

Abstract Submitted
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Randomized Benchmarking of Superconducting Qubits JERRY M. CHOW, Yale University, JAY GAMBETTA, University of Waterloo, LARS TORNBERG, Chalmers University, JENS KOCH, LEV BISHOP, ANDREW HOUCK, STEVEN GIRVIN, Yale University, ROBERT SCHOELKOPF, YALE CIRCUIT QED TEAM — We present measurements of average gate errors for a superconducting qubit using randomized benchmarking [1]. The results are compared with gate errors obtained from a double π pulse experiment and quantum process tomography. Randomized benchmarking reveals a minimum average gate error of $1.1 \pm 0.3\%$ and a simple exponential dependence of fidelity on the number of applied gates. It shows that the limits on gate fidelity are primarily imposed by qubit decoherence and finite gate lengths (constrained by qubit anharmonicity), in agreement with theory.

[1] E. Knill et al., Phys. Rev. A. **77**, 012307(2008).

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