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New Circuit QED system based on Triple-leg Stripline Resonator.[1] DONGMIN KIM, KYUNGSUN MOON, Yonsei Univ — Conventional circuit QED system consists of a qubit located inside a linear stripline resonator, which has successfully demonstrated a strong coupling between a single photon and a qubit. Here we present a new circuit QED system, where the qubit is coupled to triple-leg stripline resonator (TSR). We have shown that TSR supports two-fold degenerate photon modes among others. By coupling them to a single qubit, we have obtained the dressed states of a coupled system of a single qubit and two-fold degenerate photon modes. By locating two qubits at two legs of TSR, we have studied a potential two-bit gate operation (e.g., CNOT gate) of the system. We will discuss the main advantage of utilizing two-fold degenerate photon modes

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