W2S Seminar
(Webinar series on Spintronics)

Inertial Spin Dynamics in Ferromagnets

Speaker:
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Abstract

The understanding of how spins move and can be manipulated at pico- and femtosecond timescales has implications for ultrafast and energy-efficient data-processing and storage applications. However, the possibility of realizing commercial technologies based on ultrafast spin dynamics has been hampered by our limited knowledge of the physics behind processes on this timescale. Recently, it has been suggested that inertial effects should be considered in the full description of the spin dynamics at these ultrafast timescales, but a clear observation of such effects in ferromagnets has been lacking for about a decade. In this presentation, I will first report on the first direct experimental detection of intrinsic inertial spin dynamics in ferromagnetic thin films, in the form of a forced nutation oscillation of the magnetization at THz frequency, that we observed at the TELBE facility in Dresden, Germany. Then, I will show our most recent results on the detection of free oscillations of the spin nutation using a table-top broadband THz source, with which we investigated epitaxial thin films of cobalt in its three crystalline phases. Our data suggest a proportionality between such time and the strength of the magneto-crystalline anisotropy, deepening our fundamental understanding of magnetic inertia.

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