TUT 4: Tutorial: Spindynamics and Spintransport (MA)

Time: Sunday 16:00–18:00 Location: H10

Tutorial TUT 4.1 Sun 16:00 H10

Spindynamics and Spintransport — •Jürgen Lindner — Institute of Ion Beam Physics and Materials Research, Helmholtz-Zentrum Dresden-Rossendorf, P.O. Box 510119, D-01314 Dresden

The first part of this tutorial focusses on the dynamic response of spin systems to time-dependent driving fields. The experimental method discussed in this context is magnetic resonance. It gives insight into key parameters like magnetic anisotropy, the g-factor, magnetic relaxation, spinwave excitations and magnetic coupling. The experimental setups used to detect magnetic resonance are moreover suitable to be included into many environments like ultrahigh vacuum or to be employed for investigations of nowadays magnetic nanostructures. Examples are given how magnetic resonance is used to study ultrathin films, interlayer coupling, ensembles of magnetic nanoparticles and also single nanostructures.

Tutorial TUT 4.2 Sun 17:00 H10

Spindynamics and Spintransport — •Alina Deac — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The second part of the tutorial will discuss how spin-polarized currents can be used to excite magnetization dynamics and what applications can be envisioned. The spin-transfer torque arises from a transfer of angular momentum between the spin-polarized current and the magnetization and is sufficiently large to induce either reversal or steady-state precession. Magnetization switching via the spin-transfer torque effect relies on a constant current density, and thus the total current and the power consumption scale down with the lateral size of the device, thereby fulfilling the requirements for Green-Information-Communication Technology components. Spin-transfer driven precession generates output signals with GHz frequencies, which can be tuned by changing the applied current. Based on this effect, efficient frequency-tuneable microwave sources and resonators, nanometer scale transmitters and receivers, signal mixers and signal amplifiers can be designed. These devices could be used for mobile phone applications, on-chip communication, smart cards or even for microwave-assisted recording for hard-disk write heads.