北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Heavy Fermion: an Ideal System of Quantum Materials

Xin LU

Zhejiang University

Time: 4:00pm, Dec. 6, 2017 (Wednesday)

时间：2017年12月6日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Heavy fermions have served as an ideal prototype of strongly correlated electron systems (SCES), where exotic quantum states emerge due to the hybridization between localized ***f*** and conduction electrons, such as anti-ferromagnetism (AFM), superconductivity and quantum criticality etc.

In the first part of the talk, I will discuss the multipolar ordered states in some heavy fermions, generally referred as “hidden order”. In contrast to the dipole moments in AFM, multipole interactions of *f* electrons dominate due to the crystal electric field and multipolar order emerges at low temperature in a local *f* scenario. However, our point-contact spectroscopy studies on the hidden order in URu_2Si_2 and $PrFe_4P_{12}$ suggest their itinerant nature and an itinerant mechanism of multipolar order has been proposed accordingly. In the second part, an anomalous Kondo semiconductor system $CeRu_2Al_{10}$ has been studied, where its Kondo semiconducting behavior is interrupted by a long-range AFM order with T_N~27 K and our point-contact data reveal an AFM gap formation around Fermi surface below T_N. Both systems suggest the dichotomy of localization and itineracy in *f* electron systems where rich physics emerges due to their delicate balance.

About the speaker

Dr. Xin LU (路欣) obtained his bachelor degree from Peking University in 2003 and Ph. D degree from University of Illinois at Urbana-Champaign in 2009. He worked in Los Alamos National Laboratory as a postdoc researcher from 2010 to 2012 and is currently professor at the Center for Correlated Matter at Zhejiang University. His research now focuses on experimental studies on quantum criticality and superconductivity in heavy fermion systems under extreme conditions (high pressure & low temperature…).