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Tunable High Q Superconducting Microwave Resonator for Hybrid System with ^{87}Rb atoms[1] ZAEILL KIM, K.D. VOIGT, JONGMIN LEE, J.E. HOFFMAN, J.A. GROVER, S. RAVETS, JQI/UMD, V. ZARETSKEY, UMD, B.S. PALMER, LPS, M. HAFEZI, J.M. TAYLOR, JQI/NIST/UMD, J.R. ANDERSON, A.J. DRAGT, C.J. LOBB, L.A. OROZCO, S.L. ROLSTON, F.C. WELLSTOOD, JQI/UMD — We have developed a frequency tuning system for a "lumped-element" thin-film superconducting Al microwave resonator [1] on sapphire intended for coupling to hyperfine ground states of cold trapped ^{87}Rb atoms, which are separated by about $f_{Rb} = 6.83$ GHz. At T=12 mK and on resonance at 6.81 GHz, the loaded quality factor was 120,000. By moving a carefully machined Al pin towards the inductor of the resonator using a piezo stage, we were able to tune the resonance frequency over a range of 35 MHz and within a few kHz of f_{Rb}. While measuring the power dependent response of the resonator at each tuned frequency, we observed anomalous decreases in the quality factor at several frequencies. These drops were more pronounced at lower power. We discuss our results, which suggest these resonances are attributable to discrete two-level systems.

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

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