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Stopping Single Photons in One-dimensional Circuit Quantum Electrodynamics Systems JUNG-TSUNG SHEN, SHANHUI FAN, Stanford University — We propose a mechanism to stop and time-reverse single photons in one-dimensional circuit quantum electrodynamics systems. As a concrete example, we exploit the large tunability of the superconducting charge quantum bit (charge qubit) to predict one-photon transport properties in multiple-qubit systems with dynamically controlled transition frequencies. In particular, two qubits coupled to a waveguide give rise to a single-photon transmission lineshape that is analogous to electromagnetically-induced transparency (EIT) in atomic systems. Furthermore, by cascading double-qubit structures to form an array and dynamically controlling the qubit transition frequencies, a single photon can be stopped, stored, and time-reversed. With a properly designed array, two photons can be stopped and stored in the system at the same time. Moreover, the unit cell of the array can be designed to be of deep sub-wavelength scale, miniaturizing the circuit.

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