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## Probing ultrafast electronic and magnetic dynamics with resonant inelastic X-ray scattering

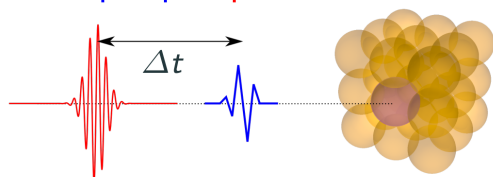
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Over the last fifteen years the resonant inelastic X-ray scattering (RIXS) evolved into a major experimental technique for probing neutral excitations with chemical sensitivity. In a RIXS experiment a monochromatic incoming X-ray beam, tuned at a resonance, is scattered by the sample of interest leaving it in an excited state. The energy deposited in the sample can be identified by measuring the energy distribution of scattered photons with high spectral resolution. RIXS grants access to orbital, magnetic or vibrational excitations of the system thus shedding light on key ingredients for the understanding of matter's properties.

“laser pump–X probe”



The recent availability of free electron lasers opens unique experimental opportunities for time-resolved RIXS experiments [1, 2], as it is illustrated by significant instrumental developments [3–5].

I will give a critical review on the RIXS potentiality for pump/probe studies of strongly correlated electron systems and present recent research examples [6].

- [1] M. Mitrano and Y. Wang. “Probing light-driven quantum materials with ultrafast resonant inelastic X-ray scattering”. In: *Communications Physics* 3 (2020), p. 184. DOI: 10.1038/s42005-020-00447-6.
- [2] E. Paris et al. “Probing the interplay between lattice dynamics and short-range magnetic correlations in  $\text{CuGeO}_3$  with femtosecond RIXS”. In: *arXiv:2104.03557 [cond-mat]* (2021).
- [3] S. Dziarzhytski et al. “The TRIXS end-station for femtosecond time-resolved resonant inelastic x-ray scattering experiments at the soft x-ray free-electron laser FLASH”. In: *Structural Dynamics* 7 (2020), p. 054301. DOI: 10.1063/4.0000029.
- [4] *RIXS at LCLS*. URL: <https://lcls.slac.stanford.edu/instruments/neh-2-2/layout>.
- [5] *hRIXS at Eur XFEL*. URL: [https://www.xfel.eu/sites/sites\\_custom/site\\_xfel/content/e51499/e60513/e107996/e117378/e117712/xfel\\_file117713/TownHallMeeting\\_hRIXS\\_SCS\\_271020\\_eng.pdf](https://www.xfel.eu/sites/sites_custom/site_xfel/content/e51499/e60513/e107996/e117378/e117712/xfel_file117713/TownHallMeeting_hRIXS_SCS_271020_eng.pdf).
- [6] S. G. Chiuzbăian et al. manuscript in preparation. 2021.