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Coherence of Donor Electron Spins in Isotopically Enriched Silicon[1] WAYNE WITZEL, RICHARD MULLER, MALCOLM CARROLL, Sandia National Laboratories, New Mexico, USA, ANDREA MORELLO, The University of New South Wales, Sydney, Australia, LUKASZ CYWINSKI, Institute of Physics, Polish Academy of Sciences, Warsaw, Poland, SANKAR DAS SARMA, University of Maryland, College Park, Maryland, USA — Silicon is promising for spin-based quantum computing because nuclear spins, a source of magnetic noise, may be nearly eliminated through enrichment. However, any Si device is expected to contain some phosphorus donor impurities. These donors generate magnetic noise through spin dynamics, induced by dipolar interactions, that conserve Zeeman and hyperfine energies. Ironically, increasing the number of nuclear spins will suppress this decoherence mechanism by effecting more hyperfine energy variation (i.e., Overhauser shifts). We study spin coherence decay as a function of donor concentration, ^{29}Si concentration, and temperature using cluster expansion techniques specifically adapted to the problem of a sparse electron spin bath.

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