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Electron-phonon scattering effects on transport properties of carbon nanotube devices using time-dependent wave-packet approach HIROYUKI ISHII, National Institute of Advanced Industrial Science and Technology (AIST), NOBUHIKO KOBAYASHI, University of Tsukuba, KENJI HIROSE, NEC Corporation — Single-walled carbon nanotubes have been expected as nanoscale electronic devices, because the nanotubes are very good conductors exhibiting ballistic transport properties. However, the electronic current is saturated by the electron-phonon coupling. To realize the application of carbon nanotube devices, understanding of the scattering mechanism is required. We investigated the electron-phonon coupling effect on the transport properties of the nanotubes with micron order channel length, using the time-dependent wave-packet approach under a tight-binding approximation [1]. The vibrational atomic displacements in real space are introduced through the time-dependent transfer energies. We solved the time-dependent Schrödinger equation and obtained the diffusion coefficients of the electronic wave packets. From these data, we can extract the mean free path and conductance. We clarified the difference of the phonon scattering effects on the conductance of the metallic nanotube and the semiconducting one. Furthermore we investigate the channel length dependence of resistance from ballistic to diffusive transport characteristics. [1] S. Roche *et al.*, PRL 95 (2005) 076803

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