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Enhancement of Inter-qubit Coupling in Singlet-Triplet Qubits by Floating Metal Gate SHANNON HARVEY, MICHAEL SHULMAN, OLIVER DIAL, Harvard University, HENDRIK BLUHM, RWTH Aachen University, VLADIMIR UMANSKY, Weizmann Institute of Science, AMIR YACOBY, Harvard University — Spin qubits in semiconductors are promising systems for quantum computing, because they have long coherence times and are potentially scalable. However, their weak interaction with the environment, which gives their long coherence times, also makes inter-qubit interactions weak. Numerous proposals use electrostatic coupling between qubits for entangling operations, but these interactions require the qubits to be near one another. These proposals also suggest that adding a metallic gate between two qubits could increase coupling and allow the qubits to be spatially separated. We present results on two singlet-triplet (S-T_0) qubits connected by a floating metallic gate. Previous work on two-qubit operations, which use a capacitive coupling, showed that the inter-qubit coupling is weak and requires the qubits to be in close proximity. We find that the inter-qubit coupling is increased with the inclusion of a floating metal gate, which improves entangling operation fidelities and allows for these qubits to be spatially separated. Together, these improvements open the door to a scalable architecture for quantum information processing for all semiconductor spin qubit platforms.

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