

PREFACE



On behalf of the staff of the Photon Factory (PF) we are pleased to present PF Highlights 2016. We hope that many people will read the PF Highlights to know about the latest topics in synchrotron radiation science from the PF, including slow positron science. This PF Highlights 2016 covers research activities carried out in fiscal 2016 (April 2016 – March 2017), and includes 34 scientific highlights from eight research fields as well as statistics on “Operation and Proposals”.

In order to strongly promote the future plan of the PF, Prof. Nobumasa Funamori and Prof. Tohru Honda joined the PF leadership from Synchrotron Radiation Science Division I and Accelerator Laboratory Division VII, respectively. The PF is one of the oldest large synchrotron radiation facilities in the world, and there is now an urgent need to proceed with the plan for the next light source facility. The High Energy Accelerator Research Organization (KEK) has pursued the energy recovery linac (ERL) as a next-generation light source for the last ten years. However, KEK has recently decided to promptly introduce a storage ring-type high-brilliance light source instead of the ERL because most of the contributions to photon science expected from the ERL can be realized more quickly by such a light source. In FY2016 we completed the conceptual design report of the light source in close collaboration with our user community (PF User Association). KEK is now working on the details of an all-Japan effort to realize the high-brightness light source together with relevant organizations. We will also develop the long-term strategic outlook of Photon Science at KEK to play a number of long-term roles as an inter-university research organization.

At the Tsukuba campus of KEK, we are currently operating two storage rings, the 2.5-GeV PF and the 6.5-GeV PF-AR (PF-Advanced Ring), to promote inter-university collaboration and encourage joint research projects. In FY2016 we had about 800 active approved proposals, 3,000 registered users and 500 publications. The inter-university research program has been going well and the activities are becoming increasingly important. The PF is also participating in the following large national projects of the Ministry of Education, Culture, Sports, Science and Technology: “Elements Strategy Initiative to Form Core Research Centers”, “Platform for Drug Discovery, Informatics, and Structural Life Science”, “Photon and Quantum Basic Research Coordinated Development Program”, “Cross-ministerial Strategic Innovation Promotion Program (SIP)”, and “Impulsing Paradigm Change through Disruptive Technologies Program”. The PF is also serving as an administrative facility in the Photon Beam Platform to open up new research fields for industrial use. KEK is participating in the Tsukuba Innovation Arena (TIA) for open innovation and creating new knowledge for industrial applications using accelerator and quantum beams; the PF is playing an important role in the TIA activities. Moreover, we are promoting international collaboration: the Indian beamline was established in 2009 after both the Indian and Japanese prime ministers welcomed it in a joint statement. This beamline is actively being used, making the project highly successful.

The PF has actively been upgrading the facilities including beamlines and experimental equipment. As a major reconstruction, the direct beam transport line for the PF-AR has been constructed to coexist with the Super-KEKB project using the common linac. We succeeded in injecting electrons at 6.5 GeV full energy and storing them in the PF-AR in February 2017. This upgrade will make it possible to operate in top-up mode in the near future. The beamline NW2A of the PF-AR was reconstructed to realize three-dimensional X-ray absorption fine structure (XAFS) imaging with 50 nm spatial resolution in the project of structural materials for innovation of SIP. This X-ray microscope will be applied to many scientific fields such as environmental science and energy science as well as structural materials science. We are also planning to totally upgrade the BL-19 of the PF to promote the industrial use of scanning transmission X-ray microscopy (STXM) in collaboration with a user group. This beamline will contribute greatly to basic science in the free-port as well as industrial use. In this way, we are focusing on industrial use of synchrotron radiation at the PF based on fundamental photon science to create innovation in many scientific fields.

Youichi Murakami

A handwritten signature in black ink that reads "Y. Murakami". The signature is stylized and cursive.