SPring-8

I. Introduction

SPring-8 was stably operated throughout FY2019 with a total operation time of the accelerator complex and the total user beam time of 5162.6 h and 4537.6 h, respectively, and a total downtime of 40.3 h. SPring-8 had to complete all its operations by the middle of February 2020.

In 2019, an automatic data collection using the *ZOO* system developed by RIKEN and JASRI was newly made available. The PX-BL Automatic Data Collection system was introduced in 2019B, and now users only need to send samples to SPring-8 to obtain data (no visit required).

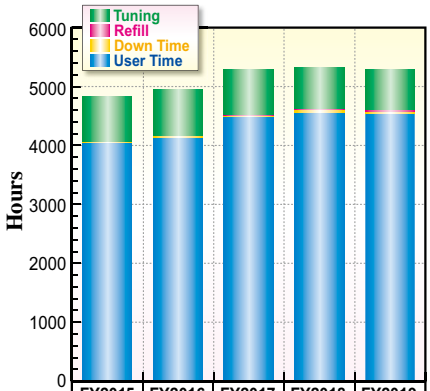
Concerning the contract beamlines, there were four interim reviews conducted for WEBRAM (BL15XU, National Institute for Materials Science), Advanced Softmaterial (BL03XU, Advanced Softmaterial Beamline Consortium), NSRRC ID (BL12XU, National Synchrotron Radiation Research Center), and NSRRC BM (BL12B2, National Synchrotron Radiation Research Center), and the projects were authorized to continue.

At present, there are as many as 15,000 SPring-8 users, all of whom are members of the SPring-8 User Community (SPRUC). It is important for SPring-8 to jointly organize scientific events with SPRUC, such as the SPring-8 Symposium, to facilitate dialogue between users and the facility staff. The SPring-8 Symposium was held at Okayama University (mainly Kanemitsu Hall) on August 30–31, 2019, with 359 participants. SPring-8 also facilitates communication between users and industry. The Joint Conference on Industrial Applications of SPring-8 was held in Kawasaki City on September 5-6, 2019, with 299 participants. As part of its continuous effort towards fostering human resources in synchrotron sciences, SPring-8 organized the 19th SPring-8 Summer School with 90 students of graduate schools nationwide, in cooperation with Hyogo University, Kwansei Gakuin University, The University of Tokyo, Okayama University, Osaka University, Japan Atomic Energy Agency, National Institutes for Quantum and Radiological Science and Technology, and RIKEN. Furthermore, SPring-8 and SPRUC organized the 3rd SPring-8 Autumn School with 62 participants, which included undergraduate to doctoral students and company researchers.

II. Machine Operation

The operation statistics for the last five fiscal years are shown in Fig. 1. In FY2019, the total operation time of the entire SPring-8 accelerator complex was 5285.7 h. The operation time of the storage ring was 5271.2 h, 86.1% of which (4537.9 h) was devoted to SR experiments. This excellent figure for the user time represents a storage ring availability of 99.0%. The total downtime caused by failures amounted to 40.5 h, accounting for 0.89% of the total user time. For 99.5% of the user time in FY2019, the stored beam current was maintained at 100 mA by the top-up operation wherein the stored beam was filled up on demand at any time. The extreme stability of the light source intensity better than 0.1% was provided by the top-up operation.

The variety of operation modes for SR experiments is one of the characteristics of SPring-8. The operation modes are classified into two types, the several-bunch and hybrid-filling modes. The several-bunch mode consists of equally spaced bunches or trains of bunches such as 203 bunches or 29 trains of 11 bunches. The hybrid-filling mode is composed of a long train of bunches and isolated single bunches. The isolated bunch current is kept constant within 1% through the top-up operation. The isolated bunch impurity is routinely maintained better than 10^{-8} by the bunch cleaning system in the booster. The operation modes of SPring-8 are listed in Table 1 with the share of each operation mode in FY2019. Table 2 summarizes the beam parameters of the storage ring.



	FY2015	FY2016	FY2017	FY2018	FY2019
Accelerator Operation Time	4817.9	4951.7	5281.6	5329.8	5285.7
Storage Ring Operation Time	4804.8	4941.1	5270.4	5316.7	5271.2
Tuning & Study (Acc. & BL)	767.2	803.1	769.6	721.8	701.7
Refill	5.3	3.4	4.6	5.3	5.6
Down Time	16.8	23.1	28.7	43.1	40.5
Mean Time Between Failures	202.8	229.2	194.7	168.9	206.3
Achieved User Time	4033.9	4125.5	4478.7	4559.6	4537.9
Planned User Time	4056.0	4152.0	4512.0	4608.0	4584.0
Availability (%)	99.5	99.4	99.3	98.9	99.0

Fig. 1. Operation statistics for last five fiscal years.

Table 1. Operation modes in FY2019

	Single bunch current (mA)	Share of operation time (%)
203 bunches		31.4
4 bunch-train × 84		3.1
11 bunch-train × 29		22.5
1/7-filling + 5 single bunches	3	7.3
2/29-filling + 26 single bunches	1.4	3.1
1/14-filling + 12 single bunches	1.6	9.4
4/58-filling + 53 single bunches	1.0	2.1
11/29-filling + 1 single bunch	5	20.9

Table 2. Beam parameters of 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 [hr]:	
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

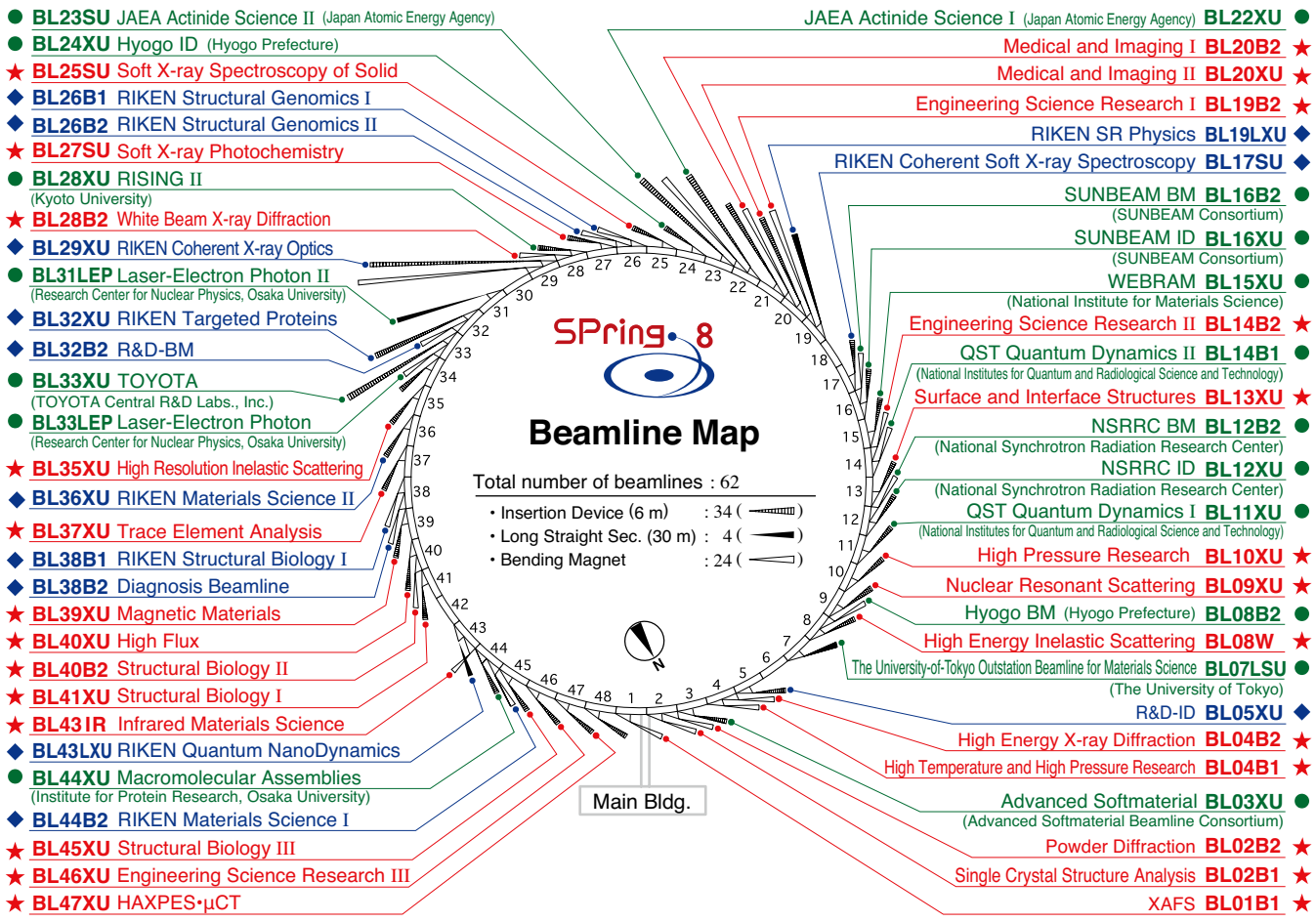
* Assuming 0.2% coupling
** Power saving mode
*** With bunch-by-bunch feedback

III. Beamlines

The SPring-8 storage ring can accommodate up to 62 beamlines: 34 insertion devices, 4 long undulators, and 24 bending magnets. At present, 57 beamlines are in operation, covering a wide variety of research fields involving synchrotron radiation science and technology. The beamlines are classified into the following three types:

(1) Public Beamlines (26 beamlines operating),
(2) Contract Beamlines (18 beamlines operating), and
(3) RIKEN Beamlines (13 beamlines operating).

There are now 26 public beamlines in full operation. The beamlines that were proposed and constructed by external organizations, such as universities, research institutes, private companies, and consortiums, are called contract beamlines and exclusively used by contractors for their own research purposes. At present, 18 contract beamlines are in operation. The beamlines constructed by RIKEN except for public beamlines are called RIKEN beamlines and mainly used for RIKEN's own research activities, with partial availability for public use. RIKEN is now operating 13 beamlines.



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

★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines

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 and Available Techniques
★ Public Beamlines as of April 2020			
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 single crystal X-ray diffraction. (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 function 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)	X-ray Imaging. 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 topography. Ultra-small angle X-ray scattering.
BL20XU	Medical and Imaging II	(Sept. 2001)	Microimaging. Micro-/nano-tomography, phase-contrast microtomography, X-ray diffraction tomography (XRD-CT), hard X-ray microbeam/scanning microscopy, imaging microscopy, coherent X-ray optics, and other experiments on X-ray optics and developments of optical elements. Refraction-enhanced imaging. 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.
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.
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. High energy X-ray microtomography.
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 spectrochemical analysis using micro/nano beam: Scanning X-ray microspectroscopy. X-ray spectroscopic imaging: Projection type spectroscopic tomography and Imaging type spectroscopic tomography. Ultra trace element analysis. High energy X-ray fluorescence analysis.
BL39XU	Magnetic Materials	(Oct. 1997)	X-ray magnetic circular dichroism (XMCD) spectroscopy and element-specific magnetometry under multiple-extreme conditions. XMCD/XAS using a 100 nm focused X-ray beam. X-ray emission spectroscopy.
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.
BL45XU	Structural Biology III	(Apr. 2019)	Structural biology. Macromolecular crystallography. Automation & High throughput data collection. Microcrystallography.
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. X-ray Imaging.
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 and Available Techniques
● Contract Beamlines as of April 2020			
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. X-ray topography. Imaging. X-ray diffraction for multipurpose.
BL11XU	**QST Quantum Dynamics I** (National Institutes for Quantum & Radiological Science & Technology)	(Oct. 1998)	Synchrotron radiation Mössbauer spectroscopy. XAFS. Resonant inelastic X-ray scattering spectroscopy. *In situ* X-ray diffraction during molecular-beam epitaxial growth.
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)	Non-resonant or resonant inelastic X-ray scattering. Hard X-ray photoemission spectroscopy.
BL14B1	**QST Quantum Dynamics II** (National Institutes for Quantum & Radiological Science & Technology)	(Dec. 1997)	Materials science under high-temperature and high-pressure. Energy-dispersive XAFS. X-ray stress/strain measurements.
BL15XU	**WEBRAM** (National Institute for Materials Science)	(Jan. 2000)	Hard X-ray photoelectron spectroscopy. High-precision X-ray powder diffraction. Structural analysis of thin film, surface and interface.
BL16B2	**SUNBEAM BM** (SUNBEAM Consortium)	(Oct. 1998)	Characterization of secondary battery related materials, semiconductors, fuel cells, catalysts, and several industrial materials with using X-ray absorption fine structure measurements, X-ray diffraction (including X-ray reflectivity technique), X-ray topography and computed tomography/laminography.
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 photoelectron spectroscopy and fluorescence X-ray analysis.
BL22XU	**JAEA Actinide Science I** (Japan Atomic Energy Agency)	(May 2002)	HAXPES. XAFS. Residual stress/strain distribution analysis. Materials science under high-pressure. Resonant X-ray scattering. Speckle scattering. Surface X-ray diffraction. High-energy X-ray diffraction.
BL23SU	**JAEA Actinide Science II** (Japan Atomic Energy Agency)	(Feb. 1998)	Surface chemistry with supersonic molecular beam. Biophysical spectroscopy. Photoelectron spectroscopy. Magnetic circular dichroism. STXM.
BL24XU	**Hyogo ID** (Hyogo Prefecture)	(May. 1998)	Microbeam small- and wide-angle X-ray scattering for local structure analysis. Scanning and imaging microscope, micro-tomography, coherent diffraction. Microbeam X-ray diffraction and bright field X-ray topography for electronic device materials. Near-ambient pressure hard X-ray photoelectron spectroscopy.
BL28XU	**RISING II** (Kyoto University)	(Apr. 2012)	Characterization of rechargeable battery reactions and battery related materials by resonance X-ray diffraction, X-ray absorption spectroscopy (XAS), X-ray diffraction spectroscopy (XDS), and hard X-ray photoemission spectroscopy (HAXPES).
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. 3DXRD. Characterization of industrial materials and devices (e.g. catalysts, lightweight bodies, secondary batteries, fuel cells, and power modules).
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 as of April 2020			
BL05XU	**R&D-ID**	(Mar. 2004)	Structural and dynamical research using small and wide angle scattering, R&D of SR instruments.
BL17SU	**RIKEN Coherent Soft X-ray Spectroscopy**	(Sept. 2003)	High resolution photoemission spectroscopy. Soft X-ray emission spectroscopy. Soft X-ray diffraction spectroscopy. Soft X-ray microspectroscopy.
BL19LXU	**RIKEN SR Physics**	(Oct. 2000)	SR science with highly brilliant X-ray beam.
BL26B1	**RIKEN Structural Genomics I**	(Apr. 2002)	Structural biology research based on single crystal X-ray diffraction.
BL26B2	**RIKEN Structural Genomics II**	(Apr. 2002)	Structural biology 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.
BL32B2	**R&D-BM**	(May 2002)	X-ray computed tomography, X-ray diffraction, X-ray absorption fine structure, R&D of SR instruments.
BL36XU	**RIKEN Materials Science II**	(Mar 2020)	Time resolved XAFS and X-ray diffraction, 2D/3D scanning XAFS imaging, 3D computed tomography/laminography XAFS imaging, X-ray emission spectroscopy, ambient pressure hard X-ray photoelectron spectroscopy, pink beam experiment.
BL38B1	**RIKEN Structural Biology I**	(Oct. 2000)	Time-resolved and static structures of non-crystalline biological materials using small-angle scattering and diffraction techniques.
BL38B2	**Diagnosis Beamline**	(Sept. 1999)	Accelerator beam diagnostics.
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.

IV. User Program and Statistics

SPring-8 calls for public use proposals twice a year, in principle. Since 1997, SPring-8 has accepted a variety of proposals as shown in Fig. 3. In FY2019, JASRI designated the field of Industrial Application Proposals Using Advanced Technology. This field is intended to promote problem-solving and the discovery of needs for new applications in various industries by utilizing advanced measurement techniques that are new to the project leader. The submitted proposals are reviewed by the SPring-8 Proposal Review Committee (SPring-8 PRC) and about 1400 proposals were approved in FY2019 (Fig. 5). Industrial Application Proposals account for approximately 16–20% of the total number of proposals conducted at the public beamlines.

The mail-in measurement service is currently provided by BL14B2 (XAFS), BL19B2 (powder diffraction and small-angle scattering), BL46XU (hard X-ray photoemission spectroscopy and thin film analysis), BL45XU, and BL32XU (protein crystallography). Figures 4 to 13 show the information on user programs.

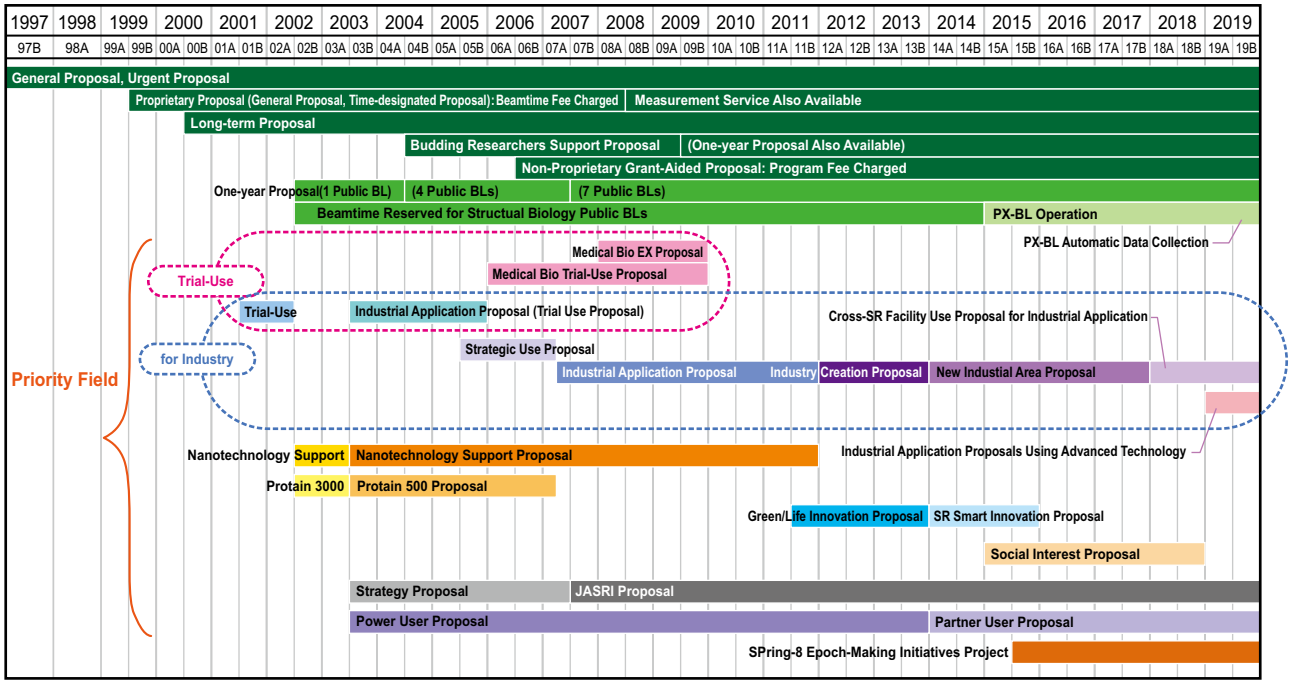


Fig. 3. Categories of proposals for the public beamlines.

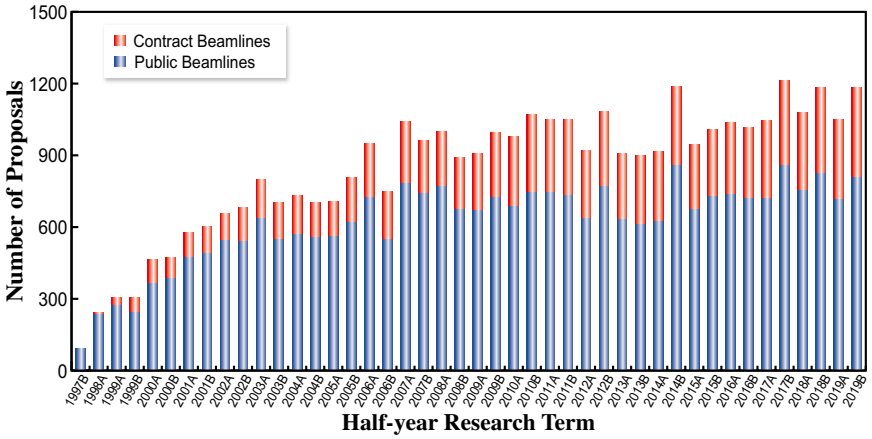


Fig. 4. Numbers of conducted experiments.

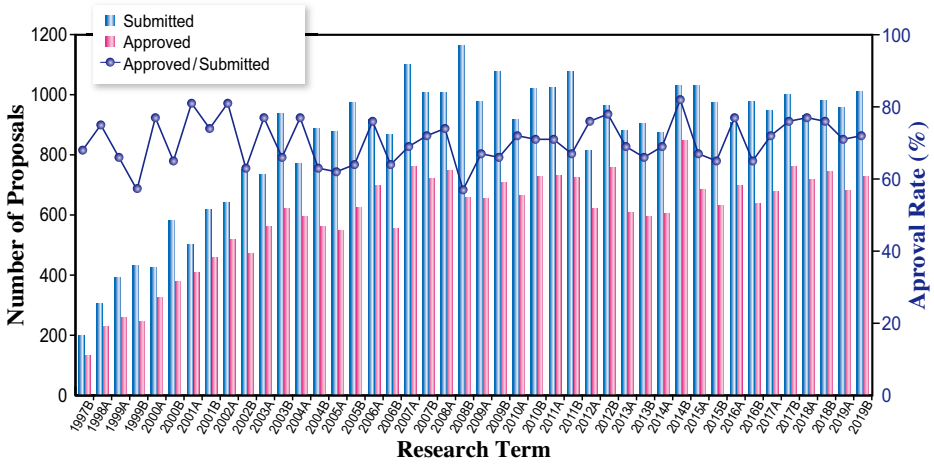


Fig. 5. Numbers of submitted proposals and approved proposals by research term (public beamlines).

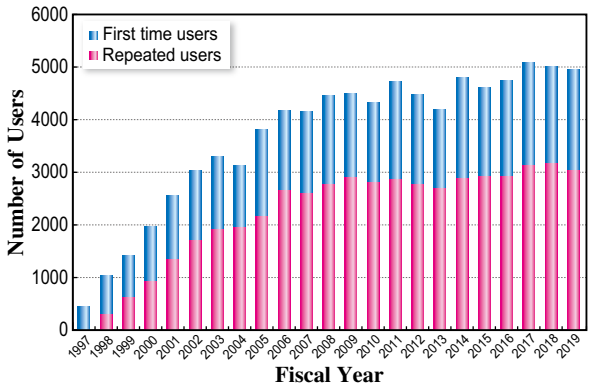


Fig. 6. Numbers of users by fical year.

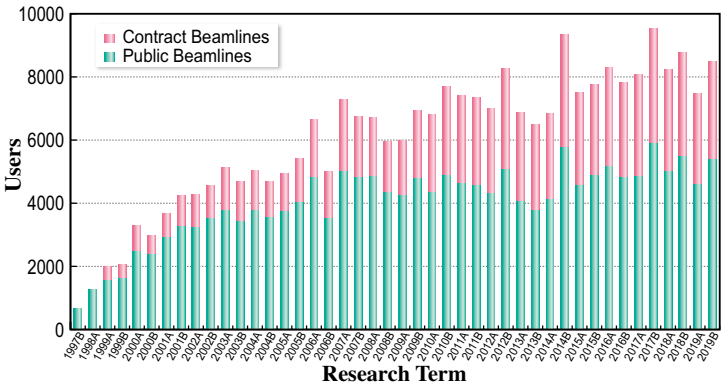


Fig. 7. Numbers of users visits by research term.

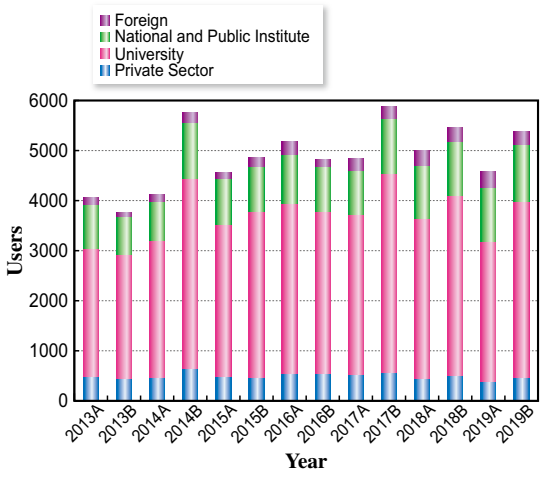


Fig. 8. Numbers of users by affiliation categories (public beamlines).

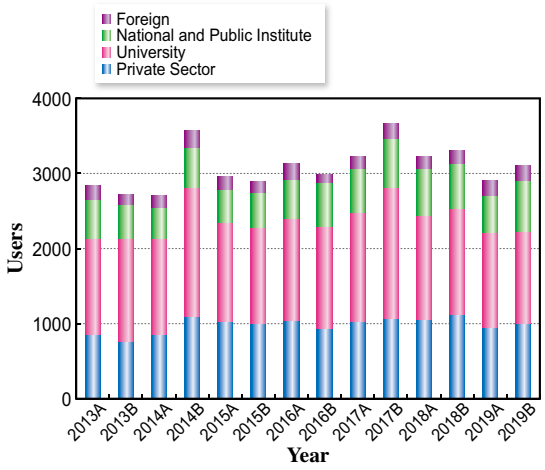


Fig. 9. Numbers of users by affiliation categories (contract beamlines).

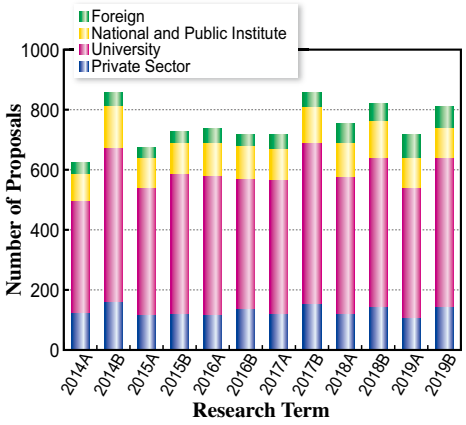


Fig. 10. Numbers of conducted proposals by affiliation (public beamlines).

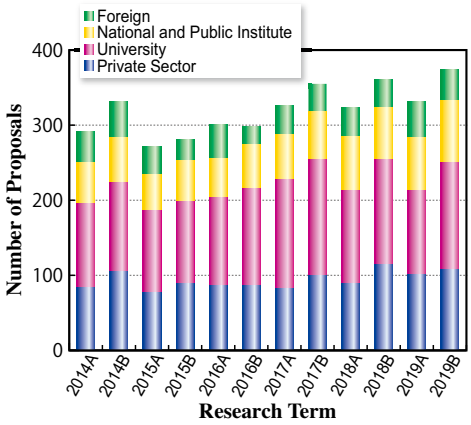


Fig. 11. Numbers of conducted proposals by affiliation categories (contract beamlines).

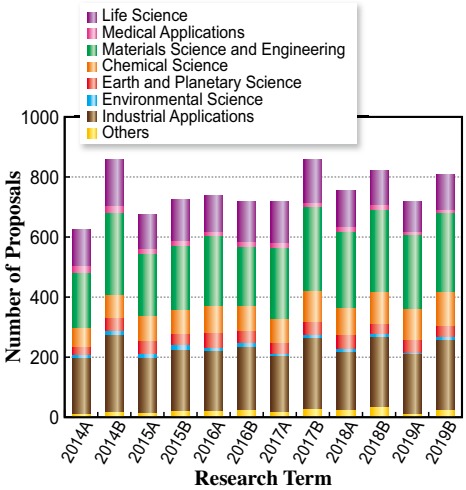


Fig. 12. Numbers of conducted proposals by research area (public beamlines).

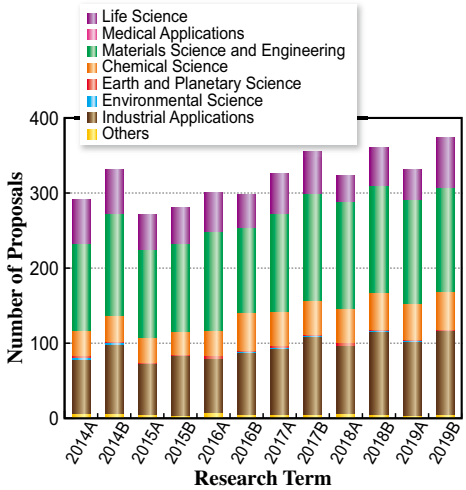


Fig. 13. Numbers of conducted proposals by research area (contract beamlines).

V. Research Outcome

As of March 2020, the total number of registered refereed papers that involved the use of SPring-8 was 16,500. Figure14 shows the annual statistics of refereed papers.

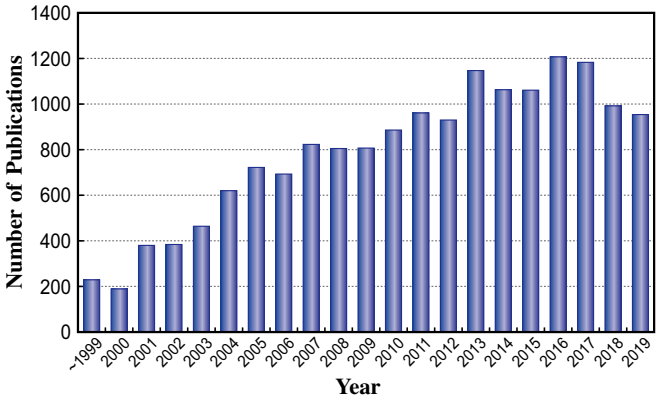


Fig. 14. Number of refereed publications.

VI. Budget and Personnel

The total budget for the operation of SPring-8 in FY2019 was about 9.3 billion yen. As of October 2019, RIKEN and JASRI have a total of 440 staff members. Figure 15 shows the annual budget allocated to operations, maintenance, and promotion of SPring-8. Figure 16 shows the number of staff at of RIKEN and JASRI.

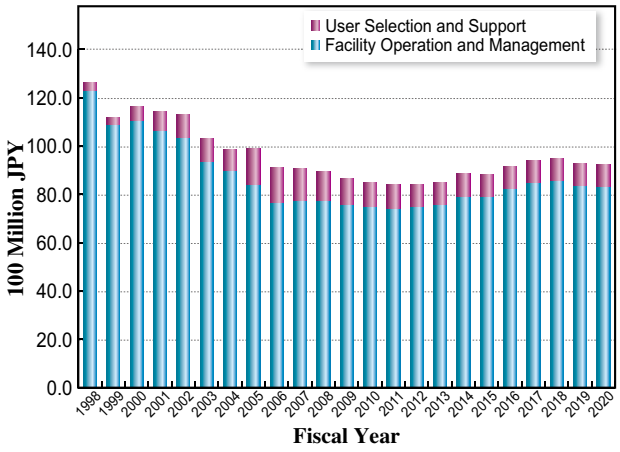


Fig. 15. SPring-8 budget.

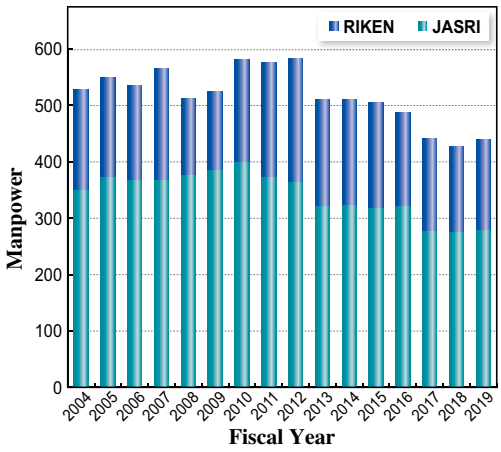


Fig. 16. Personnel at SPring-8: JASRI and RIKEN.

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 its own role in delivering high-quality results to 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. 17 and Fig. 18, respectively.

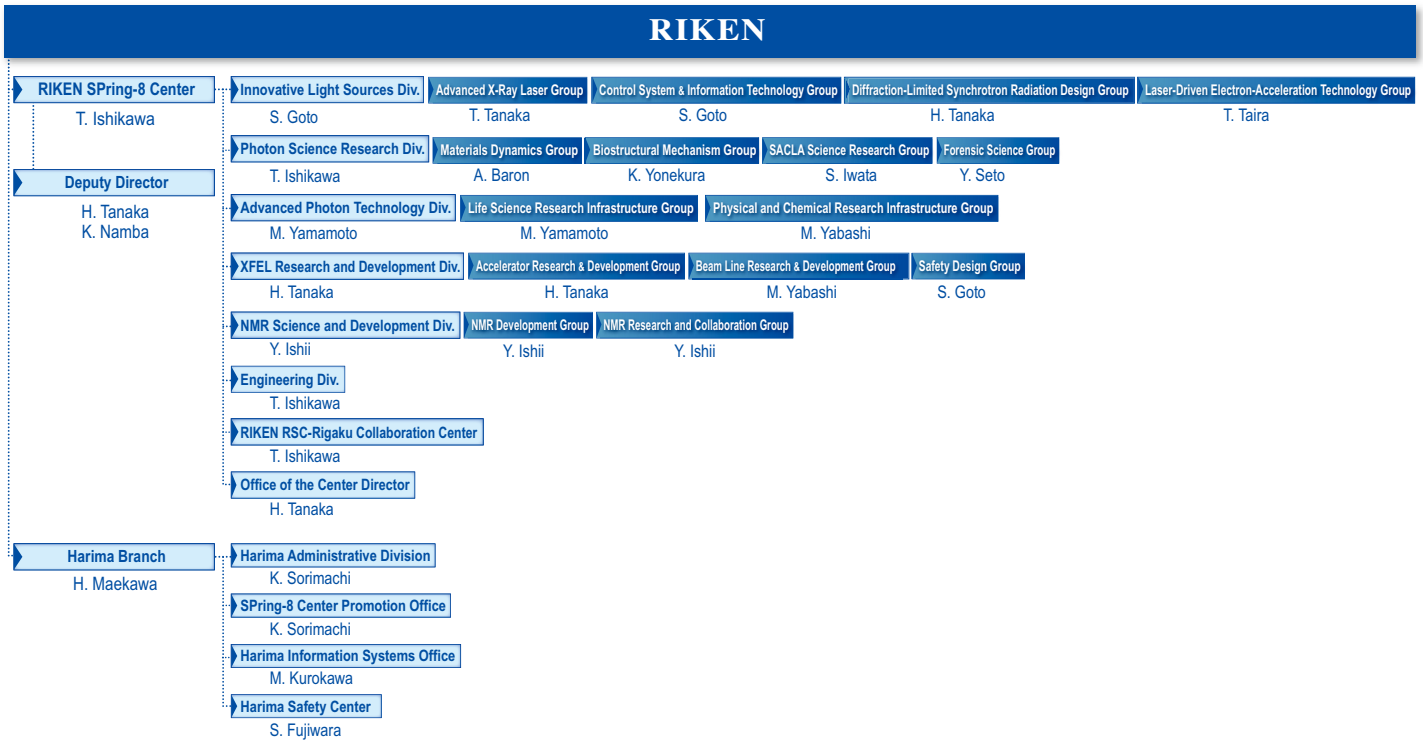


Fig. 17. RIKEN Harima Branch chart as of April 2020.

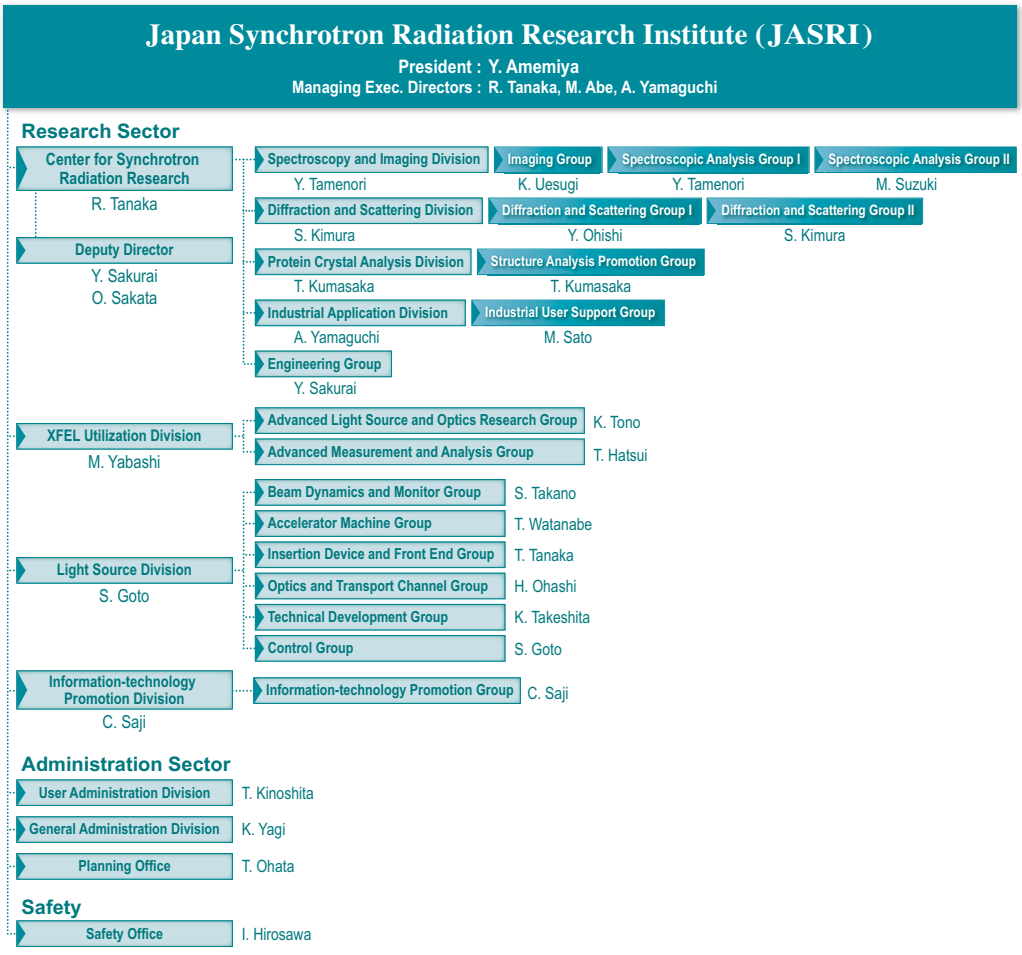


Fig. 18. JASRI chart as of April 2020.

VIII. SPring-8 Users Community (SPRUC)

Prof. J. Mizuki
Kwansei Gakuin University
SPRUC Chairman FY2019

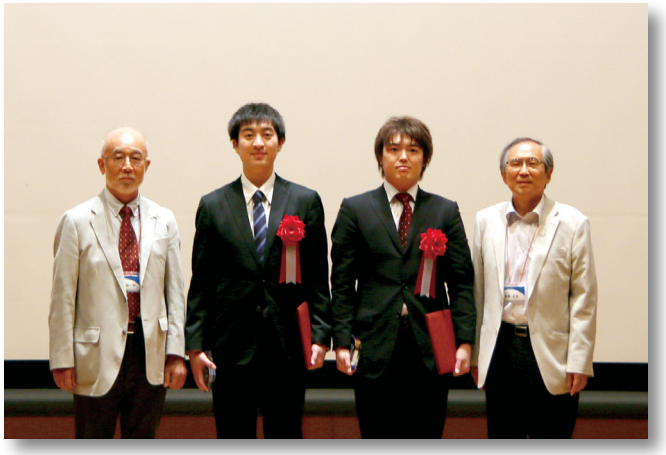
The SPring-8 Users Community (SPRUC) is a user society consisting of all users of SPring-8/SACLA. In addition to individuals, representative organizations from 26 institutes (i.e., principal universities, national/international research institutes, industries, and beamline consortiums) participate in SPRUC to discuss further promotion of the utilization of SPring-8 from 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 representative organizations jointly with RIKEN and JASRI. SPring-8 Symposium 2019 with the theme "One step for the coming two decades" was held at 50th Anniversary Hall, Okayama University on August 30–31. As indicated by the theme, a major aim of the symposium was to form a consensus on a future plan of SPring-8 through a discussion and share practical ways to realize the plan. The award ceremony of the SPRUC 2019 Young Scientist Award, which was conferred on Dr. Wataru Shihoya, The University of Tokyo, and Dr. Yuya Kubota, JASRI, was also held. SPring-8 Symposium 2020, jointly hosted by SPRUC, RIKEN, JASRI, NIMS, and University of Tsukuba, is scheduled to be held on September 18–19 at International Congress Center EPOCAL TSUKUBA.

SPRUC co-hosted the 2nd Beamlines Upgrade Workshop (February 21–22) with RIKEN and JASRI. The workshop was planned to enrich information exchange between members of SPRUC and the facility side. The facility side presented the latest situation of beamline reorganization, future prospect, and relatied problems, and the members discussed their requirements and gave suggestions for the beamline upgrade.

SPRUC has continued to promote the activities of SPRUC multidisciplinary research groups in order to develop the use of SPring-8 in new areas that will be important to future science and technology. Owing to the successful termination of the research period of the research group for nanodevice science, the research group for applied science, led by Dr. Masatoshi Takao (program officer) and Dr. Akihiko Fujiwara (project director), is the only remaining multi-disciplinary research group active at the end of the fiscal year. As an activity of the Science Promotion Board, as a subsidiary board in the SPring-8 utilization committee, SPRUC started a survey of research fields that should be promoted to generate new science. On the basis of this activity, the formation of new multidisciplinary research groups is expected.

The 4th-term SPRUC research groups were voluntarily organized in each research field, and each research group conducted research meetings actively. At the call for the 5th-term SPRUC research group,



SPRUC2019 Young Scientist Award
Prof. J. Mizuki, Dr. W. Shihoya, Dr. Y. Kubota, and Prof. M. Oshima

the SPring-8 utilization committee requested that the 5th-term SPRUC research group should carry out some activities that contribute to a vision for beamline reorganization, future beamline technology, new application fields, and recruiting new users.

SPRUC supported the SPring-8 Summer School to enhance user research competency and also hosted the SPring-8 Autumn School with JASRI to acquire new users and for human resource development. The SPRUC research group contributed to planning the lectures in both schools.

Finally, modifications of the SPRUC organization and rules are described. SPRUC established the Science Promotion Board with the purpose of making practical plans toward realizing forthcoming cutting-edge science that SPring-8 should tackle. The rule for recommending councilor candidates was changed to make it possible to recruit a much broad range of candidates. The early election of the next president was introduced, and the next president from April 2020 will be Prof. Akio Kimura from Hiroshima University. The terms describing the valid period of the membership were changed to those with a much clear description. The rule for filling a vacancy for a councilor was established. These changes should contribute to the efficient and powerful operation of SPRUC.

SPring-8 Symposium 2019

IX. Outreach Activities

To recruit new users in unexplored fields of application, SPring-8 holds a series of seminars named "Workshop on Advanced Techniques and Applications at SPring-8". Here are some representatives.

- 40th: Social science and SPring-8
  May 21, 2019 • Campus Innovation Center Tokyo (Tokyo)

- 41st: Practical use of SPring-8 in Earth science field
  May 28, 2019 • Makuhari Messe (Chiba)

- 42nd: Current status and future prospects of protein structural biology research at SPring-8
  September 9-10, 2018 • Osaka University (Osaka)

- 49th: Prospects for the element-selective electric state studies with high sensitive X-ray emission spectroscopy and inelastic X-ray scattering measurement
  January 9, 2020 • Nagoya University (Aichi)

- 50th: Future prospect for room temperature superconductivity in hydride research with SPring-8
  December 24, 2019 • SPring-8 site (Hyogo)