



Contribution ID: 2139 Contribution code: TUPM104

Type: **Poster Presentation**

Development of a pulse current monitoring device for the Eddy septum magnets in J-PARC main ring

Tuesday, 9 May 2023 16:30 (2 hours)

Two new eddy-current-type septum magnets were installed at the fast extraction section of J-PARC main ring in April 2022. Eddy septum magnets (EDDYs) are energized pulse currents; thus, it is necessary to consider the possibility of misfires. Based on simulation results, if one of the EDDY misfires, the extraction beam will be irradiated to the ducts of the superconducting magnets (SCs) on the beamline to the neutrino facility. If this occurs, then the SC can be quenched owing to heating. Therefore, we built a safety device to prevent beam failure by monitoring the output pulse currents of the EDDYs. If a pulse-current anomaly is detected, the beam is kicked to the abort line using kicker magnets. This process must be completed within 390 μ s, known as the pulse rise time period. The parameters used to determine the pulse-current waveform anomalies were determined from the beam optics simulation. This pulse-monitoring device has an added functionality to stop and protect the power supplies of the EDDYs when the pulse current waveform is abnormal. We consider that by 2023, it will be remotely controlled by the accelerator control system.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

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Session Classification: Tuesday Poster Session

Track Classification: MC4: Hadron Accelerators: MC4.T12: Beam Injection/Extraction and Transport