

## **Qubit-mediated spin-spin gates for hybrid quantum computing**

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Electronic spins associated with defects in semiconductors have emerged as promising candidates for quantum information processing due to their long coherence times. Recent experimental advances have demonstrated the feasibility of coupling multiple such spins to a single superconducting qubit, opening new avenues for scalable quantum architectures. In this work, we numerically investigate a theoretical scheme that leverages the qubit as an intermediary to implement controllable spin-spin gates. Our preliminary results indicate that, with an appropriate choice of system parameters, it is possible to engineer an effective interaction between the spins that remains robust against the qubit decay. This approach provides a pathway for enhancing gate fidelity in hybrid quantum systems and contributes to the broader effort of integrating defect-based qubits into superconducting platforms.