

The variable polarization undulator beamline UE52 SGM at BESSY II

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Abstract: UE52 SGM is an open port beamline with a monochromator containing 3 spherical gratings covering the energy range of 100 to 1500 eV and allows for variable polarization (circular and in any orientation linear) with a focus of about 20 - 60 μm (horizontal) x beamline slit (vertical) spot in focus.

1 Introduction

Soft X-ray beamline for flexible end stations with variable polarization covering the range of 100 - 1500 eV with an X-ray spot size of approximately 20 - 60 μm (horizontal) x beamline exit slit (vertical) in focus. The polarization can on request be freely chosen between linear (any orientation) and circular due to the source undulator UE52 with more details in section 3. The beamline consists of a spherical gratings monochromator with 3 spherical gratings, an exit slit (that presents the vertical spot size) and two (horizontal and vertical) refocusing chambers. More details are presented in section 4.

2 Instrument application

Typical applications are:

- Magnetism and Magnetization dynamics
- Holography, coherent diffractive imaging
- Self-assembled monolayers, photo-switches

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- Single-molecule magnets (surfaces)
- Correlated systems, superconductivity
- Nanoparticles, aerosols, clusters
- Atomic and molecular physics (gas phase)



Figure 1: Top-view of beamline UE52 SGM.

3 Source

The insertion device is the elliptical undulator UE52 with the following parameters:

Type	APPLE2
Location	H09
Periode length	52 mm
Periods/Pols	77 n
Minimal Energy at 1.7 GeV	72 eV
Minimal Gap	16 mm
Polarisation	linear variable $0^\circ \dots +90^\circ$ elliptical, circular

Table 1: Parameters of insertion device UE52.

4 Optical Design

Pre monochromator optics	M1: cylindrical mirror, horizontal deflection, $2\Theta=175^\circ$, gold coated, water cooled, vertical demagnification (17:2.5) of source on entrance slit
Entrance slit	Slit setting: 0-2000 μm , water cooling, insulated blades for vertical beam position sensing, on line laser diffraction slit width monitor
Monochromator	Principle: variable deflection angle, focused spherical grating monochromator
Optical components	M2: plane mirror, vertical deflection, $2\Theta=169-175^\circ$, gold coated, water cooled G1-3: spherical gratings, vertical deflection, $2\Theta=169-175^\circ$, gold coated, originally water cooled, but since October 2014 not anymore. Therefore 100 eV is now the lowest reachable energy.
Exit slit	Slit setting= 0-2000 μm , ± 200 mm translation, on line laser diffraction slit width monitor
Post monochromator optics	M3: cylindrical mirror, horizontal deflection, $2\Theta=176^\circ$, gold coated, vertical demagnification (1:1) of exit slit M4: plane elliptical mirror, horizontal deflection, $2\Theta=176^\circ$, gold coated, horizontal demagnification of source

Table 2: Optical layout of beamline UE52 SGM.

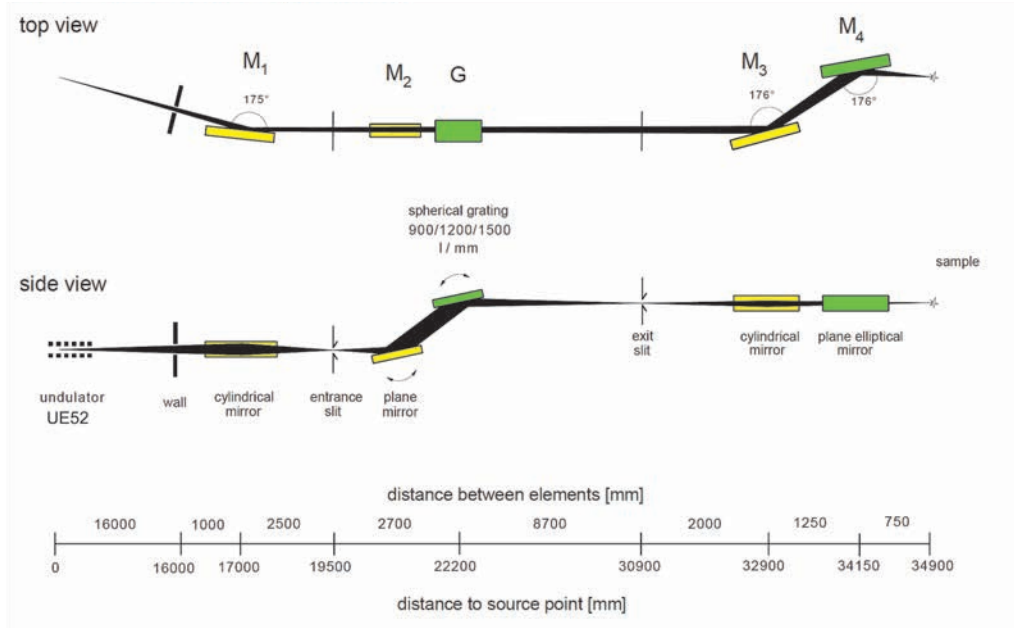


Figure 2: Optical layout of beamline UE52 SGM (modified from Senf et al. (2001)).

5 Technical Data

Location	10.2
Sourcen	UE52
Monochromator	SGM
Energy range	100 - 1500 eV
Energy resolution	> 4,000
Flux	> 1012
Polarization	Variable
Divergence horizontal	6 mrad
Divergence vertical	1 mrad
Focus size (hor. x vert.)	60 μm (hor)
Distance Focus/last valve	530 mm
Height Focus/floor level	1417 mm
Free photon beam available	Yes
Fixed end station	No

Table 3: Technical data of Beamline UE52 SGM.

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