

Preface

This annual report from the Kansai Photon Science Institute (KPSI) provides highlights of the scientific and technical research that was conducted over the 2017 fiscal year.

KPSI was reconstituted in April 2016 as one of the research and development bases of the National Institute of Quantum and Radiological Science and Technology (QST). At KPSI's two research sites—the Kizu site in Keihanna Science City in Kyoto Prefecture and the Harima site in Hyogo Prefecture—there are around 150 staff members, comprising around 80 researchers and the technical and administrative staff who support them. We promote the research and development of optical science and technology using lasers and synchrotron-radiation X-rays, which is the mission of KPSI in QST. At the Kizu site, we are conducting state-of-the-art research such as (i) developing new types of laser-driven radiation sources such as laser-accelerated particle beams and ultrashort X-rays based upon world-leading top-class high-intensity laser technology, (ii) ultrahigh-speed measurement technology using short laser pulses, and (iii) quantum life science that helps us understand radiation effects and develop new medicines. At the Harima site, using two contract beamlines of SPring-8 and computer simulations, we are developing new technology to utilize synchrotron-radiation X-rays and carrying out state-of-the-art research in material science.

Two years have passed since the restart of KPSI in QST and the new organization is beginning to produce outstanding research results. The J-KAREN laser system at the Kizu site has achieved a focusing intensity of 10^{22} W/cm² as the result of wavefront compensation by means of a deformable mirror system, and experiments using this laser are now underway on laser acceleration and X-ray generation. In particular, laser acceleration research is promoted by entrusting the external budget JST-Mirai R&D program from this fiscal year, in addition to the ImPACT research program of the Cabinet Office. Many outstanding results have also begun to flow from the Harima site, such as the discovery of a new magneto-optical effect in the X-ray region (the so-called *Inami effect*), a new high-temperature superconducting phase in iron-based material, and clarification of why the performance of fuel-cell catalysts degrade. In addition, regarding the social implementation of optical technology, we are making efforts toward practical application of non-invasive blood glucose measurement and laser-based tunnel inspection technology.

KPSI will continue to fulfill our role as an open research center of the "science of light" and will contribute to quantum science and technology and the strategy for innovation in Japan. We appreciate your understanding and cooperation.

Director General of KPSI
Tetsuya KAWACHI