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High sensitivity ancilla assisted nanoscale DC magnetometry YIXIANG LIU, ASHOK AJOY, LUCA MARSEGLIA, KASTURI SAHA, PAOLA CAPPELLARO, Massachusetts Institute of Technology — Sensing slowly varying magnetic fields are particularly relevant to many real world scenarios, where the signals of interest are DC or close to static. Nitrogen Vacancy (NV) centers in diamond are a versatile platform for such DC magnetometry on nanometer length scales. Using NV centers, the standard technique for measuring DC magnetic fields is via the Ramsey protocol, where sensitivities can approach better than 1μT/vHz, but are limited by the sensor fast dephasing time T_2^*. In this work we instead present a method of sensing DC magnetic fields that is intrinsically limited by the much longer T_2 coherence time. The method exploits a strongly-coupled ancillary nuclear spin to achieve high DC field sensitivities potentially exceeding that of the Ramsey method. In addition, through this method we sense the perpendicular component of the DC magnetic field, which in conjunction with the parallel component sensed by the Ramsey method provides a valuable tool for vector DC magnetometry at the nanoscale.

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