

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Nitrogen Impurities in Diamond Studied using Magnetic Resonance Force Microscopy MICHAEL HERMAN, PALASH BANERJEE, DENIS PELEKHOV, P. CHRIS HAMMEL, The Ohio State University — Spin-bearing defects and impurities in diamond have attracted much attention in recent years, with the N-V center defect being a good example. A related defect in the diamond lattice is comprised of a substitutional nitrogen alone and is known as the P1 center with an electron spin $S = 1/2$ localized on a N-C bond with a strong hyperfine coupling to the ^{14}N nuclear spin $I = 1$. We have used Magnetic Resonance Force Microscopy (MRFM) to study the properties of a small collection of P1 centers in diamond. By operating with large field gradients approaching a few Gauss per nanometer, we are able to couple fewer than 100 spins and probe their relaxation properties with a sensitivity approaching a few spins. We have seen that spin lifetimes in the rotating frame are dependent on impurity concentration. We'll show long spin lifetimes (>2 s) while undergoing tens of thousands adiabatic spin flips. We also show that spin lifetimes are shorter in diamond implanted with nitrogen ions to create P1 centers. This work was supported by The Army Research Office under W911NF-07-1-0305 and the National Science Foundation under DMR-0807093.

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Date submitted: 07 Dec 2010

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