TRR 80 Seminar

Am Dienstag, den 21. Januar um 16:00 Uhr

spricht

Prof. Dr. István Kézsmárki

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über das Thema

One-way Transparency of Magnetoelectric Spin-wave Exctations in Multiferroics

Simultaneous breaking of time-reversal and spatial inversion symmetries can lead to the emergence of new optical phenomena in multiferroics. As the most peculiar example, we have recently found that multiferroics can exhibit strong directional dichroism [1,2], i.e. they absorb counter-propagating light beams with different strength, where the absorbing and transparent directions of propagation can be reversed by the application of either magnetic or electric fields.
In the THz spectral range, directional dichroism is the consequence of the optical magnetoelectric effect, i.e. the coupled dynamics of spins and local electric dipoles. Spin-wave modes in multiferroics can simultaneously be excited by the electric and magnetic components of light, hence, they can be viewed as the “elementary excitations” of such hybrid magnetoelectric response. Our recent studies on several multiferroic compounds, including Ba2CoGe2O7, Ca2CoSi2O7, Sr2CoSi2O7, CaBaCo4O7 and BiFeO3, show that such magnetoelectric spin excitations efficiently generate directional optical anisotropy leading to one-way transparency at these resonances [3].
Such unidirectional optical properties, present in a large variety of multiferroic materials, can open new horizon in photonics [4,5]. Since these phenomena are also related to the static magnetoelectric response, these optical studies can provide guidelines for the systematic synthesis of new materials with large dc magnetoelectric effect.

[1] I. Kezsmarki et al. Enhanced Directional Dichroism of Terahertz Light in Resonance with Magnetic Excitations of the Multiferroic Ba2CoGe2O7 Oxide Compound, Phys. Rev. Lett. 106, 057403 (2011).

[2] S. Bordacs et al. Chirality of matter shows up via spin excitations, Nat. Phys. 8, 734 (2012).

[3] I. Kezsmarki et al. Four-coloured spin-wave excitations in multiferroic materials, arXiv:1310.0789 (2013) — accepted in Nat. Commun.

[4] K. Penc et al. Spin-Stretching Modes in Anisotropic Magnets: Spin-Wave Excitations in the Multiferroic Ba2CoGe2O7, Phys. Rev. Lett. 108, 257203 (2012).

[5] D. Szaller et al. Symmetry conditions for nonreciprocal light propagation in magnetic crystals, Phys. Rev. B 87, 014421 (2013).

Gäste sind herzlich willkommen!
Der Vortrag findet im Seminarraum S-288/Physik-Süd, Universität Augsburg statt.
Gastgeber: Prof. Dr. Alois Loidl