JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar: Hard Condensed Matter Theory

Room: Medienraum, 03-431 (Staudinger Weg 7)
Time: Friday, 07.10.2016, 13:00

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Controlling the damping inside a magnetic insulator

The recent discovery that spin transfer between a metal and a ferromagnet could be achieved using the spin-orbit effects has created a great excitement in the community for two reasons: first, one could control electronically the damping of magnetic insulators, which can offer improved properties compared to metals, and here Yttrium Iron Garnet (YIG) has the lowest damping known in nature; second, the damping compensation could be achieved on very large objects, a particularly relevant point for the field of magnonics whose aim is to use spin-waves as carriers of information. But most notably, none of these high-quality ultra-thin YIG films display a purely homogeneous FMR line. In such extended films, there are many degenerate modes with the main, uniform FMR mode, which through the process of two-magnon scattering broaden the linewidth. In this talk, we will demonstrate that the inhomogenous broadening decreases as the the lateral size decreases due to a lift the degeneracy between modes through confinement. We also show the key influence of the field orientation as well as the mode index number. By studying the dependence of the auto-oscillation threshold current at low bias field (where the inhomogeneous contribution dominates the broadening) for different disk size, we were able to demonstrate that the inhomogeneous broadening increases the threshold current. We also demonstrate that it is possible to reach full damping compensation in micron-sized YIG discs of thickness 20~nm and we show clear evidence of coherent spin-orbit torque induced auto-oscillation.

All interested are cordially welcome!

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