Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Collective electronic excitations in single wall carbon nanotubes RICARDO PEREZ, WILLIAM QUE, Ryerson University — Collective electronic excitations in single wall carbon nanotubes are studied theoretically, using a tight-binding model. Our results suggest that a new theoretical explanation is possible for the controversial nondispersive modes discovered in the electron energy-loss spectroscopy experiment of Pichler et al. on bulk carbon nanotube samples. These modes have been attributed by Pichler et al. to interband excitations between localized states polarized perpendicular to the nanotube axis. This interpretation has been challenged by a theorist Bose [2] who attributed the modes to optical plasmons carrying nonzero angular momenta. Both interpretations suffer from difficulties. We find that the nondispersive modes could be due to collective electronic modes in chiral carbon nanotubes, while the observed dispersive mode should be due to collective electronic modes in armchair and zigzag carbon nanotubes. Momentum-dependent electron energy-loss experiments on individual carbon nanotubes should be able to confirm or disprove this interpretation decisively. [1] T. Pichler et al., PRL 80, 4729 (1998). [2] S. M. Bose, Phys. Lett. A 289, 255 (2001).

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Date submitted: 17 Nov 2004 Electronic form version 1.4