

## PREFACE



It is my great pleasure to share our research highlights based on the Photon Factory (PF) users' program during the fiscal year 2017. The achievements described here were made before I was appointed as Director of the Institute of Materials Structure Science (IMSS), KEK, from April FY2018. IMSS is in charge of neutron, muon, and slow positron facilities as well as the photon science facility (PF), which has been a key X-ray facility in Japan for more than 35 years.

Since the PF users' program started in 1983, more than 17,000 research papers have been published. We are proud to have produced a considerable number of papers describing breakthroughs in broad research areas of physical, chemical, biological, medical, materials, earth and environmental sciences. I hope that several examples of the excellence and diversity in scientific studies carried out at the PF in FY2017 can be found in this latest issue of PF Highlights.

We have several review committees for our projects in photon science. In order to review our own design of a future storage ring with sub-nmrad emittance after the present PF, a meeting of the PF Machine Advisory Committee (PF-MAC) was held on April 5–6, 2017. Mike Borland (APS) kindly chaired the meeting, and S. Leemann (ALS), T. Tanabe (NSLS-II), R. Walker (Diamond), M. Katoh (UVSOR) and Z. Zhao (Shanghai) joined the PF-MAC. Because most of the MAC members are deeply involved in the construction or upgrade projects at the existing light sources (e.g. APS-U, ALS-U, NSLS-II, MAX-IV, and Diamond upgrade projects), their detailed suggestions and proposals on the lattice design, beam dynamics, magnets, RF, vacuum, diagnostics, facilities and even beamlines are essential and thought-provoking for PF staff. We deeply appreciate their hard work to summarize the report, and we are now starting some R&D projects following crucial suggestions from the PF-MAC for our future.

In FY2017, several projects to upgrade and refurbish the PF beamlines were carried out to open new fields for users. One of them was started at BL-19, which is being completely replaced by a new undulator beamline for spectroscopy and scattering in the energy range of 100 to 2000 eV, especially targeting nano-scale soft X-ray spectro-microscopy. This upgrade project is mainly supported by two projects: "Promotion of Industrial Innovation using Beamlines of Synchrotron Radiation" (Special Project Budget for Research Enhancements, MEXT) and "Aquaplanetology" (Grant-in-Aid for Scientific Research on Innovative Areas, JSPS). One of the most important targets of the new BL-19 is the study of "heterogeneity of chemical states and its change," which is important for designing and producing actual materials for batteries, catalysts, magnets, composite structural materials and so on. The beamline also provides crucial information on the history of materials, which is essential to investigate the history of planets using specimens returned by HAYABUSA-2 as well as to consider the life cycle of materials and their relationship with the earth's environment. The new beamline BL-19 is expected to be opened to users from FY2019.

Finally, with great sadness we report the passing away of Professor Emeritus Tadashi Matsushita on July 7, 2017 at the age of 72. He was a former director of PF and deputy director of IMSS. He joined PF as a key staff member in 1980, and led crucial projects such as R&D of X-ray optics, construction of beamlines, upgrading of the PF, and so on. In our community, the fixed-exit double-crystal X-ray monochromator based on his original design is widely known as the "Matsushita monochromator." After his official retirement, he returned to his own research and once again enjoyed his work at the PF. We would like to extend our deepest sympathies to his family.

Nobuhiro Kosugi  
Director of IMSS

A handwritten signature in black ink, appearing to read 'Nobuhiro Kosugi' in a cursive style.