Special seminar

Topological conducting channels in bilayer graphene

Jun Zhu

The Pennsylvania State University

Time: 2:00pm, June 8, 2016 (Wednesday)

时间: 2016年6月8日 （周三）下午2:00

Venue: w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Two-dimensional honeycomb lattices are characterized by a unique electronic degree of freedom, namely, valley, in the momentum space, which greatly enriches the physics of Dirac fermions. In analogy to electron spin, the manipulation of the valley index may open new pathways for electronic applications. In this talk, I will first give a brief overview of valley-derived phenomena in 2D honeycomb lattices. Then I will discuss our experimental effort in realizing the valley analogue of the quantum spin Hall effect in bilayer graphene. Theory predicts the existence of one-dimensional valley-momentum locked edge states (a.k.a. kink states) at the line junction of two oppositely gapped bilayer graphene sheets. I will describe the experimental realization and transport properties of such topological conducting channels. The kink states have a mean free path of a few hundred nanometers in the absence of a magnetic field but can exhibit conductance close to the expected ballistic limit of 4e^2/h in a magnetic field. Potential mechanisms of backscattering will be discussed. I will finish by briefly mentioning the prospect of a gate-controlled kink state electron beam filter and beam splitter.

About the Speaker

Jun Zhu received her B. S. from the University of Science and Technology of China in 1996. She obtained her PhD in physics from Columbia University (2003) working on the quantum Hall and fractional quantum hall physics in GaAs 2D systems. She was a postdoc at Cornell University from 2003-2005 before joining Penn State as an assistant professor in 2006. Her current research interest focuses on the electronic properties of two-dimensional materials, most notably graphene and graphene-derived materials.