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Enhanced solid-state multi-spin metrology using dynamical decoupling LINH PHAM, Harvard University, NIR BAR-GILL, Harvard University, Harvard-Smithsonian Center for Astrophysics, CHINMAY BELTHANGADY, DAVID LE SAGE, Harvard-Smithsonian Center for Astrophysics, PAOLA CAPPELLARO, Massachusetts Institute of Technology, MIKHAIL LUKIN, AMIR YACOBY, Harvard University, RONALD WALSWORTH, Harvard University, Harvard-Smithsonian Center for Astrophysics — We use multi-pulse dynamical decoupling to increase the coherence lifetime (T2) of large numbers of nitrogen-vacancy (NV) electronic spins in room temperature diamond, thus enabling scalable applications of multi-spin quantum information processing and metrology. We realize an order-of-magnitude extension of the NV multi-spin T2 for diamond samples with widely differing spin environments. For samples with nitrogen impurity concentration $\gtrsim 1$ ppm, we find T2 > 2 ms, comparable to the longest coherence time reported for single NV centers, and demonstrate a ten-fold enhancement in NV multi-spin sensing of AC magnetic fields.

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