

# Hyperfine interaction and the two-electron spin states of a double quantum dot

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We explore the effect of the hyperfine interaction on two-electron spin states in coupled GaAs quantum dots, using transport measurements. We find that the statistical polarization of the nuclear spins in the semiconductor lattice gives rise to a randomly oriented nuclear field of  $\sim 0.1 \mu\text{eV}$ . This implies a time-averaged  $T_2^*$  for the electron spin of  $\sim 10 \text{ ns}$ . The  $0.1 \mu\text{eV}$  energy scale also provides a sensitive probe of the two-electron spin levels as the interdot tunnel coupling and the potential misalignment between the two dots are varied in situ through electrostatic gates. Finally, the measurements show dynamic nuclear polarization and depolarization, hysteresis, and a striking bistable behavior.