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Deterministic generation of entangled photon pairs in coupled superconducting resonators[1] YONG HU, LIN TIAN, 5200 N Lake Rd., School of Natural Sciences, University of California, Merced, CA 95343, USA — Entangled photon pairs play an important role in quantum information. In this work, we propose a scheme for the on-demand generation of entangled photon pairs in a circuit of four superconducting transmission-line resonators connected in a ring geometry. Each resonator in this circuit couples with a superconducting qubit. Strong coupling between superconducting resonators and superconducting qubits has been demonstrated in recent experiments. This coupling can generate a tunable Kerr-like nonlinearity in the resonators. Combining this nonlinearity with the photon tunneling between adjacent resonators, the system can be described as a Bose-Hubbard-like model. We will show that entangled photon pairs, i.e. EPR pairs, can be prepared by microwave pulses with high fidelity when the nonlinearity dominates over the photon tunneling; and can be transferred to flying modes when the photon tunneling dominates over the nonlinearity. We also studied the effect of resonator damping on this scheme.

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