Contribution ID: **74** Type: **Oral**

Ferromagnetic Resonance in a Nickel thin film driven by optically-excited Surface Acoustic Waves (SAWs) in a Transient Grating (TG) setup

Monday, 16 May 2022 17:40 (20 minutes)

Moore-ruled down-scaling of magnetic bits in new-generation memories hampers deterministic switching and calls for new techniques for magnetization manipulation. Acoustic control of magnetism is an appealing route for low-energy-consumption operation, e.g. exploiting magneto-elastic coupling (MEC) in a thin-film planar heterostructure, where SAWs at micron-size wavelength drive magnetization precession by inverse magnetostriction [1].
We studied MEC in Nickel films (8-40 nm) deposited on amorphous and crystalline substrates. We employed a four-wave-mixing approach [2] in a UHV-ready TG-spectroscopy setup, with a 300 fs, high frequency laser (NFFA-SPRINT*). Two pump pulses thermally excite SAWs, which couple to magnetostatic waves. A third time-delayed pulse acts either as acoustic (TG diffraction), or as magnetic probe (Faraday rotation). Tuning an external magnetic field, the condition of SAW-driven ferromagnetic resonance (FMR) is reached: the time-dependent magneto-elastic field balances the Gilbert damping, allowing spin precession to last long after its natural damping. The range of wavevectors studied (few inverse microns) allows a comparison with results from standard FMR in terms of Kittel curve and extrinsic contribution to the magnetic damping.

*https://www.trieste.nffa.eu/techniques/spectroscopy/tg-sprint/

[1] W.Yang and H.Schmidt, Appl.Phys.Rev. 8, 021304 (2021)
[2] J.Janušonis et al. Sci.Rep. 6.1, 1-10 (2016)

Primary authors: DAGUR, Deepak (Università degli Studi di Trieste); LONGO, Emanuele (CNR IMM); PANACCIONE, Giancarlo (CNR IOM); ROSSI, Giorgio (Università degli Studi di Milano); VINAI, Giovanni (CNR IOM); FANCIULLI, Marco (Università degli Studi di Milano Bicocca); BRIOSCHI, Marta (Università degli Studi di Milano); CARRARA, Pietro (Università degli Studi di Milano); CUCINI, Riccardo (CNR IOM); MANTOVAN, Roberto (CNR IMM); POLEWCZYK, Vincent (CNR IOM)

Presenter: CARRARA, Pietro (Università degli Studi di Milano)