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Out-of-equilibrium transport phenomena through a quantum dot in a magnetic field

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Recently the mesoscopic devices have provided new stages to study the many-body problems. As an interesting feature it becomes possible to investigate the physics in the fully nonequilibrium states. One of attractive topics is the nonequilibrium Kondo effect at a dot. Many authors have tried to explore the Kondo effect in the nonequilibrium situations. However a fully satisfying theory is not still obtained. Recently we have shown that the fourth-order perturbation theory in U for the symmetric case may provide a unified approach to the Kondo transport in the wide range of the voltage. Here we develop it to include the effect of a magnetic field. In order to consider the magnetic field, we introduce a procedure to self-consistently determine a molecular field based on the Keldysh formalism. Both magnetic and transport properties of the Kondo effect under a finite bias voltage is discussed.

Keywords : nonequilibrium Kondo effect