

## Case Studies of Elementary Excitations in Cuprates using Soft X-ray RIXS

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### Abstract

Characterizing elementary excitations associated with lattice, spin, charge, and orbital degrees of freedom is a crucial approach to understand the complex phenomena exhibited in the strongly correlated materials. Due to rapid improvements of instrumental resolution, RIXS has emerged to be a powerful tool to study elementary excitations [1]. In this talk, I will first highlight our investigations on the evolution of the orbital, magnetic, and other excitations in the electron-doped cuprates  $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_4$ . Using RIXS at the Cu  $L$ -edge, anomalous behaviours across the antiferromagnetic-superconducting phase boundary will be discussed [2]. In addition, I will also talk about a case study of phonons in one-dimensional cuprates  $\text{Y}_{2+x}\text{Ca}_{2-x}\text{Cu}_5\text{O}_{10}$  to highlight RIXS as a probe of interactions. Using O  $K$ -edge RIXS, we resolve site-dependent harmonic phonon excitations of a 70 meV mode [3], which reflect the electron-lattice coupling strength. In addition, signature of phonons coupling to other degrees of freedom will also be discussed [3, 4].

### References

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