Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The effect of dynamical decoupling in the case of a single fluctuator coupled to a qubit[1] CODY NAVE, ROMAN LUTCHYN, LUKASZ CYWINSKI, SANKAR DAS SARMA, Condensed Matter Theory Center and Joint Quantum Institute; Department of Physics; University of Maryland - College Park
— We consider the role of dynamical decoupling in the case of a single classical fluctuator coupled to a qubit which is operated in a pure dephasing regime. We study the effect of various pulse sequences on the decoherence time for both weakly and strongly coupled fluctuators described by random telegraph noise (RTN). For a strongly coupled two-level system, the application of multiple pulses leads to a large enhancement of qubit coherence time. By theoretically comparing various dynamic decoupling schemes, we conclude that the Car-Purcell-Meiblum-Gill (CPMG) pulse sequence, well-known in NMR spectroscopy and recently discussed in the context of electron spin qubits in semiconductors [1], is the most optimal coherence-restoring scheme for the single fluctuator problem of relevance to superconducting qubits. We also find that for a large number of applied pulses the Gaussian approximation for the noise reproduces the exact results even in the strongly coupled regime.
[1] W. M. Witzel and S. Das Sarma, Phys. Rev. Lett. 98, 077601 (2007).

[1]This work is supported by the LPS-NSA-CMTC grant and by a fellowship from the Joint Quantum Institute (RL).

Cody Nave
University of Maryland

Date submitted: 26 Nov 2007 Electronic form version 1.4