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1/f Noise of Josephson Tunnel Junction Embedded Microwave Resonators at Single Photon Energies and Millikelvin Temperatures[1] I. SIDDIQI, KATER MURCH, STEVEN WEBER, ELI LEVENSON-FALK, R. VIJAY, UC Berkeley, QNL — We present measurements of the 1/f frequency noise of superconducting aluminum lumped and distributed element resonators in the low power, low temperature operating regime characteristic of superconducting qubits. A comparison was made between these devices and similar co-fabricated linear resonators to infer the level of critical current noise associated with the tunnel junctions. At 25 mK and in the single photon regime, the observed frequency fluctuations of junction embedded and linear resonators were comparable. Attributing all the observed noise to critical current fluctuations, we report an upper bound for 1/f critical current fluctuations in 0.5-2 μA junctions of 3 x $10^{-8}(1/\sqrt{Hz})$ at 1 Hz. We note that for some samples we observed the activation of a single fluctuator above 50 mK which increased the level of noise significantly.

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