# Experimental Facilities
# - General -

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## 1. Introduction

A highlight of the SPring-8 year came in October 1997 when the facility opened for research. After storage ring commissioning and confirmation of electron capture by the rf system, it was possible to transport synchrotron radiation beams from bending magnet and insertion device sources to the front end channels of beamlines. Some beamline commissioning took place in July 1997 and several beamlines were installed in the storage ring during the summer shutdown. With the opening of beamlines in October, the Experimental Facilities Division, Beamline Division and Experimental Research Division, became especially busy. Along with beamline commissioning, SPring-8 has been continuing with its beamline construction program, organizing the Beamline Committee and the Proposal Review Committee (PRC). It also held an international conference and workshop.

## 2. Beamline commissioning and initiation of public use

By the end of 1996, the SPring-8 Project Team was able to accelerate electrons to an energy of 1 GeV in the linac and inject them into the synchrotron, where they can be further accelerated to an energy of 8 GeV. In March 1997, SPring-8 was successful in storing an 8GeV in the storage ring and, on March 26th, 1997, used a bending magnet section of the ring to produce the facility's first synchrotron radiation.

Progress to beamline commissioning was as follows:

April 23rd Observation of synchrotron radiation from insertion device;
May 16th Transfer of synchrotron radiation from a bending magnet to an experimental station;
May 22nd Transfer of synchrotron radiation from an insertion device to an experimental station;
July 3rd Six beamlines ready for commissioning.

After a two-month summer shutdown for accelerator maintenance and the installation of additional beamlines, commissioning of public beamlines began in September. On October 6th, SPring-8 held an inauguration ceremony to mark its opening for research. The first phase of experiments covered the period from October 8th, 1997 until March 1998. The "SPring-8 Research Promotion and User Support" section of this report contains details of research proposal selection procedures, beamtime allocation and storage ring operating schedules.

## 3. Beamline construction

SPring-8 beamlines comprise either a bending-magnet or an insertion device source, together with a front-end channel, transport channel and optics, experimental station equipment (including additional optics), diffractometers, a detector and data acquisition system, shielding hatches, and interlock/beamline control systems. The

table below shows the construction status of SPring-8's beamlines at the end of 1997. When SPring-8 began operation in October 1997, eight public beamlines were already installed.

BL01B1 XAFS (EXAFS)
BL02B1 Crystal Structure Analysis
BL04B1 High Temperature Research
BL08W High Energy Inelastic Scattering
BL09XU Nuclear Resonant Scattering
BL10XU Extremely Dense State Research
BL39XU Physicochemical Analysis
BL41XU Bio-Crystallography

SPring-8's plans allow for two R&D beamlines. One of these,

BL47XU

has been completed. A proportion of its beamtime is available for public use and this is mainly allocated to imaging research.

In addition to the above beamlines, SPring-8 has two public beamlines with soft X-rays:

BL25SU Soft X-ray Spectroscopy of Solid; and

BL27SU Soft X-ray Photochemistry.

These soft X-ray beamlines became available for public use in April 1998.

SPring-8 has also started construction of beamline

BL20B2 Biomedical Imaging Research,

which is scheduled for completion by Autumn 1998. The distance from this beamline's X-ray source to its experimental station is 200 meters. The experimental station will be housed in the specially constructed Medical Imaging Center, which is located outside the storage ring's Experimental Hall.

JAERI and RIKEN have constructed six beamlines for the exclusive use of their scientists. Of these, RIKEN's Structural Biology Beamline I,

BL45XU Structural Biology,

was commissioned in parallel with the first phase of public beamline construction and was available for research when SPring-8 opened in October. This beamline is equipped to conduct research using the multiple wavelengths anomalous diffraction (MAD) technique for bio-crystallography measurement and small-angle X-ray scattering measurement. By March 1998, four of the other five beamlines had been commissioned.

Five contract beamlines are under construction; two of which are scheduled for completion during fiscal year 1998:

BL25XU Materials Science, Bio-crystallography and Medical application (Hyogo Prefecture) ,
BL44XU Macromolecular Assemblies Research (Osaka University).

The other three contract beamlines being constructed are:

BL15IN Advanced Materials Research (National Institute for Research in Inorganic Materials),
BL16XU Materials Research (Industrial Consortium),
BL16BM Materials Research (Industrial Consortium).

## 4. Beamline Committee

At the beginning of fiscal year 1997, the Beamline Committee and Contract Beamline Committee operated independently. The former committee dealt with scientific and technical aspects of public beamlines, while the latter evaluated proposals to construct contract beamlines. However, the high

demand for a limited number of insertion device beamlines caused the SPring-8 Project Team to conclude that it should encourage greater coordination between the two committees. Consequently the same members now serve on both committees.

*4-1 Beamline Committee*

The SPring-8 Project Team is establishing a master plan for public beamline construction during the second phase of the project. This will increase the number of public beamlines from 10 to 30. At a construction rate of four public beamlines per year, SPring-8 will have a total of 30 such beamlines by fiscal year 2003.

The fist step towards public beamline construction involves submission of a "letter-of-intent" to the Beamline Committee, giving provisional plans for the intended beamline. After reviewing these letters-of-intent, the Beamline Committee might request a more detailed "beamline proposal." In 1997, it received seven beamline proposals and recommended to the JASRI, JAERI and RIKEN SPring-8 Steering Committee that six be accepted for construction. The Steering Committee endorsed this recommendation and gave its formal approval to the six proposals, which are as follows:

Medical Beamline

-As mentioned earlier, this bio-medical imaging research beamline is scheduled for completion in Autumn 1998 --construction began in fiscal year 1997

High Flux Beamline

-Undulator beam without monochromatization, using the wealth of high flux as in the time-resolved small-angle scattering experiment

High Resolution Beamline

-high energy resolution beams for research in inelastic scattering,

Crystal Structure Analysis II Beamline

-powder diffraction,

Surface and Interface Structure Research Beamline

Infrared Spectroscopy Beamline

Provisions for the High Flux and High Resolution beamlines are included in the government's fiscal year 1998 budget. Construction will take place during fiscal years 1998 and 1999.

Meanwhile the Japanese government has allocated a budget for the construction of a second insertion device X-ray source public beamline for medical use. Construction will start in fiscal year 1998 and is scheduled for completion in fiscal year 2000. A special committee of medical experts is discussing detailed research plans this beamline.

The Beamline Committee continues to evaluate proposals for future public beamlines.

*4-2 Contract Beamline Committee*

SPring-8 accepts applications to construct contract beamlines from universities, national laboratories and private companies. Successful applicants build a contract beamline and, in principle, have exclusive rights to its use. All applications to construct contract beamlines are subject to evaluation by the Contract Beamline Committee.

As mentioned earlier, five contract beamlines are now under construction. In the meantime, the Synchrotron Radiation Research Institute (SRRC) in Chinese Taipei has submitted letters-of-intent for two contract beamlines: one from a bending magnet and the other from an insertion device.

Moreover, an Indian organization has expressed interest in constructing a contract beamline and SPring-8 expects to receive a letter-of-intent soon.

## 5. Proposal Review Committee

As other sections of this report explain, the first period of research at SPring-8 (October 1997 to March 1998) attracted a large number of applications to conduct experiments using its public beamlines. A similar level of interest accompanied the next call for proposals for the second research period (April through October 1998). The submission deadline for this second research period was early January 1998.

During the second research period, the storage ring will be operated mostly in three-weeks cycles. Users will be able to have continuous access to beam time for up to 42 shifts (336 hours). Some parts of these three-week cycles will operate in either 21 or 42 bunch mode.

## 6. Symposia and Workshops

As explained elsewhere in this report, the "6th International Conference on Synchrotron Radiation Instrumentation" was held in Himeji from August 4th to 8th, together with a number of satellite meetings. In parallel with the conference, SPring-8 held an international workshop in nearby Kobe that addressed Long Straight Sections of SPring-8 Storage Ring. The workshop was concerned with evaluating the SPring-8 storage ring from the point of view of accelerator physics and scientific programs using coherent X-rays from the ring's long insertion devices.

As usual APS, ESRF and SPring-8 held their annual three-way workshop. The 1997 workshop took place in Grenoble, France and 1998 event will be held in Argonne, U. S. A.

BEAMLINES AT THE SPring-8

- COMPLETED/UNDER CONSTRUCTION BY THE END OF 1997 -

| Beamline | Type of Source* | Subject | Category** | Status*** |
|---|---|---|---|---|
| BL01B1 | BM | XAFS(EXAFS) | Public | C |
| BL02B1 | BM | Crystal Structure Analysis | Public | C |
| BL04B1 | BM | Geophysics | Public | C |
| | | High Temperature Research | | |
| BL08W | W | Compton Scattering | Public | C |
| BL09XU | U | Nuclear Resonant Scattering | Public | C |
| | | Surface Science | | |
| BL10XU | U | High Pressure Research | Public | C |
| | | High Brilliance XAFS | | |
| BL11XU | U | Materials Science | JAERI | UC |
| BL14B1 | BM | Materials Science | JAERI | UC |
| BL20B2 | BM | Biomedical Imaging | Public | UC |
| BL23SU | U | RI & Actinide Science | JAERI | UC |
| BL24XU | U | Imaging, Structure Analysis | Hyogo | UC |
| BL25SU | U | Spectroscopy of Solid | Public | UC |
| BL27SU | U | Soft X-ray Photochemistry | Public | UC |
| BL29XU | U | Coherent X-ray Science | RIKEN | UC |
| BL39XU | U | Chemical Element Analysis | Public | C |
| | | Magnet Circular Dichroism | Public | |
| BL41XU | U | Bio-Crystallography | Public | C |
| BL44XU | U | Bio-macromolecular Assemblies | OUP | UC |
| BL44B2 | U | Bio-Crystallography, XAFS | RIKEN | UC |
| BL45XU | U | Small-angle Scattering | RIKEN | C |
| | | Bio-Crystallography (MAD) | | |
| BL46XU | U | R&D | JASRI | UC |
| BL47XU | U | R&D | JASRI | C |

*Type of Source : BM, bending magnet; W, wiggler: U, undulator.

**Category : Hyogo, contract beamline by Hyogo Prefecture: OUP, contract Beamline by the Institute for Protein Research, Osaka University.

***Status : C, completed by the end of 1997; UC, uncompleted at the end of 1997.

The arrangement of the beamlines in the Experimental Hall of SPring-8 Storage Ring is shown elsewhere in this report.