Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Origin of the Terahertz Absorption Peak in Single-Walled Carbon Nanotubes QI ZHANG, LEI REN, H. GOJUKI, E.H. HAROZ, T. ARIKAWA, J. KONO, ECE Dept., Rice University, C.L. PINT, R.H. HAUGE, Chemistry Dept., Rice University, A.K. WOJCIK, A.A. BELYANIN, Dept. of Physics, Texas A&M Univ., ECE DEPT., RICE UNIVERSITY TEAM, CHEMISTRY DEPT., RICE UNIVERSITY COLLABORATION, DEPT. OF PHYSICS, TEXAS A&M UNIV. COLLABORATION — Single-walled carbon nanotubes (SWNTs) are promising for high-frequency electronics and terahertz (THz) applications, as well as for fundamental studies of finite-frequency dynamics of one-dimensional electronics. Previous studies of dynamic conductivities of various types of SWNTs have revealed a pronounced and broad absorption peak around 4 THz, whose origin has been a matter of controversy. Both the effects of curvature-induced band gaps and plasmonic absorption due to finite lengths have been proposed to be important, but a consensus has not emerged. We have studied 4THz peak in highly aligned and length-controlled SWNT films and metallically-enriched SWNT films through FTIR and THz time-domain spectroscopy. We provide evidence that this peak is observable only when the THz polarization is parallel to the nanotubes and only in metallic tubes. We will discuss the origin of this absorption peak in light of these new findings.

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Date submitted: 09 Dec 2010 Electronic form version 1.4