Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spin-valley physics in realistic silicon quantum dots RUSKO RUSKOV, CHARLES TAHAN, Laboratory for Physical Sciences, College Park, MD 20740, U.S.A. — Silicon quantum dots are leading approach for solid-state quantum bits. However, one must contend with new physics due to the multi-valley nature of silicon. At a Si heterostructure interface the valley degeneracy is lifted and the different valley subspaces of the confined electron spin configurations do not interact. When, however, the valley states are brought at resonance in the presence of a non-ideal interface, spin-valley mixing can occur via spin-orbit coupling. Within the same theoretical framework, we can successfully describe the spin relaxation processes in non-ideal quantum dots [e.g., relaxation "hot spots" in C. H. Yang, A. Rossi, R. Ruskov, N. S. Lai, F. A. Mohiyaddin, S. Lee, C. Tahan, G. Klimeck, A. Morello, and A. S. Dzurak, Nature Comm. 4, 2069, (2013)] and a new electron spin resonance (ESR) anticrossing splitting in a double quantum dot transport experiment [X. Hao, R. Ruskov, M. Xiao, C. Tahan, and H. W. Jiang, work in preparation]. Understanding the spin-valley physics of inelastic tunneling is critical to a proper understanding of the transport through double quantum dots, with or without an ESR drive field.

Rusko Ruskov
Laboratory for Physical Sciences, College Park, MD 20740, U.S.A.

Date submitted: 15 Nov 2013 Electronic form version 1.4