Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Ferromagnetic resonance force spectroscopy of a magnetic vortex
G. DE LOUBENS, O. KLEIN, SPEC, CEA Saclay, A. RIEGLER, F. LOCHNER, G. SCHMIDT, L.W. MOLENKAMP, Universitat Wuerzburg, H. HURDEQUINT, LPS, Orsay, F. BOUST, ONERA, N. VUKADINOVIC, Dassault Aviation, A.N. SLAVIN, Oakland University — Due to its nanometer size (of the order the exchange length), probing the high frequency dynamics of a magnetic vortex core is an experimental challenge. Precessional dynamics of the magnetization of individual nano-disks of NiMnSb perpendicularly magnetized is measured in a wide range of bias magnetic fields using a magnetic resonance force microscope (MRFM). A full dynamic phase diagram, demonstrating excitation of a Kittel-type dipolar mode in the saturated disks and the gyrotropic mode of vortex core rotation in the vortex-state unsaturated disks, is established. Switching of the vortex core polarity in a negative (anti-parallel to core) bias magnetic field is registered dynamically. Analytic theory and micromagnetic simulations provide a quantitative description of the experimental results.

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Date submitted: 07 Dec 2008 Electronic form version 1.4