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Bistability of qubit chains coupled to a superconducting resonator[1] LIN TIAN, 5200 N Lake Rd., School of Natural Sciences, University of California, Merced, CA 95343, USA — When a quantum many-body system is coupled to a cavity, the cavity not only can be used to probe the quantum phase transition but can also induce novel effects in the many-body system. In this work, we study the bistable effect in a chain of superconducting qubits coupled to a superconducting resonator cavity. The qubits are connected to their nearest neighbors capacitively and form a transverse Ising model. Using a semiclassical approach to treat the resonator in the bad cavity limit, we show that a bistable regime exists where the ground state of the transverse Ising model can be in either the paramagnetic state or the ferromagnetic state as the driving of the resonator increases. In a full quantum calculation including the resonator damping and the qubit decoherence, the photon distribution of the resonator shows bimodular behavior which agrees well the bistable solutions in the semiclassical approach.

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