

Colloquium on Solid-State Physics

Date: Thursday, Oct. 25, 2012

Time: 17.15 h
Coffee, tea and cookies at 17.00h in front of the lecture hall

Place: Hörsaal HS 3
Physik - Department
Technische Universität München



Seminar of the Collaborative Research Centre/Transregio TRR 80:

Spin-wave devices based on metamaterial concepts

Dr. Stefan Mendach
Institut für Angewandte Physik und Mikrostrukturforschungszentrum,
Universität Hamburg
Jungiusstrasse 11
D-20355 Hamburg, Germany

Optical metamaterials with a hyperbolic light dispersion recently paved the way to novel devices, e.g., for light wave guiding [1], perfect imaging [2] or spontaneous emission enhancement [3]. Interestingly, spin waves travelling in thin ferromagnetic films - under certain conditions – exhibit such a hyperbolic dispersion, which offers the possibility to build the aforementioned metamaterial devices also for spin waves. In this talk I discuss, both, our recent progress in the area of optical metamaterials [4] and how we transfer metamaterial concepts to the research area of spin-wave optics [5].

[1] B. Wood, J. B. Pendry, and D. P. Tsai, “Directed subwavelength imaging using a layered metal-dielectric system”, *Physical Review B* 74, 115116 (2006).

[2] Z. Liu, H. Lee, Y. Xiong, C. Sun, and X. Zhang “Far-Field Optical Hyperlens Magnifying Sub-Diffraction-Limited Objects”, *Science* 315, 1686 (2007).

[3] T. Tumkur, G. Zhu, P. Black, Y. A. Barnakov, C. E. Bonner, and M. A. Noginov “Control of spontaneous emission in a volume of functionalized hyperbolic metamaterial”, *Applied Physics Letters* 99, 151115 (2011).

[4] S. Schwaiger, M. Bröll, A. Krohn, A. Stemmann, C. Heyn, Y. Stark, D. Stickler, D. Heitmann, and S. Mendach, “Rolled-Up Three-Dimensional Metamaterials with a Tunable Plasma Frequency in the Visible Regime”, *Physical Review Letters* 102, 163903 (2009).

[5] S. Mansfeld, J. Topp, K. Martens, J. N. Toedt, W. Hansen, D. Heitmann, and S. Mendach, “Spin Wave Diffraction and Perfect Imaging of a Grating”, *Physical Review Letters* 108, 047204 (2012).