Humboldt-Universität zu Berlin
Institut für Physik

AG Theoretische Optik & Photonik
top.physik.hu-berlin.de/teaching

Discrete Quantum Optics

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Module Information (Lecture and Exercises):

Objectives:

The aim of this course is to introduce the elements of quantum mechanics that are essential for understanding quantum optical systems described in a discrete framework, e.g. free-space and integrated interferometers, quantum optical gates, and general unitary transformations. This course will be useful background for pursuing more advanced courses in integrated quantum photonics, optoelectronics, solid state physics, and semiconductor optics, as well as for studying applied quantum computation and information. Prerequisites for the class are linear algebra, calculus and partial differential equations, and elementary quantum physics.

Exercises:

The lectures (first lecture on October 21, 2019) are accompanied by weekly tutorials where the solutions of the problem sheets are presented. In addition, these tutorials represent opportunities for discussing issues related to the content of the lecture. Currently, the tutorials are scheduled to take place on Wednesday from 3 to 5 pm in the seminar room NEW 14, 1'09 (if required, a more convenient day/time might be arranged subject to the availability of an appropriate room). Depending on the number of participants, further tutorials will be arranged.

Exam:

Oral exams will be arranged at a day/time after the lecture period has ended (February 14, 2020) and student preferences will be accomodated as best as possible.

Literature:

- Cristopher Gerry and Peter L. Knight, *Introductory Quantum Optics*, Cambridge University Press (2005)
- Rodney Loudon, *The Quantum Theory of Light*, Oxford University Press (2000)
- Markus Gräfe et al.., *Integrated Photonic Quantum Random Walks*, J. of Optics **18**, 103002 (2016)
- T. Meany et al., *Laser written Circuits for Quantum Photonics*, Laser & Photonics Reviews **9**, 363 (2015)