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Dynamical Decoupling with Imperfect Pulses in P Doped Silicon[1]

Z. WANG, Ames Laboratory, Ames, IA, 50011, USA, W. ZHANG, Fudan University, Shanghai, 200433, China, V. V. DOBROVITSKI, Ames Laboratory, Ames, IA, 50011, USA, A. M. TYRYSHKIN, S. A. LYON, Princeton University, Princeton, NJ, 08544, USA, J. AGER, LBNL, Berkeley, CA, 94720, USA — Dynamical decoupling (DD) is an important tool for prolonging coherence in solid-state spin systems. For advanced DD protocols comprising many pulses, the accumulation of pulse errors may become devastating. We studied DD of the electron spins of P donors in silicon with pulsed ESR [1]. Two-axis periodic pulse sequences, and their concatenated and symmetrized versions, have been investigated experimentally and theoretically. The impact of pulse errors has been analyzed for different initial states of the P spins. Depending on the sequence, some spin components decay after only 3 periods (12 pulses), while other components exhibit artificial freezing [2] at long times. We give a theoretical description for these effects, showing that their origin is the accumulation of pulse errors. We identify promising sequences where the impact of errors is minimized. [1] A. M. Tyryshkin et al., J. Phys. Cond. Mat. 18, S783 (2006) [2] W. Zhang et al., Phys. Rev. B 77, 125336 (2008)

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