# Stuttgarter Physikalisches Kolloquium

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

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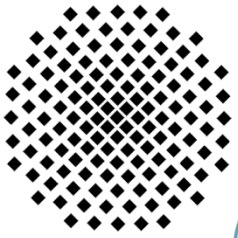

| Dienstag, 7. Januar 2014 | 17:15 Uhr | Hörsaal V 57.01 |
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# On efficient interaction of photons and atoms: from quantum optics to biophotonics

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## Abstract

Recently, we showed that in the linear excitation regime, an atom can theoretically block a propagating light beam by up to 100%. I will formulate this finding in a more general context of mode matching between the incident and scattered photons and present an overview of our experimental work on the efficient interaction of light and single organic molecules both in the near and far fields. We will see that at cryogenic temperatures, solid-state emitters can attenuate, transmit, amplify or phase-shift a focused laser beam. Furthermore, I will report on the direct long-distance communication of two optical emitters via single photons and the first high-resolution spectroscopy of single rare earth ions.

In the second part of this presentation, I will show that the same concepts in mode matching can lead to ultrasensitive detection, microscopy and tracking of biological nanoparticles such as viruses and proteins. In particular, I will discuss our new results in label-free single protein sensing and diffusion in lipid bilayers. If time permits, I will also discuss strategies for the optimization of the interaction between photons and optical emitters via dielectric antennas and plasmonic nanoantennas.