

BEAMLINES

SPring-8 beamlines are categorized into four groups as listed below:

- (1) Public Beamlines
- (2) Contract Beamlines
- (3) JAERI / RIKEN Beamlines
- (4) Accelerator Beam Diagnosis

The public beamlines are constructed by JAERI and RIKEN with government grants, and are open for public use. This category of public beamlines includes three R&D beamlines, which were constructed for the purpose of developing new devices and beamline equipment such as optical elements, detection systems, and so forth. Used mainly by SPring-8 staff, the R&D beamlines are also open to public. Now 25 public beamlines (22 X-ray beamlines, two soft X-ray beamlines and one infrared beamline) are operational and available for public use.

The contract beamlines are, on the other hand, facilities that are installed, owned, operated and maintained by universities, companies and other organizations. Beamline contractors can use their beamline almost exclusively. Hyogo Prefecture took the lead in the contract beamline construction. Industrial Consortium, National Synchrotron Radiation Research Center (NSRRC, Taiwan), Institute for Protein Research (Osaka Univ.), Research Center for Nuclear Physics (RCNP, Osaka Univ.), National Institute for Materials Science and Pharmaceutical Consortium followed in that order. NSRRC was the

first to construct foreign contract beamlines (BL12B2 and BL12XU) at SPring-8. Currently those nine contract beamlines are all in operation.

The JAERI/RIKEN beamlines are those constructed by JAERI and RIKEN for the exclusive use to promote their own research activities although 20% of beamtime is reserved for public use. Four JAERI and six RIKEN beamlines have already been constructed and one of the RIKEN beamlines, BL17SU, is in commissioning. RIKEN BL19LXU is the only one long undulator beamline and can provide the highest brilliance. Experimental stations of BL22XU and BL23SU are located at RI Laboratory and dedicated to research utilizing radioactive isotopes and actinide materials. BL26B1 and BL26B2 are beamlines used for high throughput protein crystallography following the human genome project. BL29XU has two experimental stations, one located in the experimental hall, and the other at the end of the 1 km beamline. Dedicated to studying the characteristics of the electron beam accumulated in the storage ring, the accelerator beam diagnosis beamlines are currently under the exclusive use of the JASRI accelerator group.

All 62 beamlines that SPring-8 can accommodate (34 insertion devices, 4 long undulators, 23 bending magnets and 1 infrared) are shown in the Beamline Map (Fig. 2). As of March 11, 2004, one beamline (BL17SU) is in the phase of commissioning. Including the two accelerator beam diagnosis beamlines, we have 47 beamlines, about 75% of full capacity (Table II).

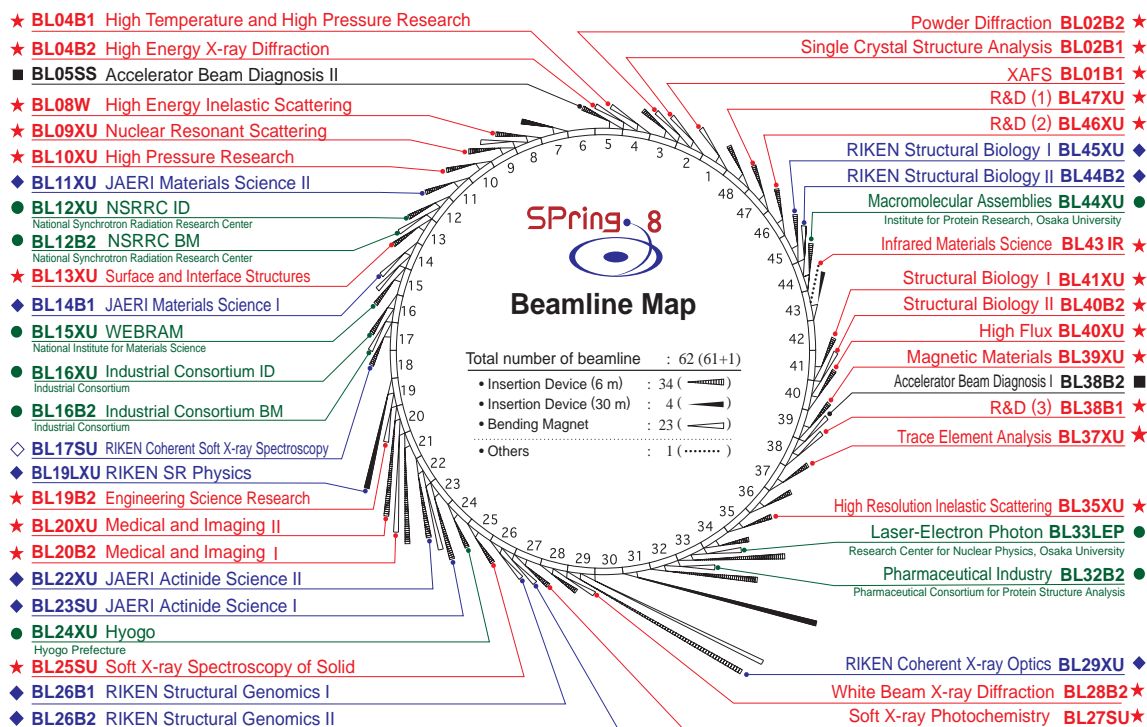


Fig. 2. Beamline Map.

Table II. List of beamlines

BL #	Beamline Name	(Public Use)	Areas of Research
★ Public Beamlines			
BL01B1	XAFS	(Oct. 1997)	XAFS in wide energy region (3.8 to 113 keV). XAFS of dilute systems and thin films.
BL02B1	Single Crystal Structure Analysis	(Oct. 1997)	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.
BL02B2	Powder Diffraction	(Sep. 1999)	Accurate structure analysis of crystalline materials using powder diffraction data. Structural aspects of phase transition. <i>Ab initio</i> structure determination by powder diffraction. Rietveld refinements.
BL04B1	High Temperature and High Pressure Research	(Oct. 1997)	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.
BL04B2	High Energy X-ray Diffraction	(Sep. 1999)	Structural analysis of glass, liquid, and amorphous materials. X-ray diffraction under ultra high-pressure. Precise single crystal structure analysis
BL08W	High Energy Inelastic Scattering	(Oct. 1997)	Magnetic Compton scattering. High-resolution Compton scattering. High-energy Bragg scattering. High-energy fluorescent X-ray analysis.
BL09XU	Nuclear Resonant Scattering	(Oct. 1997)	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.
BL10XU	High Pressure Research	(Oct. 1997)	Structure analysis and phase transitions under ultra high pressure (DAC experiment). Earth and planetary science.
BL13XU	Surface and Interface Structures	(Sep. 2001)	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.
BL19B2	Engineering Science Research	(Nov. 2001)	XAFS in wide energy region. Residual stress measurement. Structural analysis of thin film, surface and interface. Powder diffraction. X-ray imaging.
BL20XU	Medical and Imaging II	(Sep. 2001)	Microimaging: Scanning microscopy. Imaging microscopy. Microtomography. X-ray holography and other experiments on X-ray optics and developments of optical elements. / Medical application: Microangiography. Refraction-enhanced imaging. Radiation therapy. / Ultra-small angle scattering.
BL20B2	Medical and Imaging I	(Sep. 1999)	Medical research: Microradiography, microtomography and refraction-contrast imaging on biological specimens and small animals. / Imaging techniques: Evaluation and development of various kinds of optical elements for novel imaging techniques.
BL25SU	Soft X-ray Spectroscopy of Solid	(Apr. 1998)	High resolution photoemission. Photoelectron diffraction and holography. Magnetic circular dichroism in the core absorption (MCD). Photoelectron emission microscope (PEEM).
BL27SU	Soft X-ray Photochemistry	(May 1998)	Industrial research: Growth of thin film of functional material. Micro-fabrication by functional material etching. / Atomic and molecular spectroscopy: 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. / Surface analysis and solid state physics: Search of electronic structures of solids and nanolayers. Elucidation of electronic state of molecule on surface.
BL28B2	White Beam X-ray Diffraction	(Sep. 1999)	White X-ray diffraction. Time-resolved energy-dispersive XAFS (DXAFS) for studies of chemical and/or physical reaction process.
BL35XU	High Resolution Inelastic Scattering	(Sep. 2001)	Dynamics of materials including phonons. Glass transitions. Liquid dynamics. Diffusion. Methods of investigation for inelastic X-ray scattering (IXS) and nuclear resonant scattering (NRS).
BL37XU	Trace Element Analysis	(Nov. 2002)	X-ray microbeam spectrochemical analysis. Ultra trace element analysis. High energy X-ray fluorescence analysis.
BL38B1	R&D (3)	(Oct. 2000)	XAFS. R&D of optics and detector. Monochromatic data collection for routine macromolecular crystallography.
BL39XU	Magnetic Materials	(Oct. 1997)	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.
BL40XU	High Flux	(Apr. 2000)	Time-resolved diffraction and scattering experiments. X-ray speckle. X-ray fluorescence trace analysis.
BL40B2	Structural Biology II	(Sep. 1999)	Macromolecular crystallography. Small angle X-ray (solution) scattering.
BL41XU	Structural Biology I	(Oct. 1997)	Macromolecular crystallography.
BL43IR	Infrared Materials Science	(Apr. 2000)	Infrared microspectroscopy. Magneto-optical spectroscopy. Infrared surface science. Absorption and reflection spectroscopy. Time-resolved experiments with pulsed laser and SR (pump and probe).
BL46XU	R&D (2)	(Nov. 2000)	R&D of insertion devices. Resonant and non-resonant magnetic scattering structural analysis.
BL47XU	R&D (1)	(Oct. 1997)	R&D of microtomography and microbeam technique.

BL #	Beamline Name (First Beam)	Areas of Research
● Contract Beamlines		
BL12XU	NSRRC ID (NSRRC) (Dec. 2001)	Elementary electronic excitations, quasiparticle behaviors, and electron-correlation effects in correlated electron systems by high resolution non-resonant or resonant inelastic X-ray scattering. Local electronic structure of molecular solids of low-Z elements (e.g., biomaterials) by high resolution near-edge X-ray Raman scattering. Phase transitions under high-pressure, low and high temperatures. Materials science by high-resolution X-ray absorption and emission spectroscopy. X-ray physics and optics.
BL12B2	NSRRC BM (NSRRC) (Oct. 2000)	X-ray absorption spectroscopy. Powder X-ray diffraction. High resolution X-ray scattering. Protein crystallography.
BL15XU	WEBRAM (National Institute for Materials Science) (Jan. 2000)	Highly precise characterization of advanced materials: 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.
BL16XU	Industrial Consortium ID (Industrial Consortium) (Oct. 1998)	Characterization of thin films for VLSI and magnetic devices, catalysts, functional materials, and structural materials.
BL16B2	Industrial Consortium BM (Industrial Consortium) (Oct. 1998)	Characterization of industrial materials, such as metal and oxide films, semiconductor crystals by XAFS, topography and other methods.
BL24XU	Hyogo (Hyogo Prefecture) (May 1998)	Structure analysis of small bio-crystals for industry. Surface/interface analysis of metallic materials for industry by fluorescent X-ray analysis and strain measurements. Surface/interface analysis during metal-organic chemical vapor deposition by grazing incidence X-ray diffraction. Microbeam formation studies for materials and life science.
BL32B2	Pharmaceutical Industry (Pharmaceutical Consortium) (Apr. 2002)	Protein structure analysis for structure-based drug design: Design and optimization of new leading compounds based on pharmacodynamic action mechanism elucidated at the molecular level which obtained from a detailed interaction analysis of receptor-drug complexes.
BL33LEP	Laser-Electron Photon (Osaka University) (Jun. 1999)	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.
BL44XU	Macromolecular Assemblies (Osaka University) (May 1999)	Crystal structure analysis of biological macromolecular assemblies (e.g. membrane protein complexes, protein complexes, protein-nucleic acid complexes, and viruses).
◆ JAERI Beamlines		
BL11XU	JAERI Materials Science II (Oct. 1998)	Nuclear resonant scattering. Surface and interface structure with MBE. Inelastic scattering. XAFS.
BL14B1	JAERI Materials Science I (Dec. 1997)	Materials science at high pressure. Structure physics.
BL22XU	JAERI Actinide Science II (May 2002)	Materials science at high pressure. Resonant X-ray scattering (activity at RI laboratory).
BL23SU	JAERI Actinide Science I (Feb. 1998)	Surface chemistry with supersonic molecular beam. Biophysical spectroscopy. Photoelectron spectroscopy (activity at RI laboratory). Magnetic circular dichroism (activity at RI laboratory).
◆ RIKEN Beamlines		
BL17SU	RIKEN Coherent Soft X-ray Spectroscopy (Sep. 2003)	Spectroscopic study on multiply charged ions: Photoabsorption study on multiply charged ions. Fundamental research for X-ray astronomy using synchrotron radiation. / High resolution photoemission spectroscopy: 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. / Soft X-ray emission spectroscopy for solid and biological samples: 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.
BL19LXU	RIKEN SR Physics (Oct. 2000)	Any research field requiring the highly brilliant X-ray beam.
BL26B1/B2	RIKEN Structural Genomics I & II (Apr. 2002)	Structural genomics research based on single crystal X-ray diffraction.
BL29XU	RIKEN Coherent X-ray Optics (Dec. 1998)	X-ray optics, especially coherent X-ray optics.
BL44B2	RIKEN Structural Biology II (Feb. 1998)	Laue macromolecular crystallography.
BL45XU	RIKEN Structural Biology I (Jul. 1997)	Time-resolved structures of non-crystalline biological materials such as protein, nucleic acid solutions, membrane, muscle, and micelle system under various conditions by small-angle scattering and diffraction technique.
■ Accelerator Beam Diagnosis		
BL05SS	Accelerator Beam Diagnosis (Mar. 2004)	Accelerator beam diagnostics. R&D of accelerator components.
BL38B2	Accelerator Beam Diagnosis (Sep. 1999)	Accelerator beam diagnostics. R&D of accelerator components. Production of MeV γ -ray photons.