Universität Regensburg

FAKULTÄT FÜR PHYSIK
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Prof. Dr. Rupert Huber

Seminar

Thursday, November 24, 2022, 10:00 AM, PHY 5.1.01

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From 2D optical spectroscopy to ultrafast quantum science at the nanoscale: Developing research tools for materials science

Abstract

Quantum science is a strong driver for fundamental research as well as industrial innovation. Enabling the systematic investigation of complex materials at the frontier of space and time resolution provides an important bridge from science towards application. I will present coherent multidimensional spectroscopy as a tool to study prototypical semiconductors in the visible and multi-THz range. Precise mapping of the carrier dynamics in GaSe unclutters the complex many-body dynamics in a bulk semiconductor [1].

On the basis of pioneering works that combine ultrafast dynamic excitation with atomic spatial resolution of scanning probe methods [2], new capabilities for exploring the nanoworld are on the rise. In the second part, I will introduce the implementation of a high repetition rate THz laser for the investigation of ultrafast dynamics of single quantum emitters in 2D materials. Intentional defect creation in transition metal dicalcogenide monolayers provides a robust platform to study quantum interactions at the space-time limit [3]. Atomic confinement, symmetry breaking, local charging, long range order, and light-matter interaction are key aspects of this exciting material class.

[1] J. Allerbeck et al. PRB **104**, L201202 (2021)
[2] T. Cocker et al., Nat. **539**, 263 (2016)
[3] B. Schuler & J. Robinson, APL **119**, 140501 (2021)

Host: Rupert Huber