

CTCP SEMINAR

Mesoscopic Non-Hermitian Physics and
Theory of Non-Hermitian Symmetry Breaking

Prof. Wei CHEN

School of Physics, Nanjing University

Tuesday, February 3, 2026, 4:00pm

Room 522, 5/F, Chong Yuet Ming Physics Building,

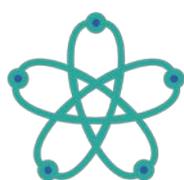
The University of Hong Kong

Abstract:

In condensed matter physics, various physical phenomena can be effectively described using Green's functions, typically corresponding to non-Hermitian Hamiltonians. Recent advancements in non-Hermitian physics have offered a fresh perspective to condensed matter physics, leading to exploration of non-Hermitian self-energies with intricate structures. One intriguing non-Hermitian phenomenon is the non-Hermitian skin effect, characterized by the nonreciprocal propagation of wave packets within the system and the accumulation of bulk states at open boundaries. In this talk, I will discuss the implementation and control of the non-Hermitian skin effect in mesoscopic electronic systems. Specifically, the conventional, spin-, and valley-resolved non-Hermitian skin effect can be realized through complex band engineering in mesoscopic heterostructures, resulting in nonreciprocal electron transport phenomena. This effect holds promise for the development of robust electronic devices, such as valley filters. Additionally, the application of a magnetic field can suppress the skin effect, providing an effective means for its control. In the second part of the talk, we will introduce a general framework for non-Hermitian spontaneous symmetry breaking. The transition of energy spectra from real to complex values, together with the accompanying spontaneous symmetry breaking of eigenstates, is one of the central topics in non-Hermitian physics. However, a complete and universal theory that characterizes the properties of individual energy levels has been lacking. By employing the complex path integral formalism and developing a generalized Gutzwiller trace formula, we establish a universal quantum-classical correspondence that precisely connects the properties of single energy levels to the symmetries of their corresponding semiclassical orbits. This physical mechanism applies broadly to systems with pseudo-Hermitian symmetries and provides practical insights for the precise control of non-Hermitian phenomena.

ANYONE INTERESTED IS WELCOME TO ATTEND!

HK Institute of Quantum Science & Technology,
Room525, Chong Yuet Ming Physics Building, The University of Hong Kong
Phone: 3917 1108



HK Institute of
Quantum Science & Technology
香港量子研究院



Department of Physics
THE UNIVERSITY OF HONG KONG