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RF system upgrade for 1.3 MW operation of J-PARC main ring

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The J-PARC Main Ring accelerates proton beam from 3 GeV to 30 GeV and delivers it to T2K neutrino experiment with fast extraction and hadron experiments with slow extraction. In the last two years the beam power to the neutrino experiment was increased from 500 kW to 750 kW. The T2K detector is scheduled to be replaced by the new Hyper-K detector; the latter will be able to accept a 1.3 MW proton beam by 2028. To achieve 1.3 MW beam power, J-PARC plans to upgrade the Main Ring by increasing intensity and repetition rate. The Main Ring uses low frequency, high bandwidth RF cavities with Magnetic Alloy cores, powered by two 600 kW tetrode tubes. Under the upgrade plan, the number of RF cavities will be increased to secure the RF voltage and longitudinal acceptance. The anode power supply will be upgraded to provide enough current for both gap voltage and beam loading compensation. The upgraded LLRF system will be optimized to control fundamental and 2nd harmonic RF voltages, suppress coupled bunch instabilities and compensate beam loading effects. Current operational status as well as details of the upgrade plan and related simulation results will be discussed in this paper.

Footnotes

Funding Agency

Paper preparation format

Region represented

Asia

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