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Microwave Photon Detection Using an Impedance-Matched Λ System KUNIHIRO INOMATA, ZHIRONG LIN, RIKEN, KAZUKI KOSHINO, Tokyo Medical and Dental University, WILLIAM OLIVER, MIT Lincoln Laboratory, JAWSHEN TSAI, RIKEN, YASUNOBU NAKAMURA, RIKEN and The University of Tokyo, TSUYOSHI YAMAMOTO, NEC Smart Energy Research Laboratories — We demonstrate microwave photon detection using an impedance-matched Λ system consisting of dressed states in a circuit QED system [1, 2]. When a microwave photon resonant with the Λ system is input, it deterministically induces a Raman transition in the system and excites the qubit, enabling its applications to the single photon detection by reading out a qubit state before its relaxation. The resonant microwave pulses with an average photon number of ~ 0.1 are applied to the Λ system. The qubit state is read out by using a parametric phase-locked oscillator, which enables a fast, single-shot, and non-destructive readout [3]. The photon detection efficiency of $\sim 70\%$ has been achieved. The loss of the efficiency is mainly attributed to the relaxation of the qubit state due to short T_1.

[1] K. Koshino *et al.*, Phys. Rev. Lett. **111**, 153606 (2013).
[2] K. Inomata *et al.*, Phys. Rev. Lett. **113**, 063604 (2014).
[3] Z. R. Lin *et al.*, Nat. Commun. **5**, 4480 (2014).

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