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Theoretical Characterization of Nonlocal Two-qubit Operations for Electrostatically Coupled Singlet-Triplet Qubits FERNANDO CALDERON, JASON KESTNER, University of Maryland, Baltimore County — Singlet-triplet qubits are an attractive candidate for implementing a quantum processor because of their scalability and fast control. In this system, entangling inter-qubit interactions can be performed via electrostatic coupling. It is an open question whether a single square pulse of the system's evolution operator can perform a maximally entangling operation or not. Using Makhlin's invariants [1], which characterize the nonlocal part of 2-qubit unitary transformations, and a geometric representation of those local invariants, we will give a description of the gates that can be directly generated by this particular Hamiltonian and its suitability for performing a maximally entangling gate.

[1] Y. Makhlin, "Nonlocal properties of two-qubit gates and mixed states, and the optimization of quantum computations," Quantum Inf. Process., vol. 1, no. 4, 2002.

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