Announcement

Experimental Quantum Optics
Prof. Dr. Alexander Kubanek

Description
The course gives an introduction into the field of quantum optics. Basic concepts and experimental methods are introduced. Theoretical tools will be covered when needed.

The laser plays a central role in quantum optics experiments. Therefore, we will start with an introduction to laser physics. We then discuss the quantum nature of light and study light-matter interaction in different systems. Afterwards, we turn to the fascinating physics of cavity quantum electrodynamics. Finally, we discuss current research directions in the field.

Learning Outcomes
Students who have taken this course are expected to be familiar with concepts and techniques used in modern quantum optics. The course is targeted to prepare students for performing research in the fields of quantum optics.

Content
• Laser physics
• Quantum nature of light
• Interaction of light and matter
• Atomic and “atom-like” systems
• Cavity Quantum Electrodynamics
• Current research topics in Quantum Optics
  (depending on time we discuss: Nonlinear Optics, Quantum Entanglement, Bell’s inequalities, Quantum Teleportation, Quantum Cryptography, Quantum Computing )

Prerequisites
Optics, atomic physics, quantum mechanics

Literature
Specific literature will be provided throughout the course. In depth literature research is also part of independent preparation of the student presentations.

Quantum Optics books for general preparation:
• G. Grynberg, A. Aspect and C. Fabre, Introduction to Quantum Optics
• Rodney Loudon - The Quantum Theory of Light (Oxford University Press)
• M.O. Scully and M.S. Zubairy, Quantum Optics (Cambridge University Press, Cambridge, 1997)

More specialized books:
  Comment: “Specialized on Light Atom Interaction”
  Comment: “Specialized on cavity quantum electrodynamics”
**Additional Information**

The course includes lectures, student presentations and problem sets. Active participation throughout the semester is required for final grading in written or oral examination.

6 ECTS credits

**Lecturer**

Prof. Dr. Alexander Kubanek, Institute of Quantum Optics