Talk 11, 9:00–

Orbital Kondo Effects in Quantum Dot Systems – Application of Exact Solution –

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We discuss two topics of the orbital Kondo effects in quantum-dot systems. We first study the Kondo effect in multiple-dot systems for which the inter- as well as intra-dot Coulomb repulsions are strong. The application of the Ward-Takahashi identity enables us to analytically calculate the conductance for a double-dot system in terms of the exact solution of the $SU(4)$ Anderson model. It is elucidated how the inter-dot "orbital" Kondo effect enhances or suppresses the conductance under gate-voltage or magnetic-field control. We then extend our analysis to multiple-dot systems by using the exact solution of the $SU(N)$ Anderson model.

We then investigate the multi-orbital Kondo effect in a single-dot system. We again make use of the exact solution to investigate the low-temperature conductance for the two-orbital $SU(4)$ and the three-orbital $SU(6)$ Kondo effect. It is remarkable that the zero-temperature conductance in the two-orbital case does not depend on magnetic fields. By taking into account the change in the effective Kondo temperature, we can qualitatively reproduce the temperature-dependent conductance observed for a carbon nanotube quantum dot. We further extend our analysis to the three-orbital case, which is in accordance with the recent transport measurement of Tarucha's group for a lateral quantum dot.