北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Tunable Superconductivity in Bernal Bilayer Graphene/ WSe_2 Heterostructures

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Time: 3:00 pm, Oct.22, 2025 (Wednesday)

时间：2025年10月22日（周三）下午3:00

Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Robust superconductivity has been observed in both twisted multilayer graphene moiré and crystalline (moiréless) graphene systems, highlighting that high-quality graphene devices offer a highly tunable experimental platform for studying superconductivity. In this talk, I will present our recent study on the low-temperature transport properties of Bernal bilayer graphene (BBG) / WSe_2 heterostructure. Notably, we applied an external vertical electric field of up to 1.6 V/nm, revealing a rich phase diagram with multiple spontaneously symmetry-broken states and superconductivity on both hole- and electron-doped sides, as a function of carrier density and electric field. Additionally, we offered possible Fermi surface structures for these symmetry-broken states by analyzing quantum oscillations. Our findings not only provide important experimental constraints on understanding the nature of superconductivity in the graphene-based systems, but also pave the way for developing and manipulating superconducting quantum devices based on these systems.

About the speaker

Xiaoxue Liu is currently an associate professor at the Tsung-Dao Lee Institute, Shanghai Jiao Tong University. Before that she did her postdoctoral research at Brown University and received her Ph.D. degree from Peking University. Her research interests focus on exploring exotic quantum states of matters in low-dimensional electronic systems. Her recent work includes studies on superconductivity in both graphene-based moiré and moiréless systems, the Integer and Fractional Quantum Anomalous Hall effects in TMDc moiré superlattices, interlayer exciton condensate, etc.