

# Tables of summaries of all the beamlines

## Public Beamline

BL No.	BL name / Areas of research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL01B1	<b>XAFS</b> · XAFS in wide energy region (3.8 to 113 keV) · XAFS of dilute systems and thin films	Bending magnet	3.8 ~ 113	$3 \times 10^{-5} \sim 2 \times 10^{-4}$	$10^9 \sim 10^{11}$	10 (H) × 0.2 (V)
BL02B1	<b>Single Crystal Structure Analysis</b> · Single crystal structure analysis in X-ray wide energy range · Precise X-ray diffraction analysis of the lattice or charge modulation originated from the phase transition at low temperatures	Bending magnet	5 ~ 115	$10^4$	$10^{12}$	3 (H) × 0.1 (V)
BL02B2	<b>Powder Diffraction</b> · Accurate structure analysis of crystalline materials using powder diffraction data · Structural aspects of phase transition · Ab initio structure determination by powder diffraction · Rietveld refinements	Bending magnet	12 ~ 35	Si (111): $\sim 2 \times 10^{-4}$	$\sim 10^{11}$	3 (H) × 0.7 (V)
BL04B1	<b>High Pressure and High Temperature Research</b> · Determination of phase relation, Equation of state of mantle, Viscosity of melts, Kinetics of mineral transformation, Rheology of mantle minerals, Structure of melts and glasses at high pressures	Bending magnet	20 ~ 150	-	-	0.05 (H) × 0.05 (V) ~ 10 (H) × 10 (V)
BL04B2	<b>High Energy X-ray Diffraction</b> · Structural analysis of glass, liquid, and amorphous materials · X-ray diffraction under ultra high-pressure · Precise single crystal structure analysis	Bending magnet	Si (111): 37.8 Si (220): 61.7	$10^3$	$2 \times 10^{10}$ (37.8 keV, Flat), $7 \times 10^{11}$ (37.8 keV, Bent), $3 \times 10^9$ (61.7 keV, Flat), $9 \times 10^{10}$ (61.7 keV, Bent)	0.22 (H) × 2.5 (V) (37.8 keV) 0.38 (H) × 2.5 (V) (61.7 keV)
BL08W	<b>High Energy Inelastic Scattering</b> · Magnetic Compton scattering · High-resolution Compton scattering · High-energy Bragg scattering · High-energy fluorescent X-ray analysis	Elliptical Multipole Wiggler	Si (620): 174 ~ 270	$\sim 2 \times 10^{-3}$	$5 \times 10^9$ (@300 keV)	3 (H) × 1 (V)
			Si (777): 270 ~ 300			
			Si (400): 100 ~ 120	$< 1 \times 10^{-3}$	$1 \times 10^{13}$ (@115 keV)	1 (H) × 2 (V)
BL09XU	<b>Nuclear Resonant Scattering</b> · Lattice dynamics by using nuclear inelastic scattering · Time domain Mössbauer spectroscopy, especially under the extreme conditions · Coherent X-ray optics using nuclear resonant scattering · Nuclear excitation by electron transition (NEET) · Surface structures and residual strain analysis	In-vacuum linear undulator	9 ~ 80	$10^4$	$1.4 \times 10^{13}$ (@14.4 keV)	2.7 (H) × 1 (V)
BL10XU	<b>High Pressure Research</b> · Structure analysis and phase transitions under ultra high pressure (DAC experiment) · Earth and planetary science	In-vacuum linear undulator	18 ~ 35	$\sim 10^4$	$\sim 1 \times 10^{13}$	2 (H) × 0.8 (V)

EH : Experimental hutch

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			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL13XU	<b>Surface and Interface Structures</b> · Atomic-scale structure analysis of a crystal surface, an ultra-thin film and a nanostructure · Surface structure analysis under thin-film growth · Analysis of nanostructures grown at a vacuum/solid, liquid/solid, and solid/solid interface	In-vacuum linear undulator	7 ~ 18.9	$10^4$	$10^{13}$	2 (H) × 1.5 (V) (@EH1)
BL19B2	<b>Engineering Science Research</b> · XAFS in wide energy region · Residual stress measurement, Structural analysis of thin film, Surface, Interface · Powder diffraction · X-ray imaging	Bending magnet	5 ~ 100	$\sim 10^4$	$\sim 10^9$	5 (H) × 2 (V) (@EH1&2) 10 (H) × 10 (V) (@EH3)
BL20XU	<b>Medical and Imaging II</b> · Micro-imaging: Scanning microscopy, Imaging microscopy, Micro-tomography, X-ray holography and other experiments on X-ray optics and developments of optical elements · Medical application: Micro-angiography, Refraction-enhanced imaging, Radiation therapy · Ultra-small angle scattering	In-vacuum linear undulator	8 ~	$\sim 10^4$	$10^{13}$	1.2 (H) × 0.7 (V) (@EH1) 4 (H) × 2 (V) (@EH2)
BL20B2	<b>Medical and Imaging I</b> · The medical research mainly involves micro-radiography, micro-tomography and refraction-contrast imaging on biological specimens and small animals. · Imaging techniques involve the evaluation and development of various kinds of optical elements for novel imaging techniques.	Bending magnet	Si (311): 8.4 ~ 72.5 Si (111): 5.0 ~ 37.5 Si (511): 13.5 ~ 113.3	$\sim 10^4$	$10^{11}$	75 (H) × 5 (V) (Si (311), @Exp. Hall) 300 (H) × 20 (V) (Si (311), @Biomedical Imaging Center)
BL26SU	<b>Soft X-ray Spectroscopy of Solid</b> · High resolution photoemission · Photoelectron diffraction and holography · Magnetic circular dichroism in the core absorption (MCD) · Photoelectron emission microscope (PEEM)	Twin helical undulators	0.22 ~ 2	$E/\Delta E > 10^4$	$> 10^{11}$	0.2 (H) × 0.1 (V)
BL27SU	<b>Soft X-ray Photochemistry</b> <i>Industrial research --- B branch</i> · Growth of thin film of functional material · Micro fabrication by functional material etching <i>Atomic and molecular spectroscopy --- C branch (C1, C2 station)</i> · Search of novel photochemical processes · High resolution atomic and molecular electron spectroscopy · Complete determination of electronic decay channel · Dissociation dynamics of inner-shell excited molecules · Site-specific dissociation processes of isolated molecules <i>Surface analysis and solid state physics --- C branch (C3 station)</i> · Search of electronic and chemical structures of solids and nano layers · Elucidation of electronic state of molecule on surface	Figure-8 undulator	0.17 ~ 2.8	A and B branches : $E/\Delta E \sim 10^2$	$> 10^{15}$	4 (H) × 2 (V)
				C branch : $E/\Delta E > 10^4$	$> 10^{11}$	0.2 (H) × 0.2 (V) (C1,C2) 0.2 (H) × 0.01 (V) (C3)

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BL28B2	<b>White Beam X-ray Diffraction</b> · White X-ray diffraction · Time-resolved energy-dispersive XAFS (DXAFS) for studies of chemical and/or physical reaction process.	Bending magnet	> 5	-	-	30 (H) × 10 (V)
BL35XU	<b>High Resolution Inelastic Scattering</b> · Dynamics of materials including phonons, Glass transitions, Liquid dynamics, Diffusion, etc. · Methods of investigation include inelastic X-ray scattering (IXS) and nuclear resonant scattering (NRS).	In-vacuum linear undulator	8 ~ 50 (fundamental to 5th)	Optics Dependent		
BL37XU	<b>Trace Element Analysis</b> · X-ray microbeam spectrochemical analysis · Ultra trace element analysis · High energy X-ray fluorescence analysis	In-vacuum linear undulator	A branch : 5~37 B branch : Si (111) : 75.5	$2 \times 10^4$	A branch : $10^{12} \sim 10^{13}$ B branch : $10^{10} \sim 10^{12}$	A branch : 2 (H) × 0.7 (V) B branch : 3 (H) × 0.5 (V)
BL38B1	<b>R&amp;D (3)</b> · XAFS, R&D of optics and detector · Monochromatic data collection for routine macromolecular crystallography	Bending magnet	3.7 ~ 198	$3 \times 10^5$ $\sim 2 \times 10^4$	$10^8 \sim 10^{11}$	0.15 (H) × 0.15 (V) (@12 keV, with mirror)
BL39XU	<b>Magnetic Materials</b> · X-ray magnetic circular dichroism (MCD) spectroscopy · Element-specific magnetometry · X-ray emission spectroscopy and its magnetic circular dichroism · Resonant or non-resonant magnetic scattering	In-vacuum linear undulator	5 ~ 37	$2 \times 10^4$	$4 \times 10^{13}$	2 (H) × 0.6 (V)
BL40XU	<b>High Flux</b> · Time-resolved diffraction and scattering experiments · X-ray speckle · X-ray fluorescence trace analysis	Helical undulator	8 ~ 17	0.017	$10^{15}$ (@12.4 keV)	0.25 (H) × 0.04 (V) (with mirror)
BL40B2	<b>Structural Biology II</b> · Macromolecular crystallography, Small angle X-ray (solution) scattering	Bending magnet	6 ~ 17.5	$10^4$	$\sim 10^{11}$ (@12 keV)	0.25 (H) × 0.15 (V)
BL41XU	<b>Structural Biology I</b> · Macromolecular crystallography	In-vacuum linear undulator	6 ~ 38	$< 2 \times 10^4$	$10^{13}$	0.1 (H) × 0.1 (V)
BL43IR	<b>Infrared Materials Science</b> · Infrared microspectroscopy · Magneto-optical spectroscopy · Infrared surface science · Absorption and reflection spectroscopy · Time-resolved experiments with pulsed laser and SR (pump and probe)	Bending magnet	Wave num. 100 ~ 20000 $\text{cm}^{-1}$	0.0063 $\text{cm}^{-1}$	-	-
BL46XU	<b>R&amp;D (2)</b> · Insertion devices R&D · Resonant and non-resonant magnetic scattering structural analysis	In-vacuum linear undulator	12 ~ 25 (1st harmonic)	$\sim 10^4$	$4.6 \times 10^{12}$	< 1 (H) × 1 (V)

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BL47XU	<b>R&amp;D (I)</b> · R&D · Microtomography · Microbeam	In-vacuum linear undulator	5.3 ~ 37.8	$\sim 2 \times 10^{-4}$	$\sim 4 \times 10^{13}$ (@18 keV)	1.2 (H) $\times$ 0.3 (V) (@18 keV, 40 m from source)

### JAERI Beamline

BL No.	BL name / Areas of research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL11XU	<b>JAERI Materials Science II</b> · Nuclear Resonant Scattering · Surface and interface structure with MBE · Inelastic scattering · XAFS	In-vacuum linear undulator	6 ~ 70	$10^{-4}$	$1.2 \times 10^{13}$ (@14.4 keV)	1.8 (H) $\times$ 0.5 (V) (@EH1)
BL14B1	<b>JAERI Materials Science I</b> · Materials science at high pressure · Structure physics	Bending magnet	5 ~ 90 (monochromatic)	Si (111) : $10^{-4}$ Si (311) : $3 \times 10^{-5}$ Si (511) : $7 \times 10^{-6}$	$10^{10}$	1 (H) $\times$ 1 (V)
			5 ~ 150 (white)	-	$\sim 10^{13}$	
BL22XU	<b>JAERI Actinide Science II</b> · Materials science at high pressure · Resonant X-ray scattering (activity at RI laboratory)	In-vacuum linear undulator	3 ~ 70	$\sim 10^{-4}$	$2 \times 10^{13}$	0.5 (V) $\times$ 0.4 (H) (focusing, @ EH3)
BL23SU	<b>JAERI Actinide Science I</b> · Surface chemistry with high speed molecular beam · Biophysical spectroscopy · Photoelectron spectroscopy (activity at RI laboratory) · MCD (activity at RI facility)	Variably-polarizing undulator	0.5 ~ 1.5 (circular polarization)	$\sim 10^{-4}$	$10^{11}$ ph/s/0.02% b.w.	2 (H) $\times$ 1 (V) (Exp.Hall) < $\phi$ 200 $\mu$ m (RI lab.)

**RIKEN Beamline**

BL No.	BL Name / Areas of Research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL17SU	<b>RIKEN Coherent Soft X-ray Spectroscopy</b> <i>Spectroscopic study on multiply charged ions --- A1a station</i> · Photoabsorption study on multiply charged ions · Fundamental research for X-ray astronomy using synchrotron radiation <i>High resolution photoemission spectroscopy --- A2 station</i> · Angle-resolved photoemission (ARPES) study using soft X-rays to observe 'bulk' band structure · <i>In situ</i> ARPES measurement on strongly-correlated transition-metal oxide thin films fabricated by laser MBE method <i>Soft X-ray emission spectroscopy for solid and biological samples --- A3 station</i> · Soft X-ray emission study on transition metal compounds to study electronic correlations in solids · Study of the electronic structure of biological samples by soft X-ray emission spectroscopy	Asymmetric figure-8 undulator	0.1 ~ 3.1 (designed)	$E/\Delta E > 10^4$	$> 10^{11}$	0.5 (H) × 0.5 (V)
BL19XU	<b>RIKEN SR Physics</b> · This beamline is open for any research field requiring the highly brilliant X-ray beam.	27-m In-vacuum linear undulator	7.2 ~ 18 (1st harmonic) 22 ~ 51 (3rd harmonics)	$10^4$	$2 \times 10^{14}$	1.5 (H) × 0.8 (V)
BL26B1/B2	<b>RIKEN Structural Genomics I &amp; II</b> · Structural genomics research based on single crystal X-ray diffraction	Bending magnet	6 ~ 17	$\sim 10^4$	$\sim 10^{11}$ (@12 keV)	0.3 (H) × 0.2 (V) (@12 keV)
BL29XU	<b>RIKEN Coherent X-ray Optics</b> · X-ray optics, especially coherent X-ray optics	In-vacuum linear undulator	4.4 ~ 37.8	$\sim 1.3 \times 10^4$	$6 \times 10^{13}$ (@10 keV)	0.72 (V) × 1.3 (H) (@EH1) 10 (V) × 30 (H) (@EH2)
BL44B2	<b>RIKEN Structural Biology II</b> · Laue macromolecular crystallography	Bending magnet	6 ~ 30	$\sim 10^4$	$10^{11}$ (@20 keV, monochromatic) $10^{15}$ (@7 ~ 30 keV, white)	0.2 (H) × 0.2 (V)
BL45XU	<b>RIKEN Structural Biology I</b> · Time-resolved structures of non-crystalline biological materials such as protein, nucleic acid solutions, membrane, muscle, and micelle system under various conditions, are studied by using small-angle scattering and diffraction technique.	Tandem vertical undulators	13.8 (@SAXS station) 7.5 ~ 14.0 (@crystallography station)	$10^4$ (@S St.) $< 10^4$ (@P St.)	$\sim 3 \times 10^{11}$ (@S St.) $\sim 10^{11}$ (@P St.)	0.4 (H) × 0.2 (V) (@S St.) 0.1 (H) × 0.1 (V) (@P St.)

## Contract Beamline

BL No.	BL Name / Areas of research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL12XU	<b>NSRRC ID</b> · Elementary electronic excitations, quasiparticle behaviors, and electron-correlation effects in correlated electron systems investigated using high resolution non-resonant or resonant inelastic X-ray scattering · Local electronic structure of molecular solids of low-Z elements (e.g., biomaterials) investigated by high resolution near-edge X-ray Raman scattering · Phase transitions under high-pressure, low and high temperatures · Materials science using high-resolution X-ray absorption and emission spectroscopy · X-ray physics and optics	In-vacuum linear undulator	1st harmonic : 4.6 ~ 16 3rd harmonics : 13.8 ~ 48 5th harmonics : 23 ~ 75	Optics Dependent		0.12 (H) × 0.075 (V)
BL12B2	<b>NSRRC BM</b> · X-ray absorption spectroscopy · Powder X-ray diffraction · High resolution X-ray scattering · Protein crystallography	Bending magnet	5 ~ 70 (monochromatic) 5 ~ 90 (white)	$\sim 10^4$ -	$10^{10} \sim 10^{12}$	0.25 (H) × 0.25 (V)
BL15XU	<b>WEBRAM (National Institute for Materials Science)</b> <i>Highly precise characterization of advanced materials</i> · High resolution X-ray photoemission microscopy · Study and analysis for synthesis process of thin films assisted with X-ray irradiation · High energy excitation X-ray photoelectron spectroscopy · High resolution X-ray emission spectroscopy · Highly precise X-ray powder diffraction study and ultra-small angle scattering	Revolver type undulator	0.5 ~ 60	$\sim 10^4$	$> 10^{12}$ (@5 ~ 20 keV)	$\sim 0.8 \phi$
BL16XU	<b>Industrial Consortium ID (SUNBEAM-ID)</b> · Characterization of thin films for VLSI and magnetic devices, catalysts, functional materials, and structural materials	In-vacuum linear undulator	4.5 ~ 40	$10^4$	$> 10^{12}$ (normal) $\sim 10^9$ (focusing)	0.88 (H) × 0.6 (V) 1 $\mu\text{m}$ $\phi$
BL16B2	<b>Industrial Consortium BM (SUNBEAM-BM)</b> · Characterization of industrial materials, such as metal and oxide films, semiconductor crystals, etc., by XAFS, topography and other methods	Bending magnet	4.5 ~ 113	$10^4$	$\sim 10^{10}$	$\sim 0.1$ (H) × 0.1 (V) (with mirror) $\sim 40$ (H) × 2 (V) (without mirror)

BL No.	BL Name / Areas of Research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL24XU	<b>Hyogo</b> · Structure analysis of small bio-crystals for industry · Surface/interface analysis of metallic materials for industry (fluorescent X-ray analysis and strain measurements) · Surface/interface analysis during metal-organic chemical vapor deposition (grazing incidence X-ray diffraction) · Microbeam formation studies for materials and life science	In-vacuum figure-8 undulator	3.5 ~ 60	$< 10^{-4}$	$\sim 10^{12}$	$< 1 (H) \times 1 (V)$
BL32B2	<b>Pharmaceutical Industry</b> · Protein structure analysis for structure-based drug design	Bending magnet	7 ~ 17	$\sim 10^{-4}$	$\sim 10^{10}$ (@12 keV)	0.2 (H) $\times$ 0.2 (V) (@12 keV)
BL33LEP	<b>Laser-Electron Photon (RCNP, Osaka University)</b> · Meson photoproduction from nucleon and nucleus · Photoexcitation of hyperons, nucleon resonances, and other exotic states · Photonuclear reactions · Beam diagnoses · Test and calibration of detectors with GeV photon beam	Laser backward Compton scattering	1.5 ~ 2.4 GeV (tagged photon)	$\Delta E \sim 15$ MeV	$3 \times 10^6$ (@1.5 ~ 2.4 GeV)	7.3 (H) $\times$ 5.7 (V)
BL44XU	<b>Macromolecular Assemblies (Institute for Protein Research, Osaka University)</b> · Crystal structure analysis of biological macromolecular assemblies (e.g. membrane protein complexes, protein complexes, protein-nucleic acid complexes, and viruses)	In-vacuum linear undulator	9 ~ 16	$2 \times 10^{-4}$	$10^{12}$	1 (H) $\times$ 0.7 (V)

### Accelerator Beam Diagnostic Line

BL No.	BL Name / Areas of research	Light source	X-rays at sample			
			Energy range (keV)	Energy resolution ( $\Delta E/E$ )	Photon flux (photon/s)	Beam size (mm)
BL38B2	<b>Accelerator Beam Diagnosis</b> · Accelerator beam diagnostics · R&D of accelerator components · Production of MeV $\gamma$ -ray photons	Bending magnet	4.0 ~ 14.2	$\sim 10^{-4}$	$10^{10} \sim 10^{12}$	-