The SAXS / WAXS laboratory beamline

X-ray beam delivery system

Source	Microfocus sealed tube (Cu 30 W/30 µm) - Dual source or triple source (Mo/Cr)
Optic	Single reflection multilayer optic with 2D collimation for Cu
Collimation	2 motorized scatterless slits 2.0 with variable aperture. Includes 3 configured standard settings (HF/HR/VHR)
Divergence	< 0.4 mrad in both planes perpendicular to beam axis
Max flux at sample in (ph/s)	$>1x10^8$
Spectral purity	> 97 %

Sample stages*

XZ stage	Motorized XZ stage for multiple sample analysis and sample mapping
GISAXS stage	Motorized Omega rotation (incidence angle tilting) with sample horizontal (scanning capability)
Advanced GISAXS stage	Module with Omega (incidence tilting) and Phi motorized rotations (in plane sample rotation) for texture measurement. With Rx, Ry motorized rotation for surface alignment
Vacuum chamber (for SAXS)	Vacuum < 1mbar or controlled atmosphere

**Axis definition: Y: beam axis; Z: perpendicular to beam axis, vertical; X: perpendicular to beam axis, horizontal*

Sample holders and stages

Sample holder base	Quick connect magnetic base for easy change of standard sample holders without need of any realignment
Liquid sample	Multicapillary holder (27 slots) Vacuum compatible capillary flow cell Vacuum compatible low noise flow cell Robot for liquid injection (2x48 or 96 multi-well plates)
Solid sample	15 slot sample holder for powder, paste, solid samples Holder for gels (8 positions)
Thin film	Thin film transmission Sample holder for GISAXS (multisample or scanning) Sample holder for GISAXS for large samples up to 4 inches diameter samples (advanced GISAXS stage)
Temperature units	Multiple sample cooling / heating unit: -10°C to +110°C, accuracy +/- 0.1° C Mono sample cooling / heating unit: -196° C to +350° C, accuracy +/- 0.1° C
Tensile units	Linkam TST250V with temperature control Tensile Force range: 0.01 N to 20 N or 0.1 to 200 N Temperature range: -196°C to +250°C

Sample alignment

Video telescope with LCD monitor for sample alignment in the beam. Transmission measurement with SAXS detector.

Diffracted beam path

Type	Multi segment vacuum tube
Sample-to-Detector Distance	11 cm (WAXS) up to 650 cm
Diameter	200 mm for vacuum
Operation condition	Vacuum (< 1mbar)

Primary beam stop

Motorized beamstop with vertical (Z) and horizontal (X) adjustments (range +/- 12 mm)

Detector

Pilatus3 R detectors: 200K, 300K or 1M	- Hybrid pixel detectors for direct detection in single photon counting mode - High sensitivity, extremely fast readout - Dynamic range of 20 bits (>1 million counts or >6 decades) - Close to ideal Point Spread Function : 1 pixel - Energy threshold
Detector Stage	- Motorized X/Y stage, standard : +/-12.5 cm - Virtual detector acquisition for larger azimuthal coverage - Manual translation along the beam

Resolution and Q range with Cu radiation

System length					PILATUS 3 200K		PILATUS 3 300K		PILATUS 3 1M		Virtual Detector	
			Sample-to-Detector distance	Minimum q value	Maximum q value	2θ	Maximum q value	2θ	Maximum q value (>50° azimuth)	2θ	Maximum q value	2θ
Xeuss 2.0 - 3 meters	Xeuss 2.0 - 5 meters	Xeuss 2.0 - 10 meters	(mm)	nm^{-1}	nm^{-1}	°	nm^{-1}	°	nm^{-1}	°	nm^{-1}	°
			111**	0.92*	29.9	43.1	34.15	49.5	35.5	51.6	40.75	60
			156	0.65*	23.6	33.65	27.8	39.8	29.14	41.9	33.15	48
			550	0.19*	7.6	10.7	9.45	13.3	10.1	14.3	11.2	15.75
			1200	0.08*	3.5	4.95	4.4	6.2	4.7	6.65	5	7
			2500	0.025	1.7	2.4	2.1	3	2.3	3.2	2.4	3.4
			6400	0.01	0.7	0.9	0.8	1.2	0.9	1.25	0.9	1.3

** Q_{min} value in High Flux mode (HF). Smaller q_{min} achievable in Higher Resolution modes (HR, VHR).*

*** Shortest distance value depends on the type of sample stages. This value is for standard sample holders.*

Simultaneous SAXS/WAXS

Optional WAXS detector	Vacuum compatible 2D hybrid pixel detector for simultaneous SAXS and WAXS measurement up to 2θ 60°. Module delivered with dedicated software for easy and powerful SAXS and WAXS data recombination.

Software

System control and data acquisition software with graphical user interface and macro script mode
Data processing and analysis software

Energy consumption

Power consumption	< 3000 W (single phase power)

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