

Abstract Submitted  
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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  $\pi$ -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  $10\mu s$ , 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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