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Measurement of the Magnetic Flux Noise Spectrum in Superconducting Xmon Transmon Quantum Bits BEN CHIARO, UC - Santa Barbara, D. SANK, J. KELLY, Google - Santa Barbara, Z. CHEN, B. CAMPBELL, A. DUNSWORTH, P. O'MALLEY, C. NEILL, C. QUINTANA, A. VAINSENCHER, J. WENNER, UC - Santa Barbara, R. BARENDS, Y. CHEN, A. FOWLER, E. JEFFREY, A. MIGRANT, J. MUTUS, P. ROUSHAN, T. WHITE, Google - Santa Barbara, J. M. MARTINIS, UC - Santa Barbara and Google - Santa Barbara — Dephasing induced by magnetic flux noise limits the performance of modern superconducting quantum processors. We measure the flux noise power spectrum in planar, frequency-tunable, Xmon transmon quantum bits (qubits), with several SQUID loop geometries. We extend the Ramsey Tomography Oscilloscope (RTO) technique by rapid sampling up to 1 MHz, without state reset, to measure the flux noise power spectrum between 10^{-2} and 10^{5} Hz. The RTO measurements are combined with idle gate randomized benchmarking and Ramsey decay to give a more complete picture of dephasing in SQUID-based devices.

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