

MAR06-2005-004894

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Laser ARPES, the sudden approximation, and quasiparticle-like peaks in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+d}$

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A new low photon energy regime of angle resolved photoemission spectroscopy is accessed with lasers and used to study the superconductor $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+d}$. The low energy increases bulk-sensitivity, reduces background, and improves resolution. Crucial aspects of the data such as the dispersion, superconducting gaps, and the bosonic coupling kink are found to be robust to a possible breakdown of the sudden approximation. We observe spectral peaks which are sharp on the scale of their binding energy - the clearest evidence yet for quasiparticles in the normal state. The very sharp spectral peaks and high statistics enables detailed investigations of the temperature and energy dependences of the lineshapes, giving critical insights into the nature of the scattering mechanisms in these materials. We thank collaborations with J. D. Koralek, J.F. Douglas, N.C. Plumb, Z. Sun, A.V. Fedorov, M. Murnane, H. Kapteyn, S. Cundiff, Y. Aiura, K. Oka, and H. Eisaki