ID-02-1 7T-WLS-µSpot

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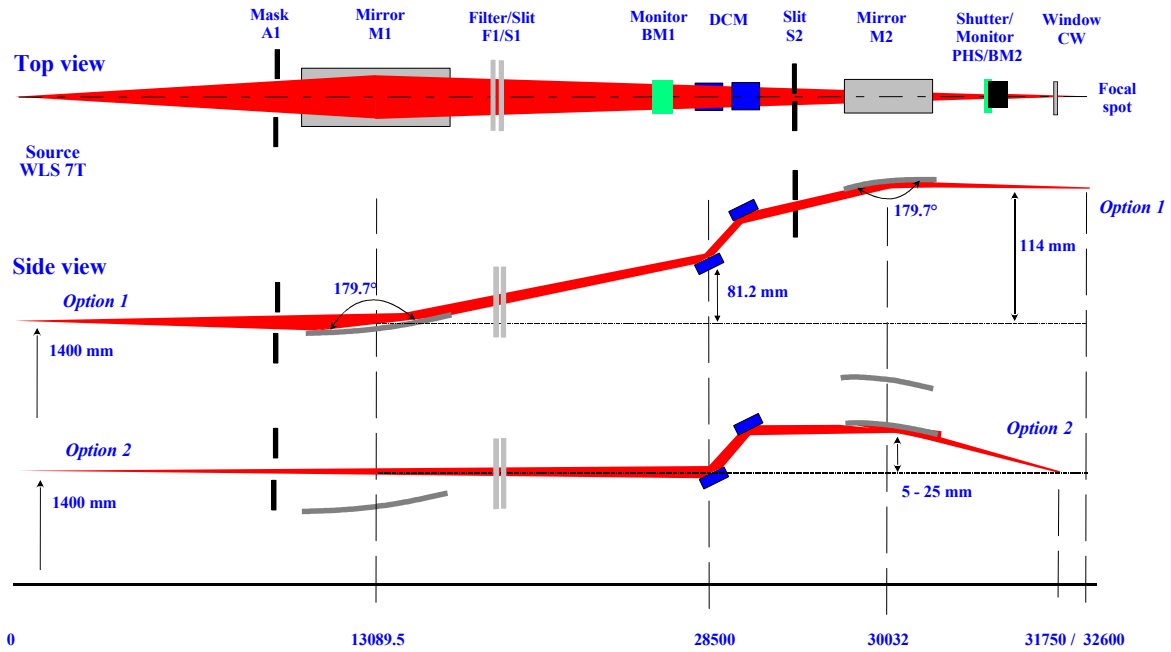
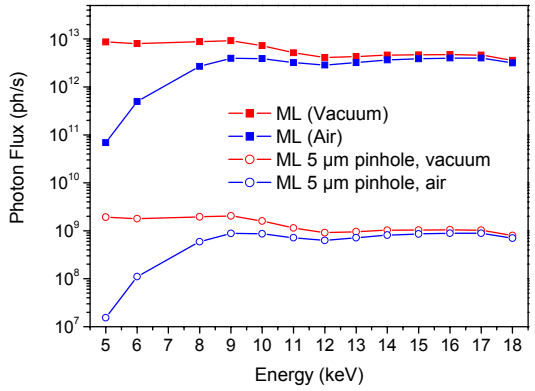
OPTICAL LAY-OUT (schematic)



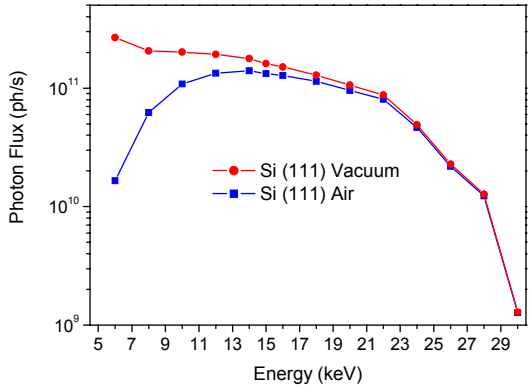
Aceptance	1.5 mrad horizontal
Input mask	22 mm x 3 mm (H x V), water cooled.
Filters:	Be 200µm, Cu 200µm, Al 200µm, Al 1000µm
Premonochromator optics	Pt/Rh-coated cylinder mirror with bending mechanics. Fixed horizontal focus at 32.6 m from the source, variable vertical focus 31 m – inf. from the source. Vertical beam deviation of 0.3°
Entrance slits: Pinholes:	Vertical and horizontal: 0-20 mm, water cooled Ø10 µm, Ø 100 µm, Ø 150 µm, Ø 500 µm, 17.5 m from the source.
Monochromator:	Double-crystal monochromator, first crystal water cooled. Three sets of crystals: Si 111, Si 311 and Ge 111, angular range 3 ° - 75°, One set of Si/W multilayer. Energy range 1.9 keV - 30 keV, feedback stabilization for EXAFS measurements
Postmonochromator optics	Cylinder bimorph mirror with 3 stripes (Pt, Rh and ucoated silica). Variable vertical focus 32.6 m - 36 m from the source. Vertical beam deviation of 0.3°
Exit slit	Vertical and horizontal slits: 0-10 mm
references	A. Erko, F. Schäfers, A. Firsov, W.B. Peatman, W. Eberhardt, R. Signorado, “The BESSY X-Ray Microfocus Beamline project”, Spectrochimica Acta A, 2004, **Part B 59**, 1543-1548

PERFORMANCE DATA

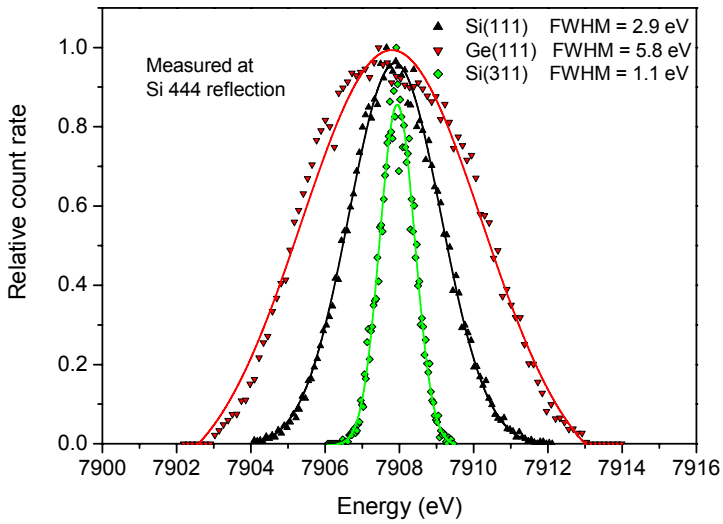
Exit flux with multilayer monochromator:
10^{12} – 10^{13} phot/sec/100mA



Exit flux with crystal monochromator:
10^{8} – 10^{11} phot/sec/100mA



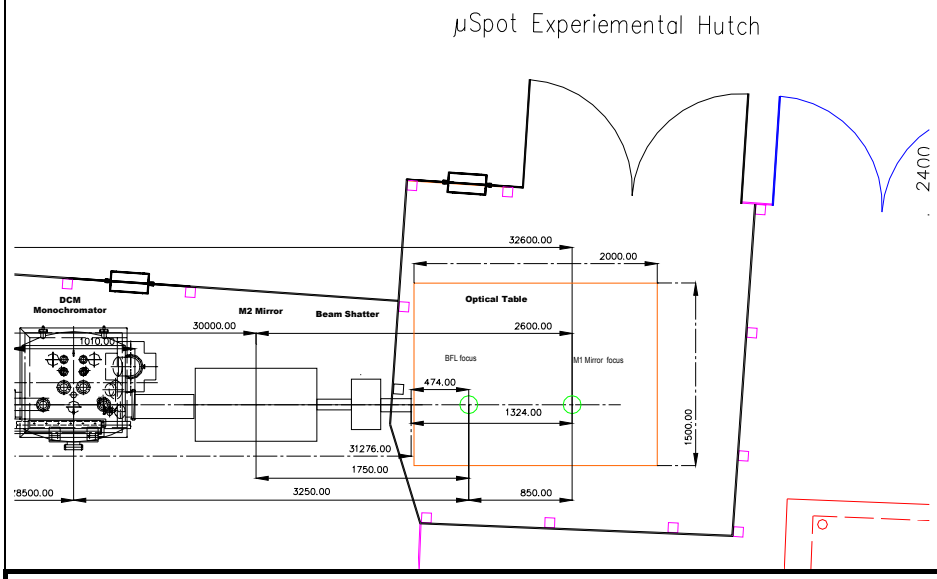
Resolving power Si 444 normal incidence reflection:



spot size at experiment:	Ø300 µm (Ø 5 µm with capillary optics) with premirror optics Ø15 µm with Bragg-Fresnel lens
Maximal divergence at sample position:	1 mrad (hor.) x 1 mrad (ver.) with premirror optics 0.25 mrad (hor.) x 0.55 mrad (ver.) with Bragg-Fresnel optics

TECHNICAL REFERENCE

FLOOR PLAN at – air experimental arrangement. Top view



GEOMETRICAL BOUNDARY CONDITIONS

	In-air experimental area	Optical table 2.0 m x 1.5m, in the Hutch (see floor plan), 2 Capton windows, differential pumping at 31.276 m from source.
	Focus position in the hutch	Mirror M1 / Bimorph mirror M2 focal position: 32,6m from source, 1324 mm from the capton window. Bragg-Fresnel (Si Fresnel) lens / Bimorph mirror M2 focal position: 31,75m from source, 474 mm from the capton window
	Focus height in the hutch	1425 - 1545 mm above floor
	Special instrumentation: **XRF/EXAFS/XANES**	Following equipment is available: - X-ray detectors: o Ion chambers for flux measurement o A calibrated photodiode for absolute flux determination o A 7-element Si(Li) array detector with digital signal electronic for XRF and XAFS (high throughput mode for XAFS) Further detectors are available on demand - A long distance microscope with a resolution of 2-3 µm. CCD-camera and framegrabber for image acquisition. - A liquid nitrogen based cryo-stream for sample cooling - Two xyz sample stages with 20 mm and 150 mm travel range resp. and an accuracy of 0.1 µm. Load can be up to ca. 10 kg. - Glas capillary lenses with spatial resolution of ca. 15 and 25 µm. The beamline is equipped for **micro-XRF**, **micro-XAFS** experiments with a resolution down to 15 µm. An additional polycapillary X-ray optic can be placed in the detection channel. 3**D micro-XRF** and **3D micro-XAFS** can be carried out. The beamline is equipped with a graphical user interface for positioning, spectra acquisition and image acquisition. Data are stored in an easily understandable XML-format. Online spectra evaluation is in preparation. In preparation as well is a free offline version for data inspection and evaluation. Please contact the beamline scientist for specific needs and for information on the current state of development. Realtime remote access to spectra and microscope images is possible. In addition all the above mentioned detectors are available. A high-resolution X-ray CCD camera with a pixel size of 6.7 µm can be used for experiments alignment.

	SAXS/WAXS/XRF	• Detectors o MarMosaic 225 (SAXS/WAXS detector, 16 bit CCD coupled with fibre-optic taper to a 225 mm Phosphor, 3072x3072 pixels, pixel size 73 µm, readout time 1 s, low noise) o Silicon Drift Detector (XRF) o Ionisation Chamber o Calibrated Photodiode • On-axis long-distance optical microscope with CCD camera and framegrabber on 2Θ goniometer arm • Two separate XYZ sample stages (20mm or 150mm travel, resolution 0.1 µm, load up to 10kg), sample rotation about vertical axis. • Independent 5-axes / 2-axes positioning systems for pinholes or capillaries for beam definition, 3-axes beam stop positioning system. • Liquid nitrogen based cold gas stream for sample cooling (KGW Isotherm). • He-Tube for SAXS measurements • Microbeam for SAXS/WAXS o Option 1: 10 µm beam size with torroidal mirror, multilayer monochromator and pinhole / Si zone plate, $\Delta E/E=10^{-2}$, Flux ≈ 10^9 photons/s/100 mA. o Option 2: 20 µm beam size with Ge111 with BFL / bimorph mirror Si zone plate combination, $\Delta E/E=3\ 10^{-4}$, Flux ≈ 10^8 ph/s/100 mA. The current setup is suitable for (scanning) microbeam SAXS/WAXS experiments with simultaneous XRF detection. The small-angle resolution (minimum $q=4\pi\sin\theta/\lambda$) due to beam divergence for all energies is about 0.1 nm^{-1}. Up to 3 orders of magnitude in q can be covered simultaneously (simultaneous SAXS/WAXS) **Data acquisition and SAXS/WAXS instrumentation control:** Sample positioning, instrument control and data acquisition is under SPEC (Certified Scientific Software, Cambridge MA (USA)) using several graphical user interfaces on the basis of custom made PHYTON based programs. Detector data and motor scan position are stored in a SPEC-data file, Mar-frames and Microscope images are stored separately as, e.g., Tiff images.

□ VACUUM REQUIREMENTS	
max. pressure	< 2 x 10^{-8} mbar at last valve, live zero point signal for interlock
oil free vacuum system	yes
In - air experiments	yes
□ INFRASTRUCTURE AT EXPERIMENTAL STATION	
electrical power supplies	220V, 380 V max 135 kVA
cooling water	20° / 25°, 1 bar / 2 bar
pressurized air	8 bar
oilfree exhaust line	not for hazardous gases!
He-recycling system	yes
□ DATA ACQUISITION	
control system	PC-based
data-acquisition computer	Personal Computer, measurement bus-extention.
data-acquisition software	.
remote-control	