

凝縮系物理学ゼミナール

Condensed Matter Seminar

Date: 13:30-15:00, Wednesday, 15 November 2023

Title: Nonreciprocal charge transport in helical superconductors

Speaker: Prof. Akito Daido (Condensed Matter Theory Group)

Abstract:

Noncentrosymmetric materials show various nonreciprocal current responses including the magnetochiral anisotropy, nonlinear Hall effect, and superconducting diode effect [1,2]. They can serve as novel probes of noncentrosymmetric systems and are among the hallmarks of modern condensed matter physics. Further study of nonreciprocal phenomena would illuminate unprecedented phenomena in noncentrosymmetric materials.

In this talk, we theoretically study the intrinsic nonreciprocity in the charge transport of noncentrosymmetric superconductors under magnetic fields. It is known that Cooper pairs spontaneously acquire a finite center-of-mass momentum in such systems even in equilibrium owing to the magnetoelectric coupling of electrons by the Rashba spin-orbit coupling. We discuss the fingerprint of finite-momentum Cooper pairs in nonreciprocal charge transport such as the directional resistance and nonlinear Hall effect [3]. The obtained results uncover the novel aspect of finite-momentum superconductors and show that nonreciprocal charge transport offers a versatile probe of the finite-momentum superconductivity.

Reference :

- [1] Y. Tokura and N. Nagaosa, *Nat. Commun.* 9, 3740 (2018).
- [2] T. Ideue and Y. Iwasa, *Annu. Rev. Condens. Matter Phys.* 12, 201 (2021).
- [3] A. Daido and Y. Yanase, [arXiv:2302.10677](https://arxiv.org/abs/2302.10677).