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Dressed-state engineering for continuous detection of itinerant microwave photons KAZUKI KOSHINO, Tokyo Medical and Dental University, ZHIRONG LIN, KUNIHIRO INOMATA, RIKEN Center for Emergent Matter Science, TSUYOSHI YAMAMOTO, NEC Smart Energy Research Laboratories, YASUNOBU NAKAMURA, University of Tokyo — Microwave quantum optics using superconducting qubits and transmission lines enables various quantum-optical phenomena that have not been reached in the visible light domain. However, the lack of an efficient detector for itinerant microwave photons has been a long-standing problem. A promising approach is to use the deterministic switching of a Λ system induced by individual photons. Recently, we realized a Λ system by the dressed-state engineering of a qubit-resonator system and achieved a detection efficiency $\sim 66\%$. However, this detector should be operated in the time-gated mode, since the drive field to generate the Λ-type transition must be turned off during the qubit readout. Here, we propose a scheme for continuous detection of itinerant microwave photons. In the proposed device, a superconducting qubit is coupled dispersively to two resonators: one is used to form a Λ system that deterministically captures incoming photons and the other is used for continuous monitoring of the event. The proposed device enables continuous operation of the photon detector, preserving the advantages of our previous scheme, such as a high detection efficiency, insensitivity to the signal pulse shape, and short dead times after detection.

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