

凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: 13:30-15:00, Wednesday, 22 July 2015

Ab initio study on superconducting gap structure in UPt₃

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Abstract:

Heavy Fermion compound UPt₃ has been long regarded as a rare candidate for the spin-triplet superconductor. Until now, the most prominent macroscopic theories consistent with observations have been considered as E_{1u} and E_{2u} scenarios originally proposed by K. Machida [1] and C. Choi [2] respectively. Although both theories have a drawback and an advantage, recently performed thermal transport measurement [3] seems to support the E_{1u} scenario because the two-fold symmetry observed in C phase is incompatible with the E_{2u} scenario. However, the specific heat measurement [4] in a rotated magnetic field detects no signature of in-plane symmetry breaking in all phases, and that appears to suggest the importance of multi-band nature of UPt₃.

In the present study, we investigated the superconducting gap structure in UPt₃ based on the first principles calculations and found the gap functions belonging to E_{2u} representation, which may reconcile the two conflicting experimental observations. In this seminar, I will speak about previous studies on the superconductivity of UPt₃ and details of our calculations.

Reference:

- [1] K. Machida, T. Nishira, and T. Ohmi, J. Phys. Soc. Jpn. **68**, 3129 (1998).
- [2] C. Choi and J. A. Salus, Phys. Rev. Lett. **66**, 484 (1991).
- [3] Y. Machida *et. al.*, Phys. Rev. Lett. **108**, 157002 (2012).
- [4] S. Kittaka *et. al.*, J. Phys. Soc. Jpn. **82**, 024707 (2013).