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Theoretical fits of laser-ARPES energy distribution curves of the high Tc superconductor Bi2212 N.C. PLUMB, University of Colorado, P.A. CASEY, Princeton University, J.D. KORALEK, LBNL and UC Berkeley, J.F. DOUGLAS, Z. SUN, University of Colorado, Y. AIURA, K. OKA, H. EISAKI, AIST Tsukuba, P.W. ANDERSON, Princeton University, D.S. DESSAU, University of Colorado — Laser-ARPES has produced spectral lineshapes in photoemission that are much sharper than any previous data, which is due to increased energy and momentum resolution, increased bulk sensitivity, and decreased final state broadening. The lifetimes of these states, extracted from simple Lorentzian fits to the data, are consistent with bulk-sensitive optical data, implying that we are for the first time measuring the intrinsic spectral function. It therefore is appropriate to study the spectral lineshape in detail. We have looked at standard Lorentzian energy distribution curves, as well as extensions based upon Fermi Liquid theory, Marginal Fermi Liquid theory, and of great interest, a non-Fermi Liquid theory based upon Anderson's treatment of the Gutzwiller projection. The lineshapes based upon the Gutzwiller projection utilize only one free parameter and include no background term, yet they fit the data well over a broad range of temperatures and energies.

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