

凝縮系物理学ゼミナール

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「Ferromagnetic spin fluctuations and superconductivity in UCoGe」

Observations of superconductivity in the vicinity of quantum critical points (QCP) have been reported in several systems. For such a kind of superconductivity, it is considered that the pairing mechanisms would be related to the critical fluctuations near the QCPs, and a lot of theoretical and experimental work have been dedicated to confirm the scenario of the fluctuation-mediated superconductivity in actual materials. However, in spite of these efforts, there has been a small number of direct evidence for it. Establishing a direct relation between the critical fluctuations and the superconductivity in a system near a QCP will give deep insights not only for the system but also for other quantum critical systems.

We discuss the pairing mechanism of the superconductivity in recently discovered heavy fermion system UCoGe ($T_c \sim 0.6$ (K))[1]. On the one hand, there exist characteristic Ising spin fluctuations in UCoGe related to the ferromagnetism with $T_{\text{Curie}} \sim 2.5$ (K). On the other, the upper critical field H_{c2} shows anomalous behaviors, such as the strongest field angle dependence among all the 3-dimensional superconductors ever discovered. We study the relation between these two and find clear-cut evidence for the spin-fluctuation-mediated superconductivity with triplet pairing in UCoGe. Some feature studies and remaining problems will also be discussed.

[1] For a review, A. Gasparini *et al.*, J. Low Temp. Phys. 161 (2010) 134-147.