TECHNISCHE UNIVERSITÄT DRESDEN

Bereich Mathematik und Naturwissenschaften Fakultät Physik

PHYSIKALISCHES KOLLOQUIUM

Referent: **Dr. Ralph Ernstorfer**
Fritz Haber Institute of the Max Planck Society,
Berlin, Germany

Thema: **Ultrafast dynamics of electrons, excitons and phonons in momentum space**

Zeit und Ort: Dienstag, 24.11.2020, 16:40 Uhr
Online-Meeting: Zugangsdaten sind auf der Webseite des Physikalischen Kolloquiums zu finden. (**https://tud.link/6og1**)

Leiter: Prof. Dr. Karl Leo

Kurzfassung: The dynamics of quasi-particles in non-equilibrium states of matter reveal the underlying microscopic coupling between electronic, spin and vibrational degrees of freedom. We aim for a quantum-state-resolved picture of coupling on the level of quasi-particle self-energies, which goes beyond established ensemble-average descriptions, and which requires ultrafast momentum-resolving techniques. The dynamics of electrons and excitons is measured with four-dimensional time- and angle-resolved photoelectron spectroscopy (trARPES), featuring a high-repetition-rate XUV laser source and momentum microscope detector. I will exemplify this experimental approach by discussing electron and exciton dynamics in the semiconducting transition metal dichalcogenide WSe_2. Our approach provides access to the transient distribution of hot carriers in the entire Brillouin zone of photo-excited semiconductors and allows the quantification of energy relaxation dynamics. I will sketch the capability of multidimensional photoemission spectroscopy of providing orbital information. The complementary view of ultrafast phonon dynamics is obtained through femtosecond electron diffraction. The elastic and inelastic scattering signal reveals the temporal evolution of vibrational excitation of the lattice and momentum-resolved information of transient phonon populations.

Biographie: Study of Physics at TU Munich; PhD (2004) at FU Berlin / Hahn-Meitner Institut under the supervision of Frank Willig; postdoc at the University of Toronto (with Dwayne Miller) and at the MPI Quantenoptik in Garching (with Ferenc Krausz and Reinhard Kienberger); since 2010: independent Max Planck Research Group *Structural & Electronic Surface Dynamics* (W2 position, tenure-track → tenured) at the Fritz-Haber-Institut, 2016: ERC Consolidator Grant.