

T_cSUH Special Seminar

Texas Center for Superconductivity at the University of Houston



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“Pseudogap, Superconducting Energy Scale, and Fermi Arcs in Cuprate Superconductors”

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Room 102, University of Houston Science Center

4:00 p.m. – 5:00 p.m.

Abstract

Through low temperature specific heat and point contact tunneling measurement, we investigated the pairing symmetry and low energy quasiparticle excitation behavior in cuprate superconductors. The following conclusions are drawn:

1. For hole doped samples, the Volovik's relation predicted for the d-wave pairing symmetry has been well demonstrated by low temperature specific heat in wide doping regime in $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$. This is supported by the tunneling spectrum with a zero-bias-conductance peak along nodal direction. The nodal slope of the superconducting gap is thus derived and is found to follow the same doping dependence of the pseudogap Δ_p . Both indicate a close relationship between the pseudogap and superconductivity.
2. Still in the hole-doped side, it is also found that the critical temperature T_c is determined by the multiplication of the nodal gap slope and the residual Fermi arc length.
3. For electron doped samples, both specific heat and tunneling measurements reveal an unavoidable s-wave component which may be explained by the two-band and thus two-gap pictures. The evidence for pseudogap is presented from the tunneling data under a high magnetic field for electron-doped samples. It is found that the pseudogap does not change with temperature instead of being filled up by thermal excitation.

These observations put strong constraints on the theoretical models of high temperature superconductors.

Bio

Hai-Hu Wen is Director of the State Key Laboratory for Superconductivity, Chinese Academy of Sciences (since 2000) and Research Fellow at the Institute of Physics, Chinese Academy of Sciences (since 1998). He received his Ph.D. in 1991 from the Plasma Institute of Physics, Chinese Academy of Sciences and was a Postdoctorate Researcher at the Physics Department, Free University, Amsterdam, The Netherlands. 1991-1993, and an Alexander von Humboldt Fellow at the Physics Department, Ulm University, Germany, 1996-1998. His research interests include: flux dynamics and vortex phase diagram of superconductors; high- T_c mechanism (electronic phase diagram, ground state properties, low lying quasiparticle excitations, transport and thermal properties); and new doped Mott insulators (ground state properties and QCP etc.).

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