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UPGRADES OF TEMPERATURE MEASUREMENTS AND INTERLOCK SYSTEM FOR THE PRODUCTION TARGET AT J-PARC HADRON EXPERIMENTAL HALL

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Introduction: The Hadron experimental facility (HD-hall) at Japan Particle Accelerator Complex (J-PARC) shown in Figure 1 is designed to handle intense slowextraction proton beam (750kW-15µA) from Main Ring (MR). The period of beam extraction from the MR to the HD-hall is 2 seconds and the operation cycle is 6 seconds. On May 23th, 2013, 2×10¹³ proton beams were rapidly extracted to the HD-hall in 5 milliseconds due to malfunction of power supply of Extraction Quadrapole magnet in the MR. The production target in the HD-hall was locally damaged because of rapid rise of temperature by beam deposit in extreme short period. In order to detect the damage to the production target, the requirements of temperature measurement system are as follows. •Upgrade read-out system of the production target temperature.

- ✓ Hundred milliseconds sampling
- ✓ Synchronization with beam extraction

•Make the waveform spectra of target temperature as a function of time to tell the operators the state of the production target.

1. The production target



Figure 5: Display of the temperatures synchronized with beam extraction during the typical beam operation of 33kW.

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5. Summary

The measurement and the interlock system of the target temperature has been developed with the PLC.

- \checkmark The sequence-CPU module can handle and control the temperature data and the interlock signals.
- \checkmark The EPICS-CPU module can handle the data from the sequence-CPU via the shared memory.
- ✓The waveform records of temperature as a function of time can be referred on the EPICS-CPU.
- The operator can monitor the waveform spectra as a function of time in every beam extraction.
- The upgraded system has been successfully and stably operated with up to 33-kW proton beams.
- The details of trend graphs and an interlock system of the production target are mentioned in our proceedings.

Acknowledgement	References	1
This work was supported by JSPS KAKENHI Grant Number 26800153.	[1] http://www-linac.kek.jp/cont/epics/f3rp61/	