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Coherence control via dynamical decoupling of an electron spin in a quantum dot WENXIAN ZHANG, V.V. DOBROVITSKI, NIKOLAOS KONSTANTINIDIS, Ames Laboratory, Iowa State University, Ames, Iowa 50011, USA, LEA F. SANTOS, LORENZA VIOLA, Department of Physics and Astronomy, Dartmouth College, Hanover, New Hampshire 03755, USA, B.N. HARMON, Ames Laboratory, Iowa State University, Ames, Iowa 50011, USA — An electron spin in a quantum dot is a promising system for applications in coherent spintronics and quantum computation, but the interaction with the nuclear spins leads to fast decoherence. Subjecting the electron spin to a suitable pulsed control field decouples it from the nuclear spin bath and suppresses decoherence. We study numerically and analytically several most promising decoupling protocols, taking into account the intra-bath coupling, using fully quantum mechanical treatment of the system plus bath dynamics. We show that some high-level protocols extend the coherence time by 3 orders of magnitude for an arbitrary initial spin state. Moreover, we present the protocols which preserve a known initial state with near-to-optimal fidelity for arbitrarily long times.

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