Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

DC Magnetometry Using 15N-enriched Nitrogen-Vacancy Center Ensembles JNER TZERN OON, Boston University, CONNOR HART, MATTHEW TURNER, JENNIFER SCHLOSS, Harvard University, RONALD WALSWORTH, University of Maryland, College Park — Nitrogen-vacancy ensembles in diamond offer promising applications in magnetometry, including navigation, object detection, and imaging. The recent development of high-purity ^{15}N-doped CVD diamond ($I = 1/2$) offers advantages over the naturally occurring ^{14}N isotope ($I = 1$) for magnetometry. However, the lack of a quadrupole moment leads to pronounced envelope modulation effects in the presence of misaligned fields, and hinder magnetic sensitivity. While such effects in spin echo experiments (ESEEM) have been well studied, discussion of analogous effects in Ramsey measurements and the implications for magnetometry remain under-explored. Double-quantum (DQ) coherences that utilize the full 3-level ground state electronic system can be used to suppress these effects, while additionally proving resilient to effects from local strain and temperature shifts. In this work, we analytically describe the expected Ramsey response for ^{15}N ensembles in the presence of misaligned bias magnetic fields and compare with results of simulations and experiments, for both single- and double-quantum experiments. We also introduce conditions unique to ^{15}N-vacancies which enable robust preparation of DQ superposition states without the need for high microwave power.

Jner Tzern Oon
Boston University

Date submitted: 30 Jan 2020 Electronic form version 1.4