

Abstract Submitted  
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**Probing the permittivity from two-level system defects which are manipulated in population and swept in energy using a superconducting resonator** SAMARESH GUCHHAIT, YANIV ROSEN, Laboratory for Physical Sciences, College Park, Maryland 20740, USA, ALEX BURIN, Department of Chemistry, Tulane University, New Orleans, Louisiana 70118, USA, KEVIN OSBORN, Laboratory for Physical Sciences, College Park, Maryland 20740, USA — Two-level systems (TLSs) in a dielectric have a deleterious effect on the coherent states of superconducting resonators and qubits. By application of a microwave field outside the bandwidth of a microwave cavity mode we can invert these TLSs with the simultaneous application of time-dependent electric field bias. This latter field also changes the TLS energies, towards or away from resonance with the resonator before they decay. This changes the permittivity of the dielectric. By controlling the bias rate, we can manipulate the number of excited TLSs and their energy distribution. This changes the cavity resonance frequency by few MHz and also the loss tangent of the mode resonance. Numerical modelling explains the experimental data.

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