



Colloquium

Quantum Information Perspectives on Non-Hermitian Quantum Systems 非厄米量子系統的量子資訊觀點

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Time: 14:00

Abstract :

Non-Hermitian quantum systems exhibit many phenomena without Hermitian counterparts, including exceptional points, PT-symmetry breaking, and unconventional criticality. In this talk, I will show how ideas from quantum information and quantum geometry provide useful tools for understanding these systems. I will begin with generalized notions of fidelity and fidelity susceptibility for non-Hermitian Hamiltonians, and show how they diagnose exceptional points through the characteristic divergence of the real part of the fidelity susceptibility. I will then discuss general properties of fidelity in PT-symmetric systems and explain how these ideas extend to Dirac exceptional points, where the geometric response becomes strongly anisotropic. In the second part of the talk, I will turn to many-body entanglement in non-Hermitian systems. I will present generalized entanglement and Rényi entropies that capture non-unitary critical behavior and negative central charges, and discuss recent results on entanglement Hamiltonians in non-Hermitian spin ladders.

非厄米量子系統展現出許多在厄米系統中不存在的現象，包括 **exceptional points**、**PT** 對稱破缺，以及非常規的臨界行為。在這場演講中，我將說明量子資訊與量子幾何中的概念，如何成為理解這些系統的有力工具。我將先介紹適用於非厄米哈密頓量的 **fidelity** 與 **fidelity susceptibility** 的廣義定義，並說明它們如何藉由 **fidelity susceptibility** 實部的特徵性發散來診斷 **exceptional points**。接著，我將討論 **PT** 對稱系統中 **fidelity** 的一般性質，並進一步說明這些想法如何延伸到 **Dirac exceptional points**；在此情況下，幾何回應呈現出強烈的各向異性。在演講的後半段，我將轉向非厄米多體系統中的量子糾纏，介紹可用來刻畫非么正臨界行為與負中心荷的廣義 **entanglement entropy** 與 **Rényi entropy**，並討論近期關於非厄米自旋梯中 **entanglement Hamiltonian** 的結果。