Mid-Infrared Semiconductor lasers

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Learning objective

Upon completion of the lecture, the student will have an understanding of
- A short panorama development of semiconductor mid-infrared sources
- An understanding of the basic physics and technological difference between the different mid-infrared devices
- Some quintessential features (Power, efficiency, Linewidth, tUnability)
- An insight into some new developments such as QC combs
- A few example of applications

Intended audience

The lecture is aimed at Ph.d students or researchers who are interested in mid-infrared lasers either for their further development or their applications in mid-infrared systems

Lecture: 4x 45 min

- Semiconductor lasers:
    - General characteristics: Light-current, wallplug
      Temperature variation of the characteristics

- Mid-infrared lasers: Interband and intersubband devices
    - Band structure
    - Band engineering
    - Heterostructure and electron states

    Device optimization:
    - Waveguide losses
    - Optical confinement
    - Electron and hole confinement
    - Auger processes
- Intersubband gain
    - Active region design
    - Design optimization:
        - Active region design
        - upper and lower state lifetimes
        - doping
        - Automated techniques

- Power: Wallplug efficiency, beam profiles and dissipation
    - General concepts
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- Tunable devices
    - Fabry Perot
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- Optical frequency combs