FRONTIERS OF QUANTUM MATTER

量子物质前沿讲座

Conference Hall 104
Science Building
Tsinghua University

Counting holes in the Fermi sea ---- topological aspects of metals

Pok Man Tam (Princeton)

Tuesday, Jan 16 & Thursday, Jan 18 3:30PM

It is commonly known that the quantum ground state of a metal is characterized by a manifold in momentum space called the Fermi sea. Fermi sea can be distinguished topologically in much the same way that a bun can be distinguished from a donut by counting the number of holes. The associated topological invariant, i.e. the Euler characteristic (χ_F), serves to classify metals.

In this series of lecture, I will explain how χ_F is beyond a mathematical construct and carries important physical consequences. In the first lecture, we will discuss topological density correlation and multipartite entanglement that reflect χ_F , which may be measurable in fermionic ultracold atomic gases. In the second lecture, we will discuss quantized transport in solid-state settings that generalize the 1D Landauer conductance. Particularly, I will introduce a quantized rectification effect in planar Josephson junctions, which captures the topology of the proximitized metal.

Bio: Pok Man obtained B.Sc from Hong Kong University of Science and Technology in 2018 and graduated in 2023 with a PhD from University of Pennsylvania under the supervision of Prof. Charles Kane. He is currently a postdoctoral fellow in Princeton Center for Theoretical Science and has his research supported by the Croucher Foundation in Hong Kong. He is mainly interested in quantum condensed matter physics and its interplay with quantum information science and AMO physics.