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Design and status of MTCA.4 based LLRF control system for the J-PARC MR

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The Japan Proton Accelerator Research Complex (J-PARC) is a high-intensity proton accelerator facility.
The 30 GeV Main Ring (MR) of the J-PARC delivered the proton beam with a beam power of 500kW as of February 2020.
We observed longitudinal coupled bunch instabilities (CBI) above 450 kW due to the beam loading effect.
To mitigate the CBI, we installed the prototype modules of the low-level-rf (LLRF) system based on the MTCA.4 platform.
The wake voltage at the RF cavity, which causes the CBI, was suppressed by the multi-harmonic vector rf voltage control function implemented in the prototype module.
Suppression of the CBI with the prototype module was a key to achieve a beam power of 500kW in the MR.
Following the prototype's success, we developed the MTCA.4 based LLRF system for the MR with full configuration.
In this workshop, we present the configuration of the system and its preliminary test results.

Summary

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