

The plane grating monochromator beamline U49/2 PGM1 at BESSY II

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Instrument Scientists:

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Abstract: U49/2 PGM1 is one of HZB open-port VUV beamlines. Therefore and due to the fact that it delivers highest flux with very acceptable energy resolution it is the most heavily booked BESSY II beamline. Earlier work has largely focused on surface science and catalysis. After shut down of the former U41 PGM an increasing number of experiments on liquids and solutions are carried out.

1 Introduction

The plane grating monochromator U49/2 PGM1 delivers soft X-ray undulator radiation of linear polarization between 84 and about 1500 eV. High photon flux combined with high stability and a comparatively small spot size allow for "photon hungry" experiments like e.g. coincidence methods, photo-excitation on liquid jets or clusters. Experiments have a strong focus on surface chemistry and surface physics but also serve selected topics in molecular and atomic science. The high demand of these radiation properties is visible by the overbooking in beam time requests and the number and quality of high impact publications by external and in-house users.

*Cite article as: Helmholtz-Zentrum Berlin für Materialien und Energie. (2016). The plane grating monochromator beamline U49/2 PGM1 at BESSY II. *Journal of large-scale research facilities*, 2, A72. <http://dx.doi.org/10.17815/jlsrf-2-75>



Figure 1: Top-view of beamline U49/2 PGM1.

2 Instrument application

Typical applications are:

- Surface science
- Catalysis
- Photoemission
- Liquids
- Liquid Solutions

3 Source

Type	planar hybrid
Location	H15
Periode length	49.4 mm
Periods/Pols	84
Minimal Energy at 1.7 GeV	84.4 eV
Minimal Gap	16 mm
Polarisation	linear horizontal

Table 1: Parameters of the undulator U49/2.

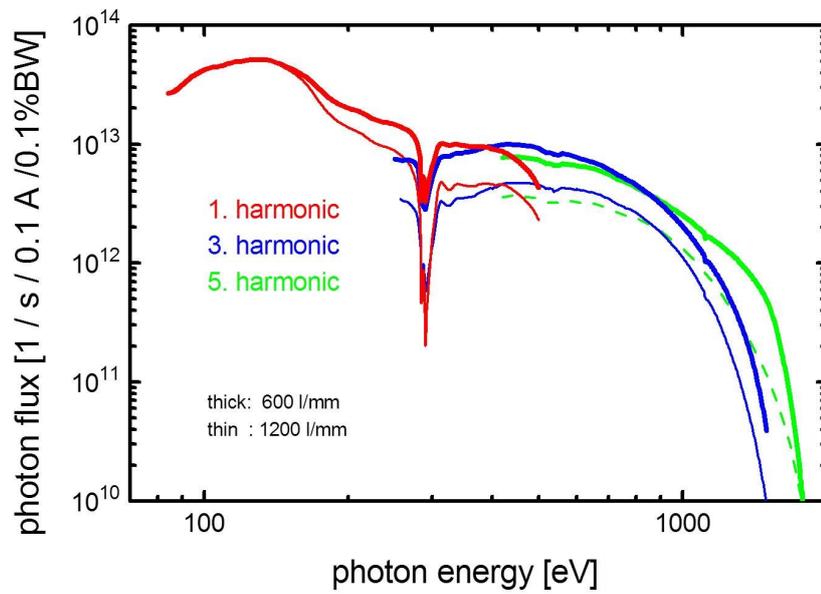


Figure 2: Photon flux at beamline U49/2 PGM1.

4 Optical Design

The M1 toroidal mirror M1 collimates the radiation horizontally and vertically. The monochromator pre-mirror M2 together with the exchangeable gratings G build up a standard Zeiss P(lane)-G(rating)-M(onochromator) configuration. The cylindrical mirror M3 focuses the dispersed beam onto the exit slit while it leaves the horizontal component unaffected. The refocusing mirror M4 has an arm length ratio of 3:2 vertically. Horizontally the incoming collimated beam is focused at 1200 mm.

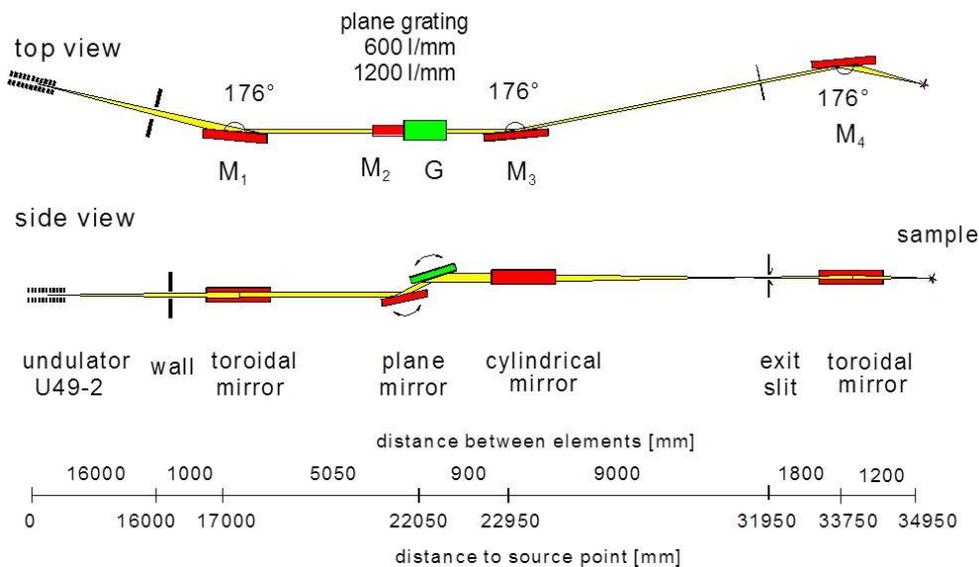


Figure 3: Optical layout of beamline U49/2 PGM1.

5 Technical Data

Location	16.2
Source	U49/2
Monochromator	PGM1
Energy range	85 - 1600 eV
Energy resolution	25,000 (85 - 500 eV) 15,000 (500 - 1,500 eV) (standard grating)
Flux	1013 ph/s (85 - 500 eV) 1012 ph/s (500 - 1500 eV) (standard grating)
Polarization	Horizontal
Divergence horizontal	2 mrad
Divergence vertical	2 mrad
Focus size (hor. x vert.)	100 μm x 22 μm
Distance Focus/last valve	959 mm
Height Focus/floor level	1417 mm
Free photon beam available	Yes
Fixed end station	No

Table 2: Technical parameters of beamline U49/2 PGM1.

References

- Sawhney, K., Senf, F., & Gudat, W. (2001). PGM beamline with constant energy resolution mode for U49-2 undulator at BESSY-II. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 467–468, Part 1, 466 - 469. (7th Int. Conf. on Synchrotron Radiation Instrumentation) [http://dx.doi.org/10.1016/S0168-9002\(01\)00360-6](http://dx.doi.org/10.1016/S0168-9002(01)00360-6)