Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Navigating the vortex pinning landscape for bistable coupling of a ferromagnetic vortex to individual nitrogen vacancy spins[1] JESSE BEREZOVSKY, MICHAEL WOLF, ROBERT BADEA, Case Western Reserve University — A ferromagnetic (FM) vortex coupled to nitrogen-vacancy (NV) spins in diamond provides an integrated platform for fast, nanoscale addressability of coherent spins [1]. The vortex moves in a complex effective potential landscape set by the geometry of the disk and the defects present in the material. As the vortex moves through this landscape, the coupling to a proximal NV varies. We use differential magneto-optical microscopy to extract the effective potential through which the vortex moves [2], and optically-detected magnetic resonance to study the coupling of the vortex to an adjacent NV spin. When multiple local minima are present in the vortex potential, the vortex/NV coupling displays bistability. We switch between these bistable states with short magnetic field pulses. This allows an NV spin transition to be switched between on-resonance and off-resonance with a driving field with the same set of external parameters, and also yields information about the mechanisms of vortex/NV coupling. [1] M.S. Wolf, R. Badea, J. Berezovsky, arXiv:1510.07073, 2015 [2] R. Badea, J. Berezovsky, arXiv:1510.07059, 2015.

[1]We acknowledge support from US Department of Energy, award DE-SC008148

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Date submitted: 06 Nov 2015 Electronic form version 1.4