Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Environmental Manipulation of the Electronic Structure of Suspended Carbon Nanotubes A.G. WALSH, Y. YIN, Physics Dept, BU, A.N. VAMIVAKAS, ECE Dept, BU, S.B. CRONIN, M. TINKHAM, Physics Dept, Harvard, M.S. UNLU, ECE Dept, BU, B.B. GOLDBERG, Physics Dept, BU, A.K. SWAN, ECE Dept, BU — We use tunable resonant Raman spectroscopy to study the effect of changing the dielectric environment on the electronic structure of single wall carbon nanotubes (CNTs) suspended over trenches. The 1D nature of CNTs is responsible for weak intrinsic screening and large Coulomb interactions are anticipated. Two-photon absorption experiments have determined the presence of excitons with large binding energies.[1,2] Therefore, modulation of the surrounding dielectric constant significantly alters the strength of the Coulomb interactions and leads to changes in the exciton binding energy and band-gap renormalization which should be evident in the resulting spectra.[3] Until recently, CNTs were primarily studied in bulk, in suspensions, or coated in surfactants. We measure resonance excitation profiles (REPs) from individual suspended CNTs where the intensity of the Raman peak is plotted vs. excitation energy. We vary the humidity and monitor the shift of the REP peak of the radial breathing mode and the G-Band. We thereby directly measure the relative shift of the renormalized band-edge and exciton binding energy as a function of dielectric constant. [1] Wang, Science, 308, 838 (2005). [2] Maultzsch, arXiv, 0505150 (2005). [3] Perebeinos, PRL, 92, 257402 (2004).

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Date submitted: 28 Nov 2005 Electronic form version 1.4