Multipole Ordering Scenario for Hidden Order Phase in URu₂Si₂

Tetsuya Takimoto*

Asia Pacific Center for Theoretical Physics, Korea

*Email of Presenting Author: takimoto@apctp.org

<u>Abstract</u>

It is known that URu_2Si_2 shows a second-order transition at $T=T_0=17.5$ K in the ambient pressure [1], where the order is called "hidden order", because the order parameter is not clarified yet. Increasing the pressure, T_0 increases monotonously, and the compound shows a transition from the hidden order phase to the antiferromagnetic phase. The type of this transition is regarded as a first-order one under the observation of staggered magnetic moment in the high pressure phase.

W regard the order parameter of hidden order as a multipole moment of f-electron state belonging to j=5/2 multiplet, which provides multipole moments up to rank 5. These multipole moments are classified according to representations of the point group of the compound.

In order to confirm the suitable multipole moment, we calculate directly instabilities of all types of multipole ordered states within and beyond RPA, using an actual electronic band structure. As a result, we have suggested that the order parameter of hidden order is a dotriacontapole moment (rank 5) belonging to a two dimensional representation with the time reversal odd parity [2].

References:

- [1] T.T.M. Palstra et al., Phys. Rev. Lett. 55, 2727 (1985).
- [2] H. Ikeda et al., Nature Phys. 8, 528 (2012).

About the speaker

Prof Tetsuya Takimoto obtained his PhD at Science University of Tokyo in 1997. Since his student time, he studied magnetism and unconventional superconductivity. In these years, his interest is in these phenomena, especially, in orbital degenerate systems. His recent research interest includes topological insulator/superconductor.