

Abstract Submitted
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Long distance coupling of resonant exchange qubits MAXIMILIAN RUSS, GUIDO BURKARD, Department of Physics, University of Konstanz, D-78457 Konstanz, Germany — We investigate the effectiveness of a microwave cavity as a mediator of interactions between two resonant exchange (RX) qubits^{1,2} in semiconductor quantum dots (QDs) over long distances³, limited only by the extension of the cavity. Our interaction model includes the orthonormalized Wannier orbitals constructed from Fock-Darwin states under the assumption of a harmonic QD confinement potential. We calculate the qubit-cavity coupling strength g_r in a Jaynes Cummings Hamiltonian, and find that dipole transitions between two states with an asymmetric charge configuration constitute the relevant RX qubit-cavity coupling mechanism. The effective coupling between two RX qubits in a shared cavity yields a universal two-qubit iSWAP-gate with gate times on the order of nanoseconds over distances on the order of up to a millimeter. Funded by ARO through grant No. W911NF-15-1-0149.

¹J. Medford et al., Phys. Rev. Lett. 111, 050501 (2013)

²J. M. Taylor et al., Phys. Rev. Lett. 111, 050502 (2013)

³M. Russ and G. Burkard, arXiv: 1508.07122 (2015)

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