Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**Transmission line impedance of carbon nanotube thin films for chemical sensing applications.** G. ESEN, M. S. FUHRER, Department of Physics and Center for Superconductivity Research, University of Maryland, College Park, Maryland 20742, J. H. CHEN, M. ISHIGAMI, E. D. WILLIAMS, Laboratory for Physical Sciences and Department of Physics, University of Maryland, College Park, Maryland 20742 — We measure the resistance and frequency-dependent (50 Hz - 20 KHz) gate capacitance of carbon nanotube (CNT) thin films as a function of DC gate bias under ambient conditions, in ultra-high vacuum, and under low-pressure ($10^{-6}$ torr) gaseous environments of water, acetone, and argon. We have analyzed our results by modeling the CNT film as an RC transmission line. We show that changes in the measured capacitance as a function of gate bias and analyte pressure can be explained by the changes in the CNT film resistivity alone; the electrostatic gate capacitance of the CNT film does not depend on gate voltage or chemical analyte adsorption to within the resolution of our measurement. We also show that the resistance of the CNT film is enormously sensitive to exposure to low pressures ($< 10^{-6}$ Torr) of analytes. This research was supported by the Laboratory for Physical Sciences and the U.S. Army Research Laboratory MICRA Program. MI received support from the Director of Central Intelligence Postdoctoral Fellowship program.

Gokhan Esen
Department of Physics and Center for Superconductivity Research,
University of Maryland, College Park, Maryland 20742

Date submitted: 29 Nov 2006 Electronic form version 1.4