Physics
AT QUEENS COLLEGE

Colloquium Notice

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How to pass all this heat through a needle's eye: The quantum theory of nano-carbon thermal interconnects

New solutions for thermal management have been sought recently due to increasing density of dissipated power in modern sub-50 nm electronic devices. Heat transport in nanostructures is affected both by bulk thermal resistances and by thermal coupling across the interfaces between dissimilar materials. The interface thermal resistance, also known as a Kapitza resistance, is in the focus of this talk. Highest intrinsic thermal conductivity of nano-carbons (such as graphene and nanotubes), closest to or even exceeding the diamond, is not helpful enough until one can efficiently connect the nano-carbon to the substrate. We will show that the near-field radiation, or quantum-electrodynamic Kapitza conductance mechanism is the main term in the heat exchange between the polar substrate and graphene or tubes. Such quantum terms may be anticipated to allow a breakthrough in the existing thermal technologies, and, at least, change our understanding of the heat transport at the nanoscale, still largely based on the classical thermal physics.

Monday
March 5, 2012
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326