ELECTRICAL AND MICROMAGNETIC CHARACTERIZATION OF MAGNETIC DISKS AND RINGS

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Magnetic sensors based on disk-shape and ring-shape structures are attractive because they give high magnetic and angular sensitivity as well as a very good thermal stability because they are used mainly in a Wheatstone bridge configuration. Field and angular Planar Hall effect (PHE) measurements were performed on Permalloy (NiFe) based thin films and multilayered structures as FeMn/NiFe/NM/NiFe where NM denotes nonmagnetic layers of Cu or Al_2O_3. The samples were circular and ring-shape thin film structures used as magnetic sensors. When the applied magnetic field is less than 200 Oe, we observed hysteretic effects and distortions from the expected sinusoidal shape of the angular dependence of the PHE voltage [1]. In order to have a better understanding of this behaviour, micromagnetic simulations were made to obtain the magnetization curve and angular dependence of the sample magnetization for different intensities of the rotating magnetic field. The film plane was divided into a number of single domains which interact between them and with the applied magnetic field [2]. The structures used in our simulations were inspired from the real ones in what concern the grain dimensions, coupling between magnetic layers trough the non magnetic layer, the pinning field, etc. In Figure 1 are presented two results of micromagnetic simulations performed on NiFe, 10 nm thick, disk-shape and ring-shape structures

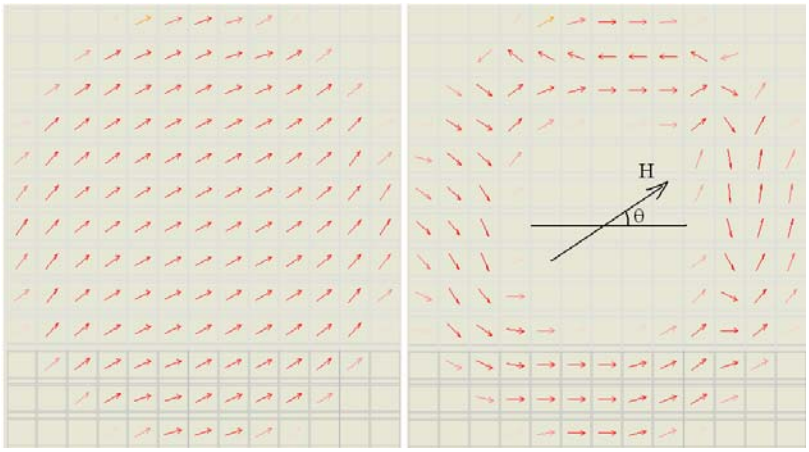

Figure 1. Screen shot during micromagnetic simulations; θ=30° and H=100 Oe

The use of these structures for magnetic sensing and methods to improve their response are discussed in this study.

[1] M. Volmer, J. Neamtu, Journal of Magnetism and Magnetic Materials, **316,** e265-e268 (2007)
[2] M. Volmer, J. Neamtu, Physica B **403**, 350–353 (2008)