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Relaxation of the electron spin in a quantum dot due to interaction with nuclear spin bath KHALED AL-HASSANIEH, Department of Physics, Florida State University and ORNL, V.V. DOBROVITSKI, Ames Laboratory, Iowa State University, E. DAGOTTO, Department of Physics, University of Tennessee and ORNL , B.N. HARMON, Ames Laboratory, Iowa State University — Understanding the dynamics of electron spins in semiconducting nanostructures is important for novel applications in spintronics and in quantum information processing. An electron spin in a quantum dot is strongly affected by its interaction with the environmental degrees of freedom, in particular, with the nuclear spins. In this work we study the longitudinal relaxation of the electron spin component S^z by the nuclear spin bath for different applied fields and initial polarizations of the bath. We numerically simulate the motion of the compound system (the electron spin plus the bath) by explicitly solving the corresponding time-dependent Schrödinger equation using the method described in [1]. Typically, S^z exhibits a pronounced oscillation with subsequent saturation; at high fields, several such oscillations are observed. We compare our numerical results with the earlier analytical predictions [2], and discuss the agreements and differences.

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