Coupling single bright spins with channels of intermediate dark spins in diamond

FELIX M. MENDOZA, RONALD HANSON, RYAN J. EPSTEIN, DAVID D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA 93106 — The nitrogen-vacancy (N-V) center in diamond has garnered interest as a room-temperature solid-state system not only for exploring electronic and nuclear spin phenomena but also as a candidate for spin-based quantum information processing. Recent experiments reveal the coupling of a single bright electron spin of an N-V center to small numbers of dark electron spins of nitrogen defects in its immediate vicinity, not otherwise detected in luminescence. We explore the possibility of utilizing this magnetic dipole coupling between bright and dark spins to couple two spatially separated single N-V center spins by means of intermediate dark nitrogen spins. The angle-resolved magneto-photoluminescence microscopy technique is extended to simultaneously detect a pair of single N-V centers a few microns apart.

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