Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Currently Realizable Quantum Error Detection/Correction Algorithms for Superconducting Qubits[1] KYLE KEANE, Department of Physics and Astronomy, University of California, Riverside, ALEXANDER N. KOROTKOV, Department of Electrical Engineering, University of California, Riverside — We investigate the efficiency of simple quantum error correction/detection codes for zero-temperature energy relaxation. We show that standard repetitive codes are not effective for error correction of energy relaxation, but can be efficiently used for quantum error detection. Moreover, only two qubits are necessary for this purpose, in contrast to the minimum of three qubits needed for conventional error correction. We propose and analyze specific two-qubit algorithms for superconducting phase qubits, which are currently realizable and can demonstrate quantum error detection; each algorithm can also be used for quantum error correction of a specific known error. In particular, we analyze needed requirements on experimental parameters and calculate the expected fidelities for these experimental protocols.

[1]This work was supported by NSA and IARPA under ARO grant No. W911NF-10-1-0334.

Kyle Keane
Department of Physics and Astronomy, University of California at Riverside

Date submitted: 17 Nov 2010 Electronic form version 1.4