Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Energy barriers for vortex nucleation and annihilation in sub-100 nm magnetic dots[1] ANDREW T. KING, IGOR V. ROSHCHIN, Texas A&M University — Understanding energy barriers involved in nucleating and annihilating magnetic vortices in nanodots is important for magnetic memories and nano-oscillators. We used a "rigid-vortex approximation" and micromagnetic approach to calculate the total magnetic energy of a nanodot for various magnetic configurations. This was done for 20 nm-thick iron nanodots with different diameters (30, 40, 65, and 80 nm) as a function of applied magnetic field. By analyzing the energy landscape for different magnetic configurations, we calculated the energy barrier for switching from the vortex to the single-domain state (vortex annihilation) and the converse (vortex nucleation). The applied fields required to overcome these two barriers are compared to those obtained from the simulations directly and to the experimental values.[2] The role of the thermal fluctuations in the temperature dependence of these critical fields will be discussed by comparison of the energy barriers with the thermal energy, kT.

[1]Work is supported by Texas A&M University, TAMU-CONACYT Collaborative Research Program.
[2]R. K. Dumas, *et. al.*, Appl. Phys. Lett. **91**, 202501 (2007).

Andrew T. King
Texas A&M University

Date submitted: 21 Nov 2011 Electronic form version 1.4