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A photonic quantum diode using superconducting qubits ANDRES ROSARIO HAMANN, The University of Queensland, MAXIMILIAN ZANNER, Karlsruhe Institute of Technology, MARKUS JERGER, The University of Queensland, MIKHAIL PLETYUKHOV, RWTH Aachen University, JOSHUA COMBES, CLEMENS MÜLLER, The University of Queensland, ALEXANDRE ROULET, National University of Singapore, MARTIN WEIDES, Karlsruhe Institute of Technology, THOMAS STACE, ARKADY FEDOROV, The University of Queensland — Strong coupling between quantum emitters and photons in a one-dimensional waveguide is a key element for waveguide quantum electrodynamics (QED), a regime of great interest for universal quantum computing and communication. The basic ingredient of waveguide QED, a single two-level system (TLS) in a waveguide, can behave as a mirror whose transparency depends on the frequency and power of the incoming radiation. In this work we present our experimental results on the system consisting of two superconducting transmon-like qubits embedded in a copper waveguide realizing an analogue of a Fabry-Pérot interferometer. Two external coils provide control over the flux threading the transmons, thus allowing us to individually tune their transition frequencies and to change the effective distance between the mirrors *in situ*. By exploiting the quantum properties of the mirrors we achieve new functionalities of the interferometer. Most notably, when the TLSs are asymmetrically detuned with respect to the frequency of the incident radiation, the system exhibits previously unobserved non-reciprocal behavior and operate as a microscopic light diode.

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