Abstract Submitted
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The Nuclear Environment for Electron Spins in a Double Quantum Dot[1] DAVID REILLY, Harvard University, JACOB TAYLOR, MIT, JASON PETTA, Princeton, CHARLES MARCUS, Harvard, MICAH HANSON, ART GOSSARD, UCSB, HARVARD COLLABORATION, UCSB COLLABORATION — We report measurements examining the nuclear spin environment for electrons in a GaAs double quantum dot. The hyperfine field, which drives transitions of a two-electron spin state, is detected via spin-to-charge transfer and rf-QPC readout. Fluctuations of the hyperfine field are measured to be broadband, with spectral content ranging from milliseconds to the decorrelation time of ~ 10 seconds. In addition, we demonstrate dynamic nuclear polarization (DNP) using a cyclic gate-pulse sequence. Relaxation of the DNP is studied using time-resolved measurements and found to be sensitive to the spin-state of electrons. The presence of a small DNP is found to suppress hyperfine fluctuations by a factor of ~ 100, leading to a time-ensemble dephasing time, $T_2^* \sim 1$ microsecond for electron spins.

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