SPring-8

I. Introduction

As of December 2015, the cumulative number of users who visited SPring-8 for their experiments since 1997 was as high as 200,000, showing that SPring-8 has been reliably and continuously contributing to the SR community as a center of advanced photon science. Indeed, as reported in the next section in detail, SPring-8 was stably operated throughout 2015 with the total operation time of the storage ring and the total user beam time of 4805.8 h and 4033.9 h, respectively, with the total down time of 16.8 h. Because of the major renovation of an extra-high-tension power source starting from the end of December 2015 up to the end of March 2016, SPring-8 had to complete all its operations by the middle of December 2015, making the machine schedule quite tight and, thus, challenging.

Regarding its research proposal system, SPring-8 introduced a novel category of proposals for the public beamlines, called Epoch-Making Initiatives Projects, which entails the creation and development of unexplored fields in combined and interdisciplinary research beyond the boundaries of traditional fields and the broadening of the basis for using SPring-8. Concerning the contract beamlines, JAEA Quantum Dynamics (BL11XU), JAEA Materials Science (BL14B1), JAEA Quantum Structural Science (BL22XU), JAEA Actinide Science (BL23SU), Catalytic Reaction Dynamics for Fuel Cell (BL36XU, The University of Electro-Communication), and Hyogo ID (BL24XU, Hyogo Prefecture), have undergone the interim review process for the year 2015 and all their proposals have been approved for continuation.

At the time of writing this report, SPring-8 users number as many as 11,000, all of whom are respected members of the SPring-8 User Community (SPRUC). It is, hence, important for SPring-8 to jointly organize scientific events with SPRUC, such as the SPring-8 Symposium and The Joint Conference on Industrial Applications of SPring-8, to facilitate dialogue between them. In 2015, the SPring-8 Symposium was held on September 13–14, 2015, at Kyushu University with a participant number of 259, and The Joint Conference on Industrial Applications of SPring-8 held on September 3–4, 2015, Kawasaki, had 296 participants. As part of its continuous effort towards the fostering of human resources, SPring-8 organized the 15th SPring-8 Summer School with 66 students of graduate schools nationwide, on cooperation with Hyogo University, Kwansei Gakuin University, the University of Tokyo, Okayama University, and Japan Atomic Energy Agency.

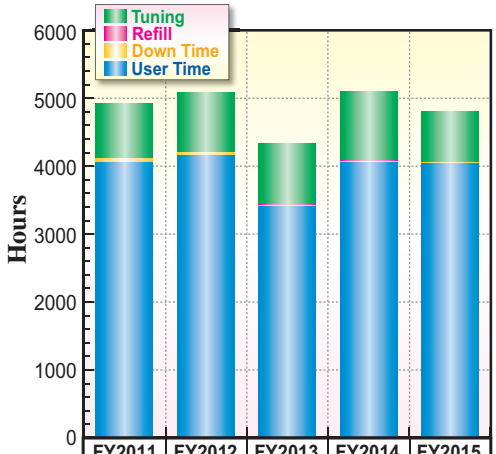
By hosting those delegations from APS, ESRF, and DESY, SPring-8 organized the 15th Three-Way Meeting from February 26, 2015, and lasting three days, to reconsider the raison d'etre of this meeting that has continued for more than twenty years. This latest meeting reconfirmed its significance, and it was decided to hold the next one at DESY in the early autumn of 2016. As in the past years, SPring-8 contributed to the synchrotron radiation community of the Asia-Oceania region by organizing the Cheiron School for young scientists/engineers from this region for the period of September 10–19, 2015. There were 60 participants who joined the school for the year. As an annual event, SPring-8 held its 23rd Open House on Sunday, April 26, 2015, to communicate with the local community. The total number of visitors was 5,634, which provided an excellent opportunity to win public understanding of the highly advanced photon science realized at SPring-8 and SACLA.

The 15th Three-Way Meeting

II. Machine Operation

The operation statistics for the last five fiscal years are shown in Fig. 1. In FY2015, the total operation time of the accelerator complex was 4817.9 h. The operation time of the storage ring was 4804.8 h, 84.0% of which (4033.9 h) was for SR experiments. This excellent figure of user time represents a storage ring availability of 99.45%, which ranks with the best record of 99.46% established last year. The downtime resulting from failure accounted for 0.45% (16.8 h) of the total user time, and no loss of user time exceeding several hours occurred. The intensity of the light source, i.e., the stored current, is kept extremely stable owing to the top-up operation, in which the current is filled up at any time on demand. The dead band of the stored current in the top-up operation is routinely 0.03 mA (0.03%) and the current stayed within 0.1% in 99.5% of the user time in FY2015, which also beats the all-time record of 99.2% in FY2012.

The variety of operation modes is one of the characteristics of SPring-8. The operation modes are grouped into the multibunch mode, several-bunch mode, and hybrid-filling mode. There has been no user operation with the multibunch mode since FY2011. The several-bunch mode consists of equally spaced bunches or bunch trains, i.e., 203 bunches, or 29 trains of 11 bunches, and the hybrid-filling mode is composed of a long bunch train and isolated single bunches, as shown in Table 1, where the share of each operation mode is also shown. An isolated bunch impurity is routinely maintained less than 10^{-8} in the top-up operation by bunch cleaning in the booster. The bunch current is also kept constant within a 1% band by the top-up operation. Table 2 summarizes the beam parameters of the storage ring.



	FY2011	FY2012	FY2013	FY2014	FY2015
Accelerator Operation Time	4918.6	5078.8	4330.0	5099.3	4817.9
Storage Ring Operation Time	4904.2	5063.1	4265.5	5080.7	4804.8
Tuning & Study (Acc. & BL)	803.0	884.0	898.0	1024.7	748.8
Refill	4.4	5.2	3.5	5.1	5.3
Down Time	57.0	39.2	20.0	17.1	16.8
Mean Time Between Failures	117.7	107.7	213.0	163.2	202.8
Achieved User Time	4058.5	4155.6	3408.5	4057.8	4033.9
Planning User Time	4120.0	4200.0	3432.0	4080.0	4056.0
Availability (%)	98.5	98.9	99.3	99.5	99.5

Fig. 1. Operation statistics for most recent five fiscal years.

Table 1. Operation modes in FY2015

	Single bunch current (mA)	Share of operation time (%)
203 bunches		21.3
4 bunch-train × 84		0.0
11 bunch-train × 29		35.5
1/7-filling + 5 single bunches	3	8.9
2/29-filling + 26 single bunches	1.4	6.5
1/14-filling + 12 single bunches	1.6	11.2
4/58-filling + 53 single bunches	1	0.0
11/29-filling + 1 single bunch	5	16.6

Table 2. Beam parameters of the SPring-8 storage ring

Energy [GeV]	8
Number of buckets	2436
Tunes (ν_x / ν_y)	41.14 / 19.34
Current [mA]:	
single-bunch	12
multi-bunch	100
Bunch length (σ) [psec]	13
Horizontal emittance [nm·rad]	2.4 *
Vertical emittance [pm·rad]	4.8 *
Coupling [%]	0.2
RF Voltage [MV]	14.4 ** ~ 16
Momentum acceptance [%]	3.2 (~256 MeV)
Beam size (σ_x / σ_y)* [μm]	
Long ID section	333 / 7
ID section	316 / 5
BM1 section	94 / 12
BM2 section	100 / 12
Beam divergence (σ_x' / σ_y')* [μrad]	
Long ID section	8 / 0.7
ID section	9 / 1.0
BM1 section	58 / 0.5
BM2 section	68 / 0.5
Operational chromaticities (ξ_x / ξ_y)	+2 / +2 ***
Lifetime [h]:	
100 mA (multi-bunch)	~250
1 mA (single-bunch)	~30
Horizontal dispersion [m]:	
Long ID section	0.153
ID section	0.146
BM1 section	0.039
BM2 section	0.059
Fast orbit stability (0.1 – 200 Hz) [μm]:	
horizontal (rms)	~4
vertical (rms)	~1

* Assuming 0.2% coupling
** Power saving mode
*** With bunch-by-bunch feedback

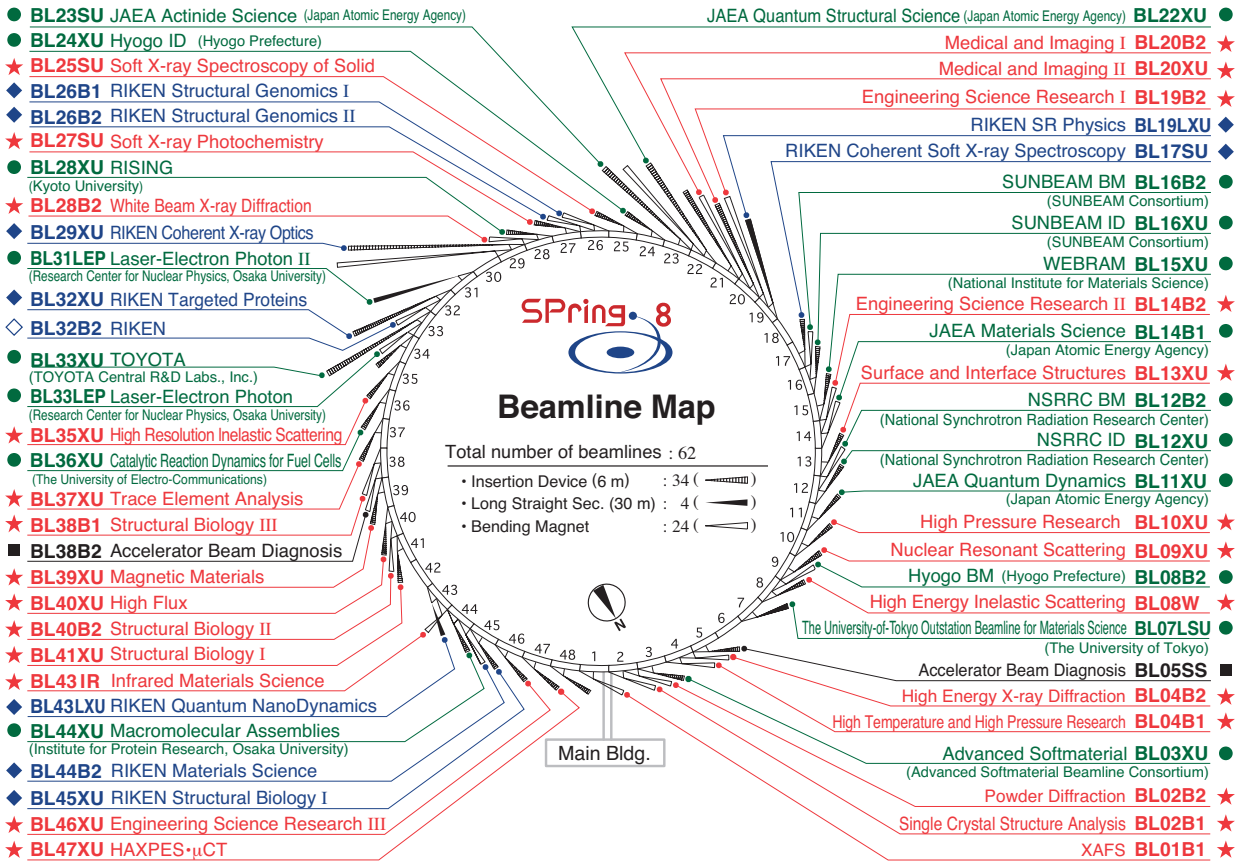
III. Beamlines

The SPring-8 storage ring can accommodate up to 62 beamlines: 34 insertion devices, 4 long undulators, and 24 bending magnets. At the time of writing, 56 beamlines were in operation, covering a wide variety of research fields involving synchrotron radiation science and technology. The beamlines are classified into the following four types.

(1) Public Beamlines
(2) Contract Beamlines
(3) RIKEN Beamlines
(4) Accelerator Diagnostics Beamlines

There are now 26 public beamlines in full operation. The beamlines that are proposed and constructed by external organizations, such as universities, research institutes, and private companies, are called contract beamlines and are exclusively used by the contractors for their own research purposes. At present, 19 contract beamlines are in operation. The contract beamlines include the NSRRC BM (BL12B2) and NSRRC ID (BL12XU) beamlines, which were constructed by the National Synchrotron Radiation Research Center of Taiwan. The beamlines constructed by RIKEN are called RIKEN beamlines, and are mainly used for RIKEN's own research activities, with partial availability for public use. RIKEN is now operating 9 beamlines and is reconstructing one beamline. In addition, two accelerator diagnostics beamlines are in operation (BL05SS accelerator diagnostics beamline is also partly available for public use).

To illustrate the beamline portfolio of SPring-8, a beamline map is shown in Fig. 2 together with the beamline classification. The research fields of each beamline are presented in Table 3.



BL: Beamline
B1, B2: Bending Magnets
XU: X-ray Undulator
SU: Soft X-ray Undulator
W: Wiggler
IR: Infrared Radiation
LEP: Laser-Electron Photon
LXU: Long-length X-ray Undulator
LSU: Long-length Soft X-ray Undulator
SS: Straight Section

★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines
■ : Accelerator Diagnostics Beamlines
◇ : Planned or Under Construction

WEBRAM: Wide Energy Range Beamline for Research in Advanced Materials
NSRRC: National Synchrotron Radiation Research Center, Taiwan
RISING: Research & Development Initiative for Scientific Innovation of New Generation Batteries

Fig. 2. Beamline map.

Table 3. List of beamlines

BL #	Beamline Name	(Public Use) or (First Beam)	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. Quick XAFS with a time resolution of seconds to tens of seconds.
BL02B1	Single Crystal Structure Analysis	(Oct. 1997)	Charge density study and crystal structure analysis from accurate single crystal diffraction measurements. (X-ray energy range: 8 – 115 keV)
BL02B2	Powder Diffraction	(Sept. 1999)	Charge density study and phase identification of crystalline materials from accurate powder diffraction measurements. (X-ray energy range: 12.4 – 35 keV)
BL04B1	High Temperature and High Pressure Research	(Oct. 1997)	High temperature and high pressure research with the multi-anvil press by powder X-ray diffraction, radiography and ultrasonic measurement.
BL04B2	High Energy X-ray Diffraction	(Sept. 1999)	Pair distribution analysis for glass, liquid, and amorphous materials. High-energy X-ray total scattering. Containerless levitation.
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 using nuclear inelastic scattering. Mössbauer spectroscopy, especially for the surface/interface study and under the extreme conditions. Hard X-ray photoelectron spectroscopy (HAXPES). Depth analysis of HAXPES with high flux and energy resolution.
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	(Sept. 2001)	Atomic-scale structural analysis of surfaces and interfaces of crystalline materials, ultra-thin films, and nanostructures. Surface X-ray diffraction (SXRD). Microbeam diffraction.
BL14B2	Engineering Science Research II	(Sept. 2007)	XAFS in wide energy region (3.8 to 72 keV). XAFS of dilute systems and thin films.
BL19B2	Engineering Science Research I	(Nov. 2001)	Residual stress measurement. Structural analysis of thin film, surface, interface. Powder diffraction. X-ray imaging, X-ray topography. Ultra-small angle X-ray scattering.
BL20XU	Medical and Imaging II	(Sept. 2001)	Microimaging. Hard X-ray microbeam/scanning microscopy, imaging microscopy, microtomography, phase-contrast microtomography with Bonse-Hart interferometer, X-ray holography, coherent X-ray optics, and other experiments on X-ray optics and developments of optical elements. Medical application. Microangiography, refraction-enhanced imaging, phase-contrast CT using interferometer. Ultra-small angle scattering.
BL20B2	Medical and Imaging I	(Sept. 1999)	Microimaging: microtomography, phase-contrast microtomography with grating interferometer for biological specimen and other kinds of specimen. Evaluation and development of various kinds of optical elements for novel imaging techniques. Large field X-ray topography.
BL25SU	Soft X-ray Spectroscopy of Solid	(Apr. 1998)	Study of electronic state of solids by soft X-ray photoemission spectroscopy (PES) including angle-resolved PES (ARPES). Atomic arrangement analysis of surfaces by photoelectron diffraction (PED) technique using two-dimensional photoemission analyzer. Magnetic state analysis by magnetic circular dichroism (MCD) of soft X-ray absorption and its element-specific magnetization curve measurements. Chemical and magnetic imaging by soft X-ray scanning microscopy and photoelectron emission microscopy (PEEM).
BL27SU	Soft X-ray Photochemistry	(May 1998)	Ambient atmospheric pressure soft X-ray photoabsorption spectroscopy. Chemical state analysis of light elements in dilute samples (NEXAFS). Elemental and chemical mapping using micro soft X-ray beam. Soft X-ray emission spectroscopy for solids.
BL28B2	White Beam X-ray Diffraction	(Sept. 1999)	White X-ray diffraction and topography. Time-resolved energy-dispersive XAFS (DXAFS) for studies of chemical and/or physical reaction process. Biomedical imaging and radiation biology studies.
BL35XU	High Resolution Inelastic Scattering	(Sept. 2001)	Materials dynamics on ~meV energy scales using inelastic X-ray scattering (IXS).
BL37XU	Trace Element Analysis	(Nov. 2002)	X-ray microbeam spectrochemical analysis. Ultra trace element analysis. High energy X-ray fluorescence analysis.
BL38B1	Structural Biology III	(Oct. 2000)	Structural biology. Macromolecular crystallography. Automatic data collection.
BL39XU	Magnetic Materials	(Oct. 1997)	X-ray magnetic circular dichroism (XMCD) spectroscopy and element-specific magnetometry under multiple-extreme conditions. XMCD/XAS using a sub-micron X-ray beam. X-ray emission spectroscopy. Resonant X-ray magnetic scattering.
BL40XU	High Flux	(Apr. 2000)	Time-resolved diffraction and scattering experiments. Microbeam X-ray diffraction and scattering experiments. X-ray photon correlation spectroscopy. Fluorescence analysis. Quick XAFS. Submicrometer-scale single crystal structure analysis with high flux and zone plate focused X-ray beam. Single shot imaging with X-ray choppers. Laser pump-X-ray probe experiment.
BL40B2	Structural Biology II	(Sept. 1999)	Noncrystalline small and wide angle X-ray scattering.
BL41XU	Structural Biology I	(Oct. 1997)	Structural biology. Macromolecular crystallography. Microcrystallography. High resolution data collection.
BL43IR	Infrared Materials Science	(Apr. 2000)	Infrared microspectroscopy.
BL46XU	Engineering Science Research III	(Nov. 2000)	Structural characterization of thin films by X-ray diffraction and X-ray reflectivity measurement. Residual stress measurement. Time resolved X-ray diffraction measurement. Hard X-ray photoemission spectroscopy.
BL47XU	HAXPES·μCT	(Oct. 1997)	Hard X-ray photoelectron spectroscopy (HAXPES). Depth analysis of angle resolved HAXPES with wide acceptance lens. Projection type microtomography. Imaging type microtomography. Hard X-ray microbeam/scanning microscopy.

BL #	Beamline Name	(Public Use) or (First Beam)	Areas of Research
	● Contract Beamlines		
BL03XU	**Advanced Softmaterial** (Advanced Softmaterial Beamline Consortium)	(Nov. 2009)	Structural characterization of softmaterials using small- and wide-angle X-ray scattering. Grazing-incidence small- and wide-angle X-ray scattering for thin films. X-ray diffraction and reflectivity measurements for softmaterials.
BL07LSU	**The University-of-Tokyo Outstation Beamline for Materials Science** (The University of Tokyo)	(Oct. 2009)	Time-resolved soft X-ray spectroscopy, nano-beam photoemission spectroscopy, ultra high-resolution soft X-ray emission spectroscopy, and any methods requiring the highly brilliant soft X-ray beam.
BL08B2	**Hyogo BM** (Hyogo Prefecture)	(Jun. 2005)	XAFS in a wide energy region. Small angle X-ray scattering for structural analyses of polymer and nanocomposite materials. X-ray topography. Imaging. Powder diffraction with a high angular-resolution.
BL11XU	**JAEA Quantum Dynamics**	(Oct. 1998)	Nuclear scattering. Surface and interface structure analysis with MBE. Inelastic X-ray scattering. XAFS.
BL12B2	**NSRRC BM** (National Synchrotron Rad. Res. Center)	(Oct. 2000)	X-ray absorption spectroscopy. Powder X-ray diffraction. High resolution X-ray scattering. Protein crystallography.
BL12XU	**NSRRC ID** (National Synchrotron Rad. Res. Center)	(Dec. 2001)	High resolution non-resonant or resonant inelastic X-ray scattering. High resolution near-edge X-ray Raman scattering. Phase transitions under high-pressure, low and high temperatures. High-resolution X-ray absorption and emission spectroscopy. X-ray physics and optics.
BL14B1	**JAEA Materials Science**	(Dec. 1997)	Materials science under high-temperature and high-pressure. *In situ* study on catalysis using dispersive XAFS. X-ray diffraction for structure physics.
BL15XU	**WEBRAM** (National Institute for Materials Science)	(Jan. 2000)	Hard X-ray photoelectron spectroscopy. High-precision X-ray powder diffraction.
BL16B2	**SUNBEAM BM** (SUNBEAM Consortium)	(Oct. 1998)	Characterization of secondary battery related materials, semiconductors, fuel cells, catalysts, and several industrial materials using X-ray absorption fine structure measurements, X-ray diffraction (including X-ray reflectivity technique) and X-ray topography.
BL16XU	**SUNBEAM ID** (SUNBEAM Consortium)	(Oct. 1998)	Characterization of secondary battery related materials, semiconductors, fuel cells, catalysts, and structural materials using X-ray diffraction, X-ray microbeam based evaluation techniques (including X-ray magnetic circular dichroism), hard X-ray photoemission spectroscopy and fluorescence X-ray analysis.
BL22XU	**JAEA Quantum Structural Science**	(May 2002)	Materials science under high-pressure. Resonant X-ray scattering. Speckle scattering. Residual stress/strain distribution analysis.
BL23SU	**JAEA Actinide Science**	(Feb. 1998)	Surface chemistry with supersonic molecular beam. Biophysical spectroscopy. Photoelectron spectroscopy. Magnetic circular dichroism.
BL24XU	**Hyogo ID** (Hyogo Prefecture)	(May. 1998)	Surface/interface analysis for industry by fluorescent X-ray analysis, strain measurements and grazing incidence X-ray diffraction. Microbeam formation studies for materials and life sciences. Micro-SAXS for local long-range structure analysis.
BL28XU	**RISING** (Kyoto University) RISING: Research & Development Initiative for Scientific Innovation of New Generation Batteries	(Apr. 2012)	Analysis of rechargeable batteries. X-ray diffraction spectroscopy. Time-resolved X-ray diffraction and XAFS. Hard X-ray photoelectron spectroscopy.
BL31LEP	**Laser-Electron Photon II** (RCNP, Osaka University)	(Oct. 2013)	Production of high intensity GeV photon beam by laser-backward Compton scattering. Hadron physics via photonucleon and photonuclear reactions. Test and calibration of detectors with GeV gamma-ray and converted electrons/positrons.
BL33LEP	**Laser-Electron Photon** (RCNP, 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.
BL33XU	**TOYOTA** (TOYOTA Central R&D Labs., Inc.)	(Apr. 2009)	Time-resolved XAFS. Characterization of industrial materials, such as catalysts, secondary batteries, fuel cells.
BL36XU	**Catalytic Reaction Dynamics for Fuel Cells** (The University of Electro-Communications)	(Jan.2013)	Real time analysis of catalytic reaction dynamics for fuel cells: time resolved XAFS and X-ray diffraction, 2D scanning microscopic XAFS, 3D computed tomography/laminography XAFS, ambient pressure hard X-ray photoelectron spectroscopy.
BL44XU	**Macromolecular Assemblies** (IPR, Osaka University)	(May 1999)	Crystal structure analysis of biological macromolecular assemblies (e.g., membrane protein complexes, protein complexes, protein-nucleic acid complexes, and viruses).
	◆ RIKEN Beamlines		
BL17SU	**RIKEN Coherent Soft X-ray Spectroscopy**	(Sept. 2003)	High resolution photoemission spectroscopy. Soft X-ray emission spectroscopy for liquid and biological samples. Soft X-ray diffraction spectroscopy. Surface science.
BL19LXU	**RIKEN SR Physics**	(Oct. 2000)	SR science with highly brilliant X-ray beam.
BL26B1	**RIKEN Structural Genomics I**	(Apr. 2002)	Structural genomics research based on single crystal X-ray diffraction.
BL26B2	**RIKEN Structural Genomics 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.
BL32XU	**RIKEN Targeted Proteins**	(Oct. 2009)	Protein microcrystallography.
BL43LXU	**RIKEN Quantum NanoDynamics**	(Oct. 2011)	High resolution inelastic X-ray scattering for investigating atomic and electronic dynamics.
BL44B2	**RIKEN Materials Science**	(Feb. 1998)	Structural materials science research using powder X-ray diffraction.
BL45XU	**RIKEN Structural Biology I**	(Jul. 1997)	Time-resolved and static structures of non-crystalline biological materials using small-angle scattering and diffraction techniques.
	■ Accelerator Diagnostics Beamlines		
BL05SS	**Accelerator Beam Diagnosis**	(Mar. 2004)	Accelerator beam diagnostics. R&D of accelerator components. Nano-forensic science.
BL38B2	**Accelerator Beam Diagnosis**	(Sept. 1999)	Accelerator beam diagnostics.

IV. User Program and Statistics

SPring-8 calls for public use proposals twice a year, in principle. The submitted proposals are reviewed by the SPring-8 Proposal Review Committee (SPring-8 PRC). Since 1997, SPring-8 has accepted a variety of proposals. For the promotion of research on industrial applications at SPring-8, the Industrial Application Division was established in 2005. With consultation support for industrial users provided by the division's coordinators, currently, Industrial Application Proposals account for approximately 20% of the total number of proposals conducted at the public beamlines. In addition, the Measurement Service was introduced in 2007B, wherein the personnel of the Industrial Application Division carry out XAFS measurements on behalf of users at BL14B2. SPring-8 also launched a Protein Crystallography Data Collection Service at BL38B1 and Powder X-ray Diffraction Measurement Service at BL19B2 in 2009B, a Hard X-ray Photoemission Spectroscopy (HAXPES) Measurement Service, and a Thin Film Analysis (GIXD/XRR) Measurement Service at BL46XU in 2012B, and a Small Angle Scattering (SAXS) Measurement Service at BL19B2 in 2014B.

In FY2015, JASRI established the Social Interest Proposals and the Epoch-Making Initiatives Projects, which are new types of proposals at the public beamlines. The purpose of the former is to support research proposals with themes that attract public interest and meet social requirements, and the latter is to establish and develop unexplored fields in combined and interdisciplinary research beyond the boundaries of traditional fields and to broaden the basis for using SPring-8.

In FY2015, JASRI has also improved the beamtime allocation system for research proposals in the field of Life Science(L1)/Protein Crystal Analysis with the use of SPring-8 Public Macromolecular Crystallography Beamlines. These main improvement points are as follows:

(i) The SPring-8 Proposal Review Committee (PRC) will determine only the acceptance or rejection of a proposal and the order of priority.

(ii) The research period for the proposal is one year.

(iii) A questionnaire on the beamtime allocation (the number of shifts, date of use, desired beamline) must be completed by project leaders four times a year.

SPring-8 has consistently provided ~4,000 h of user beamtime per year. Since the start of its operation in 1997, SPring-8 has succeeded in providing users with a total beamtime of 70,797 h. The beamtime available to users, the number of experiments conducted, and the number of user visits at the public and contract beamlines are summarized in Fig. 3. Part of the proposals are for proprietary use, for which refereed reports are not required. More details can be found at ***http://www.spring8.or.jp/en/about_us/spring8data/***.

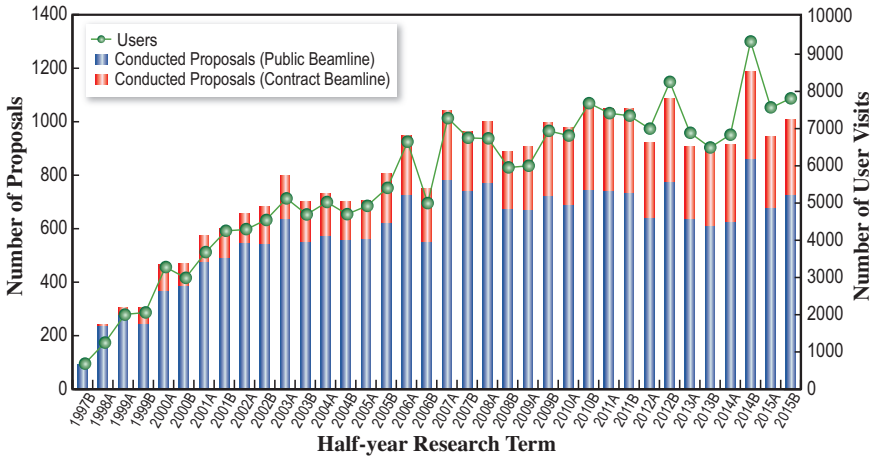


Fig. 3. Numbers of user visits and conducted experiments.

V. Research Outcomes

As of March 2016, the total number of registered refereed papers since the opening of SPring-8 was 11,498, out of which 9,575 papers resulted from the use of public beamlines (including public use at other beamlines), 2,355 papers from that of contract beamlines, 1,151 papers from that of RIKEN beamlines, and 557 papers from hardware/software R&D. The papers resulting from the use of two or more beamlines are counted for each beamline. More details can be found at *http://www.spring8.or.jp/en/about_us/spring8data/* and the publication database is available at *https://user.spring8.or.jp/uisearch/publication2/*.

VI. Budget and Personnel

When SPring-8 started operation in 1997, it was jointly managed by RIKEN, JAERI (now JAEA), and JASRI. However, JAERI withdrew from the management of SPring-8 on September 30, 2005. SPring-8 is currently administered by RIKEN and JASRI in a collaboratively manner.

The total budget for the operation of SPring-8 in FY2015 was 9.259 billion yen. As of October 2015, RIKEN and JASRI have a total of 506 staff members.

VII. Research Complex

The facilities of SPring-8, SACLA, and NewSUBARU form the Center of Excellence (COE) at the SPring-8 campus, where JASRI, public beamline users, the contractors of contract beamlines, RIKEN, and the University of Hyogo work in close cooperation, forming a research complex where each member has their own role in delivering high-quality results in the field of synchrotron radiation science and technology. The organizational charts of RIKEN and JASRI, which are at the center of this research complex, are shown in Fig. 4 and Fig. 5, respectively.

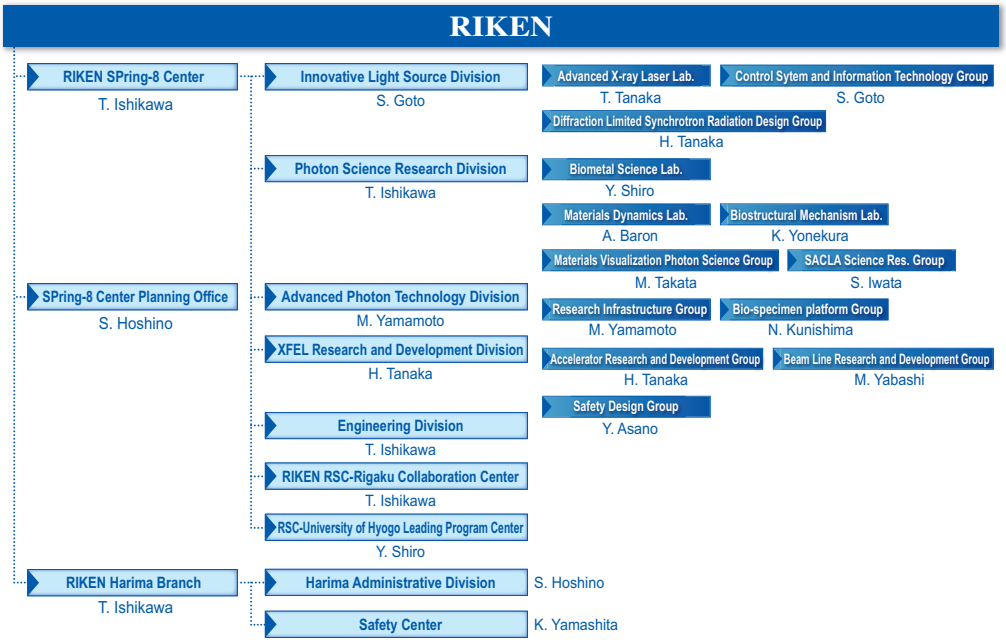


Fig. 4. RIKEN Harima Branch chart as of April 2016.

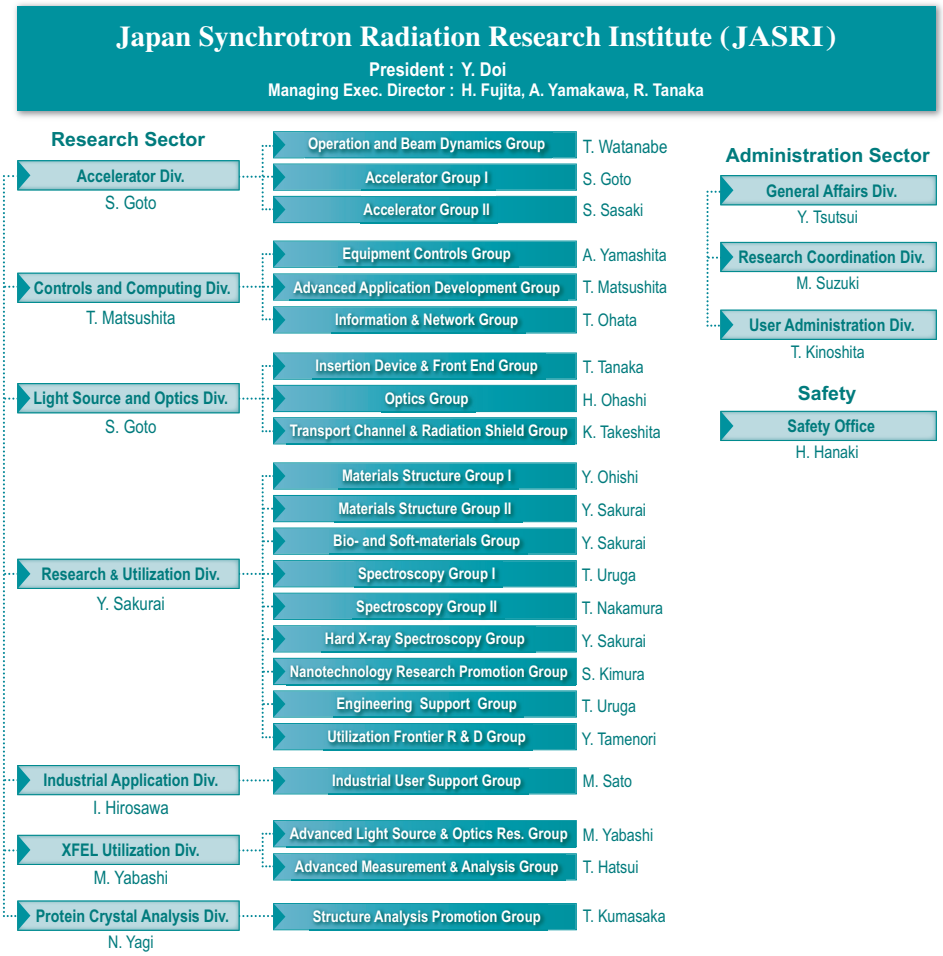


Fig. 5. JASRI chart as of April 2016.

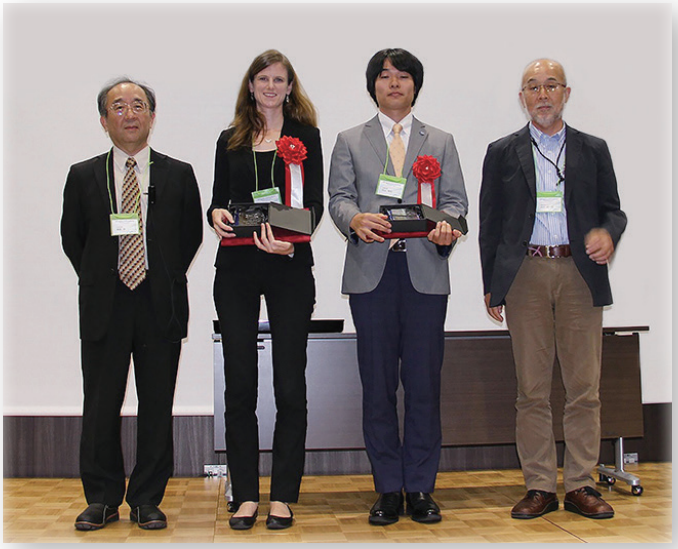
VIII. Users Societies and Other Activities

SPring-8 Users Community (SPRUC)

The SPring-8 Users Community (SPRUC) is a user society that includes not only all users but also potential users who are interested in using SPring-8. In addition to these individuals, representative organizations of about 24 institutes (principal universities, national/international research institutes, industries, beamline consortiums), participate in SPRUC to discuss further promotion of the utilization of SPring-8 from the strategic and perspective viewpoints.

As one of the key activities of SPRUC, the SPring-8 Symposium is held annually at the site of one of the representing organizations jointly with RIKEN and JASRI. SPring-8 Symposium 2015, with the theme "Global Innovation Utilizing Synchrotron Radiation Science-From Global View Point," was held at Kyushu University on September 13 and 14, 2015. SPRUC provides the Young Scientist Award to recognize pioneering achievements in photon science by individual young scientists using SPring-8. The award ceremony and award lecture were held at the SPring-8 Symposium. The SPRUC 2015 Young Scientist Award was conferred to two young scientists (Dr. Kaye Morgan, Monash University and Dr. Satoshi Matsuyama, Osaka University). SPring-8 Symposium 2016 is scheduled to be held on August 29 and 30, at Kwansei Gakuin University.

In accordance with the recommendation by the "WG on Reorganization of SPRUC Research Groups," SPRUC has established "SPRUC multidisciplinary research groups" that work in multidisciplinary research fields in order to promote the use of SPring-8 in the new areas that will be important for future developments in science and technology. This was one of the main activities of SPRUC in 2015. Four multidisciplinary research fields and four program officers, each leading a multidisciplinary research group, were designated following comprehensive advice from the advisors of the SPRUC research groups. For the constant renewal of the system, each multidisciplinary research group works two years and is then expected to organize a new research group. Two multidisciplinary research groups for nanodevice science and application were launched in 2015 through an innovative use of SPring-8 via organic collaboration with JASRI and RIKEN. Two more research groups will start their activities soon. Moreover, research groups were reorganized at the end of March 2016 and new research groups will start from April 2016.



Young Scientist Award
Prof. A. Takahara, Dr. K. Morgan, Dr. S. Matsuyama, and Prof. J. Mizuki

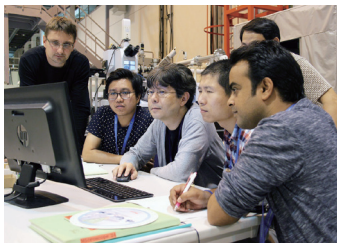
Other Activities

◆ The 23rd SPring-8 Open House
April 26, 2015 • SPring-8

◆ The 15th SPring-8 Summer School 2015
July 5 – 8, 2015 • Public Relations Center, SPring-8

◆ The 9th AOFSRR School - Cheiron School 2015
September 10 – 19, 2015 • Public Relations Center, SPring-8

Cheiron School





Summer School