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Electric dipolar spin resonance in systems with a valley dependent g-factor MARKO RANCIC, GUIDO BURKARD, Department of Physics, University of Konstanz, D-78457 Konstanz, Germany — We theoretically investigate the electric dipole spin resonance (EDSR) in a single Si/SiGe quantum dot in the presence of a magnetic field gradient, e.g., produced by a micromagnet. The control of electron spin states can be achieved by applying an oscillatory electric field, which induces periodic oscillations in real space of the electron spin inside the quantum dot. This motion inside a magnetic field gradient produces an effective periodic in-plane magnetic field, and allows for driven spin rotations near resonance. The magnetic field gradient induces a valley dependent g-factor and a valley dependent Rabi frequency. Our first goal is to quantitatively and qualitatively describe valley dependent g-factors and a valley dependent Rabi frequencies using a microscopic model. A valley dependent g-factor combined with inter-valley scattering gives rise to a novel electron spin decoherence mechanism. The second goal of our study is to describe the drop of coherence in the presence of inver-valley scattering, and furthermore, to discuss the interplay between valley and spin relaxation. All relevant decoherence mechanisms are quantitatively evaluated by solving a Lindblad master equation.

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