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DISTINGUISHED LECTURE SERIES

Summer Term 2021

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Reconfigurable magnonics based on spin textures

Magnetic spin textures are of great current interest in the field of magnonics thanks to their properties, which offer unique opportunities for the generation and manipulation of spin waves (SW) at the nanoscale, opening new perspectives for the implementation of innovative device functionalities. In this presentation I will discuss two different approaches to control SW propagation by exploiting magnetic spin textures.

First I will present recent results showing the experimental realization of reconfigurable magnonic elements based on spin textures created by crafting at the nanoscale the magnetic anisotropy landscape of a ferromagnet exchange-coupled to an antiferromagnet. By performing a highly localized field cooling with the hot tip of a scanning probe microscope, magnetic structures, with arbitrarily oriented magnetization and tunable unidirectional anisotropy, can be patterned without modifying the film chemistry and topography. I will show that in such structures the spin-wave propagation can be spatially controlled and tuned by external magnetic fields. Moreover I will provide experimental demonstration of channeling and steering of propagating SWs in nanomagnonic waveguides based on patterned domain walls, as well as of the generation and the control of SWs wavefronts by using tailored spin textures.

Then I will discuss the possibility to use magnetic stripe domains, characterized by alternating up and down out-of-plane orientation of the magnetization, to control SWs propagation as in artificial magnonic crystals (MCs). Since the direction of the stripes domains is always parallel to the last saturation direction, regardless of the crystallographic direction, stripe structure leads the potential for the development of reconfigurable MCs. In particular, I will present a Brillouin light scattering investigation of the NdCo/Al/Py system, where a soft magnetic film is combined with a hard magnetic layer developing

stripe domains. I will show that SWs mainly localized in the Py thin film, exhibit a non-reciprocal dispersion relation, strongly sensitive to the periodic stripe-domain texture imprinted from the NdCo film.

Date: **Monday, July 12, 2021**
Time: **04:00 pm**
Venue: **Online via Zoom (Webinar ID: 848 7643 6740)**