Message from the Director

As I write this section of Activity Report 2025, my final message as Director of the NSRRC, I feel a deep sense of gratitude for having had the opportunity to lead such a world-class research center. Throughout these years, I have been continually inspired by the dedication of our staff and the vibrant community of users who together advance the development of synchrotron light sources in Taiwan and address the global challenges of today and tomorrow.

The past year once again demonstrated the exceptional performance and stability of our accelerator facilities. In 2025, we successfully delivered beamtime at both the Taiwan Photon Source (TPS) and the Taiwan Light Source (TLS), achieving excellent availabilities of 98.7% and 98.4%, respectively, while the mean time between failures (MTBF) at TPS reached a new high of 222.91 hours. At the same time, NSRRC continued to enhance energy-use efficiency across the facility. Through a series of energy-saving measures, electricity consumption in 2025 was reduced by 0.912 million kWh compared with 2024 and by 6.959 million kWh relative to the 2019 baseline year, reaching an overall reduction of 9.6%. Looking ahead, we have initiated a feasibility study to upgrade TPS to a fourth-generation multi-bend achromat (MBA) synchrotron light source, which would significantly enhance beam brightness and coherence and open new opportunities for high-resolution imaging and novel scientific discoveries.

Alongside accelerator development, beamline construction and technological advancement have continued steadily. By the end of 2025, the number of TPS beamlines open to users had reached 18. Notably, we are advancing automation at selected TPS beamlines and experimental stations, including TPS 32A, to reduce manpower demands and strengthen operational efficiency. Artificial intelligence and machine learning tools are also being introduced at some beamlines to accelerate data analysis, allowing researchers to focus on high-level scientific inquiry rather than manual operations.

These efforts supported the growth of our user community and enabled us to serve 2,964 users during the year, marking a new milestone for the NSRRC. Their research resulted in 616 SCIE publications, more than half of which appeared in high-impact journals. Such achievements highlight the synergy between NSRRC's advanced X-ray technologies and the creativity of our users.

The year 2025 also celebrated the 20th anniversary of the Taiwan–Australia collaboration on the construction and operation of the SIKA cold neutron triple-axis spectrometer. We are proud to have been part of this long-standing partnership and will continue to support neutron science, which complements synchrotron X-ray studies in exploring material structures. In addition, NSRRC hosted two major international conferences: IPAC'25, the world's leading event in accelerator research and development, and AsCA 2025, the largest regional conference in structural science. Participants from across the world had the opportunity to visit TPS, learn about our latest developments, and experience the culture and hospitality of Taiwan. These events not only demonstrated NSRRC's commitment to international scientific exchange but also solidified Taiwan as a pivotal hub connecting researchers worldwide.

The NSRRC serves as both a user-centered platform and a research institute, providing cutting-edge beams, advanced experimental facilities, and state-of-the-art technologies to drive scientific discovery. This Activity Report presents the facility developments and research highlights of 2025. It is widely recognized that transforming fundamental research into practical materials, technologies, and devices requires time and sustained effort. We are pleased to see that, after more than three decades of dedication, our users' research results have been successfully translated into commercial products, including drug delivery systems, pharmaceuticals, LED phosphor materials, OLED technologies, microspectrometers, and more. With steadfast support from the National Science and Technology Council (NSTC), the NSRRC has established itself as a reliable, long-term partner for both academia and industry. Together with our users and collaborators worldwide, we will continue to push the frontiers of knowledge and shape a future without limits.

Chia-Hung Hsu
Director