

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Emergence of superconductivity in HighTc copper oxide superconductors via two crossovers UTPAL CHATTERJEE, MIKE NORMAN, Argonne National Laboratory, MOHIT RANDEIRA, Ohio State University, STEPHAN ROSENKRANZ, JUAN CARLOS CAMPUZANO, Argonne National Laboratory — From our detailed ARPES measurements on BISCO 2212 High Tc Superconductors we found that unlike in conventional superconductors, where there is a single temperature scale T_c separating the normal from the superconducting state, HTSCs exhibit with two additional temperature scales. One is T^* , below which electronic excitations are gapped. And the other one is T_{coh} , below which electronic states are long-lived. We observed that T^* and T_{coh} change strongly with doping. They cross each other near optimal doping. There is a region in the normal state where the single particle excitations are gapped as well as coherent. Quite remarkably, this is the region from which superconductivity with highest T_c emerges. Our experimental finding that the two crossover lines intersect is not consistent with a “single quantum critical” point near optimal doping, rather it is more naturally consistent with theories of superconductivity for doped Mott insulators.

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Date submitted: 06 Dec 2010

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