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A Josephson junction resonator to test the quality of superconducting qubit circuits[1] KEVIN OSBORN, JOSH STRONG, ADAM SIROIS, RAYMOND SIMMONDS, NIST - Boulder — Superconducting Josephson junction resonators can probe nonlinear oscillators such as qubit readout amplifiers and qubits themselves. We have fabricated weakly coupled resonators with a flux tunable resonant frequency of over 1 GHz. At high powers the Josephson junction resonators become nonlinear and two stable oscillation states are observed which can be harnessed to readout qubits. At sufficiently low powers, the resonators can probe a qubit since they store no more than one photon of energy. At these low powers we observe two-level system defects attributed to the Josephson junction, similar to those observed in the phase qubit. We have fabricated and measured resonators with different device parameters, such as the junction area and the critical current density. We will report on the quality of the resonators as a function of the device parameters.

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