Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Doping Dependence of Electronic Excitations in $La_{2-x}Sr_xCuO_4$ Observed by K-edge RIXS D.S. ELLIS, JUNGHO KIM, Univ. Toronto, J.P. HILL, Brookhaven National Lab, S. WAKIMOTO, Japan Atomic Energy Research Institute, R.J. BIRGENEAU, Univ. California Berkely, T. GOG, D. CASA, Argonne National Lab, Y.-J. KIM, Univ. Toronto — Resonant inelastic xray scattering (RIXS) spectra of the cuprate $La_{2-x}Sr_xCuO_4$are measured for single crystal samples with progressively larger value of x, ranging from undoped to the overdoped regime. As x is increased in the underdoped region, the lowest energy excitation above the charge transfer gap is sharply suppressed, but many of the general spectral features and overall spectral weight distribution above the gap do not appreciably change, and the broad intensity around the same energy of the exciton remains constant. As the sample becomes overdoped, a much more pronounced change of the spectral weight above the charge transfer gap occurs. An in-gap state at $\sim$1.8 eV in the undoped case, which shows no dispersion with momentum, broadens and shifts down in energy as the doping is increased. The amount of the observed shift is to within an order of magnitude of the change calculated from simple crystal field model. .

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Date submitted: 18 Dec 2007 Electronic form version 1.4