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Study of operation above half-integer random resonance in the J-PARC RCS

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In the 3-GeV Rapid Cycling Synchrotron (RCS) of the Japan Proton Accelerator Research Complex (J-PARC), the beam power ramp-up aiming to surpass the design of 1 MW enhances the space charge effect. It pushes the beam toward the structure resonance. To mitigate the beam loss, the operating point is required to be apart from the structure resonance as the beam power ramp-up. However, large beam loss was observed when the operating point was set near the half-integer resonance. Thus, the maximum beam power of the RCS is currently limited so that the beam does not overlap the structure resonance or half-integer random resonance. To address this issue and achieve the beam power ramp-up, we experimentally studied the half-integer resonance compensation using trim quadrupole magnets. In addition, detailed numerical simulations were performed to develop a better understanding. The experimental and numerical results of the operation above half-integer random resonance are presented.

Footnotes

Paper preparation format

LaTeX

Region represented

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