北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Competing orders and symmetry breaking in underdoped cuprates

Yuxuan Wang

Time: 10:00am, June. 09, 2015 (Tuesday)

时间：2015年06月09日 （周二）上午10:00

Venue: Room W563, Physics Building, Peking University

地点：北京大学物理楼 西563

Abstract

Recent experiments have provided strong evidence that there exist incommensurate static charge-density-wave (CDW) order with momenta (Q,0) and (0,Q) in underdoped cuprates. In the same doping range and at higher temperatures, there are evidence for broken rotational symmetry and broken time-reversal symmetry. In this talk we argue that magnetically-mediated interaction, which is known to give rise to d-wave superconductivity, can also lead to CDW order. We will then discuss the interplay between different charge order parameters and show that rotational symmetry and time-reversal symmetry are both broken in the ground state. Going beyond mean-field analysis we show that these discrete symmetries indeed get broken at higher temperatures than the CDW onset temperature.

In the second part, we show an SU(2) particle-hole symmetry of the model leads to the coexistence of CDW order and a pair-density-wave (PDW) order, the latter defined as a superconducting order with a finite total Cooper pair momentum. The PDW order has been argued to exist in the pseudogap region, and we show the coexistence of CDW and PDW explains ARPES data. We make specific predictions for experiments. .

About the speaker

Yuxuan Wang was born in Jiangsu in 1988. He obtained his B.S. in physics in 2009 from Yuanpei College, PKU. He will soon obtain his PhD in physics in July 2015 from University of Wisconsin-Madison, USA. In August 2015 he will start working as a Gordon and Betty Moore postdoctoral fellow at University of Illinois at Urbana-Champaign. During his PhD research, his interest has focused on theoretical studies of unconventional superconductivity, and competing orders and pseudogap physics in cuprates.