

Abstract Submitted
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State tomography of a three-level superconducting quantum circuit S. FILIPP, R. BIANCHETTI, ETH Zurich, M. BOISSONNEAULT, Universite de Sherbrooke, A. WALLRAFF, ETH Zurich — Coherent control of higher than two-dimensional quantum systems can considerably improve present techniques for quantum information processing. In particular, superconducting quantum circuits can be operated in a regime with closely spaced energy levels, where arbitrary superposition states can be prepared by applying appropriately shaped microwave pulses at different frequencies. We employ dispersive read-out [1] to discriminate the population of upper energy levels of superconducting transmon circuits coupled to a coplanar microwave resonator. This allows us to determine the dynamics in the restricted two-dimensional qubit subspace and assess the population transfer to the third level. Finally, we fully characterize arbitrary three-dimensional qutrit states by a complete tomographic measurement.

[1] R. Bianchetti *et al.*, Phys. Rev. A **80**, 043840 (2009).

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