Abstract Submitted
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Ultra long coherence of GaAs electron spin qubits through dynamic decoupling from a spin bath HENDRIK BLUHM, SANDRA FOLETTI, Harvard University, DIANA MAHALU, VLADIMIR UMANSKY, Weizmann Institute of Science, AMIR YACOBY, Harvard University — Semiconductor spin qubits are promising candidates for quantum computation because of their slow decoherence and potential for scalability. All fundamental single qubit operations have been demonstrated for GaAs based spin qubits, but they suffer from decoherence due to hyperfine coupling to nuclei. We show experimentally that this nuclear decoherence can be mitigated very effectively. Using CPMG decoupling pulses, we extended the coherence time of two-electron spin qubits in GaAs double quantum dots to more than 200 μs, two orders of magnitude larger than previously measured. For a Hahn echo with a single refocusing pulse, coherence persists for 30 μs. At low fields, the Hahn echo shows collapses and revivals associated with electron mediated spin-transfer between nuclei. They are in good agreement with recent theoretical work based on a quantum mechanical treatment of the nuclear spin bath. In conjunction with our quantum feedback technique that suppresses slow nuclear fluctuations, our results indicate that GaAs spin qubits are promising candidates for reaching the quantum error correction threshold.

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