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)
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Topological phase in a two-dimensional metallic heavy-fermion system

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Abstract:

In these years, realizations of topological phases are theoretically proposed in strongly correlated electron systems, and correlation effects on topological phases are extensively studied. Very recently, theoretical and experimental studies suggested that SmB_6, a representative example of Kondo insulators, possesses a non-trivial structure [1-4].

Motivated by these studies, we have analyzed topological phases in heavy-fermion systems with dynamical mean field theory and the numerical renormalization group. In this talk, we report on a topological insulating state in a heavy-fermion system away from half-filling, which is hidden within a ferromagnetic metallic phase [5]. In this phase, the cooperation of the RKKY interaction and the Kondo effect, together with the spin-orbit coupling, induces a spin-selective gap, bringing about topologically non-trivial properties. This topological phase is robust against a change in the chemical potential in a much wider range than the gap size. Its topological properties support a gapless chiral edge mode, which exhibits a non-Tomonaga-Luttinger liquid behavior due to the coupling with bulk ferromagnetic spin fluctuations. The effects of the spin fluctuations on the edge mode could be detected via the NMR relaxation time measurement.

Reference:

[1] T. Takimoto *et al.*, J. Phys. Soc. Jpn. **80**, 123710 (2011).
[2] L. Fu *et al.*, Phys. Rev. Lett. **110**, 096401 (2013).
[3] J. Botimer *et al.* arXiv:1211.6769
[4] X. Zhang *et al.*, Phys. Rev. X **3**, 011011 (2013)
[5] T. Yoshida *et al*, Phys. Rev. B **87**, 165109 (2013).