

Inhomogeneous perpendicular magnetic anisotropy as a source of higher-order quasistatic and dynamic anisotropies

C.K.A. Mewes*, Tim Mewes, J. Beik Mohammadi, and K. Cole

Department of Physics and Astronomy/MINT, The University of Alabama, Tuscaloosa, AL 35487

* cmewes@mint.ua.edu

Functional materials with optimized properties, such as the magnetic anisotropy and magnetic relaxation rate, are crucial for the next generation of spintronic devices. Therefore, technological progress in this area depends heavily on the successful search for new materials as well as on a deeper understanding of the fundamental mechanisms of the spin polarization, the damping and the magnetic anisotropy within a confined device setting. For many spintronic devices, the presence of a strong perpendicular anisotropy, often created through symmetry breaking at the surface, is of significant importance for materials intended for use in spintronic devices. For example, a significant reduction of the switching current density while maintaining the thermal stability for spin transfer torque magnetic random access memories, can be achieved by utilizing a perpendicular anisotropy. This talk will focus on the investigation of the influence of lateral variations of the second-order perpendicular anisotropy in thin films on the effective anisotropies required to represent this structure using a macrospin approximation. Second-order and fourth-order effective anisotropies are required for the macrospin approximation, often used to describe experimental observed data. Especial focus will be given to the values accessible through dynamic and quasi-static calculations.

Acknowledgements: This work was supported by National Science Foundation Faculty Early Career Development Program (NSF-CAREER) Grant No. 1452670. We would also like to acknowledge the support of the University of Alabama High Performance Computing facilities and staff.