



The μ mRIXS spectrometer at BESSY II

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Abstract: The μ mRIXS confocal plane grating spectrometer offers high resolution resonant inelastic x-ray scattering (RIXS) spectroscopy in the soft x-ray range between 90 eV and 1000 eV. The small focus of its dedicated beamline allows for spectroscopical imaging at selected sample sites with a spatial resolution of 1 micrometer.

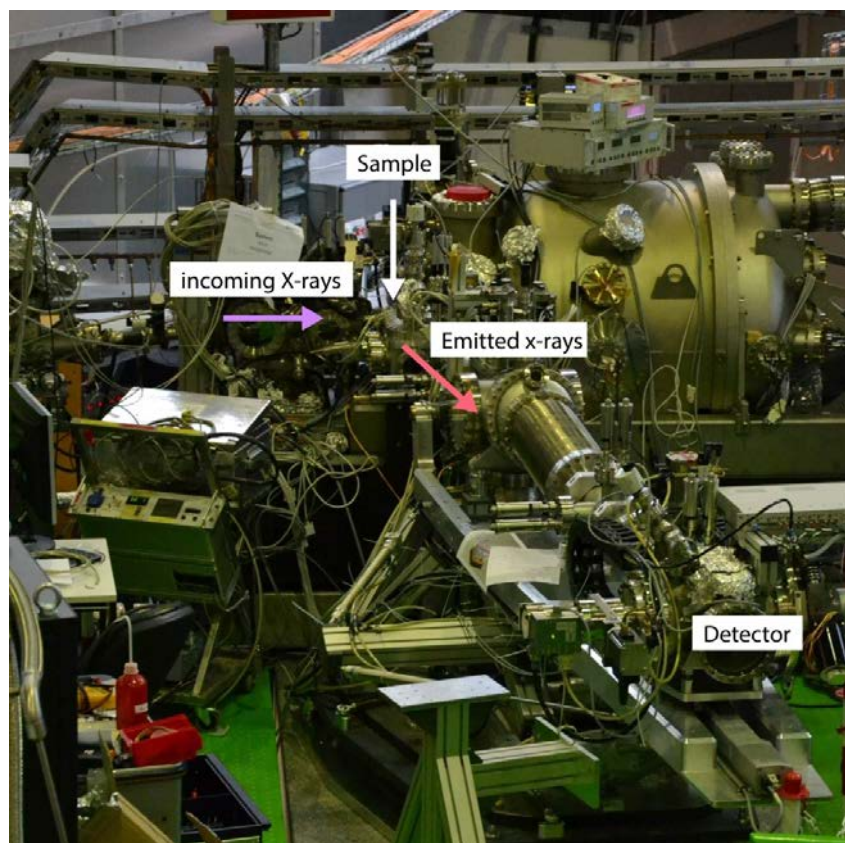
1 Introduction

The μ mRIXS plane grating spectrometer consists of two parabolical mirrors with a plane grating in between. The first mirror collects and collimates the radiation from the $1 \times 4 \mu\text{m}^2$ beamline microfocus on the sample onto the grating while the second mirror focusses the diffracted light onto the detector. The spectrometer houses two laminar grating structures on a common substrate: 1050 l/mm for high transmission and 4200 l/mm for high resolution. The photons are detected by a PHOTONIS multi channel plate (MCP) stack in combination with a RoentDek delay line detector DLD-120. The MCP channel diameter is 25 μm and the top MCP is coated with CsI to improve the quantum efficiency of the detector. The samples are mounted in the solid state experimental chamber directly to a Janis ST-500 Microscopy Cryostate which allows for a maximum stability of the sample position. To avoid mechanical instabilities in sample positioning, no sample translation stage is installed, but the whole vacuum chamber can be positioned by a 3-axis Huber table vertically and in the horizontal plane. Rotation of the sample around the vertical axis is achieved via a rotation of the microscope cryostate.

The μ mRIXS spectrometer is permanently situated at the UE49-SGM beamline while the solid state experimental chamber can be exchanged for the coherent X-ray scattering (CXS) chamber.

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Figure 1: View of the μ RIXS spectrometer.

2 Typical applications

- RIXS with micrometer focus on solid samples
- Fluorescence yield absorption spectroscopy with micrometer focus
- Temperature dependent measurements

3 Technical Data

Energy range	Soft X-rays from 90 to around 1000 eV, resolving power better than 2000
Sample environment	Solid samples in vacuum, sample transfer
Temperature range	From liquid helium temperatures to 600 K
Detectors	Plane grating spectrometer with MCP stack + Delay line detector, GaAs photodiode
Manipulators	He cryostate with 4 degrees of freedom, all motorized

Table 1: Technical parameters of the μ RIXS spectrometer.

References

Könnecke, R., Follath, R., Pontius, N., Schlappa, J., Eggenstein, F., Zeschke, T., ... Föhlisch, A. (2013). The confocal plane grating spectrometer at BESSY II. *Journal of Electron Spectroscopy and Related Phenomena*, 188, 133 - 139. <http://dx.doi.org/10.1016/j.elspec.2012.11.003>