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Spin Engineering with Ion Implantation of Diamond Nitrogen-Vacancy Centers[1] G.D. FUCHS, F.J. HEREMANS, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation-University of California, Santa Barbara, CA, R. HANSON, Kavli Institue of Nanoscience - Delft Institute of Technology, A. BATRA, T. SCHENKEL, Lawrence Berkley National Lab, S. SHIRVASTAVA, T. MUGATO, E. SIDERAS-HADDAD, University of Witwaterstrand, Johannesburg, S. Africa — Nitrogen-vacancy (NV) defect centers in diamond exhibit long coherence times of spin states at room temperature. Individual NV centers can be optically initialized and read-out, making them attractive candidates for quantum information. By exploiting the interactions with naturally occurring, nearby spins, NV centers have been incorporated into two quantum bit (qubit) systems. Despite these successes, scaling NV qubit systems with naturally occurring spins is a challenge. Here we present an alternative approach where we deliberately place NV centers using spatial and energy selective ion-implantation of nitrogen into synthetic diamond samples with low nitrogen content. Since we use isotopically pure N-15 for implantation, we can distinguish the implanted NV centers from the naturally occurring N-14 centers by measuring the hyperfine splitting of the electron spin resonance peaks of individual NV centers.

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