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Electron spin decoherence by interacting nuclear spins in quantum dot II: Coherent control REN-BAO LIU, Department of Physics, University of California, San Diego, California and Department of Physics, The Chinese University of Hong Kong, Hong Kong, WANG YAO, LU J. SHAM, Department of Physics, University of California, San Diego, California — Due to the hyperfine interaction, the nuclear spins in a quantum dot, driven by nuclear spin pair-wise flip-flops, evolve in different pathways in the Hilbert space for different electron spin states, resulting in the electron-nuclei entanglement and hence the electron spin decoherence. When the electron spin is flipped by a pulse, the nuclear spin states for different electron spin states swap their pathways, and could intersect in the Hilbert space, which disentangles the electron and the nuclei and hence restores the electron spin coherence. The coherence restoration by disentanglement and the conventional spin echo in ensemble dynamics are fundamentally different and generally occur at different time. Pulse sequences can be applied to force the disentanglement to coincide with the spin echo, making the coherence recovery observable in ensemble dynamics. This work was supported by NSF DMR-0403465, NSA/ARO, and DARPA/AFOSR.

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