清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: **Kondo Effect in Cold Atoms**

Speaker: **Prof. Y. Avishai (*Ben-Gurion University*)**

Time: **3:30pm, Monday, 2016-08-08**

Venue: **Conference Hall 322, Science Building, Tsinghua University**

Abstract

Motivated by the impressive recent advance in manipulating cold fermionic atoms I will focus on two problems involving magnetic impurities. Experimentally it requires the preparation of a Fermi sea of cold atoms that are confined by a shallow harmonic potential and a trapping of a few other atoms (that serve as magnetic impurities) in specially designed optical potential. When there is an antiferromagnetic exchange interaction between the itinerant atoms in the Fermi sea and the localized magnetic impurity it gives rise to the Kondo effect.

The first problem employs the fact that fermionic atoms can have spin $s>\frac{1}{2}$ and thereby the magnetic impurity is over-screened. At low temperature, such system displays a non-Fermi liquid behaviour. We establish a theoretical analysis of interacting cold fermionic atomic systems that are governed by an effective Hamiltonian whose low energy physics displays an over-screening by large spin. In addition, we indicate candidate systems in which it can be experimentally realized.

In the second part we explore and substantiate the feasibility of realizing the Coqblin-Schrieffer model in a gas of cold fermionic ^{173}Yb atoms. Making use of different AC polarizabillity of the electronic ground state (electronic configuration $^1S_0$) and the long lived metastable state (electronic configuration $^3P_0$), it is substantiated that the latter can be localized and serve as a magnetic impurity while the former remains itinerant. The exchange mechanism between the itinerant $^1S_0$ and the localized $^3P_0$ atoms is analyzed and shown to be antiferromagnetic. The ensuing SU(6) symmetric Coqblin-Schrieffer Hamiltonian is constructed. A number of thermodynamic measurable observables are calculated in the weak coupling regime $T>T_K$ (using perturbative RG analysis) and in the strong coupling regime $T<T_K$ (employing known Bethe ansatz techniques).

http://www.castu.tsinghua.edu.cn Contact: Li Li (62789984, castu03@tsinghua.edu.cn)