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Non-QNDness of Dispersive Measurement in Superconducting Qubits, Part II: Experiment DANIEL SANK, Google Inc - Santa Barbara , Z. CHEN, UC Santa Barbara, M. KHEZRI, UC Riverside, R. BARENDS, Google Inc - Santa Barbara, B. CAMPBELL, UC Santa Barbara, Y. CHEN, Google Inc - Santa Barbara, B. CHIARO, A. DUNSWORTH, UC Santa Barbara, A. FOWLER, R. GRAFF, E. JEFFREY, J. KELLY, E. LUCERO, A. MEGRANT, J. MUTUS, M. NEELEY, Google Inc - Santa Barbara, C. NEILL, P. J. J. O'MALLEY, UC Santa Barbara, C. QUINTANA, P. ROUSHAN, Google Inc - Santa Barbara, A. VAINSENCHER, J. WENNER, UC Santa Barbara, T. WHITE, Google Inc - Santa Barbara, A. KOROTKOV, UC Riverside, J. M. MARTINIS, Google Inc - Santa Barbara — Modern quantum state measurement in transmon qubits uses the interaction between the qubit and a harmonic oscillator. In the dispersive limit of the interaction, the coupling operator $n\,\sigma_z$ commutes with the qubit Hamiltonian and should be perfectly QND. However, previous experiments have indicated that sufficiently high resonator drive power causes unwanted qubit state transitions, producing errors. We investigate these errors in detail, connect the results with theory, and comment on the implications for quantum computer design.

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