北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

The observation of quantum oscillations in correlated insulators of a moiré superlattice

杨威

中国科学院物理研究所

Time: 3:00pm, June. 16, 2023 (Friday)

时间：2023年6月16日 （周五）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

New phase of matter usually emerges when a given symmetry breaks spontaneously, which can involve charge, spin, and valley degree of freedoms. By twisting graphene multilayer to form a moiré superlattice, it leads to moiré flat band where various correlated states are developed. In this talk, I will discuss the correlated phases at half fillings in twisted double bilayer graphene (TDBG). We induce an isospin competition between spin and valley flavours by orbital Zeeman effect, and observe the resulting valley polarized correlated insulator [1] at half fillings. Moreover, the valley polarized correlated insulators are found hosting anomalous quantum oscillations (QOs) [2] with a period of 1/B, and the periodicity is strongly displacement field dependent. Our study suggests that TDBG is an excellent platform to discover exotic phases where correlation and topology are at play.

[1] Le Liu, Wei Yang*, et al., Isospin competitions and valley polarized correlated insulators in twisted double bilayer graphene, Nature Communications, 13, 3292 (2022).

[2] Le Liu, Wei Yang*, et al., Quantum oscillations in field-induced correlated insulators of a moiré Superlattice, Science Bulletin 68, 1127(2023). [arXiv: 2205.10025(2022)].

About the speaker

杨威，中国科学院物理研究所特聘研究员。2014年在中国科学院物理研究所获得凝聚态物理博士学位，先后在法国国家科学研究中心(CNRS)-巴黎高等师范学校(ENS) 和西班牙光子科学研究所(ICFO)从事博士后研究。2019年加入中国科学院物理研究所纳米实验室，获得国家人才青年项目支持，任“特聘研究员”，博士生导师。研究领域涉及石墨烯等低维量子体系的电学输运、高频(GHz)热输运、纳米机械振动等方面，近期关注转角多层石墨烯的量子输运及其奇异物性。担任《2D materials》“Focus on Twistronics in 2D Materials”专刊和《物理学报》 “二维转角莫尔超晶格” 专题的客座编辑。目前已在Nature及其子刊，PRL等发表SCI学术论文50余篇，总计被引用5000余次（Google Scholar）。