

Challenges for time-resolved RIXS instrumentation at European XFEL

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Abstract

The Resonant Inelastic X-ray Scattering (RIXS) instrumentation at the soft X-ray branch of European XFEL will be discussed. To allow high-resolution time-resolved RIXS experiments, the Heisenberg-RIXS (hRIXS) spectrometer has been installed and in operation at the SCS instrument.¹

The spectrometer is equipped with two gratings covering photon energy range 250 – 1600 eV, essential to probe low-energy excitations in functional materials.

hRIXS instrument is designed to reach a resolving power of 30000, while 10000 combined resolving power in RIXS experiments is achieved.

Current limitation in resolution of RIXS experiments is due to the present limitations on monochromator resolution.² Challenges for the monochromator allowing time-resolved experiments at femtosecond time scale will be discussed.

Since diffraction grating elongates femtosecond pulses, very low line density gratings are required. The aim to achieve both high photon-energy and time resolution results in demand to minimise all aberrations ideally below instrument response function of ideal grating. This poses very high demands on the monochromator grating quality.

To enhance combined photon energy resolution in RIXS experiments, modifications of mechanics and upgrades of optics of the monochromator are in progress.

Another planned upgrade of RIXS spectrometer towards tender X-ray range up to 3000 eV will be also discussed.

April 24th, 2026, 11:00 – 11:45

SRIS Building, Entrepreneur Hall

References: [1] J. Schlappa et al. *J. Synchrotron Rad.* 32, 29 (2025) [2] N. Gerasimova et al. *J. Synchrotron Rad.* 29, 1299 (2022)

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