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, 3 July 2019

“Relation between exceptional points and the Kondo physics in f-electron materials”

Speaker:

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Abstract:

The phenomena described by the non-hermitian Hamiltonian has been intensively studied especially in the context of artificial quantum systems[1-4]. Effective non-hermitian Hamiltonian induces novel topological phases[1,2], unusual critical phenomena[3], enhanced sensitivity[4] , and so on.

In the open quantum systems(OQS), such as cold atomic systems, it is possible to derive an effective non-hermitian Hamiltonian under certain conditions even though the Hamiltonian describing the total system is hermitian. However, as the system becomes larger, it becomes difficult to experimentally realize these conditions, such as post selection or a PT-symmetric setup. Thus, experiments about nonhermitian phenomena in artificial quantum systems are particularly done in one-dimensional or small systems.

On the other hands, in strongly-correlated electron systems(SCES), it is also possible to derive the effective non-hermitian Hamiltonian determining the spectral function[5]. In this case, the non-hermiticity comes from the scattering by interaction and the certain setup, such as post selection or PT-symmetric setup, is not necessary. Thus, it seems to be easier to observe the bulk 2D or 3D non-hermitian phenomena in SCES than in OQS. The non-hermitian physics in SCES also hold the potential to explain the pseudo-gap in curate superconductors or quantum oscillation[6] in the topological Kondo insulator SmB6 and YbB12. Therefore, the non-hermitian physics in SCES is also studied intensively today.

We studied the non-hermitian phenomena induced by the self-energy in the Kondo regime of 2D f-electron materials by using the DMFT/NRG. We elucidate the relation between the appearance of the exceptional points, which are the unique in the non-hermitian Hamiltonian, and the transition from the metal at high temperature to the Kondo temperature or heavy fermion state at low temperature. We also reveal that the effective non-hermitian Hamiltonian in SCES have higher-dimensional non-hermitian property than in OQS because of the ω-dependence of the effective Hamiltonian. In this seminar, I will shortly explain about the difference between the non-hermitian Hamiltonian in SCES and that in OQS and talk about our recent work[7]. I look forward to your participation.

References:

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