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Ferromagnetic Resonance Imaging with Magnetic Resonance Force Microscopy

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Magnetic resonance force microscopy achieves very high resolution three-dimensional imaging capabilities of magnetic resonance imaging by taking advantage of very high sensitivity mechanical force detection. This enables non-contacting, microscopic studies and imaging of a broad range of materials. As a consequence of the strong interactions between spins, the assumptions underlying conventional MRI are not applicable to FMR imaging. However, using a new approach to localizing the resonant volume in an FMR measurement founded on the strong, nonuniform magnetic field of the micromagnetic probe tip, we have demonstrated scanned probe Ferromagnetic Resonance (FMR) imaging [1]. The scanned probe FMR images obtained in patterned ferromagnetic films are well explained by detailed numerical modeling. In addition to illuminating the mechanisms underlying localized FMR, the model provides the basis for submicron scanned probe FMR imaging of films and buried ferromagnetic elements. This work was supported by the U.S. Department of Energy through Grant No. DE-FG02-03ER46054.

[1] "Local Ferromagnetic Resonance Imaging with Magnetic Resonance Force Microscopy," Yu. Obukhov, D.V. Pelekhov, J. Kim, P. Banerjee, I. Martin, E. Nazaretski, R. Movshovich, S. An, T.J. Gramila, S. Batra, and P. C. Hammel, Phys. Rev. Lett. **100**(19), 197601 (2008).