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Precision magnetometry using NV centers in diamond DAVID LE SAGE, Harvard-Smithsonian Center for Astrophysics, LINH MY PHAM, NIR BARGILL, Harvard University, CHINMAY BELTHANGADY, Harvard-Smithsonian Center for Astrophysics, KEIGO ARAI, Massachusetts Institute of Technology, RONALD WALSWORTH, Harvard-Smithsonian Center for Astrophysics — The nitrogen-vacancy (NV) color center in diamond promises to be an extremely useful tool for precise optical magnetometry. Individual NV centers can function as atomic-scale magnetometers, for high spatial-resolution measurements, with close proximity between the field source and sensor. Improved sensitivities may be achieved by averaging the signal from many NV centers, with a resulting trade-off between sensitivity and spatial resolution. Here, we report the best magnetic field sensitivity that has thus far been achieved using a large ensemble of NV centers. These results take advantage of many recent developments, including a technique to dramatically improve the fluorescence photon collection efficiency, dynamical decoupling of the NV spins from their spin-bath environment, and improved diamond engineering to reduce magnetic impurities and increase the density of NV centers. These ongoing efforts suggest that, with additional improvements, NV magnetometers may achieve comparable sensitivities to the best magnetometers that presently exist, with the added practical benefits associated with being a robust, solid-state, room-temperature device.

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