Graduate School Seminar

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INSTITUT FÜR PHYSIK

Talks in SS 2018

Traditio et Innovatio

Universität Rostock

24th May 2018, **15:00 s.t.**

Sjard-Ole Krüger

AG Quantum Optics of Macroscopic Systems

Trapping potentials for Rydberg excitons in cuprous oxide (Cu_2O)

Semiconductor excitons are bound states of electrons and holes, forming a hydrogen-like series below the bandgap. Since the first observation of P-type excitons up to a principal quantum number *n=25* in Cu_2O [1], these highly excited states have gained attention due to their exaggerated properties and signs of the onset of Rydberg physics. The intensity- and state dependent bleaching of these resonances has been interpreted as an excitonic Rydberg blockade, whereby one excitation shifts nearby excitations out of resonance via their mutual dipole-dipole interaction. In atomic Rydberg-systems a similar blockade mechanism has been proposed and is routinely exploited for quantum information processing, nonlinear quantum optics and more.

One important ingredient in many such experiments are effective trapping potentials such as dipole traps for neutral atoms. For semiconductor excitons, similar traps can be created by a spatial variation of the strain field.
These strain traps offer a great variety of achievable geometries, depending on the stressor, its orientation relative to the crystal axes, the stress and the excitonic state in question. In this talk, calculations of a strain-induced waveguide potential [2] for the Rydberg excitons of the yellow series in Cu_2O will be presented and conditions for the formation of such traps will be evaluated.

References:

[1] T. Kazimierczuk et al. , Nature 514, 343 (2014)
[2] S. O. Krüger and S. Scheel, http://arxiv.org/abs/1711.06639

Talk: English
Slides: English

Location: Institute of Physics, Albert-Einstein-Str. 24, HS 1