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Cavity Josephson Bifurcation Amplifier: a microwave readout for a superconducting qubit MICHAEL METCALFE, ETIENNE BOAKNIN, VLADIMIR MANUCHARYAN, Department of Applied Physics, Yale University, New Haven, CT, 06511, SIMON FISSETTE, Departement de Physique, Universite de Sherbrooke, Sherbrooke, Canada , IRFAN SIDDIQI, RAJAMANI VIJAYARAGHAVAN, CHAD RIGETTI, ANDREAS WALLRAFF, ROBERT SCHOELKOPF, MICHEL DEVORET, Department of Applied Physics, Yale University, New Haven, CT, 06511 — A Josephson junction, embedded in a microwave circuit that displays a resonance, and driven near the resonance frequency by a sinusoidal signal with adequate amplitude, can adopt one of two dynamical metastable states. The transition between the two states can be triggered by a small variation in the environment of the junction. This switching phenomenon naturally lends itself to the readout of a superconducting quantum bit. We are approaching the problem of mapping the two states of a qubit onto the two dynamical states of the Josephson junction by placing it in an on-chip coplanar waveguide superconducting cavity. We present the characterization of the cavity Josephson bifurcation amplifier (CJBA) and show that it follows theoretical predictions over a wide range of operating frequencies and bandwidth. This architecture provides a calculable RF environment which can be readily optimized. We also discuss a multi-resonator chip geometry that would implement the multiplexed readout of more than 10 qubits.

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