SPring-8 Beamline Review Committee Report
on
R&D Beamlines
(BL38B1, BL46XU, BL47XU)

Report for Director General of
Japan Synchrotron Radiation Research Institute

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1. Introduction

This committee meeting was held on January 24-25, 2005, on the SPring-8 campus. In advance, the committee members received a report on the activities of the R&D beamline panel in SPring-8, books of abstracts and presentations on the annual meetings of the R&D beamlines from FY2001 to FY2003, and SPring-8 Overview 2004. Then, they submitted individual review reports to the JASRI prior to the meeting. Six committee members attended the meeting. The committee received a brief orientation for this review meeting, an overview of SPring-8 and explanations of the past and current operations of the R&D beamlines and the selected results, and they then visited the R&D beamlines. After that, the committee received a detailed explanation on the management policy of future R&D activities and had a question-and-answer session. This report was compiled on the basis of the discussion during the meeting.

2. Past and Current R&D Activities

2.1 Operation

SPring-8 has designated the BL38B1, BL46XU and BL47XU beamlines as R&D beamlines, and has been assigning 70% of their beamtimes to R&D proposals. Instrumentation, development of new experimental methods, exploration of new research fields and upgrading of the beamline facilities have been carried out at these beamlines.

The committee considers that such R&D beamlines are necessary for upgrading public beamlines in the transition period from the construction to the utilization of the SPring-8 facility. The R&D beamlines should be managed differently from the public beamlines because they have different purposes. From this viewpoint, we judge that the past and current management of the R&D beamlines is appropriate in general.

However, the committee admits some drawbacks. First, R&D has been performed on the basis of proposals from individual researchers. Although individual ideas are essential to the exploration and development of a new research field, we feel that strategic R&D on selected fields and methods, led by the facility, should have been performed in addition to the individual proposals. Regarding this point, SPring-8 has stated that “adequate planning and cooperation organized by the SPring-8 management are necessary in the future.” We expect that SPring-8 will provide appropriate feedback in the future.

The committee considers the assignment of 70% of beamtime to R&D proposals appropriate. We are concerned about a recent decrease in R&D beamtimes caused by the inclusion of Strategic Proposals in R&D beamlines.

2.2 Adequacy of Accepted Proposals

The committee finds many accepted proposals to be adequate as R&D subjects that promote new fields.

These accepted proposals are classified into two groups. One is instrumentation of the light sources and detectors, and the other is development of new experimental methods. Both are the key to successful operation and development of the SPring-8 facility.

The former proposals have produced many results and should be continued in the future in order to operate the SPring-8 facility as a world-class advanced light source. In particular, additional measures against heat-load and vibration problems and further upgrades of rotated-inclined monochromators should be considered as R&D topics.

The aim of the latter group of proposals is rather difficult to accomplish in the framework of public beamtime. However, the committee judges that sufficient results have been produced on the whole. In the utilization phase of the SPring-8 facility, some of the accepted proposals are inappropriate for R&D aimed at instrumentation and are difficult to distinguish from general proposals.

2.3 Level of R&D Results

The accepted proposals have produced world-class results in diverse fields including optics, detectors, basic beamline-technology (stabilization technology) and the development of new experimental methods. However, the committee admits that there are fewer results that have contributed to the upgrading of public beamlines or that will be put into practical use in a new beamline.

The number of R&D results is adequate for the three-year-long operation. In addition, development of software as part of measurement techniques has been carried out to some extent.

These results are nonuniform in their levels. The differences are due to the various ideas and the level of data analysis attained, rather than the level of hardware development attained.

3. Future R&D Activities

The R&D activity is also essential in the utilization phase of the SPring-8 facility, and the same distributions of beamtimes should be maintained in the future.

Considering the above, in order to meet the needs of the utilization phase, the proposed reconsideration of the policy of R&D management is well timed. The committee thinks that the need for the following types of R&D will increase: continuation of R&D toward the full use of the potential of the light sources and R&D on upgrading the beamline facilities and developing new research fields for users. From this point of view, the committee supports the proposed policy on R&D management in the future.

R&D is deemed successful when output can be applied in practice. It is necessary to correctly grasp and to respond positively to the needs of user groups. To this end, constant cooperation between in-house staff and users is essential. Individual proposals from in-house staff should also be accepted. In both cases, the in-house staff should take charge of performing R&D, while regularly reporting to users.

SPring-8 has proposed two categories with different purposes: one aimed at fully utilizing the potential of the light sources (Comprehensive R&D for Beamline Technologies) and the other aimed at raising the level of scientific activities (Pilot R&D for Advanced Studies). This categorization is adequate for the utilization phase and our comments are as follows.

3.1 Comprehensive R&D for Beamline Technologies

BL46XU continues to be used as a R&D beamline for Comprehensive R&D for Beamline Technologies. At BL46XU, fundamental R&D on a microcrystal beamline and a next-generation light source are performed in order to make full use of the SPring-8 capacity. The committee feels that these activities are essential for upgrading the SPring-8 facility since their results are expected to be used in other beamlines. Because of the limited manpower and budget, we agree that SPring-8 should have a beamline dedicated to such R&D activities.

The result of R&D on instrumentation should attain a level of practical use.

SPring-8 should consider opportunities to include the developments of a control system and a data-analysis program and their promotion.

In addition, in order to make effective use of the beamtime, SPring-8 should adopt a flexible attitude that allows some projects of Pilot R&D for Advanced Studies to use BL46XU.

3.2 Pilot R&D for Advanced Studies

Pilot R&D for Advanced Studies is essential for maintaining the research activity at its best. A plan for shifting the research subjects from individual research to project research will be useful.

SPring-8 should maintain the same distributions of beamtime for R&D through the facility. Work of Pilot R&D for Advanced Studies is performed in each public beamline, in addition to that of general proposals, while BL38B1 and BL47XU are converted to public beamlines. It is necessary to consider the balance in beamtime between R&D and general proposals.

In a beamline, pilot R&D that upgrades a beamline facility or expands a research field may need a longer beamtime than a general proposal if it involves a user experiment. In such a case, SPring-8 should allocate such a long beamtime for the R&D after reaching an agreement with users' group.

The list shows 11 examples for Pilot R&D for Advanced Studies. Some of the examples are classified as prioritized or strategic proposals, rather than R&D proposals. Therefore, the committee suggests reconsidering the list. In addition to the shift from individual to project research, SPring-8 should clarify the connection between a R&D project and the mid- or long-term strategy. The committee suggests including a long-term project, such as exploiting the coherence of X-ray beams, in the list. Some proposals of Pilot R&D for Advanced Studies should have a feature that draws the attention of scientists in other fields. SPring-8 should take these points into consideration in the selection of research subjects for Pilot R&D for Advanced Studies.

The selection process of beamlines and projects should be visible to public. Flexible management of beamtime assignment is necessary since some projects require intensive work over several cycles, although currently, one proposal is allowed only one cycle. Furthermore, SPring-8 should review the R&D projects and revise the list every year. On implementing the new R&D scheme, SPring-8 should clarify the difference between Pilot R&D for Advanced Studies and the current prioritized research subjects. SPring-8 should prioritize an R&D subject that has the capability of leading to a

cutting-edge experimental technique in the future. However, more than 50% of total beamtime of the public beamlines should be reserved for general proposals.

3.3 Other R&D Opportunities

Effective management with close collaboration between the beamline and accelerator groups is essential for maintaining the international competitiveness in the utilization phase. The committee suggests that SPring-8 should implement the scheme of “R&D in collaboration with the accelerator group”, aimed at public use, under close collaboration between the two groups.

The committee also suggests collaboration between “Comprehensive R&D for Beamline Technologies” and “Pilot R&D for Advanced Studies”, since the two sometimes may have the same goal.

Securing manpower and budget is essential since R&D is an important issue in the future of the facility. It is also important, in terms of correct understanding, motivation and effectiveness, for the staff to grasp the trend of synchrotron radiation facilities worldwide as well as experimental methods other than those for synchrotron radiation. The committee recommends that SPring-8 provides in-house staff a chance to acquire such information.

The committee recommends international collaboration with other institutions. In doing so, SPring-8 should have a system in which the staff has an awareness of benefiting users and the facility and contributing to the synchrotron radiation community.

4. Summary

Effective management of R&D to upgrade the facility and expand research fields with a approproate perspective is essential to maintain SPring-8 as an advanced facilities. Proper selection and implementation of R&D projects, review of these projects, and infrastructure that enables R&D on the most advanced technologies to be conducted are indispensable for pursuing the above goals.
Finally, the committee expects SPring-8 to manage the R&D activities with the high motivation and pride befitting a leading third-generation synchrotron radiation facility.