

15th International Conference on Muon Spin Rotation, Relaxation and Resonance



Contribution ID: 184

Type: Oral

What high resolution RIXS can tell us of cuprates (and of other quantum materials)

Monday, 29 August 2022 11:40 (40 minutes)

Resonant Inelastic X-rays Scattering (RIXS) is an energy loss spectroscopy made with x rays whose energy is tuned to a suitable absorption edge. When the instrumental resolution is good enough, RIXS spectra provide information on the energy, dispersion and symmetry of local and collective excitations, such as ligand field excitations, magnons and paramagnons, phonons, particle-hole pairs, charge density fluctuations and order. RIXS is a powerful complement of more traditional techniques like inelastic neutron scattering, Raman scattering, electron energy loss spectroscopy.

The rich physics of cuprates is very effectively captured by high resolution RIXS experiments made at Cu L3 and O K edges. This fortunate conjuncture has boosted the development of better and better instrumentation at synchrotrons and has served as one of the scientific cases for RIXS at XFELs. The field is expanding and experiments are leading to more insightful results, where the different degrees of freedom are organically studied.

After introducing the technique, I will provide a survey of results on cuprate parent compounds [1] and superconductors [2,3] and on infinite layer nickelates [4], which share several properties with high Tc superconductors.

References

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3. Peng, Y.Y, Martinelli, L, et al. *Doping-dependence of the electron-phonon coupling in two families of bilayer superconducting cuprates*. Phys. Rev. B **105**, 115105 (2022).
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Session Classification: Invited Talks

Track Classification: Superconductivity