北京大学量子材料科学中心

International Center for Quantum Materials, PKU

# Weekly Seminar

# From probing non-Hermitian band structures to soliton transitions


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**Time: 3:00 pm, Sept.23, 2026 (Wednesday)**

**时间：2026年9月23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


Non-Hermitian physics extends the Hermitian framework to incorporate dissipation and gain, giving rise to novel phenomena such as the non-Hermitian skin effect and exceptional-point-based sensing. Probing the underlying band structures, however, remains challenging, as both complex energies and complex momenta come into play. In the first part of this talk, I will introduce a non-Bloch supercell framework that addresses this challenge by recasting the imaginary components of wavevectors into engineered hoppings combined with twisted boundary conditions. Implemented in one- and two-dimensional acoustic crystals, it enables direct extraction of non-Hermitian band features, in agreement with real-space observations under open boundary conditions [1]. Building on this framework, we reveal that non-Bloch exceptional points are generically detached from the branch points of Riemann surfaces, and identify a novel geometric structure—the Whitney cusp—emerging from the intersection of branch points with generalized Brillouin zones [2]. The second part turns to the impact of non-Hermiticity on soliton formation and dynamics [3]. By constructing a soliton threshold diagram, we identify two distinct soliton families and the transitions between them. A Wannier-function-based nonlinear Hamiltonian shows that soliton formation hinges on the interplay between skin-mode localization and band nonreciprocity, which jointly suppress or enhance wave dispersion. Both families are dynamically accessible from bulk and edge excitations, opening a new arena for nonlinear non-Hermitian wave phenomena.



[1] Nature Communications (2026), https://doi.org/10.1038/s41467-026-77152-5.

[2] arXiv:2601.01886.

[3] National Science Review 13, nwag381 (2026).


## About the speaker

丁鲲2013年毕业于复旦大学物理学系并获博士学位，导师为周磊教授。2013-2018年，他于香港科技大学高等研究院和物理系先后担任博士后和科研助理教授，导师是陈子亭教授（Prof. C. T. Chan）；2019-2020年，他在英国帝国理工学院Sir John B. Pendry教授课题组从事博士后研究。2021年1月丁鲲加入复旦大学物理学系担任青年研究员(2024年12月升任教授)，近年来主要的研究方向为非厄米物理、卡西米尔物理、等离子体激元等相关研究。