Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**Cooper-pair Tunneling in a High Impedance Environment.** M. A. CASTELLANOS-BELTRAN, K. W. LEHNERT, JILA, NIST and the University of Colorado, and the Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA. — Coulomb blockade of current and coherent oscillations in the voltage across a small tunnel junction can only be observed if the junction is embedded in the appropriate electromagnetic environment. The demanding condition is an environment with an impedance large compared to the quantum of resistance ($R_Q$ = 6.5 k$\Omega$) at all relevant frequencies (DC - 20 GHz). We will show results from two different experiments that characterize the impedance of one-dimensional Josephson junction arrays. First, by using the array to bias a SQUID made from small area junctions, we show the behavior of this system can only be explained if the array creates an environment with an impedance several times $R_Q$. Second, we measure the speed at which microwave signals propagate through coplanar waveguides whose inner conductors are formed from an array of Josephson junctions. We find that these waveguides behave as LC transmission lines with wave impedances of several k$\Omega$ and wave speeds less than 1% of the speed of light in free space.

Manuel Castellanos-Beltran
JILA, NIST and the University of Colorado, and the
Department of Physics, University of Colorado

Date submitted: 29 Nov 2006 Electronic form version 1.4