500 nm light. The metamaterial was fabricated by wet self-assembly, that can scale to 1 m2 areas.

JSIII-2.3 THU 11:15

Linear and nonlinear optical properties of colloidal suspensions of functionalized graphene nanoparticles

•*E. Sani*[1], *J.P. Vallejo*[2], *L. Mercatelli*[1], *M.R. Martina*[1], *D. Di Rosa*[1,3], *A. Dell'Oro*[4], *and L. Lugo*[2]; [1]*CNR-INO National Institute of Optics, Firenze, Italy*; [2]*Departamento de Física Aplicada, Facultade de Ciencias, Universidade de Vigo, Vigo, Spain*; [3]*Department of Energy, Systems, Territory and Constructions Engineering (D.E.S.T.eC.), University of Pisa, Pisa, Italy*; [4]*INAF, Astrophysical Observatory of Arcetri, Firenze, Italy*

Optical properties of stable aqueous colloids of polycarboxylate-functionalized and sulfonic acid-functionalized graphene nanoplatelets are investigated. Spectral extinction coefficients make them interesting for thermal solar absorbers. Optical limiting is obtained at 355, 532 and 1064 nm.

ROOM 4b ICM

EF-8.3 THU (Invited) 11:00

Observation of laser-cavity solitons in micro-resonators

H. Bao[1], *A. Cooper*[1], *M. Rowley*[1], *L. Di Lauro*[1], *J.S. Totero Gongora*[1], *S.T. Chu*[2], *B.E. Little*[3], *G.-L. Oppo*[4], *R. Morandotti*[5,6,7], *D.J. Moss*[8], *B. Wetzel*[1,9], *M. Peccianti*[1], *and* •*A. Pasquazi*[1]; [1]*University of Sussex, Brighton, United Kingdom*; [2]*City University of Hong Kong, Hong Kong, China*; [3]*Xi'an Institute of Optics and Precision Mechanics , Xi'an, China*; [4]*SUPA, University of Strathclyde, Glasgow, United Kingdom*; [5]*INRS-EMT, Québec, Canada*; [6]*Institute of Fundamental and Frontier Sciences, Chengdu, China*; [7]*ITMO University, St. Petersburg, Russia*; [8]*Centre for Microphotonics, Hawthorn, Australia*; [9]*Xlim Research Institute, Limoges, France*

We generate a new class of highly-efficient cavity-solitons in a micro-resonator laser system with a tuneable repetition rate and no active control. Results are presented in detail.

ROOM 5 ICM

EB-6.3 THU 11:00

Experimental multiphase estimation in an integrated reconfigurable multi-arm interferometer

E. Polino[1], *M. Riva*[2,3], *M. Valeri*[1], *R. Silvestri*[1], *G. Corrielli*[2,3], *A. Crespi*[2,3], •*N. Spagnolo*[1], *R. Osellame*[2,3], *and F. Sciarrino*[1]; [1]*Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy*; [2]*Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Milano, Italy*; [3]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*

We report the experimental implementation of an integrated platform for multiphase estimation, consisting in reconfigurable multiarm interferometers realized by femtosecond laser writing technology. We show experimentally enhanced multiphase estimation with two-photon input states.

EB-6.4 THU 11:15

Experimental device-independent certification of a SIC-POVM

M. Smania[1], *P. Mironowicz*[2], *M. Nawareg*[1], *M. Pawlowski*[2], *A. Cabello*[3], *and* •*M. Bourennane*[1]; [1]*Department of Physics, Stockholm University, Stockholm, Sweden*; [2]*Institute of Theoretical Physics and Astrophysics, National Quantum Information Centre, Faculty of Mathematics, Physics and Informatics, University of Gdansk, Gdansk, Poland*; [3] *Departamento de Fisica Aplicada II, Universidad de Sevilla, Sevilla, Spain*

We present the first experimental confirmation in device-independent way, using the observed correlations between the outcomes of the measurement and the outcomes of measurements performed on a separated quantum system in a Bell inequality experiment.

ROOM 13a ICM

CB-9.3 THU 11:00

Low-loss RF cavity for Quantum Cascade Laser frequency combs

•*F. Kapsalidis, M. Singleton, M. Beck, and J. Faist*; *Institute of Quantum Electonics, ETH Zurich, Zurich, Switzerland*

A QCL structure is grown on a high-doped substrate, and by restricting the area of the top contact, the parasitic capacitance is reduced, improve the RF-frequency response and enhancing the coupling between the comb formation and the transport.

CB-9.4 THU 11:15

Low RF-power injection-locking and beatnote control of terahertz quantum cascade laser frequency combs

•*P. Taeschler, A. Forrer, D. Stark, T. Olariu, M. Beck, J. Faist, and G. Scalari*; *Institute of Quantum Electronics ETH Zürich, Zürich, Switzerland*

We demonstrate that the round-trip frequency of terahertz quantum cascade laser frequency combs can be injection-locked by direct RF-modulation of the bias current. Furthermore, we show beatnote control by means of an external cavity.

ROOM 13b ICM

EC-2.2 THU 11:00

Supersymmetric transformations of photonic topological systems

•*G. Queraltó*[1], *M. Kremer*[2], *L. Maczewsky*[2], *M. Heinrich*[2], *V. Ahufinger*[1], *J. Mompart*[1], *and A. Szameit*[2]; [1]*Departament de Física, Universitat Autònoma de Barcelona, E-08193 Bellaterra, Spain*; [2]*Institut für Physik, Universität Rostock, 18059 Rostock, Germany*

We explore the interplay between supersymmetry and topology by applying supersymmetric transformations to a photonic lattice supporting topologically protected states. These transformations change the spectrum of the system, leading to topological transitions.

EC-2.3 THU 11:15

Topological Cylindrical Resonators and Optical Fibers

•*L. Pilozzi*[1] *and C. Conti*[2]; [1]*CNR- Institute for Complex Systems, Roma, Italy*; [2]*Department of Physics, University Sapienza, Roma, Italy*

We propose a new scheme of optical resonators based on the edge modes of a radial topological structure. Field confinement and resonator dispersion are achieved through a recursive approach able to tackle with arbitrary arrangement of annular concentric layers.

ROOM 14a ICM

EG-4.3 THU 11:00

Symmetry-Forbidden Second-Harmonic Generation In A Fully Centro-Symmetric Plasmonic Nanocircuit

T.-Y. Chen[1,2], J. Obermeier[3], •T. Schumacher[3], F.-C. Lin[4], J.-S. Huang[5,6,7], M. Lippitz[3], and C.-B. Huang[1,2,7]; [1]Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan; [2]International Intercollegiate PhD Program, National Tsing Hua University, Hsinchu, Taiwan; [3]Department of Physics, University of Bayreuth, Bayreuth, Germany; [4]Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan; [5]Leibniz Institute of Photonic Technology, 07745 Jena, Germany; [6]Department of Electrophysics, National Chiao Tung University, Hsinchu 30010, Taiwan; [7]Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan

Although both the material as well as the structure are fully symmetric, the optical modes in a plasmonic two-wire transmission line lead to allowed second-harmonic generation at the metal surface

EG-4.4 THU 11:15

Tailoring second-harmonic generation in plasmonic radial trimers using cylindrical vector beams

•G. Bautista[1], C. Dreser[2,3], X. Zang[1], D.P. Kern[2,3], M. Kauranen[1], and M. Fleischer[2,3]; [1]Photonics Laboratory, Tampere University, Tampere, Finland; [2]Institute for Applied Physics, University of Tübingen, Tübingen, Germany; [3]Center for Light-Matter-Interaction, Sensors and Analytics LISA+, University of Tübingen, Tübingen, Germany

We investigate second-harmonic generation in a single plasmonic radial trimer using cylindrical vector beams. The second-harmonic generation from the trimer was found to depend strongly on the input vector beam structure and trimer gap size.

ROOM 14b ICM

CH-11.3 THU 11:00

Upgrading a Laser-Based Spectrometer for the Mapping of Gas-phase CO2 in the Headspace of Champagne Glasses

•B. Parvitte, A.-L. Moriaux, R. Vallon, C. Cilindre, G. Liger-Belair, and V. Zeninari; Groupe de Spectrométrie Moléculaire et Atmosphérique, Reims, France

We report the latest developments and the application of an infrared diode laser spectrometer devoted to the monitoring and mapping of gas-phase carbon dioxide in the headspace of Champagne and sparkling wines glasses.

CH-11.4 THU 11:15

Multi-Species Environmental Gas Sensing Using Drone-Based Fourier-Transform Infrared Spectroscopy

•M. Rutkauskas[1], M. Asenov[2], S. Ramamoorthy[2], and D. Reid[1]; [1]Heriot-Watt University, Edinburgh, United Kingdom; [2]University of Edinburgh, Edinburgh, United Kingdom

We report a broadband FTIR spectrometer integrated with an autonomous UAV enabling quantitative aerial surveys of multiple gas species simultaneously with an estimated noise-limited performance of 18 ppm and sub-metre accuracy for a source localization.

ROOM Osterseen ICM

CD-10.3 THU 11:00

Nonlinear Generation of Ultrafast, Higher Order Vector Vortex Beams

•R.K. Saripalli[1], A. Ghosh[1], A.C. Nellikka[2], and G.K. Samanta[1]; [1]Physical Research Laboratory, Ahmedabad, India; [2]Tecnologico de Monterrey, Monterrey, Mexico

We report on a novel experimental scheme based on single-pass, second harmonic generation producing ultrafast vector vortex beams of order as high as 24 and output power as high as 20.5 mW at 405 nm.

CD-10.4 THU 11:15

Dynamic Range of an Upconversion Detection Module for MWIR Laser Spectroscopy

•S. Wolf[1], P. Reiser[1,2], J. Kießling[1], and F. Kühnemann[1]; [1]Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany; [2]Quantum-Sensing Lab, University of Basel , Basel, Switzerland

We examine properties of a nonlinear-optical upconversion detection system for MIR laser spectroscopy. Results show that upconversion detection can significantly improve dynamic range and acquisition bandwidth, important to currently investigated techniques such as dual-frequency-comb spectroscopy.

ROOM 1 Hall A1

CC-6.3 THU 11:00

Terahertz wave generation in air by femtosecond optical vortex pulses

•M. Ivanov[1], I. Thiele[2], S. Skupin[3], D. Buozius[1], and V. Vaicaitis[1]; [1]Laser Research Center, Vilnius University, Vilnius, Lithuania; [2]Chalmers University of Technology, Gothenburg, Sweden; [3]Institut Lumière Matière, UMR 5306 Université Lyon 1 - CNRS, Université de Lyon, Villeurbanne, France

We propose a generation scheme for broadband THz pulses with a phase singularity from two-color femtosecond laser-induced gas-plasmas. The predictions are confirmed by means of THz intensity and phase measurements for Vortex driving pulses.

CC-6.4 THU 11:15

50mW average power gas-plasma THz generation driven by a fiber laser

•J. Buldt[1], C. Jauregui[1], M. Müller[1], L.H. Stark[1], and J. Limpert[1,2,3,4]; [1]Institute of Applied Physics, Jena, Germany; [2]Helmholtz Institute, Jena, Germany; [3]Active Fiber Systems GmbH, Jena, Germany; [4]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

We present a laser driven, 50 mW THz source based on two-color gas plasma. This is currently the highest power laser driven THz source and scaling to watt-level THz radiation is in reach.

ROOM 2 Hall A1

CF-10.3 THU 11:00

Dispersive Fourier transform based single-shot CEP drift measurement at arbitrary repetition rate

•M. Kurucz[1], S. Tóth[1], R. Flender[1], L. Hazier[1], B. Kiss[1], B. Perseille[2], and E. Cormier[2]; [1]ELI-ALPS, Szeged, Hungary; [2]CELIA, Université de Bordeaux , Talence, France

A single-shot dispersive Fourier transform based CEP drift measurement technique with arbitrary repetition rate capabilities is presented. We validated the concept by comparing to a well-established measurement device using high-repetition rate mid-IR laser source.

CF-10.4 THU 11:15

Depletion based thin-disk CEP stabilization

•J.R. C. Andrade[1,2], S. Kleinert[1,2], A. Tajalli[1,2], C.M. Dietrich[1,2], F. Placzek[1,3], B. Kreipe[1], and U. Morgner[1,2,4,5]; [1]Institut für Quantenoptik, Hannover, Germany; [2]Cluster of Excellence PhoenixD, Hannover, Germany; [3]Center for Medical Physics And Biomedical Engineering, Vienna, Austria; [4]Laser Zentrum Hannover e.V., Hannover, Germany; [5]Hannoversches Zentrum für Optische Technologien, Hannover, Germany

We present the first results of a novel concept for the stabilization of the CEP of thin-disk lasers. Our scheme involves using part of the laser to modulate the gain region and hence the CEP.

ROOM 3 Hall A1

ROOM 1 ICM

CJ-12.5 THU 11:30

Spectral response of distributed-feedback resonators with a continuously distributed phase shift

•*C.C. Kores*[1], *N. Ismail*[2], *E. Bernhardi*[3], *F. Laurell*[1], *and M. Pollnau*[2,4]; [1]*Department of Applied Physics, Royal Institute of Technology, Stockholm, Sweden*; [2]*Department of Materials and Nano Physics, Royal Institute of Technology, Kista, Sweden*; [3]*Visiting Scientist, Department of Materials and Nano Physics, Royal Institute of Technology, Kista, Sweden*; [4]*Advanced Technology Institute, University of Surrey, Guildford, United Kingdom*

In distributed-feedback laser resonators with a distributed phase shift, the resonance wavelength deviates from design. Calculations and experiments hold an incomplete accumulation of distributed phase shift due to light intensity decaying into the grating responsible.

CJ-12.6 THU 11:45

All-fiber Bi-doped laser continuously tunable from 1317-1375nm

•*N.K. Thipparapu, S. Wang, A.A. Umnikov, P. Barua, and J.K. Sahu*; *University of Southampton, SOUTHAMPTON, United Kingdom*

We demonstrate a tunable Bi-doped fiber laser covering 1317-1375nm with a maximum power of 57mW. With further amplification, the output reached more than 100mW over 52nm bandwidth with an OSNR of >40dB.

ROOM 4a ICM

JSIII-2.4 THU 11:30

Slow Light to Reduce the Energy Dissipation of Mach-Zehnder Modulators in Silicon Photonics

M. Passoni[1], *D. Gerace*[1], *G.C.R. Devarapu*[2,3], *L. O'Faolain*[2,3], *and* •*L.C. Andreani*[1]; [1]*Physics Department, University of Pavia, PAVIA, Italy*; [2]*Cork Institute of Technology, Cork, Ireland*; [3]*Tyndall National Institute, Cork, Ireland*

We propose the use of band-edge slow light combined with spatially periodic (interlaced) p-n junctions to design Mach-Zehnder modulators for silicon photonics with improved modulation efficiency and reduced energy dissipation per bit.

JSIII-2.5 THU 11:45

Flexible periodic half-cylinder photonic plate as a light recycling device applicable to liquid crystal displays

•*G. Martínez-Denegri*[1], *J. Toudert*[1], *M. Kramarenko*[1], *S. Colodrero*[1], *Q. Liu*[1], *G. Kozyreff*[2], *and J. Martorell*[1,3]; [1]*The Institute of Photonic Sciences - ICFO, Castelldefels, Spain*; [2]*Université Libre de Bruxelles - ULB, Brussels, Belgium*; [3]*Universitat Politecnica de Catalunya - UPC, Barcelona, Spain*

Efficient light management is essential in photonic technology to minimize the energy cost during its operation. Herein, we propose a novel polarizing photonic plate able to recycle the non-transmitted light normally wasted in standard liquid crystal displays.

ROOM 4b ICM

EF-8.4 THU 11:30

Switching Dynamics of Dark Solitons in Kerr Microresonators

•*E. Nazemosadat*[1], *A. Fülöp*[1], *Ó.B. Helgason*[1], *P.-H. Wang*[2], *Y. Xuan*[2], *D.E. Leaird*[2], *M. Qi*[2], *E. Silvestre*[3], *A.M. Weiner*[2], *and V. Torres-Company*[1]; [1]*Photonics Laboratory, Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Göteborg, Sweden*; [2]*School of Electrical and Computer Engineering, Purdue University,, West Lafayette, IN 47907-2035, USA*; [3]*Department of Optics-ICMUV, University of Valencia, 46100 Burjassot, Valencia, Spain*

We report the discovery of deterministic switching of dark-pulse Kerr comb states. Our results indicate that these combs arise as a complex interplay of multiple dark solitons circulating in the cavity.

EF-8.5 THU 11:45

Wideband tunability of Kerr parametric oscillation in an MgF2 microresonator

N. Sayson[1,2,3], *T. Bi*[1,2], *V. Ng*[1,2], *H. Pham*[1,2], *L. Trainor*[2,4], *H. Schwefel*[2,4], *S. Coen*[1,2], *M. Erkintalo*[1,2], *and* •*S. Murdoch*[1,2]; [1]*Physics Department, University of Auckland, Auckland, New Zealand*; [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand*; [3]*Physics Department, Mindanao State University - Iligan Institute of Technology, Iligan City, Philippines*; [4]*Physics Department, University of Otago, Dunedin, New Zealand*

The generation of large frequency shift parametric sidebands is achieved in a Kerr microresonator with carefully engineered higher-order dispersion. Experimentally we use three MgF2 microresonators to demonstrate over an octave of sideband tunability.

ROOM 5 ICM

EB-6.5 THU 11:30

Refuting observer-independence in quantum theory

•*M. Proietti*[1], *A. Pickston*[1], *F. Graffitti*[1], *P. Barrow*[1], *D. Kundys*[1], *C. Branciard*[2], *M. Ringbauer*[1,3], *and A. Fedrizzi*[1]; [1]*Scottish Universities Physics Alliance (SUPA), Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Universite' Grenoble Alpes, CNRS, Grenoble INP, Institut Neel, 38000 Grenoble, Grenoble, France*; [3]*Institut fur Experimentalphysik, Universitat Innsbruck, 6020 Innsbruck, Innsbruck, Austria*

We present the first experimental implementation of an extended Wigner's friend scenario, where quantum mechanics is shown to be incompatible with a framework where "facts of the world" can coexist independently from observers and observations.

EB-6.6 THU 11:45

Experimental Violation of Bell's Inequality for Temporal Orders

•*L. Rozema*[1], *G. Rubino*[1], *F. Massa*[1], *M. Araújo*[2], *M. Zych*[3], *Č. Brukner*[1,4], *and P. Walther*[1]; [1]*Vienna Center for Quantum Science and Technology (VCQ), Faculty of Physics, University of Vienna, Vienna, Austria*; [2]*Institute for Theoretical Physics, University of Cologne, Cologne, Germany*; [3]*Centre for Engineered Quantum Systems, School of Mathematics and Physics, University of Queensland, St Lucia, Australia*; [4]*. Institute for Quantum Optics & Quantum Information (IQOQI), Austrian Academy of Sciences, Vienna, Austria*

Bell's inequality has been violated using different physical systems, but never for the temporal order between events. Here we present such a Bell inequality and experimentally violate it by entangling the temporal order between events.

ROOM 13a ICM

CB-9.5 THU 11:30

Interband Cascade Lasers for Monolithic and Battery Driven Dual-Comb Spectrometers

•*B. Schwarz*[1], *J. Hillbrand*[1], *M. Beiser*[1], *A.M. Andrews*[1,2], *G. Strasser*[1,2], *H. Detz*[2,3], *A. Schade*[4], *R. Weih*[5], *and S. Höfling*[4,6]; [1]*Institute of Solid State Electronics, TU Wien, Vienna, Austria*; [2]*Center for Micro- and Nanostructures, TU Wien, Gerbrunn, Austria*; [3]*Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic*; [4]*Technische Physik, Physikalisches Institut, University Würzburg, Würzburg, Germany*; [5]*Nanoplus Nanosystems and Technologies GmbH, Am hubland, Germany*; [6]*SUPA, School of Physics and Astronomy, University of St Andrews, St. Andrews, United Kingdom*

We present a dual-comb platform combinging interband cascade laser frequency combs and sensitive on-chip heterodyne detection functinoality. FM-type frequency comb operation is obtained by utilizing the inherent nonlinearity of the laser gain medium.

CB-9.6 THU 11:45

Compressed Pulses from a Mid-Infrared Quantum Cascade Frequency Comb

•*M. Singleton, M. Beck, and J. Faist*; *ETH Zürich, Zuerich, Switzerland*

A Martinez-style grating compressor is used to compensate the intermodal phase differences of a mid-IR QCL comb, resulting in a train of pulses 12 ps FWHM and peak-to-average ratio exceeding 40.

ROOM 13b ICM

EC-2.4 THU 11:30

Inducing topological effects in locally resonant metamaterials

S. Yves[1], *G. Lerosey*[2], *and* •*F. Lemoult*[1]; [1]*Institut Langevin, ESPCI Paris, PSL University, CNRS UMR 7587, Paris, France*; [2]*Greenerwave, Paris, France*

The concept of topological insulators is investigated macroscopically for the propagation of electromagnetic waves within a metamaterial. We explain how structural deformations, although subwavelength scaled, induce topological phase transition and experimentally map some topological invariants.

EC-2.5 THU 11:45

Floquet topological metals

•*L.K. Upreti and P. Delplace*; *École normale supérieure de Lyon, Lyon, France*

We propose a new phase with no static counterpart: the Floquet topological metal. Two types of such a phase are found in scattering networks models, with possible experimental implementation in several photonic platforms.

ROOM 14a ICM

EG-4.5 THU 11:30

Coherent Control of the Non-instantaneous Response of Plasmonic Nanostructes

•*E. Bahar, U. Arieli, and H. Suchowski*; *Tel Aviv University, Israel*

We experimentally demonstrate coherent control of the nonlinear response of resonant nanostructures beyond the weak-field regime. Furthermore, we develop a novel theoretical approach capturing the induced nonlinearities of shaped ultrafast pulses with resonant nanostructured media.

EG-4.6 THU 11:45

Second-Harmonic Generation in (111) Gallium Arsenide Nanoantennas

•*J.D. Sautter*[1,2], *L. Xu*[3], *A. Miroshnichenko*[3], *M. Lysevych*[4], *D.A. Smirnova*[1], *I. Volkovskaya*[5], *R. Camacho-Morales*[1], *K. Zangeneh Kamali*[1], *F. Karouta*[4], *K. Vora*[4], *H.H. Tan*[4], *M. Kauranen*[6], *I. Staude*[2], *C. Jagadish*[4], *D.N. Neshev*[1], *and M. Rahmani*[1]; [1]*Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National Univ., Canberra, Australia*; [2]*Institute of Applied Physics, Abbe Center of Photonic, Friedrich Schiller Univ. Jena, Germany*; [3]*School of Engineering and Information Technology, Univ. of New South Wales, Canberra, Australia*; [4]*Department of Electronic Materials Engineering, Research School of Physics and Engineering, The Australian National Univ., Canberra, Australia*; [5]*Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia*; [6]*Photonics Laboratory, Physics Unit, Tampere Univ., Finland*

We report directional second-harmonic generation (SHG) from (111) gallium arsenide nanodisks embedded in a low-index matrix. Due to the specific crystal symmetry, the observed SHG exhibits well-controlled radiation patterns and a polarization independent conversion efficiency.

ROOM 14b ICM

CH-11.5 THU 11:30

Mid-infrared multi-species trace gas sensing using a supercontinuum light source

•*Q. Pan, K. Eslami Jahromi, A. Khodabakhsh, and F. Harren*; *Radboud University, Nijmegen, Netherlands*

We report upon an integrated and transportable multi-species trace gas sensor by combining a bright mid-infrared supercontinuum light source with a fast-scanning spectrometer employing a balanced detection scheme.

CH-11.6 THU 11:45

Compact, UAV compatible 2D Spectrometer for multi-species atmospheric gas analysis

J. Gouman[1], *P. Renevey*[1], *S. Dasen*[1], •*T. Herr*[1], *G. Buchs*[1], *F. Lütolf*[1], *S. Lecomte*[1], *G. Vergara*[2], *H. Martin*[3], *P.M. Moselund*[4], *F. Harren*[5], *and L. Balet*[1]; [1]*Swiss Center for Electronics and Microtechnology (CSEM), Neuchâtel, Switzerland*; [2]*NIT, New Infrared Technologies S.L., Boadilla del Monte, Madrid, Spain*; [3]*SenseAir AB, Delsbo, Sweden*; [4]*NKT Photonic A/S, Birkerød, Denmark*; [5]*Trace gas Research Group, IMM, Radboud University, Nijmegen, Netherlands*

The FLAIR system aims at multi-species atmospheric gas detection for air-quality monitoring in remote or dangerous areas. UAV compatible, it relies on a supercontinuum source to detect several un-defined gases simultaneously, and in real-time.

ROOM Osterseen ICM

CD-10.5 THU 11:30

Optically Probed Time Dynamics of $\chi(2)$ Grating Inscription in SiN Waveguides

•*E. Nitiss*[1], *T. Liu*[1], *T.J. Kippenberg*[2], *D. Grassani*[1], *and C.-S. Brès*[1]; [1]*Ecole Polytechnique Fédérale de Lausanne (EPFL), Photonic Systems Laboratory, Lausanne, Switzerland*; [2]*Ecole Polytechnique Fédérale de Lausanne (EPFL), Laboratory of Photonics and Quantum Measurements, Lausanne, Switzerland*

We probe the $\chi(2)$ grating in all-optically poled Si3N4 waveguides. We show that poling rate, efficiency and number of the inscribed gratings can be dynamically altered by changing pump laser wavelength and power.

CD-10.6 THU 11:45

Cavity opto-mechanics in liquid droplets

A. Giorgini[1], *S. Avino*[1], *P. Malara*[1], *P. De Natale*[2], *and* •*G. Gagliardi*[1]; [1]*Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Pozzuoli, Italy*; [2]*Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Firenze, Italy*

Liquid droplets are used as optical microresonators exciting whispering-gallery modes by free-space lasers. Optomechanical surface vibrations are stimulated via Brillouin scattering. Operation of droplet oscillators is characterized in terms of power, mechanical quality and stability

ROOM 1 Hall A1

CC-6.5 THU 11:30

Optical rectification of a 100-W average power modelocked oscillator in cryogenically-cooled GaP

•*N. Hekmat, F. Meyer, S. Mansourzadeh, F. Aslani, F. Fobbe, M. Hoffmann, Y. Wang, and C.J. Saraceno*; *Ruhr Universität Bochum, Faculty of Electrical Engineering and Information Technology, Photonics and Ultrafast Laser Science , Bochum, Germany*

We investigate optical rectification of a 100W average power thin-disk laser in GaP crystals cooled to cryogenic temperatures. We show that a balance between cooling and velocity-matching is required for efficient conversion at high power

CC-6.6 THU 11:45

High-power 0.33 mW broadband THz source driven by an ultrafast Yb-based thin-disk laser oscillator

•*J. Drs*[1], *N. Modsching*[1], *C. Paradis*[1], *C. Kränkel*[2], *V.J. Wittwer*[1], *O. Razskazovskaya*[1], *and T. Südmeyer*[1]; [1]*Université de Neuchâtel, Neuchâtel, Switzerland*; [2]*Leibniz-Institut für Kristallzüchtung, Berlin, Germany*

We show that Yb-based ultrafast thin-disk lasers are well-suited for high-power broadband THz generation in GaP, demonstrating 0.33 mW of average THz power with spectrum extending to 5 THz at 48 MHz repetition rate.

ROOM 2 Hall A1

CF-10.5 THU 11:30

Active f-to-$2f$ interferometer for carrier-envelope phase locking

•*G. Steinmeyer*[1], *R. Liao*[2], *Y. Song*[2], *and M. Hu*[2]; [1]*Max-Born-Institut, Berlin, Germany*; [2]*Tianjin University, Tianjin, China*

We report that introduction of optical gain into an f-$2f$ interferometer can boost signal-to-noise ratios in CEP stabilization by up to 20dB. This finding opens an avenue for previously unstabilizable mode-locked lasers, including thin-disk lasers and high-repetition rate sources.

CF-10.6 THU 11:45

Towards a CEP-stable 10-mJ-level mid-IR OPCPA at 7 μm

•*U. Elu*[1], *D. Sánchez*[1], *T. Steinle*[1], *K. Zawilski*[2], *P. G. Schunemann*[2], *G. Matras*[3], *C. Simon-Boisson*[3], *and J. Biegert*[1,4]; [1]*ICFO - The Barcelona Institute of Science and Technology, 08860 Castelldefels, Barcelona, Spain*; [2]*BAE Systems, New Hampshire 03061, USA*; [3]*THALES Optronique S.A.S., 78995 Elancourt Cedex, France*; [4]*ICREA, 08010 Barcelona, Spain, Spain*

We present 0.7 mJ, femtosecond 7 μm OPCPA pumped by 2 μm Ho:YLF CPA delivering 260 mJ at 100 Hz. We show the generation of HHG in ZnSe expanding from 530 nm to 2400 nm.

ROOM 3 Hall A1

CG-7.2 THU 11:30

Electron Wavefunctions Probed by All-Optical Attosecond Interferometry

•*M. Krüger*[1], *D. Azoury*[1], *O. Kneller*[1], *B.D. Bruner*[1], *A. Clergerie*[2], *B. Fabre*[2], *B. Pons*[2], *Y. Mairesse*[2], *and N. Dudovich*[1]; [1]*Weizmann Institute of Science, Rehovot, Israel*; [2]*University of Bordeaux - CELIA-CEA-CNRS, Bordeaux, France*

We measure the absolute phase difference of the harmonic emission of Ar, Ne and He atoms using XUV interferometry, providing a direct insight into electron scattering, structural phase jumps and multi-electron resonances of atomic systems.

CG-7.3 THU 11:45

High harmonic cross-correlation between two channels of a parametric waveform synthesizer

•*G.M. Rossi*[1,2], *R.E. Mainz*[1,2], *Y. Yang*[1,2], *F. Scheiba*[1,2], *M.A. Silva-Toledo*[1,2], *G. Cirmi*[1,2], *and F.X. Kärtner*[1,2]; [1]*Center for Free-Electron Laser Science, Hamburg, Germany*; [2]*Physics Department and The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

High-harmonics are generated during the cross-correlation of the pulses from two channels of a parametric waveform synthesizer. During a delay scan we observe both continuum generation close to time-zero and streaking-like perturbations for large delays.

ROOM 1 ICM

14:00 – 15:30

CJ-13: Raman and NIR fiber lasers

Chair: Bülend Ortaç, UNAM - Bilkent University, Bilkent, Turkey

CJ-13.1 THU (Invited) 14:00

Diode-pumped multimode Raman fiber lasers

•*S.A. Babin*; *Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; *Novosibirsk State University, Novosibirsk, Russia*

We review the results on all-fiber diode-pumped Raman lasers based on graded-index fibers enabling beam quality improvement via specific transverse structure of Raman gain, fs-inscribed fiber Bragg gratings and Rayleigh backscattering employed for cavity feedback.

ROOM 4a ICM

14:00 – 15:30

EH-5: Nonlinear metasurfaces and plasmonics

Chair: Timur Shegai, Chalmers University of Technology, Göteborg, Sweden

EH-5.1 THU 14:00

The contribution has been withdrawn.

EH-5.2 THU 14:15

Ultra-Fast Laser Printing of IR-resonant Plasmonic Metasurfaces

•*M. Lapine*[1], *D. Pavlov*[2], *A. Porfirev*[3], *and A. Kuchmizhak*[2]; [1]*University of Technology Sydney, Sydney, Australia*; [2]*Far Eastern Federal University, Vladivostok, Russia*; [3]*Samara National Research University, Samara, Russia*

We report on ultra-fast fabrication of patterned plasmonic metasurfaces, suitable for production of controllable resonances in the infrared range, and explain the observed resonances by analysing plasmonic features of these structures.

ROOM 4b ICM

14:00 – 15:30

EC-3: Lasing and driven dissipative topological systems

Chair: Laura Pilozzi, Institut for complex systems, CNR, Roma, Italy

EC-3.1 THU 14:00

Topological and geometrical effects in the bulk Hall response of driven-dissipative photonic lattices

•*T. Ozawa*[1] *and I. Carusotto*[2]; [1]*RIKEN iTHEMS, Saitama, Japan*; [2]*INO-CNR BEC Center and University of Trento, Povo, Italy*

We discuss how an analog of the quantum Hall effect appears in driven-dissipative photonic lattices. This analog quantum Hall effect can be used to detect the topological and geometrical properties of photonic lattices.

EC-3.2 THU 14:15

Observation of photonic Landau levels in strained honeycomb lattices

•*O. Jamadi*[1], *E. Rozas*[2], *M. Milićević*[3], *G. Salerno*[4], *T. Ozawa*[5], *I. Carusotto*[6], *L. Le Gratiet*[3], *I. Sagnes*[3], *A. Lemaître*[3], *A. Harouri*[3], *J. Bloch*[3], *and A. Amo*[1]; [1]*Laboratoire de Physique des Lasers, Atomes et Molécules, Lille, France*; [2]*Dept. Física de Materiales & Inst. Nicolás Cabrera, Madrid, Spain*; [3]*Centre de Nanosciences et de Nanotechnologies, Palaiseau, France*; [4]*Center for Nonlinear Phenomena and Complex Systems, Brussels, Belgium*; [5]*Interdisciplinary Theoretical and Mathematical Sciences Program, Saitama, Japan*; [6]*Center and Dipartimento di Fisica, Povo, Italy*

In this work, we implement unidirectional strain in polariton honeycomb lattices to generate strong pseudo-magnetic fields and study the associate photonic Landau levels by combining real and reciprocal space photoluminescence experiments.

ROOM 5 ICM

14:00 – 15:30

EB-7: Colour centres and novel sources

Chair: Simone Luca Portalupi, Universtät Stuttgart, Stuttgart, Germany

EB-7.1 THU (Invited) 14:00

Multi-qubit registers of individually addressable solid-state defect centers

•*E. Bersin*[1], *M. Walsh*[1], *S. Mouradian*[1], *M. Trusheim*[1], *K. Chen*[1], *T. Schröder*[2], *and D. Englund*[1]; [1]*Massachusetts Institute of Technology, Cambridge, USA*; [2]*Humboldt University of Berlin, Berlin, Germany*

Medium-scale qubit ensembles offer a platform for quantum technologies and many-body physics. We demonstrate individual control and readout on such an ensemble formed from solid-state defect centers. We further discuss scalable creation of such clusters.

ROOM 13a ICM

14:00 – 15:30

CB-10: Semiconductor laser dynamics

Chair: Jesper Mørk, Technical University of Denmark, Copenhagen, Denmark

CB-10.1 THU 14:00

Temporal Localized Structures in mode-locked Vertical External-Cavity Surface-Emitting Lasers

P. Camelin[1], *C. Schelte*[2,3], *A. Verschelde*[1], *A. Garnache*[4], *G. Beaudoin*[5], *I. Sagnes*[5], *G. Huyet*[1], *J. Javaloyes*[2], *S. Gurevich*[3], *and* •*M. Giudici*[1]; [1]*Univ. Côte d'Azur, CNRS, Inst. de Physique de Nice UMR 7010, Valbonne, France*; [2]*Departament de Fisica, Univ. de les Illes Balears, Palma de Mallorca, Spain*; [3]*Inst. for Theoretical Physics, Univ. of Münster, Münster, Germany*; [4]*Inst. d'Electronique et des Systèmes UMR 5214, CNRS, Univ. of Montpellier, Montpellier, France*; [5]*Centre de Nanosciences et de Nanotechnologies, C2N UMR 9001, CNRS, Univ. Paris Sud, Univ. Paris-Saclay, Palaiseau, France*

A mode-locked VECSEL is designed to operate in the regime of localized structures which enables reconfigurable multi-pulses emission and arbitrary low rates. VECSEL resonator is self-imaging, thus opening the way towards dissipative light-bullets.

CB-10.2 THU 14:15

Breaking the limit of laser chaos bandwidth using phase conjugate feedback

•*G. Bouchez*[1,2], *D. Wolfersberger*[1,2], *and M. Sciamanna*[1,2]; [1]*Chaire photonique, LMOPS EA-4423 Laboratory, CentraleSupélec and Université Paris-Saclay, 57070 Metz, France*; [2]*Chaire photonique, LMOPS EA-4423 Laboratory, CentraleSupélec and Université de Lorraine, 57070 Metz, France*

A laser diode with phase-conjugate feedback can generate high frequency dynamics. Experimen-

ROOM 13b ICM

14:00 – 15:30

CD-11: Nonlinear application at extreme wavelengths

Chair: Gregor Knopp, Paul Scherrer Institute, Villingen, Switzerland

CD-11.1 THU (Invited) 14:00

XUV Free Electron Laser based Nonlinear Optics

•*C. Masciovecchio*; *Elettra Sincrotrone Trieste, Trieste, Italy*

XUV Free Electron Laser based wave mixing experiments such as second harmonic generation and four wave mixing experiments will be discussed.

ROOM 14a ICM

14:00 – 15:30

EG-5: Emission control at the nanoscale

Chair: Thomas Volz, Macquarie University of Sydney, Australia

EG-5.1 THU (Invited) 14:00

The Next Generation of Quantum Emitters?

•*D. Norris*; *ETH Zurich, Zürich, Switzerland*

We will discuss recent work to create a new generation of quantum emitters for nanophotonics. Semiconductor nanocrystals have been developed that are significantly brighter and provide much narrower fluorescence linewidths than conventional quantum dots.

ROOM 14b ICM

14:00 – 15:30

CH-12: Spectroscopic sensing

Chair: Stephen James, Cranfield University, Bedfordshire, United Kingdom

CH-12.1 THU 14:00

Field-resolved infrared spectroscopy of biological samples

•*I. Pupeza*[1,2], *M. Huber*[2], *M. Trubetskov*[1], *W. Schweinberger*[2,3], *S.A. Hussain*[2], *C. Hofer*[1,2], *K. Fritsch*[2], *L. Vamos*[2], *N. Karpowicz*[1], *V. Pervak*[1,2], *O. Pronin*[1,2], *A. Azzeer*[3], *M. Zigman*[1,2], *and F. Krausz*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*Ludwig Maximillians University Munich, Garching, Germany*; [3]*King Saud University, Riyadh, Saudi Arabia*

We discuss how recent advances in the generation and electric-field-resolved detection of broadband, coherent mid-infrared pulses afford molecular fingerprinting of aqueous biological samples sub-μm/ml sensitivity and >5 orders of magnitude of molecular concentration dynamic range.

CH-12.2 THU 14:15

Spectral Superresolution in Fourier Transform InfraRed (FTIR) spectroscopy

•*E. Lifshitz, U. Arieli, S. Katz, A. Levanon, M. Mrejen, and H. Suchowski*; *Tel Aviv University, Tel Aviv, Israel*

We introduce a novel method to achieve high spectral resolution in a compact FT-IR spectrometer. In the superresolution FTIR, demonstrated in simulation and experiment, interferograms are stitched to effectively increase its size and yield higher spectral resolution.

ROOM Osterseen ICM

14:00 – 15:30

EF-9: Solitons and their applications

Chair: Frank Setzpfandt, Friedrich Schiller University, Jena, Germany

EF-9.1 THU (Invited) 14:00

Experimental demonstration and numerical study of plasmon-soliton waves

•*G. Renversez*[1], *M. Elsawy*[1], *M. Chauvet*[2], *T. Kuriakose*[2], *T. Halenkovic* [3], *V. Nazabal*[4], *and P. Nemec*[3]; [1]*Aix-Marseille Univ, CNRS, Institut Fresnel, Marseille, France*; [2]*FEMTO-ST Institute, CNRS, Université de Bourgogne Franche-Comté, Besançon, France*; [3]*Department of Graphic Arts and Photophysics, Faculty of chemical Technology, University of Pardubice, Pardubice, Czech Republic*; [4]*Institut des sciences chimiques de Rennes, CNRS, Equipe Verres et Céramiques, Université de Rennes 1, Rennes, France*

We present the first experimental observation of plasmon-soliton waves. The demonstration, backed by numerical simulations, is performed in a chalcogenide-based multilayered waveguide, with gold structures, designed to limit propagation losses while exhibiting efficient Kerr self-focusing at moderate power.

ROOM 1 Hall A1

14:00 – 15:30

CC-7: CW THz systems and spectroscopy

Chair: Wolfgang Freude, KIT, Karlsruhe, Germany

CC-7.1 THU 14:00

Continuous wave THz source based on an electrically tunable monolithic two-color semiconductor diode laser

•*J.O. Gwaro*[1], *C. Brenner*[1], *B. Sumpf*[2], *A. Klehr*[2], *J. Fricke*[2], *and M.R. Hofmann*[1]; [1]*Lehrstuhl für Photonik und Terahertztechnologie, Ruhr Universität Bochum, Bochum, Germany*; [2]*Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

A monolithically integrated two-color distributed Bragg reflector (DBR) semiconductor laser emitting at 785 nm together with fiber coupled ion-implanted gallium Arsenide (GaAs) photoconductive antennas is used as coherent CW THz source.

CC-7.2 THU 14:15

THz transceiver with 6.5 THz bandwidth

•*R.B. Kohlhaas, S. Nellen, L. Liebermeister, S. Breuer, M. Schell, and B. Globisch*; *Fraunhofer Heinrich Hertz Institute, Berlin, Germany*

An integrated THz transceiver for THz time-domain spectroscopy in reflection geometry is presented. With 6.5 THz bandwidth and 80 dB dynamic range, the transceiver is very well suited for many applications in non-destructive testing.

ROOM 2 Hall A1

14:00 – 15:30

CF-11: XUV generation and characterisation

Chair: Chuncheng Wang, ETH Zurich, Zurich, Switzerland

CF-11.1 THU (Invited) 14:00

Realization of Polarization Control in High-order Harmonic Generation

P.-C. Huang[1], *P.-Y. Huang*[1], *K.-Y. Chang*[1], *and* •*M.-C. Chen*[1,2]; [1]*Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan*; [2]*Department of Physics, National Tsing Hua University, Hsinchu, Taiwan*

I will present the recent breakthrough that by adjusting the ellipticity of counter-rotating polarized few-cycle pulses for non-collinear high order harmonic generation, we obtain full control of polarization states of isolated high harmonic pulses.

ROOM 3 Hall A1

14:00 – 15:30

CG-8: Harmonic generation and spectroscopy

Chair: Matteo Lucchini, Politecnico di Milano, Milano, Italy

CG-8.1 THU 14:00

High harmonic generation in arrays of CdSe quantum dots

•*D. Kartashov*[1,2], *R. Hollinger*[1,2,3], *V. Schumakova*[4], *A. Schleusener*[5,6], *C. Reichardt*[5,6], *J. Irrek*[1], *A. Baltuska*[4], *A. Pugzlys*[4], *M. Wächtler*[5,6], *and C. Spielmann*[1,2,3]; [1]*Institute of Optics and Quantum Electronics, Jena, Germany*; [2]*Abbe Center of Photonics, Jena, Germany*; [3]*Helmholtz Institute Jena, Jena, Germany*; [4]*Photonics Institute, Vienna, Austria*; [5]*Leibniz Institute of Photonic Technology, Jena, Germany*; [6]*Institute of Physical Chemistry, Jena, Germany*

We report on results of experimental investigation on high order harmonic generation in semiconductor quantum dots, resembling an intermediate system between gaseous and condensed matter.

CG-8.2 THU 14:15

Comparative study of high order harmonic generation in monolayer-thick semiconductors

•*R. Hollinger*[1,2,3], *V. Shumakova*[4], *A. George*[5], *Z. Tang*[5], *C. Spielmann*[1,2,3], *A. Baltuska*[4], *A. Pugzlys*[4], *A. Turchanin*[5], *and D. Kartashov*[1,2]; [1]*Institute of Optics and Quantum Electronics, Jena, Germany*; [2]*Abbe Center of Photonics, Jena, Germany*; [3]*Helmholtz Institute Jena, Jena, Germany*; [4]*Photonics Institute, Vienna, Austria*; [5]*Institute of Physical Chemistry, Jena, Germany*

We report on results of comparative experimental study on the dependence of high order harmonic generation on the intensity, polarization and the angle of incidence in different single atomic layer semiconductors.

ROOM 1 ICM

CJ-13.2 THU 14:30

Raman-free switching between dissipative soliton resonances in fiber figure of eight laser

•*A. Kokhanovskiy*[1], *E. Kuprikov*[1], *A. Ivanenko*[1], *S. Smirnov*[1], *S. Kobtsev*[1], *and S. Turitsyn*[1,2]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

We demonstrate a switching between different dissipative soliton resonances (DSR) inside figure of eight laser with two independently pumped amplifying fibers. Laser provides four Raman-free DSR with peak power range from 50 to 300 W.

CJ-13.3 THU 14:45

Achieving high-power, ultra-high spectral purity cascaded Raman fiber lasers through low intensity-noise pump sources

•*V. Balaswamy, B.S. Vikram, P. Raj, H. M R, D. Nair, and V.R. Supradeepa*; *Centre for Nano Science and Engineering, Indian Institute of Science, Bengaluru, India*

We investigate recently proposed role of pump intensity noise on output spectral purity of cascaded Raman fiber lasers. We demonstrate >97% in-band power ratio from 1.1 to 1.5μm based on high-power phase-modulated narrow-linewidth pump laser.

ROOM 4a ICM

EH-5.3 THU 14:30

Second-harmonic generation in monolithic lithium niobate metasurfaces

L. Carletti[1,2,3], *C. Li*[1,4], *J. Sautter*[5], *I. Staude*[5], *C. De Angelis*[2], *T. Li*[4], *and* •*D. Neshev*[1]; [1]*Australian National University, Canberra, Australia*; [2]*University of Brescia, Brescia, Italy*; [3]*University of Padova, Padova, Italy*; [4]*Nanjing University, Najing, China*; [5]*Friedrich Schiller University of Jena, Jena, Germany*

We propose a new design concept for second-order nonlinear metasurfaces on a monolithic lithium niobate substrate. For z-cut orientation, we predict efficiency of 10^{-5} for second-harmonic generation in the blue spectral region.

EH-5.4 THU 14:45

Third-harmonic imaging with all-dielectric nonlinear metalenses

•*C. Schlickriede*[1], *S. Kruk*[2], *L. Wang*[2], *B. Sain*[1], *Y. Kivshar*[2], *and T. Zentgraf*[1]; [1]*Paderborn University, Paderborn, Germany*; [2]*Nonlinear Physics Centre, Canberra, Australia*

Image formation with highly efficient all-dielectric metalenses for THG is investigated experimentally and described analytically with a generalized lens equation. Thereby, we study spatial information crosstalk originating from the nonlinear nature of the effect.

ROOM 4b ICM

EC-3.3 THU (Invited) 14:30

Topological Insulator Laser

•*M.A. Bandres*[1,2], *S. Wittek*[2], *G. Harari*[1], *M. Parto*[2], *J. Ren*[2], *M. Segev*[1], *D.N. Christodoulides*[2], *and M. Khajavikhan*[2]; [1]*Technion, Haifa, Israel*; [2]*CREOL, Univeristy of Central Florida, Orlando, USA*

We demonstrate a nonmagnetic topological insulator laser exhibiting topologically-protected transport. The topological properties of the system give rise to single mode lasing, robustness against fabrication defects, and higher slope efficiencies compared to its trivial counterpart.

ROOM 5 ICM

EB-7.2 THU 14:30

Femtosecond Laser Inscription of Integrated Diamond Quantum Photonics for Quantum Information and Sensing

•*V. Bharadwaj*[1], *J.P. Hadden*[2], *M. Ramos Vázquez*[3], *A.N. Giakoumaki*[1], *O. Jedrkiewicz*[4], *R. Giri*[5], *F. Gorrini*[5], *L. Basso*[5], *B. Sotillo*[1], *T. Le Phu*[1], *P.E. Barclay*[2], *R. Ramponi*[1], *A. Bifone*[5], *and S.M. Eaton*[1]; [1]*Istituto di Fotonica e Nanotecnologie-Consiglio Nazionale delle Ricerche (IFN-CNR) and Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*; [2]*Institute for Quantum Science and Technology, University of Calgary, Calgary, Canada*; [3]*Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore*; [4]*Istituto di Fotonica e Nanotecnologie, CNR-IFN and, Università dell'Insubria Department of Science and High Technology, Como, Italy*; [5]*Center for Neuroscience and Cognitive Systems, Istituto Italiano di Tecnologia, Rovereto, Italy*

We present the use of femtosecond laser writing to create photonic networks coupled with laser written single Nitrogen Vacancy(NV) centers for quantum information and ensemble NVs for high sensitivity field sensing applications in bulk diamond.

EB-7.3 THU 14:45

Fabrication of High Quality Quantum Emitters in Diamond Nanostructures

•*M. Walsh*[1], *E. Bersin*[1], *S. Mouradian*[2], *N. Wan*[1], *and D. Englund*[1]; [1]*MIT, Cambridge, USA*; [2]*University of California Berkeley, Berkeley, USA*

We demonstrate an autonomous alignment technique enabling fabrication of devices registered to emitters. This technique has revealed that nitrogen implantation to create nitrogen-vacancy centers at a precise depth does not produce desirable optical properties.

ROOM 13a ICM

tal and numerical studies demonstrate the chaos bandwidth is limited by filtering effect in the phase-conjugation but does not depend on the delay.

CB-10.3 THU 14:30

Spatio-temporal dynamics of microlasers with chaotic ray dynamics

•*S. Bittner*[1,2], *S. Guazzotti*[3], *Y. Zeng*[4], *K. Kim*[1], *Q.J. Wang*[4], *O. Hess*[3], *and H. Cao*[1]; [1]*Department of Applied Physics, Yale University, New Haven, USA*; [2]*Chaire Photonique, LMOPS, CentraleSupélec, University Paris-Saclay, Metz, France*; [3]*Department of Physics, Imperial College, London, United Kingdom*; [4]*School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, Singapore*

We show experimentally that the spatio-temporal instabilities common to broad-area semiconductor lasers are strongly suppressed in microcavities with chaotic ray-dynamics. This stabilization of the dynamics results from complex wave interference in a wave-chaotic microcavity.

CB-10.4 THU 14:45

Reservoir computing using VCSEL polarization dynamics

•*J. Vatin*[1,2], *D. Rontani*[1,2], *and M. Sciamanna*[1,2]; [1]*Chaire Photonique, LMOPS EA-4423 Laboratory, CentraleSupelec and Universite Paris-Saclay, Metz, France*; [2]*Chaire Photonique, LMOPS EA-4423 Laboratory, CentraleSupelec and Universite Lorraine, Metz, France*

We design a reservoir computer made of a VCSEL with time-delayed feedback and optical injection. Experiments confirm that the VCSEL polarization dynamics enhances the computational performance on chaos prediction and channel equalization.

ROOM 13b ICM

CD-11.2 THU 14:30

Efficient 2-W Average Power 206 nm Deep-UV Generation from 100-kHz Picosecond Pulses

B. Willenberg, •*F. Brunner, C.R. Phillips, and U. Keller*; *Departement of Physics, ETH Zurich, Zurich, Switzerland*

We present a 100-kHz all-solid-state deep-ultraviolet source delivering 206 nm few-picosecond pulses with 2-W average power based on non-collinear sum frequency generation, which features high conversion efficiency by pulse front tilt matching and beam flattening.

CD-11.3 THU 14:45

A 12.6 – 15 μm Mid-IR Source Based on Difference Frequency Generation in Orientation-Patterned GaAs

•*M.K. Shakfa*[1], *M. Lamperti*[2], *D. Gatti*[2], *M. Marangoni*[2], *and A. Farooq*[1]; [1]*King Abdullah University of Science and Technology (KAUST), Clean Combustion Research Center (CCRC), Thuwal 23955-6900, Saudi Arabia*; [2]*Politecnico di Milano, Department of Physics and IFN-CNR, Via G. Previati 1/C, 23900 Lecco, Italy*

A broadly tunable mid-IR laser source, scanning over 12.65 – 15 μm with an output power up to 55 μW, has been developed based on difference-frequency generation in an orientation-patterned GaAs crystal.

ROOM 14a ICM

EG-5.2 THU 14:30

Scanning Resonant Nano-antenna High Resolution Imaging and Emission Control of hBN Defect Photon Emission

•*N. Palombo Blascetta*; *ICFO, Casteldefels, Spain*

First systematic coupling and imaging of hBN defects with resonant optical antennas, nanometer control and optical resolution of 45 nm. Nano-antennas manipulation of hBN defects by emission depletion of 30-70% and maximum lifetime reduction of 2x.

EG-5.3 THU 14:45

Extreme multiexciton emission from deterministically assembled single emitter subwavelength plasmonic patch antenna

A. Dhawan[1], *J.-U. Esparza-Vila*[1], *M. Nasilowski*[2], *L. Coolen*[1], *B. Dubertret*[2], *P. Senellart*[3], *and* •*A. Maitre*[1]; [1]*Institut des NanoSciences, Sorbonne Universite, Paris, France*; [2]*Laboratoire Photon et matiere, ESPCI, Paris, France*; [3]*Centre de Nanosciences et de nanotechnology, Palaiseau, France*

We position deterministically a single CdSe/CdS colloidal quantum dot in the center of a patch antenna.. Thanks to high Purcell factor, it becomes very bright, efficient : multiexcitonic radiative recombination becomes competitive with auger one

ROOM 14b ICM

CH-12.3 THU 14:30

Probing Molecules next to Surfaces

J. Lukusa Mudiayi[1], *T. Mashimo*[1,2], *I. Maurin*[1], *D. Bloch*[1], *B. Darquié*[1], *and* •*A. Laliotis*[1]; [1]*Laboratoire de Physique des Lasers, UMR7538 CNRS, Université Paris13, Sorbonne Paris-Cité, Villetaneuse, France*; [2]*Department of Physics, Chuo University, Tokyo, Japan*

We present high-resolution reflection spectroscopy of a micrometric molecular gas layer next to a surface. Our measurements offer spectroscopic information on SF6 rovibrational transitions and allow compact molecular spectroscopy and measurements of the molecule-surface interaction.

CH-12.4 THU 14:45

Spectral Ghost Imaging for Spectroscopy and Optical Coherence Tomography

•*C.G. Amiot*[1], *P. Ryczkowski*[1], *A.T. Friberg*[2], *J.M. Dudley*[3], *and G. Genty*[1]; [1]*Laboratory of Photonics, Physics Unit, Tampere University, Tampere, Finland*; [2]*University of Eastern Finland, Institute of Photonics, Joensuu, Finland*; [3]*Institut FEMTO-ST, UMR 6174 CNRS - Université Bourgogne Franche-Comté, Besançon, France*

We demonstrate, for the first time, ghost imaging in the spectral domain using an incoherent supercontinuum source with large shot-to-shot spectral fluctuations. We apply the technique to broadband absorption spectroscopy and optical coherence tomography.

ROOM Osterseen ICM

EF-9.2 THU 14:30

Self-written Y-junctions using spatial solitons

•*A. Alberucci*[1], *C.P. Jisha*[1], *J. Beeckman*[2], *F. Van Acker*[2], *K. Neyts*[2], *and S. Nolte*[1,3]; [1]*Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Ghent University, Gent, Belgium*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We experimentally observed the spontaneous formation of soliton-based Y-junctions in nematic liquid crystals excited by a bell-shaped beam. A theoretical explanation based upon the interplay between a focusing and a defocusing nonlinearity is provided.

EF-9.3 THU 14:45

Buildup of noise-like pulses in ultrafast fiber lasers

•*N. Kanagaraj*[1,2], *Z. Wang*[1,3], *A. Coillet*[1], *P.-T. Dinda*[1], *and P. Grelu*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS, Université Bourgogne Franche-Comté, Dijon, France*; [2]*UFE Institute of Photonics and Electronics, Prague, Czech Republic*; [3]*Nanjing University of Posts and Telecommunications,, Nanjing, China*

We resolve experimentally the build-up of noise-like pulses in a passively mode-locked fiber laser, for both anomalous and normal dispersion cases, using the time-stretch real-time spectral recording. Universal features and specific transition stages are highlighted.

ROOM 1 Hall A1

CC-7.3 THU 14:30

Room-temperature CW widely-tunable THz-generating laser

•*K.A. Fedorova, H. Guoyu, C. Kriso, F. Zhang, W. Stolz, and A. Rahimi-Iman*; *Philipps-Universität Marburg, Marburg, Germany*

We demonstrate a room-temperature, CW, tunable THz-generating laser in the 0.8–1.1THz spectral region. The laser source is based on intracavity frequency conversion in an aperiodically-poled lithium niobate crystal within a dual-wavelength semiconductor disk laser.

CC-7.4 THU 14:45

Realtime coherent cw THz system: Phase modulation without phase modulator

•*L. Liebermeister, S. Nellen, R.B. Kohlhaas, S. Breuer, M. Schell, and B. Globisch*; *Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, Berlin, Germany*

A new continuous wave THz detection paradigm is presented, exploiting the intrinsic phase modulation of fast-tunable cw THz systems. This allows to eliminate active phase modulation while preserving phase-sensitive detection.

ROOM 2 Hall A1

CF-11.2 THU 14:30

A compact tunable narrow-bandwidth and high-photon-flux turnkey XUV source for experiments with highly charged ions at storage rings

•*V. Hilbert*[1], *M. Tschernajew*[1,2], *R. Klas*[1,2], *J. Limpert*[1,2,3], *and J. Rothhardt*[1,2]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Helmholtz Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

In our experiment HHG-radiation is created in Argon and subsequently analyzed. At 26.5eV an energy bandwidth of ΔE/E=7.5·10E-4 is achieved. Merging of the XUV source with a heavy ion storage ring is presented in detail.

CF-11.3 THU 14:45

Single shot temporal characterization of SASE XUV FEL Pulses

•*R. Ivanov*[1], *I. Bermudez*[1], *G. Brenner*[1], *J. Liu*[2], *and S. Düsterer*[1]; [1]*Deutsches Elektronen Synchrotron - DESY, Hamburg, Germany*; [2]*European XFEL, Schenefel, Germany*

Terahertz-field-driven streaking is a powerful tool for measuring on a single-shot base free-electron laser (FEL) SASE pulses providing pulse duration and arrival time information with around 10 fs resolution for each single FEL pulse.

ROOM 3 Hall A1

CG-8.3 THU 14:30

Attosecond Soft-X-Ray Spectroscopy in a transition metal dichalcogenide

B. Buades[1], *I. Leon*[1], •*N. Di Palo*[1], *D.E. Rivas*[1,2], *T.P.H. Sidiropoulos*[1], *S. Severino*[1], *M. Reduzzi*[1], *S.L. Cousin*[1], *M. Hemmer*[1], *C. Cocchi*[3], *E. Pellegrin*[4], *J. Herrero Martin*[4], *S. Mañas-Valero*[5], *E. Coronado*[5], *T. Danz*[6], *C. Draxl*[3], *M. Uemoto*[7], *K. Yabana*[7], *M. Schultze*[8], *S. Wall*[1], *A. Picon*[1,9], *and J. Biegert*[1,10]; [1]*ICFO-Inst. de Ciencies Fotoniques, The Barcelona Inst. of Science and Technology, Castelldefels, Spain*; [2]*European XFEL GmbH, Schenefeld, Germany*; [3]*Inst. für Physik and IRIS Adlershof, Berlin, Germany*; [4]*ALBA Synchrotron Light Source, Cerdanyola del Vallés, Spain*; [5]*Inst. de Ciencia Molecular (ICMol), Paterna, Spain*; [6]*4th Physical Inst. - Solids and Nanostructures, Göttingen, Germany*; [7]*Center for Computational Sciences, Tsukuba, Japan*; [8]*Fakultät für Physik, LMU, Garching, Germany*; [9]*Depart. de Química, Univ. Autónoma, Madrid, Spain*; [10]*ICREA, Barcelona, Spain*

We exploit temporal resolution and spectral sensitivity of attosecond soft X-ray spectroscopy to follow petahertz carrier motion in semi- metallic TiS2. The results demonstrate the high mobility and significant carrier injection in the material.

CG-8.4 THU 14:45

Breakdown of the quasi-1D nature of Black phosphorus in Non-perturbative Higher harmonic generation

•*K. Uchida*[1], *V. Pareek*[2], *K. Nagai*[1], *K. Dani*[2], *and K. Tanaka*[1]; [1]*Dep. of Physics, Kyoto Univ., Kyoto, Japan*; [2]*Femtosecond Spectroscopy Unit, Okinawa Inst. of Science & Techn. Graduate Univ., Okinawa, Japan*

We observed higher harmonic generation from thin-layer black phosphorus, which shows quasi-one dimensional nature in transport and liner optical properties. The crystal orientation dependence shows large deviation from that is expected in quasi-one dimensional system.

ROOM 1 ICM

CJ-13.4 THU 15:00

29 W diffraction limited monolithic ytterbium doped fiber laser system operating at 976 nm in the continuous wave regime

•*N. Valero*[1], *C. Feral*[1], *J. Lhermite*[1], *S. Petit*[1], *R. Royon*[1], *Y. Bardin*[2], *J. Boullet*[2], *A. Proulx*[3], *Y. Taillon*[3], *and E. Cormier*[1]; [1]*CNRS-Centre Laser Intense et Applications (CELIA), Talence , France*; [2]*ALPhANOV - Institut d'Optique d'Aquitaine (IOA), Talence, France*; [3]*Institut National d'Optique (INO), Québec, Canada*

We report an all-fiber MOPA system emitting up 29 W in continuous wave regime at 976 nm. This laser is built around a specially designed Large Mode Area Ytterbium doped fiber.

CJ-13.5 THU 15:15

High slope efficiency and high power 813-nm Tm3+:ZBLAN fiber MOPA for the lattice laser of Sr optical lattice clock

•*E. Kajikawa*[1], *T. Ishiii*[1], *T. Kubo*[1], *K. Ogawa*[2], *and M. Musha*[1]; [1]*Institute for Laser Science, University of Electro-Communications, 1-5-1 Chofugaoka, Chofushi, Tokyo 182-8585, Japan*; [2]*FiberLabs Inc. KDDI Research building, 2-1-15 Ohara, Fujimino-shi, Saitama 356-8052, Japan*

Photodarkening-free Tm:ZBLAN fiber MOPA generated the maximum output power of 1.95 W with the slope efficiency of 48%, which is the highest output power at around 810 nm fiber laser sources.

ROOM 4a ICM

EH-5.5 THU (Invited) 15:00

Giant nonlinear response at a plasmonic nanofocus drives efficient four wave mixing over micron length scales

•*R. Oulton, N. Gusken, M. Nielsen, X. Shi, P. Dichtl, and S. Maier*; *Imperial College London, London, United Kingdom*

We demonstrate four wave mixing in an integrated plasmonic gap waveguide on silicon that strongly confines light within a nonlinear organic polymer. We report >1% signal to idler conversion efficiency over micron-scale interaction lengths.

ROOM 4b ICM

EC-3.4 THU 15:00

The contribution has been withdrawn.

EC-3.5 THU 15:15

Topological protection of defect states from semi-chiral symmetry in a photonic Lieb lattice

M. Bellec[1], *U. Kuhl*[1], *H. Schomerus*[2], *and* •*F. Mortessagne*[1]; [1]*Institut de Physique de Nice, Université Côte d'Azur, CNRS, Nice, France*; [2]*Department of Physics, Lancaster University, Lancaster, United Kingdom*

We propose a microwave realization of a dimerized Lieb lattice with a natural reduction of chiral symmetry, which gives rise to topologically protected spectrally zero-mode, and also demonstrate topological mode selection via sublattice-staggered absorption.

ROOM 5 ICM

EB-7.4 THU 15:00

Electrically Driven Single-Photon Sources Based on Color Centers in Silicon Carbide: Pursuing Gigacount-per-Second Emission Rates

•*D. Fedyanin, I. Khramtsov, and A. Vyshnevyy*; *Moscow Institute of Physics and Technology, Dolgoprudny, Russia*

We reveal the physics behind the process of single-photon emission from color centers in SiC under electrical pumping and show how to increase the brightness of SiC single-photon emitting diodes by four orders of magnitude.

EB-7.5 THU 15:15

Planar Optical Antennas as Efficient Single-Photon Sources for Free-Space and Fiber-Based Operation in Quantum Optics and Metrology

•*P. Lombardi*[1,2], *H. Schauffert*[3], *M. Colautti*[2], *S. Pazzagli*[2], *M. Agio*[4], *and C. TOninelli*[1,2]; [1]*CNR-INO, Firenze, Italy*; [2]*LENS and Dip. di Fisica, Università di Firenze, Firenze, Italy*; [3]*Atominstitute, TU Wien, Wien, Austria*; [4]*Laboratory of Nano-Optics, University of Siegen, Siegen, Germany*

We present a planar optical antenna design for the redirection of light from quantum emitters into a small solid angle around the polar axis, with overall losses smaller than 20%, and suitable for fiber coupling.

ROOM 13a ICM

CB-10.5 THU 15:00

Phase synchronization of monolithic dual DFB lasers for microwave photonics: experiment vs model

A. Thorette[1], •*M. Romanelli*[1], *F. Van Dijk*[2], *and M. Vallet*[1]; [1]*Univ Rennes, CNRS, Institut FOTON - UMR 6082, Rennes, France*; [2]*III-V Lab, a joint lab of Thales Research and Technology, Nokia Bell Labs France and CEA LETI, Palaiseau, France*

Phase synchronization of the beat-note of monolithic DFB lasers on a microwave reference using an optical loop is investigated, both numerically and experimentally. The influence of feedback phases and delay on the dynamics is studied.

CB-10.6 THU 15:15

Polarisation-resolved investigations of the pico- and nanosecond dynamics of broad area distributed Bragg reflector lasers under very high-current pulse excitation

•*A. Klehr, A. Liero, H. Wenzel, A. Zeghuzi, A. Maaßdorf, J. Fricke, and A. Knigge*; *Ferdinand-Braun-Institut,Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

We present detailed experimental and theoretical investigations of the polarization-resolved dynamic behaviors of single emitter broad area distributed Bragg reflector lasers under very high-current pulse excitation in the pico- and nanosecond range.

ROOM 13b ICM

CD-11.4 THU 15:00

Ultra-compact Low-noise Broadband Upconversion Detector at 6 μm

•*A. Barh, P. Tidemand-Lichtenberg, and C. Pedersen*; *DTU Fotonik, Technical University of Denmark, Roskilde, Denmark*

We present an ultra-compact low-noise mid-infrared (MIR: 6 - 6.8 μm) upconversion detector using an AgGaS2 crystal, placing inside a long-wavelength (than upconverted wavelength) diode pumped solid-state LASER cavity (1.03 μm) for broad-band MIR spectroscopy.

CD-11.5 THU 15:15

High-order harmonic analysis of anisotropic petahertz photocurrents in solids

•*A.A. Lanin*[1,3,4], *E.A. Stepanov*[1,3], *A.V. Mitrofanov*[1,3,5,6], *D.A. Sidorov-Biryukov*[1,3,5,6], *A.B. Fedotov*[1,3,4,5], *and A.M. Zheltikov*[1,2,3,4,5]; [1]*Physics Department, International Laser Center, M. V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Department of Physics and Astronomy, Texas A&M University, College Station TX, USA*; [3]*Russian Quantum Center, Moscow, Russia*; [4]*Kazan Quantum Center, A.N. Tupolev Kazan National Research Technical University, Kazan, Russia*; [5]*Kurchatov Institute National Research Center, Moscow, Russia*; [6]*Institute of Laser and Information Technologies, Russian Academy of Sciences, Shatura, Moscow Region, Russia*

We have shown that polarization maps of high-order harmonics from a zincblende-ZnSe crystal can serve to characterize vectorial properties of petahertz electron currents generated in the crystalline solid by an ultrashort optical driver

ROOM 14a ICM

EG-5.4 THU 15:00

Plasmon Based Suppression of Surface Trap States and Enhanced Band-edge Emission Rate in a Single CdTe Quantum Dot

•*A.M. Flatae*[1], *F. Tantussi*[2], *G.C. Messina*[2], *F. De Angelis*[2], *and M. Agio*[1,3]; [1]*Laboratory of Nano-Optics and Cμ, University of Siegen, Siegen, Germany*; [2]*Istituto Italiano di Tecnologia, Genova, Italy*; [3]*National Institute of Optics (INO), National Research Council (CNR), Florence, Italy*

A hybrid-quantum system of a quantum dot coupled to plamonic-nanocone provides enhanced band-edge emission and selective suppression of surface-states. The spontaneous emission rate is enhanced by more than two orders of magnitude by Purcell effect.

EG-5.5 THU 15:15

The contribution has been withdrawn.

ROOM 14b ICM

CH-12.5 THU 15:00

Broadband dual-comb spectroscopy of methane with a free-running erbium chip laser

•*P. Guay*[1], *N. Bourbeau Hébert*[1], *V. Michaud-Belleau*[1], *D. Lancaster*[2], *and J. Genest*[1]; [1]*Centre d'optique, photonique et laser, Université Laval, Québec, Québec, G1V 0A6, Canada*; [2]*Laser Physics and Photonics Devices Laboratory, Future Industries Institute, and School of Engineering, University of South Australia, Mawson Lakes, SA 5095, Australia*

Absorption lines in the R and Q branches of methane's overtone $2\nu 3$ were measured simultaneously with a broadband, simple, and compact spectrometer. The free-running mode-locked dual-comb laser is based on a single erbium-doped glass chip.

CH-12.6 THU 15:15

Achromatic interferometric subtraction of optical fields

•*T. Buberl*[1], *P. Sulzer*[2], *A. Leitenstorfer*[2], *F. Krausz*[1,3], *and I. Pupeza*[1,3]; [1]*Max-Planck-Institute of Quantum Optics, Garching, Germany*; [2]*Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*; [3]*Ludwig-Maximilians-Universität München, Garching, Germany*

We present a Mach-Zehnder-like interferometer capable of simultaneous super-octave (950-2100 nm) destructive interference with an intensity extinction of 4×10^{-4}. This enables differential spectroscopy with more than one order of magnitude higher sensitivity than traditional spectroscopy.

ROOM Osterseen ICM

EF-9.4 THU 15:00

Optical self-localization based upon the Pancharatnam-Berry phase

C.P. Jisha[1], •*A. Alberucci*[1], *J. Beeckman*[2], *and S. Nolte*[1,3]; [1]*Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Ghent University, Gent, Belgium*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We discuss light self-focusing and self-trapping based upon the Pancharatnam-Berry phase. Contrarily to the Kerr effect, the nonlinear tailoring of the wavefront is achieved by an intensity-driven manipulation of the polarization variations.

EF-9.5 THU 15:15

Pure-quartic solitons in the presence of quadratic dispersion

K. Tam, T. Alexander, A. Blanco-Redondo, and •*M. de Sterke*; *University of Sydney, Sydney, Australia*

We consider solitons with quadratic and quartic dispersion. We find a single family of solutions, encompassing, in the appropriate limits, conventional solitons and pure quartic solitons, which are promising for applications in ultrafast lasers.

ROOM 1 Hall A1

CC-7.5 THU (Invited) 15:00

Room-Temperature 1 to 7.5 THz Metrological Grade Terahertz Spectrometer

•*M. De Regis*[1], *L. Consolino*[1,2], *S. Bartalini*[1,2], *and P. De Natale*[1,2]; [1]*INO, Istituto Nazionale di Ottica-CNR, Largo E. Fermi 6, Florence, I-50125, Italy*; [2]*LENS, European Laboratory for Nonlinear Spectroscopy, Via N. Carrara 1, Sesto Fiorentino (FI), I-50019, Italy*

A continuous-wave terahertz (THz) spectrometer, referenced to the primary frequency standard and tunable from 1 to 7.5 THz is presented. Room-temperature detection and high-accuracy spectroscopy is demonstrated with a state-of-the-art accuracy of 10^-9.

ROOM 2 Hall A1

CF-11.4 THU 15:00

A spectrally resolved single-shot wavefront sensor for broadband high-harmonic generation sources

•*X. Liu*[1,2], *M. Jansen*[1,2], *A. de Beurs*[1,2], *K. Eikema*[1,2], *and S. Witte*[1,2]; [1]*Advanced Research Center for Nanolithography, Amsterdam, Netherlands*; [2]*Vrije Universiteit, Amsterdam, Netherlands*

We present a wavefront sensor that can characterise wavefronts of multiple extreme-ultraviolet high harmonics in a single exposure. We demonstrate its capabilities by measuring wavefronts of nine harmonics between 25 and 49 nm simultaneously.

CF-11.5 THU 15:15

13.5 nm High Harmonic Source Driven by a Few Cycle Fiber Laser

•*R. Klas*[1,2], *W. Eschen*[1], *A. Kirsche*[1,2], *J. Rothhardt*[1,2], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Albert-Einstein-Str. 6, 07745 Jena, Germany*; [2]*Helmholtz-Institute Jena, Fröbelstieg 3, 07745 Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany*

A few-cycle fiber-laser driven High-Harmonic source for 13.5 nm is presented, delivering a photon flux of 3.8e9 ph/s/1% BW. Two orders of magnitude higher fluxes can be expected soon, due to the average-power scalability.

ROOM 3 Hall A1

CG-8.5 THU 15:00

1.9 fs deep-UV pulses from Third-harmonic Generation in Argon

•*V. Wanie*[1,2,3], *M. Galli*[1,3,4], *D.P. Lopes*[4], *E.P. Månsson*[1], *A. Trabattoni*[1], *L. Colaizzi*[1], *K. Saraswathula*[1], *A. Cartella*[1,5], *F. Frassetto*[6], *L. Poletto*[6], *F. Légaré*[2], *S. Stagira*[3,4], *M. Nisoli*[3,4], *R.M. Vazquez*[3], *R. Osellame*[3], *and F. Calegari*[1,3,5,7]; [1]*DESY, Hamburg, Germany*; [2]*Inst. National de la Recherche Scientifique, Varennes, Canada*; [3]*Inst. for Photonics and Nanotechnologies CNR-IFN, Milan, Italy*; [4]*Depart. of Physics, Politecnico di Milano, Milan, Italy*; [5]*Hamburg Centre for Ultrafast Imaging, Univ. Hamburg, Hamburg, Germany*; [6]*Inst. for Photonics & Nanotechnologies CNR-IFN, Padova, Italy*; [7]*Physics Depart., Univ. of Hamburg, Hamburg, Germany*

We report 1.9 fs deep-UV pulses from frequency up-conversion of 800 nm (5 fs) pulses in argon using a laser micromachined gas cell. A cross-correlation with the near-infrared field was performed in xenon for characterization.

CG-8.6 THU 15:15

Cavity-Enhanced Noncollinear High-Harmonic Generation

•*M. Högner*[1,2], *T. Saule*[1,2], *S. Heinrich*[1,2], *N. Lilienfein*[1,2], *D. Esser*[3], *M. Trubetskov*[1], *V. Pervak*[2], *and I. Pupeza*[1,2]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Ludwig-Maximilians-Universität München, Garching, Germany*; [3]*Fraunhofer-Institut für Lasertechnik, Aachen, Germany*

We demonstrate the first cavity-enhanced noncollinear high-harmonic generation, offering the prospects of gating isolated attosecond pulses at multi-10-MHz repetition rates and a highly efficient, photon-energy- and power-scalable output coupling mechanism.

ROOM 1 ICM

16:00 – 17:30

CJ-14: Coherent beam combining and multi-core fibers

Chair: Siddharth Ramachandran, Boston University, Boston, United States

CJ-14.1 THU 16:00

3.5 kW four-channel coherently combined ultrafast fiber laser

•*M. Mueller*[1], *A. Klenke*[1,2], *A. Steinkopff*[1,3], *E. Shestaev*[1], *A. Tünnermann*[1,2,3], *and J. Limpert*[1,2,3]; [1]*Friedrich Schiller University Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present a 3.5 kW average power four-channel ultrafast fiber laser emitting 430 fs pulses at 80 MHz repetition rate with close to diffraction limited beam quality. Further power scaling is discussed.

CJ-14.2 THU 16:15

170 W Multicore Fiber based Femtosecond CPA System

•*A. Klenke*[1,2], *M. Müller*[1], *H. Stark*[1], *A. Tünnermann*[1,2,3], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller Universität Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute of Applied Optics and Precision Engineering, Jena, Germany*

We present a femtosecond fiber CPA system emitting up to 172 W average power. The main amplifier comprises a multicore fiber with 16 amplification channels that are coherently combined in a compact system.

ROOM 4a ICM

16:00 – 17:30

EH-6: Plasmonic enhancement of light-matter interactions

Chair: Vinod Menon, City College and Graduate of CUNY, New York, USA

EH-6.1 THU 16:00

Quantum Nano-Jewelry: Plasmonic Addressing of Single-Photon Emitters in High-quality Diamond Nanostructures

•*T. Jaffe*[1], *N. Felgen*[2], *L. Gal*[1], *C. popov*[2], *J.P. Reithmaier*[2], *and M. Orenstein*[1]; [1]*Andrew & Erna Viterbi Department of Electrical Engineering, Technion - Israel Institute of Technology, Haifa, Israel*; [2]*Institute of Nanostructure Technologies and Analytics, University of Kassel, kassel, Germany*

We designed, fabricated and validated by calculations bright sources consisting of plasmonic structures centered about diamond nanopillars hosting silicon-vacancy centers enabling the simultaneous focusing of the excitation (532nm) and enhanced extraction of their emission (738nm).

EH-6.2 THU 16:15

Electron-Driven Photon Sources for Spectral Interferometry Using Electron Microscopes

•*N. Talebi*[1], *S. Meuret*[2], *S. Guo*[1], *M. Hentschel*[3], *A. Polman*[2], *H. Giessen*[3], *and P. van Aken*[3]; [1]*Max Planck Institute for Solid State Research, Stuttgart, Germany*; [2]*Center for Nanophotonics, AMOLF, Amsterdam, Netherlands*; [3]*University of Stuttgart, Stuttgart, Germany*

Spectral interferometry is a powerful technique for characterization of ultrafast optical pulses and excitations in the sample. Here, we discuss the possibilities and underline the principles for applying the spectral interferometry to the electron microscopes

ROOM 4b ICM

16:00 – 17:30

EC-4: Nonlinear and quantum aspects in topological photonics

Chair: Hannah Price, University of Birmingham, Birmingham, UK

EC-4.1 THU 16:00

Topological interface states in a polariton SSH lattice: linear and nonlinear regimes

•*P. St-Jean*[1], *N. Pernet*[1], *A. Lemaître*[1], *A. Harouri*[1], *I. Sagnes*[1], *S. Ravets*[1], *A. Amo*[2], *and J. Bloch*[1]; [1]*CNRS - Université Paris-Sud, Paris, France*; [2]*CNRS - Université de Lille, Lille, France*

Polaritons, half-light and half-matter quasiparticles, appear as an ideal candidate for exploring nonlinear topological photonics. Here, using an array of coupled micropillars, we show that the robustness and spatial distribution of topological states are not affected by strong nonlinearities.

EC-4.2 THU 16:15

Wavefront Dislocation as Real-Space Measurement of the Zak Phase in 1D Photonic Topological Insulators

C. Dutreix[1], *P. Delplace*[2], •*M. Bellec*[3], *and F. Mortessagne*[3]; [1]*Laboratoire Ondes et Matière d'Aquitaine, Université de Bordeaux and CNRS, Talence, France*; [2]*Univ Lyon, Ens de Lyon, Univ Claude Bernard, CNRS, Laboratoire de Physique, Lyon, France*; [3]*Institut de Physique de Nice, Université Côte d'Azur and CNRS, Nice, France*

We investigate the Friedel oscillations in a 1D photonic topological insulator and experimentally report the existence of wavefront dislocations in the interference patterns, a direct real-space measurement of the Zak phase.

ROOM 5 ICM

16:00 – 17:30

EB-8: Quantum networks

Chair: Mohamed Bourennane, Stockholm University, Stockholm, Sweden

EB-8.1 THU 16:00

Demonstration of Device-Independent Certification of a 398 m Link for Future Quantum Networks

•*K. Redeker*[1], *R. Garthoff*[1], *T. van Leent*[1], *W. Zhang*[1], *H. Weinfurter*[1,2], *J.-D. Bancal*[3], *P. Sekatski*[3], *N. Sangouard*[3], *and W. Rosenfeld*[1]; [1]*Falkultät für Physik, Ludwig-Maximilians-Universität, München, Germany*; [2]*Max Planck Institut für Quantenoptik, Garching, Germany*; [3]*Quantum Optics Theory Group, Universität Basel, Basel, Switzerland*

We report the first fully device-independent certification of entanglement distribution over 398 meters. This link can be integrated in a quantum network enabling a guarantee for security, which is independent of the actual implementation.

EB-8.2 THU 16:15

Two-photon interference at 1550 nm after quantum frequency conversion of remote quantum emitters

•*S.L. Portalupi*[1], *J.H. Weber*[1], *B. Kambs*[2], *J. Kettler*[1], *S. Kern*[1], *J. Maisch*[1], *H. Vural*[1], *M. Jetter*[1], *C. Becher*[2], *and P. Michler*[1]; [1]*Institut für Halbleiteroptik und Funktionelle Grenzfiächen, Center for Integrated Quantum Science and Technology (IQST) and SCoPE, University of Stuttgart, Stuttgart, Germany*; [2]*Fachrichtung Physik, Universität des Saarlandes, Saarbrücken, Germany*

Two remote quantum dots emitting at ≈900 nm are converted to ≈1550 nm via two independent quantum frequency converters, maintaining single-photon purity and indistin-

ROOM 13a ICM

16:00 – 17:30

CB-11: Vertical cavity semiconductor lasers

Chair: Michael Jetter, University of Stuttgart, Stuttgart, Germany

CB-11.1 THU 16:00

Pulse dynamics in SESAM-free electrically-pumped VECSEL

•*N. Chichkov*[1], *A. Yadav*[1], *T. Munshi*[2], *K. Fedorova*[2], *A. Kovalev*[3], *E. Viktorov*[3], *and E.U. Rafailov*[1]; [1]*Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom*; [2]*Faculty of Physics and Materials Science Center, Philipps-University Marburg, Marburg, Germany*; [3]*ITMO University, Saint Petersburg, Russia*

We analyze the pulse dynamics in a mode-locked, SESAM-free EP-VECSEL. The laser generates a continuous pulse train with average pulse energies of 3.6 pJ. The observed pulse-to-pulse fluctuations are explained with the delay-differential-equation modelling approach.

CB-11.2 THU 16:15

Nonlinear lensing phenomena in semiconductor disk lasers

•*C. Kriso*[1], *S. Kress*[1], *T. Munshi*[1], *M. Grossmann*[2], *R. Bek*[2], *M. Jetter*[2], *P. Michler*[2], *W. Stolz*[1], *M. Koch*[1], *and A. Rahimi-Iman*[1]; [1]*Faculty of Physics and Materials Sciences Center, Philipps-Universität Marburg, Marburg, Germany*; [2]*Institut für Halbleiteroptik und Funktionelle Grenzflächen, Universität Stuttgart, Stuttgart, Germany*

Kerr lensing is assumed to drive ultrafast self-mode-locking of vertical-external-cavity surface-emitting lasers (VECSELs). We investigate nonlinear lensing in a VECSEL gain chip and its dependency on probe wavelength and optical pumping using the Z-scan technique.

ROOM 13b ICM

16:00 – 17:30

CD-12: Quantum and information technologies

Chair: Dario Polli, Politecnico di Milano, Milano, Italy

CD-12.1 THU (Invited) 16:00

Demonstration of distributed quantum sensing using nonlinear optics

X. Guo[1], *C. Breum*[1], *J. Borregaard*[2], *S. Izumi*[1], *M.V. Larsen*[1], *J.S. Neergaard-Nielsen*[1], *and* •*U.L. Andersen*[1]; [1]*), Technical University of Denmark, Department of Physics, Lyngby, Denmark*; [2]*University of Copenhagen, Department of Mathematical Sciences, , Copenhagen, Denmark*

Quantum networks can enhance the precision in sensing global parameters. We demonstrate quantum-enhanced sensing of four delocalized phase shifts using an entangled state which is produced by the nonlinear process of optical parametric amplification.

ROOM 14a ICM

16:00 – 17:30

EG-6: Coupling at the nanoscale

Chair: David Norris, ETH Zürich, Switzerland

EG-6.1 THU 16:00

Quantum-correlated photons from semiconductor fiber-cavity polaritons

G. Munoz-Matutano[1], A. Wood[1], M. Johnsson[1], X. Vidal[1], B.Q. Baragiola[1], A. Reinhard[1], A. LeMaitre[3], J. Bloch[3], A. Amo[3], G. Nogues[2], B. Besga[1,2], M. Richard[1,2], and •T. Volz[1]; [1]ARC CoE EQUS, Macquarie University, Sydney, Australia; [2]Institut Néel, Université Grenoble Alpes , Grenoble, France; [3]CNRS, Univ. Paris-Sud, Université Paris-Saclay, Marcoussis, France

We report the observation of quantum-correlated photons from strongly confined quantum-well cavity polaritons. From the dispersive variation of the photon autocorrelation function, we are able to extract a value for the non-linear polariton-polariton interaction constant.

EG-6.2 THU 16:15

Cavity Exciton-Polariton Condensates in Engineered Potential Landscapes at Room Temperature

•F. Scafirimuto, D. Urbonas, T. Stöferle, and R.F. Mahrt; IBM Research–Zurich, Zurich, Switzerland

We generate condensates of exciton-polaritons in polymer-filled optical microcavity with micrometer-scale lateral confinement. Different engineered potential landscapes are studied, ranging from 0D Gaussian-shaped defect microcavity to 2D arrays of coupled defects.

ROOM 14b ICM

16:00 – 17:30

CH-13: Time-resolved sensing

Chair: Walter Lubeigt, Squared Lasers LTD, Glasgow, United Kingdom

CH-13.1 THU 16:00

Time-Resolved Continuous-Filtering Vernier Spectroscopy in a Flame

•F. Senna Vieira[1], C. Lu[1], F.M. Schmidt[2], and A. Foltynowicz[1]; [1]Department of Physics, Umeå University, Umeå, Sweden; [2]Department of Applied Physics and Electronics, Umeå University, Umeå, Sweden

Fast and multispecies detection is essential for combustion diagnostics. Here, we present a continuous-filtering Vernier spectrometer able to measure H_2O and OH concentrations in a premixed CH_4/air flame with 2-5% precision in 25 ms.

CH-13.2 THU 16:15

Enhancement of QEPAS Sensitivity based-on Quartz Resonance Frequency Tracking

•H. Tatenguem, A. Sacher, M. Hoppe, T. Milde, and J. Sacher; Sacher-Lasertechnik GmbH, Marburg, Germany

This study reports on the development of a platform based-on a Field-Programmable Gate Arrays (FPGAs) and suitable for high speed measurements and enhancement of QEPAS sensitivity.

ROOM Osterseen ICM

16:00 – 17:30

EF-10: Frequency conversion and localized structures

Chair: Abdelkrim Bendahmane, Université Lille 1, Villeneuve d'Ascq, France

EF-10.1 THU 16:00

Highly efficient frequency shifting from temporally modulated Epsilon-Near-Zero surfaces

•V. Bruno[1], S. Vezzoli[2], C. DeVault[3], V.M. Shalaev[3], A. Boltasseva[3], M. Clerici[4], M. Ferrera[5], and D. Faccio[1]; [1]School of Physics and Astronomy,University of Glasgow, Glasgow, United Kingdom; [2]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom; [3]School of Electrical and Computer Engineering and Birck Nanotechnology Center, Purdue University, West Lafayette, USA; [4]School of Engineering, University of Glasgow, Glasgow, United Kingdom; [5]5 Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom

Our experiment with an optically pumped, homogeneous time dependent epsilon-near-zero surface shows a 47 nm frequency shift of the phase conjugate time beam that is more than 2x the bandwidth of the input pulse.

EF-10.2 THU 16:15

Dynamics of Kerr-like Optical Frequency Combs Generated via Phase-mismatched Second-harmonic Generation

•M. Erkintalo[1,2], Z. Li[1,2], P. Parra-Rivas[3], and F. Leo[3]; [1]Department of Physics, The University of Auckland, Auckland, New Zealand; [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Auckland, New Zealand; [3]Université libre de Bruxelles, Brussels, Belgium

We show that Kerr-like optical frequency comb dynamics can manifest themselves in quadratically nonlinear resonators under

ROOM 1 Hall A1

16:00 – 17:30

CC-8: High power THz sources and application

Chair: Ileana-Cristina Benea-Chelmus, ETH, Zürich, Switzerland

CC-8.1 THU 16:00

Two-Color Mid-Infrared Laser Filaments Produce Terahertz Pulses With Extreme Efficiency

•A.D. Koulouklidis[1,2], C. Gollner[3], V. Shumakova[3], V.Y. Fedorov[2,4], A. Pugžlys[3,5], A. Baltuška[3,5], and S. Tzortzakis[1,2,6]; [1]Institute of Electronic Structure and Laser, FORTH, Heraklion, Greece; [2]Science Program, Texas A&M University at Qatar, Doha, Qatar; [3]Photonics Institute, TU Wien, Vienna, Austria; [4]P.N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia; [5]Center for Physical Sciences & Technology, Vilnius, Lithuania; [6]Department of Materials Science and Technology, University of Crete, Heraklion, Greece

We demonstrate, intense broadband THz emission with extreme efficiency from two-color mid-infrared (3.9 μm) femtosecond laser filaments. The THz conversion efficiency of 2.36 % exceeds by far any previous values reported for plasma-based THz sources.

CC-8.2 THU 16:15

Phase-Locked Programmable Femtosecond Pulse Bursts from a Regenerative Amplifier

•T. Flöry[1], E. Kaksis[1], A. Pugžlys[1,2], A. Baltuska[1,2], G. Krizsán[3,4], G. Polónyi[3,4], and J. Fülöp[3,4]; [1]Photonik Institut, TU Wien, Wien, Austria; [2]Center for Physical Sciences & Technology, Vilnius, Lithuania; [3]Institute of Physics, University of Pécs, Pecs, Hungary; [4]ELI-ALPS, ELI-HU, Szeged, Hungary

We demonstrate phase-controlled pulse-burst amplification based on differential pathlength stabilization between the master oscillator

ROOM 2 Hall A1

16:00 – 17:30

CF-12: New techniques for ultrafast spectroscopy and imaging

Chair: Zhong Yin, ETH Zurich, Zurich, Switzerland

CF-12.1 THU 16:00

Generation of Broad-band Circularly Polarised Supercontinua in Chiral Photonic Crystal Fibre

•R. Sopalla[1], G.K.L. Wong[1], N.Y. Joly[2,1], X. Jiang[1], M.H. Frosz[1], G. Ahmed[1], and P.S.J. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany

We report generation of a broad-band supercontinuum, robustly circularly polarised across its spectrum, in a chirally twisted photonic crystal fibre pumped with circularly polarised picosecond laser pulses at 1064 nm.

CF-12.2 THU 16:15

Gigawatt Peak Power Pulses in the 5-9 μm Window Driven by an Yb Amplifier

•I. Astrauskas[1], G. Archipovaitė[2], V. Shumakova[1], G. Fan[1], T. Lihao[3], E. Kaksis[1], E. Cormier[2], T. Balčiūnas[1], A. Pugžlys[1,4], and A. Baltuška[1,4]; [1]Photonics Institute, TU Wien, Vienna, Austria; [2]CELIA, Université de Bordeaux–CNRS–CEA, Talence, France; [3]DSO National Laboratories, Singapore, Singapore; [4]Center for Physical Sciences & Technology, Vilnius, Lithuania

As a difference frequency between the signal and idler pulses of Yb:CaF2 laser driven OPA, sub-mJ, mid-IR pulses tunable in the 5–9 μm spectral range, having peak powers above 1GW are generated and characterized.

ROOM 3 Hall A1

16:00 – 17:15

CG-9: Photoemission spectroscopy and sources

Chair: Christopher R. Phillips, ETH Zurich, Zurich, Switzerland

CG-9.1 THU 16:00

Femtosecond Laser Assisted Field Emission Spectroscopy of a single Quantum dot

•M. Duchet, S. Perisanu, E. Constant, A. Ayari, V. Loriot, F. Lepine, and S. Purcell; Institut Lumière Matière, Villeurbanne, France

We will present the first observation of the ultrafast electron dynamics of a quantum dot by femtosecond laser assisted field electron emission and measurement of their high effective cross section.

CG-9.2 THU 16:15

Sub-cycle Metallization of SiO_2 Nanoparticles Probed via Carrier-Envelope Phase Dependent Electron Acceleration

•Q. Liu[1,2], S. Zherebtsov[1,2], F. Süßmann[1,2], J. Passig[3], L. Seiffert[4], V. Mondes[5], A. Kessel[1], S. Trushin[1], C. Graf[4], E. Rühl[4], J. Tiggesbäumker[3], K.-H. Meiwes-Broer[3], M. Stockman[5], T. Fennel[3,6], and M. Kling[1,2]; [1]Max Planck Institute of Quantum Optics, Garching, Germany; [2]Department of Physics, Ludwig-Maximilians-Universität Munich, Garching, Germany; [3] Institute of Physics, Universität Rostock, Rostock, Germany; [4]Physical Chemistry, Freie Universität Berlin, Berlin, Germany; [5]Physics Department, Georgia-State University, Atlanta, USA; [6]Max Born Institute, Berlin, Germany

We studied the ultrafast metallization of SiO_2 nanoparticles by intense few-cycle light pulses. The carrier-envelope phase dependent electron emission from the particles probes the metallization process, which occurs above the intensity of 1.8×10^{14} W/cm^2.

ROOM 1 ICM

CJ-14.3 THU 16:30

AI Controlled Tiled Aperture Coherent Beam Combining

•*H. Tünnermann and A. Shirakawa*; *University of Electro-Communications, Tokyo, Japan*

We applied deep reinforcement learning for tiled aperture CBC. The trained stabilization algorithm relies only on the far-field image of the beam and was derived purely from observed data.

CJ-14.4 THU 16:45

High-Power Electro-Optically Controlled Divided-Pulse Amplification

•*H. Stark*[1], *J. Buldt*[1], *M. Müller*[1], *A. Klenke*[1,2], *A. Tünnermann*[1,2,3], *and J. Limpert*[1,2,3]; [1]*Institute of Applied Physics, Friedrich-Schiller-University, Jena, Germany*; [2]*Helmholtz-Institute, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Bursts of 8 pulses are amplified in 15 parallel fiber amplifiers. All signals are combined to a single pulse with 700 W average power and 16 mJ pulse energy, compressible to 260 fs pulse duration.

ROOM 4a ICM

EH-6.3 THU (Invited) 16:30

Strong plasmon-exciton interactions at a single nanoantenna level

•*T. Shegai*; *Chalmers University of Technology, Gothenburg, Sweden*

In this talk, I will show that exciton-plasmon interactions between mono- and multilayer transition metal dichalcogenides and individual plasmonic nanoantennas can reach the level of strong plasmon-exciton coupling.

ROOM 4b ICM

EC-4.3 THU 16:30

Realization of Aharonov-Bohm Cages in Photonic Lattices

S. Mukherjee[1], •*M. Di Liberto*[2], *P. Öhberg*[3], *R.R. Thomson*[3], *and N. Goldman*[2]; [1]*The Pennsylvania State University, State College, USA*; [2]*Université Libre de Bruxelles, Bruxelles, Belgium*; [3]*Heriot-Watt University, Edinburgh, United Kingdom*

We experimentally demonstrate how the interplay between lattice connectivity and synthetic magnetic flux yields full localization of light in a rhombic array of optical waveguides, a phenomenon known as Aharonov-Bohm caging.

EC-4.4 THU 16:45

Quantum Interference of Topologically Protected Photonic States in a Laser-Written Waveguide Array

J.-L. Tambasco[1], •*G. Corrielli*[2,3], *R.J. Chapman*[1], *A. Crespi*[2,3], *O. Zilberberg*[4], *R. Osellame*[2,3], *and A. Peruzzo*[1]; [1]*Center for Quantum Computation and Communication Technology, School of Engineering, RMIT University, Melbourne, Australia*; [2]*Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche, Milano, Italy*; [3]*Dipartimento di Fisica - Politecnico di Milano, Milano, Italy*; [4]*Institute for Theoretical Physics, ETH Zurich, Zurich, Switzerland*

ROOM 5 ICM

guishability. Remote two-photon interference is conducted in a realistic fibre network.

EB-8.3 THU 16:30

Network integration and coherent operation of telecom entangled light sources based on semiconductor quantum dots

•*J. Huwer*[1], *T. Müller*[1], *Z. Xiang*[1,2], *M. Anderson*[1,2], *R.M. Stevenson*[1], *J. Skiba-Szymanska*[1], *M.B. Ward*[1], *I. Farrer*[2,3], *A. Krysa*[4], *J. Heffernan*[3], *D.A. Ritchie*[2], *and A.J. Shields*[1]; [1]*Toshiba Research Europe Ltd., Cambridge, United Kingdom*; [2]*Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*; [3]*Department of Electronic & Electrical Engineering, University of Sheffield, Sheffield, United Kingdom*; [4]*EPSRC National Epitaxy Facility, University of Sheffield, Sheffield, United Kingdom*

We operate quantum-dot entangled photon-pair sources emitting in the telecom O- and C-band. Stable transmission of entanglement over installed networks and generation of highly coherent states for teleportation prove their suitability for future network integration.

EB-8.4 THU 16:45

An Entanglement-based wavelength multiplexed quantum communication network

S. Wengerowsky[1], •*S.K. Joshi*[1,2], *F. Steinlechner*[1,3], *and H. Hübel*[4]; [1]*Institute for Quantum Optics and Quantum Information - Vienna (IQOQI),, Vienna, Austria*; [2]*Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory & Department of Electrical and Electronic Engineering, University of Bristol, Bristol, UK., Bristol, United Kingdom*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany., Jena, Germany*; [4]*Austrian Institute of Technology, Vienna, Austria.,*

ROOM 13a ICM

CB-11.3 THU 16:30

Double-side pumped membrane external-cavity surface-emitting lasers (MECSELs): Towards a "solid-state laser"-like gain pump configuration

•*H. Kahle, J.-P. Penttinen, H.-M. Phung, P. Rajala, A. Tukiainen, S. Ranta, and M. Guina*; *Tampere University - Optoelectronics Research Centre (ORC), Tampere, Finland*

We present the latest results comparing single-side-pumping with double-side-pumping (DSP) of membrane external-cavity surface-emitting lasers (MECSELs). DSP increases the efficiency of MECSELs and allows treating them like classical solid-state lasers.

CB-11.4 THU 16:45

Thermal noise in optically pumped DF-VECSELs

•*G. Gredat, H. Liu, and F. Bretenaker*; *Laboratoire Aimé Cotton, Université Paris-Sud, ENS Paris-Saclay, CNRS, Université Paris-Saclay, Orsay, France*

An analytical model of the thermal phase noise of an optically pumped Vertical-External-Cavity Surface-Emitting Laser is established starting from a heat equation resolution and propagating both pump-induced and fundamental temperature fluctuations within the laser mode.

ROOM 13b ICM

CD-12.2 THU 16:30

Temporal Ghost Imaging with Wavelength Conversion

H. Wu[1,2], •*P. Ryczkowski*[1], *A. Friberg*[3], *J.M. Dudley*[4], *and G. Genty*[1]; [1]*Photonics Laboratory, Tampere University, Tampere, Finland*; [2]*Key Lab of Optical Fiber Sensing & Communications, University of Electronic Science &Technology of China, Chengdu, Sichuan, China*; [3]*University of Eastern Finland, Institute of Photonics, , Joensuu, Finland*; [4]*Institut FEMTO-ST, UMR 6174 CNRS - Université Bourgogne Franche-Comté, Besançon, France*

We experimentally demonstrate temporal ghost imaging with frequency conversion. Our results show that the correlation information is preserved during the wavelength conversion, allowing for ultrafast imaging in spectral regions where fast detectors are not available.

CD-12.3 THU 16:45

Third Harmonic Generation with Ultrashort Pulses in a C2Cl4 filled Liquid Core Fiber

•*K. Schaarschmidt*[1,2], *M. Chemnitz*[1,2], *R. Scheibinger*[1,2], *and M.A. Schmidt*[1,2,3]; [1]*Leibniz-Institute of Photonic Technology, Jena, Germany*; [2]*Abbe School of Photonics and Faculty of Physics, Friedrich Schiller University, Jena, Germany*; [3]*Otto-Schott-Institute of Material Research, Friedrich-Schiller University Jena, Jena, Germany*

Ultrafast third harmonic generation in a liquid core fiber filled with Tetrachloroethylene (C2Cl4) is demonstrated experimentally for different pump pulse durations (30fs

ROOM 14a ICM

EG-6.3 THU 16:30

Modifying the Optical Phonon Response of Nanocrystals inside Terahertz Plasmonic Nanocavities

•*X. Jin*[1], *A. Cerea*[2], *G.C. Messina*[2], *A. Rovere*[1], *R. Piccoli*[1], *F. De Donato*[2], *F. Palazon*[2], *A. Perucchi*[3], *P. Di Pietro*[3], *R. Morandotti*[1], *S. Lupi*[4], *F. De Angelis*[2], *M. Prato*[2], *A. Toma*[2], *and L. Razzari*[1]; [1]*INRS Énergie, Matériaux et Télécommunications, Varennes, Canada*; [2]*Istituto Italiano di Tecnologia, Genova, Italy*; [3]*Elettra - Sincrotrone Trieste, Trieste, Italy*; [4]*Università di Roma "La Sapienza", Roma, Italy*

We show that the dipole–active phonon resonance of cadmium sulphide nanocrystals can be hybridized by the terahertz vacuum field of plasmonic nanocavities, even without a direct resonant cavity excitation.

EG-6.4 THU 16:45

Inhomogeneous broadening of a polaritonic mode in the ultrastrong coupling regime

•*S. Rajabali, G. Scalari, J. Keller, M. Beck, and J. Faist*; *ETH Zurich, Institute of Quantum Electronics, Auguste-Piccard-Hof 1, Zurich, Switzerland*

We investigate the influence of the capacitive gap width of complementary split ring resonators on their coupling to Landau level transitions. Below a threshold width, the upper polariton of the coupled system broadens inhomogeneously.

ROOM 14b ICM

CH-13.3 THU 16:30

Biochemical kinetic parameters evaluation by resonator-based multiplexed sensor

•*A. Saetchnikov*[1,2], *E. Tcherniavskaia*[2], *V. Saetchnikov*[2], *and A. Ostendorf*[1]; [1]*Ruhr University Bochum, Bochum, Germany*; [2]*Belarussian State University, Minsk, Belarus*

In the work we report on quantification of the kinetic parameters of protein adsorption via resonator-based multiplexed sensor. The relative variability between the extracted values is less than 5% for different analyte concentrations.

CH-13.4 THU 16:45

Probing living cells by terahertz attenuated total reflection. Application to permeabilization dynamics.

•*G. Gallot*[1], *X. Zheng*[1], *M. Grognot*[1], *A. Azan*[2], *T. Garcia-Sanchez*[2], *L. Descamps*[2], *and L. Mir*[2]; [1]*Ecole polytechnique, Palaiseau, France*; [2]*Institut Gustave Roussy, Villejuif, France*

We present terahertz ATR dynamics measurements of cytoplasm leakage in live epithelial cells, after permeabilization by detergent or electropermeabilization, and analytical models for the transport of non-permeant molecules through the cytosol membrane.

ROOM Osterseen ICM

conditions of phase-mismatched second-harmonic generation. Moreover, we show that even a finite phase-mismatch can result in novel dissipative soliton states.

EF-10.3 THU 16:30

Locking of domain walls and quadratic frequency combs in doubly resonant optical parametric oscillators

•*P. Parra-Rivas*[1,2], *L. Gelens*[2], *T. Hansson*[3], *S. Wabnitz*[4,5], *and F. Leo*[2]; [1]*OPERA-photonics, Univ. libre de Bruxelles, Brussels, Belgium*; [2]*Lab. of Dynamics in Biological Systems, KU Leuven Department of Cellular and Molecular Medicine, Univ. of Leuven, Leuven, Belgium*; [3] *Department of Physics, Chemistry and Biology, Linköping Univ., Linköping, Sweden*; [4]*Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Univ. of Rome, Rome, Italy*; [5]*Istituto Nazionale di Ottica del CNR, Pozzuoli, Italy*

In this work we theoretically investigate the formation, through the locking of domain walls, of localized dissipative structures, and their corresponding frequency combs, in doubly resonant dispersive optical parametric oscillators.

EF-10.4 THU 16:45

Soliton Enhancement Cavities

N. Lilienfein[1,2], •*M. Högner*[1,3], *C. Hofer*[1,3], *T. Saule*[1,3], *M. Trubetskov*[1], *V. Pervak*[3], *E. Fill*[3], *C. Riek*[4], *A. Leitenstorfer*[4], *J. Limpert*[5], *F. Krausz*[1,3], *and I. Pupeza*[1,3]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Menlo Systems GmbH, Martinsried, Germany*; [3]*Ludwig-Maximilians-Universität München, Garching, Germany*; [4]*Universität Konstanz, Konstanz, Germany*; [5]*Friedrich-Schiller-Universität Jena, Jena, Germany*

We report temporal soliton formation in a free-space enhancement cavity. Enabled by a spectrally tai-

ROOM 1 Hall A1

and the amplifier cavities. This technique boosts the safe level of extractable burst energy and suppresses fluctuations in various burst-mode applications.

CC-8.3 THU 16:30

Multi-cycle THz generation by difference frequency generation of 2 narrow-linewidth pulsed laser

•*W. Tian*[1,2], *H. Olgun*[1,3,4], *D. Schimpf*[1], *N. Matlis*[1], *and F. Kärtner*[1,3]; [1]*DESY, Hamburg, Germany*; [2]*School of Physics and Optoelectronic Engineering, Xidian University, , Xi'an , China*; [3]*Department of Physics and The Hamburg Centre for Ultrafast Imaging (CUI), University of Hamburg, Hamburg, Germany*; [4]*Helmholtz-Institut Jena, Jena, Germany*

Multi-cycle 0.3 THz pulses are generated by implementing difference frequency generation of two narrow-linewidth lasers for the first time. More than 100 nJ THz energy is generated with total incident optical energy of 1.6 mJ.

CC-8.4 THU 16:45

Generation of >50 kW narrow-line radiation at 5.7 THz from seeded KTP off-axis THz parametric oscillator

•*M.-H. Wu, W.-C. Tsai, Y.-C. Chiu, and Y.-C. Huang*; *National Tsinghua Unviersity, Hsinchu, Taiwan*

We report generation of >50 kW narrow-line radiation at 5.7 THz from a pulsed KTP off-axis THz parametric oscillator seeded by a synchronously pumped KTP THz parametric generator.

ROOM 2 Hall A1

CF-12.3 THU 16:30

Metasurface-enabled Fourier-transform optical pulse shaper

S. Divitt[1,2], *W. Zhu*[1,2], *C. Zhang*[1,2], *L. Chen*[1,2], •*H. Lezec*[1], *and A. Agrawal*[1,2]; [1]*National Institute of Standards and Technology, Gaithersburg, MD, USA*; [2]*Maryland NanoCenter, College Park, MD, USA*

By incorporating dielectric metasurfaces in a Fourier-transform pulse shaper, we demonstrate temporal shaping of sub-10-fs-duration ultrafast optical pulses, achieving a spectral resolution of 140 GHz and the number of independently controllable spectral features of 660.

CF-12.4 THU 16:45

Ultrafast single-shot burst imaging in a few-nanosecond window using a spectrally sweeping laser pulse train

•*H. Nemoto, T. Suzuki, K. Matsushita, K. Takasawa, and F. Kannari*; *Keio University, Yokohama, Japan*

Adopting spectrally sweeping laser pulses and a 1-kfps fast camera to sequentially timed all-optical mapping photography utilizing spectral filtering (SF-STAMP), we realize single-shot 2-D burst imaging with a nanosecond time window at every 1 ms.

ROOM 3 Hall A1

CG-9.3 THU 16:30

Ultrafast Spin Dynamics Resolved with High-Harmonic Generation Microscopy

•*S. Zayko*[1], *O. Kfir*[1], *M. Heigl*[2], *M. Lohmann*[1], *M. Sivis*[1], *M. Albrecht*[2], *and C. Ropers*[1,3]; [1]*4th. Physical Institute – Solids and Nanostructures, University of Göttingen, Göttignen, Germany*; [2]*Institute of Physics, University of Augsburg, Augsburg, Germany*; [3]*International Center for Advanced Studies of Energy Conversion (ICASEC), University of Göttingen, Göttingen, Germany*

We demonstrate the first femtosecond microscopy using high-harmonic radiation. The ultrafast demagnetization dynamics in the network of nanoscale magnetic domains are quantitatively mapped with 30 nm spatial, and 50 fs temporal resolution.

CG-9.4 THU 16:45

Ultrafast Extreme-Ultraviolet Photoemission Spectroscopy at 18.4 MHz

•*S. Heinrich*[1,2], *T. Saule*[1,2], *J. Schötz*[1,2], *N. Lilienfein*[1,2], *M. Högner*[1,2], *O. de Vries*[3], *M. Plötner*[3], *J. Weitenberg*[1,4], *D. Esser*[4], *J. Schulte*[4], *P. Russbueldt*[4], *J. Limpert*[5,6,7], *M. Kling*[1,2], *U. Kleineberg*[1,2], *and I. Pupeza*[1]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Ludwig-Maximilians-Universität München, Garching, Germany*; [3]*Fraunhofer-Institut für Angewandte Optik und Feinmechanik , Jena, Germany*; [4]*Fraunhofer-Institut für Lasertechnik, Aachen, Germany*;

ROOM 1 ICM

CJ-14.5 THU 17:00

Modal properties of Yb-doped 4-core fibers under heat load

F. Poli[1], J. Lægsgaard[2], •A. Cucinotta[1], and S. Selleri[1]; [1]Department of Engineering and Architecture, University of Parma, Parma, Italy; [2]DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Kongens Lyngby, Denmark

The influence of thermo-optic refractive-index changes on supermode guiding properties of 4-core fiber amplifiers is numerically studied for the first time. Besides effective area shrinking, the higher-order supermode guidance is demonstrated at high heat load.

CJ-14.6 THU 17:15

A focal-ratio-degradation (FRD) resistant multimode fibre link using mode-selective photonic lanterns

•A. Benoit[1], S. Yerolatsitis[2], K. Harrington[2], T.A. Birks[2], and R.R. Thomson[1]; [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, UK; [2]Department of Physics, University of Bath, Bath, UK

Mode-selective multicore fibre photonic lanterns are used to create a 6-mode multimode optical fibre link that is considerably more resistant to focal ratio degradation (FRD) than a 6-mode step-index optical fibre.

ROOM 4a ICM

EH-6.4 THU 17:00

Towards near-field coupling of surface plasmon polaritons across few-nanometer gaps between two laterally tapered gold waveguides

V. Smirnov[1], S. Stephan[1], M. Westphal[2], H. Kollmann[1], D. Emmrich[2], A. Beyer[2], A. Gölzhäuser[2], C. Lienau[1], and •M. Silies[1]; [1]Institute of Physics and Center of Interface Science, Carl von Ossietzky University Oldenburg, Oldenburg, Germany; [2]Faculty of Physics, Universität Bielefeld, Bielefeld, Germany

Optical spectro-microscopy is used to study the coupling of two μm-sized, tapered plasmonic waveguides fabricated using Ga- and He-based FIB via SPP waves. For gap sizes below 20nm between the waveguides near-field coupling is observed.

EH-6.5 THU 17:15

Plasmon-plasmon Coupling Probed by Ultrafast, Strong-field Photoemission with <7 Å Sensitivity

•Z. Pápa[1,2], J. Budai[2,3], I. Márton[1], P. Wróbel[4], T. Stefaniuk[4], Z. Márton[2,5], P. Rácz[1], and P. Dombi[1,2]; [1]MTA "Lendület" Ultrafast Nanooptics Group, Wigner Research Centre for Physics, Budapest, Hungary; [2]ELI-ALPS Research Institute, ELI-HU Nonprofit Kft., Szeged, Hungary; [3]Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary; [4]Faculty of Physics, University of Warsaw, Warsaw, Poland;

ROOM 4b ICM

We fabricate an integrated beam splitter for topologically protected photonic states in a linear array of evanescently coupled waveguides. We use this device for successfully observing high visibility 2-photon quantum interference between topological modes.

EC-4.5 THU 17:00

Topological states of sound and light in 2D arrays with solid state emitters: A novel quantum hybrid platform

•M.-A. Lemonde[1], V. Peano[2], P. Rabl[3], and D.D. Angelakis[1,4]; [1]Centre for Quantum Technologies, Singapore, Singapore; [2]Institute for Theoretical Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany; [3]Vienna Center for Quantum Science and Technology, Vienna, Austria; [4]School of Electrical and Computer Engineering, Technical University of Crete, Chania, Greece

We investigate the effects of interaction between the topological states of sounds and light produced in a two-dimensional array of optomechanical nano-cavities and solid-state emitters coupled via strain coupling.

EC-4.6 THU 17:15

Optimal Design Strategy of Non-Abelian Geometric Phases based on Quantum Metric

•M. Kremer, L. Teuber, A. Szameit, and S. Scheel; Institut für Physik, Universität Rostock, Rostock, Germany

We experimentally demonstrate non-Abelian geometric phases by measuring Wilson loops in femtosecond laser written waveguide arrays. To ensure the adiabaticity of the process, we harness the novel concept of quantum metrics for optimization.

ROOM 5 ICM

Vienna, Austria

We present a fully connected 4 user entanglement-based quantum network. Our network architecture allows multiple users connected to a single source of polarization entanglement with minimal resources per user in an easily scalable way.

EB-8.5 THU 17:00

Entanglement between a photonic time-bin qubit and a collective atomic spin excitation

•P. Farrera[1], G. Heinze[1], and H. de Riedmatten[1,2]; [1]ICFO - The Institute of Photonic Sciences, Barcelona, Spain; [2]ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

Light-matter entanglement combines long-distance-transmission advantage of photonic qubits with storage and processing capabilities of atomic qubits. In this work we used a laser-cooled atomic cloud to generate entanglement between photonic time-bin qubits and atomic spin-waves.

EB-8.6 THU 17:15

Remote State Preparation and Quantum Steering based on Hybrid Entanglement of Light

•T. Darras[1], A. Cavaillès[1], H. Le Jeannic[2], J. Raskop[1], K. Huang[3], G. Guccione[1], and J. Laurat[1]; [1]Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-PSL Université, Collège de France, 4 Place Jussieu, 75005, Paris, France; [2]Niels Borh Institute, University of Copenhagen, Blegdamsvej 17, DK-2100, Copenhagen, Denmark; [3]Shanghai Key Laboratory of Modern Optical Systems, and Engineering Research Center of Optical Instruments and Systems, School of

ROOM 13a ICM

CB-11.5 THU 17:00

Room-Temperature Continuous-Wave Electrically Pumped 3.3 micron Vertical Cavity Laser

V. Jayaraman[1], •S. Segal[2], F. Towner[2], K. Lascola[2], B. Kolasa[1], D. John[3], A. Cazabat[1], and C. Burgner[1]; [1]Praevium Research, Inc., Santa Barbara, USA; [2]Thorlabs Quantum Electronics, Jessup, USA; [3]University of California, Santa Barbara, USA

We present the first room temperature continuous wave operation of any electrically pumped vertical cavity laser operating at >3 micron wavelength. Devices employ an Interband Cascade active region and an Aluminum Gallium Arsenide mirror.

CB-11.6 THU 17:15

25 GHz Small-Signal Modulation Bandwidth with a 7-Element Electrically-Parallel Vertical-Cavity Surface-Emitting Laser Array

•N. Haghighi, P. Moser, and J. Lott; Technische Universität Berlin, Berlin, Germany

Via a simplified epitaxial layer design we achieve a record small-signal modulation bandwidth near 25 GHz with operating optical output power of 50 mW with a 7-element electrically-parallel top-emitting 980 nm VCSEL array.

ROOM 13b ICM

and 100fs). Distinct modes at the harmonic wavelength are excited and investigated.

CD-12.4 THU 17:00

Refreshed opto-acoustic memory

•B. Stiller[1,2], M. Merklein[1,2], K. Vu[3], P. Ma[3], S.J. Madden[3], and B.J. Eggleton[1,2]; [1]Institute of Photonics and Optical Science (IPOS), School of Physics, University of Sydney, Sydney, Australia; [2]The University of Sydney Nano Institute, University of Sydney, Sydney, Australia; [3]Laser Physics Centre, RSPE, Australian National University, Canberra, Australia

The storage time of Brillouin-based memory is so far limited to the acoustic lifetime. Here, we experimentally demonstrate the optical reinforcement of the acoustic wave and show coherent on-chip storage up to 40 ns.

CD-12.5 THU 17:15

Optical cavity-less 40-GHz picosecond pulse generator in the visible wavelength range

•G. Xu[1], V. Pêcheur[2], J. Fatome[1], M. Chauvet[2], and B. Kibler[1]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France; [2]Institut FEMTO-ST, Besançon, France

We report the generation of a 40-GHz picosecond pulse source in the visible range by means of an efficient frequency doubling of a near-infrared nonlinear pulse generator in a LiNbO3 ridge waveguide.

ROOM 14a ICM

EG-6.5 THU 17:00

Coherent coupling of single molecules to microresonators

•*A. Shkarin*[1], *D. Rattenbacher*[1], *J. Renger*[1], *T. Utikal*[1], *S. Goetzinger*[2,1], *and V. Sandoghdar*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Department of Physics, Friedrich Alexander University Erlangen-Nuremberg, Erlangen, Germany*

We report on fabrication and use of chip-based micro-resonators to efficiently couple light to single dye molecules. We observe enhancement of light-matter coupling by a factor of 3.5 compared to a simple waveguide.

EG-6.6 THU 17:15

Graphene Near-field Interactions for the Observation of DNA Hybridization in Aqueous Environment with Nanoscale Resolution

•*R.M.R. Adão*[1], *R. Campos*[2], *E. Figueiras*[1], *P. Alpuim*[2,3], *and J.B. Nieder*[1]; [1]*Dept. of Nanophotonics, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal*; [2]*Dept. of Quantum Materials Science and Technology, INL - International Iberian Nanotechnology Laboratory, Braga, Portugal*; [3]*Dept. of Physics, University of Minho, Braga, Portugal*

Non-radiative near-field interac-

ROOM 14b ICM

CH-13.5 THU 17:00

Phase-Coded Brillouin Optical Correlation Domain Analysis for Extreme Temperature Sensing

J. Morosi[2], •*I. Di Luch*[1], *M. Ferrario*[1,2], *and P. Boffi*[1]; [1]*Politecnico di Milano - Dipartimento di Elettronica Informazione e Bioingegneria (DEIB), Milano, Italy*; [2]*Cohaerentia Srl, Milano, Italy*

The feasibility of a phase-coded BOCDA fiber optic sensor for industrial applications in extreme-temperature environments is demonstrated by experimentally reconstructing, with centimetric spatial resolution, temperature profiles featuring hot-spots up to 600°C.

CH-13.6 THU 17:15

Wavefront Metrology Developments Using Adaptive Optics And Debris Shield Wavefront Measurements

•*V. Iancu*[1,2], *G. Kolliopoulos*[1], *Y. Nakamiya*[1], *V. Nastasa*[1], *and D. Ursescu*[1,2]; [1]*ELI-NP, Magurele, Romania*; [2]*University of Bucharest, Bucharest, Romania*

Wave front metrology system, including closed feedback loop adaptive optics (AO), has been used to characterize the transmitted optical wave front of thin films required for debris shielding at ELI-NP high intensity laser experiments.

ROOM Osterseen ICM

lored input coupler, a self-stabilizing 37-fs cavity soliton was driven by 350-fs laser pulses at a peak power enhancement of 3200.

EF-10.5 THU 17:00

Nonlinear Optics under Extreme Focusing Conditions

R. Penjweini[1,2], *M. Weber*[1,2], •*M. Sondermann*[1,2], *R.W. Boyd*[3], *and G. Leuchs*[1,2,3]; [1]*Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Department of Physics, Erlangen, Germany*; [2]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [3]*Department of Physics, University of Ottawa, Ottawa, Canada*

We investigate nonlinear optics with pump beams focused from full solid angle, examining the paradigmatic process of third-harmonic generation in a gas. We discuss similarities with and differences to the paraxial regime.

EF-10.6 THU 17:15

Optical Control of Spatial Riemann Waves & Burgers' Equation Dynamics

•*D. Bongiovanni*[1,2], *B. Wetzel*[3], *P. Yang*[2], *Y. Hu*[2], *Y. Qiu*[2], *J. Xu*[2], *S. Wabnitz*[4], *Z. Chen*[2,5], *and R. Morandotti*[1,6,7]; [1]*INRS University,1650 Blvd. Lionel-Boulet, Varennes, Canada*; [2]*TEDA Applied Physics Institute and School of Physics, Nankai University, Tianjin, China*; [3]*School of Mathematical and Physical Sciences, University of Sussex, Sussex House, Falmer, Brighton, United Kingdom*; [4]*DIET, University of Rome, Rome, Italy*; [5]*Department of Physics & Astronomy, San Francisco State University, San Francisco, USA*; [6]*Institute of Fundamental*

ROOM 1 Hall A1

CC-8.5 THU 17:00

Terahertz-Induced Electron Emission from a Gold Surface

•*S. Li*[1], *P.S. Nugraha*[1,2], *A. Sharma*[3], *C. Lombosi*[1], *Z. Ollmann*[1], *I. Márton*[4], *G. Farkas*[4], *J. Hebling*[1,2,5], *P. Dombi*[4], *and J.A. Fülöp*[1,2,3]; [1]*Szentágothai Research Centre, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*; [3]*ELI-ALPS, ELI-Hu, Szeged, Hungary*; [4]*MTA "Lendület" Ultrafast Nanooptics Group, Wigner Research Centre for Physics, Budapest, Hungary*; [5]*Institute of Physics, University of Pécs, Pécs, Hungary*

Strong-field photoemission of electrons has been extensively studied employing sufficiently strong THz field (at low Keldysh parameters). Flipping the polarity of the THz pulses resulted in a significantly different current signal. The experiment and simulation results are demonstrated.

CC-8.6 THU 17:15

Low loss Suspended Silicon waveguide and photonic crystal for THz regime

•*E. Akiki*[1], *M. Verstuyft*[2], *G. Ducournau*[1], *B. Walter*[3], *E. Mairiaux*[3], *M. Faucher*[1], *J.-F. Lampin*[1], *M. Vanwolleghem*[1], *and B. Kuyken*[2]; [1]*Univ. Lille, CNRS, Centrale Lille, ISEN, Univ. Valenciennes, UMR 8520 - IEMN, Lille, France*; [2]*Photonics Research Group, Department of Information Technology, Ghent University-imec,, Ghent, Belgium*; [3]*Vmicro SAS, Villeneuve d'Ascq, France*

We present experimental results on an integrated Si suspended wave-

ROOM 2 Hall A1

CF-12.5 THU 17:00

Spatio-temporal wide-field imaging with 50 fs resolution based on frequency upconversion

•*D. Kimbaras*[1,2,3], *M.F. Kling*[1,2], *R. Butkus*[3], *and P. Wnuk*[1,2]; [1]*Ludwig-Maximilians-Universität München, Garching, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [3]*Laser Research Center, Vilnius, Lithuania*

We present a high-speed imaging method, which employs a non-collinear sum frequency generation based optical shutter together with a wide-field imaging module. We demonstrated various light propagation dynamics with 50 fs temporal resolution.

CF-12.6 THU 17:15

Extreme Infrared Nonlinear Optics of Wide-Bandgap Solids Driven by Gigawatt Fe:ZnSe Laser System

F. Potemkin[1], •*E. Migal*[1], *A. Pushkin*[1], *B. Bravy*[2], *and V. Gordienko*[1]; [1]*Faculty of Physics and International Laser Center M.V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Institute of Problems of Chemical Physics, Chernogolovka, Russia*

We summarize recent experimental results on femtosecond amplification in Fe:ZnSe crystal providing access to gigawatt peak power around 4.3 μm. Filamentation in

ROOM 3 Hall A1

[5]*Friedrich-Schiller-Universität Jena, Institut für Angewandte Physik , Jena, Germany*; [6]*Helmholtz-Institut Jena, Jena, Germany*; [7]*Active Fiber Systems GmbH, Jena, Germany*

Space charge effects impair many applications in photoelectron spectroscopy employing state-of-the-art multi-kHz repetition-rate lasers. We demonstrate a high-flux, high-photon-energy, enhancement-cavity-based high-harmonic generation source at 18.4 MHz repetition rate for space-charge-free attosecond time-resolution photoelectron spectroscopy.

CG-9.5 THU 17:00

Towards High-Resolution Imaging at 13.5 nm using a Fiber Laser Driven High-order Harmonic Source

•*W. Eschen*[1,2], *G. Tadesse*[1,2], *R. Klas*[1,2], *M. Tschernajew*[2], *H. Gross*[2], *J. Limpert*[1,2,3], *and J. Rothhardt*[1,2]; [1]*Helmholtz-Institut Jena, Fröbelstieg 3, Jena, Germany*; [2]*Institute of Applied Physics, Friedrich-Schiller-University Jena, Albert-Einstein-Straße 15, Jena, Germany*; [3]*Fraunhofer Institute of Applied Optics and Precision Engineering, Jena, Germany*

We present our latest results on table-top coherent diffractive imaging using a laser driven high-harmonic source. We resolved features with the size of only 47 nm and show significant progress towards imaging at 13.5 nm.

ROOM 1 ICM | ROOM 4a ICM | ROOM 4b ICM | ROOM 5 ICM | ROOM 13a ICM | ROOM 13b ICM

[5]*Department of Experimental Physics, University of Pécs, Pécs, Hungary*
Plasmon-plasmon coupling probed by ultrafast photoemission revealed that large field enhancements of nanostructured silver layers can be associated to the coupling of propagating to localized plasmons, and the level of localization depends on nanostructure size.

Optical Electrical and Computer Engineering, University of Shanghai for Science and Technology, 200093, Shanghai, China
Based on optical hybrid entanglement between discrete- and continuous-variable quantum states, we report the remote creation of high-fidelity continuous-variable states, and the violation of an Einstein-Podolsky-Rosen steering inequality.

Hall B0

13:00 – 14:00

CD-P: CD Poster session

CD-P.1 THU

Retaining 3D laser pulse shape at sum frequency generation processes
•*I. Kuzmin, E. Gacheva, S. Mironov, A. Potemkin, and E. Khazanov*; *Federal Research Center Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*
Possibility of effective second, fourth and third harmonics generation with retaining of a shape of linearly chirped ellipsoidal IR laser pulses with triangular temporal intensity profile has been demonstrated numerically.

CD-P.2 THU

Effect of annealing on nonlinear optical properties of 70% deuterated DKDP crystal at 355 nm
•*D. Cai, X. Pan, X. Xu, Z. Wang, and X. Sun*; *State Key Laboratory of Crystal Materials, Shandong University, Jinan, China*
Thermal annealing decreased the nonlinear absorption and refraction of DKDP crystal, which could lead an improvement of the laser-induced damage threshold. This indicated nonlinear properties may play important role in the damage process.

CD-P.3 THU

Nonlinear-optical label-free multimodal imaging of neurons, astrocytes and gliovascular interfaces
•*M.S. Pochechuev*[1,5], *A.A. Lanin*[1,3,4], *A.S. Chebotarev*[1], *I.V. Kelmanson*[6], *V.V. Belousov*[6], *A.B. Fedotov*[1,3,4,5], *and A.M. Zheltikov*[1,2,3,4,5]; [1]*Physics Department, International Laser Center, M. V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Department of Physics and Astronomy, Texas A&M University, College Station, Texas, USA*; [3]*Russian Quantum Center, Moscow, Russia*; [4]*Kazan Quantum Center, A.N. Tupolev Kazan National Research Technical University, Kazan, Russia*; [5]*Kurchatov Institute National Research Center, Moscow, Russia*; [6]*M.M. Shemyakin and Yu.A. Ovchinnikov Institute of Bioorganic Chemistry, Moscow, Russia*
Combination of harmonics generation and multiphoton microscopy of endogenous chromophores is shown to enable imaging of neurons, astrocytes and gliovascular interfaces in rat brain without exogenous labels.

CD-P.4 THU

Thermal effects in a single-frequency optical parametric oscillator pumped by a master oscillator fiber amplifier laser
T. Hamoudi[1,2], *J.-B. Dherbecourt*[1], *X. Délen*[2], *A. Godard*[1], *P. Georges*[2], •*J.-M. Melkonian*[1], *and M. Raybaut*[1]; [1]*DPHY, ONERA, Université Paris Saclay, Palaiseau, France*; [2]*Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Université Paris-Saclay, Palaiseau, France*
We investigate thermal effects in a nested-cavity doubly resonant optical parametric oscillator (NesCOPO), pumped by a high repetition rate laser, and the consequences on its spectral characteristics.

CD-P.5 THU

Adaptive spectral phase optimization of high repetition rate electro-optic frequency combs for enhanced nonlinear spectral broadening
•*B.S. Vikram, R. Prakash, S.K. Selvaraja, and V.R. Supradeepa*; *Indian Institute of Science, Bangalore, India*
We demonstrate enhanced spectral broadening of a 9 line, 25GHz C-band electro-optic frequency comb in highly nonlinear fibre through adaptive optimization of spectral phase, increasing the bandwidth by over 13 times to 121 lines.

CD-P.6 THU

Lithium-niobate-based Cavity Resonator-Integrated Guided-mode Resonance Filters
•*S. Calvez, A. Monmayrant, and O. Gauthier-Lafaye*; *LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France*
We report the fabrication and characterisation of the first Cavity Resonator-Integrated Guided-mode Resonance Filters made using lithium niobate on insulator (LNOI) technology for nonlinear optics applications. The measured resonant characteristic shows a Q-factor of ~1620.

CD-P.7 THU

Ge/SiGe Asymmetric Quantum Wells for Second Harmonic Generation in the Mid-Infrared
•*J. Frigerio*[1], *A. Ballabio*[1], *C. Ciano*[2], *A. Mancini*[2], *L. Baldassarre*[2], *J. Allerbeck*[3], *J. Kuttruff*[3], *G. Isella*[1], *D. Brida*[4], *M. Virgilio*[5], *and M. Ortolani*[2]; [1]*L-NESS, Dipartimento di Fisica, Politecnico di Milano, Polo Territoriale di Como, Como, Italy*; [2]*Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy*; [3]*Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*; [4]*Faculté des Sciences, de la Technologie et de la Communication, Université de Luxembourg, Luxembourg, Luxembourg*; [5]*Dipartimento di Fisica "E. Fermi", Università di Pisa, Pisa, Italy*
We present the theoretical investigation and the experimental demonstration of second harmonic generation in the mid-infrared by hole-doped Ge/SiGe asymmetric quantum wells. Possible applications in non-linear molecular sensing are discussed.

CD-P.8 THU

Tailored spontaneous four-wave mixing in sinusoidally-tapered fibres
•*M. Saleh*; *Heriot-Watt University , Edinburgh, United Kingdom*
A rigorous quantum model is developed to investigate spontaneous four-wave mixing in periodically-tapered waveguides. Using sinusoidally-modulated fibres with only 50 periods can enhance photon-pairs generation at on-demand frequencies and with high spectral-purity by 35 dB.

CD-P.9 THU

Parametric Mechanism of the Self-Mode-Locking in a CW Non-Stationary Superradiant Laser with a Combined DFB Fabry-Perot Low-Q Cavity
•*V. Kocharovsky*[1], *A. Mishin*[1], *V. Kocharovsky*[1,2], *E. Kocharovskaya*[1], *and V. Kukushkin*[1]; [1]*Institute of Applied Physics, Russian Academy of Science, Nizhny Novgorod, Russia*; [2]*Department of Physics and Astronomy, Texas A&M University, College Station, USA*
We find a new parametric mechanism of self-mode-locking which operates via beating of two su-perradiant lasing modes with a period two times less that a round-trip period and doesn't require implementation of any standard mode-locking technique.

CD-P.10 THU

Nonlinear frequency conversion of broadband mid-IR laser radiation
A. Ionin, •*I. Kinyaevskiy, Y. Klimachev, A. Kotkov, A. Kozlov, D. Sinitsyn, and L. Seleznev*; *P.N.Lebedev Physical Institute of Russian Academy of Sciences, Moscow, Russia, Moscow, Russia*
Nonlinear frequency conversion of broadband mid-IR radiation of different molecular gas lasers by various nonlinear crystals converting their multi-line emission into broadband radiation on sum and difference frequencies within ~ 1.7 – 17 micron is discussed

ROOM 14a ICM | ROOM 14b ICM | ROOM Osterseen ICM | ROOM 1 Hall A1 | ROOM 2 Hall A1 | ROOM 3 Hall A1

tions that modify the fluorescence lifetime of fluorophores in the vicinity of graphene are used to develop a DNA biosensor. The developed biosensor allows observation of the DNA hybridisation process with nanometer resolution.

and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, China; [7]*ITMO University, St. Petersburg, Russia*
We report on the control of Riemann wave dynamics in nonlinear optics, obtained by spatially tailoring the initial optical beam with the optional application of an external potential. Both numerical and experimental results show controllable steepening and shock formation.

guide showing ultra-low modal THz losses, improving significantly previous demonstrations. High-Q THz cavities by etching circular holes in the waveguide membrane are also demonstrated.

CaF2 enabling spectral coverage of the whole 1-6 μm region is also presented.

Hall B0

CD-P.11 THU

Peak Power Enhancement of Yb:YAG Laser Pulses by Second Harmonic Generation with Time Predelay in Borate Crystals

•*M. Duda*[1,2], *O. Novák*[1], *H. Turčičová*[1], *M. Chyła*[1], *V. Kubeček*[2], *M. Smrž*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics CAS, Dolní Břežany, Czech Republic*; [2]*Faculty of Nuclear Sciences and Physical Engineering, CTU in Prague, Prague, Czech Republic*

Compression of 1.5 ps pulses in BBO and LBO crystals cut for type II phase matching to few hundreds of femtoseconds, leading to the increase of peak power, is calculated and measured.

CD-P.12 THU

Optimization of the Efficient Single Pass Two-Stage DFG of Er and Yb Fiber Lasers Radiation into Mid-Infrared Region.

•*A. Gulyashko*[1], *I. Larionov*[1,2], *and V. Tyrtyshnyy*[1]; [1]*NTO "IRE-Polus", Fryazino, Russia*; [2]*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*

We investigate the difference frequency generation to the mid-infrared region with 20 W average power in tandems of PPLN or PPLT crystals. The theoretical model allowed optimizing conversion setup by tuning seed wavelength.

CD-P.13 THU

Nonlinear chiroptical response of GaAs nanowires partially covered by Au

A. Belardini[1], *J. Collins*[2], *D. Hooper*[2], *E. Petronijevic*[1], *T. Hakkarainen*[3], *E. Koivusalo*[3], *M. Rizzo Piton*[3], *S. Soumalainen*[3], *M. Guina*[3], *V. Valev*[2], *and* •*C. Sibilia*[1]; [1]*Sapienza Università di Roma, Roma, Italy*; [2]*University of Bath, Bath, United Kingdom*; [3]*Tampere University of Technology, Tampere, Finland*

Extrinsic chirality can be dramatically evidenced by using circular polarised light in the second harmonic field. Here we present nonlinear measurements obtained on GaAs nanowires partially coated by gold in an asymmetric way.

CD-P.14 THU

Comparative Analysis of Optical Damage in Advanced Barium Chalcogenides Nonlinear Crystals at 1-μm and 2-μm

•*N. Kostyukova* [1,2,3,4], *A. Boyko* [1,2,3], *E. Eryshin*[2,4], *D. Kolker*[1,2,4], *O. Antipov*[5], *I. Eranov*[5], *L. Isaenko*[1], *D. Badikov*[6], *and V. Badikov*[6]; [1]*Novosibirsk State University, Novosibirsk, Russia*; [2]*Institute of Laser Physics of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia*; [3]*Special technology Ltd., Novosibirsk, Russia*; [4]*Novosibirsk State Technical University, Novosibirsk, Russia*; [5]*Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [6]*High Technologies Laboratory, Kuban State University, Krasnodar, Russia*

Optical damage of the new advanced high-$\chi(2)$ nonlinear crystals, BaGa4Se7 and BaGaGe2Se6, was examined by repetitively-pulsed laser radiation at 1 μm and 2 μm. The damage threshold versus wavelength and pulse repetition rate was studied.

CD-P.15 THU

Comparison of SC fibers for fs Ti:Sapphire based hyperspectral CARS microscopy

•*K.P. Herdzik*[1,2], *K.N. Bourdakos*[2], *D.J. Richardson*[1], *P. Horak*[1], *J.H.V. Price*[1], *and S. Mahajan*[2]; [1]*Optoelectronics Research Centre, Southampton, United Kingdom*; [2]*Institute for Life Sciences, Southampton, United Kingdom*

We present the first detailed comparison of the polarisation and spectral characteristics of three SC fiber designs for hyperspectral CARS using a Ti:Sapphire laser and suggest optimal choices for the fingerprint and lipid imaging bands.

CD-P.16 THU

Experimental investigation of ultrafast solitonic all-optical switching in a high index contrast dual-core optical fiber

•*M. Longobucco*[1,2], *I. Astrauskas*[3], *A. Pugzlys*[3], *D. Pysz*[1], *M. Uherek*[4], *A. Baltuška*[3], *R. Buczyński*[1,2], *and I. Bugár*[1,4]; [1]*Institute of Electronic Materials Technology, Wólczyńska 133, 01-919 Warsaw, Poland, Poland*; [2]*Department of Geophysics, Faculty of Physics, University of Warsaw, Pasteura 5, 02-093 Warsaw, Poland, Poland*; [3]*Photonics Institute, Vienna University of Technology, Gusshausstrasse 27-387, 1040 Vienna, Austria, Austria*; [4]*International Laser Centre, Ilkovičova 3, 841 04 Bratislava, Slovakia, Slovakia*

Experimental study of novel all-optical switching concept based on self-trapping of ultrafast sub-nJ solitons in high-index contrast dual-core fiber. Nonlinear switching and moderate spectral broadening were observed through single-core output camera pictures and spectral registrations.

CD-P.17 THU

Polarization modulation instability in all-normal dispersion microstructured optical fibers with quasi-continuous 1064 nm pump

•*A. Loredo-Trejo*[1], *Y. López-Diéguez*[1,2], *L. Velázquez-Ibarra*[1,3], *A. Díez*[1], *E. Silvestre*[4], *and M. Andrés*[1]; [1]*Departamento de Fisica Aplicada - ICMUV, Universidad de Valencia, Burjassot, Spain*; [2]*División de Ingenierías Campus Irapuato-Salamanca, Universidad de Guanajuato, Salamanca, Mexico*; [3]*Departamento de Física, Universidad de Guanajuato, León, Mexico*; [4]*Departamento de Óptica - ICMUV, Universidad de Valencia, Burjassot, Spain*

Experimental observation of polarization modulation instability (PMI) in all-normal dispersión microstructured optical fibers pumped in the picosecond regime is reported. Only one PMI procces was observed. Residual fiber birrefringence is enough to produce widely spaced sidebands.

CD-P.18 THU

Quadratic solitons and their interaction with dispersive waves in Lithium Niobate nano-waveguides

•*W. Rowe, A.V. Gorbach, and D.V. Skryabin*; *Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom*

We investigate the frequency conversion due to the mixing of the dispersive waves and quadratic solitons in Lithium Niobate nano-waveguides. Analytical predictions for frequencies of the dispersive radiation are backed up by simulation.

CD-P.19 THU

Tunable Near 3-μm Difference Frequency Generation Using Ytterbium and Broadband Seed Erbium Fiber Lasers

•*I. Larionov*[1,2], *A. Gulyashko*[2], *and V. Tyrtyshnyy*[2]; [1]*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*; [2]*IRE-Polus, Fryazino, Russia*

Wavelength tunable parametric generation of mid-infrared radiation in the periodically poled lithium niobate crystals was investigated. Up to 8 W of output radiation power with 15% conversion efficiency was obtained in 2.9–3.1 μm tuning range

CD-P.20 THU

Photonic crystal fiber infiltrated with carbon tetrachloride for supercontinuum generation

•*V.T. Hoang*[1,2], *R. Kasztelanic*[1,2], *A. Filipkowski*[1,2], *M. Klimczak*[1], *D. Pysz*[1], *G. Stepniewski*[1,2], *K. Dinh Xuan*[3], *and R. Buczynski*[1,2]; [1]*Department of Glass, Institute of Electronic Materials Technology, Warsaw, Poland*; [2]*Faculty of Physics, Univeristy of Warsaw, Warsaw, Poland*; [3]*Department of Physics, Vinh University, Vinh, Vietnam*

We report all-normal dispersion supercontinuum generation in photonic crystal fiber with carbon tetrachloride liquid core. The supercontinuum in the range 850-1250 nm is achieved with 400 fs pulses with 62.5 kW of peak power.

CD-P.21 THU

Temperature Noncritical Phase Matching For Borate Crystals

•*S. Gagarskiy*[1], *S. Grechin*[2], *P. Druzhinin*[1], *K. Kato*[3,4], *D. Kochiev*[2], *and N. Umemura*[3]; [1]*ITMO University, Sankt-Peterburg, Russia*; [2]*Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia*; [3]*Chitose Institute of Science and Technology, Chitose, Japan*; [4]*Okamoto Optics Works, Inc., Yokohama, Japan*

Results for possible realization of temperature noncritical phase matching in borate crystals for different nonlinear optical processes and for all types of interactions of frequency conversion in the band of tranasparency are represented.

CD-P.22 THU

4π-periodicity of Stokes Vector in Second Harmonic Generation from Bacteriorhodopsin protein

A. Di Vito[1] *and* •*F.A. Bovino*[2]; [1]*Dept Electronic Engineering University of Rome Tor Vergata, Rome, Italy*; [2]*Dept. SBAI University of Rome Sapienza , Rome, Italy*

We report the experimental evidence of 4π-symmetry of the Stokes Vector of Second Harmonic Field generated by from Bacteriorhodopsin protein.

CD-P.23 THU

Achromatic Electro-Optic Modulation using Cascaded Lithium Niobate Ti:diffused Waveguides

•*M. Foin*[1], *G. Martin*[1], *S. Lacour*[2], *G. Ulliac*[3], *and N. Courjal*[3]; [1]*IPAG CNRS, Grenoble, France*; [2]*LESIA CNRS, Meudon, France*; [3]*FEMTO ST, Besançon, France*

We present achromatic modulation in the visible using two cascaded lithium niobate modulators, using two different size and polarization waveguides, to compensate the differential dispersion using two external but related voltages

CD-P.24 THU

Impact of the electrical configuration on the thermal poling of optical fibres with embedded electrodes: theory and experiments

•*F. De Lucia*[1], *R. Bannerman*[1], *J. Gates*[1], *M.M.A. Nunez Velazquez*[1], *J. Sahu*[1], *N. Englebert*[2], *F. Leo*[2], *S.-P. Gorza*[2], *and P. Sazio*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*Service OPERA-photonique, Universite' libre de Bruxelles, 50 Avenue F. D. Roosevelt, Bruxelles, Belgium*

We compare both theoretically and experimentally different electrical configurations for poling optical fibres with embedded electrodes and demonstrate that the single anode one is the most convenient in terms of value of the nonlinearity induced.

CD-P.25 THU

tunable mid-infrared continuous-wave optical parametric oscillator based on fan-out grating PPLN pumped at 1064 nm

•*J.-k. Yoo*[1], *I.-h. Bae*[1,2], *S.d. Lim*[1], *S.K. Kim*[2], *and D.-h. Lee*[1,2]; [1]*division of physical metrology, korea research institute of standards and science, daejeon, South Korea*; [2]*quantum technology institute, korea research institute of standards and science, daejeon, South Korea*

we developed a continuous-wave optical parametric oscillator that can be tuned from 2.5 μm to 5.0 μm based on fan-out grating PPLN pumped at 1064 nm.

CD-P.26 THU

Development of Periodically Poled Lithium Niobate Zinc-Indiffused Ridge Waveguides at Blue Wavelengths

•*A.C. Gray*[1], *L.G. Carpenter*[1], *S.A. Berry*[1], *J.C. Gates*[1], *C. Holmes*[1], *P.G.R. Smith*[1,2], *and C.B.E. Gawith*[1,2]; [1]*Optoelectronics Research Centre, Southampton, United Kingdom*; [2]*Covesion Ltd., Romsey, United Kingdom*

We will present recent developments on blue/UV wavelength generation for ion cooling sources via zinc-indiffused PPLN ridge waveguides. Fabrication details, spectra and the effect of waveguide non-uniformity on these devices will be discussed.

CD-P.27 THU

Single-Pass Generation of Spatio-Temporal Coupled States from Multimode Squeezed Vacuum

•*T. Kouadou, L. La Volpe, S. De, C. Fabre, V. Parigi, and N. Treps*; *Laboratoire Kastler Brossel, Paris, France*

We show the single-pass generation of entangled states featuring spatial-spectral quantum correlations via SPDC. They constitute multimode building blocks of dual-rail cluster states, which can be achieved via multiplexing in the time (pulsed) domain.

CD-P.28 THU

Green-pumped optical parametric oscillator based on fan-out-grating periodically-poled Mg-doped congruent $LiTaO_3$

• *Sukeert*[1], *C.K. Suddapalli*[1,2], *and M. Ebrahim-Zadeh*[1,2,3]; [1]*ICFO—Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain*; [2]*Radiantis, Castelldefels, Spain*; [3]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

We report the first realization of an optical parametric oscillator based on PPMCLT pumped in green, widely tunable across 674-1000 nm (signal) and 1134-2479 nm (idler) with more than 130 mW of output power in high beam quality.

CD-P.29 THU

Dynamics of coupled degenerate parametric oscillators beyond coupled Ising spins

•*L. Bello*[1], *M.C. Strinati*[2], *E.G. Dalla Torre*[2], *and A. Pe'er*[1]; [1]*Department of Physics and BINA Center of Nanotechnology, Bar-Ilan University , 52900 Ramat-Gan, Israel*; [2]*Department of Physics, Bar-Ilan University, 52900 Ramat-Gan, Israel*

Coupled parametric oscillators offer a venue to solve Ising spin networks. We study the simplest building block of such network, namely two coupled parametric oscillators. We find that this system shows everlasting coherent beats that had not been discussed before.

CD-P.30 THU

A tellurite all-solid hybrid microstructured fiber with ultra-small chromatic dispersion fluctuation

•*H.P.T. Nguyen, H.T. Tong, T.S. Saini, X. Luo, T. Suzuki, and Y. Ohishi*; *Toyota Technological Institute, Nagoya, Japan*

We report a tellurite all-solid hybrid microstructured fiber with ultra-small chromatic dispersion fluctuation which has the potential as mid-infrared fiber optical parametric amplifier medium.

CD-P.31 THU

Optical Computing of Mathematical Derivatives using Dispersion and Coherent Detection

M. Suthar[1] *and* •*B. Jalali*[1,2,3,4]; [1]*Department of Electrical and Computer Engineering, University of California Los Angeles, Los Angeles, USA*; [2]*California NanoSystems Institute, Los Angeles, USA*; [3]*Department of Bioengineering, University of California Los Angeles, Los Angeles, USA*; [4]*Department of Surgery, David Geffen School of Medicine, University of California Los Angeles, Los Angeles, USA*

This paper presents a novel approach for computing mathematical derivatives of a signal using optical group delay dispersion followed by coherent detection. This easy-to-implement differentiator computes different orders of differentiation by controlling the dispersion profile.

CD-P.32 THU

Coherent Mid-IR Supercontinuum Generation using Tapered Chalcogenide Step-Index Fiber

T.S. Saini, H.P.T. Nguyen, X. Luo, T.H. Tong, T. Suzuki, and •*Y. Ohishi*; *Research Center for Advanced Photon Technology, Toyota Technological Institute, Nagoya, Japan*

We demonstrate coherent mid-IR supercontinuum extending from 1.6 μm to 3.7 μm using a 3 cm long tapered chalcogenide fiber pumped with femtosecond laser pulses of the peak power of 18.4 kW at 2.5 μm.

CD-P.33 THU

Slow light using photorefractive beam fanning

•*N. Bouldja*[1,2], *M. Sciamanna*[1,2], *and D. Wolfersberger*[1,2]; [1]*Chaire Photonique, LMOPS-EA 4423, CentraleSupélec and Université Paris-Saclay, 57070, Metz, France*; [2]*Chaire Photonique, LMOPS-EA 4423, CentraleSupélec and Université de Lorraine, 57070, Metz, France*

We experimentally show the deceleration of light pulses in SPS crystal by using photorefractive beam fanning. It is possible to slow-down a single Gaussian pulse profile of duration shorter than ms.

CD-P.34 THU

Picosecond Deep Ultraviolet Pulses Generated in Excess of the 1030 nm Fundamental Beam

•*H. Turcicova*[1], *O. Novak*[1], *M. Duda*[1,2], *L. Roskot*[1,2], *J. Muzik*[1,2], *M. Smrz*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics CAS, Dolni Brezany, Czech Republic*; [2]*Faculty of Nuclear Sciences and Physical Engineering, CTU, Prague, Czech Republic*

Picosecond deep ultraviolet pulses are generated at an Yb:YAG thin disk diode pumped laser system. The fifth harmonic is generated as SFG process of 4H + 1H, the effect of the strong 1H beam is discussed.

CD-P.35 THU

Piezoelectric Resonance Laser Calorimetry of LBO Crystals at Low Air Pressures

•*I. Shebarshina*[1], *A. Kozhevnikov*[3], *A. Korolkov*[1,2], *A. Konyashkin*[1,2], *and O. Ryabushkin*[1,2]; [1]*Moscow Institute of Physics and technology, Dolgoprudny, Russia*; [2]*Kotelnikov Institute of Radio-Engineering and Electronics of RAS, Fryazino, Russia*; [3]*Bauman Moscow State Technical University, Moscow, Russia*

Optical absorption of lithium triborate (LBO) crystals at one micron wavelength was measured at different air pressures (from 1E-1 Pa to 1E5 Pa) using piezoelectric resonance laser calorimetry.

CD-P.36 THU

Generation of synchronized, narrow bandwidth picosecond pulses in the visible spectral region based on an Yb pump laser

•*L. Ebner and A. Zumbusch*; *University of Konstanz, Konstanz, Germany*

We present a novel, simple source of synchronized, narrow bandwidth ps pulses in the visible based on an Yb pump laser suitable especially for CARS and SRS microscopy under electronic pre-resonance conditions.

CD-P.37 THU

In Situ Fabrication of Far-Detuned Mid-Infrared Optical Fiber Wavelength Converters

•*I. Alamgir, N. Abdukerim, and M. Rochette*; *McGill University, Montreal, Canada*

We demonstrate the fabrication of far-detuned wavelength converters from As2Se3 microwires. The in situ technique is the most advantageous approach for the fabrication of wavelength converters with predetermined far-detuned wavelength offset.

CD-P.38 THU

Towards optimized photon-pair sources for two-photon transitions

•*A. Krstić*[1], *S. Saravi*[1], *M. Gräfe*[2], *T. Pertsch*[1], *and F. Setzpfandt*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller University, Jena, Germany*; [2]*Fraunhofer Institute of Applied Optics and Precision Engineering IOF, Jena, Germany*

We investigate the spectral properties of two-photon absorption of photon pairs and identify regimes of photon-pair spectra that induce these transitions optimally, based on the group indices of optical modes in photon-pair sources.

CD-P.39 THU

Polarization organisation hidden in the middle point of an optical fiber

•*A. Fusaro*[1], *N. Berti*[1], *M. Guanosi*[2], *H.-R. Jauslin*[1], *A. Picozzi*[1], *J. Fatome*[1], *and D. Sugny*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS, Université Bourgogne Franche-Comté, Dijon, France*; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We report numerically and experimentally a phenomenon of polarization self-organization occurring in the middle point of an optical fiber, when two partially polarized and uncorrelated waves are simultaneously injected at both ends of the fiber.

CD-P.40 THU

Comparison of seed sources for a high-power, picosecond mid-IR optical parametric amplifier: Optical parametric generation versus supercontinuum

•*B. Csanaková*[1,2], *L. Roškot*[1,2], *O. Novák*[1], *J. Mužík*[1,2], *H. Jelínková*[2], *M. Smrž*[1], *and T. Mocek*[1]; [1]*HiLASE Centre, Institute of Physics AS CR, Dolní Břežany, Czech Republic*; [2]*Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic*

We are developing a picosecond, high-power, parametric, mid-IR source broadly tunable in wavelength between 1.45 and 3.5 μm. We compare two different seed sources of the mid-IR system – an optical parametric generator and a supercontinuum

CD-P.41 THU

Magic crossing points of temperature dependent cascaded frequency conversions in nonlinear photonic crystals

•*S. Mohand Ousaid*; *Laboratoire de Physique de Lasers CNRS UMR 7538, Université Paris 13, Sorbonne Paris Cité, Villetaneuse, France*

We report the study of crossing points when mapping the nonlinear interactions vs temperature in PPLT-2D. Results suggest a novel approach to generate entangled photons with controlled spectral features by parametric down conversion interactions.

CD-P.42 THU

Using Bessel beams to induce programmable volume integrated optical circuitry

•*F. Xin*[1,2], *M. Flammini*[1], *F. Di Mei*[1], *L. Falsi*[1], *D. Pierangeli*[1,3], *A.J. Agranat*[4], *and E. DelRe*[1]; [1]*Department of Physics, University of Rome "La Sapienza", Rome, Italy*; [2]*College of Physics and Materials Science, Tianjin Normal University, Tianjin, China*; [3]*ICL-2DMOST, College of Optoelectronic Engineering, Shenzhen University, Shenzhen, China*; [4]*Applied Physics Department, Hebrew University of Jerusalem, Jerusalem, Israel*

We use Bessel beams to fabricate scalable optical wiring through direct writing in a photosensitive volume. The method is used to realize single, double and multiple waveguides, and 1x2, 1x3, 1x4 splitters.

CD-P.43 THU

Measurement of the third order nonlinear susceptibility of a paratellurite single crystal using multiplex CARS

•*L.Z. Rajaofara*[1,2], *P. Thomas*[1], *J.-R. Duclère*[1], *E. Capitaine*[2], *P. Leproux*[2], *V. Couderc*[2], *H. Kano*[3], *and T. Hayakawa*[4]; [1]*Institut de Recherche sur les Céramiques (IRCER) - University of Limoges, Limoges, France*; [2]*XLIM - University of Limoges, Limoges, France*; [3]*Graduate School of Pure and Applied Sciences - University of Tsukuba, Tsukuba, Japan*; [4]*Field of Advanced Ceramics, Department of Life Science - Nagoya Institute of Technology, Nagoya, Japan*

Using the nonresonant contribution of the multiplex coherent anti-Stokes Raman scattering, we estimated the value of nonlinear refractive index of a paratellurite single crystal using SF57 and SiO2 as references and highlighted its angular dependence.

CD-P.44 THU

Femtosecond Coherent Anti-Stokes Raman Scattering Measurement of Gas Temperature Simultaneously from H2, N2 and CO2

•*Y. Ran*[1], *S. Nolte*[1,2], *A. Tünnermann*[1,2], *and R. Ackermann*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

A two-beam femtosecond coherent anti-Stokes Raman scattering (fs-CARS) system is presented to provide accurate, high-repetition-rate thermometric measurements simultaneously and independently from H2, N2 and CO2 fs-CARS signals.

CD-P.45 THU

The contribution has been withdrawn.

CD-P.46 THU

Continuum generation in higher-order modes of photonic crystal fibers

•*J. Lægsgaard*; *DTU Fotonik, Technical University of Denmark, Ørsteds Plads 343, Kongens Lyngby, Denmark*

The perspectives for generating supercontinuum in a single higher-order mode of a photonic crystal fiber are numerically investigated using a novel simulation technique relying on a real-space representation of the nonlinear polarization.

CD-P.47 THU

Intense Stimulated Raman Scattering in CO2-filled Hollow Core Fiber

•*K. Krupa*[1], *K. Baudin*[1], *A. Parriaux*[1], *G. Fanjoux*[2], *and G. Millot*[1]; [1]*Université Bourgogne Franche-Comté, Laboratoire Interdisciplinaire Carnot de Bourgogne (ICB), UMR CNRS 6303, Dijon, France*; [2]*Université Bourgogne Franche-Comté, FEMTO-ST, UMR CNRS 6174, Besançon, France*

We demonstrate experimentally generation of an intense broadband comb-like spectrum through stimulated Raman Scattering obtained, for the first time of our knowledge, in low-pressure CO2-filled hollow-core photonic crystal fiber pumped by relatively low-power infrared pump.

CD-P.48 THU

All-optical sampling of a 40 GHz signal based on four wave-mixing through a nonlinear InGaP on Silicon platform

•*L. Constans*; *Center of nanosciences and nanotechnologies, Palaiseau, France*

All-optical sampling of a 40 GHz signal is demonstrated using four-wave-mixing implemented in a low loss InGaP on Silicon waveguide. The sampled signal is reconstructed up to 40 GHz at a sampling rate of 2 GHz.

CD-P.49 THU

Femtosecond-Laser-Written Waveguides In Periodically Poled MgO-Doped Stoichiometric Lithium Tantalate For Frequency Conversion

•*S. Watanabe, J. Hirohashi, K. Imai, M. Hoshi, and S. Makio*; *OXIDE Corporation, Yamanashi, Japan*

We developed optical waveguides inside periodically poled MgO-doped stoichiometric LiTaO3 frequency conversion device by direct femtosecond laser writing. The waveguiding and SHG properties were characterized with a CW 1064 nm laser.

CD-P.50 THU

Quasi-Phase-Matched Third Harmonic Generation in Periodic Stacks of Polymer Bilayers

•*M. Cha*[1], *J. Kim*[1], *P. Kumar*[1], *H. Choi*[2], *K.-J. Kim*[2], *and N. Peyghambarian*[2]; [1]*Department of Physics, Pusan National University, Busan, South Korea*; [2]*College of Optical Sciences, University of Arizona, Tucson, USA*

Enhanced third harmonic generation (THG) was obtained from periodic stacks of polymer bilayers; polymer containg ethyl-violet molecules and passive resin. The quasi-phase-matching characteristics were verified by performing THG experiments with tunable fundamental wavelength.

CD-P.51 THU

Zn:MgO:PPLN Waveguides for Rb cold Atom Trap based Quantum Gravitometry in a CubeSat

•*L.G. Carpenter*[1], *S.A. Berry*[1], *T.H. Legg*[2], *M.C. Farries*[2], *C.J. Watson*[1], *R.H.S. Bannerman*[1], *A.C. Gray*[1], *C. Holmes*[1], *J.C. Gates*[1], *P.G.R. Smith*[1,3], *and C.B.E. Gawith*[1,3]; [1]*University of Southampton, Southampton, United Kingdom*; [2]*Gooch and Housego, Torquay, United Kingdom*; [3]*Covesion Ltd, Romsey, United Kingdom*

We will present our latest work on Zn:MgO:PPLN ridge waveguides for magneto-optical cooling of Rb within a CubeSat. We will report on fabrication, second harmonic generation spectra/efficiency, loss, vibration and radiation testing.

CD-P.52 THU

Characterization of broadband spontaneous parametric down-conversion in periodically poled materials

•*C. Lindner, S. Wolf, J. Kießling, and F. Kühnemann*; *Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany*

We develop an application-oriented model for the signal power density of broadband SPDC with near- to mid-infrared idler wavelengths. The model is verified by characterizing SPDC in periodically poled lithium niobate pumped at 532 nm.

CD-P.53 THU

Anisotropic Dispersive Shock Waves in Highly Nonlinear M-Cresol/Nylon

•*G. Marcucci*[1], *P. Cala*[2], *G. Siggins*[2], *W. Man*[2], *C. Conti*[1], *and Z. Chen*[2,3]; [1]*Sapienza University, Rome, Italy*; [2]*San Francisco State University, San Francisco (CA), USA*; [3]*Nankai University, Tianjin, China*

In optics, nonlinear Schroedinger equation rules many phenomena, including dispersive shock waves (DSWs). We report experimental evidence of optical DSWs with an anisotropic zero-singularity in m-cresol/nylon, and theoretical describe it by time asymmetric quantum mechanics.

13:00 – 14:00

EB-P: EB Poster session

EB-P.1 THU

Validation of échelle-based quantum-classical discriminator with novelty SPAD array sensor

•*V. Mitev*[1], *L. Balet*[1], *N. Torcheboeuf*[1], *L. Gasparini*[2], *M. Perenzoni*[2], *B. Bessire*[3], *A. Stefanov*[3], *A. Mikhalychev*[4], *D. Mogilevtsev*[4], *and D. Boiko*[1]; [1]*CSEM, Neuchâtel, Switzerland*; [2]*Fondazione Bruno Kessler, Trento, Italy*; [3]*University of Bern, Bern, Switzerland*; [4]*Institute of Physics, National Academy of Sciences of Belarus (IP-NASB), Minsk, Belarus*

The separation of entangled and classical photons of the same optical wavelength is demonstrated with échelle grating and observed by novelty SPAD imager. Separation is possible due to de Broglie wavelength of entangled photon pair.

EB-P.2 THU

Entanglement Witness for Hybrid Bipartite States Based on the Negativity Volume of the Wigner Function

•*J. Svozilík*[1,2], *I.I. Arkhipov*[2], *and A. Barasinski*[2,3]; [1]*Yachay Tech University, Urcuquí, Ecuador*; [2]*Joint Laboratory of Optics, Palacký University, Olomouc, Czech Republic*; [3]*Institute of Physics, University of Zielona Góra, University of Zielona Góra, Poland*

We present a new entanglement witness for arbitrary hybrid quantum states based on the generalized Wigner function. It is shown that this witness can be also applied on quantum systems undergoing decoherence effects.

EB-P.3 THU

Experimental demonstration of Entropic Steering

•*S. Wollmann*[1] *and A. Costa*[2]; [1]*University of Bristol, Bristol, United Kingdom*; [2]*Federal University of Parana, Curitiba, Brazil*

Here we experimentally test a novel quantum steering criteria which is based on entropic uncertainty relations.

EB-P.4 THU

Experimental witness of genuine multiphoton indistinguishability

D.J. Brod[1], *E.F. Galvao*[1], *N. Viggianiello*[2], *F. Flamini*[2], •*N. Spagnolo*[2], *and F. Sciarrino*[2]; [1]*Instituto de Fìsica, Universidade Federal Fluminense, Niteroj, Brazil*; [2]*Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy*

We report the experimental implementation of an indistinguishability witness for three photons. Such approach can be extended with limited interferometric complexity to n particles, and is able to testify and bound genuine multiphoton indistinguishability.

EB-P.5 THU

All-fibre postselection-loophole-free generation of a one-photon time-bin qubit characterised by energy-time tomography

•*M. Jacquet, S. Zeppetzauer, L. Rozema, and P. Walther*; *Vienna Center for Quantum Science and Technology (VCQ), Faculty of Physics, University of Vienna, Vienna, Austria*

We generate a one-photon time-bin qubit without the postselection loophole characteristic of Franson experiments. The state is characterised by Quantum State Tomography in the Energy-Time basis. This is directly applicable to communication and computing tasks.

EB-P.6 THU

Tomography of Quantum Dots in a Non-Hermitian Photonic Chip

•*S.J.U. White*[1,2], *K. Wang*[3,2], *T.T. Tran*[1], *M. Kianinia*[1], *J. Titchener*[3,4], *M. Gräfe*[5], *S. Fischbach*[6], *J.-D. Song*[7], *S. Reitzenstein*[6], *I. Aharonovich*[1], *A.A. Sukhorukov*[3], *A. Szameit*[2], *and A.S. Solntsev*[1]; [1]*School of Mathematical and Physical Sciences, Faculty of Science, University of Technology Sydney, Ultimo, Australia*; [2]*Institut für Physik, Universität Rostock, Rostock, Germany*; [3]*Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National University, Canberra, Australia*; [4]*Quantum Technology Enterprise Centre, Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom*; [5]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*; [6]*Institut für Festkörperphysik, Quantum Devices Group, Technische Universität Berlin, Berlin, Germany*; [7]*Center for Opto-Electronic Convergence Systems, Korea Institute of Science and Technology, Seoul, South Korea*

We present an integrated optical chip for efficient quantum tomography of photon states generated by quantum dots. The design of the chip is non-Hermitian and allows utilising optical losses for greater tolerance to errors.

EB-P.7 THU

Four-Port Interference Device on an Integrated Photonics Platform Based on Tilted Bragg Gratings

•*M.J. Weisen, J.C. Gates, C.B.E. Gawith, P.G.R. Smith, and P. Horak*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

A novel interference device is investigated where multimode integrated waveguides are coupled via tilted Bragg gratings to a common cladding mode. We show that arbitrary and compact 4x4-mode couplers can be achieved in this platform.

EB-P.8 THU

Operational Description of Single-Photon Detectors Including Timing-Jitter Effects

É. Gouzien[1], *B. Fedrici*[1], •*F. Mondain*[1], *A. Zavatta*[2,3], *S. Tanzilli*[1], *and V. D'Auria*[1]; [1]*Université Côte d'Azur, Institut de Physique de Nice (INPHYNI), CNRS UMR 7010, Nice, France*; [2]*Istituto Nazionale di Ottica (INO-CNR), Firenze, Italy*; [3]*LENS and Department of Physics, Universitá di Firenze, Firenze, Italy*

We model single photon detectors by explicitly taking into account their timing-jitter, finite efficiency and dead-time effects. Our model represents the first operational and full description of temporal limitations of those detectors.

EB-P.9 THU

Frequency-multiplexed singly-resonant photon pairs from a quadratic nonlinear waveguide resonator

•*R. Ikuta*[1,2], *R. Tani*[1], *M. Ishizaki*[1], *S. Miki*[3], *M. Yabuno*[3], *H. Terai*[3], *N. Imoto*[1,2], *and T. Yamamoto*[1,2]; [1]*Graduate School of Engineering Science, Osaka University, Toyonaka, Japan*; [2]*Quantum Information and Quantum Biology Division, Institute for Open and Transdisciplinary Research Initiatives, Osaka University, Toyonaka, Japan*; [3]*Advanced ICT Research Institute, National Institute of Information and Communications Technology, Kobe, Japan*

We demonstrated a frequency multiplexed photon pair generation by using a quadratic nonlinear optical waveguide monolithically integrated in an optical cavity which confines only one halves of the photon pairs.

EB-P.10 THU

Superconducting Single-Photon Detector for Lithium Niobate Integrated Quantum Photonic at Telecom Wavelengths

•*P. Agruzov*[1], *A. Ionov*[2], *S. Chekmazov*[2], *S. Bozhko*[2], *I. Ilichev*[1], *A. Tronev*[1,3], *M. Parfenov*[1,4], *and A. Shamrai*[1]; [1]*Ioffe Institute, St. Petersburg, Russia*; [2]*Institute of Solid State Physics Russian Academy of Sciences, Chernogolovka, Russia*; [3]*ITMO University, St. Petersburg, Russia*; [4]*Peter the Great Saint-Petersburg Polytechnic University, St. Petersburg, Russia*

A waveguide configuration of a single-photon detector on the lithium niobite substrate was demonstrated. Waveguide fabrication technological parameters were optimized for subsequent growth of NbN nanostructures with high superconducting properties (critical current density of 1.2x10^9A/m^2).

EB-P.11 THU

Multi-shear reconstruction of the joint spectral phase of two photons

•*I. Gianani*; *Dipartimento di Scienze, Università degli studi di Roma Tre, Rome, Italy*

A novel multi-shear technique for the reconstruction of the joint spectral phase of a biphoton state is discussed. We report on simulations for the phase reconstruction and propose an experiment using a Franson-modified interferometer.

EB-P.12 THU

Single photon temporal wavepacket control and its application for qudit encoding

•*K. Sedziak-Kacprowicz, M. Lasota, and P. Kolenderski*; *Nicolaus Copernicus University, Torun, Poland*

We present a method of remote temporal wavepacket narrowing by utilizing spectrally entangled photon pairs. The technique can be applied to extend the range of quantum communication protocols and qudit encoding.

EB-P.13 THU

Cooperative States of Nd3+ Ion Pairs and Clusters in Nd3+:LaF3 crystal

•*Y. Orlovskii*[1,2], *E. Vinogradova*[1], *and V. Hiznyakov*[1]; [1]*Institute of Physics, University of Tartu, Tartu, Estonia*; [2]*Prokhorov General Physics Institute, Moscow, Russia*

Site-selective fluorescence spectral and kinetic studies of 1%Nd3+:LaF3 crystal at 1.6K at the 4F3/2(1)→4I9/2(1) crystal-field transition revealed numerous pairs and larger clusters with their own spectral positions and radiative lifetimes. Cooperative bright and dark states are detected.

EB-P.14 THU

Variable Delay based on Electromagnetically Induced Transparency in Cesium at Room Temperature for Photon Storage

•*T. Kroh*[1], *E. Gomez Lopez*[1], *C. Müller*[1], *J. Wolters*[2], *and O. Benson*[1]; [1]*Humboldt-Universtät zu Berlin, Berlin, Germany*; [2]*University of Basel,, Basel, Switzerland*

We present a controlled delay experiment based on electromagnetically induced transparency at the Cesium D1 hyperfine transitions for pair photons from cavity-enhanced SPDC. The results aim towards application as a room-temperature memory in quantum networks.

EB-P.15 THU

Plasmonic Quantum Walk in Gold Strip Parallel Waveguides

•*N. Namekata*[1], *R. Kobayashi*[1,2], *T. Naka*[1], *A. Tada*[1], *D. Fukuda*[2], *and S. Inoue*[1]; [1]*Institute of Quantum Science, Nihon University, 1-8-14 Kanda-Surugadai, Chiyoda-ku, Tokyo, 101-8308, Japan*; [2]*ational Institute of Advanced Industrial Science and Technology, 1-1-1 Umezono, Tsukuba, Ibaraki 305-8563 , Japan*

Continuous quantum walk was demonstrated using a plasmonic chip composed of 50 long-range surface plasmon polariton parallel waveguides. Non-Gaussian intensity distribution different from that of classical random walk was successfully observed.

EB-P.16 THU

Subohmic decoherence of a quantum emitter embedded in a nanomechanical beam

•*I. Wilson-Rae*[1], *A. Imamoglu*[2], *and W. Zwerger*[3]; [1]*Department of Physics, University of York, York, United Kingdom*; [2]*Institute of Quantum Electronics, ETH Zurich, Zurich, Switzerland*; [3]*Physik Department, Technische Universitaet Muenchen, Garching, Germany*

We calculate the fluorescence of a quantum emitter embedded in a nanomechanical beam and find markedly Non-Markovian features, including a strong dependence of the coherent fraction on the detuning and that the zero-phonon line collapses.

EB-P.17 THU

Circuit Quantum Electrodynamic Model of a Resonantly Phase-Matched Josephson Traveling Wave Parametric Amplifier

•*M. Haider, Y. Yuan, J. Abundis Patino, J. Russer, P. Russer, and C. Jirauschek*; *Department of Electrical and Computer Engineering, TU Munich, Munich, Germany*

A quantum mechanical closed analytic solution for a resonantly phase-matched Josephson traveling wave parametric amplifier, based on a discrete chain Hamiltonian, is derived. Our model is validated against available results from literature, yielding excellent agreement.

EB-P.18 THU

Toward coupling color centers in single crystal diamond to two-dimensional materials

•*O. Opaluch*[1], *R. Nelz*[1], *M. Challier*[1], *M. Radtke*[1], *A. Slablab*[1], *Z. Xu*[2], *I. Aharonovich*[2], *and E. Neu*[1]; [1]*Faculty of Natural Science and Technology, Exp. Physics, Universität des Saarlandes, 66123 Saarbrücken, Germany*; [2]*Institute of Biomedical Materials and Devices (IBMD), Faculty of Science, University of Technology Sydney, Ultimo, NSW, 2007, Australia*

We present results towards demonstrating the interaction of nitrogen vacancy color centers in single crystal diamond with tungsten-diselenide WSe_2 via nearfield energy transfer. We envisage using quenching of the NV center as a sensing ressource.

EB-P.19 THU

Method for Quantum Key Establishment Through a Multimode Fiber

•*L. Amitonova*[1,2,3], *T. Tentrup*[1], *I. Vellekoop*[2], *and P. Pinkse*[1]; [1]*Complex Photonic Systems, University of Twente, Enschede, Netherlands*; [2]*Biomedical Photonic Imaging, University of Twente, Enschede, Netherlands*; [3]*Vrije Universiteit Amsterdam, Amsterdam, Netherlands*

We propose a fundamentally new concept for secure high-dimensional remote key distribution. Our method utilizes a quantum-secure wavefront shaping procedure and transmit information encoded into a few-photon light pulse through a light-scrambling multimode fiber.

EB-P.20 THU

Miniaturized Devices For Free Space Quantum Key Distribution; In Your Pocket And In Space.

•*D. Lowndes, S. Frick, A. Hart, and J. Rarity*; *University of Bristol, Bristol, United Kingdom*

We discuss our miniaturized quantum key distribution source and novel implementations where it can be applied. Based on these applications we consider the specific requirements imposed on the source and possible improvements necessary.

EB-P.21 THU

A Ghost Communication Scheme based on 2nd Order Polarization Correlations

•*M. Rosskopf, T. Mohr, and W. Elsäßer*; *Technische Universität Darmstadt, Darmstadt, Germany*

We demonstrate a novel ghost communication scheme, camouflaging the information in the polarization state of unpolarized light. The 2nd order intensity correlation is used to retrieve the transmitted polarization state and thus the message.

EB-P.22 THU

The contribution has been withdrawn.

EB-P.23 THU

Nonlocal Dispersion Compensation in Multi-segment Deployed Telecommunications Fiber

•*J.A. Grieve*[1], *Y. Shi*[1], *H.S. Poh*[1], *C. Kurtsiefer*[1,2], *and A. Ling*[1,2]; [1]*Centre for Quantum Technologies, Singapore, Singapore*; [2]*Department of Physics, National University of Singapore, Singapore, Singapore*

Time-energy entangled photon pairs experience nonlocal dispersion compensation after propagation over multi-segment deployed telecommunications fiber. The preservation of tight timing correlations enables the use of broadband quantum light sources in existing metropolitan fiber networks.

EB-P.24 THU

Simulation of a Telecom-Provider Driven Reference QKD-Network

•*A. Poppe*[1], *M. Gunkel*[2], *F. Wissel*[2], *P. Schilder*[2], *D. Witt*[2], *and M. Peev*[1]; [1]*Huawei Technologies Duesseldorf GmbH, Munich, Germany*; [2]*Deutsche Telekom Technik GmbH, Darmstadt, Germany*

A reference network from Deutsche Telecom with 39 nodes and connected by 66 eges was used to simulate the deployment of QKD-links. Two existing algorithms optimizing telecom networks compete for uniformly distributed maximal key rates.

EB-P.25 THU

Highly Efficient Ultra-Broadband Entangled Photon-Pair Generation using a Chirped PPSLT Ridge Waveguide

•*B. Cao*[1], *R. Okamoto*[1], *M. Hisamitsu*[2], *K. Tokuda*[2], *and S. Takeuchi*[1]; [1]*Department of Electronic Science and Engineering, Kyoto University, Kyoto University, Kyoto daigaku-katsura, Nishikyo-ku, Kyoto, Japan*; [2]*Shimadzu Corporation, 2385-13, Liyama, Atsugi, Kanagawa 243-0213, Japan*

We developed an entangled photon source based on the technology of chirp Quasi-Phase Matching together with a ridge waveguide structure for highly efficient frequency entanglement generation with ultra-broadband spectra.

EB-P.26 THU

Entanglement generation by conversion of position correlation into polarization entanglement

•*A. Lohrmann*[1], *C. Perumangatt*[1], *and A. Lohrmann*[1,2]; [1]*Centre for Quantum Technologies, National University of Singapore, Singapore, Singapore*; [2]*Department of Physics, National University of Singapore, Singapore, Singapore*

We present a compact source of polarization entangled photons from a single periodically poled potassium titanyl phosphate crystal. The source converts the intrinsic position correlation of photon pairs generated to a polarization entangled bi-photon state.

EB-P.27 THU

Polarization Measurement of Time-energy Entanglement

C. Perumangatt[1], •*A. Lohrmann*[1], *and A. Ling*[1,2]; [1]*Centre for Quantum Technologies , Singapore, Singapore*; [2]*Physics Department, National University of Singapore, Singapore, Singapore*

In this work we convert the quantum correlation of time-energy entangled photons into polarization entanglement using unbalanced polarizing Michelson interferometers.

EB-P.28 THU

The contribution has been withdrawn.

EB-P.29 THU

Biphoton shaping with cascaded entanglement sources

•*A. Riazi*[1], *E.Y. Zhu*[1], *C. Chen*[1], *A.V. Gladyshev*[2], *P.G. Kazansky*[3], *J.E. Sipe*[4], *and L. Qian*[1]; [1]*Department of Electrical and Computer Engineering, University of Toronto, Toronto, Canada*; [2]*Fiber Optics Research Center, Russian Academy of Sciences, Moscow, Russia*; [3]*Optoelectronics Research Center, University of Southampton, Southampton, United Kingdom*; [4]*Department of Physics, Toronto, Canada*

We experimentally demonstrate the ability to simultaneously tune the spectral and polarization properties of biphotons through cascading two biphoton sources and altering the dispersion and birefringence properties of the medium in between.

EB-P.30 THU

Joint Topological and Polarization Entanglement Enables Noise-Resistant Optical Information Processing

•*A. Sergienko*[1], *D. Simon*[1,2], *and S. Osawa*[1]; [1]*Boston University, Boston, USA*; [2]*Stonehill College, Easton, USA*

Linear-optical photonic quantum walks are used to jointly entangle polarization and topological winding number. This joint entanglement allows polarization entanglement-based quantum information processing tasks to be performed with high degree or error protection.

EB-P.31 THU

Removing phase ambiguity in fiber-based interferometers for coherent time-bin operations

•*P. Roztocki*[1], *M. Islam*[1], *C. Reimer*[1,2], *B. Fischer*[1], *S. Sciara*[1,3], *Y. Zhang*[1], *D.J. Moss*[4], *M. Kues*[5,6], *and R. Morandotti*[1,7,8]; [1]*INRS-EMT, Varennes, Canada*; [2]*HyperLight Corporation, Cambridge, USA*; [3]*University of Palermo, Palermo, Italy*; [4]*Swinburne University of Technology, Hawthorn, Australia*; [5]*University of Glasgow,*

Glasgow, United Kingdom; [6]*Aarhus University, Aarhus, Denmark*; [7]*ITMO University, St. Petersburg, Russia*; [8]*University of Electronic Science and Technology of China, Chengdu, China*

A novel phase-recovery scheme for fiber interferometers, exploiting frequency-multiplexing in orthogonal fiber polarization modes, enables unambiguous phase mapping. This allows for computer-controllable arbitrary phase tuning and stabilization, providing a precise tool for time-bin qubit manipulation.

EB-P.32 THU

Field trial of a finite-key quantum key distribution system in the metropolitan Florence area

•*D. Bacco*[1], *I. Vagniluca*[2,3], *B. Da Lio*[1], *N. Biagi*[2,3], *A. Della Frera*[4], *D. Calonico*[5], *C. Toninelli*[2,3], *F.S. Cataliotti*[2,3], *M. Bellini*[2,3], *L.K. Oxenløwe*[1], *and A. Zavatta*[2]; [1]*Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*CNR-INO, Istituto Nazionale di Ottica, Sesto F.no, Firenze, Italy*; [3]*LENS and Università di Firenze, Sesto F.no, Firenze, Italy*; [4]*Micro Photon Devices S.r.l., Bolzano, Italy*; [5]*I.N.Ri.M.—Istituto Nazionale di Ricerca Metrologica, Torino, Italy*

Field trial experiments allow the development of a rising technology towards its integration in existing infrastructures. We demonstrate the coexistence of a quantum and classical fiber-based communication system in the Florence metropolitan area.

EB-P.33 THU

Discrete-time Quantum Walks in the Angular Momentum of a Single Photon for Engineering Quantum States

•*T. Giordani*[1], *E. Polino*[1], *S. Emiliani*[1], *A. Suprano*[1], *L. Innocenti*[2], *H. Majury*[2], *L. Marrucci*[3], *M. Paternostro*[2], *A. Ferraro*[2], *N. Spagnolo*[1], *and F. Sciarrino*[1,4]; [1]*Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy*; [2]*Centre for Theoretical Atomic, Molecular, and Optical Physics, School of Mathematics and Physics, Queen's University Belfast, Belfast, United Kingdom*; [3]*Dipartimento di Fisica "Ettore Pancini", Università Federico II, Complesso Universitario di Monte Sant'Angelo, Napoli, Italy*; [4]*Consiglio Nazionale delle Ricerche, Istituto dei sistemi Complessi (CNR-ISC), Roma, Italy*

In this work we present a new approach to the problem of quantum state engineering. High-dimensional quantum states, encoded in the angular momentum of single-photon, are generated exploiting quantum walks dynamics boosted by numerical optimization.

EB-P.34 THU

Quantum Key Distribution Exploiting a Faraday Rotator and a Single SPAD

•*P. Martelli, M. Brunero, A. Fasiello, F. Rossi, A. Tosi, and M. Martinelli*; *Politecnico di Milano, Dipartimento di Elettronica Informazione e Bioingegneria, Milano, Italy*

The feasibility of a novel implementation of BB84 protocol for QKD, based on the use of a Faraday rotator variable over four states and a single SPAD, has been experimentally proved.

EB-P.35 THU

Towards a Suburban Quantum Network Link

•*T. van Leent*[1], *R. Garthoff*[1], *K. Redeker*[1], *P. Koschmieder*[1], *W. Zhang*[1], *W. Rosenfeld*[1,2], *and H. Weinfurter*[1,2]; [1]*Fakultät für Physik, Ludwig-Maximilians-Universität, München, Germany*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We report on progress on achieving heralded entanglement between two atoms separated by several kilometers. This work is based on recent achievement of entanglement generation over a distance of 400 meter.

EB-P.36 THU

A ps-pulse laser for ultrafast entanglement generation at 42.66 GHz repetition rate

S. Zeiger, •*F. Laudenbach, B. Schrenk, M. Hentschel, and H. Hübel*; *AIT - Austrian Institute of Technology, Vienna, Austria*

We present a source for polarization-entangled photon pairs operating at tunable clock rates of up to 42.66 GHz. Pumped by a self-assembled high-speed laser system, our source emits photons of high purity and entanglement visibility.

EB-P.37 THU

Quantum Noiseless linear processor with optical parametric amplifier

•*S. Yang*[1], *S. Zhang*[2], *Q. Sun*[1], *Y. Zheng*[1], *and Y. Su*[1]; [1]*Beijing Institute of Space Mechanics&Electricity, Beijing, China*; [2]*Beijing Institute of Technology, Beijing, China*

We propose a scheme for quantum noiseless linear processor which can exhibit amplification or attenuation by tuning one coupling parameter of an optical parametric amplifier. Our approach has a high success probability for amplification gain Geff>2.

EB-P.38 THU

New insights on quantum random number generation (QRNG) by phase diffusion

B. Septriani, O. de Vries, and •*M. Gräfe*; *Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*

We present a parametric study of QRNG harnessing phase diffusion in gain-switched DFB laser diode. Our findings give new insights into the process, its limitations regarding maximum raw data rate, and advantage of pulsed regime.

EB-P.39 THU

Direct Quantum Error Detection in Spatially Multiplexed Transmission

•*K. Wang*[1,2], *F. Eilenberger*[3,4,5], *A. Szameit*[2], *and A.A. Sukhorukov*[1]; [1]*Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National University, Canberra, Australia*; [2]*Institute for Physics, Rostock Universität, Rostock, Germany*; [3]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center for Excellence in Photonics, Jena, Germany*; [5]*Max Planck School of Photonics, Jena, Germany*

We introduce a protocol for direct detection of arbitrary continuous phase errors in transmission of multi-photon spatially entangled quantum states, and present a design and experimental evidence for its realization in an integrated photonic circuit.

EB-P.40 THU

Squeezing-Enhancement of Stimulated and Spontaneous Raman Spectroscopy

•*Y. Michael, L. Bello, M. Rosenbluh, and A. Pe'er*; *Bar-Ilan University, Ramat Gan, Israel*

We present a new scheme for Raman spectroscopy, which significantly enhances the detection sensitivity beyond the shot-noise-limit while suppressing the nonresonant background using two-mode squeezed illumination.

EB-P.41 THU

Universality of local weak interactions and its application for interferometric alignment

•*J. Dziewior*[1,2], *L. Knips*[1,2], *D. Farfurnik*[3], *K. Senkalla*[1,2], *N. Benshalom*[3], *J. Efroni*[3], *J. Meinecke*[1,2], *S. Bar-Ad*[3], *H. Weinfurter*[1,2], *and L. Vaidman*[3]; [1]*Max-Planck-Institut für Quantenoptik, 85748 Garching, Germany*; [2]*Department für Physik, Ludwig-Maximilians-Universität, 80797 München, Germany*; [3]*Raymond and Beverly Sackler School of Physics and Astronomy, Tel-Aviv University, Tel-Aviv 69978, Israel*

Based on a novel paradigm for the description of pre- and postselected quantum systems the universality of weak values is derived and tested experimentally, forming the basis of an efficient alignment technique for optical interferometers.

EB-P.42 THU

Quantum-classical image distillation

•*H. Defienne*[1], *M. Reichert*[2], *J. Fleischer*[2], *and D. Faccio*[1]; [1]*School of Physics and Astronomy, University of Glasgow, Glasgow G128QQ, United Kingdom*; [2]*Department of Electrical Engineering, Princeton University, Princeton NJ 08544, USA*

We experimentally demonstrate a technique that allows selective distillation of a quantum image from measured data composed of a superposition of both quantum and classical light.

13:00 – 14:00

EC-P: EC Poster session

EC-P.1 THU

Orbital angular momentum in photonic integrated circuits

•*A. Turpin*[1,2], *G. Pelegrí*[3], *J. Polo*[4], *J. Mompart*[3], *and V. Ahufinger*[3]; [1]*Leibniz Institute of Photonic Technology, Jena, Germany*; [2]*University of Glasgow, Glasgow, United Kingdom*; [3]*Universitat Autònoma de Barcelona, Bellaterra, Spain*; [4]*University Grenoble Alpes, Grenoble, France*

We demonstrate theoretically the existence of orbital angular momentum (OAM) supermodes in a three-evanescently-coupled waveguides system. We use this result to design OAM cloners and OAM inverters by adding dissipation to one of the waveguides.

EC-P.2 THU

Adiabatic Transport of Multipartite-Entangled Edge states in Topological Insulators

•*J. Tangpanitanon*[1], *M.-A. Lemonde*[1], *and D. Angelakis*[1,2]; [1]*Centre for Quantum Technologies, Singapore, Singapore*; [2]*Technical University of Crete, Chania, Greece*

Topological insulators exhibiting arbitrary non-interacting edge states are proposed. Adiabatic pumping of the edge state across the lattice and its robustness against disorders are discussed. Our proposal is implementable in photonic lattices and superconducting circuits.

EC-P.3 THU

A Topologically Robust Formation of Broadband Vortices Propagating at the Speed of Light

•*A. Zdagkas*[1], *V. Savinov*[1], *N. Papasimakis*[1], *and N. Zheludev*[1,2]; [1]*University of Southampton, Southamp-*

ton, United Kingdom; [2]*Nanyang Technological University, Singapore, Singapore*
We show that Flying Doughnuts, exact propagating solutions of Maxwell equations in the form of single-cycle toroidal pulses have complex and robust fine topological structure of spectrally broadband vortices and extended areas of energy backflow.

EC-P.4 THU

Generation of Photon Pairs in Waveguide Arrays Supporting Topologically Protected Guided Modes

•*N. Bergamasco and M. Liscidini*; *Dipartimento di Fisica, Università degli studi di Pavia, Pavia, Italy*
We study the generation of photon pairs by parametric fluorescence in topologically protected and trivial guided modes. Our statistical analysis reveals that path correlations and the Schmidt number are not always topologically protected against disorder.

EC-P.5 THU

Bulk mode resonances in Floquet topological insulators based on coupled microring resonator lattices

•*S. Afzal and V. Van*; *University of Alberta, Edmonton, Canada*
We report a new optical resonance phenomenon based on light trapping in the bulk modes of Floquet topological microring lattices. These bulk-mode resonances do not require a cavity and exist only in nontrivial topological lattices.

EC-P.6 THU

Optical Chiral Edge Modes at Magnetic Domain Boundaries in Continuous Gyrotropic Media

•*M. Marciani and P. Delplace*; *Univ Lyon, Ens de Lyon, Univ Claude Bernard, CNRS, Laboratoire de Physique, F-69342, lyon, France*
We show the emergence of interface chiral modes in continuous gyrotropic media and highlight their topological origin that precludes the need for a Brillouin zone.

EC-P.7 THU

Anderson localization in synthetic photonic lattice with static random coupling disorder

•*A. Pankov*[1], *I. Vatnik*[1], *D. Churkin*[1], *and S. Derevyanko*[2]; [1]*Novosibirsk State Universlity, Novosibirsk, Russia*; [2]*Ben Gurion University of the Negev, Beersheba, Israel*
We study Anderson localization in the synthetic photonic lattice with static disorder in the coupling ratio between two fiber loops. We obtain new analytical result for the localization length in the case of weak disorder.

EC-P.8 THU

Switching quasi- at modes at the interface between detuned anomalous Floquet topological insulators

F. Piccioli, •L. Maczewsky, M. Kremer, M. Heinrich, and A. Szameit; *Universität Rostock, Institute of Physics, Rostock, Germany*
We show that the interface between topologically equivalent photonic Anomalous Floquet Topological Insulators supports trivial modes. A fraction of light flowing in a topological edge mode can be extracted and desposited on the interface mode.

EC-P.9 THU

Simulating artificial graphene with superconducting resonators

•*A. Morvan, M. Féchant, G. Aiello, J. Gabelli, and J. Estève*; *Laboratoire de Physique des Solides, CNRS, Univ. Paris-Sud, Universitée Paris-Saclay, Orsay, France*
We present the observation of artificial graphenes realized with superconducting circuits. In particular, we present experimental observation of topological Semenoff edge states at the interface between two gapped artificial graphenes.

EC-P.10 THU

Existence loci of bound states in the continuum in the parameter space of anisotropic planar structures

•*S. Mukherjee*[1], *J. Gomis-Bresco*[1], *P. Pujol-Closa*[1], *D. Artigas*[1,2], *and L. Torner*[1,2]; [1]*ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain*; [2]*Department of Signal Theory and Communications, Universitat Politècnica de Catalunya, Barcelona, Spain*
We investigate the existence of bound states in the continuum (BICs) under the variation of system parameters in planar structures with uniaxial materials and uncover a topological transition under breaking of the anisotropy-symmetry.

EC-P.11 THU

Dirac and Exceptional Points in uniaxial waveguides

•*J. Gomis-Bresco*[1], *D. Artigas*[1,2], *and L. Torner*[1,2]; [1]*ICFO-The Institute of Photonic Sciences, The Barcelona Institute of Science and Technology, Castelldefels, Spain*; [2]*Department of Signal Theory and Communications, Universitat Politècnica de Catalunya, Barcelona, Spain*
We show the existence of Dirac Points in highly structural and anisotropy symmetric planar waveguides, which adiabatically transforms into two exceptional points by adding gain or losses.

EC-P.12 THU

Scattering of light in dimension (2+1): spin Hall effect and non-paraxial diffusion

•*N. Cherroret*; *Laboratoire Kastler Brossel, CNRS, Paris, France*
I will show that light propagating in materials with spatial disorder along two transverse directions but longitudinally homogeneous exhibit a spin Hall effect. This is the first manifestation of spin-orbit interactions of light in the presence of disorder.

EC-P.13 THU

Experimental realisation of PT-symmetric flat bands

•*T. Biesenthal, M. Kremer, M. Heinrich, and A. Szameit*; *Institut für Physik, Universität Rostock, Rostock, Germany*
This work experimentally connects the growing field of non-Hermitian photonics with light localisation in photonic lattices. Here the intrinsic PT-symmetry induces a flat band structure with a compact localised eigenmode at the systems exceptional point.

EC-P.14 THU

Experimental Demonstration of a Non-Quantized Square Root Topological Insulator using Photonic Aharonov-Bohm Cages

•*M. Kremer*[1], *I. Petrides*[2], *E. Meyer*[1], *M. Heinrich*[1], *O. Zilberberg*[2], *and A. Szameit*[1]; [1]*Institut für Physik, Universität Rostock, Rostock, Germany*; [2]*Institut für Theoretische Physik, ETH Zürich, Zürich, Switzerland*
We report a new type of insulator that displays nonquantized topological invariants. Moreover, a quantisation reveals itself upon squaring the Hamiltonian, assuring the topological robustness. We experimentally verify these findings by using photonic Aharonov-Bohm cages.

EC-P.15 THU

Experimental Realization of Two-Dimensional PT-Symmetric Graphene: Bulk Properties and Edge States

•*M. Kremer*[1], *T. Biesenthal*[1], *L. Maczewsky*[1], *M. Heinrich*[1], *R. Thomale*[2], *and A. Szameit*[1]; [1]*Institut für Physik, Universität Rostock, Rostock, Germany*; [2]*Department of Physics and Astronomy, Julius-Maximilians-Universität Würzburg, Würzburg, Germany*
We report the first implementation of a 2D PT-symmetric crystalline structure. Using a novel isotropic loss mechanism in a photonic setting, we probe bulk and edge properties and study the interplay between PT-symmetry and topology.

EC-P.16 THU

Theoretical Description of a Non-Quantized Square-Root Topological Insulator using Photonic Aharonov-Bohm Cages

M. Kremer[2], •*I. Petrides*[1], *E. Meyer*[2], *M. Heinrich*[2], *O. Zilberberg*[1], *and A. Szameit*[2]; [1]*Institut fur Theoretische Physik, ETH, Zurich, Switzerland*; [2]*Institut fur Physik, Universitat Rostock, Rostock, Germany*
We predict a topological insulator with nonquantized indices, but with robust boundary states. We show that this robustness stems from the quantization of the indices in the corresponding system where the squared Hamiltonian is taken.

13:00 – 14:00

EG-P: EG Poster session

EG-P.1 THU

The contribution has been withdrawn.

EG-P.2 THU

Antenna impedance for FRET: A theoretical and experimental framework for studying dipole-dipole interactions with microwave antennas

K. Rustomji[1], *R. Abdeddaim*[1], *M. Dubois*[1], *B. Kuhlmey*[2], •*M. de Sterke*[2], *J. Wenger*[1], *and S. Enoch*[1]; [1]*Aix Marseille Univ, CNRS, Centrale Marseille, Marseille, France*; [2]*University of Sydney, Sydney, Australia*
We report direct measurements of Förster Resonant Energy Transfer at microwave frequencies in a cavity. To achieve this we developed a theoretical framework unifying the descriptions of dipole-dipole interactions and microwave antenna engineering.

EG-P.3 THU

Spectroscopic Ellipsometry of Surface Plasmons

J. Budai[1,2], •*Z. Pápa*[1,3], *J. Csontos*[1], *and P. Dombi*[1,3]; [1]*ELI-ALPS Research Institute, ELI-HU Non-Profit Ltd., Szeged, Hungary*; [2]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*; [3]*MTA "Lendület" Ultrafast Nanooptics Group, Wigner Research Centre for Physics, Budapest, Hungary*
Spectroscopic ellipsometric measurements of gold films and nanoparticles allow to reveal plasmon associated changes of the dielectric function. Changes occurring near the d-band transition edge were investigated, results will be extended with femtosecond time-resolved measurements.

EG-P.4 THU

Ultrafast all-optical switching in III-V semiconductor resonant nanostructures

•*V. Snigirev, A. Shorokhov, D. Gulkin, V. Bessonov, I. Soboleva, and A. Fedyanin*; *Lomonosov Moscow State University, Moscow, Russia*

We demonstrate, both numerically and experimentally, the considerable change of the light scattering in nanoantennas made of direct-bandgap semiconductor materials for the low-intesity optical pumping.

EG-P.5 THU

Nanostructured control of interactions of quantum emitters beyond electric dipole approximation

M. Kosik[1], *O. Burlayenko*[2], *and* •*K. Słowik*[1]; [1]*Institute of Physics, Nicolaus Copernicus University, Torun, Poland*; [2]*Department of Physics and Technology, V.N. Karazin Kharkiv National University, Kharkiv, Ukraine*

We investigate interactions and collective emission of multiple quantum emitters sharing the same photonic environment modified by nanostructured materials. Our analytical approach based on Green's tensor formalism allows steps beyond electric dipole approximation.

EG-P.6 THU

Photoelectrochemical water splitting with cobalt oxide coated gold nanorods under visible excitation

•*P. Ghosh*[1], *A. Kar*[2], *A.L. Chakraborty*[1], *S. Sharma*[2], *A. Dutta*[2], *and S. Khatua*[2]; [1]*Electrical Engineering, Indian Institute of Technology, GANDHINAGAR, India*; [2]*Chemistry, Indian Institute of Technology, Gandhinagar, India*

A new plasmonic photocatalyst, CoO coated gold nanorod shows great potential for photoelectrochemical water oxidation with a low overpotential of 255 mV and generates large photocurrent under visible excitation.

EG-P.7 THU

Spectroscopic probing of retardation effects in the Casimir-Polder interaction: a theoretical study

J.C. de Aquino Carvalho, P. Pedri, M. Ducloy, and •*A. Laliotis*; *Laboratoire de Physique des Lasers, UMR7538 CNRS, Université Paris13, Sorbonne Paris-Cité, Villetaneuse, France*

We analyse the fully retarded Casimir-Polder potential of cesium energy states. We show deviations from the electrostatic approximation even at nanometric distances away from the surface. These effects are measurable by selective reflection spectroscopy.

EG-P.8 THU

Investigation of Electrical Transport in Semiconductor Heterostructure Devices Coupled Strongly to the Light Field

B. Limbacher[1,3], •*M. Kainz*[1,3], *S. Schönhuber*[1,3], *M. Wenclawiak*[1,3], *C. Derntl*[1,3], *A. Andrews*[2,3], *H. Detz*[3,5], *A. Schwaighofer*[4], *B. Lendl*[4], *G. Strasser*[2,3], *J. Darmo*[1,3], *and K. Unterrainer*[1,3]; [1]*Photonics Institute, TU Wien, Vienna, Austria*; [2]*Institute for Solid State Electronics, TU Wien, Vienna, Austria*; [3]*Center for Micro- and Nanostructures, TU Wien, Vienna, Austria*; [4]*Institute of Chemical Technologies, TU Wien, Vienna, Austria*; [5]*CEITEC, Brno, Czech Republic*

We investigate the influence of electrical current on intersubband polaritons and vice-versa in two quantum well structures originally designed for electrical transport.

EG-P.9 THU

Vibrational ladder-climbing and molecular ground-state dissociation driven by mid-infrared chirp-pulsed plasmonic near-fields

•*I. Morichika, A. Sakurai, and S. Ashihara*; *Institute of Industrial Science, The University of Tokyo, Tokyo, Japan*

We report on successful driving of vibrational ladder-climbing and ground-state dissociation of W(CO)6 in n-hexane solutions by mid-infrared chirp-pulsed plasmonic near-fields. The demonstrated scheme will pave the way to controlled ground-state chemistry in the condensed-phase.

EG-P.10 THU

Nonlinear splitting of optical trap of metallic nanoparticles

A. De and •*A. Devi*; *Indian Institute of Science Education and Research (IISER) Mohali, SAS Nagar, India*

We investigated splitting of potential well into two for trapping of metallic nanoparticles due to optical nonlinearity under femtosecond pulsed excitation; this can be utilized to simultaneously trap two particles to study long-range inter-particle interactions.

EG-P.11 THU

Terahertz radiation from nanostructures due to tunnel ionization

•*I. Babushkin*[1,2,3], *L. Shi*[1,2], *A. Demircan*[1,2,4], *M. Kovacev*[1,2], *and U. Morgner*[1,2,4]; [1]*Institute of Quantum Optics, Leibniz University, Hannover, Germany*; [2]*Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany*; [3]*Max Born Institute, Berlin, Germany*; [4]*Hannover Centre for Optical Technologies, Hannover, Germany*

We show that free electrons created by ionization near asymmetric metallic nanostructure allow to generate terahertz radiation. This mechanism is an analog of so called Brunel harmonics arising in gases, but requires simpler driver waveforms.

EG-P.12 THU

The contribution has been withdrawn.

EG-P.13 THU

Coherent Scattering of Light from Large Ions Strings and their Mirror Images

A. Lešundák[2], *P. Obšil*[1], *T. Pham*[2], *M. Čížek*[2], *O. Číp*[2], *R. Filip*[1], *and* •*L. Slodička*[1]; [1]*Dept. of Optics, Palacky University, Olomouc, Czech Republic*; [2]*Institute of Scientific Instruments of the CAS, Brno, Czech Republic*

We present the experimental observation of scalable coherent light scattering from long trapped ion strings and their mirror images.

EG-P.14 THU

A theoretical study of collective Rabi splitting in nano-lasers and -LEDs

•*E. André*[1], *I. Protsenko*[2], *A. Uskov*[2], *J. Mørk*[1], *and M. Wubs*[1]; [1]*Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*Lebedev Physical Institute of RAS, Moscow, Russia*

We analytically derive the emission spectrum for many pumped cavity-coupled emitters, and show that collective Rabi splitting can occur. We find the splitting decreases with increasing pump and derive a connection between splitting and lasing.

EG-P.15 THU

Reversible Spontaneous Emission Dynamics and Quantum Interference of Quantum Emitters near a MoS_2 Nanodisk

I. Thanopulos[1], *V. Karanikolas*[2], *N. Iliopoulos*[2], *and* •*E. Paspalakis*[2]; [1]*Department of Optics and Optometry, T.E.I. of Western Greece, Aigio, Greece*; [2]*Materials Science Department, University of Patras, Patras, Greece*

We show that the spontaneous emission dynamics of quantum emitters close to a MoS_2 nanodisk exhibits strong non-Markovian effects, including decaying Rabi or complex decaying oscillations and population trapping, combined with strong quantum interference effects.

EG-P.16 THU

Harmonic generation in Mie-resonant GaAs nanowires

•*D. de Ceglia*[1], *L. Carletti*[1], *A. Galtarossa*[1], *M.A. Vincenti*[2], *C. De Angelis*[2], *and M. Scalora*[3]; [1]*Uniersity of Padova, Padova, Italy*; [2]*University of Brescia, Brescia, Italy*; [3]*US Army AMRDEC, Huntsville, USA*

We discuss enhanced second- and third-harmonic generation from isolated and arrayed Mie-resonant GaAs nanowires. Narrow resonances appear in the nonlinear scattering spectra of harmonic light, due to the excitation of the nanowires' higher-order normal modes.

EG-P.17 THU

Ultrafast two-dimensional electronic spectroscopy of millimeter-sized halide perovskite single crystals

X.T. Nguyen[1], *D. Timmer*[1], *Y. Rakita*[2], *D. Cahen*[2], *A. De Sio*[1], *and* •*C. Lienau*[1]; [1]*Institut für Physik, Universität Oldenburg, Germany*; [2]*Department of Materials & Interfaces, Weizmann Institute of Science, Rehovot, Israel*

Ultrafast two-dimensional electronic spectroscopy probes excitons and free carrier dynamics and their interplay on a sub-100-fs timescale, and highlights the importance of many-body interactions in halide perovskites crystals

EG-P.18 THU

Deceleration of Carrier Relaxation through Coulomb Screening in Few-layered MoS2

•*M. Karmakar*[1], *S. Bhattacharya*[1], *S. Mukherjee*[2], *S.K. Ray*[1,3], *and P.K. Datta*[1]; [1]*Department of Physics, Indian Institute of Technology Kharagpur, Kharagpur, India*; [2]*Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, India*; [3]*S.N. Bose National Centre for Basic Sciences, Kolkata, India*

Non-radiative carrier relaxation pathways in transition metal dichalcogenides are explored through a non-equilibrium spectroscopic technique. Slower carrier relaxation due to environmental dielectric screening is revealed by comparing C exciton dynamics in a quasi-3D and a quasi-0D system.

EG-P.19 THU

Analytical Mie Theory of Vector Complex Source Vortices and its Application for the Investigation of Planar Chiral Structures

•*S. Orlov, J. Berškys, and K. Laurinavičius*; *Center for Physical and Technology Sciences, Vilnius, Lithuania*

Analytical Mie theory for vector complex source vortices is introduced and used to study how the chiral response of a planar heterogeneous trimer cluster depends on dielectric constant, radii of nanoparticles and geometric angle

EG-P.20 THU

Characterization of Dielectric Solids with Single Quantum Emitters: from Measuring at the Nano-scale to Mapping at Micro- and Macro-level

•*M. Gladush*[1], *A. Gorshelev*[1], *I. Eremchev*[1], *J. Koehler*[2], *L. Kador*[2], *and A. Naumov*[1]; [1]*Institute for Spectroscopy RAS, Troitsk, Moscow, Russia*; [2]*University of Bayreuth, Bayreuth, Germany*

We report development of a new experimental technique for mapping effective values of local dielectric characteristics of solid films and progress in the theory of fluorescence changing due to the local field the generalized Purcell effect

Hall B0

EG-P.21 THU

Time Resolved Four-Wave Mixing in Nanocomposites

O. Fedotova[1,2], •O. Khasanov[1], V. Nikiforov[3], and V. Samartsev[3]; [1]SPMRC NAS Belarus, Minsk, Belarus; [2]BSU, Minsk, Belarus; [3]Kazan E. K. Zavoisky Physical-Technical Institute (KPhTI) of the KSC of the RAS , Kazan', Russia

Features of photon echo and time resolved four-wave mixing signals in nanocomposites consisted of semiconductor quantum dots incorporated into nonlinear dielectric matrix are studied

EG-P.22 THU

Development of quantum network with warm atomic vapors operating with 10 MHz spectral bandwidth

•J. Mika, P. Obšil, L. Podhora, and L. Slodička; Palacky University, Olomouc, Czech Republic

We present the realizations of mutually compatible source of nonclassical light and optical quantum memory in warm atomic vapor with spectral bandwidths in the range of tens of MHz.

13:00 – 14:00

JSIII-P: JSIII Poster session

JSIII-P.1 THU

In-situ photoluminescence kinetics of lead halide perovskites under sunlight excitation

•G.E. Arnaoutakis, N. Samoylova, M.V. Khenkin, R. Guo, and E.A. Katz; Dept. of Solar Energy and Environmental Physics, J. Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Midreshet Ben-Gurion, 84990, Israel, Midreshet Ben-Gurion, Israel

We report on the first in-situ PL monitoring of methylamonium lead iodide thin films upon excitation by concentrated sunlight up to 90 suns.

JSIII-P.2 THU

Absorption Enhancement of a Thin Silicon Film using a 3D Photonic band gap crystal back reflector

D. Devashish[1,2,3], R. Saive[1,4], J.J.W.v.d. Vegt[2], and •W.L. Vos[1]; [1]Complex Photonics Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands; [2]Mathematics of Computational Science (MACS), University of Twente, Enschede, Netherlands; [3]ASML, Veldhoven, Netherlands; [4]Thomas J. Watson Laboratories of Applied Physics and Material Science, California Institute of Technology, Pasadena, USA

As a back reflector for thin silicon film solar cells, we study a thin 3D photonic band gap crystal that forbids light within the band gap for all directions and for all polarizations.

JSIII-P.3 THU

Syntheses of conjugated polymers containing 6-(2-thienyl)-4H-thieno[2,3-b]indole (2-TTI) as electron-rich unit for photovoltaics

•J. Kim[1], S. Chae[2], A.Y. Yi[2], H.J. Kim[2], and H. Suh[1]; [1]Department of Chemistry and Chemistry Institute for Functional Materials, Pusan National University, Busan, South Korea; [2]Department of Organic Material Science and Engineering, Pusan National University, Busan, South Korea

We designed and synthesized polymers containing 6-(2-thienyl)-4H-thieno[2,3-b]indole (2-TTI) as electron-rich unit with low band-gap to provide the new conjugated polymers, PDOCF3, PDOBT, PMBI and PDOMBI.

JSIII-P.4 THU

Upconversion dependence of the thermal behavior in Er-doped oxysulfide crystal nanopowders

•J. Fernandez[1] and R. Balda[2,3]; [1]Donostia International Physics Center, San Sebastian, Spain; [2]Departamento de Física Aplicada I, Escuela Superior de Ingeniería, Universidad del País Vasco UPV/EH, Bilbao, Spain; [3]Materials Physics Center CSIC-UPV/EHU, San Sebastian, Spain

Infrared emission obtained by pumping the 4I9/2 level of Er3+ ions in Gallium and Lanthanum Oxysulfide nanopowders shows inhomogeneous thermal confinement as well as temperature reduction due to upconversion precesses.

NOTES

The index entries consist of the following data: *<session key>.<paper in the session> <day>* (p*<page>*). Presenting authors are marked by •.

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