Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Coherence properties of individual electron and nuclear spins in diamond JERONIMO MAZE, LILIAN CHILDRESS, GURUDEV DUTT, LIANG JIANG, MIKHAIL LUKIN, EMRE TOGAN, Harvard University, JACOB TAYLOR, MIT, PHILIP HEMMER, Texas A&M University, FEDOR JELEZKO, Universitat Stuttgart — Understanding decoherence processes is essential for coherent manipulation of quantum bits. We consider the electron and nuclear spin associated with the negatively charged NV center in diamond, and show that their decoherence properties are governed by interactions with a spin bath composed of naturally occurring ^{13}C isotopic impurities. This spin bath model yields estimates for coherences times T_2 which are in good agreement with experimental data, and reproduce the observed dependence of T_2 on the magnetic field. Physically, these results arise because the electron spin alters the properties of the nuclear spin bath, affecting both the coupling between ^{13}C nuclei and their effective g tensor. Detailed knowledge of this mechanism may be used to improved techniques for manipulating both electronic and single nuclear spins.

Jeronimo Maze
Harvard University

Date submitted: 05 Feb 2007 Electronic form version 1.4