

758th ASRC Seminar

Date: 令和元年6月20日(木)

13:30~14:30

Location: 第1センター会議室

Speaker: 堀田貴嗣氏

(首都大学東京 理学研究科)

Title: Microscopic theory of Γ_3 quadrupole ordering in Pr compounds on the basis of a j-j coupling scheme

Abstract:

In recent decades, multipole ordering in f^2 -electron systems such as Pr and U compounds have attracted continuous attention in the research field of condensed matter physics. In fact, peculiar modulated antiferro Γ_3 quadrupole ordering in PrPb₃ has been reported in 2005 [1], but the mechanism has been still under debate. To understand such incommensurate Γ_3 quadrupole ordering in PrPb₃, we develop a microscopic theory of multipole ordering in f^2 -electron systems from an itinerant picture by exploiting a j-j coupling scheme [2]. For the purpose, we introduce the Γ_7 - Γ_8 Hubbard model on a simple cubic lattice with the effective interactions which induce local Γ_3 doublet states. By evaluating multipole susceptibility in a random phase approximation, we find that the hybridization between Γ_7 and Γ_8 orbitals plays a key role for the emergence of Γ_3 quadrupole ordering. We propose that Γ_3 quadrupole ordering can be explained from a combined concept of “multipole nesting”, which contains a couple of pieces of information about nesting properties and multipole density distribution on the Fermi surfaces.

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