Dynamical suppression of $1/f$ noise processes in qubit systems

Lara Faoro faoro@isiosf.isi.it  Institute for Scientific Interchange Foundation, Viale Settimio Severo 65, 10133 Torino, Italy
Lorenza Viola lviola@lanl.gov  Los Alamos National Laboratory, Mail Stop B256, Los Alamos, New Mexico 87545, USA

September 18, 2003

abstract We investigate the capability of dynamical decoupling techniques to reduce decoherence from a realistic environment generating $1/f$ noise. The predominance of low frequency modes in the noise profile allows for decoherence scenarios where relatively slow control rates suffice for a drastic improvement. However, the actual figure of merit is very sensitive to the details of the dynamics, with decoupling performance which may deteriorate for non-Gaussian noise and/or high frequency working points. Our results are promising for robust solid-state qubits and beyond.