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Quantum Dot Device Design Optimization for Resonator Coupling[1] CAMERON KING, S. N. COPPERSMITH, MARK FRIESEN, University of Wisconsin, Madison — Coupling a semiconductor quantum dot qubit to a superconducting resonator broadens the possibilities for interqubit communication and potentially allows integration of quantum dots with other qubit systems. The major technological hurdle that must be overcome is reaching the strong coupling limit, where the coupling frequency between the resonator and the qubit is larger than both the qubit decoherence rate and the photon loss rate of the resonator. In this work, we examine optimization of the quantum dot device design. Using the Thomas-Fermi approximation in conjunction with a metallic dot capacitive model, we focus on improving the capacitive coupling between a resonator gate and a quantum dot while decreasing the cross-coupling to nearby dots. Through these simulations, we find that the optimization follows an intuitive geometric relation.

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