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Quantum phase transition of light in the resonator array CHUN-WANG WU, MING GAO, ZHI-JIAO DENG, HONG-YI DAI, PING-XING CHEN, CHENG-ZU LI, College of Science, National University of Defense Technology, Changsha 410073, China, QUANTUM COMPUTATION GROUP OF NUDT TEAM — We give a concrete experimental scheme for engineering the insulator-superfluid transition of light in a one-dimensional (1-D) array of coupled superconducting stripline resonators. In our proposed architecture, the on-site interaction and the photon hopping rate can be tuned independently by adjusting the transition frequencies of the charge qubits inside the resonators and at the resonator junctions, respectively, which permits us to systematically study the quantum phase transition of light in a complete parameter space. By combining the techniques of photon-number-dependent qubit transition and fast read-out of the qubit state using a separate low-Q resonator mode, the statistical property of the excitations in each resonator can be obtained with a high efficiency. An analysis of the various decoherence sources and disorders shows that our scheme can serve as a guide to coming experiments involving a small number of coupled resonators.

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