Short Course 5: Practical Quantum Optics

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Course description:

What does it mean if optics is quantum? Is hard core quantum optics solely concerned with the study of fundamental physics questions or is it also useful for practical applications? The course will give answers to these questions. An introduction to quantum aspects in optics will be given and experimental demonstrations will underline some of the counter intuitive quantum phenomena. The generation, propagation and detection of quantum light are central topics. Practical quantum optics is all about noise, noise reduction and over coming established sensitivity limits in interferometry, imaging, communication and sensing. Such applications of modern quantum optical technologies will be addressed in detail. Mathematical descriptions of the light field and its interaction with matter will be given whenever necessary but emphasis is put on practical considerations. Possible limits that quantum effects may impose on or opportunities that they may offer for applications in industry in the foreseeable future will be discussed.

Experimental demonstrations at the course:

- demonstration of the different properties of classical and quantum noise
- demonstration of the strong correlations of photon pairs generated in parametric down conversion.