Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Temperature dependent nucleation and annihilation of individual magnetic vortices in sub-micron permalloy disks[1] GORAN MIHAJLOVIC, MIKE S. PATRICK, JOHN E. PEARSON, VALENTYN NOVOSAD, MSD, Argonne National Laboratory, SAM D. BADER, AXEL HOFFMANN, MSD and CNM, Argonne National Laboratory, MARK FIELD, GERRY J. SULLIVAN, Teledyne Scientific Company LLC — Using micro-Hall and band-resistance magnetometry we studied the temperature dependence of the magnetization reversal in individual permalloy disks with diameters of 526-865 nm and thickness of 50 nm. We identified interesting thermal effects in the smallest and largest disks. The nucleation field exhibits a non-monotonic dependence with positive and negative slopes at low and high temperatures, respectively, while the annihilation field monotonically decreases with increasing temperature, but with distinctly different slopes at low and high temperatures. Our analysis suggests that at low temperatures vortex nucleation and annihilation proceeds via thermal activation over an energy barrier, while at high temperatures they are governed by the temperature dependence of the saturation magnetization due to thermally populated spinwaves. For intermediate-size disks we observed complex reversal behavior. Despite this, probing individual disks is much more revealing of the underlying physics than is probing arrays of disks.

[1]Supported by DOE-BES under contract No. DE-AC02-06CH11357.

Goran Mihajlovic
MSD, Argonne National Laboratory

Date submitted: 22 Nov 2009 Electronic form version 1.4