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MTCA.4 based LLRF control system for the J-PARC MR

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The J-PARC Main Ring (MR) has achieved the delivery of the 30 GeV proton beam with the beam power of 515 kW to the neutrino experiment as of April 2021.

The Longitudinal coupled bunch instabilities (CBI) has been observed above 450 kW operation due to the cavity impedance.

To mitigate the CBI, we designed the prototype modules of the low-level-rf (LLRF) system based on the MTCA.4 platform.

The multi-harmonic vector rf voltage control function was implemented in the module to suppress the beam induced wake voltages in the RF cavity, which is considered to be the main source of the CBI.

Suppression of the CBI with the prototype system was a key and led to achieve the beam power of 500kW in the MR.

Following the prototype's success, we developed the new LLRF system based on MTCA.4. The original LLRF system

was replaced with the new system in 2021.

We present the configuration of the new system and the beam test results.

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