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Higher Energy Levels in Qubit Networks[1] ZECHARIAH THRAILKILL, JOSEPH LAMBERT, ROBERTO RAMOS, Drexel University — Josephson junctions can be capacitively coupled together to form qubit networks capable of carrying out quantum logic operations. In order to fully utilize these systems, the influence of energy levels higher than the ground and first excited states in the qubits must be examined. We have analyzed such networks with three, four, and more qubits biased to both anharmonic and harmonic regimes. As the qubits become harmonic, the higher energy levels will interact more strongly with the computational basis. Allowing the system to pass through these higher energy levels can allow quantum state transfers where, in the anharmonic regime, it would not occur. We will discuss the impact these higher energy levels have on the natural state evolution of the systems, quantum information transfer, and state manipulation using a time independent, or adiabatically changing Hamiltonian.

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Zechariah Thrailkill
Drexel University

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