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Single-photon switch: Controllable scattering of photons inside a one-dimensional resonator waveguide L. ZHOU, Z.R. GONG, Y.X. LIU, C.P. SUN, F. NORI, RIKEN Advanced Science Institute, ITP CAS, Hunan Normal Univ., and Univ. of Michigan — We analyze the coherent transport of a single photon, which propagates in a one-dimensional coupled-resonator waveguide and is scattered by a controllable two-level system located inside one of the resonators of this waveguide. Our approach, which uses discrete coordinates, unifies low and high energy effective theories for single-photon scattering. We show that the controllable two-level system can behave as a quantum switch for the coherent transport of a single photon. This study may inspire new electro-optical single-photon quantum devices. We also suggest an experimental setup based on superconducting transmission line resonators and qubits. References: L. Zhou, Z.R. Gong, Y.X. Liu, C.P. Sun, F. Nori, Controllable scattering of photons inside a one-dimensional resonator waveguide, Phys. Rev. Lett. 101, 100501 (2008). L. Zhou, H. Dong, Y.X. Liu, C.P. Sun, F. Nori, Quantum super-cavity with atomic mirrors, Phys. Rev. A 78, 063827 (2008).

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