Strain controlled magnetization dynamics in thin films and planar nanostructures

S. A. Cavill[1,2], D. E. Parkes[3], S. Bowe[3,2], R. Beardsley[3], C. Reardon[1], A. W. Rushforth[3], T. A. Ostler[1], R. W. Chantrell[1], I. Isakov[4], P. Warburton[4]

[1]*Department of Physics, The University of York, York, YO10 5DD, United Kingdom*
[2]*Diamond Light Source, Harwell Science and Innovation Campus, Chilton, Didcot, OX11 0DE*
[3]*School of Physics and Astronomy, The University of Nottingham, Nottingham, NG7 2RD, UK*
[4]*London Centre of Nanotechnology, University College London, London WC1H 0AH, UK*

The interplay between strain-induced, shape-induced, and magnetocrystalline anisotropy energies in (sub)-micron scaled magnetostrictive devices coupled to an underlying ferroelectric (FE) layer is presented. Varying the voltage applied to the FE layer not only tunes the shape of the magnetic hysteresis loop and the magnetic reversal processes [1], but also provides a means of controlling and stimulating magnetization dynamics [2-4]. Using both experimental imaging techniques and numerical simulations I will present a means of manipulating vortex core dynamics in a planar structure, displaying the landau flux closure ground state, utilizing both static and time-varying strain induced anisotropy.

References

[1] S. A. Cavill *et al*. Electrical control of magnetic reversal in magnetostrictive structures, Applied Physics Letters **102**, 032405 (2013).

[2] D. E. Parkes *et al*. Voltage controlled modification of flux closure domains in planar magnetic structures for microwave applications, Applied Physics Letters, **105**, 062405 (2014).

[3] D. E. Parkes *et al*. Magnetostrictive thin films for microwave spintronics, Scientific Reports **3**, 2220 (2013).

[4] J. V. Jäger *et a*l. Picosecond Inverse Magnetostriction in Galfenol Thin Films, Applied Physics Letters, **103**, 032409 (2013).

Email corresponding author: stuart.cavill@york.ac.uk