

凝縮系物理学ゼミナール

Condensed Matter Theory Seminar

Date: 13:30-15:00, Wednesday, 13 November 2024

Title: Non-Hermitian Z_4 skin effect with glide symmetry

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Abstract:

In Hermitian systems, topological insulators and superconductors exhibit gapless boundary states induced by nontrivial topology of the bulk. In particular, under nonsymmorphic symmetry, it is known that unique boundary states emerge due to Z_4 topology [1]. On the other hand, it is elucidated that non-Hermiticity induces novel topological phenomena without Hermitian counterparts. A representative example is the non-Hermitian skin effect (NHSE) [2]. While NHSE is originally reported for systems with no symmetry, symmetry-protected NHSEs are also reported for systems with time-reversal symmetry [2] or reflection symmetry [3]. However, non-Hermitian topological phenomena induced by the above Z_4 topology remain elusive.

In our study [4], we show the emergence of an NHSE protected by glide symmetry, a type of nonsymmorphic symmetry. Our model is characterized by the Z_4 topological invariant ν . We elucidate that the NHSE emerges in models with $\nu = 1$ and 2. The NHSE characterized by $\nu=2$ appears only for boundaries where glide symmetry is closed. In addition, one-dimensional topology is trivial for the toy model with $\nu=2$. Furthermore, we observe that the NHSE is destroyed by perturbations preserving the relevant symmetry for $\nu=4$, which indicates that the NHSE is induced by Z_4 topology. The above results elucidate the non-Hermitian Z_4 skin effect protected by glide symmetry.

References :

- [1] K. Shiozaki, M. Sato, and K. Gomi, Phys. Rev. B 93, 195413 (2016).
- [2] N. Okuma, K. Kawabata, K. Shiozaki, and M. Sato, Phys. Rev. Lett. 124, 086801 (2020).
- [3] T. Yoshida, T. Mizoguchi, and Y. Hatsugai, Phys. Rev. Res. 2, 022062 (2020).
- [4] S. Ishikawa and T. Yoshida, Phys. Rev. B 110, 115301 (2024).