BL16XU
RIKEN Analytical Science I

1. Introduction

BL16XU, which had been operated as a contract beamline by the SUNBEAM Consortium [1], became a RIKEN beamline (RIKEN Analytical Science I) in FY2024.

The light source of BL16XU is an in-vacuum linear undulator with a period length of 40 mm and 112 periods. The X-ray beam in a photon energy range from 6 to 72 keV can be used by employing a double-crystal monochromator with Si(111) or Si(311) reflection. A vertically deflecting bent cylindrical mirror works for harmonic suppression and vertical/horizontal focusing.

A versatile 6-axis X-ray diffractometer manufactured by HUBER is installed inside the experimental hutch and is available for public use. This diffractometer is used for diverse academic and industrial needs for X-ray diffraction and scattering analyses, including the structural analysis of thin films, bulk materials, and practical materials, as well as residual strain analysis and various types of in-situ X-ray diffraction.

The basic specifications of the beamline and a diagram of the equipment layout are shown in Table 1 and Fig. 1, respectively.

Table 1. Basic specifications of BL16XU.

Light source	in-vacuum undulator period length: 40 mm period number: 112
Energy range	4.5–72 keV (Si111/Si311)
Photon flux	~10^{12} ph/s at 12.4 keV
Beam size	0.5 mm (H) × 0.5 mm (V)
Experimental station (public use)	Versatile 6-axis X-ray diffractometer

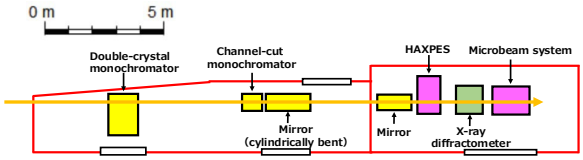

Fig. 1. Layout of BL16XU.

2. Recent activities

The following activities were carried out during the first half of FY 2024:

・preparations to accept public use on the versatile 6-axis X-ray diffractometer,

・network upgrade and introduction of the BL-774 system for optical hatch equipment control, and

・upgrade of the double-crystal monochromator (introduction of Si111/Si311 switching mechanism and temperature stabilization).

To reduce the high competition rate of BL13XU, the versatile 6-axis X-ray diffractometer system was arranged for public use. The equipment control software and accessories (e.g., sample stage, detector, and sample environment equipment) were standardized for both the BL13XU and BL19B2 diffractometers. Figure 2 shows a photograph of the diffractometer. During 2024B, five public proposals were performed, including the in-situ X-ray

diffraction of metal under the tensile testing, the operando electrochemical X-ray diffraction of CO_2 electroreduction catalysts, and the grazing-incidence wide-angle X-ray scattering of a thin film [2].

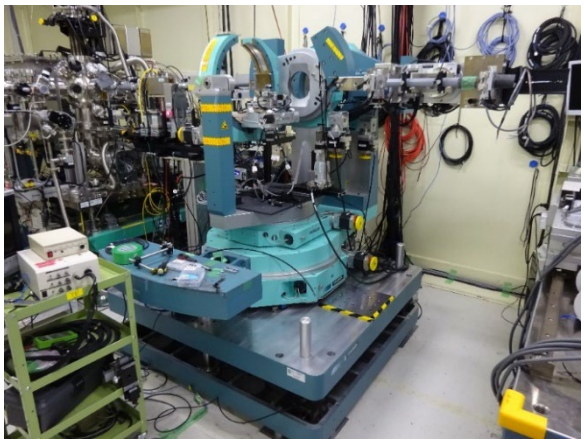

Fig. 2. Photograph of the versatile 6-axis X-ray diffractometer.

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References:

[1] Niwa, Y. (2023). *SPring-8/SACLA Annual Report FY2023*, 148–150.

[2] Tashiro, K. et al. (2025). *Macromolecules*. **58**, 7367–7378.