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Photoemission Evidence for New Microscopic Scaling Relation in the Cuprate Superconductors¹ JONATHAN RAMEAU, ZHIHUI PAN, HONGBO YANG, GENDA GU, PETER JOHNSON, Brookhaven National Laboratory — We use angle resolved photoemission spectroscopy (ARPES) to investigate the relationship between the superconducting gap at low temperature and the quasiparticle scattering rates in the normal state, on the Fermi arc, for optimal and underdoped Bi2212 cuprate high temperature superconductors. Combining these results with similar data on Bi2201 from the literature we find evidence of a new and simple microscopic scaling relation connecting the normal and superconducting states of the cuprates. The result suggests that while nodal-region Cooper pairs decohere above T_c they retain the signature of a strong pairing amplitude. The anomalous momentum dependence of excitation lifetimes on the Fermi arc, above T_c , are dominated by the same interactions that induce superconductivity at and below T_c .

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