Influence of the spin orbit torques on the current-induced propagation of the DWs in materials with in-plane anisotropy

Contact: Gilles GAUDIN DSM/INAC/SPINTEC gilles.gaudin@cea.fr 0438782384

PhD may follow: Yes

Summary :

The electric control of the magnetization is essential for the downscaling of the magnetic random access memories. We develop innovating switching schemes based on the transfer of angular momentum from the crystal lattice. The magnetization reversal in thin films is generally occurring through non-uniform rotation, a process consisting of a small domain nucleation followed by a domain wall propagation. In this context, the understanding and the control of the DW dynamics is essential for the design of novel switching schemes.

The objective of the project is to study the influence of the spin orbit torques on the current-induced propagation of the DWs in materials with in-plane anisotropy.

Full description :

The electric control of the magnetization is essential for the downscaling of the magnetic random access memories. The mainstream technology relies on the transfer of spin angular momentum from an adjacent ferromagnet. We develop innovating switching schemes based on the transfer of angular momentum from the crystal lattice. In magnetic materials lacking structural inversion symmetry, the electric current produces torques that allow to reverse the magnetization. The magnetization reversal in thin films is generally occurring through non-uniform rotation, a process consisting of a small domain nucleation followed by a domain wall propagation. In this context, the understanding and the control of the DW dynamics is essential for the design of novel switching schemes.

The objective of the project is to study the influence of the spin orbit torques on the current-induced propagation of the DWs in materials with in-plane anisotropy.

For this purpose we will fabricate samples by patterning the magnetic nano-structures out of Pt/NiFe thin films. The DW motion will be studied using wide field Kerr microscopy and also using magneto-transport measurements.

The necessary equipment already exists at Spintec; the experimental setup will be adapted for the specificities of the DW motion experiments during the internship.

[1] I. M. Miron, et al., Nature Materials, 9, 230-234 (2010)

[2] I. M. Miron, et al. Nature 476, 189-193 (2011)

Contacts:

Ioan Mihai Miron : mihai.miron@cea.fr

Gilles Gaudin : gilles.gaudin@cea.fr

Requested skills :

Master M2 Nanoscience, condensed matter