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Spin Relaxation and Manipulation in Spin-orbit Qubits[1] MASSOUD BORHANI, Laboratory for Physical Sciences, XUEDONG HU, SUNY at Buffalo — We derive a generalized form of the Electric Dipole Spin Resonance (EDSR) Hamiltonian in the presence of the spin-orbit interaction for single spins in an elliptic quantum dot (QD) subject to an arbitrary (in both direction and magnitude) applied magnetic field. We predict a nonlinear behavior of the Rabi frequency as a function of the magnetic field for sufficiently large Zeeman energies, and present a microscopic expression for the anisotropic electron g-tensor. Similarly, an EDSR Hamiltonian is devised for two spins confined in a double quantum dot (DQD). Finally, we calculate two-electron-spin relaxation rates due to phonon emission, for both in-plane and perpendicular magnetic fields. Our results have immediate applications to current EDSR experiments on nanowire QDs, g-factor optimization of confined carriers, and spin decay measurements in DQD spin-orbit qubits.

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