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Electrical and thermal transport in metallic carbon nanotubes
MARCELO KURODA, Beckman Institute and Dept. of Physics, University of Illinois at Urbana-Champaign, JEAN-PIERRE LEBURTON, Beckman Institute and Dept. of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign — The interpretation of the non-linear I-V characteristics of metallic single wall carbon nanotubes under electric stress has been particularly puzzling because the role played by Joule heating remains an open question [1]. In this talk, we present an electron transport model, which takes into account thermal heating in metallic single wall carbon nanotubes. The model is based on the solution of the Boltzmann equation in presence of electron-(optical)phonon scattering, in which heat production/dissipation determines self-consistently the local temperature in the nanotube. Not only does our model reproduce the features of the IV characteristics as a function of tube length but also predicts the electrical breakdown of the nanotube. This work is supported by the Beckman Institute and NSF through the National Computation Network at Purdue University. [1] P.G. Collins et al, Phys. Rev. Lett. 86, 3128 (2001)

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