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Nuclear Polarization and its Influence on Spin Relaxation in Double Quantum Dots[1] JAMES MEDFORD, CHRISTIAN BARTHEL, HENDRIK BLUHM, Department of Physics, Harvard University, MORTEN KJAERGAARD, Nano-Science Center, Niels Bohr Institute, University of Copenhagen; Department of Physics, Harvard University, MICHAEL STOPA, CHARLES MARCUS, Department of Physics, Harvard University, MICAH HANSON, ARTHUR GOSSARD, Materials Department, University of California, Santa Barbara — High-fidelity repeated single-shot readout of the arrangement of two electrons in a GaAs double quantum dot with less than 1 μs repetition period is demonstrated experimentally. A radio frequency sensor quantum dot, fabricated next to the double dot and operated in the Coulomb blockade regime, is employed as a charge-sensor. Nuclear polarization created by electrical gate pulses is examined along with its decay as a function of field and pumping rate. The influence of the Overhauser field difference on the two electron spin relaxation is then investigated, yielding connections between the Overhauser field and the T1 of the qubit in the measurement position.

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