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Estimation of the required current on the anode power supply for high power operation in the J-PARC Main Ring

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The J-PARC Main Ring (MR) RF system has been undergoing an upgrade since 2022 in preparation for the Hyper-K neutrino experiment, which is expected to accept a 1.3 MW proton beam starting in 2028. The beam will be accelerated from 3 GeV to 30 GeV within the MR in 0.65 seconds, with the time duration being reduced to 0.55 seconds. Additionally, the beam intensity will be increased by 30% to support high-power operations. To accommodate these changes, additional cavities, operated with 600 kW vacuum tubes, will be installed, and the anode current will be increased. In order to maintain a constant RF voltage, the anode current must be adjusted to supply the necessary voltage and compensate for beam loading effects. The generator cuurent, total current, and beam curent are measured and compared on a phasor diagram under varying beam intensities. This paper will present the measurement and simulation results, as well as the estimation of the required current for high-power beam operation.

Footnotes

Paper preparation format

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Region represented

Asia

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