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Composite-pulse magnetometry in the solid-state CLARICE AIELLO, MASASHI HIROSE, PAOLA CAPPELLARO, Department of Nuclear Science and Engineering, Massachusetts Institute of Technology — The sensitivity yielded by magnetometry schemes at the quantum level is limited by experimental imperfections in the interrogation pulses and, especially in the solid-state, by relatively short dephasing times. We investigate the use of composite-pulse magnetometry sequences as a means of addressing both limitations. We perform proof-of-principle experiments on magnetometry and noise characterization through a continuous sequence of rotary echoes applied to a single qubit in the nitrogen-vacancy center in diamond. The rotary echo is the simplest unit of a composite pulse sequence, consisting of two consecutive pulses of identical nominal rotation angle applied with opposite excitation phases. Unlike other composite sequences, the rotary echo corrects for excitation field, but not for static field, inhomogeneities. The presented scheme is flexible in that a suitable choice of rotation angle compensates for different scenarios of noise strength and origin (dephasing or fluctuations in excitation intensity). Obtained sensitivities are in the range between those obtained with the widely used Ramsey spectroscopy sequence and the recently implemented method relying on frequency beats in Rabi oscillations.

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