Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Single Electron Effects in a Carbon Nanotube Electromechanical Oscillator AREND VAN DER ZANDE, LASSP Cornell University, RENA ZIEVE, Department of Physics, UC Davis, VERA SAZONOVA, PAUL MCEUEN, LASSP Cornell University — We have fabricated suspended, doubly clamped, carbon nanotube (NT) transistors to investigate the low temperature coupling between mechanical vibration of the NT and single electron effects. At low temperatures of 0.3K to 4.2K, the NT behaves as a quantum dot. The NT quantum dot displays Coulomb oscillations in the conductance by sweeping a gate voltage. Mechanical vibrations are induced in the NT by applying a high frequency AC voltage relative to the gate [1]. The nonlinear conductance of the Coulomb oscillations can be used as a mixer to detect the NT's own motion. We find that the mechanical resonances of the NT are influenced by the Coulomb oscillations. We observe a dip in the resonance frequency and a dip in the quality factor as the gate voltage is swept through a Coulomb oscillation. We attribute these dips to the forces on the NT from the hopping of single electrons on and off the NT as it moves with respect to the gate. [1] V. Sazonova, Y. Yaish, H. Ustunel, D. Roundy, T.A. Arias, and P.L. McEuen, Nature 431, 284-287 (2004)

Arend van der Zande
LASSP Cornell University

Date submitted: 28 Nov 2005 Electronic form version 1.4