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Electron-Nuclear Spin Transfer in Triple Quantum Dot Networks
MARTA PRADA, School of Electronic and Electrical Engineering, University of Leeds, RYAN TOONEN, ROBERT BLICK, Department of Electrical and Computer Engineering, University of Wisconsin at Madison, PAUL HARRISON, School of Electronic and Electrical Engineering, University of Leeds — We investigate the conductance spectra of coupled quantum dots to study systematically the nuclear spin relaxation of delta- and y-junction networks and observe spin blockade dependence on the electronic configurations. We derive the conductance using the Beenakker approach generalised to an array of quantum dots where we consider the nuclear spin transfer to electrons by hyperfine coupling. This allows us to predict the relevant memory effects on the different electronic states by studying the evolution of the single electron resonances in presence of nuclear spin relaxation. We find that the gradual depolarisation of the nuclear system is imprinted in the conductance spectra of the multidot system. Our calculations of the temporal evolution of the conductance resonance reveal that spin blockade can be lifted by hyperfine coupling.

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