

BL29XU RIKEN Coherent X-ray Optics

BL29XUL is a one-kilometer long beamline with a SPring-8 standard undulator. The optics hutch is equipped with a SPring-8 standard Si 111 double-crystal monochromator with a liquid nitrogen cooling system, and a pair of platinum-coated vertical reflecting mirrors for higher harmonics reduction and vertical focusing. The first experimental hutch (EH1) is placed at 52 m from the source in the storage ring building, and the second (EH2) is at 987 m in the long beamline experimental facility building. These hutches are connected by two-story vacuum ducts, which are vertically separated by 1 m. The lower duct guides the X-ray beam directly from the beamline monochromator. EH2 provides unique opportunity to use wide area coherent X-rays. There is no permanently installed equipment in the hutches, which increases the versatility of the beamline. Various experiments can be performed by bringing users' own apparatus.

Area of research

X-ray optics, especially coherent X-ray optics

Keywords

Scientific field

Coherent X-ray optics

Equipment

Optical benches, Precision goniometers and stages, Standard X-ray detectors and electronics

Source and optics

The source is a SPring-8 standard in-vacuum undulator. It has 32 mm magnetic period length and 140 periods. The fundamental radiation covers the energy range from 4.9 to 18.7 keV by tuning the gap from 8.8 to 50.0 mm.

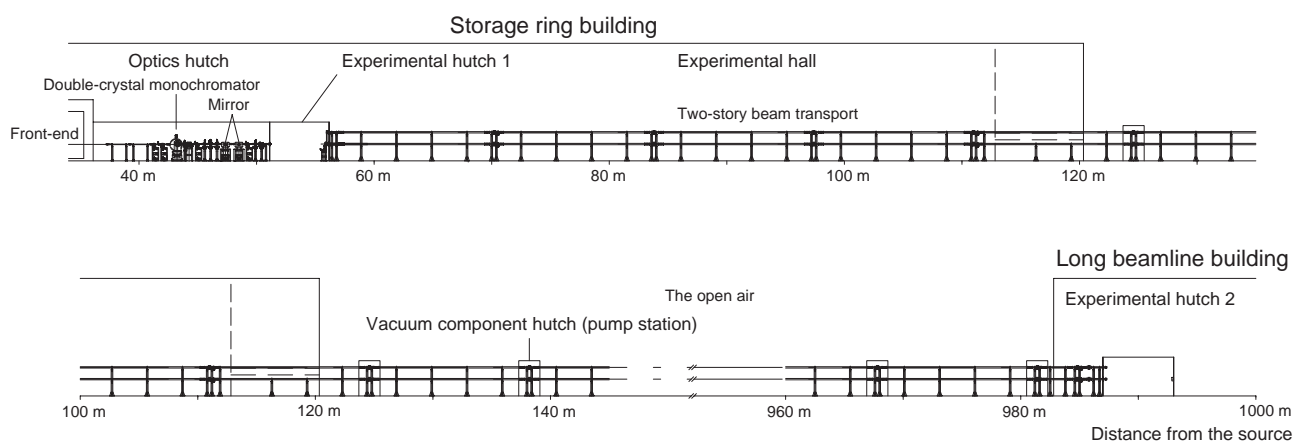
A front-end slit is placed at 28.9 m from the source. The maximum aperture is $1 \times 1 \text{ mm}^2$.

In the optics hutch there is a SPring-8 standard type monochromator at 43.2 m from the source. The scanning angle ranges from 3 to 27 degree corresponding to the energy range from 37.8 to 4.4 keV with Si 111. Symmetric Si 111 crystals are cooled indirectly by the closed loop liquid nitrogen with three 250 W helium refrigerators.

A pair of platinum-coated vertical reflecting mirrors is also equipped in the optics hutch. The upward and downward reflecting mirrors are at 47.35 m and 48.50 m from the source, respectively. They both are 400 mm long. They can be used for higher harmonics reduction and for vertical focusing.

X-rays at sample

Energy range	4.4 ~ 37.8 keV (Si 111)
Energy resolution	$\sim 1.3 \times 10^{-4}$
Photon flux	6×10^{13} photon/s (@10 keV)
Beam size (FWHM)	0.72 (V) \times 1.3 (H) mm^2 (EH1) 10 (V) \times 30 (H) mm^2 (EH2)



Schematic view of beamline

Experimental stations

EH1 is at 52 m from the source and has a size of 5 (along beam) \times 3 (W) \times 3.3 (H) m³. EH2 is at 987 m and has a size of 6 (along beam) \times 3 (W) \times 3.3 (H) m³. There is no permanently installed equipment in the hutches. At the both experimental stations the following equipments are available.

Optical benches

2.0 (along beam) \times 1.0 (W) m², 1.2 (along beam) \times 0.9 (W) m²

Precision goniometers and stages

Standard X-ray detectors

Diode detectors (APD, PIN), Scintillation counters, Ionization chambers, etc.

Standard electronics

NIM Bin, Power supply, Counter/timer, MCA, SCA, Current amp., etc.

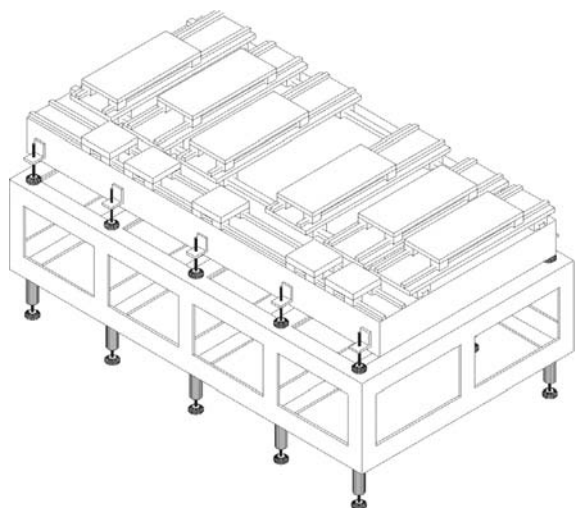


Fig. A schematic view of the larger optical bench available at EH1 and EH2.

It has six XY-carriers to mount the goniometers and five Y-carriers for detectors and small stages.

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