

Abstract Submitted
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Compressed Sensing Quantum Process Tomography of Superconducting Qubit Gates¹ ANDREY RODIONOV, ALEXANDER N. KOROTKOV, University of California, Riverside, ROBERT L. KOSUT, SC Solutions, Sunnyvale, CA, MATTEO MARIANTONI, DANIEL SANK, JAMES WENNER, JOHN M. MARTINIS, University of California, Santa Barbara — We characterize the quantum gates based on superconducting phase qubits using the Quantum Process Tomography (QPT) with strongly reduced set of initial states and/or measurement configurations. This is done by applying the Compressed Sensing (CS) method to estimate the process matrix χ . Using experimental data for 2-qubit controlled-Z gate, we show that the CS-QPT method gives an estimate of the χ -matrix with reasonably high fidelity, compared with full QPT. The method works well even when the amount of used data is so small, that the standard QPT would have an underdetermined system of equations. The CS-QPT is also applied to the analysis of a three-qubit Toffoli gate with numerically added noise. Similarly, we show that the method works reasonably well for a strongly reduced set of data, including the underdetermined case.

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