Plenary Talk PLV V Wed 8:30 HSZ 01

Advances in Ultrafast Electron Microscopy — •Claus Ropers — Max-Planck Institute for Multidisciplinary Sciences, Göttingen — University of Göttingen

Providing the most detailed views of atomic-scale structure and composition, Transmission Electron Microscopy (TEM) serves as an indispensable tool for structural biology and materials science. The combination of electron microscopy with pulsed electrical or optical stimuli allows for the study of transient phenomena, involving magnetization dynamics, strain evolution and structural phase transformations. Ultrafast transmission electron microscopy (UTEM) is a pump-probe technique, in which non-equilibrium processes can be tracked with simultaneous femtosecond temporal and nanometer spatial resolutions.

This talk will cover recent developments and applications in UTEM based on laser-triggered field emitters, including the real-space and diffractive probing of a structural phase transition. Moreover, the mechanisms involved in free-electron beams interacting with optical fields at photonic structures will be discussed, emphasizing quantum effects. In particular, recent progress in the coupling of electron beams to integrated photonic structures will be presented. Finally, harnessing developments in event-based electron spectroscopy, we demonstrate the preparation and characterization of electron-photon and electron-electron pair states.