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POLYX: a new compact beamline at SOLARIS for X-ray microimaging and microspectroscopy in the 4 – 15 keV energy range

Wednesday 28 August 2024 11:40 (20 minutes)

POLYX is a newly constructed compact bending magnet beamline at the SOLARIS National Synchrotron Radiation Centre in Kraków. The design of POLYX was motivated by the high demand among Polish synchrotron radiation users for experiments at hard X-ray energies. The operating range of POLYX, 5 –15 keV, is well above the 2 keV critical energy of the 1.5 GeV SOLARIS source. To compensate for the relatively low flux of the SOLARIS bending magnet at higher energies, POLYX can utilize polychromatic X-rays and achromatic polycapillary and monocapillary optics for efficient X-ray focusing.
A water-cooled hybrid double multilayer/Si(111) monochromator with a constant offset is used to generate beams with bandwidths of 2% and 0.02%, respectively. Due to the short length of the beamline (source-to-sample distance equal to 14.5 m), compact achromatic polycapillary and single-bounce monocapillary optics are used to achieve beam spot sizes ranging from approximately 3 μm to 100 μm. The end-station (Figure 1) is designed for micro-XRF mapping, micro-XAS spectroscopy, and micro-tomography experiments.
Switching between focused and unfocused beams can be performed within several seconds, and switching between white or monochromatic modes in several minutes. White beam commissioning of the beamline was carried out in 2022 [1], and the monochromator was commissioned in 2023. Since fall 2023, POLYX has supported user experiments in what is referred to as expert commissioning mode. Regular experiments are scheduled to start in fall 2024.
In this talk, the performance of the beamline will be presented along with the results of the first user experiments. Development plans related to multibeam X-ray imaging will also be discussed [2].
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[1] . M. Sowa, P. Wróbel, T. Kołodziej, W. Błachucki, F. Kosiorowski, M. Zając, P. Korecki, PolyX beamline at SOLARIS—Concept and first white beam commissioning results, Nuclear Instruments and Methods in Physics Research Section B 538, 131 (2023)
[2] K. M. Sowa, B.R. Jany, P. Korecki, Multipoint-projection X-ray microscopy, Optica 5, 577 (2018).

Figure 1. Experimental table at POLYX. The beamline enables micro-XRF mapping, micro-XAS spectroscopy as well as micro-tomography experiments. Beam focusing is achieved by compact polycapillary and monocapillary optics.

I plan to submit also conference proceedings

Yes

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