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SPring-8-II Latest Accelerator Design Overview

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Takahiro Watanabe Japan Synchrotron Radiation Research Institute (JASRI) RIKEN SPring-8 Center (RSC)

SPring-8 major upgrade, SPring-8-II, is undergoing, where we have recently updated our accelerator design aiming at even brighter light source performance. The latest design includes the five-bend lattice at the electron energy of 6 GeV, damping wigglers, and newly develop undulators. The revised five-bend lattice is supposed to produce the bare lattice emittance of 110 pmrad, and the additional damping from damping wigglers and undulators can further reduce the emittance down to 50 to 60 pmrad at minimum. Such an extremely small emittance light source is expected to produce two orders of magnitude brighter x-ray than current SPring-8. The underlying conditions and strategies for our light source design are (i) to construct a whole new storage ring in the existing accelerator tunnel, (ii) to keep ID beamline axes, (iii) to cover the same spectral range of x-rays as SPring-8, and (iv) to suppress power consumption as low as possible. For (ii), the new lattice is designed while keeping ID positions and angles so that existing ID beamlines will not have to be significantly moved. For (iii), a compact in-vacuum undulator equipped with a magnetic force cancellation, called IVU-II, and a helical-8 undulator have been newly developed covering the same spectral range as SPring-8. For (iv), we plan to install permanent magnet to several kinds of dipole magnets such as longitudinal gradient dipoles. The reduction of the electron energy from 8 to 6 GeV also helps reduce power consumptions. Most of the lattice design and related hardware developments are in the final stage, and we are now preparing for making a prototype cell in fiscal year 2024. Soon after, we expect to start procurements of accelerator components, anticipating the full replacement of accelerators sometime in 2027-2028. The current project plan, the latest accelerator design, expected light source performances, and critical issues will be presented.

I plan to submit also conference proceedings

Primary author: WATANABE, Takahiro (Japan Synchrotron Radiation Research Institute (JASRI) RIKEN SPring-8 Center (RSC))

Presenter: WATANABE, Takahiro (Japan Synchrotron Radiation Research Institute (JASRI) RIKEN SPring-8 Center (RSC))

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