MA 6: Invited Talks Hehn / Eimüller

Time: Monday 14:00–15:00 Location: HSZ 04

Invited Talk MA 6.1 Mon 14:00 HSZ 04

Symmetry dependent spin injection from Fe/MgO in single crystal based magnetic tunnel junctions — •Michel Hehn[1], Fanny Greullet[1], Julien Bernos[1], Coriolan Tiusan[1], Christine Bellouard[1], Francois Montaigne[1], Daniel Lacour[1], Marc Alnot[1], Yuan Lu[1], Gwladys Lengaigne[1], David Halley[2], and Wolfgang Weber[2] — [1]LPM, Vandoeuvre les Nancy (France) — [2]IPCMS, Strasbourg (France)

The transport in crystalline magnetic tunnel junctions (MTJ) attracted the interest of the international community after the theoretical predictions of Butler et al of giant tunnel magnetoresistance (TMR) effects. In these model systems the electrons are classified with respect to the symmetry of their associated electronic Bloch wave function. The large predicted TMR ratio is related to a symmetry dependent attenuation rate within the MgO single crystal barrier combined with a half metallic property of a specific symmetry in the Fe electrode. After a brief introduction to the physics of the transport in Fe/MgO/Fe MTJ, I will show how to exploit the symmetry dependence of the tunnel conductivity to engineer novel MTJs functionalities. We demonstrate that, a suitably chosen Cr(001) epitaxial metallic spacer layer quenches the transmission of particular electronic states, therefore acting as an additional symmetry dependent tunnel barrier for electrons at the Fermi level. Moreover, we show that this ultrathin Cr metallic barrier can promote quantum well states in an adjacent Fe layer. These results confirm the transport mechanism proposed by Butler et al. Extension to other materials will also be discussed.

Invited Talk MA 6.2 Mon 14:30 HSZ 04

Magnetic imaging at the limits of space and time — •Thomas Eimüller[1,2], Wei He[1], Jie Li[1], Min-Sang Lee[1], Björn Redeker[1], and Stefan Buschhorn[3] — [1]Nachwuchsgruppe Magnetische Mikroskopie, Ruhr-Universität Bochum, 44780 Bochum — [2]Hochschule Kempten, University of Applied Sciences, Bahnhofstr. 61, 87435 Kempten — [3]Institut für Experimentalphysik IV, Ruhr-Universität Bochum, 44780 Bochum

Magnetic technology, driven by "smaller and faster" aims for magnetic imaging methods that obtain simultaneously a high spatial and temporal resolution. For decades this was the domain of optical microscopy. However, recently synchrotron techniques emerged which combine a lateral resolution down to 15 nm with elemental, chemical, spin, and orbital selectivity. Full field (TXM) and scanning (STXM) transmission x-ray microscopy as well as photoemission electron microscopy (X-PEEM) have been used for dynamic magnetic imaging.

Nevertheless, the highest temporal resolution, down to about 200 fs can be obtained by femtosecond laser scanning Kerr microscopy. All-optical two-colour pump-probe experiments reveal variations in the magnetization dynamic of different magnetic dots in arrays. The large temporal resolution enables us to observe higher harmonics of spin waves and nonlinear coupling phenomena in permalloy films. Special coating techniques allow studying the magnetization dynamics of dots with a size below the optical diffraction limit.

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