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Evidence for pairing above Tc from the electronic dispersion in the pseudogap phase of cuprates A. KANIGEL, Technion, Haifa 32000, Israel, U. CHATTERJEE, University of Illinois at Chicago, Chicago, IL 60607, M. RANDERIA, The Ohio State University, Columbus, OH 43210, M.R. NORMAN, Argonne National Laboratory, Argonne, IL 60439, J.C. CAMPUZANO, University of Illinois at Chicago, Chicago, IL 60607 — In the BCS paradigm for the superconducting state, electrons close to the Fermi level E_F form Cooper pairs which condense into a zero center of mass momentum state. This results in a gap in the electronic excitation spectrum which is symmetrically centered about E_F. Above T_c where the condensate is lost, the pairs dissociate, the energy gap collapses, and the the normal state Fermi surface appears. On the other hand, in the underdoped high temperature superconductors, instead of a complete Fermi surface above T_c, only disconnected Fermi arcs appear, separated by regions that still exhibit an energy (pseudo)gap. We show that in this pseudogap phase, the energy-momentum relation of electronic excitations near E_F behaves like the dispersion of a normal metal on the Fermi arcs, but like that of a superconductor in the gapped regions. We argue that this dichotomy in the dispersion is hard to reconcile with a competing order parameter, but is consistent with pairing without condensation. Below T_c the pairs condense and the electronic excitations, that were short-lived above T_c, become long-lived and exhibit a d-wave energy gap.

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