Intersection of two nanotubes: density of states modulated by plasmon beatings with period governed by Luttinger-liquid parameter\textsuperscript{1}

VAGHARSH MKHITARYAN, YUAN FANG, JORDAN GERTON, EUGENE MISHCHENKO, MIKHAIL RAIKH, Department of Physics, University of Utah — We study theoretically the plasmon scattering at the intersection of two metallic carbon nanotubes. We demonstrate that for a small angle of crossing, $\theta \ll 1$, the transmission coefficient is an oscillatory function of $\lambda/\theta$, where $\lambda$ is the interaction parameter of the Luttinger liquid in an individual nanotube. We calculate the tunnel density of states, $\nu(\omega, x)$, as a function of energy, $\omega$, and distance, $x$, from the intersection. In contrast to a single nanotube, we find that, in the geometry of crossed nanotubes, conventional “rapid” oscillations in $\nu(\omega, x)$ due to the plasmon scattering acquire an aperiodic “slow-breathing” envelope which has $\lambda/\theta$ nodes.

\textsuperscript{1}Supported by the Petroleum Research Fund, DOE and Research Corporation.