

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)

Time and date: 13:30 – 15:00, Wednesday, 26 Jun 2013

Strong-coupling effects on the coexistence of superconductivity and antiferromagnetism induced by paramagnetic pair-breaking.

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Abstract:

In the high-field low-temperature (HFLT) phase of a heavy fermion superconductor CeCoIn_5 , where a long-sought FFLO state is thought to be realized, antiferromagnetic (AFM) order is observed, but not in the normal phase or the usual SC phase [1]. In our previous study based on the weak-coupling BCS model [2,3], we found that paramagnetic pair-breaking (PPB) effect induces AFM order in a d-wave SC phase in a high-field region. This mechanism explains the unusual AFM ordering of CeCoIn_5 . However, because strong-coupling superconductivity is realized in CeCoIn_5 , it is important to investigate how the PPB-induced AFM ordering is affected by the strong-coupling effects.

In this study, we investigated PPB-induced AFM ordering in a strong-coupling SC phase by applying FLEX approximation to the quasi-2D Hubbard model including paramagnetic effect. It is shown that PPB-induced AFM order is realized in a high-field SC phase by the same mechanism as the weak-coupling model, and that the strong-coupling effects influence on the PPB-induced AFM ordering through quasiparticle renormalization and SC gap amplitude. We also report the model parameter dependence of the PPB-induced AFM ordering.

References:

- [1] M.Kenzelmann *et al.*, Science **321**, 1652 (2008).
- [2] R.Ikeda, Y.Hatakeyama and K.Aoyama, Phys. Rev. B **82**, 060510 (2010).
- [3] Y.Hatakeyama and R.Ikeda, Phys. Rev. B **83**, 224518 (2011).