SYKM 2: Lichtausbreitung in kohärent präparierten Medien II

Zeit: Donnerstag 16:30–18:00 Raum: VMP 6 HS-D

Hauptvortrag SYKM 2.1 Do 16:30 VMP 6 HS-D
Quantum fluid properties of coherently prepared microcavity polaritons — •E. Giacobino, A. Amo, J. Lefrère, S. Pigeon, C. Adrados, C. Ciuti, I. Carusotto, R. Houdré, and A. Bramati — Laboratoire Kastler Brossel, Université Paris 6, Ecole Normale Supérieure et CNRS, UPMC Case 74, 4 place Jussieu, 75252 Paris Cedex*05, France

A semiconductor microcavity polariton fluid, injected by a nearly-resonant continuous wave pump laser can exhibit collective excitations which deeply modify its propagation. Superfluid behaviour of the polariton fluid is obtained and manifests itself as the suppression of scattering from defects. In other conditions Cerenkov-like patterns are observed. Microcavities polaritons are thus very good tools for exploring the physics of non-equilibrium quantum fluids.

Hauptvortrag SYKM 2.2 Do 17:00 VMP 6 HS-D
3D metamaterials: from simple to complex - coupling matters! — •Harald Giessen — 4th Physics Institute, University of Stuttgart, Germany

Metallic metamaterials have shown a number of fascinating properties over the last few years. A negative refractive index, negative refraction, superlenses, and optical cloaking are some of the ambitios applications where metamaterials hold great promise. We are going to present fabrication methods for the manufacturing of 3D metamaterials [1]. We are investigating their coupling properties and the resulting optical spectra. Hybridization of the electric [2] as well as the magnetic [3] resonances allows us to easily understand the optical properties. Lateral coupling can result in EIT-like phenomena [4]. The connection between structural symmetry and their electric as well as magnetic dipole and higher-order multipole coupling will be elucidated. It turns out that stereometamaterials, where the spatial arrangement of the constituents is varied, reveal a highly complex rotational dispersion.

[1] Na Liu, Hongcang Guo, Liwei Fu, Stefan Kaiser, Heinz Schweizer, and Harald Giessen: Three-dimensional photonic metamaterials at optical frequencies, Nature Materials 7, 31 (2008).

[2] N. Liu, H. Guo, L. Fu, S. Kaiser, H. Schweizer, and H. Giessen: Plasmon Hybridization in Stacked Cut-Wire Metamaterials, Advanced Materials 19, 3628 (2007)

[3] Na Liu, Liwei Fu, Stefan Kaiser, Heinz Schweizer, and Harald Giessen: Plasmonic Building Blocks for Magnetic Molecules in Three-Dimensional Optical Metamaterials, Advanced Materials 20, 3859 (2008).

[4] Na Liu, Stefan Kaiser, and Harald Giessen: Magnetoinductive and Electroinductive Coupling in Plasmonic Metamaterial Molecules, Advanced Materials 20 (2008), DOI: 10.1002/adma.200801917

Hauptvortrag SYKM 2.3 Do 17:30 VMP 6 HS-D
Optically Driven Atomic Coherences : From the Gas Phase to the Solid State — •F. Beil, J. Klein, G. Heinze, and T. Halfmann — Institute of Applied Physics, Technische Universität Darmstadt (Germany)

Interactions between strong, coherent radiation and quantum systems provide powerful tools to control optical properties and processes. Among others, contemporary research efforts aim at efficient storage and processing of optically encoded data, e.g. as required in quantum information processing. Thus, a large number of experimental studies in quantum information science have been conducted in atomic media in the gas phase. Only few experiments on coherent interactions were conducted in solid state media.

The talk presents experimental implementations of coherent laser-driven interactions in particular solid media, i.e. rare-earth doped solids. The latter media combine the advantages of atoms in the gas phase (i.e. spectrally narrow transitions) with the advantages of solids (i.e. large density and scalability). The talk reports on the experimental implementation of rapid adiabatic passage (RAP) to switch between absorption and amplification, stimulated Raman adiabatic passage (STIRAP) to manipulate population distributions, and electromagnetically-induced transparency (EIT) to store and retrieve light pulses (e.g. optically encoded information) in a rare-earth doped solid.

[1] J. Klein, F. Beil, and T. Halfmann, Phys. Rev. Lett. 99, 113003 (2007)

[2] F. Beil, J. Klein, G. Nikoghosyan, and T. Halfmann, J. Phys. B 41, 074001 (2008)