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Feedback control of nuclear spin bath for a single hole spin in a quantum dot¹ HONGLIANG PANG, ZHIRUI GONG, WANG YAO, Department of Physics, Center for Theoretical and Computational Physics, The University of Hong Kong, China — In a semiconductor quantum dot, the nuclear spin bath plays an important role as the ultimate environment of an electron or hole spin at low temperature. Through dynamic nuclear spin polarization driven by an oscillating electric field, we show that feedback controls can be implemented on the nuclear spin bath of a single hole spin. The feedback controls utilize the anisotropic hyperfine interaction between the hole spin and the nuclear spins. The negative feedback can suppress the statistical fluctuations of the nuclear hyperfine field and lead to longer coherence time of the hole spin. Positive feedback can possibly lead to cat like state of nuclear spin bath. The efficiency of the controls schemes is investigated under different parameters and control strategies.

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