Graduate School Seminar

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INSTITUT FÜR PHYSIK

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Universität Rostock

4th January 2018, **15:00 s.t.**

Björn Kruse

AG Theoretical cluster physics and nanophotonics

Signatures of Rabi cycling and excited state population in single-shot coherent diffractive imaging

Only recently, coherent single-shot diffractive imaging (CDI) of individual free nanoparticles has been demonstrated with a laser-based source using high harmonic generation [1], promising new applications and unprecedented insights into the ultrafast dynamics induced or probed via the single-shot scattering process. So far, CDI experiments have been analyzed via an effective classical linear response description, e.g. to reconstruct the shape and orientation of nanoparticles [2]. For strong laser fields and in particular for resonant excitations, both the linear and the classical description may no longer be valid as population depletion and stimulated emission become important. To what extent such processes may influence CDI scattering images is currently largely unknown.

In our theoretical analysis, we describe the quantum-mechanical few-level bound state dynamics using a density matrix formalism and incorporate this into a 3D Maxwell solver based on the finite-difference time-domain method (FDTD). We discuss how and to which extend the spatio-temporal population dynamics influences the scattering images and analyze the observed trends.

References:

[1] D. Rupp et al., Nat. Commun. 8, 493 (2017)

[2] I. Barke et al., Nat. Commun. 6, 6187 (2015)

Talk: English

Slides: English

Location: Institute of Physics, Albert-Einstein-Str. 24, HS1