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Estimation of the anode power supply current of the J-PARC MR RF system for 1.36 s cycle operation

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The J-PARC Main Ring (MR) delivers high-intensity proton beams for
the neutrino experiment.
The beam intensity delivered to the neutrino experiment reached 520kW with a cycle time of 2.48 seconds in 2021.
We chose to shorten the MR cycle time to 1.36 seconds to achieve higher beam intensity.
An anode power supply feeds a high-voltage DC current to the tetrode vacuum tubes, which drive the RF cavity.
Beam acceleration in a shorter MR cycle requires a higher RF voltage to keep the RF bucket large enough and a larger anode power supply current for the beam loading compensation.
We plan to add RF systems to achieve higher RF voltage and to manage the output current of each anode power supply under limitations.
To estimate the anode power supply current with a shorter MR cycle,
we derived the beam loading compensation contribution in the power supply current using the data recorded during the operation with a cycle time of 2.48 seconds.
We present the estimated anode power supply current for various combinations of RF voltage and the number of RF cavities.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Primary author: SUGIYAMA, Yasuyuki (High Energy Accelerator Research Organization)

Co-authors: HARA, Keigo (High Energy Accelerator Research Organization); HASEGAWA, Katsushi (High Energy Accelerator Research Organization); MIYAKOSHI, Ryosuke (Japan Proton Accelerator Research Complex (J-PARC)); NOMURA, Masahiro (Japan Atomic Energy Agency); OHMORI, Chihiro (Japan Proton Accelerator Research Complex (J-PARC)); OKITA, Hidefumi (High Energy Accelerator Research Organization); SHIMADA, Taihei (Japan Atomic Energy Agency); TAMURA, Fumihiko (Japan Atomic Energy Agency); YAMAMOTO, Masanobu (Japan Atomic Energy Agency); YOSHII, Masahito (High Energy Accelerator Research Organization)

Presenter: SUGIYAMA, Yasuyuki (High Energy Accelerator Research Organization)

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