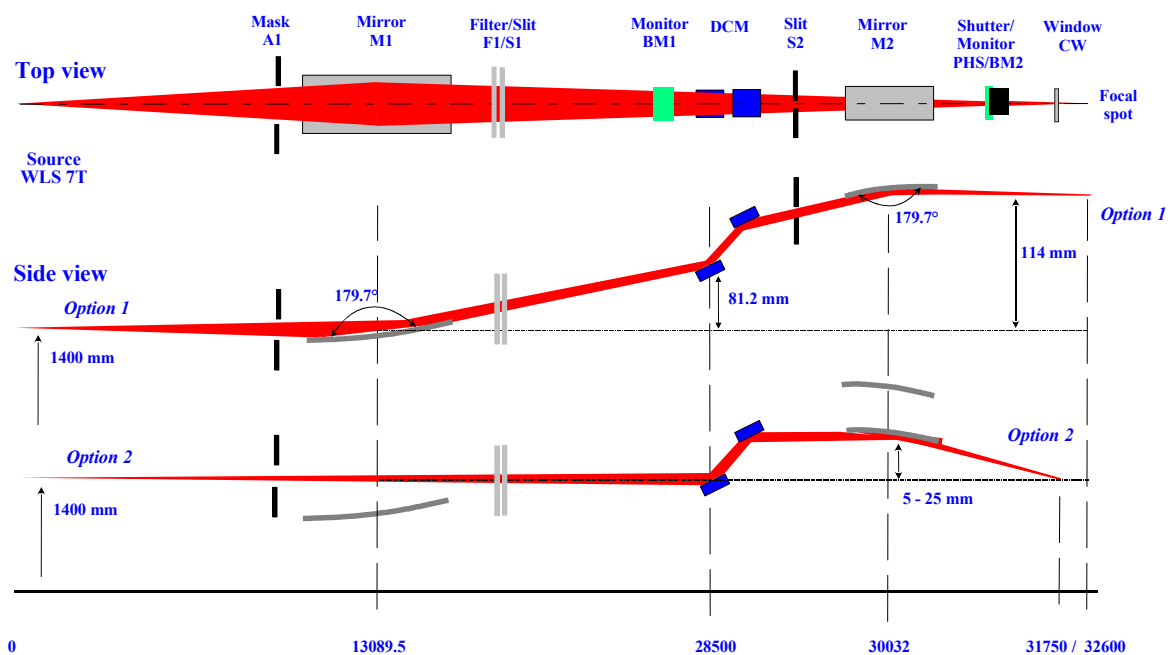


ID-02-1**7T-WLS- μ Spot**

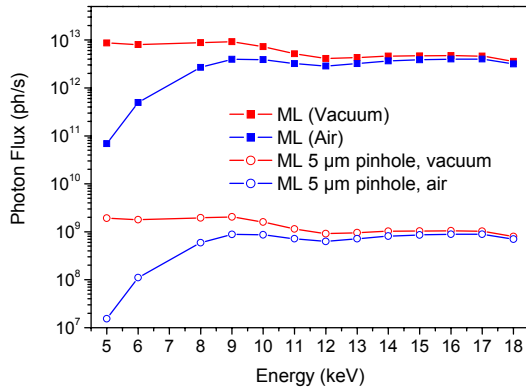
| CONTACT PERSON | building | room | phone | fax | e-mail |
|---------------------|----------|------|---------------|---------------|----------------------------|
| A. Erko (BESSY) | 14.51 | 3371 | 030 6392 2945 | 030 6392 2990 | alexei.erko@bessy.de |
| O. Paris (MPG) | | | 0331 567 9411 | 0331 567 9402 | oskar.paris@mpikg.mpg.de |
| H. Riesemeier (BAM) | | | 030 8104 - 0 | 030 8112 029 | heinrich.riesemeier@bam.de |

OPTICAL LAY-OUT (schematic)

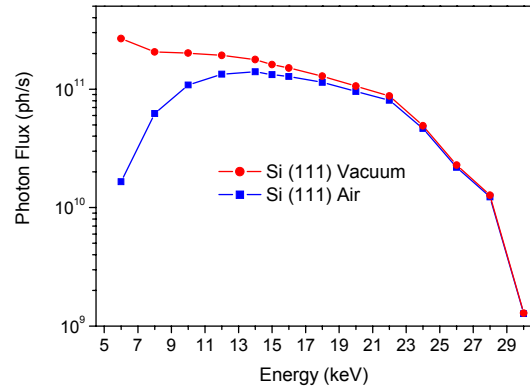
| | |
|------------------------------|---|
| Acceptance | 1.5 mrad horizontal |
| Input mask | 22 mm x 3 mm (H x V), water cooled. |
| Filters: | Be 200 μ m, Cu 200 μ m, Al 200 μ m, Al 1000 μ m |
| Premonochromator optics | Pt/Rh-coated cylinder mirror with bending mechanics. Fixed horizontal focus at 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 μ m, Ø 100 μ m, Ø 150 μ m, Ø 500 μ m, 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. Signorato, "The BESSY X-Ray Microfocus Beamline project", Spectrochimica Acta A, 2004, Part B 59 , 1543-1548 |

PERFORMANCE DATA

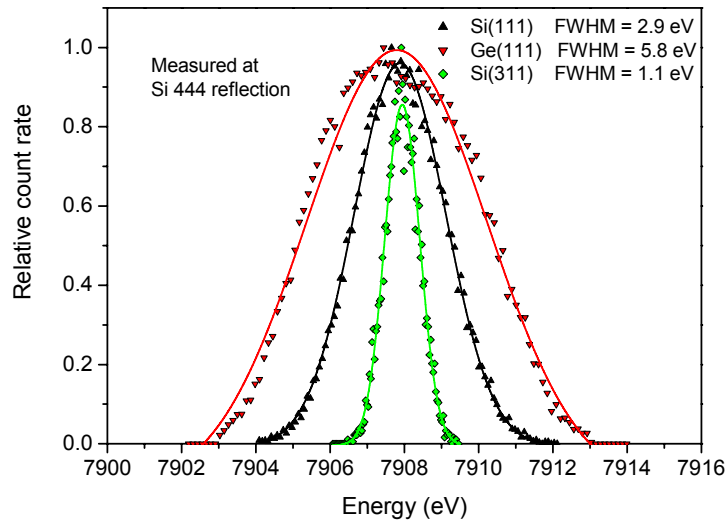
Exit flux with multilayer monochromator:
 $10^{12} - 10^{13}$ phot/sec/100mA



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



Resolving power Si 444 normal incidence reflection:

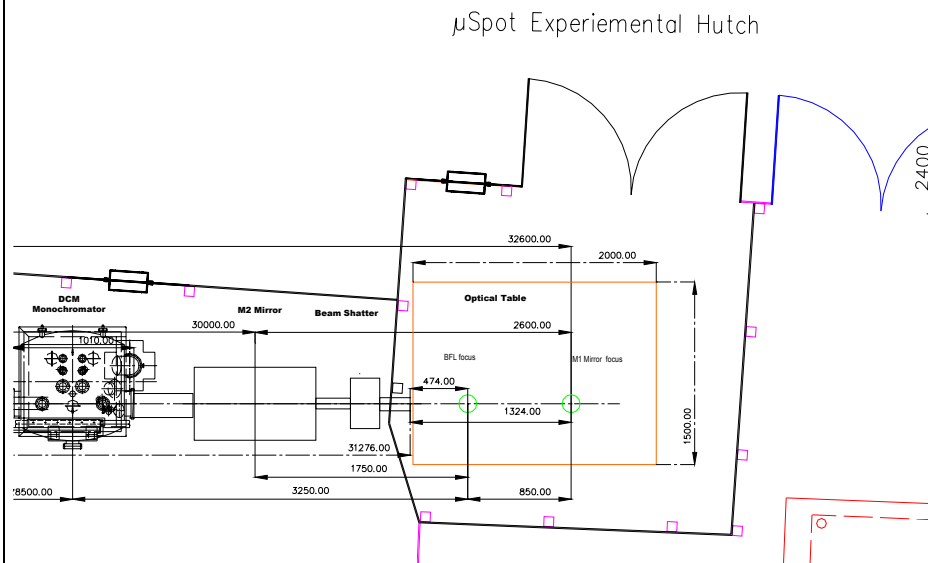


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| spot size at experiment: | Ø300 μm (Ø 5 μm with capillary optics) with premirror optics Ø15 μm with Bragg-Fresnel lens |
|---------------------------------|---|

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| 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

| | | |
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| | 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 | <p>Following equipment is available:</p> <ul style="list-style-type: none"> - X-ray detectors: <ul style="list-style-type: none"> ○ Ion chambers for flux measurement ○ A calibrated photodiode for absolute flux determination ○ A 7-element Si(Li) array detector with digital signal electronic for XRF and XAFS (high throughput mode for XAFS) <p>Further detectors are available on demand</p> <ul style="list-style-type: none"> - 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. <p>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. 3D micro-XRF and 3D micro-XAFS can be carried out.</p> <p>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.</p> <p>Online spectra evaluation is in preparation. In preparation as well is a free offline version for data inspection and evaluation.</p> <p>Please contact the beamline scientist for specific needs and for information on the current state of development.</p> <p>Realtime remote access to spectra and microscope images is possible.</p> <p>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.</p> |

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| SAXS/WAXS/XRF | <ul style="list-style-type: none"> • Detectors <ul style="list-style-type: none"> ○ 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) ○ Silicon Drift Detector (XRF) ○ Ionisation Chamber ○ 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 <ul style="list-style-type: none"> ○ Option 1: 10 μm beam size with torroidal mirror, multilayer monochromator and pinhole / Si zone plate, $\Delta E/E=10^{-2}$, Flux $\approx 10^9$ photons/s/100 mA. ○ Option 2: 20 μm beam size with Ge111 with BFL / bimorph mirror Si zone plate combination, $\Delta E/E=3 \cdot 10^{-4}$, Flux $\approx 10^8$ ph/s/100 mA. <p>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)</p> <p>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.</p> |
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| <input type="checkbox"/> VACUUM REQUIREMENTS | |
| max. pressure | $< 2 \times 10^{-8}$ mbar at last valve, live zero point signal for interlock |
| oil free vacuum system | yes |
| In - air experiments | yes |
| <input type="checkbox"/> 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 |
| <input type="checkbox"/> DATA ACQUISITION | |
| control system | PC-based |
| data-acquisition computer | Personal Computer, measurement bus-extended. |
| data-acquisition software | . |
| remote-control | |