

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ultrafast photoconductivity of undoped cuprates J. STEVEN DODGE, AMIR FARAHANI, JESSE PETERSEN, Simon Fraser University, RUIXING LIANG, University of British Columbia, IVAN BOZOVIC, Brookhaven National Laboratory — Using a visible pump-THz probe technique, we studied the ultrafast transient photoconductivity of the insulating cuprate La_2CuO_4 , and compared it with earlier measurements of $\text{Sr}_2\text{CuO}_2\text{Cl}_2$ and $\text{YBa}_2\text{Cu}_3\text{O}_6$. In all these compounds, we observe a rapid onset of photoconductivity that is followed by a non-exponential relaxation on a picosecond time scales, the dynamics of which are independent of photocarrier concentration ranging from 0.2 to 1.5 percent. The photoconductivity decay is qualitatively similar to the decay of the photoinduced gap absorption in $\text{Sr}_2\text{CuO}_2\text{Cl}_2$,¹ indicating a common origin for the two effects. Assuming a quantum efficiency of unity, the estimated peak mobility for all three compounds is within $0.1\text{-}0.4 \text{ cm}^2/\text{V} \cdot \text{s}$; this is lower than the Hall mobility in chemically doped systems with similar carrier concentrations,² but orders of magnitude larger than earlier DC photoconductivity results.³ The similarity of the peak photoconductivity across three different compounds indicates that it is an intrinsic feature of the copper oxide plane.

¹J. S. Dodge, arXiv:0910.5048

²Ando et al, Phys. Rev. Lett. 87, 017001 (2001)

³Thio et al, Phys. Rev. B 42, 10800 (1990)

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Date submitted: 20 Nov 2009

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