

# 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, 11 January 2017

### “Superconducting fluctuation under magnetic fields in the strong-coupling regime”

Speaker:

Kyosuke Adachi (Condensed Matter Theory Group)

Abstract:

Superconducting fluctuation (SCF), or metastable Cooper pair, emerges near the superconducting-transition temperature ( $T_c$ ). In superconductors with high  $T_c$  or short coherence length such as the cuprates, SCF has an important effect on thermodynamics and transport properties. In magnetic fields, in particular, the mode-coupling effect of SCF creates the vortex-liquid state [1].

Recently, anomalously large SCF effects on the diamagnetic response have been observed in FeSe [2], one of the iron-based superconductors. On the other hand, electrons in FeSe is considered to attractively interact each other in the strong-coupling BCS-BEC crossover regime [3]. Therefore, it is important to theoretically consider the SCF effects in the strong-coupling regime. In this study, we investigate the SCF effect particularly on specific heat and diamagnetism. We obtain the following results: (i) the mean-field transition can vanish due to the shift of chemical potential, and (ii) the mode-coupling effect leads to large thermodynamic response, which is qualitatively consistent with the experiment on FeSe.

References:

[1] R. Ikeda *et al.*, J. Phys. Soc. Jpn. **58**, 1377 (1989).

[2] S. Kasahara *et al.*, Nat. Commun. **7**, 12843 (2016).

[3] S. Kasahara *et al.*, Proc. Natl. Acad. Sci. U.S.A. **111**, 16309 (2014).