Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Protecting adiabatic quantum computation by dynamical decoupling GREGORY QUIROZ, DANIEL LIDAR, University of Southern California — Adiabatic quantum computation (AQC) relies heavily on a systems ability to remain in its ground state with high probability throughout the entirety of the adiabatic evolution. System-environment interactions present during the evolution manifest decoherence, thereby increases the probability of excitation. In this work, it is shown that the existence of such noise-producing terms can be dramatically reduced by Dynamical Decoupling (DD). In particular, we consider a multi-qubit system subjected to a classical bath modeled by random Gaussian-correlated noise. The performance of deterministic schemes such as Concatenated Dynamical Decoupling (CDD) and Nested Uhrig Dynamical Decoupling (NUDD) are analyzed for Grover's search algorithm and the two-qubit Satisfiability (2-SAT) problem. The CDD evolution substantially increases noise suppression with increasing concatenation level. In contrast, improvements in performance are only observed for specific sequence orders in the NUDD scheme. These results are verified for both adiabatic evolutions in terms of the total adiabatic run time and minimum pulse interval.

Gregory Quiroz
University of Southern California

Date submitted: 12 Nov 2011 Electronic form version 1.4