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Possible interactions between two-level system defects in SiNx films SERGIY GLADCHENKO, MOE KHALIL, Laboratory for Physical Sciences, MD, C.J. LOBB, F.C. WELLSTOOD, University of Maryland, Department of Physics, KEVIN D. OSBORN, Laboratory for Physical Sciences, MD — Low-temperature properties of PECVD SiNx dielectric films are measured within the capacitor of superconducting LC resonators. Experiments are made at temperatures from 30 to 300 mK, and at storage energies from 1 to 10^6 photons in a resonant cavity. While the power and temperature dependence of the loss agrees with two-level system (TLS) theory above 60 mK, below this temperature we observe significant deviations. In this regime we observe a reduction in loss upon lowering dielectric temperature, in direct contrast with the independent TLS model of defects within our film. This new phenomena may indicate interactions between two-level systems. We can also spectroscopically resolve the loss from dominant defects in our capacitors, which have a volume of $\sim$2000 μm^3.

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