MAR05-2004-005900

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Local Ordering in the Pseudogap Regime of $Bi_2Sr_2CaCu_2O_{8+\delta}$[1]

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The underdoped cuprate superconductors are anything but normal materials at temperatures above the superconducting transition. Various exotic electronic states have been proposed to explain their abnormal behavior in this regime, and in particular the pseudogap that appears in the density of states. In this talk, I will report on our recent STM measurements which show that the electronic states inside the pseudogap form dispersionless standing wave patterns in real-space.[2] The dispersionless nature of the patterns indicates they are the signature of some form of local electronic ordering. How this local ordering relates to the physics of the pseudogap, however, is a topic of intense ongoing investigation. We will present these results and more recent work which addresses the nature of the pseudogap state through examining the response of the standing wave patterns to defects.

This work was supported by NSF grants DMR-98-75565 and DMR-03- 1529632, U.S. Department of Energy grant DEFG-02-91ER4539 through the Frederick Seitz Materials Research Laboratory, and Office of Naval Research grant N000140110071.

[1]This work was done in collaboration with M. Vershinin, K. Gomes, A. Pasupathy, A. Pushp, S. Ono, Y. Abe, Y. Ando, and A. Yazdani.

[2]M. Vershinin, S. Misra, S. Ono. Y. Abe, Y. Ando and A. Yazdani, *Science* **303**, 1995 (2004).