

Abstract Submitted
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Intrinsic capacitance noise from two-level systems in dielectrics¹

IGOR DINIZ, MATTHIAS LE DALL, ROGERIO DE SOUSA, Univ of Victoria — Resonant two-level systems (TLSs) are believed to be the main source of dielectric loss in superconducting qubits at sub-Kelvin temperatures. The presence of TLSs in the capacitors and Josephson junctions forming the qubits inevitably lead to qubit energy relaxation followed by photon emission with rate $1/T_1$. We show that in addition to the broadly recognized single photon contribution to $1/T_1$, inelastic multi-photon processes may also give an important contribution. Two and three-photon processes are related to capacitance noise which, in contrast to single photon loss, gives a broadband contribution to relaxation and dephasing. Dielectric loss occurs even when there are no TLSs resonant with the qubit excitation frequency. We predict that qubits made of high quality dielectrics with a low density of TLSs will have their T_1 and T_2 times dominated by capacitance noise.

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