

SCS Instrument Parameters for User Experiments – 2021-II / 7th CfP

Page 1/3, 05 October 2020



Photon beam parameters		
Photon energy	0.5 – 3.0 keV	
X-ray pulse energy	1 - 10 mJ (SASE3), 1 - 30µJ (Mono 1 st order)	Pulse energy depends on bunch charge, electron energy and photon energy
X-ray pulse duration	10-25 fs	(rms)
Mono resolving power	1 st order: 3000 (3 permille transmission) 2 nd order: 4000 (0.2 permille transmission)	Measured @ 0.870 keV, 100µm exit slit, 1% SASE3 bandwidth
Number of 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) once safety restrictions are lifted
Repetition rate in pulse train	Up to 4.5 MHz	
Train repetition rate	10 Hz SCS train picker	SCS train picker to convert e.g. 5Hz, or single train
Polarization	Linear (horizontal) Circular polarizer (approx. 50% circ. Pol. and few % transmission)	Circular polarizer are available for Fe, Co and Ni L edges. They operate in vicinity of respective absorption resonances. Inquire for details and possibilities for other absorption resonances
Focal spot size at sample, tunable	1 µm (hor & ver) tunable up to 500µm	
FFT experiment station		
Fixed target sample holder	Frame with 50 mm x 50 mm active area. limited fast “single-shot” scanning, room temperature, forward scattering geometry	
Sample Frame	Standard frames are provided by the instrument. A drawing of the frame to produce own sample frames is available on request	
DC electromagnet	≤ 0.35 T	
Cryostat sample holder	Top-inserted He cryostat as an option. Inquire for details	

SCS Instrument Parameters for User Experiments – 2021-II / 7th CfP

Page 2/3, 05 October 2020



DSSC detector		SAXS, CDI, TZPG-XAS
Number of pixels	1024 x 1024	
Pixel coordinates	Hexagonal	Detector quadrants in windmill configuration
Pixel size	204 μm x 236 μm	
Max frame rate	4.5 MHz	
Beam hole size	Default: 4.75 mm (windmill)	The diameter of the central dead area is 8mm.
Standard detector-to-sample distance	Min: 1.2 m Max: 5.4 m Travel range: 1.5 m (under vacuum)	
Minimum sample-detector distance	< 1200 mm, inquire for details	shortest design distance 230 mm without gate Valve
Femto-XAS		XAS, TZPG
Transmission Monitor (cw diamond / MCP)	Pulse resolved detection, parallel operation to DSSC	operates up to 4.5 MHz, sensitivity: tens of nJ
Transmission zone plate gratings (TZPG)	TZPG's exist for various photon energy ranges, for photon energies above 1.5keV inquire	TZPG X-ray Absorption Spectroscopy is recorded with DSSC. Inquire for details of the method and its possibilities.
Optical laser system		SASE3 PP laser
Centre wavelength	800 nm or 1030 nm	
Wavelength tunability	Conversions from visible to IR via SHG, THG, OPA. Not commissioned: THz (0.3 THz, LiNbO3)	
Pulse duration	Default: 35fs (800nm), 800 nm: 15...300 fs, 1030nm: 850 fs or 400 ps (chirped)	
Repetition rate and Pulse energy	Default: 113kHz (depending on rep rate)	800 nm: 0.05 - 2 mJ (1 MHz - 113 kHz) 1030 nm: 1 to 40 mJ (1 MHz – 113 kHz)
Operation	Burst mode synchronized to FEL with jitter <50 fs	

SCS Instrument Parameters for User Experiments – 2021-II / 7th CfP

Page 3/3, 05 October 2020



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.

The hRIXS spectrometer and two more experiment stations will be commissioned in 2021 at the SCS instrument. We hosted a virtual town hall meeting on Oct 28, 2020 to discuss the current status of the hRIXS along with plans for commissioning and user operation. We invite interested users for participation in User-Assisted hRIXS commissioning projects of the RIXS components. Please refer to the agenda and access information [here](#).

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