Stage de master de physique / Physics Master Internship

Proposition de stage/ Internship proposal (1 page max)

Date de la proposition : 20/10/22

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*: Institut des Nanosciences de Paris

Code d'identification :UMR 7588 Organisme : CNRS/Sorbonne Universite

Site Internet / *web site*: https://w3.insp.upmc.fr/

Adresse / *address:* 4 place Jussieu, Paris

Lieu du stage / *internship place*: campus Jussieu, 22-23-206

Acoustic-driven magnetization dynamics in synthetic antiferromagnets

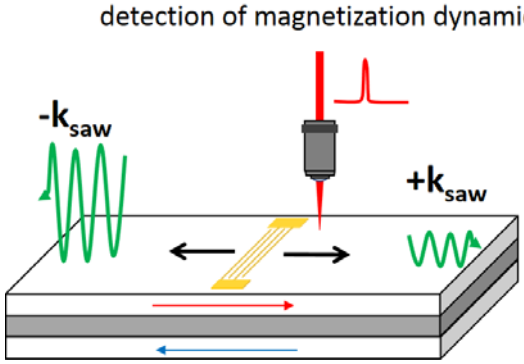
Radio Frequency (RF) signals are everywhere in today's connected society. Surface Acoustic Wave (SAW) filters are widely used components in smartphones or computers that filter out some specific RF frequencies. One of their limitations is that they are weakly tunable and reciprocal.

This internship is placed within an ANR (Agence Nationale de la Recherche) collaborative project (associated labs C2N and CEA/SPEC among others) in which we're making these surface acoustic waves travel over magnetic thin films, and use the magneto-elastic interaction to alter their properties. When acoustic and magnetic eigenmodes are made to match, this interaction is an original way to modify strongly an acoustic wave's amplitude or velocity. Here we'll use a particular kind of magnetic thin film: synthetic antiferromagnets made of a sandwich of two ferromagnetic layers coupled anti-parallel. Their highly non-reciprocal dispersion relationship (different for k>0 and k<0) is indeed expected to allow for a very non-reciprocal coupling to a SAW of given wave-vector $\mathbf{k}_{saw}$ [Verba *et al.* Phys. Rev. Appl. 2019]. This will occur by triggering magnetization dynamics in the thin film with different efficiency for $+\mathbf{k}_{saw}$ and $-\mathbf{k}_{saw}$.

Actually, there has so far been no experimental demonstration that magnetization dynamics can even be triggered at all by SAWs in this type of stacks. The aim of the internship will first be to evidence experimentally these dynamics, and secondly to see just how non-reciprocal the magneto-acoustic coupling is.

Techniques used: time-resolved Kerr effect using a pulsed laser, RF circuitry and electronics, room for micromagnetic simulation and analytical calculation if desired

Desired skills: Strong motivation for experimental work, Background in magnetism and/or optics



Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : yes**

Si oui, financement de thèse envisagé/ *financial support for the PhD***: ED 397, or possibly ANR projet**