Dipartimento di Fisica
Università di Cagliari
INFN, Sezione di Cagliari

High Energy Physics Colloquia

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Thermal Transport in Low Dimensions

Abstract

The physics of many-body systems constrained in reduced spatial dimensions (1 and 2D) display many unusual properties. One of the issues that attracted a certain interest in the last decade is the problem of anomalous heat conduction in low-dimensional lattice models. Historically, this originates from the attempt to construct a minimal, non-perturbative theory of nonequilibrium stationary states and the quest for a rigorous microscopic foundation of phenomenological relations (as Fouriers law and heat equation). Moreover, many of the peculiarities of low-dimensional models turned out to be of interest by themselves, as examples of highly correlated, and thus complex, behavior. This leads to various forms of violation of the ordinary laws of diffusive heat conduction. Theoretical studies of low-dimensional transport were recently paralleled by those on phonon thermal transfer in nano- and microscale systems (nanotubes, nanowires, and even graphene).
I will expose some mathematical results were fractional heat equation emerges as universal behaviors governing the superdiffusion of energy, and at the interactions between mass transport and energy transport.

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