Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Distinguishing Single-Particle Lifetime and Population Lifetime in a Cuprate Superconductor SHUOLONG YANG, Stanford University, JONATHAN SOBOTA, DOMINIK LEUENBERGER, SLAC National Accelerator Laboratory, YU HE, Stanford University, MAKOTO HASHIMOTO, DONGHUI LU, SLAC National Accelerator Laboratory, HIROSHI EISAKI, National Institute of Advanced Industrial Science and Technology, PATRICK KIRCHMANN, SLAC National Accelerator Laboratory, ZHI-XUN SHEN, Stanford University — We employ femtosecond time- and angle-resolved photoelectron spectroscopy to study optimally doped Bi-2212 ($T_c = 96$ K). In the low excitation limit, the energy-resolved population lifetime displays abrupt changes near 60-80 meV both below and above T_c. Moreover, the lifetime near this characteristic energy is independent of excitation density. These behaviors are consistent with theories based on electron-boson interactions, which connect the population lifetimes to the single-particle lifetimes measured by equilibrium photoemission. However, the absolute values of these two quantities are different by one to two orders of magnitude. We further demonstrate that this discrepancy is independent of experimental techniques and materials, and point out the fundamental conceptual differences between the two lifetimes.

Shuolong Yang
Stanford University

Date submitted: 10 Nov 2014 Electronic form version 1.4