



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: Competing orders and symmetry breaking in underdoped cuprates

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Time: 4:00pm, Monday, June 8, 2015

Venue: Conference Hall 322, Science Building, Tsinghua University

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.