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Discrete Two-Level Systems and Two-Level Fluctuators in a Superconducting Microwave Resonator[1] K.D. VOIGT, J.B. HERTZBERG, UMD, Z. KIM, ADD South Korea, A. CHOUDHARY, UMD, J.R. ANDERSON, C.J. LOBB, F.C. WELLSTOOD, JQI/UMD — We measure the effect of two-level systems on a thin-film superconducting Al microwave resonator at 6.83 GHz that is weakly coupled to an on-chip transmission line [1]. The device is intended for coupling to the hyperfine splitting of trapped ^{87}Rb atoms. At 12 mK the internal quality factor at low microwave power is typically 100,000. Applying a dc voltage to the transmission line leads to reproducible shifts of up to 6 kHz in the resonance frequency. These shifts are more pronounced at lower RF power, suggesting that discrete charged two-level systems in the sapphire substrate or surface Al oxide are responsible, and that the dc voltage shifts the transition energy of the two-level systems. We also see evidence for thermally activated two- level fluctuators which can be turned on and off by the applied dc voltage. We discuss our results and the characteristics of the underlying two-level systems and two-level fluctuators.

[1] Z. Kim et al., AIP ADVANCES 1, 042107 (2011).

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