

Q 55: Quanteneffekte (Lichtstreuung I)

Zeit: Donnerstag 12:00–13:00

Raum: 5E

Q 55.1 Do 12:00 5E

Localization of atomic ensembles via superfluorescence — ●JÖRG EVERS¹, MIHAI MACOVEI¹, M. SUHAIL ZUBAIRY^{1,2}, and CHRISTOPH H. KEITEL¹ — ¹Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg — ²Institute for Quantum Studies and Dept. of Physics, Texas A&M University, College Station, Texas 77843, USA

The sub-wavelength localization of an ensemble of atoms concentrated to a small volume in space is studied [1]. For this, we discuss the light scattered in the interaction of the atoms with a standing wave laser field [2]. The fluorescence light can be described by an intensity profile, which depends on the standing wave field parameters, the ensemble properties, and which is modified due to collective effects in the ensemble of nearby particles. We demonstrate that the intensity profile can be tailored to suit different localization setups, and discuss two localization schemes. First, we show how to localize an ensemble fixed at a certain position in the standing wave field. Second, we discuss localization of an ensemble passing through the standing wave field.

[1] M. Macovei, J. Evers, C. H. Keitel, and M. S. Zubairy, *quant-ph/0611148*.

[2] J.-T. Chang, J. Evers, M. O. Scully and M. S. Zubairy, *Phys. Rev. A* 73, 031803(R) (2006).

Q 55.2 Do 12:15 5E

Single-Photon emission from Silicon-Vacancy centers in diamond — ●JULIANE BAHE¹, CHUNLANG WANG¹, HARALD WEINFURTER¹, VLADIMIR CHERNYCHEV^{1,2}, and JAN MEIJER² — ¹Sektion Physik, Ludwig-Maximilians-Universität München, D-80779 München, Germany — ²Experimentalphysik III, Ruhr-Universität-Bochum, D-44780 Bochum, Germany

We report on single photon emission from SiV (silicon-vacancy) centers in bulk diamond and diamond nanocrystals. The investigated SiV centers are highly photostable and emit single photons with a narrow zero phonon line (FWHM 5nm) centered at 738nm and very weak vibronic sidebands at room temperature. The short luminescence lifetime (1.2ns) should enable efficient single photon generation. Therefore the SiV center in diamond may be a promising candidate for the practical applications in quantum cryptography.

Possibly due to the existence of a non-fluorescent neutral charge state, the actually observed quantum efficiency is very low[1]. Here we investigate the effects of additional nitrogen doping which should allow

to stabilize the negatively charged, radiating SiV center in order to significantly increase single photon emission.

[1] C. Wang, C. Kurtsiefer, H. Weinfurter and B. Burchard, *J. Phys. B: At. Mol. Opt Phys.* 39 (2006) 37-41

Q 55.3 Do 12:30 5E

Measurement-induced spatial modulation of spontaneous decay and photon arrival times — ●JOACHIM VON ZANTHIER¹, THIERRY BASTIN², and GIRISH S. AGARWAL³ — ¹Institut für Optik, Information und Photonik, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany — ²Institut de Physique Nucléaire, Atomique et de Spectroscopie, Université de Liège au Sart Tilman, Liège, Belgium — ³Department of Physics, Oklahoma State University, Stillwater, OK, USA

We report on the manipulation of the spontaneous emission process leading to a spatial modulation of spontaneous decay [1]. The effect is observed in case of coherently driven atoms separated by less than a transition wavelength. It is quantified by Glauber's photon-photon second order correlation function. We show that the photon arrival time, usually regarded as an entirely random process, depends not only on where a photon is detected but also on where a former photon had been recorded previously. Our results shed light on the unexpected consequences of state reduction and entanglement for the fundamental process of spontaneous emission.

[1] J. von Zanthier, T. Bastin, G. S. Agarwal, accepted for publication in *Phys. Rev. A (Rapid Comm.)*

Q 55.4 Do 12:45 5E

The Spectrum of non-Markovian resonance fluorescence — ●GEESCHE BOEDECKER and CARSTEN HENKEL — Universität Potsdam, Institut für Physik, Am Neuen Palais 10, 14469 Potsdam

We study the resonance fluorescence from a driven two-level atom coupled to a structured reservoir, as it can be realized in a photonic crystal near a band edge. Due to the singular mode density of the vacuum field, the time evolution of both atom and field shows nontrivial memory effects and is highly non-Markovian. We investigate the dynamics of the atomic Bloch vector and identify algebraic tails in the long-time limit. Similarly, the dipole correlation function $\langle \sigma^\dagger(t_1)\sigma(t_2) \rangle$ depends on both times t_1, t_2 which makes the notion of a spectrum problematic. We give a critical discussion of different methods to approach this problem.