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Two-level system dynamics in amorphous dielectrics probed with a dc electric field MOE KHALIL, SERGIY GLADCHENKO, M.J.A. STOUTIMORE, University of Maryland and Laboratory for Physical Sciences, F.C. WELLSTOOD, University of Maryland, K.D. OSBORN, Laboratory for Physical Sciences — We report loss in a thin-film dc electric-field tunable LC resonator built with superconducting aluminum and silicon nitride dielectric. To measure the loss we continually apply microwave power on resonance and monitor the transmitted power. At milli-Kelvin temperatures, loss is limited by two-level systems in the dielectric which are saturated with high microwave excitation power. Measurements show that a sudden change of applied dc field causes the dielectric loss to increase to the intrinsic low power loss tangent of the dielectric. We study the subsequent relaxation of the loss tangent caused by two-level system saturation and interactions. We discuss how this arises from the dynamics of a distribution of two-level system defects and compare it with new theoretical work on interacting two-level systems.

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