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Extended coherence of exchange operations in double quantum dot spin qubits using Hahn echo MICHAEL SHULMAN, HENDRIK BLUHM, OLIVER DIAL, Harvard University, VLADIMIR UMANSKY, Weizmann Institute of Science, AMIR YACOBY, Harvard University — Semiconductor spin qubits are promising candidates for quantum computation because of their long coherence times and potential for scalability. The exchange interaction is a powerful resource in these qubits, as it can drive single qubit rotations and inter-qubit entanglement. However, spin qubits driven by exchange become sensitive to charge noise, which in free induction decay experiments has lead to dephasing after a few coherent exchange oscillations. We perform a Hahn echo measurement in two-electron spin qubits in GaAs quantum dots. The π-pulse is applied by means of a stabilized nuclear gradient in the quantum dots. We find an exponential dephasing with a time constant of up to 10μs, which is more than an order of magnitude larger than T_2^*, and corresponds to 500 coherent exchange operations within T_2. This increase in T_2 is expected to allow for several cPHASE operations between two charge coupled two-electron qubits within T_2.

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