DIP-1.1	Optics Beamline PM-1	++49 30 8062 – 14755 – 14674

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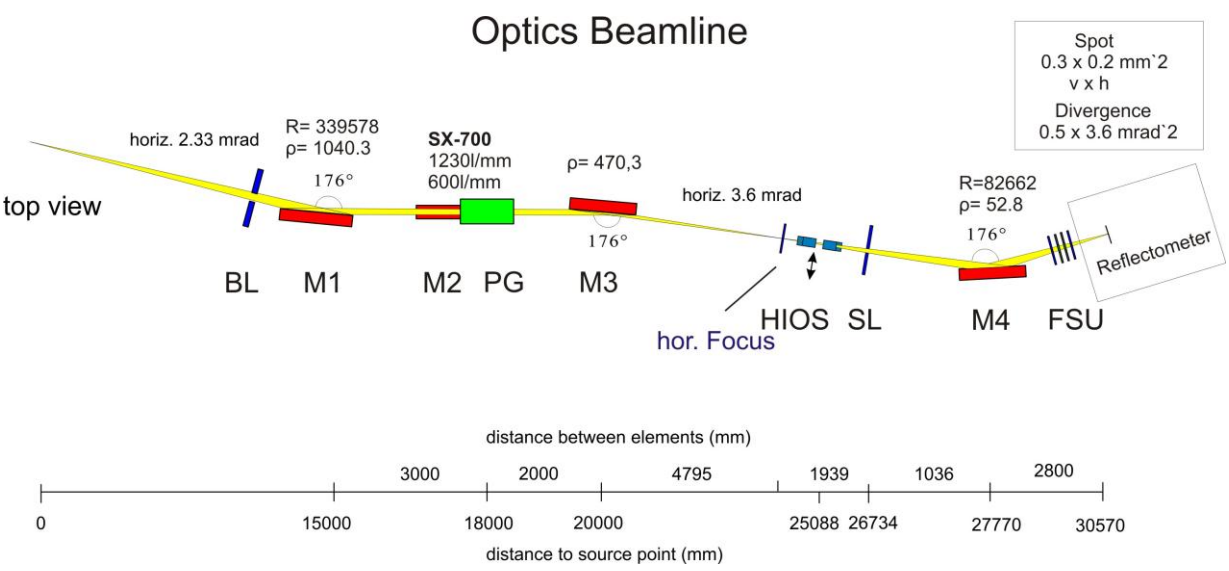


This XUV collimated plane grating monochromator (PGM-) beamline at a bending magnet is coupled to a versatile four-circle (ten axes) UHV- reflectometer as a permanent end station. The whole setup is dedicated to at-wavelength characterization and precision calibration of mirrors, multilayers, gratings, and nano-optical devices etc. It is open for external reflectivity projects (reflectometry, spectroscopy or scattering techniques)

The beamline and reflectometer is designed to take into account all specific features required for successful reflectometry - metrology experiments:

- High spectral purity
- Suppression of stray light and scattered radiation
- Broad energy range
- Low beam divergence and spot size on the sample
- Linearly (s- or p-) or elliptically polarized light
- Large samples (up to 300 mm length and 4 kg weight)

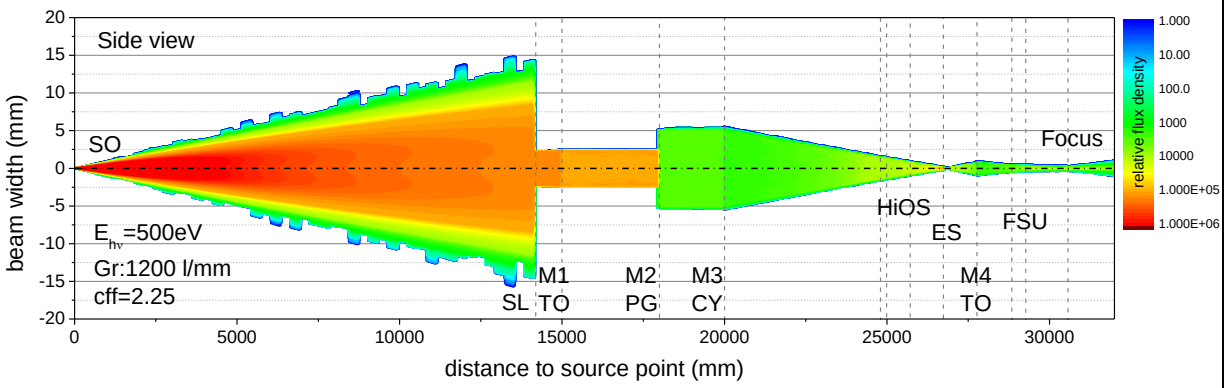
Beamtime at this station is available by user-proposals or, at short-term request, by cooperation with our Institute for Nanometre Optics and Technology (FG-INT).

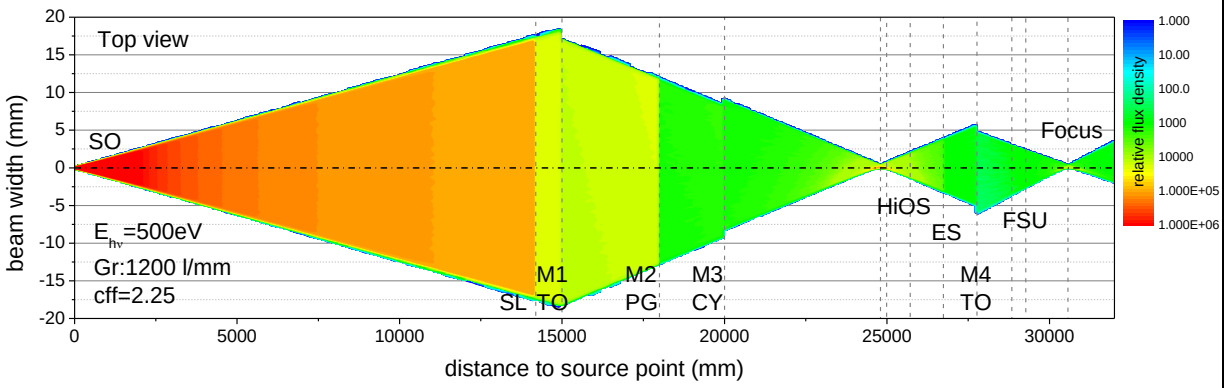
Acceptance	0.5 x 2.33 mrad^2 (v x h)
Premonochromator optics	**M1**: toroidal mirror, horizontal deflection, 2θ=176°, gold coated, water cooled, vertical collimation and horizontal focussing behind HiOS chamber.
Monochromator	**SX-700 ZEISS monochromator (PM-1)** principle: variable deflection angle, collimated plane grating monochromator optical components: **M2**: blazed plane mirror, vertical deflection, 2θ= 154-177° **G1, G2**: blazed plane gratings, vertical deflection, 2θ=132-177°

	E [eV]	d[ℓ/mm]	coating	blaze angle
G1	10 - 1500	600	Au	2.0°
G2	20 - 2000	1200	Au	1.2°

Postmonochromator optics	**M3**: cylindrical mirror, horizontal deflection, 2θ=176°, gold coated, vertical focusing on exit slit
High Order Suppression System (HiOS)	**HiOS** chamber equipped with two sets of 4 plane mirrors **1st set**: **m1**, **m2**, **m3**, **m4**, grazing angular range 2° – 12°, Si-substrate **2nd set**: **m1**, **m2**, **m3**, **m4**, grazing angular range 8° – 70°, each mirror has 3 stripes (C (35nm), AlF_3 (35nm) and Si-substrate)
Exit slit	slit setting: 0-2000 μm
Refocusing optics	**M4**: refocusing toroidal mirror, horizontal deflection, 2θ=176°, gold coated, horizontal and vertical focussing onto sample in Reflectometer chamber
Filter-slit unit chamber (FSU)	double set of **absorber filters**: Mg (750nm), Al (500nm), Be (750nm), B (750nm), C_6H_8 (1500nm), Ti (750nm), Cr (750nm), Fe (750nm), Cu (750nm) and double set of pinholes and slits (12 mm hor. size) with vertical size of: 0.2 mm, 0.4mm, 0.8mm, 1.2mm, 1.5mm, 3.6mm
Experimental station	Reflectometer

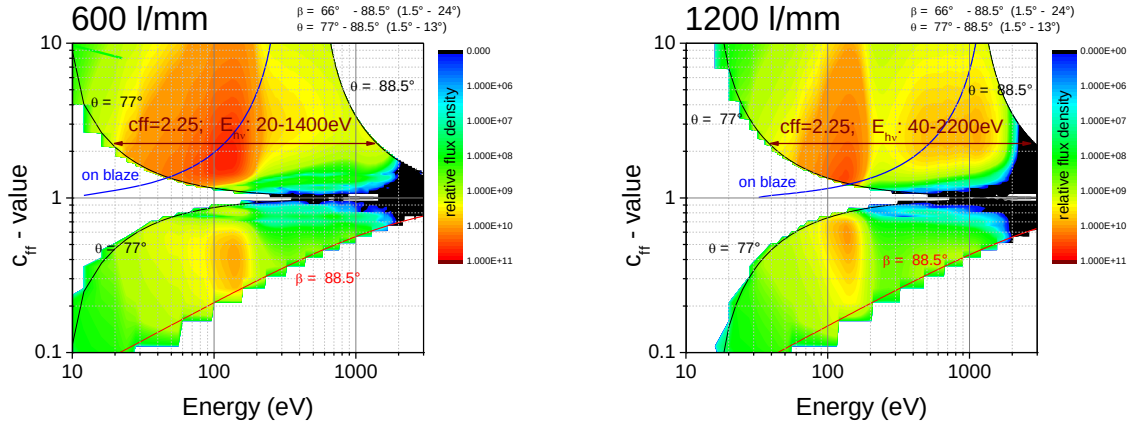
Beam size in vertical and horizontal plane along the beamline for typical operation parameters



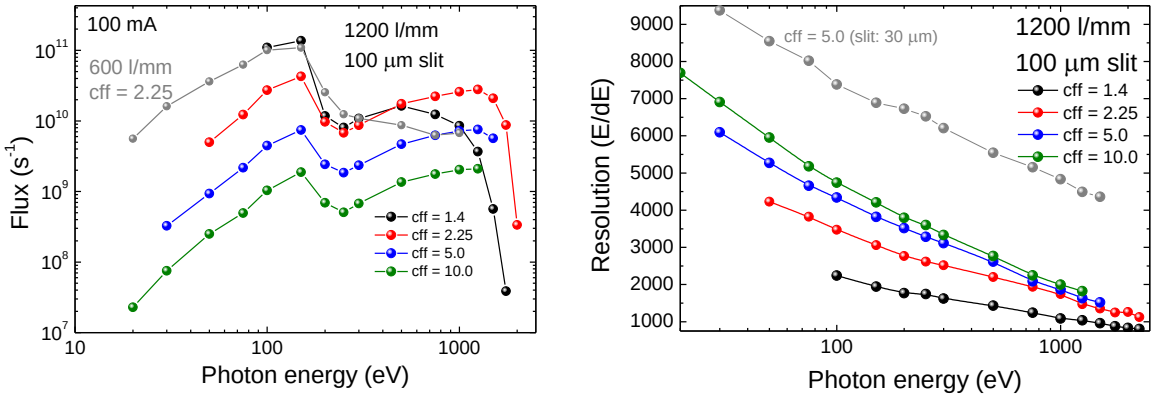


PERFORMANCE DATA

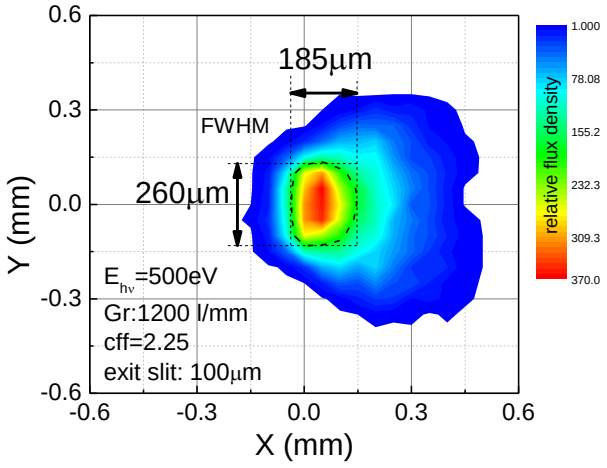
Accessable energy range and relative flux densities calculated with REFLEC



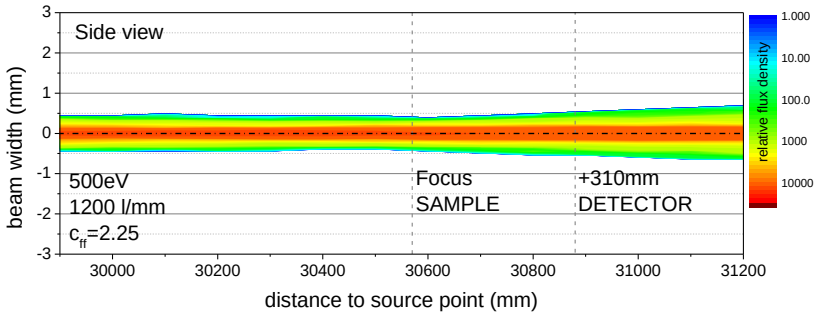
Photon flux and energy resolution calculated with RAY



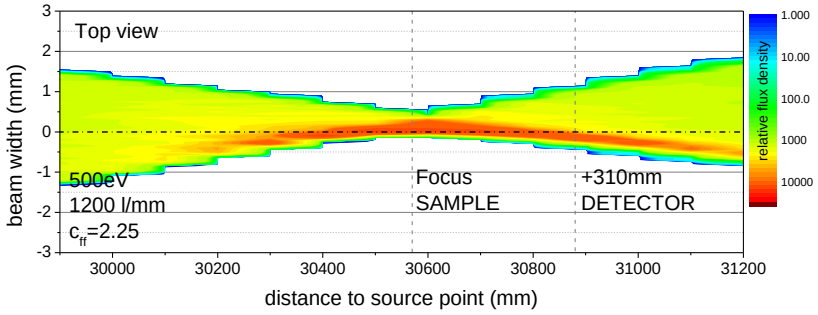
Beam size and relative flux density at the reflectometer sample position calculated with RAY. FWHM beam size is 260 µm x 185 µm with the indicated beamline settings



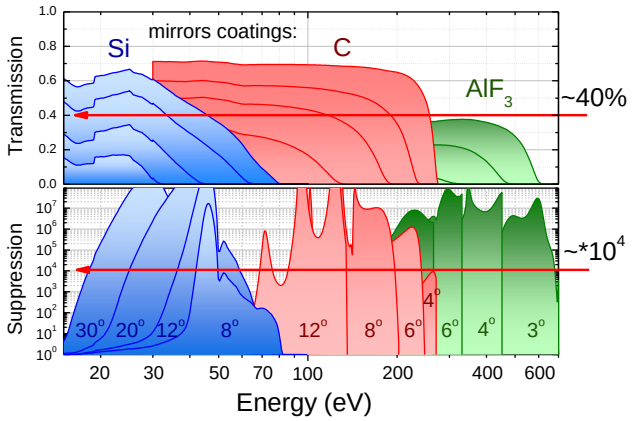
Beam divergence at the focus position in vertical plane



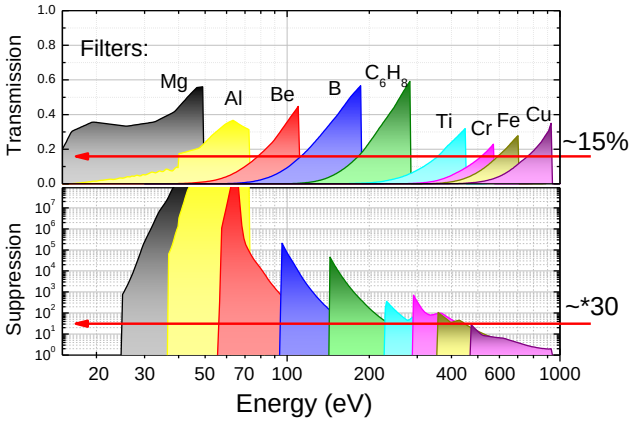
Beam divergence at the focus position in horizontal plane



Calculated second suppression and transmission for the 4-mirror High order Supression System HiOS



Calculated second order suppression and transmission by absorber filters in the FSU chamber



References

1. A. A. Sokolov *et al.*, "**An XUV Optics Beamline at BESSY II**" Proc. of SPIE **Vol. 9206,** 92060J, pp. 1 – 13 (2014)
2. F. Eggenstein *et al.*, "**A reflectometer for at-wavelength characterization of XUV-reflection gratings**", Proc. of SPIE **Vol. 9206,** 920607, pp. 1 – 12 (2014)
3. F. Eggenstein, *et al.*, "**A reflectometer for at-wavelength characterization of gratings**", Nucl. Instrum. Meth. A710 166–171 (2013)