Controllable scattering of photons in a one-dimensional resonator waveguide\textsuperscript{1} C.P. SUN, L. ZHOU, Z.R. GONG, RIKEN, Japan, and CAS, China, Y.X. LIU, RIKEN, Japan, F. NORI, RIKEN, Japan, and University of Michigan, Ann Arbor, USA — 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.


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