

凝縮系物理学ゼミナール

Condensed Matter Seminar

(※ seminar is held online via zoom)

Date: **13:30-15:00**, Wednesday, 22th July 2020

“Chiral Photocurrent in Parity-Time Symmetric Magnet”

Speaker:

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Abstract:

Photocurrent response, rectified current generation by irradiating lights, is attracting much attention of scientific and engineering fields. Historically, the photocurrent response was associated with the ferroelectric order or with the heterostructure whose prototypical example is p-n junction. On the other hand, the bulk photocurrent induced by the microscopic inversion symmetry breaking has been arousing renewed interests. Recent experiments reported that the bulk photocurrent is unconventionally enhanced due to the topological electronic structure [1]. Despite these great interests, there are few studies of the photocurrent response in magnetic materials. The inversion symmetry breaking arising from the magnetic order has been highly discussed in multiferroics and antiferromagnetic spintronics.

In this talk, we discuss our recent work on the photocurrent response in such parity-violating magnets [2]. Making use of the perturbative treatments [3], we clarify the contrasting role of time-reversal (T) and parity-time-reversal (PT) symmetries and propose a circularly-polarized-photo-induced current in PT-symmetric magnets, named *gyration current*. The gyration current is the counterpart of the shift current which is unique to T-symmetric systems. We also reveal that the gyration current shows divergent behavior in the presence of the topological dispersions.

References:

- [1] e.g. J. W. McIver, D. Hsieh, H. Steinberg, P. Jarillo-Herrero, & N. Gedik, Nat. Nanotech. **7**, 96 (2011).
- [2] HW & Y. Yanase, arXiv:2006.06908; See also, J. Ahn & N. Nagaosa, arXiv:2006.06709
- [3] J. E. Sipe and A. I. Shkrebtii, Phys. Rev. B **61**, 5337 (2000).