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Status and outlook on slow extraction operation at J-PARC main ring

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The Main Ring (MR) at J-PARC (Japan Proton Accelerator Research Complex) is a proton synchrotron that accelerates protons from 3 GeV to 30 GeV. One of the two MR's extraction modes is slow extraction using third-order resonance toward the Hadron Experimental Facility, where various particle and nuclear physics experiments are conducted. There are two major points in the slow extraction: beam loss reduction and flat spill structure of the extracted beam. In the beam operation of 2021, we achieved a beam power of 65 kW with a high extraction efficiency of 99.5% and a spill duty factor of 60%, but requirements for further improvements from physics experiments have never stopped. From 2021 to 2022, various devices in the MR were upgraded. The primary purpose of this upgrade was to increase the beam power by shortening the acceleration time and increasing the repetition rate. To achieve this goal, we rebuilt most parts of the main magnet power supplies. The new power supplies are also expected to be significantly improved in the current ripple. Thus the time structure of the slow extracted beam is also expected to be greatly improved. In addition, plans are underway for further reduction of the beam loss through the use of beam diffusers and bent silicon crystals and for improvement of the spill structure by feedback algorithms reconstruction. This talk presents the status of the MR and the prospects of the slow extraction after the MR upgrade.

Footnotes

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Region represented

Asia

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