



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

Topological Dirac Semimetal-Based Quantum Devices Towards 1D Topological Superconductivity

by

Professor Chuan LI (李川教授)
Physics Department
University of Twente, The Netherlands

Date: April 16, 2026 (Thursday)

Time: 2:30 - 3:30 p.m.

Place: Rm G26, Science Centre North Block, CUHK

ALL INTERESTED ARE WELCOME

Abstract

In this seminar, I will present our recent efforts to induce and probe superconductivity in topological Dirac semimetals. Using proximity coupling to conventional superconductors, we have demonstrated the emergence of superconducting transport in systems such as in Cd_3As_2 . Owing to the coexistence of bulk and surface states, these materials exhibit rich interference phenomena, including characteristic superconducting quantum interference patterns that allow us to distinguish different transport channels. In particular, the presence of surface Fermi arc states and their contribution to superconducting transport provide an important step toward understanding low-dimensional superconductivity in these systems.

Building on this platform, I will discuss our recent progress in $\text{Bi}_{1-x}\text{Sb}_x$, a second-order topological insulator (SOTI) hosting one-dimensional hinge states. We show that superconductivity can be preferentially established along these hinge channels, leading to edge-dominated supercurrents and signatures of unconventional Josephson effects. These results point toward the realization of effectively one-dimensional superconductivity in solid-state systems, where topology and reduced dimensionality combine to produce robust and potentially nontrivial superconducting states.

Overall, this work highlights topological Dirac materials as a powerful platform for engineering low-dimensional superconductivity, paving the way toward controllable topological superconducting devices.