

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electron-phonon scattering effects on transport properties of carbon nanotubes - From diffusive to ballistic regimes - HIROYUKI ISHII, National Institute of Advanced Industrial Science and Technology (AIST), NOBUHIKO KOBAYASHI, University of Tsukuba, KENJI HIROSE, NEC Corporation — Recently, nanotechnology has fabricated various nanoscale electronic devices. In these systems, the mean free path is comparable to the system size. Therefore, it is important to understand how the transport property changes from the ballistic to the diffusive regimes by various scattering effects. In this work, we study the transport properties of carbon nanotubes using the time-dependent wave-packet approach [1]. Combining with the molecular dynamics simulations, we can treat the electron transport from diffusive to ballistic regimes from atomistic point of views [2]. We investigated the transport properties of metallic carbon nanotubes and the channel-length dependence of resistance from diffusive to ballistic regimes. The obtained mean free path and relaxation time are consistent with experimental observations. Furthermore, we investigate the mobility of semiconducting nanotubes. In the presentation, we will discuss the detail analysis of the origin of resistance. [1] H.Ishii *et al.*, Phys.Rev.B 76(2007) 205432 [2] H.Ishii *et al.*, to be published in Applied Physics Express.

Hiroyuki Ishii
National Institute of Advanced Industrial Science and Technology (AIST)

Date submitted: 21 Nov 2008

Electronic form version 1.4