Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Environmental Entanglement Caused by a Qubit: Multipolaron Ansatz for Biased Spin-Boson Model SOUMYA BERA, S. FLORENS, Institute Neel, Grenoble, H. BARANGER, Duke University, A. NAZIR, Imperial College, A. CHIN, University of Cambridge — We show that a qubit interacting with its environment produces highly entangled states within the environment with emerging non-adiabatic features (Schrodinger-cat-like states of the environment). The model consists of a two-level system coupled to a continuum of bath modes in the presence of a bias field, which can be realized, for instance, by a qubit coupled to a high impedance superconducting transmission line. We develop a systematic coherent state expansion for the many-body ground state of this model. Comparisons to accurate numerical renormalization group calculations and the exact Bethe Ansatz solution of the model demonstrate the rapid convergence of our variationally-optimized multi-polaron expansion. This coherent state Ansatz captures all the essential features of the biased model such as the formation of low-energy antipolarons, peaks seen in the quantum tomography of the environment, and the stabilization of spin coherence.

Soumya Bera
Institute Neel, Grenoble

Date submitted: 15 Nov 2013 Electronic form version 1.4