Colloquium Notice

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Wave Transport Through Disordered Media: Anderson and Anomalous localizations

Disorder effects on the transport of classical and matter waves (EM & electrons, for instance) have been widely investigated from fundamental and practical points of view. It is widely believed that the presence of disorder in 1D random media leads to an exponential spatial localization of waves, i.e., Anderson localization. We have recently proposed, however, a model of disorder that induces anomalous localization or delocalization of electrons in disordered quantum wires. Following that model, we provide experimental evidence demonstrating that anomalous localization of electromagnetic waves can be induced in microwave waveguides with dielectric slabs randomly placed: if the random spacing between the slabs follows a distribution with a power-law tail (Lévy-type distribution), unconventional properties in the microwave-transmission fluctuations take place revealing the presence of anomalous localization. We obtain both theoretical and experimental distributions of the transmission through random waveguides and show that only two parameters, both of them experimentally accessible, determined the complete transmission distribution.

Concerning matter waves (electrons), numerical simulations of disordered armchair graphene nanoribbons reveal the presence of anomalous electron localization, while the statistical properties of the conductance are also described by our model.

In this talk we will give some general and basic ideas of our theoretical framework (random-matrix theory) for describing wave transport phenomena in the presence of standard-Anderson and anomalous localizations.

Monday
September 26, 2016
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326