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Nonlinear Behavior for the Uniform Mode and Horizontal Standing Spin Wave Modes in Metallic Ferromagnetic Microstrips: Experiment and Theory[1] B.W. SOUTHERN, M.P. WISMAYER, X.L. FAN, Y.S. GUI, C.-M. HU, University of Manitoba, R.E. CAMLEY, University of Colorado at Colorado Springs — Micron sized rectangular ferromagnetic bars have a variety of spin excitations, including a quasi-uniform mode, horizontal and vertical standing spin wave modes, and edge and corner modes. When driven by a strong microwave field, these modes differ from those found in the linear regime. For example, the resonance field or frequency becomes amplitude dependent. We study the nonlinear spin dynamics in such microstrips both experimentally and theoretically for a geometry where the static magnetic field is perpendicular to the plane of the sample. Experimentally it is found that, at a fixed microwave frequency, the resonance field for the uniform mode is significantly reduced as the microwave power is increased. In contrast, the resonance fields for the standing horizontal spin wave modes are only slightly reduced. This behavior is confirmed theoretically using micromagnetic calculations, and an intuitive explanation for this behavior is developed.

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