Sonderseminar

Donnerstag, 28. September 2017
13:00 Uhr
ZNN, Seminarraum EG 0.001

“Ultrafast magnetism and THz spintronics”

Magnetization manipulation is an indispensable tool for both basic and applied research. I will discuss some of the knobs to tune dynamics at ultrafast time scales. I will show in my presentation an actual overview over actual achievements in the developing field of ultrafast magnetism and THz spintronics, with focus on those in which we were directly involved.

The dynamics of the spin response depends on the energy transfer from the laser excited electrons to the spins within the first femtoseconds. A special material of interest for magnetic storage development is FePt. The electron temperature shoots to higher values above the Curie temperature and used for all-optical writing. Not only magnetic nanoparticles can be reversibly written. Also vortex, antivortex networks can be written in standard thin Fe films.

On the other side, due to the non-equilibrium electron distribution in layered nanoscale spintronic devices, also ultrafast spin currents are generated and contribute to the laser driven spin dynamics. Layers of a noble metals like Pt, Au or transition metals like W, Ta, Ru can convert ultrafast laser-driven spin currents via the ultrafast spin-Hall effect into a charge current burst that can even compete with state-of-art photo-conductive switch based THz emitters. On the other side, we can use the THz emission to answer fundamental questions. Ultrafast current bursts in materials generated by the laser pulses, for example in currents driven in topological insulators and ferromagnet/ topological insulators heterostructures, can be measured. At the end I will compare them with photocurrent maps in these topological materials.

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