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Design of a damping wiggler at SPring-8-II as a high-energy X-ray source

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SPring-8 will be upgraded to SPring-8-II, a fourth-generation synchrotron with a multi-bend achromat lattice, by 2028. The beam energy will be reduced from 8 to 6 GeV, substantially lowering emittance. To further reduce the emittance, a damping wiggler is planned for installation in a 30 m straight section. High-energy X-ray above 100 keV are in demand for industrial use, but lowering the beam energy reduces photon flux in this range. A damping wiggler can enhance this flux. We therefore designed the wiggler not only for emittance reduction but also as a high-energy X-ray source. The wiggler will be installed in a straight section with five drift spaces, each about 4 m long, to accommodate the wiggler, masks and related components. Its parameters—unit number, period length, gap and total length—were optimized to achieve low emittance, high photon flux and reduced heat load on absorbers. To handle radiation up to 75 kW and 800 W/mm² over a wide solid angle, the mask aperture was designed to limit angular spread and reduce the heat load on the absorber at the downstream bending magnet chamber. This study presents the optimized wiggler design and power density evaluation at the mask.

Footnotes

Funding Agency

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