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Two-qubit operations of two-electron spin qubits in GaAs quantum dots HENDRIK BLUHM, MICHAEL SHULMAN, OLIVER E. DIAL, Harvard University, VLADIMIR UMANSKY, Weizmann Institute, AMIR YACOBY, Harvard University — The realization of two-qubit entangling gates is one of the most important milestones for the development of quantum-dot based electron spin qubits. Our measurements and simulations of the coupling strength and the relevant coherence time indicate very favorable prospects for the realization of such gates using the Coulomb interaction between adjacent spin qubits. This operation can be protected against dephasing due to low frequency electric noise by simultaneously applying a π-pulse to both qubits, which is essential to achieve the required coherence time. We report the experimental realization of this echo operation in a two-qubit device, conditional evolution of one qubit depending on the charge state of the neighboring double dot, and further progress toward two-qubit entanglement.

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