21 Dec Tuesday 12:45 – 1:30 Chair: WANG Qinghai (王清海)

Non-Bloch Parity-Time Symmetry and Exceptional Points

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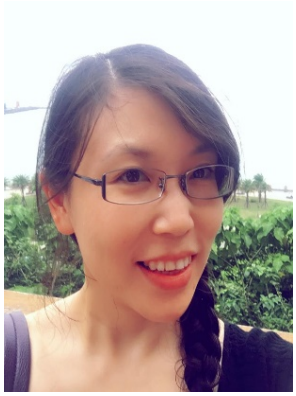

Professor XUE Peng is a Professor of Beijing Computational Science Research Center. Professor XUE received her Bachelor of Science degree in 1999 and a PhD in 2004 from University of Science and Technology of China supervised by Professor Guang-Can Guo. She continued research on quantum information science as postdoctoral at the University of Innsbruck, Austria, and then at the University of Calgary, Canada. Professor XUE joined the Physics Department of Southeast University in 2009. In 2018, she moved with her team to Beijing Computational Science Research Center. Professor XUE's current research interests belong in a broad sense to the field of physical implementation of quantum computing and quantum simulation ideas, especially on experimental realization of quantum information processing with linear optics. Apart from the design of interactions and quantum gates this research also includes the analysis of decoherence source as well as state preparation and measurement techniques as prerequisites for quantum computations. Due to the interdisciplinary character of this research field she has become interested in various physical systems, both from the field of linear optics, the field of atomic, molecular and optical physics, as well as the field of solid state physics. Her publications can be found at https://scholar.google.com/citations?hl=zh-CN&user=S8Ub3uoAAAAJ&view_op=list_works&sortby=pubdate

Abstract:

Parity-time (PT)-symmetric non-Hermitian Hamiltonians arise in open systems and, for the past two decades, have stimulated immense interests across many physical communities including photonics, phononics, and cold atoms. A central feature of a PT-symmetric Hamiltonian is the presence of exceptional points, which occur in between the exact PT phase (with entirely real eigen spectrum) and the broken PT phase (with complex eigen spectrum). At these exceptional points, the Hamiltonian features coalescing eigenstates and eigenenergies, and acquires a host of critical behaviors with abundant potentials for application. Since PT-symmetric systems are often implemented with spatially periodic structures, the location and critical phenomena of exceptional points are all characterized using the Bloch-band theory therein.

Here, we report the first experimental observation of PT symmetry and exceptional points beyond the Bloch band theory in spatially periodic systems, thus unveiling an entirely new class of exceptional points. Our "non-Bloch PT symmetry" and "non-Bloch exceptional points"
originate from the non-Hermitian skin effect, which is a unique non-Hermitian phenomenon that has fundamentally changed our understanding of non-Hermitian topology very recently. The scope of our work goes far beyond the topological phenomena and renews a central non-Hermitian concept: PT symmetry. Our work shows that non-Hermitian skin effect can be exploited as a general mechanism of PT symmetry and exceptional points.