

Chez Pierre

Presents ...

Tuesday, May 15, 2012

10:30am

MIT Room 4-331



SPECIAL CHEZ PIERRE SEMINAR

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“Probing interactions in graphene by optical spectroscopy”

Single and few layer graphene have stimulated great scientific interest because of their distinctive properties and potential for novel applications. Although many of graphene’s properties can be explained within a simple picture of non-interacting electrons and phonons, some novel phenomena cannot be understood without considering the interactions between these elementary excitations. We have carried out time-domain and frequency-domain studies to investigate various interactions in graphene by means of advanced optical techniques. Using femtosecond lasers, we have studied the dynamics of hot carriers in graphene. The photoexcited charge carriers in graphene are found to interact very strongly with one another and with a set of strongly coupled optical phonons. By monitoring the carrier dynamics process using the spontaneous light emission of the excited carriers, we find that the carriers in graphene thermalize among themselves and decay through the emission of optical phonons on a time scale of only a few 10’s of femtosecond. In addition, we have investigated the infrared absorption by the interband electronic transitions and zone-center in-plane optical phonons in few-layer graphene. We find that the infrared activity and frequency of the optical phonons are strongly renormalized by their interactions with the electronic transitions. The infrared studies of few-layer graphene also reveal the interactions between electrons in different graphene layers. In particular, graphene trilayers with ABA and ABC stacking order are found to exhibit distinct electronic band structure and tunability of band gap.