O 34: Invited Talk (Martin Weinelt)

Time: Tuesday 15:00–15:45 Location: H36

Invited Talk O 34.1 Tue 15:00 H36

Ultrafast Spin and Magnetization Dynamics and their Signatures in the Transient Band Structure — •Martin Weinelt — Freie Universität Berlin, Germany

Femtomagnetism is now an established and active research field in thin film and surface magnetism, which promises magnetic writing speeds three orders faster than current technology. Investigations in this area comprise the spin and magnetization dynamics in ferro- and ferrimagnetic samples initiated with a femtosecond laser pulse. In the first two picoseconds after optical excitation the electronic system and the underlying lattice and spin subsystems are not in equilibrium and it seems likely that the transient hot electron population is responsible for the ultrafast change of the magnetization. Still it remains controversial, which microscopic processes are fast enough to provoke femtomagnetism: direct interaction with the laser field, scattering among electrons, phonons and magnons, and/or spin-transport? We approach these problems with time- and angle-resolved photoemission (TR-ARPES) using lasers and high-order harmonics XUV sources. The spin dependence of electron scattering processes is investigated for the 3d band ferromagnets. Ultrafast demagnetization is studied for the local-moment ferromagnets Gadolinium and Terbium. Here equilibration of the excited state involves more than one timescale, because the optical excitation occurs in the valence band but the magnetic moment is dominated by the localized 4f electrons. Following excitation by an intense infrared pulse, TR-ARPES allows us to map the transient exchange splitting of the valence bands in the 3rd Brillouin zone.