

SCS Instrument Parameters for User Experiments – 2022-II / 8th CfP

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FEL parameters		
Photon energy	0.5 keV – 3.0 keV	
X-ray pulse energy SASE3	5 mJ ± 20% (0.5-1.5keV) 2 mJ ± 20% (>1.5keV)	Pulse energy depends on bunch charge, electron energy and photon energy
X-ray pulse energy after mono	1 - 30μJ (Mono 1 st order)	
X-ray pulse duration SASE3	10-25 fs	fwhm
X-ray pulse stretching	80-150 fs (mono HR) 30-50 fs (mono LR)	Expected durations based on monochromator
X-ray polarization	Linear horizontal (π -polarization)	linear vertical and circular polarizations may become available during 2022 but cannot be guaranteed.
Number of x-ray pulses per train	400	400 pulses delivered assuming equal distribution at 2.25 MHz operation (Higher/smaller pulse numbers for higher/smaller intra-train frequencies). Maximum 2250 electron bunches within 500 μs are available for distribution to the instruments (4.5 MHz)
Repetition rate in pulse train	Up to 4.5 MHz	1.1 MHz maximum for the use of liquid jet.
Train repetition rate	10 Hz, or SCS train picker	SCS train picker to convert e.g. 5Hz, or single train
Mono resolving power	10.000 (HR) 3.000 (LR)	High resolution compromises short pulse durations, see pulse stretching.
X-ray focal spot size at sample	5 μm (hor & ver) tunable up to 500 μm	Independent tuning of horizontal and vertical focus. For hRIXS line focus recommended
hRIXS parameters		
Photon energy hRIXS	0.5 keV – 1.4 keV*	Commissioned up to 1.0 keV, Spectrometer operates up to 1.4 keV. Please inquire for details.
Combined resolving power (Monochromator & hRIXS)	Up to 10.000*	value reached during commissioning in May at O K edge. At Cu L3 edge a value around 8.000 was obtained.

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XRD / Solid sample environment		
Samples	Solid samples	Samples have to be UHV compatible
Pressure	10 ⁻⁹ mbar	
Temperature	20 K* - room temperature	Specified for 20 K, however cannot be guaranteed. Commissioning in April 2022.
Sample stage	6 degrees of motion	Translation x, y, z: +/- 5 mm Theta: > 180 deg, Chi: +/- 30 deg Azimuth: +/- 90 deg
RIXS scattering angle	65 – 145 deg*	The hRIXS spectrometer is currently commissioned for 125 deg. In case the experiment cannot be done at this scattering angle, please contact us. Changing angle require more setup time
CHEM / Liquid sample environment		
Sample delivery	Liquid jet	Single cylinder, 20-50 microns
RIXS scattering angle	125 deg, 90 deg*	Standard configuration 125 deg. Inquire for details.
Solvents	Water, Ethanol, Isopropanol*	Discuss alternative solvents with the scientists
Optical laser system		
Center wavelength	800 nm	
Pulse duration	800 nm: 15 fs or 50 fs	
Repetition rate and Pulse energy, 800 nm	113 kHz 1.1 MHz	2 mJ 0.2 mJ
Wavelength tunability	Conversions from 800nm / 50 fs via SHG (400nm), THG (266nm), OPA OPA: Wavelength between 350 nm and 2.5 microns. Please inquire for pulse energies.	
Spot size	Around 100 microns	
Polarization	Linear, circular	
Operation	Burst mode synchronized to FEL with jitter <50 fs	

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Please discuss your experiment plans with the SCS team as soon as possible and **before** submitting your proposal. We can help you with any details that may have updated, assist with evaluating experiment feasibility, and much more.

This call is open for hRIXS spectrometer with solid and liquid sample environment. We will host a webinar on October 21, 2021, at 5 p.m. (CEST) to inform about the expected capabilities of hRIXS in this run. Please refer to the agenda and access information at [hRIXS webinar](#).

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