

Abstract Submitted  
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**Decoherence of coupled electron spins via nuclear spin dynamics in quantum dots**<sup>1</sup> WEN YANG, REN-BAO LIU, Department of Physics, The Chinese University of Hong Kong, Shatin, N. T., Hong Kong, China — Decoherence of coupled electron spins due to electron-nuclear hyperfine interaction in double quantum dots is a major issue of solid-state quantum computation. Using an interacting nuclear spin bath model, we show theoretically that the exchange interaction between the two electron spins renormalizes the pair-flip excitation energy in the bath and modifies the non-Markovian bath dynamics, which in turn changes the electron singlet-triplet (S-T) decoherence arising from electron-nuclear entanglement. As the energy renormalization varies with the Overhauser field mismatch between the quantum dots, the S-T decoherence depends on the sampling of nuclear spin states from an ensemble, leading to the transition from super-exponential decoherence in single-sample dynamics to power-law decay under ensemble average,[1] in contrast with the sample-independent super-exponential decoherence of a single electron spin in one dot.

[1] W. Yang and R. B. Liu, arXiv:0707.2529v1.

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