Abstract Submitted
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Coherent spin manipulation of a single NV center in its orbital excited state[1] G.D. FUCHS, D.M. TOYLI, F.J. HEREMANS, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA, V.V. DOBROVITSKI, Ames Laboratory and Iowa State University, Ames, IA, C.D. WEIS, T. SCHENKEL, Lawrence Berkeley National Laboratory, Berkeley, CA — Nitrogen vacancy centers in diamond have emerged as a promising candidate for quantum information processing in the solid state at room temperature. Recent spectroscopic investigations of the spin levels in the orbital excited state have revealed sensitivity to strain and strong hyperfine interactions with the nitrogen nuclear spin [1]. By fabricating coplanar waveguides directly on diamond substrates [2] and using pulsed laser excitation combined with sub-nanosecond timing, we investigate the coherent dynamics of a single NV center spin in its excited state. We find spin lifetimes from the decay of Rabi oscillations that are much shorter than the orbital lifetime. Results are discussed in the context of orbital and spin dynamics of the NV center excited state manifold.

[1] G. D. Fuchs *et al.*, *Phys. Rev. Lett.* **101**, 117601 (2008).
[2] G. D. Fuchs, *et al.*, *Science* (2009) (10.1126/science.1181193).

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