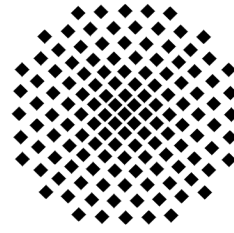


Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme*

Ansprechpartner: Prof. Harald Giessen
E-Mail: giessen@physik.uni-stuttgart.de
Telefon: 0711 - 685-65111



Dienstag, 22. November 2011

17:15 Uhr

Hörsaal V 57.01

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Peter Michler, Universität Stuttgart, Telefon: 0711 - 685-64660

Quantum Electrodynamics with Quantum Dots in Photonic Nanostructures

Peter Lodahl

Quantum Photonics Group, Niels Bohr Institute, University of Copenhagen

Abstract

2D photonic crystal membranes fabricated in GaAs containing InGaAs quantum dots have in recent years proven to be a very successful platform for all-solid-state quantum optics experiments. In a photonic crystal, the light-matter interaction strength can be tailored, i.e. either enhanced or suppressed by controlling the lattice constant of the structure. We will present experimental results on how highly efficient single-photon sources can be constructed by coupling single quantum dots to a photonic crystal waveguide exploring slow light [1]. The role of disorder in the form of fabrication imperfections is explored and found to lead to Anderson localization of light enabling cavity quantum electrodynamics by exploiting disorder as a way to enhance light-matter interactions [2]. We finally demonstrate that the mesoscopic character of quantum dot emitters implies that the traditional point-dipole description of light-matter interaction may break down in plasmonic nanostructures [3] providing a new way to strongly interface photons with matter.

[1] T. Lund-Hansen, S. Stobbe, B. Julsgaard, T. Sunner, M. Kamp, A. Forchel, and P. Lodahl, Phys. Rev. Lett. 101, 113903 (2008).

[2] L. Sapienza, H. Thyrrestrup, S. Stobbe, P.D. Garcia, S. Smolka, and P. Lodahl, Science 327, 1352 (2010).

[3] M. Lykke Andersen, S. Stobbe, A.S. Sørensen, and P. Lodahl, Nature Physics 7, 215 (2011).