Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

**Double Quantum Ramsey-based Magnetic Microscopy using Nitrogen-Vacancy Centers in Diamond** CONNOR A HART, Harvard University, JENNIFER M SCHLOSS, Massachusetts Institute of Technology, MATTHEW J TURNER, Harvard University, PATRICK SCHEIDEGGAR, ETH Zurich, ERIK BAUCH, Harvard University , RONALD L. WALSWORTH, University of Maryland — Wide-field magnetic microscopy using ensembles of nitrogen-vacancy (NV) centers in diamond has been previously demonstrated in condensed matter, biological, and paleomagnetic applications using continuous-wave optically detected magnetic resonance (CW-ODMR) measurements to image static magnetic fields under ambient conditions. However, the sensitivity of CW-ODMR measurements is commonly degraded by lattice strain gradient-induced broadening and limited by competing effects of the applied optical and microwave (MW) fields. Here we demonstrate Ramsey-based magnetic imaging using the axial strain-immune, double quantum (DQ) coherence to enable improved, more homogeneous magnetic imaging with a median volume-normalized magnetic sensitivity of 38 nTum3/2Hz-1/2 across a 125 um x 125 um field of view. A novel microwave-phase alternation protocol isolates the desired DQ magnetic signal from residual single quantum signal induced by MW pulse errors. We demonstrate a 500x suppression in sensitivity to strain- and temperature-induced NV resonance shifts. Together, the improved robustness and magnetic sensitivity provide a path toward imaging dynamic, broadband magnetic sources such as electrically-active cells.

Connor Hart
Harvard University

Date submitted: 30 Jan 2020 Electronic form version 1.4