

Simultaneous imaging of SAW and Spin waves using XPEEMFerran Macià^a

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Spin waves in magnetic materials are coherent dispersive waves, typically in the low GHz frequency regime and with wavelengths of hundreds of nanometers. Interest in spin waves is motivated by the possibility of its integration into nano-scale devices for high-speed and low-power signal processing. However, generation of spin waves with high amplitudes—and their detection—is challenging due to the mismatch of wavelengths with electromagnetic waves in free space, which is of the order of several centimeters.

In this talk I will review some recent experiments on the coupling of surface acoustic waves (SAW) and spin waves using X-ray Photo-Emission Electron Microscope (XPEEM). The main observations are: i) the control of SAW interference patterns [1], ii) the SAW generation of large amplitude spin waves (up to 25 degrees) over large distances (up to several millimeters) [2], iii) the induced delays on the SAW compared to the SW [3], and the iv) the possibility of moving magnetic domains at the SAW velocity [4,5]. Additionally, I will also show the effect of a periodical spatial strain in the reversing process of a magnetic thin film besides the reduction of the nucleation energy [6].

[1] Journal of Synchrotron Radiation 26, 184-193 (2019)

[2] Phys Rev. Lett. 124, 137202 (2020)

[3] In preparation

[4] Nature Commun. 8, 407 (2017)

[5] MRS bulletin 43, 854 (2018)

[6] In preparation.