LSU LOUISIANA STATE UNIVERSITY

PHYSICS & ASTRONOMY WEEKLY CALENDAR

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WEEKLY CALENDAR

April 14, 2008

Departmental Colloquium

"High-Tc Superconductivity: Summing Up"

3:40 PM – Thursday, April 17, 2008

109 Nicholson Hall

Dimitrii Basov

University of California, San Diego

Host – Ilya Vekhter

•Refreshments served at 3:15 PM in 201 Nicholson Hall•

Discovered more than 2 decades ago, high-Tc superconductors have consolidated a large fraction of the condensed matter community in the search for the mechanism leading to he transition temperatures as high as 160 K. In this talk I will overview recent developments in the experimental studies of high-Tc cuprates focusing on the results obtained by means of infrared spectroscopy. The crucial advantage of this technique is that one can get insights into the key characteristics of the superconducting state through a variety of model independent sum rules. Specifically, our group at UCSD has employed new analysis based on sum rules to examine the energy scales associated the superconducting condensate and with the so-called pseudogap state. We believe that the sum rule results may be instrumental in narrowing down the field of plausible microscopic scenarios of high-Tc superconductivity.

Special Colloquium

"Quantum Critical Phenomena in Correlated Electron Systems "

3:40 pm – Monday, April 14, 2008
435 Nicholson Hall

Rongying Jin

Oak Ridge National Laboratory

Host: Dana Browne

Research on correlated electronic materials has uncovered many novel physical properties that present an outstanding challenge for theoretical and experimental physicists. Puzzling new behavior develops around the precarious point of instability between two stable phases of matter - the quantum critical point. In my talk, I will give a couple of examples, showing how to promote the formation of new quantum phases by explicitly tuning systems toward special low-temperature quantum critical points.

Materials Science and Engineering Seminar

"Pairing and Magnetism in Electron-Doped High-Tc Superconductors "

3:40 pm – Wednesday, April 16, 2008
109 Nicholson Hall

Pengcheng Dai

University of Tennessee and Oak Ridge National Laboratory

Host: John DiTusa

We briefly review results of recent neutron scattering and STM experiments designed to probe the relationship between electron-pairing and magnetism in the electron-doped Pr0.88LaCe0.12CuO4 as the system is tuned from its as-grown non-superconducting antiferromagnetic (AF) state into an optimally doped superconductor (Tc = 26 K) without static AF order [1-7]. As grown, electron-doped materials are semiconducting with static long-range AF order, annealing the sample in low oxygen environment removes the static AF order and induces superconductivity. On the other hand, application of a magnetic field can also induce superconductivity-normal phase transition. In this talk, I will summarize how one can use annealing and magnetic field as tuning parameters to study the superconducting-normal phase transition. We compare our neutron scattering results with STM results on the same sample and demonstrate that AF spin fluctuations may mediate electron pairing for superconductivity.

1. Stephen D. Wilson, Pengcheng Dai, Shiliang Li, Songxue Chi, H. J. Kang, and J. W. Lynn, Nature (London) 442, 59 (2006).
2. Stephen D. Wilson, Shiliang Li, Hyungje Woo, Pengcheng Dai, H. A. Mook, C. D. Frost, S. Komiya, and Y. Ando, Phys. Rev. Lett. 96, 157001 (2006).
3. Stephen D. Wilson, Shiliang Li, Pengcheng Dai, Wei Bao, J. H. Chung, H. J. Kang, S.-H. Lee, S. Komiya, and Y. Ando, Phys. Rev. B 74, 144514 (2006).
4. H. J. Kang, Pengcheng Dai, B. J. Campbell, P. J. Chupas, S. Rosenkranz, P. L. Lee, S.L. Li, S. Komiya, and Y. Ando, Nature Materials 6, 224 (2007).
5. S. D. Wilson et al, PNAS 104, 15259 (2007).
6. J. Zhao et al., Phys. Rev. Lett. 99, 017001 (2007).
7. F. C. Niestemski et al, Nature 450, 1058 (2007).

Publication:

"Recent Results from the ATIC Science Flight", **John P. Wefel**...**T. Gregory Guzik**...**Joachim B. Isbert**... and the ATIC Collaboration, in *Cosmic Rays and High Energy Universe*, eds. T. Shabata and N. Sakaki, Frontiers Science Series No. 50, (Tokyo, 2007, Universal Academy Press), pp. 29-35.

"Self-assembly of multiwalled carbon nanotubes from quench-condensed CNi3 films", **D.P. Young, A.B. Karki, P.W. Adams**, J.N. Ngunjiri, J.C. Garno, H. Zhu, B. Wei, and D. Moldovan, J. Appl. Phys. 103, 053503 (2008).