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Beam-induced heating on the sector gate valve in the SPring-8-II storage ring

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SPring-8-II is an upgrade project toward the 4th generation synchrotron light source to provide hard X-ray with nearly two-orders of magnitude higher brilliance than the current SPring-8. Low electron beam emittance less than $100 \text{ pm} \cdot \text{rad}$ for the high brilliance requires high gradient multi-pole magnets with a small bore radius and vacuum chambers with a narrow aperture. The SPring-8-II vacuum ducts passing through electron beam have a rhombic cross-section with a small dimension of 26.16 mm between opposing inner surfaces. Strong beam wake field due to the narrow aperture increases vacuum chamber heating, so its evaluation and countermeasures are an important issue. In particular, the heating of the sector gate valve (SGV) with RF shield structure inside, which requires high reliability, should be evaluated, and measures such as water cooling should be taken if necessary. In this presentation, we report the results of simulations using the Finite Element Analysis (FEA) code ANSYS to evaluate temperature rising at the SGV for SPring-8-II due to beam-induced heating and to determine whether forced cooling is necessary.

Footnotes

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