Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Improving Superconducting Phase Qubits with Low-Loss Vacuum-Gap Capacitors[1] KATARINA CICAK, M.S. ALLMAN, K.D. OSBORN, A.J. SIROIS, J.A. STRONG, J.D. WHITTAKER, R.W. SIMMONDS, NIST, Boulder — Significant progress has been made in eliminating sources of decoherence in superconducting qubits by carefully selecting, manipulating and engineering materials used in fabrication. Dielectrics in and around a qubit remain a major source of decoherence. By decreasing the size of a Josephson junction (JJ) one can reduce the number of decoherence-causing spurious two level systems. However, in order to maintain a typical phase qubit operation frequency, one has to shunt the JJ with a capacitor. We have fabricated structurally robust parallel plate capacitors in which lossy dielectrics are replaced by vacuum. Our LC oscillator measurements show that the loss tangent of the vacuum-gap capacitor is significantly lower than that of SiO2 and SiNx capacitors. Vacuum-gap capacitor fabrication has been integrated with phase qubit fabrication. We also show that our vacuum-gap technology can be used to fabricate on-chip wiring crossovers without dielectrics and vacuum suspended qubit junctions.

[1]Supported by NIST and DTO.

Katarina Cicak
NIST, Boulder

Date submitted: 20 Nov 2006 Electronic form version 1.4