

SPB/SFX Instrument Parameters for Early User Experiments (run 2)

Version 0.4, 5 October 2017



Photon beam parameters		
Photon energy	9.35 keV	7- 14 keV optional
Pulse energy	500 μ J	
Photons per pulse (at source)	$\sim 3 \times 10^{11}$	Derived from previous two fields (9 keV photons)
Pulse duration	50 – 100 fs	Estimated
Focal spot size (FWHM)	5 - 15 μ m	Please contact instrument scientists for most up to date information
Photons / μ m ² (at sample)	$10^9 - 10^{10}$	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)
$\Delta E/E$	$\sim 0.2\%$	Estimated
No. of bunches per train	≤ 300	Some quasi-arbitrary patterns possible.
Sample delivery systems		
Liquid jet injector rod (1/2")	1/2" nozzle rod with M9x1 mm fine thread nozzle mount compatible with the CXI nozzle rod at LCLS	
Liquid jet injector rod (25 mm)	25 mm nozzle rod with 9 mm fine thread adapter or the possibilities to mount own designs with a 23 mm fine thread.	
Gas dynamic virtual nozzles (GDVN)	Outer glass nozzle with inner capillary to produce μ m-sized liquid jets. Mounted on nozzle rod.	
High viscosity liquid jet	Mounted on nozzle rod	
Aerosol injector	Swedish design; aerosols produced by GDVN spraying	
"Slow" fixed target sample holder	European XFEL design. Accepts carrier in HIREP standard with active area of 110 mm x 110 mm. No automated 10 Hz operation for run 2.	
Pressure systems	HPLC pumps, syringe pumps, gas-pressurised sample reservoirs	
AGIPD 1 Mpx detection properties		
Number of pixels	1024x1024	4 quadrants, each 512x512 px
Pixel size	200 μ m x 200 μ m	
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	~ 6 m	
Hole size	10 mm. Possibly ~ 5 mm—large	*See reference material or enquire for details

SPB/SFX Instrument Parameters for Early User Experiments (Page 2)



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	Close to TL
Train repetition rate	10 Hz	burst duration up to 300µs
Intra-train repetition rate	4.5 MHz or 1.1 MHz	variable, down to single pulse
Pulse energy	50 µJ / 200 µJ	At 4.5 MHz / 1.1 MHz
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	0.9 ps or 500 ps	Compressed or chirped
Train repetition rate	10 Hz	burst duration up to 300µs
Intra-train repetition rate	4.5 MHz or 1.1 MHz	variable, down to single pulse
Pulse energy	1 mJ / 4 mJ	At 4.5 MHz / 1.1 MHz
Wavelength conversion	SHG, THG, FHG	SHG (515 nm), THG (343 nm), FHG (258 nm)
Spot size	30–50 µm	Diameter (estimated, typical)

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

Please discuss your experiment plans with your 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.

The optical laser system is expected to be operational and we aim to make “slow” (ps and longer) pump–probe experiments possible for early experiments.

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