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

VIKTOR STEPANOV, SUSUMU TAKAHASHI, University of Southern California — 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]


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

Viktor Stepanov
University of Southern California

Date submitted: 06 Nov 2015

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