Gilbert damping on systems without inversion symmetry: the $Fe_{50}Co_{50}(100)$ case

I. P. Miranda,[1] A. B. Klautau,[2] A. Bergman,[3] D. Thonig,[4] H. M. Petrilli,[1] and O. Eriksson[3,4]

[1] *Universidade de São Paulo, Instituto de Física, Rua do Matão, 1371, 05508-090, São Paulo, SP, Brazil*
[2] *Faculdade de Física, Universidade Federal do Pará, Belém, PA, Brazil*
[3] *Department of Physics and Astronomy, Uppsala University, Box 516, SE-75120 Uppsala, Sweden*
[4] *School of Science and Technology, Örebro University, Fakultetsgatan 1, SE-701 82 Örebro, Sweden*

Gilbert damping has a critical importance in determining the lifetime, diffusion, transport and stability of domain walls, magnetic vortices, skyrmions, and other complex magnetic configurations. Given its high scientific interest, the possibility to obtain this quantity in a first-principles fashion [1] opens new perspectives of optimizing materials for devices. A way to do that is to use Kambersky's breathing Fermi surface (BFS) and torque-correlation (TC) [2,3] models, which have been explored in terms of pure/alloy bulk and surfaces via reciprocal-space methods. However, considering the nonlocality of the damping parameter that is predicted for itinerant magnets [4], there is still a gap in literature for systems with lack of inversion symmetry. Therefore, we will discuss a recent implementation of an ab-initio calculation of the damping in the real-space RS-LMTO-ASA method [5], based on the BFS and TC models. This allowed us to capture via first-principles the origins of the large damping anisotropy experimentally observed in $Fe_{50}Co_{50}(100)$ [6,7].

References:

[1] K. Gilmore, *et al.*, Phys. Rev. Lett. 99, 027204 (2007)
[2] V. Kamberský, Czech. J. Phys. B 26, 1366 (1976)
[3] V. Kamberský, Czech. J. Phys. 34, 1111 (1984)
[4] D. Thonig, *et al.*, Phys. Rev. Mater. 2, 013801 (2018)
[5] S. Frota-Pessôa, Phys. Rev. B 46, 14570 (1992)
[6] Y. Li, *et al.*, Phys. Rev. Lett. 122, 117203 (2019)
[7] I. P. Miranda, *et al.*, arXiv:2101.02794 (2021)