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Sensing rotationally-induced magnetic fields with nitrogen-vacancy centers in diamond ALEXANDER WOOD, EMMANUEL LILETTE, YAAKOV FEIN, School of Physics, University of Melbourne, VIKTOR PERUNICIC, DAVID SIMPSON, ALASTAIR STACEY, LLOYD HOLLENBERG, School of Physics, University of Melbourne and CQC2T, University of Melbourne, ROBERT SCHOLTEN, ANDY MARTIN, School of Physics, University of Melbourne — The Larmor theorem states that the effects of a uniform magnetic field on a classical magnetic moment are equivalent to rotation of the system about the axis of the field. We use nitrogen-vacancy (NV) centers in a diamond to detect the effective magnetic field generated by physically rotating the host diamond crystal. Rotationally-induced magnetic fields depend on the rotation axis and the magnetic field orientation, and perturb the precession frequency of carbon-13 nuclear spins in the diamond lattice much more strongly than the NV electron spin. We detect the precessing nuclear magnetic dipole field with an ensemble of NV sensors to infer the rotationally-induced field. These results elucidate the profound connection between magnetism and physical rotation, and establish a unique, non-magnetic means of controlling the nuclear spin bath surrounding the NV center.

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