Contribution ID: **452** Contribution code: **THPG76**   Type: **Poster Presentation**

Improved beam loss accounting with fast data acquisition (DAQ) chassis

Thursday, 23 May 2024 16:00 (2 hours)

Identifying the source of beam loss events in the CEBAF accelerator can be a challenging task. Determining whether an RF cavity with an unannounced gradient or phase transient is the culprit would be a valuable tool for operations staff in addressing recurring beam loss incidents. A prototype offline system was developed in the fall of 2022, utilizing a dispersive beam position monitor (BPM) and the existing switched electrode electronics BPM hardware. A commercial off-the-shelf data acquisition (DAQ) system was employed to capture BPM wire signals at a sample rate of 20 kS/s. The system was triggered by the fast shutdown signal, which disables the beam at the injector. Analysis of beam position and energy variation before a beam loss event was used to determine if the beam loss event was associated with an energy transient. The prototype system, implemented using National Instruments hardware and LabVIEW software, relied on a software trigger. Manual post-processing was required to ascertain whether the fault was due to an un-tripped cavity with a gradient or phase transient. This work presents a production-quality system that utilizes the same data acquisition hardware developed and installed in CEBAF to monitor the time domain RF control signals in the legacy analog RF systems. As the new system employs a hardware trigger, developing tools to automatically identify faults linked to energy transients unrelated to cavity faults will be straightforward.

Footnotes

Funding Agency

Paper preparation format

Region represented

North America

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Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback, and Operational Aspects: MC6.T27 Low Level RF