Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Simultaneous Vector Magnetometry JENNIFER SCHLOSS, Massachusetts Institute of Technology, JOHN BARRY, MIT Lincoln Labs, MATTHEW TURNER, RONALD WALSWORTH, Harvard University — We present a method for simultaneous broadband measurement of all components of a time-varying magnetic field, demonstrated on an ensemble of nitrogen-vacancy (NV) centers in diamond. Using a multichannel lock-in technique, a single photodetector records the field's projections onto the four NV crystallographic axes. By removing dead time associated with addressing NV resonances sequentially, we demonstrate a dramatic speedup in vector field sensing compared to conventional vector magnetometry on NV ensembles. Applications of this technique include fast rotation sensing, e.g. for navigation, and magnetic imaging of dynamics in neuronal networks.

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Date submitted: 28 Jan 2017 Electronic form version 1.4