北京大学量子材料科学中心

International Center for Quantum Materials, PKU

# Special Seminar

# Optoelectronics of Graphene-based Van der Waals Heterostructures

**Qiong Ma**

*Massachusetts Institute of Technology*

**Time: 4:00pm, May 10, 2016 (Tuesday)**

**时间: 2016年5月10日 （周二）下午4:00**

**Venue: w563, Physics building, Peking University**

**地点：北京大学物理楼，西563会议室**

## Abstract

The photoresponse of materials is governed by energy relaxation pathways of photo-excited electron-hole pairs. In graphene, due to frequent electron-electron collision and weak electron-lattice coupling, a novel transport regime is reached in which the photo-generated carrier population can remain hot while the lattice stays cool. In this talk, I will show that light is converted to electrical currents through a hot-carrier assisted thermoelectric effect in intrinsic graphene. The thermal energy slowly leaks to the lattice via two distinct processes of electron-phonon coupling that can be tuned by temperature and charge density. We also implemented a scheme to control the early behavior of photo-excited carriers before they collide with each other and ambient carriers to form a hot Fermi-Dirac distribution, which is realized in a graphene-boron nitride-graphene heterostructure.

The weak electron-phonon coupling and frequent electron-electron scattering revealed above strongly alter the nature of particle and energy transport, leading to a collision dominant fluid behavior for electrons. In the last part of the talk, I will discuss our observation of highly-ordered photocurrent patterns at the charge neutral point of graphene, which is likely related to ballistic thermal transport in the hydrodynamic regime.

## About the Speaker

Ms. Qiong Ma earned a BS in condensed matter physics from the University of Science and Technology in China in 2010 with the highest honor. She is currently a Ph. D student in the group of Prof. Pablo Jarillo-Herrero, Massachusetts Institute of Technology (MIT), and is anticipated to obtain her Ph. D in June 2016. Her research interests are on experimental investigation of fundamental physical processes of light-matter interactions in two-dimensional materials, such as graphene, boron nitride, transition metal dichalcogenides and heterostructures formed from these materials. She has published more than a dozen of papers, including first author or coauthor papers on Science, Nature Physics, and Phys. Rev, Lett.