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From SPring-8 to SPring-8-II

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SPring-8 was inaugurated in 1997 as a large-scale 3rd generation synchrotron radiation (SR) facility, and has served a wide range of academic and industrial users for decades. However, the demand for advanced X-ray analysis has grown significantly, far exceeding the capabilities of the current facility. Furthermore, aging and loss of competitivity have become serious concerns. To achieve both a world-leading performance and high sustainability, we planned the SPring-8-II upgrade project [1], which was recently approved by the government in December 2024.

For the SPring-8 storage ring, we adopted a five-bend achromat lattice with a reduced beam energy of 6 GeV, allowing decrease of the emittance to 110 pm.rad and increasing the beam current to 200 mA while maintaining excellent stability [2]. As unique features, newly developed short-period in-vacuum undulators (IVU-II) are used to produce brilliant high-energy X-rays even at the lower beam energy [3]. Furthermore, four 30-m long straight sections (LSSs) will accommodate dumping wigglers to further reduce the emittance down to 50 pm.rad, as well as long IVU-IIs to generate hard X-rays with the highest brilliance among the 4th generation sources. The SACLA linac is used as a As a high-performance injector, allowing stable top-up operation and drastic reduction of the power consumption [4]. The world-leading technologies of X-ray optics and detectors (such as advanced KB mirrors and CITIUS), combined with massive supercomputing infrastructures in Japan, will fully exploit the capabilities of the new source.

For SPring-8-II, almost all accelerator components will be replaced, while the building including the ring tunnel and the experimental hall will remain in continuous use. Mass production of the components started in 2025. After a one-year shutdown and successive commissioning in FY2027-28, the user operation of SPring-8-II will start in 2029.

In this presentation, I will introduce the latest status of the SPring-8-II project, and the ongoing activities to fully utilize the new capabilities.

References

[1] RIKEN-JASRI SPring-8-II Project Team, SPring-8-II Conceptual Design Report, (2014).
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[3] K. Imamura et al., J. Synchrotron Rad. 31 (2024) 1154.
[4] T. Hara et al., Phys. Rev. Accel. Beams 24 (2021) 110702.

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