

Abstract Submitted
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Dephasing of exchange coupled spin qubits by electron-phonon coupling: Effect of phonon relaxation¹ XUEDONG HU, University at Buffalo, SUNY — Electron-phonon interaction leads to pure dephasing between two-electron singlet and triplet states for two exchange-coupled spin qubits in a semiconductor double quantum dot because of the Coulombic nature of exchange interaction. Here we clarify the effect of phonon relaxation, whether via boundary scattering or phonon anharmonicity, on phonon-induced two-spin dephasing. Specifically, we show that within a spin-boson model, phonon relaxation leads to a complete exponential decay of the phase between the singlet and triplet two-spin states, with the decoherence rate proportional to the phonon relaxation rate. We examine the relevant parameter regimes and clarify the importance of this decoherence effect.

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