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Effects of Electron-phonon scattering on Conductance of Carbon nanotubes using Time-dependent wave-packet approach[1] HIROYUKI ISHII, CREST-JST, NOBUHIKO KOBAYASHI, University of Tsukuba, KENJI HIROSE, NEC Corporation — The application of single-walled carbon nanotubes as the ideal ballistic conductors is expected. However, the electronic current saturates at the high-bias regime due to electron-phonon scattering. In order to improve the conductivity, understanding of the scattering mechanism is highly required. We investigated the electron-phonon coupling effect on the conductance in single-walled carbon nanotubes 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 change of the transfer energies. We solve the time-dependent Schrödinger equation and obtain the time-dependent diffusion coefficients of the electronic wave packets. From these data, we can extract the coherence length and then the conductance. We found that the optical phonon decreases the conductance of metallic carbon nanotubes, because the propagating speed of electron is reduced by the electron-phonon scattering. Furthermore, we clarify the difference of the scattering effects on the conductivity of the metallic nanotube and the semiconducting one. [1] S. Roche *et al.*, PRL 95 (2005) 076803

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