SPring-8-II

The construction of SPring-8, Japan's premier third-generation synchrotron radiation facility, commenced in 1991 in Harima Science Garden City, Hyogo Prefecture, and the facility was officially inaugurated in 1997. Today, more than 25 years since its inception, SPring-8 remains an indispensable instrument for cutting-edge academic research and innovative developments. It continues to garner international acclaim for its status as one of the world's foremost synchrotron radiation facilities, particularly in the hard X-ray region.

However, many countries are now upgrading their third-generation synchrotron radiation facilities to fourth-generation standards. Additionally, the costs associated with maintaining SPring-8 are steadily increasing due to the aging infrastructure. Continued operation of the current accelerator would not only exacerbate maintenance costs but also necessitate extensive replacements of aging components. If left as is, and should SPring-8 become technologically outdated, researchers may be compelled to relocate their work overseas or risk disclosing proprietary research and technologies to foreign facilities, posing a significant challenge to Japan's economic security.

In response, a joint design team was established by RIKEN and the Japan Synchrotron Radiation Research Institute (JASRI) to plan the upgrade of SPring-8 (henceforth referred to as "SPring-8-II"). Following months of meticulous design work, the team published a Conceptual Design Report (CDR) in 2014 to solicit feedback from international experts, underscoring the necessity of the upgrade. This effort was further bolstered by technical collaborations during the construction of NanoTerasu, slated to commence operations in April 2024, laying the groundwork for SPring-8-II. As a result of these comprehensive efforts, the call for upgrading SPring-8-II gained increasing momentum.

Amidst this backdrop, the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) established a "Task Force on the Upgrading of SPring-8" in May 2023. The task force produced a detailed report in August of that year and began exploring the specifics of the upgrade. The Subcommittee on Quantum Beam Utilization Promotion, part of the Committee on Quantum Science and Technology within the Council for Science, Technology, and Innovation, subsequently reviewed and deliberated on the optimal design of SPring-8-II and the measures necessary to maximize the facility's potential. These discussions culminated in the March 2024 publication titled "Development of SPring-8-II Large Synchrotron Radiation Facilities and the Advancement of Japan's Synchrotron Radiation Infrastructure." The initial budget plan for FY2024 included allocations for "Measures for SPring-8-II," thus marking the formal initiation of the upgrade project.

The transformation into SPring-8-II is expected to yield a substantial increase in data acquisition and experimental efficiency, with enhancements such as a 100-fold increase in maximum brilliance compared with current levels, surpassing even the performance of existing and forthcoming fourthgeneration synchrotron facilities. This world-leading synchrotron performance is anticipated to contribute significantly to resolving global challenges, in addition to advancing traditional research and development initiatives. To minimize disruption for current users, it was decided to limit the facility's shutdown to approximately one year, starting in the summer of 2027, with the goal of commissioning SPring-8-II by FY2029.

In FY2023, substantial progress was made toward the ambitious goal of upgrading the worldclass SPring-8 to SPring-8-II. Given the scale and complexity of this project, we will continue to advance this effort in close collaboration with all relevant stakeholders, ensuring that Japan remains at the forefront of synchrotron radiation research.



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