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Evidence for symmetry breaking in the pseudogap phase of the single-layer Cuprate Pb-Bi2201 J.D. KORALEK, J. HINTON, J. ORENSTEIN, LBNL/Berkeley, R.-H. HE, M. HASHIMOTO, Z.-X. SHEN, H. KARAPETYAN, A. KAPITULNIK, Stanford/SIMES, H. EISAKI, AIST — We use time-resolved optical spectroscopy, combined with angle resolved photoemission, and polar Kerr effect measurements, to study the single-layer Cuprate superconductor $Pb_{0.55}Bi_{1.5}Sr_{1.6}La_{0.4}CuO_{6+\delta}$ (Pb-Bi2201). Near optimal doping this material has convenient temperature scales with a T_c of 38K and T^* of 130K, allowing signals associated with the superconducting and pseudogap phases to be clearly separated in the raw data. The unusual time dependence of the pseudogap signal is suggestive of a coherent nonlinear optical process which is sensitive to changes in the electronic point group symmetry. This nonlinear signal turns on at T^* and persists to low temperature. Angle resolved photoemission and polar Kerr effect measurements performed on the same batch of samples reveal the opening of a particle-hole asymmetric gap and the onset of Kerr rotation, both with strikingly similar temperature dependence to the nonlinear optical signal.

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