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Thermal analysis and design optimization of a DCM for Korea-4GSR based on PLS-II benchmarking

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The Korea fourth-generation storage ring (Korea-4GSR) is scheduled for construction in Ochang, Cheongju, Chungbuk by 2029. Designed with a significantly lower emittance of 60 pm·rad and higher storage ring energy of 4 GeV compared to PLS-II, Korea-4GSR is expected to extend the capabilities of beamline experiments by providing photon beams with enhanced brightness and coherence. However, the thermal impact of such high-intensity beams on beamline optical components must be carefully evaluated. In particular, we conducted a benchmark study at the PLS-II beamline to analyze the heat load on the first crystal of the double-crystal monochromator (DCM) in a hard X-ray beamline. Based on the benchmark results, this study presents a comprehensive thermal analysis of the Korea-4GSR DCM, evaluates its impact on photon beam performance, and proposes an improved design to mitigate thermal distortions.

Footnotes

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