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High-resolution RIXS measurement at O K-edge on the edge-shared chain cuprates, $\mathbf{Ca_{2+x}Y_{2-x}Cu_5O_{10}}$ W.S. LEE, SIMES, SLAC National Accelerator Lab., J. LEE, M. YI, Stanford University, K. ZHOU, Swiss Light Source, PSI, S. JOHNSTON, IFW Dresden, T. SCHMITT, Swiss Light Source, PSI, JEROEN VAN DEN BRINK, IFW Dresden, T.P. DEVEREAUX, SIMES, SLAC National Accelerator Lab., K. KUDO, Y. KOIKE, Tohoku University, L. PATTHEY, Swiss Light Source, PSI, Z.X. SHEN, SIMES, SLAC National Accelerator Lab. — Quasi one dimensional copper oxides have been model systems in the field of correlated electron physics, because of rich phenomena exhibited in a relatively simple geometry. Its magnetic ground states, fluctuations, and excitations have been investigated extensively by theorists and experimentalists. Among the known quasi 1-D spin-chain compounds, $Ca_{2+x}Y_{2-x}Cu_5O_{10}$ is the only compound that can be hole-doped in a wide doping range, providing a unique opportunity to study the dynamics of hole in the quasi-1D environment. Here, we report ultrahigh resolution resonant inelastic soft x-ray scattering experiment at the O K-edge. With an energy resolution of $\sim$50 meV, we resolved rich charge excitations in the sub-eV range that has not been observed in the previous RIXS measurement on the same materials. In particular, we have resolved clear multi-phonon excitations near the elastic peak, suggesting a strong electron-phonon coupling in this quasi-1D system. Doping dependence of these excitations will also be demonstrated.

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