

Quantum Heat Switch

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We reported a quantum switch that can control the heat transport between two nominally identical incoherent heat reservoirs. The heat switch is a X-mon qubit whose level spacing is tunable by an externally applied magnetic field. Each heat reservoir consists of a quarter-wavelength coplanar waveguide resonator which is capacitively coupled to the qubit at one end and terminated to the ground via a superconductor-insulator-normal metal-insulator-superconductor (SINIS) tunneling device at the other end. The SINIS devices plays the roles of heater in one reservoir and thermometer in the other reservoir. We observed tunable photonic heat transport through this reservoir-qubit-reservoir circuit and noted that the interplay between the qubit-resonator coupling and the resonator-SINIS coupling can lead to qualitatively dissimilar switching behaviors.