Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Double electron-electron resonance measurements of diamond to determine T_2 dependence on concentration of paramagnetic impurities[1]

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— A nitrogen-vacancy (NV) center in diamond is a promising candidate for investigation of fundamental sciences and applications to a nanoscale magnetic field sensing device because of unique properties of a NV center in diamond including capability to detect optically detected magnetic resonance (ODMR) signals from a single NV and initialize its spin state. Fundamental studies and applications of NV centers relay on coherent control of the NV centers that is limited by decoherence time (T_2) and, as often observed, T_2 is limited by paramagnetic impurity contents in diamond crystals. In this work, we will investigate T_2 dependence on concentration of nitrogen impurities in type-Ib and type-IIa diamond crystals. For precise determination of the nitrogen concentration, we employ a home-built high-frequency electron spin resonance spectrometer which enables broadband double electron-electron resonance spectroscopy with high spectral resolution. [1,2]

[1] F. H. Cho, V. Stepanov and S. Takahashi, Rev. Sci. Instrum. **85** , 075110 (2014).
[2] F. H. Cho, V. Stepanov, C. Abeywardana and S. Takahashi, Methods Enzymol. 563 , **95** (2015).

[1]This work is supported by the National Science Foundation (DMR-1508661) and the Searle scholars program.

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Date submitted: 06 Nov 2015 Electronic form version 1.4