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Robust d-wave pairing symmetry in hole-doped cuprate superconductors†

CHANG TSUEI, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598

After a debate over many years, it is widely agreed that an order parameter with $d_{x^2-y^2}$ symmetry has been established in optimally doped cuprate superconductors[1]. The controversy has now shifted to the possibility of changes in pairing symmetry as a result of doping. In this talk, we will first report new results of a precise measurement on the location of nodes in the d-wave gap function at the Fermi surface of a high-T_c superconductor $YBa_2Cu_3O_7$. We will then present a series of phase-sensitive tricrystal experiments to demonstrate, using the half-flux quantum effect, that the d-wave pair state in several cuprate systems is robust against a wide range of doping variations from under-doped, through optimal doping, to over-doped regimes. Implications of the findings of this work for understanding high-temperature superconductivity will be discussed at the end of the talk.

† work done with J.R. Kirtley, A. Ariando, Hans Hilgenkemp, G. Hammerl, J.Mannhart, H. Raffy, and Z.Z. Li.

[1]C.C. Tsuei and J.R. Kirtley, Rev. Mod Phys. **72**, 969 (2000)