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**Entangling multi-dot spin qubits**[1] V. SRINIVASA, Laboratory for Physical Sciences/University of Maryland, College Park, MD, J.M. TAYLOR, Joint Center for Quantum Information and Computer Science/Joint Quantum Institute/ National Institute of Standards and Technology, Gaithersburg, MD, C. TAHAN, Laboratory for Physical Sciences, College Park, MD — Single quantum bits encoded in the spins of two or three electrons confined within multiple semiconductor quantum dots provide practical advantages over individual electron spin qubits, in terms of both faster control via applied electric fields and protection from collective decoherence mechanisms. However, implementing rapid and robust entangling gates between these multi-electron, multi-dot qubits remains a current challenge. While the exchange interaction gives rise to rapid gates, it is limited in range and requires accompanying methods for suppressing leakage. Alternatively, the long-range Coulomb interaction can be used to couple both adjacent and spatially separated qubits, and rapid gates are possible through microwave manipulation of the extended charge distribution associated with a multi-dot system. We theoretically investigate different approaches for entangling qubits in double [1] and triple dots. By analyzing the coupling in the presence of charge noise and relaxation, we identify optimal regimes of operation for two-qubit gates and compare their performance for GaAs and Si quantum dots.

[1] V. Srinivasa and J. M. Taylor, arXiv:1408.4740 (2014).

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Vanita Srinivasa
Laboratory for Physical Sciences/University of Maryland,
College Park, MD

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