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Suppressing anisotropic hyperfine induced electron spin echo modulations in Si:P[1] WAYNE WITZEL, University of Maryland, XUEDONG HU, University at Buffalo, SANKAR DAS SARMA, University of Maryland — In previous work,[2] our theory of spectral diffusion (SD) agrees well with electron spin echo decay measurements[3] in Si:P. In addition to SD decay, these experiments show strong electron spin echo envelope modulations (ESEEM) that significantly reduce spin coherence at short echo times relative to SD decay. Strong demands imposed by fault tolerant quantum computing require suppression (or exploitation) of this effect in order to realize spin-based quantum computation in Si:P systems. It is known that these modulations, caused by anisotropic hyperfine interactions with ^{29}Si nuclei, can be suppressed via isotopic purification, or by applying a strong, $\sim$ 10 T,[4] magnetic field. Our insights lead to an alternative approach that eliminates predominant modulations at modest magnetic fields ($\sim$ 1 T) with little need for isotopic purification. Our calculations are in remarkable agreement with experiment, showing good theoretical understanding of refocused electron spin coherence in Si:P systems.

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[2]W.M. Witzel, *et al.*, Phys. Rev. B **72**, 161306(R) (2005).
[3]A.M. Tyryshkin, *et al.*, cond-mat/0512705.
[4]S. Saikin and L. Fedichkin, Phys. Rev. B **67**, 161302(R) (2003).

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