Weekly Seminar

From frustrated quantum magnets to excitonic fractional quantum anomalous Hall states

Rui Wang 王锐

Nanjing University

Time: 3:00 pm, Apr.16, 2025 (Wednesday)

时间：2025年4月16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

Chiral topological orders have been a topical field of research in recent decades, particularly in the context of the fractional quantum Hall effect, chiral spin liquids, and related phenomena. In this seminar, I will introduce a novel type of chiral topological order in excitonic systems, referred to as the excitonic fractional quantum anomalous Hall (EFQAH) state. This state can be viewed as an excitonic analog of the chiral spin liquid that emerges in quantum spin systems. To begin with, I will present our recent work on frustrated quantum magnets, which suggests that hardcore bosons may fail to condense on a moat-like band, leading to long-range entangled states with spontaneous time-reversal symmetry (TRS) breaking. Building on this, I will demonstrate that, in excitonic systems with a similar moat-like band structure, TRS-breaking excitonic topological orders can also emerge as the ground state. These novel states give rise to intriguing experimental signatures that can be probed through magneto-transport measurements. Finally, I will discuss the potential extension of this theory to more general systems and explore its applications to Moire materials.

About the speaker

Rui Wang received his Ph.D. in Physics from Nanjing University in 2017. He then visited University of Houston and worked as a post doctor in Shanghai Jiao Tong University. In 2019, he returned to Nanjing University as a research fellow and was promoted to associate professor in 2021. His research primarily focuses on strongly correlated systems, with particular emphasis on novel quantum phenomena arising from the interplay between correlation and topology. Dr. Wang has published over 50 peer-reviewed papers in prestigious journals, including Nature, Physical Review Letters, Nature Materials, and Nature Communications. His work spans a range of topics, from quantum magnetism to unconventional Kondo phenomena.