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Measurements of magnetic spin excitations in Permalloy microstructures using nitrogen-vacancy magnetometry H.J. JASON LIU, SEUNGHA YOON[1], ROBERT MCMICHAEL, Center for Nanoscale Science and Technology, National Institute of Standards and Technology — The magnetic properties of nitrogen-vacancy (NV) centers in diamond have enabled emerging applications in fields ranging from cell biology to quantum computing. An NV center is a lattice defect, which behaves like a spin-1 system. NV centers can be prepared in the $m_z = 0$ state by excitation with green light, and the spin state can be detected by the center's fluorescence of red light. The Zeeman splitting of the $m_z = 1$ state, combined with a spin coherence time that can approach 1 ms, makes the NV center a sensitive, atom-sized magnetometer. Recently, NV centers have been used to measure spin wave excitations and vortex core dynamics in a Permalloy microdisk. In this talk, we present current NV center measurements on Permalloy micro and nanostructures that build on previous work. Permalloy structures were fabricated on top of a microstrip antenna and the measurements were conducted on a home-built confocal microscope. Preliminary measurements show photoluminescence contrast of ~12% and field detectivity on the order of $T/Hz^{1/2}$. This allows for fine field mapping of stray magnetic fields produced by micro and nanostructures, which are typically a few milliteslas in magnitude.

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