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Noise from Two-Level Systems in Superconducting Resonators C. NEILL, R. BARENDS, Y. CHEN, B. CHIARO, E. JEFFREY, J. KELLY, M. MARIANTONI, A. MEGRANT, J. MUTUS, S. OHYA, D. SANK, A. VAINSENCHER, J. WENNER, T. WHITE, A. N. CLELAND, J. M. MARTINIS, UC Santa Barbara — Two-level systems (TLSs) present in amorphous dielectrics and surface interfaces are a significant source of decoherence in superconducting qubits. Linear microwave resonators offer a valuable instrument for characterizing the strongly power-dependent response of these TLSs. Using quarter-wavelength coplanar waveguide resonators, we monitored the microwave response of the resonator at a single near-resonant frequency versus time at varying microwave drive powers. We observe a time dependent variation of the resonator's internal dissipation and resonance frequency. The amplitude of these variations saturates with power in a manner similar to loss from TLSs. These results provide a means for quantifying the number and distribution of TLSs.

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