SPB/SFX Instrument Parameters for User Experiments (run 5)

Version 1.2

12th May 2019

Photon beam parameters		
Photon energy	5 - 10 keV	Up to 15 keV potentially possible.
Pulse energy	≥1 mJ	Less at > 12 keV
Photons per pulse (at source)	≥6 x 10^{11}	Derived from previous two fields (9 keV photons)
Pulse duration	25 fs	Estimated
Focal spot size (FWHM)	< 4 µm < 400 nm	Two KB mirror systems available. Please contact instrument scientists for the most up to date information.
Photons / µm² (at sample)	> 10^{10}	Derived. Includes abs., expected spot size range.
Train repetition rate	10 Hz	
Intra-train repetition rate	1.1 MHz	(4.5 MHz, 100 kHz, some quasi-arbitrary patterns)
ΔE/E	~0.2%	Estimated
No. of bunches per train	≤200	Some quasi-arbitrary patterns possible.
Sample delivery systems: In vacuum (upstream, 1Mpx AGIPD) and in-helium (downstream, Jungfrau) now supported		
Liquid jet injector rod	½“ nozzle rod with M9x1 mm fine thread nozzle mount compatible with the CXI nozzle rod at LCLS (MPI design), 1030 mm in length. Additionally, 25mm nozzle rod with M23 fine thread.	
Gas dynamic virtual nozzles (GDVN)	Outer glass nozzle with inner capillary to produce µm-sized liquid jets. Other nozzles also possible. Nozzles expected to be user-supplied unless otherwise arranged.	
High viscosity liquid jet	Mounted on nozzle rod	
Aerosol injector	Swedish design; aerosols produced by GDVN spraying	
Fixed target sample holder	European XFEL design. Accepts carrier in HIREP standard with active area of 110 mm x 110 mm. “Roadrunner” in-helium fixed target system (with Jungfrau detector)	
Pressure systems	HPLC pumps, syringe pumps, gas-pressurised sample reservoirs	
AGIPD 1 Mpx detection properties		
Number of pixels	1024x1024	4 quadrants, each 512x512 pixels
Pixel size	200 µm x 200 µm	
Minimum sample–detector distance	~129 mm	Maximum 200 mm stroke
Resolution at edge for min Z and 9.34 keV	< 2 Å	
Max sample detector distance	~ 5.5 m	
Hole size	10 mm. Possibly ~5 mm—large	*See reference material or enquire for details

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Optical laser system 1 properties		
Wavelength	800 nm	From 740 to 840 nm (pulse duration is longer than 15 fs)
Pulse duration	15–300 fs	
Repetition rate	4.5 MHz	Down to 100 kHz
Pulse energy	50 µJ	
Wavelength conversion	SHG, THG (no OPA)	SHG (370–420 nm), THG (246–280 nm)
Spot size	30–50 µm	Diameter (estimated, typical)
Optical laser system 2 properties		
Wavelength	1030 nm	No wavelength tunability
Pulse duration	1–400 ps	
Repetition rate	4.5 MHz	Down to 100 kHz
Pulse energy	1 mJ	
Wavelength conversion	SHG, THG, FHG	SHG (515 nm), THG (343 nm), FHG (258 nm)
Spot size	30–50 µm	Diameter (estimated, typical)
Optical laser system 3 properties (Opolette 355 HE)		
Wavelength	210 – 2400 nm	OPO output
Pulse duration	3 – 7 ns	
Repetition rate	Single shot to 20 Hz	
Pulse energy	0.5 – 9 mJ	Depends on wavelength
Spot size	4 mm	Near-field
	Three of these laser systems can be operational simultaneously	

Photon Arrival Monitor (PAM) timing tool now available upon consultation.

In Helium serial crystallography with Jungfrau detector available upon consultation.

In both cases, please contact the instrument scientists *before* submitting your proposal.

All parameters are subject to change, pending the commissioning process.

Please discuss your experiment plans with an SPB/SFX instrument scientist **before** submitting your proposal. They can help you with any details that may have updated, assist with evaluating experiment feasibility, and much more.

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