Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Mechanisms for Electric Field Control of Single Spin Relaxation in Double Quantum Dots[1] V. SRINIVASA, Joint Quantum Institute, University of Maryland and NIST, K.C. NOWACK, M. SHAFIEI, L.M.K. VANDERSYPEN, Kavli Institute of Nanoscience, TU Delft, J.M. TAYLOR, Joint Quantum Institute, University of Maryland and NIST — We theoretically investigate electrically-tunable spin-flip transitions for a single electron confined within a double quantum dot. In the presence of spin-orbit and hyperfine interactions, the rate at which phonon-induced spin relaxation occurs depends non-monotonically on the detuning between the dots. We analyze this detuning dependence for both direct decay to the ground state and indirect decay via an intermediate excited state of the double dot. A description in terms of a simple toy model captures characteristic features of the relaxation rate recently measured for GaAs double quantum dots. Our results suggest that spin-orbit mediated relaxation via phonons serves as the dominant mechanism through which the electron spin-flip rate in these systems varies with detuning.

[1]Support from DARPA MTO and IARPA is gratefully acknowledged.

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Date submitted: 27 Dec 2012 Electronic form version 1.4