

# 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, 7 October 2000

### “Strongly parity-mixed superconductivity in Rashba-Hubbard model”

Speaker:

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Abstract:

Recently, the artificial superlattices, such as  $\text{CeCoIn}_5/\text{YbCoIn}_5$ ,  $\text{CeCoIn}_5/\text{CeRhIn}_5$ , and  $\text{YbRhIn}_5/\text{CeCoIn}_5/\text{YbCoIn}_5$  was fabricated [1]. At the interface of heterostructures Rashba-type antisymmetric spin-orbit coupling (ASOC) arises, and therefore, the superlattice containing heavy ions is expected to be affected by the Rashba ASOC.

Motivated by these considerations, we study superconductivity in the two-dimensional Rashba-Hubbard model using fluctuation exchange approximation. We calculate the Fermi surfaces (FSs), magnetic susceptibility, and superconducting gap function. We show that FSs are robust in contrast to a previous theory [2]. Furthermore, we show that strongly parity-mixed superconductivity with dominant  $d$ -wave pairing is robust in a whole parameter range in contrast to the proposal in Ref. [3]. Interestingly, the parity mixing is enhanced and the subdominant spin-triplet pairing has a magnitude comparable the spin-singlet pairing. We find signatures of the type-II van Hove singularity, such as the Lifshitz transition of FSs, strong instability to commensurate antiferromagnetic order, and the spin-triplet gap function changing from  $p$ -wave to  $f$ -wave [4].

References:

- [1] M. Shimozawa, S. K. Goh, T. Shibauchi, and Y. Matsuda, Reports on Progress in Physics 79, 074503 (2016).
- [2] Y. Fujimoto, K. Miyake, and H. Matsuura, JPSJ 84, 043702 (2015).
- [3] A. Greco and A. P. Schnyder, Phys. Rev. Lett. 120,177002 (2018).
- [4] K. Nogaki and Y. Yanase, arXiv:2006.05952 (2020).