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rf Photon Peaks of a dc SQUID Phase Qubit Coupled to On-Chip LC Filter[1] R.P. BUDOYO, B.K. COOPER, Joint Quantum Institute and Center for Nanophysics and Advanced Materials, Dept. of Physics, University of Maryland, College Park, MD, V. ZARETSKEY, Dept. of Physics, University of Maryland and Laboratory for Physical Sciences, College Park, MD, C.J. BALLARD, J.R. ANDERSON, C.J. LOBB, F.C. WELLSTOOD, Joint Quantum Institute and Center for Nanophysics and Advanced Materials, Dept. of Physics, University of Maryland, College Park, MD — We have fabricated and tested an Al/AlO_x /Al dc SQUID phase qubit on a sapphire substrate. The qubit is shunted by an interdigitated capacitor and isolated from the bias leads by an inductive isolation network using a larger Josephson junction. Additional high frequency filtering is provided by an on-chip LC filter which consists of square spiral inductors and parallel plate SiN_x capacitors, with ∼330 MHz cutoff frequency. Spectroscopy of the qubit transition frequency at 8.7 GHz shows multiple equally spaced subpeaks. These subpeaks are caused by coupling between the qubit and the LC filter, forming a system that can be described by Jaynes-Cummings model. The individual subpeaks correspond to transitions with different photon numbers in the LC filter.

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