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Localized spin wave modes in parabolic field wells ROBERT MCMICHAEL, Center for Nanoscale Science and Technology, NIST, ELENA TARTAKOVSKAYA, Institute of Magnetism, NAS of Ukraine and Institute of High Technologies, Taras Shevchenko National University of Keiv, MARTHA PARDAVI-HORVATH, School of Engineering and Applied Science, The George Washington University — We describe spin wave modes trapped in parabolic-profile field wells. Trapped spin waves can be used as local probes of magnetic properties with resolution down to 100 nm in ferromagnetic resonance force microscopy.[1,2] Localized modes have been shown to form around field minima from a number of sources, including stray fields from magnetic probe tips [1,3-4] and inhomogeneous magnetostatic fields near film edges.[2] Here, we address the most basic trap, which is a parabolic minimum in the applied field. The magnetic eigenmodes in this trap are tractable enough to serve as approximations in more realistic situations. For a parabolic field, we select basis mode profiles proportional to Hermite functions because they are eigenfuctions of the applied field and exchange parts of the equations of motion. Additionally, we find that these Hermite modes are approximate eigenfunctions of magnetostatic interactions, showing good agreement with micromagnetic calculations. More precise agreement is achieved by diagonalizing the equations of motion using only a few modes. 1. I. Lee et al., Nature 466, 845 (2010). 2. F. Guo et al. Phys. Rev. Lett, 110, 017601 (2013) 3. H.-J. Chia,et al., Phys. Rev. Lett. 108, 087206 (2012). 4. R. Adur et al, Phys. Rev. Lett. 113, 176601 (2014).

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