Abstract Submitted
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Using Phase Qubits to Evaluate Dielectrics Materials[1] J.A. STRONG, M.S. ALLMAN, K. CICAK, JEFFREY S. KLINE, SEONGSHIK OH, K.D. OSBORN, G. PROKOPENKO, M.A. SILLANPAA , A.J. SIROIS , J.D. WHITTAKER, National Inst. of Standards and Tech. - Boulder, JOHN M. MARTINIS, UC Santa Barbara, D.P. PAPPAS, R.W. SIMMONDS, National Inst. of Standards and Tech. - Boulder — It has been known since the late 1970's that Amorphous insulating materials contain defects that can be modeled as a bath of interacting two-level fluctuators. Measurements of LC oscillator microwave circuits have identified these two-level systems as an inherent energy loss mechanism in Josephson phase qubits. By developing methods to reduce the volume of dielectric material in the fabrication of Josephson phase qubits, we have been able to conclusively show that the energy relaxation time can be improved in these systems. Furthermore, by using a different dielectric material with less intrinsic low temperature loss, it is possible to further improve this situation. In addition, we have fabricated new phase qubits which have strong coupling to substrate materials in an effort to evaluate loss from different substrates. We show that substrate materials with high crystalinity result in qubits with improved relaxation times.

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