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Progress in Slow Extraction Beam Operation at the J-PARC Main Ring

Wednesday, October 22, 2025 12:00 PM (30 minutes)

The J-PARC Main Ring is a 30 GeV proton synchrotron with two extraction modes: fast and slow. The slow extraction is performed using the third-order resonance of betatron oscillations, and the extracted beam is delivered to a variety of particle and nuclear physics experiments at the Hadron Experimental Facility. An upgrade of the Main Ring carried out from 2022 to 2023 significantly shortened the time required to accelerate the beam from 3 GeV to 30 GeV, reducing it from 1.4 seconds to 0.65 seconds. Following the upgrade, slow extraction operation resumed in 2024. Between April and May 2025, beam operation was successfully achieved with a beam power of 92 kW, an extraction efficiency of 99.6%, and a spill duty factor of approximately 80%. These results were made possible not only by the reduced cycle time due to the upgrade, but also by several key improvements: the activation of the second-harmonic RF system to mitigate injection losses and suppress beam instabilities during debunching; the introduction of beam diffusers to reduce beam losses; and improvements of the spill regulation system to enhance spill quality. This presentation will describe these developments in detail.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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