BL44XU Macromolecular Assemblies (Osaka University)

This beamline is specially designed to collect high quality X-ray diffraction data of biological macromolecular assemblies, e.g. protein complexes, protein-nucleic acid complexes, and viruses.

Area of research

Crystal structure analysis of biological macromolecular assemblies (e.g. membrane protein complexes, protein complexes, protein-nucleic acid complexes, and viruses)

Keywords

Scientific field

Biological macromolecular assemblies, Protein crystallography, Structural biology

Equipment

High precision goniometer, Imaging plate detector, CCD detector, Cryostream cooler

Source and optics

Main beamline optics is a double-crystal monochromator and a horizontal focusing mirror.

Insertion device	In-vacuum undulator
Undulator period : λ_u	32 mm
Number of period : N_{period}	140
Tunable range	9 ~ 16 keV

X-rays at sample

Energy resolution	$\Delta E/E < 2 \times 10^{-4}$
Photon flux	10^{12} photons/s
Beam size (focused)	80 μm (H) × 500 μm (V) (FWHM)

Experimental stations

Two individual single rotation axis (horizontal and vertical) goniometers are available in the experimental hutch.

Goniometer

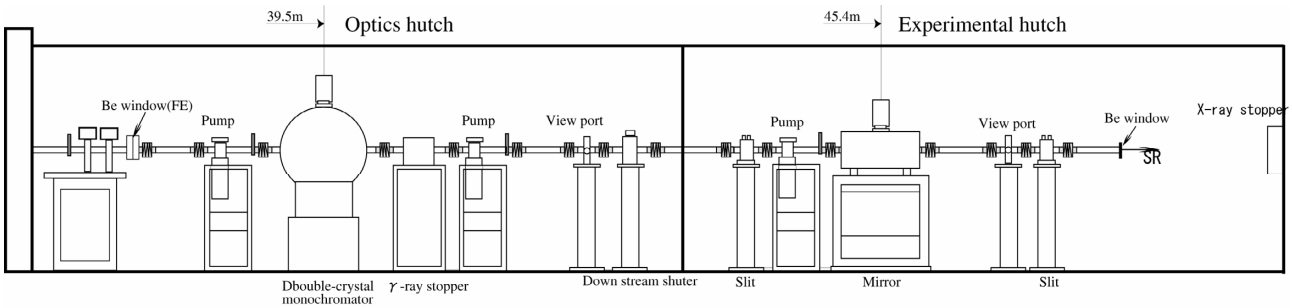
Deviation from rotation axis	+/- 2.5 μm
Position reproducibility	+/- 0.001 deg.
Sample translation range	+/- 30 mm
Sample-to-detector distance	250 ~ 1000 mm
Collimation	Quadrant slits
Sample camera	CCD camera (× 250)

Cryostream cooler

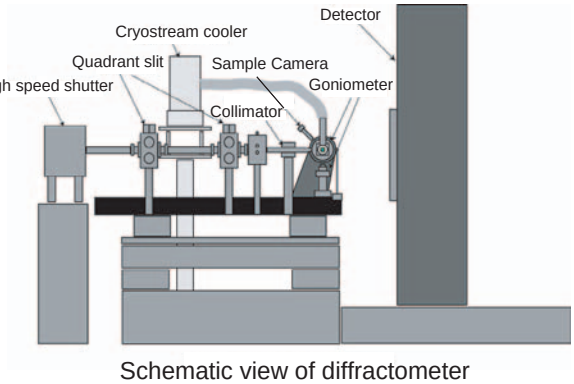
Temperature range	90 ~ 300 K (N_2 gas)
	35 ~ 300 K (He gas)
Nozzle inside diameter	7mmϕ

Detectors

DIP-6040 (Bruker-AXS) and PX210 (Oxford Instruments, ANL) can be used. DIP6040 has a CCD detector (Bruker-AXS SMART6500) surrounded by independent six imaging plate detector systems.



Schematic View of Beamline



Schematic view of diffractometer

DIP6040

Imaging plate detector parts

Number of imaging plates : 6
Size of an imaging plate : 400 mmϕ
Readout system : pulse motor control
IP changer : Spiral
ADC : 16 bit
Size of pixel : 100 μm × 100 μm
Dynamic range : > 10^6
Sensitivity : < 1.0 photon/pixel
Partial reading : Available (< 400 mmϕ)
Readout time : 400 mmϕ : 120 frame/hr.

CCD part (Smart-6500)

Sensitive area : 165 mmϕ
Number of CCDs : 1
Demagnification of fiberoptic tapers : 2.75 : 1
Conversion gain (12 keV) : 18 e^-/x-ray photons
Pixels : 2048 × 2048
Pixel size at input (avg.) : 80 μm
ADC : 16 bit
Data transfer time : 10 sec.

PX210

Sensitive area : 210 × 210 mm^2
Number of CCDs : 3 × 3
Gap between each modules : 280 μm
Demagnification of fiberoptic tapers : 2.86 : 1
Conversion gain (12 keV) : 9 e^-/x-ray photons

	FULL RESOLUTION	2 × 2 BINNING
Pixels	3072 × 3072	1536 × 1536
Active pixels	3000 × 3000	1500 × 1500
Pixel size at input (avg.)	69 μm	138 μm
Image size	18 M byte	4.5 M byte
ADC	16 bit	16 bit
Data transfer time	5 sec	5 sec

Main data processing, structure determination software

MOSFLM
HKL2000 (DIP6040, SMART6500)
CCP4

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