

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, 8 June 2011

“The Anderson impurity model: a DMRG study”

Speaker: **Dr. Robert Peters** (Department of Physics, Kyoto University)

Abstract:

Impurity models can be considered as the most basic models for strongly correlated electron systems. Nevertheless, there is a wide range of applications and interesting effects. The situations in which such impurity models are encountered range from “real” impurities in metals, like cobalt in copper, artificial created nano-structures, to dynamical mean-field theory (DMFT). Besides their wide usage, also the physical effects inherent are very interesting. The most famous finding is the Kondo-effect, which manifests itself as a narrow resonance in the single-particle spectrum of *e.g.* the Anderson impurity model.

I am going to study single- and multi-impurity models using the density matrix renormalization group (DMRG). I will especially focus on the calculations of spectral functions. A big advantage of DMRG is the possibility to calculate spectral functions for real frequencies, at zero temperature, with homogeneous resolution for all frequencies. A disadvantage is an intrinsic broadening, which limits the resolution. I am going to show a way how to improve the resolution by using complete diagonalization of Hamiltonians created by the DMRG basis. This will allow for calculating unbroadened spectral functions or changing the broadening. Besides spectral functions I will also include a discussion on the Kondo screening cloud, how the impurity spin degree of freedom is screened by the non-interacting conduction band electrons.