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Two-photon Rabi oscillations in a superconducting transmon qubit DONG-GWANG HA, JUNG HWAN PARK, SEUNG-BO SHIM, WOON SONG, YONUK CHONG, Korea Research Institute of Standards and Science (KRISS) — We report our detailed measurement of two-photon Rabi oscillations in superconducting transmon qubit. For a transmon qubit, two-photon process has the advantage that it allows the direct transition from the ground state to the second excited state, which is forbidden in the dipole transition by the selection rule. We demonstrate two-photon Rabi oscillations in a superconducting transmon qubit made of Al/AlOx/Al Josephson junction. The qubit is strongly coupled to a three-dimensional superconducting aluminum resonator, and the quantum state population is measured through the cavity readout in the strong dispersive regime. In two-photon Rabi oscillation, its dependence on the driving microwave power and the frequency is in good agreement with the theoretical expectation. We will also show the measurement of the ac Stark shift from strong qubit drive for both one- and two-photon Rabi oscillations.

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