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Detecting and Reducing Gate Leakage in Superconducting Qubits using Randomized Benchmarking Z. CHEN, J. KELLY, UC Santa Barbara, R. BARENDS, Google, Santa Barbara, B. CAMPBELL, UC Santa Barbara, Y. CHEN, Google, Santa Barbara, B. CHIARO, A. DUNSWORTH, UC Santa Barbara, A. FOWLER, Google, Santa Barbara, I.-C. HOI, UC Santa Barbara, E. JEFFREY, Google, Santa Barbara, A. MEGRANT, UC Santa Barbara, J. MUTUS, Google, Santa Barbara, C. NEILL, P.J.J. O'MALLEY, C. QUINTANA, UC Santa Barbara, P. ROUSHAN, D. SANK, Google, Santa Barbara, A. VAINSENCHER, J. WENNER, T. WHITE, UC Santa Barbara, A.N. KOROTKOV, UC Riverside, A.N. CLELAND, UC Santa Barbara, J.M. MARTINIS, University of California and Google, Santa Barbara — Superconducting qubits are a promising platform for building a quantum computer due to their scalability and ease of control. One potential drawback is the existence of more than two energy levels, which can allow the qubit to leak out of the computational subspace when performing operations. This leakage error is particularly detrimental in the surface code scheme, where it leads to correlated errors. I will present a method for characterizing gate leakage rates using randomized benchmarking, and present strategies based on these results for reducing leakage.

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