Introduction

Soichi Wakatsuki

This annual report covers the fiscal year 2006 from April 2006 to March 2007, but because of the delay in writing this introduction, it covers some more recent issues. Since the start of the new PF management in April 2006, we have examined the activities of the beamlines and addressed the organizational issues as well as the user science program. Activities of synchrotron facilities are judged by the science and the contribution to university education. To stay abreast with the rapid progress and expansion of synchrotron science around the globe, we need two things: strong scientific motivation to reorganize the current beamlines and build new ones, but at the same time, a project on future light source to replace the PF and PF-AR storage rings.

In March 2006 we had an external review committee who had advised us on several key issues. Average number of beamline staff per station is exceptionally low, fewer than one, in the Photon Factory. In many of the synchrotron facilities in the United States and Europe, the corresponding number is usually between three and four. An obvious remedy for the personnel problem is to reduce the number of stations. In general, however, closing beamlines is viewed negatively by user community. The best strategy to reduce number of beamlines would be to build new beamlines with superior quality and persuade users to switch from the old and obsolete ones to the new, and then close the old ones. The critical factor in doing this kind of refurbishment program is to have open ports readily available. The Photon Factory cannot really do this because almost all the ports are used already. Although we have created four new short straight sections during the PF 2.5 GeV ring upgrade, in order to build new insertion device beamlines, the beamlines occupying the floor have to be either decommissioned or transferred to other stations. This means that the scientific activities also have to be moved to other stations or otherwise terminated. Obviously this process involves agony on some users and beamline scientists no matter how the new beamlines will bring bright future.

For the Photon Factory, this is even more critical because there are quite a few stations which unfortunately have lost the status of being cutting edge instruments. The mission of the Photon Factory is to provide synchrotron light to a large number of users in variety of sciences. To be able to do this, we need not only to maintain the storage rings and the beamlines but also to keep developing new ones. Thus it is vital for us to develop a strategic plan which spans from the short to medium and long terms. After many discussions within the PF and with the community, we have come to a conclusion that the strategic plan should be built as a three-tier system: (1) areas of excellence, (2) light source and beamline developments, and (3) facility operation:

1. Areas of Excellence
   - A) Strongly-correlated electron systems
   - B) Materials under extreme conditions (e. g., earth science)
   - C) Novel material device: polymer and functional organic materials, & nano materials
   - D) Environment, energy, and rare materials (high-sensitivity chemical state analyses)
   - E) Structural biology of molecular machinery
   - F) Chemical reactions: from fundamentals to applications
2. Light Source and Beamline Developments
   - A) Time-resolved experiments
   - B) Imaging and spectromicroscopy (phase contrast imaging, PEEM, fluorescence microscopy)
   - C) (In-situ or operand) Characterization with multiple techniques
   - D) R&D for exploitation of coherence using future light source
   - E) Detector developments (APD array and PAD)
   - F) Use of microbeam (e. g., BL1, BL17 microdiffractometers)
   - G) Insertion devices (short gap undulators, fast switching polarization)
   - H) Electron beam stabilization and top-up operation
3. Facility Operation
   - A) Human resource development
   - B) Collaboration with overseas facilities
   - C) Novel schemes for beamline operation
     - – Beamlines coupled with university education
     - – Establishing a new PRT system
     - – Industrial use and collaboration
     - – Beamline evaluation scheme distinct from the Areas of Excellence activities

We are in the process of finalizing this with detailed plans for each category listed above, and formulate them into a strategic plan.

PF International Science Advisory Committee and PF Strategic Planning Working Group

The PF external review committee also encouraged us to form a regular and sustained International Science

Advisory Committee (ISAC). We had the first ISAC in April 2007 and the second is to be held in March 2008. This is an extremely important committee for us to seek advice from internationally renowned scientists on our program from the international point of view. For more specific areas, we organize several subcommittees centered on specific science fields. As the first batch of such subcommittees we have decided to hold two committees on electronic structure (solid state, atomic and molecular physics, and theory) and medical imaging. These subcommittees will have participation from the members of the PF-ISAC.

Another important committee that has been formed recently is the PF Strategic Planning Working Group. This one is composed of leading Japanese synchrotron scientists and discusses in depth on issues of the strategic plan and communication with the users on beamline construction and decommissioning.

Discussion with the PF user community

The PF User Organization has more than 20 User Groups, each of which represents part of the user community related to a particular science or instrument. When a need for immediate reorganization of beamlines arises, relevant User Groups as well as power users of the beamlines involved are invited to the PF to discuss the beamline refurbishment plan. Decommissioning experimental stations could be agonizing and must be dealt with caution. We are still learning how to do this, but have felt the strong need for dialogues with the user community in terms of the medium to long term planning. While there are several schemes to do this, for example the group leader meetings of the PF UGs, five Meta User Groups have recently been formed as a forum to discuss the medium to long term beamline refurbishment projects. Each Meta UG represents several UGs. The science areas these Meta UGs cover more or less correspond to the new PF group structure. This has just started and I hope it will become a strong conduit between the PF user community and the PF.

International relationships

International relationships are of extreme importance for the PF. We have a number of MOUs (memoranda of understanding) with overseas facilities and are pursuing various collaborations ranging from light source to beamline optics and endstation sciences. I have been fortunate to be a member of the beamline committee of SESAME, a synchrotron facility being constructed in Jordan to serve the science community in the Middle East. Thanks to this we have several people in my group, one lecturer from Cairo University, and two Ph.D. students, one from Egypt and another from Iran, as well as visitors from the region. Furthermore we are preparing a SESAME workshop in Egypt in 2008 with other synchrotron facilities in Japan, as well as a SOKENDAI (the Graduate School for Advanced Sciences) lecture series in India. We have also participated in the Cheiron School organized by RIKEN/JASRI/SPring-8 under the auspices of the Asia Oceania Forum for Synchrotron Radiation Research (AOFSRR). On areas close to beamlines, we have been discussing an India-Japan beamline scheme with Indian scientists. To this end, a letter of intent was signed between the IMSS and the Department of Science and Technology, India. The discussion is ongoing to use one of the stations for surface scattering of liquid interface and powder diffraction.

Australian National Beamline Facility (ANBF) at BL-20B on the PF ring is one of the most productive beamlines at the PF. This is a long standing collaboration with the Australian Nuclear Science and Technology Organisation (ANSTO). As of December 2007 the beamline has had 698 experiments, circa 1,500 scientist visits to the PF, amounting to over 2,000 days of beam time and many hundreds of publications according to Dr. Richard Garrett, Director of ASRP, which are truly impressive statistics. We have been told that the experience of BL-20B was one of the key factors which helped growing the Australian synchrotron community, and the subsequent move to building their own synchrotron light source, Australian Synchrotron (AS). The ASRP is to be consolidated with the AS which has started its operation, but there are a number of Australian groups who have expressed the interest in continuing to use BL-20B. We are discussing with the AS and the ASRP on possibilities to continue in a reduced scale.

KEK roadmap and future light source

Given the recent moves in the high energy physics science, the commissioning of J-PARC and the progress of the RIKEN XFEL project, KEK is facing serious challenges both in materials structure and high energy physics research. Hence KEK roadmap is being discussed to establish an overall strategic plan of the entire KEK activities. The roadmap is to produce the maximum and continuous science output and to meet future prospects for accelerator based science. In the context of the photon science, an upgrade of PF/PF-AR is an important section of the KEK roadmap: further expansion of SR research with upgrade of PF/PF-AR and exploration of new scientific fields towards ERL. Here, the construction of a compact ERL with the energy between 60 and 200 MeV, not only as a proof of principle machine but also as a user facility for THz radiation and inverse Compton scattering, is an important component of the KEK roadmap. This will form an basis for the future light source on the KEK Tsukuba campus. In the USA, CHESS, Cornell University has been developing the ERL project for a number of years, recently joined by the Advance Photon Source (APS) as their upgrade project. We will keep the dialogue going as open as possible within Japan as well as with overseas facilities.

Director
Soichi Wakatsuki