Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Measurement of quantum capacitance in individual semiconducting single-walled[1] YANFEI YANG, Physics Department, Georgetown University, GEORGY FEDOROV, RRC Kurchatov Institute, Russia, SERHII SHAFRANJUK, Physics and Astronomy Department, Northwestern University, PAOLA BARBARA, Physics Department, Georgetown University, PHYSICS DEPARTMENT, GEORGETOWN UNIVERSITY TEAM, SERHII SHAFRANJUK COLLABORATION, GEORGY FEDOROV COLLABORATION — The capacitance of a carbon nanotube consists of its geometrical capacitance and its quantum capacitance. The latter is determined by the electronic density of states of the nanotube and the electron interactions, therefore it is a tool for probing fundamental electronic properties in carbon nanotubes, as well as an important parameter to design carbon nanotube electronic devices. The quantum capacitance of a carbon nanotube was first measured by using a capacitance bridge at 77K [1]. Here we extract the quantum capacitance of a semiconducting single-walled carbon nanotube in two one-dimensional subbands from electronic transport measurements at 4.2 K. We compare our results to other experiments and predictions from theoretical models.

[1] S. Ilani, L. A. K. Donev, M. Kindermann, and P. L. McEuen, Nature Physics, 2, 687, (2006).

[1]Funded by NSF, DMR-0907220

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Date submitted: 29 Dec 2010 Electronic form version 1.4