TECHNISCHE UNIVERSITÄT CHEMNITZ

Institut für Physik
Physikalisches Kolloquium

Mittwoch, 15.05.2019, um 16:00 Uhr

Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude,
Raum 2/N013

Dr. Katrin Schultheiß

Institut für Ionenstrahlphysik und Materialforschung,
Helmholtz-Zentrum Dresden – Rossendorf

WHAT ARE WHISPERING GALLERY MAGNONS AND HOW TO EXCITE THEM

One of the most fascinating topics in current quantum physics are hybridized systems, in which resonators of different quantum systems are strongly coupled. Prominent examples are circular resonators with high quality factors that allow the coupling of optical whispering gallery modes to microwave cavities or magnon resonances. However, the coupling to magnons with finite azimuthal wave vectors has not yet been achieved due to the lack of efficient excitation schemes.

After giving an introduction about magnetization dynamics, I will present the generation of whispering gallery magnons with unprecedented high azimuthal wave vectors via nonlinear 3-magnon scattering in a µm-sized magnetic vortex state disc [1]. These modes exhibit a strong localization at the disk's perimeter and practically zero amplitude in an extended area around the vortex core. They originate from the splitting of the fundamental radial magnon modes (see Figure), which can be resonantly excited in a vortex texture by an out-of-plane microwave field. I will shed light on the basics of this non-linear scattering mechanism from experimental and theoretical point of view. Using Brillouin light scattering (BLS) microscopy, the frequency and power dependence of this nonlinear mechanism is investigated. The spatially resolved mode profiles give evidence for the localization at the disk's boundaries and allow for a direct determination of the modes' wavenumber. Furthermore, time resolved BLS in combination with pulsed microwave excitation revealed the temporal evolution of the 3-magnon splitting and its dependence on the applied microwave power.

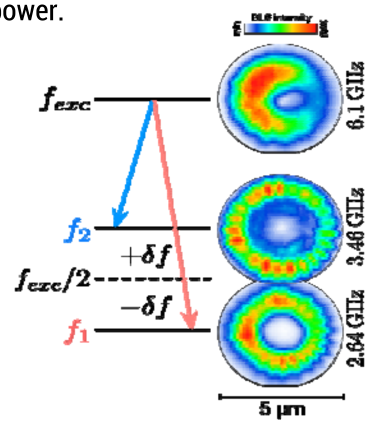

Fig.1 Left side: Schematic illustration of the 3-magnon scattering process. The excited mode at f_{exc} splits in two secondary modes with frequencies f_1 and f_2, equally spaced around half the excitation frequency. Right side: Two-dimensional profiles of the whispering gallery magnons measured by BLS microscopy.

References
[1] K. Schultheiss, R. Verba, F. Wehrmann, K. Wagner, L. Körber, T. Hula, T. Hache, A. Kákay, A.A. Awad, V. Tiberkevich, A.N. Slavin, J. Fassbender, and H. Schultheiss, Physical Review Letters 122, 097202 (2019).

Alle Zuhörer sind ab 15:45 zu Kaffee und Tee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt:
Prof. Dr. Sibylle Gemming, Tel. 0351 260-2470,

www.tu-chemnitz.de/physik