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Effect of Nuclear Quadrupole Moments on Electron Spin Coherence in Semiconductor Quantum Dots ERIK WELANDER, Department of Physics, University of Konstanz, Germany, EVGENY CHEKHOVICH, ALEXANDER TARTAKOVSKII, Department of Physics and Astronomy, University of Sheffield, United Kingdom, GUIDO BURKARD, Department of Physics, University of Konstanz, Germany — We theoretically investigate the influence of the fluctuating Overhauser field on the spin of an electron confined to a quantum dot. The fluctuations arise from nuclear spin being exchanged between different nuclei via the nuclear magnetic dipole coupling. We focus on the role of the nuclear interaction from electric quadrupole moments (QPM), which generally cause a reduction in internuclear spin transfer efficiency. By dividing the nuclear problem into subcells we are able to describe $10^4 - 10^5$ nuclei, which are realistic numbers for a quantum dot. The effects on the electron spin coherence time are studied by modeling an electron spin echo experiment. We find that the QPM cause an increase in the electron spin coherence time and that an inhomogeneous distribution, where different nuclei have different QPM, causes an even larger increase than a homogeneous distribution.

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