Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Lévy flights in laser cooling of nuclear spins SWATI SINGH, ITAMP, University of Connecticut, Y. CHU, A. PICK, Department of Physics, Harvard University, A. ASPECT, Laboratoire Charles Fabry de l'Institut d'Optique, CNRS, M. LUKIN, Department of Physics, Harvard University, S. YELIN, ITAMP, University of Connecticut — Interaction between an electronic spin and its surrounding nuclear spin environment is a major source of decoherence in most solid-state spin qubits. We develop a phenomenological model for nuclear spin diffusion in the presence of electronic dark states. As an quantitative example, we study the diffusion in ^{13}C nuclear spin bath of an NV^- impurity in diamond. We use this model to predict that the nuclear diffusion time-scales exhibit Lévy statistics— enabling nuclear spins to remain trapped in certain configurations for long times. We comment on observing such statistics by measuring photon scattering rates that are dependent on nuclear diffusion rates, leading to quantitative measurements of the non-equilibrium bath dynamics in such central-spin systems.

Swati Singh
ITAMP, University of Connecticut

Date submitted: 31 Jan 2014 Electronic form version 1.4