Introduction

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Fiscal year 2002 (April 2002 – March 2003) was also very productive for the Photon Factory, with stable operation of the facility being maintained and also a number of new developments taking place. The 2.5-GeV and 6.5-GeV rings both performed well, and were operated for 5568 and 4656 hours respectively over the year. The overall availability of light to users was 97.9% for both the rings. Many users expressed praise for the improved operation of the 6.5-GeV ring since the vacuum-system improvements made in 2000-2001.

In FY2002, 343 new experimental proposals were accepted, resulting in a total of 684 active proposals and over 2700 registered users - the highest ever throughout the history of the Photon Factory. Among these users, 52% were graduate students from a number of universities and colleges, demonstrating that the Photon Factory is not only providing advanced research opportunities for university professors and researchers, but is also providing good educational opportunities for students.

Continued efforts have been put into upgrading and re-furbishing existing beamlines and constructing new ones. A new X-ray in-vacuum undulator beamline AR-NW12 for protein crystallography was built and commissioned in the new north-west experimental hall building of the 6.5-GeV ring, which is described in the "Experimental Facilities" section. Using the new beamline a complete set of data for one protein crystal can be collected in only 10-20 minutes, with the data being of the same quality as that reported from third-generation synchrotron sources such as SPring-8. A multipole wiggler beamline for protein structure analysis is also being constructed at BL-5, the seventh and last straight-section available on the 2.5-GeV ring with the current lattice arrangement. Commissioning of this beamline will take place in the Autumn run of 2003.

A report from the Photon Factory external review committee (chaired by Prof. H. Kuroda of the Tokyo University of Science) was submitted to Prof. Y. Kimura, the director of the Institute of Materials Structure Science (IMSS) in October 2002. As a response to the comments and recommendations made in this report, discussions were commenced regarding the "scrap-and-build" of existing beamlines. The first outcome from these discussions has been the decision to convert BL-28 to a dedicated beamline for high-resolution angle-resolved photoelectron spectroscopy. Design of the new optics is currently in progress.

It was also strongly recommended by the external review committee that efforts be made to increase the number of available insertion-device beamlines. We are currently continuing our efforts to increase the number of insertion-device straight sections from 7 to 13 by modifying the arrangement of the quadrupole and sextupole magnets of the 2.5-GeV ring. Prototypes of new quadrupole and sextupole magnets were successfully built and tested during FY2002. In the western part of the 6.5-GeV ring, there is a 20 m long straight section where four RF cavities are installed. If two of these cavities were transferred to the eastern straight section, a 10 m long straight section would be created with enough room for an in-vacuum X-ray undulator. This would be the fifth insertion-device straight section in the 6.5-GeV ring. Conceptual designs will be discussed during FY2003.

The Australian National Beamline Facility, BL-20B, has been operational for 10 years since its commissioning in 1992, and has a large number of active Australian users. It can be said that the activities at BL-20B have formed part of the driving force for the realization of the Australian Synchrotron source. We congratulate our Australian colleagues and friends on the commencement of the construction of the new synchrotron radiation facility in Melbourne.

A number of interesting experimental results from a variety of scientific disciplines are reported in the "Highlights" section (p. 3 - 48) and also in Part B of this volume. Some of these represent the results of instrumental developments and improvements in for example detector technology and sample environment control cells. A good example of these developments is found in the spectroscopic study of fixed-in-space molecules (p. 5), where vibrational modes are resolved for the first time by improving the resolution of a time-of-flight spectrometer. Novel synthetic materials and devices have also been attracting much attention recently, and synchrotron radiation plays an important role in their characterization. Examples can be found in the studies of photo-induced phases of Cu(II) complexes (p. 6), titania nano-sheets (p. 7), lithium-ion batteries (p. 9), in *in-situ* photoelectron spectroscopic studies of manganese oxide films (p. 15), in experiments on the magneto-resistance of Sr_2FeMoO_6, and ferro-type orbital ordering in a superlattice of $La_xSr_{1-x}MnO_3$ (p. 19). Bending magnet beamlines still provide good opportunities for performing such experiments, and it is becoming more and more important to make beamtime available for them. In this context, for providing beamtime to the national structural genomics project we have made the arrangement that 30% of the available beamtime on protein-crystallography beamlines be assigned to this project. Details of the expanding activities in structural biology can be found in chapter 8 of the "Highlights" section (p. 30) and chapter 4 of the "Experimental Facilities" section (p. 69) of this report.

Future plans for the facility were discussed by a working group formed under the laboratory's Advisory Council. The group discussed the feasibility of an energy-recovery linac, which would give an extremely low electron-beam emittance and a sub-picoseond pulsed X-ray beam with increased spatial coherence and an extremely small, round spot-size. Although discussions are still in an early stage, a study report (in Japanese) was published in March 2003.

At the end of FY2002 there were big changes in the management board of KEK. Three of the leaders of KEK went into retirement; Prof. Hirotaka Sugawara, the director general of KEK, Prof. Yoshitaka Kimura, the director of the Institute of Materials Structure Science (IMSS), and Prof. Sakue Yamada, the director of the Institute of Particle and Nuclear Studies (IPNS). The Photon Factory staff members and users express their sincere thanks for their leadership, guidance, and assistance. From April 2003, Prof. Yoji Totsuka, former professor of the Institute for Cosmic Ray Research of the University of Tokyo was appointed as the new director general of KEK, Prof. Atsushi Koma, former vice-president of the University of Tokyo, was appointed as the new director of the IMSS, and Prof. Makoto Kobayashi, former professor in the IPNS became the new director of the IPNS. The Photon Factory will continue expanding and strengthening its activities under the new leadership.

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