MAR14-2013-020142

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Ubiquitous Interplay between Charge Ordering and High-Temperature Superconductivity in Cuprates[1]

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In this talk, we will report on scanning tunneling microscopy (STM) and resonant elastic x-ray scattering measurements that are used to establish the formation of charge ordering in the high-temperature superconductor $Bi_2Sr_2CaCu_2O_{8+x}$. Depending on the hole concentration, the charge ordering in this system occurs with the same period as those in Y-based or La-based cuprates, but also displays the analogous competition with superconductivity. These results indicate the universality of charge organization competing with superconductivity across different families of cuprates. Our spectroscopic STM measurements demonstrate that this charge ordering leaves a distinct signature in its energy-dependence, which allows us to distinguish the charge order from impurity-induced quasiparticle interference, and to connect it to the physics of a doped Mott insulator [1]. Finally, we will comment on recent claims of electronic nematicity in $Bi_2Sr_2CaCu_2O_{8+x}$ from STM studies. We show that anisotropic STM tip structures can induce energy-dependent features in spectroscopic maps on different correlated electron systems (cuprates and heavy-fermions) that can be misidentified as signatures of a nematic phase. Our findings show that such experimental features, which can be reproduced by a simple toy model calculation, can be understood as a generic tunneling interference phenomenon within an STM junction [2]. Work done in collaboration with: P. Aynajian, A. Frano, R. Comin, E. Schierle, E. Weschke, A. Gyenis, J. Wen, J. Schneeloch, Z. Xu, R. Baumbach, E. D. Bauer, J. Mydosh, S. Ono, G. Gu, M. Le Tacon, and A. Yazdani

[1] E.H. da Silva Neto et al. Science (2013).
[2] E.H. da Silva Neto et al. PRB 87, 161117(R) (2013).

[1]Work supported by: DOE-BES, NSF-DMR1104612, NSF-MRSEC (DMR-0819860), Linda and Eric Schmidt Transformative Fund, W. M. Keck Foundation, The Max Planck - UBC Centre for Quantum Materials, CIFAR Quantum Materials, and DOE (DE-AC02-98CH10886).
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