筑波大学
University of Tsukuba

Condensed Matter Seminar
物性論セミナー

Supported by Variety and universality of bulk-edge correspondence in topological phases: From solid state physics to transdisciplinary concepts
Grant-in-Aid for Scientific Research (S) Project No.17H06138

2018年5月30日 (水), July 11 (Wed), 2018 13:30-14:30
自然系学系棟B棟６階: ６０２号室
[地図]

Topological Phases of Non-Hermitian Systems

Zongping Gong
Department of Physics, University of Tokyo

Recent experimental advances in controlling dissipation have brought about unprecedented flexibility in engineering non-Hermitian Hamiltonians in open classical and quantum systems. A particular interest centers on the topological properties of non-Hermitian systems, which exhibit unique phases with no Hermitian counterparts. However, no systematic understanding in analogy with the periodic table of topological insulators and superconductors has been achieved.

In this seminar, we introduce a coherent framework of topological phases of non-Hermitian systems [1]. We start with one-dimensional lattices, which exhibit topological phases with no Hermitian counterparts and are found to be characterized by an integer topological winding number even with no symmetry constraint, reminiscent of the quantum Hall insulator in Hermitian systems. A system with a nonzero winding number is shown to be robust against disorder, a phenomenon observed in the Hatano-Nelson model with asymmetric hopping amplitudes. We also unveil a novel bulk-edge correspondence that features an infinite number of (quasi-)edge modes. We then apply the K-theory to systematically classify all the non-Hermitian topological phases in the Altland-Zirnbauer classes in all dimensions. The obtained periodic table unifies time-reversal and particle-hole symmetries [2]. We provide concrete examples for all the nontrivial non-Hermitian Altland-Zirnbauer classes in zero and one dimension.

[1] ZG, Yuto Ashida, Kohei Kawabata, Kazuaki Takasan, Sho Higashikawa, and Masahito Ueda, arXiv: 1802.07964.
[2] Kohei Kawabata, Sho Higashikawa, ZG, Yuto Ashida, and Masahito Ueda, arXiv: 1804.04676.

Contact : T. Yoshida 吉田恒也 Tel:029-853-4535 Email: yoshida@rhodia.ph.tsukuba.ac.jp