Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Nanoscale spin wave localization using magnetic resonance force microscopy HAN-JONG CHIA, ROBERT MCMICHAEL, NIST — We report on a novel technique for exciting localized spin wave modes in ferromagnetic thin films using the magnetostatic field from a soft magnetic tip on a scanned probe. Unlike previous studies [1,2] that used permanent magnet tips and applied fields at or near the film normal, we use a configuration of ferromagnetic resonance force microscopy (FMRFM) where the applied field, sample magnetization and probe magnetization are all aligned parallel to the film plane. In this configuration, the dipole field of the tip creates a minimum in the net applied field where spin waves are localized. Our experiments confirm the presence of localized spin waves. Micromagnetic modeling is used to generate images of the localized spin waves at various tip-sample separations. These images indicate that the localized modes exist in a region that is smaller than the tip diameter and that they have the form of standing waves with wave vectors parallel to the applied field. Our technique combined with micromagnetic modeling presents a pathway for obtaining magnetic resonance imaging (MRI)-like spatial maps in ferromagnetic films with submicron resolution.

[1] I. Lee et al., *Nature* **466**, 845 (2010).
[2] E. Nazaretski et al., *Phys. Rev. B*, **79**, 132401 (2009).

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Date submitted: 12 Nov 2010 Electronic form version 1.4