Stuttgarter Physikalisches Kolloquium

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Ultrafast Electron Diffraction and Microscopy with High-Coherence Beams

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Abstract

Time-resolved electron imaging, diffraction and spectroscopy are exceptional laboratory-based tools to trace non-equilibrium dynamics in materials with a sensitivity to structural, electronic and electromagnetic degrees of freedom. The capabilities of these approaches are largely governed by the quality of the beam of electrons used.

This talk will discuss recent advances made by employing high-coherence ultrashort electron pulses from nanoscale field emitters, which substantially enhance the achievable image resolution in both real and reciprocal space. Two complementary developments with ultimate surface sensitivity and spatial resolution, respectively, will be presented, namely Ultrafast Low-Energy Electron Diffraction (ULEED) and Ultrafast Transmission Electron Microscopy (UTEM). Several recent examples of applying these methods to the observation of phase-ordering kinetics, the excitation of strongly-coupled fluctuation modes and the control of metastable states will be given.