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Time-resolved spectroscopy of the charge-transfer gap in $Sr_2CuO_2Cl_2$ J. STEVEN DODGE, Simon Fraser University, ANDREAS SCHUMACHER, Lawrence Berkeley National Laboratory, LANCE MILLER, Ames Laboratory, DANIEL CHEMLA, Lawrence Berkeley National Laboratory — We present energy- and time-resolved pump-probe spectroscopy near the charge-transfer gap in the undoped cuprate compound $Sr_2CuO_2Cl_2$. Upon photoexcitation, an increase in absorption is observed for energies below 1.95 eV, whereas a decrease occurs above 1.95 eV. Overall, the spectral weight is not conserved over the probe range of 1.6-2.3 eV. No hole-burning is observable at the pump energy $E_{\mathrm{pump}} = 2.1$ eV. The transient spectral changes appear as one spectral unit instantaneously after the excitation, and they decay, again as one spectral unit, on a picosecond time scale. The photoinduced response relates simply to the thermal response, indicating a common boson-mediated origin. These results support a theoretical model that places the gap energy near 1.5 eV, well below the peak in the charge-transfer absorption spectrum.[1] In this model, the photoexcited state decays rapidly to the gap energy via phonon emission, and the presence of the additional phonons then has the same effect on the charge-transfer absorption as an increase in the equilibrium lattice temperature.

[1]K. M. Shen *et al.*, Phys. Rev. B **75**, 075115 (2007).

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