Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Continuous Wave Noise Spectroscopy Beyond the Weak Coupling Limit KYLE WILLICK, Institute for Quantum Computing, University of Waterloo, DANIEL PARK, Korea Advanced Institute of Science and Technology, JONATHAN BAUGH, Institute for Quantum Computing, University of Waterloo

— The optimization of dynamical decoupling and quantum error correction for a particular qubit realization is based on a detailed knowledge of the noise properties. Spectroscopy of single-axis noise using dynamical decoupling pulse sequences has garnered much recent attention. In this work we consider noise spectroscopy based on a continuous-wave (CW) on-resonance driving field. Standard CW noise spectroscopy is limited to the weak coupling regime, in which the generalized Bloch equation (GBE) and filter function approaches are valid. We present a technique for extending the range over which the spectral density of the noise S(ω) can be reliably reconstructed to beyond the weak coupling limit, i.e. to frequencies small compared to the noise strength. The technique utilizes a numerical calculation of the short-time signal decay under the zeroth order average Hamiltonian to iteratively correct the estimated S(ω) at low frequencies. The results demonstrate faithful extraction of colored noise spectra to zero frequency, whereas naive application of the GBE fitting can significantly underestimate the low frequency noise power.

Kyle Willick
University of Waterloo

Date submitted: 06 Nov 2015 Electronic form version 1.4