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Nanoscale Spin Radar with Nitrogen Vacancy centers in Diamond

YIXIANG LIU, Research Lab of Electronics, MIT Cambridge MA, ASHOK AJOY, University of California Berkeley, CA, PAOLA CAPPELLARO, Research Lab of Electronics, MIT Cambridge MA — Nitrogen Vacancy (NV) centers in diamond have emerged as the preeminent platform for nanoscale magnetic resonance imaging. The NV center acts a single point dipole that can image the presence of spins in its environment by exploiting the anisotropy of the dipole-dipole Hamiltonian that governs the interactions between the spins. Indeed, the NV center can be pictured to be an antenna with that senses spins with a specific angular sensing “lobe”. In this work, we show this anisotropic interaction can be effectively manipulated by the application of strong pulsed DC magnetic fields. This allows the calibrated rotation of the NV angular sensing lobe, allowing one to tunably scan the space around an NV center, and through it reconstruct the real-space spin density with high spatial resolution.

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