



北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Rational design of magnetic topological insulators

王靖

复旦大学



Time: 3:00 pm, Oct.15, 2025 (Wednesday)

时间: 2025年10月15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

The discovery of the quantum anomalous Hall (QAH) effect marked a milestone in the study of topological quantum states. Experimental realizations of the QAH effect span a range of material systems, yet all occur at liquid helium temperatures. Here we review the theoretical and experimental progress achieved in the field of magnetic topological insulators, beginning with the theoretical prediction of the QAH effect without Landau levels, and leading to the recent discoveries of antiferromagnetic topological insulators. We outline alternative approaches to make intrinsic magnetic topological insulators at higher temperatures by rational design as well as machine learning methods. We present distinctive mechanisms with two material examples: one is for integer QAH state and the other for fractional QAH state. This mechanism, where both magnetism and topology emerge cooperatively from d -orbital physics, suggests a broadly applicable design principle for engineering magnetic topological phases in correlated materials. Finally we discuss future perspectives.

About the speaker

王靖现为复旦大学物理学系“谢希德”青年特聘教授, 2011年于清华大学获博士学位, 2011年在美国斯坦福大学物理系进行博士后研究, 2015年在SLAC国家加速器实验室任副研究员, 2016年加入复旦大学物理学系。从事理论凝聚态物理研究, 将拓扑应用于固体电子态以及新物态和材料。发表论文80余篇, 引用13000余次。