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Driven nonlinear dynamics of two coupled exchange-only qubits[1]
ARIJEET PAL, EMMANUEL RASHBA, BERTRAND HALPERIN, Harvard University — Exchange-only (RX) qubits are a promising candidate for the fundamental unit of a quantum computer. Recently, such a qubit has been experimentally realized and its complete two-axis control demonstrated in a system of exchange coupled triple dots [1, 2]. The next step is to establish the control of two such coupled RX qubits. We have explored the dynamical effects of two capacitively-coupled RX qubits. We formulate the Hamiltonian for two capacitively-coupled RX qubits constructed from six dots where they are arranged in different geometries. Under the conditions of resonant driving of one of the qubits, the other qubit serves as a detector of the coupling. When driven strongly even a modest strength of interaction can result in nonlinear effects and putatively make the control of two-qubit entanglement irregular. In this regard the different geometries give rise to substantially disparate responses which will be relevant for future experiments in these systems. 1. Self-Consistent Measurement and State Tomography of an Exchange-Only Spin Qubit, J. Medford et. al., Nature Nanotechnology 8, 654 (2013) 2. Quantum-Dot-Based Resonant Exchange Qubit, J. Medford et al., PRL 111, 050501 (2013)

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