DIPARTIMENTO DI FISICA "E.Fermi"
UNIVERSITÀ DI PISA
CORSO DI DOTTORATO IN FISICA
Largo B.Pontecorvo,3 - Edificio B-C
56127 PISA - ITALY

CORSO DI DOTTORATO IN FISICA
AVVISO DI SEMINARIO

Mercoledi 27 Febbraio 2008
ore 15:00

Dipartimento di Fisica
Largo B.Pontecorvo, 3
Sala 131 - piano terra - Ed. C

Prof. Francesco Mauri

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"Electron transport and hot-phonon generation in carbon nanotubes"

Abstract:
Metallic carbon nanotubes can carry the highest current density before they break. This makes them the best candidates as interconnects in future electronic devices. For voltages > 0.2 V, the measured IV curve of metallic tubes displays a sudden increase of the resistivity which is due to the scattering with optical phonons. Recently, we have shown [1,2] that the largest part of this electrical resisitivity is due to the presence of an anomalously-high optical-phonon occupation (hot phonons). Indeed, during transport, the conducting electrons scatter with optical phonons. If the rate at which optical phonons are generated is faster than the rate at which they can release energy to the system, their population increases. This hot-phonon generation, in turn, augments the electrical resistivity of the system. I will show that it is possible in practice to diminish the hot-phonon population and, thus, to improve the electrical performances of metallic tubes.

[1] Lazzeri, Piscanec, Mauri, Ferrari, Robertson, Phys.Rev.Lett. 95, 236802 (2005),
[2] Lazzeri, Mauri, Phys.Rev.B 73, 165419 (2006).
[3] Vandecasteele, Lazzeri, Mauri, to be published

G.Grosso