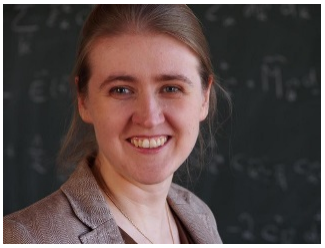
WWU MÜNSTER

Aktuelle Fragen
der Nanophysik

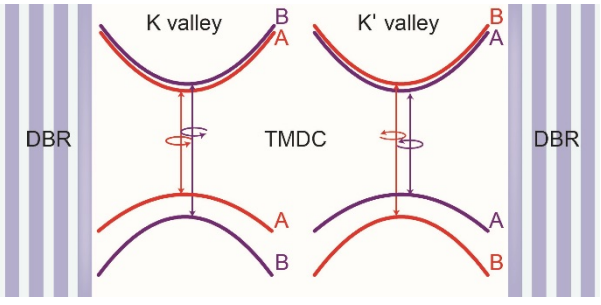
Montag, 20.11.2017 um 15:15 Uhr
Ort: Seminarraum 87, Wilhelm Klemm-Straße 10

Microscopic simulation of second harmonic generation in a transition metal dichalcogenide monolayer



Jun.-Prof. Dr. Doris Reiter
Institut für Festkörpertheorie
Universität Münster

Semiconducting monolayers of transition metal dichalcogenides (TMDCs) show strong optical responses. In the linear regime pronounced exciton lines are visible and in the nonlinear regime a strong second harmonic generation has been observed. By embedding a TMDC monolayer in a photonic structure the optical signals from a TMDC monolayer can be efficiently tailored.
In this talk, I will present a novel method to calculate the linear and nonlinear optical signals of a MoS_2 monolayer. For the simulation we combine a finite difference time domain (FDTD) method, which accounts for the light field dynamics, and couple it to the semiconductor Bloch equations, which give us a microscopic description of the carrier dynamics in the TMDC monolayer [1]. The strong excitonic effects are taken on board by calculating the Coulomb interaction dynamically on the Hartree-Fock level, while the second harmonic generation is achieved by introducing a permanent dipole. Using our self-consistent method, we determine the shape of the second harmonic signal in a MoS_2 monolayer and discuss its dependence on the exciting frequency. We show that by an appropriately designed cavity a strong enhancement of the second harmonic can be achieved.



[1] S. Guazzotti, A. Pusch, D. E. Reiter, and O. Hess, Tailoring the optical response of a transition metal dichalcogenide monolayer through photonic structures, to be submitted (2017)