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Toward Quantum Non-demolition of nitrogen-vacancy centers in diamond JONATHAN HODGES, Harvard University and Massachusetts Institute of Technology, LIANG JIANG, JERONIMO MAZE, MIKHAIL LUKIN, Harvard University, Department of Physics — The nitrogen-vacancy color center (NVC) in diamond, which possesses a long-lived electronic spin ($S=1$) ground state with optical addressability, is a promising platform for quantum networks, single-photon sources, and nanoscale magnetometers. Here, we make use of a nuclear spin based quantum memory to demonstrate quantum non-demolition measurement of a solid-state spin qubit. By entangling the electron spin with a polarized carbon-13 spin ($I=1/2$) in the lattice, we have repeated optical measurement of the electron spin for the polarization lifetime of the nuclear spin. We show relative improvements in signal-to-noise of greater than 300%. These techniques can be used to improve the sensitivity of NVC magnetometers.

Jonathan Hodges
Harvard University and Massachusetts Institute of Technology

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