MAR17-2016-020084

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Quantitative Determination of the Pairing Interactions for High Temperature Superconductivity in Cuprates

XINGJIANG ZHOU, Institute of Physics, Chinese Academy of Sciences

A profound problem in modern condensed matter physics is to discover and understand the nature of the fluctuations and their coupling to fermions in cuprates which lead to high temperature superconductivity and the associated strange-metal normal state. In this talk, we will report the quantitative determination of the normal and pairing self-energies, made possible by laser-based angle-resolved photoemission measurements with unprecedented accuracy and stability. Through a precise inversion procedure, both the effective interactions in the attractive d-wave symmetry and the repulsive part in the full symmetry are determined. Besides finding the pairing self-energy and the attractive interactions for the first time, these results expose a central paradox of the high Tc problem: how the same frequency independent fluctuations can dominantly scatter at angles +-pi/2 in the attractive channel as well as lead to angle-independent repulsive scattering. The experimental results will be compared with the available theoretical calculations based on antiferromagnetic fluctuations, Hubbard model and the quantum-critical fluctuations of loop-current order. *This work is done in collaboration with Jin Mo Bok, Jong Ju Bae, Han-Yong Choi, Chandra M. Varma, Wentao Zhang, Junfeng He, Yuxiao Zhang and Li Yu [1]. J. M. Bok et al., Science Advances 2, e1501329 (2016).