Special Seminar

Probing strongly correlated quantum states in 2D material moiré superlattice

Guo Yu

Princeton University

Time: 10:00 am, May. 9, 2024 (Thursday)

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Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

In solid state materials, numerous electrons are interacting due to Coulomb interactions. In the strongly-correlated regime, interactions can give rise to intriguing quantum phenomena including the appearance of “fractionalized” excitations. Their investigation is critical to fundamental physics and future quantum technologies but is challenging in both material realization and experimental detection. 2D materials and their moiré structures offer a promising platform to search for and investigate such states. In this talk, I will provide a new example of strongly correlated quantum states, i.e. a 2D anisotropic Luttinger Liquid state in small-angle twisted bilayer WTe_2. This state exhibits three key transport characteristics, including (i) an exceptionally large in-plane transport anisotropy, (ii) a power-law scaled conductance in the hard direction and (iii) a distinct nonlinear differential resistance along the easy direction that features a vanishing value at zero bias. By tuning the twist angle, we demonstrate that such a 2D correlated state, akin to the 1D Luttinger liquid, can be stabilized down to at least 50 mK, providing a platform for further studying phenomena related to non-Fermi liquids.

About the speaker

Guo Yu is a graduate student in Sanfeng Wu group at Princeton University, working on quantum transport of two-dimensional materials. Before Princeton, she obtained bachelor’s degree at Physics Department, Tsinghua University in 2018. She will join Physics Department at Harvard University as a Harvard Quantum Initiative (HQI) postdoc fellow in fall 2024. Her research interest lies in developing next generation quantum devices and experimental probes for correlated 2D quantum states.