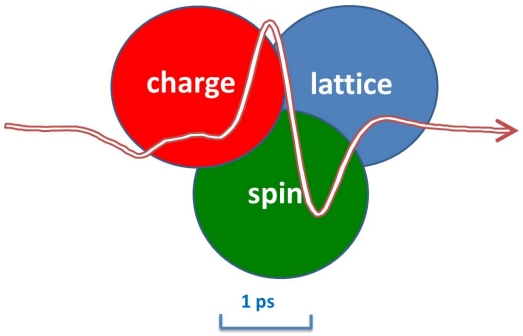
Universität Bielefeld Fakultät für Physik

Physikalisches Kolloquium / Antrittsvorlesung

Prof. Dr. Dmitry Turchinovich

Universität Bielefeld

Direct look at charge, lattice and spin dynamics in solids with ultrafast terahertz spectroscopy



Many elementary processes in electron, phonon and spin subsystems of a solid: e.g. elementary acts of conduction, lattice oscillation periods, spin dynamics etc, occur on the ultrafast timescale of 10s of femtoseconds up to a few picoseconds. This timescale τ matches the terahertz (THz) frequency range, broadly defined as $\omega/2\pi \sim 0.1 - 30$ THz, and corresponding to the period of oscillation of electromagnetic fields in the range $\sim$ 10 ps - 30 fs, or to the photon energies of $\sim$ 0.4 - 120 meV. This facilitates the use of THz radiation for spectroscopy in a unique regime of $\omega\tau \sim 1$, where the elementary ultrafast dynamics in condensed matter can be directly resolved. Based on modern femtosecond laser technology, ultrafast THz spectroscopy allows one to directly probe equilibrium and non-equilibrium dynamics of charge, lattice and spins with temporal resolution down to 10s of femtoseconds, in a contact-free and non-destructive fashion. In this presentation, after an introduction to the method, we will review some of our recent case studies: (i) ultrafast linear and nonlinear electron conduction in graphene, in particular leading to highly efficient THz high harmonic generation, and (ii) spin-dependent electron transport in ferromagnetic metals.

Montag, 17.06.2019, 16:15 Uhr
Ort: Hörsaal 6

www.physik.uni-bielefeld.de