



Seminar

“Spin Density Wave and Superconductivity in Iron Pnictides LaOFeAs”



Dr. Sen Zhou (周森)

Boston College and Rutgers University

- **Time: 4:00pm, Sept. 13, 2011 (Tuesday)**
- **时间: 2011年9月13日 (周二) 下午4:00**
- **Venue: Room 607, Conference Room A, Science Building 5**
- **地点: 理科五号楼607会议室**

Abstract

The discovery of superconductivity in the iron pnictides LaOFeAs and the subsequent increase in the transition temperature T_c exceeding 50 K in the same family of compounds has sparked enormous interest in this class of material. The parent compound exhibits metallic spin density wave (SDW) phase, while the unconventional superconductivity (SC) emerges upon sufficient doping. It is important to understand the SDW and SC phases to understand this material.

In this talk, we shall show that correlation effects are essential to stabilize the metallic SDW phase for the intermediate correlations appropriate for iron pnictides. The ordered moments depend sensitively on Hund's rule coupling J but weakly on the intraorbital Coulomb repulsion U , varying from $0.3 \mu_B$ to $1.5 \mu_B$ in the range $J = 0.3 \sim 0.8$ eV for $U = 3 \sim 4$ eV. We study the magnetic phase diagram, the evolution of the Fermi surfaces with the ordered moment, the effects of electron doping and compare to recent experiments.

We present a scenario for iron pnictides superconductivity mediated by charge fluctuations that are strongly enhanced by Fe-As intersite electronic interactions. The charge fluctuations induced by p-d charge transfer and As orbital polarization interactions in the Fe-pnictogen structure peak at wavevectors $(0, 0)$, and $(\pi, 0)$ and (π, π) respectively. Intraorbital pairing attraction develops at these wavevectors and the solution of the linearized Eliashberg equation shows robust s-wave superconductivity with both s_{π} and s_{++} symmetry. Possible signature of strong charge fluctuations in this compound are also discussed.

About the Speaker

周森, 1999年于厦門大學物理系取得理學學士學位, 2007年于波士頓學院物理系取得理學博士學位。2007年至2009年在美国国家高磁场实验室做博士后研究, 2009年至今在美国波士頓學院和羅格斯大學做助理研究員。研究反常凝聚態物理理論, 尤其是强相關材料的理論研究。此前從事過对銅氧化合物, 納鈷氧化合物, 和鐵基超導体的研究, 在Phys. Rev. Lett., Phys. Rev. B, EuroPhys. Lett., 和 Nature 等杂志上发表过十余篇论文。