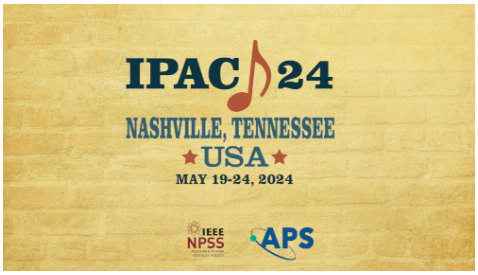

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Real-time processing of longitudinal Schottky signals in CERN's antiproton chain

Wednesday, 22 May 2024 16:00 (2 hours)

A low-latency, real-time diagnostic system for the analysis of longitudinal Schottky signals in CERN's antiproton chain has been developed. The system, installed in CERN's Antiproton Decelerator (AD), processes the combined output of two low-noise, wideband AC beam transformers. It uses a GPU and the NVIDIA CUDA Toolkit, exploiting the directly sampled data and hardware features provided by the low-level radio-frequency (LLRF) VMEBus Switched Serial (VXS) system and its companion ObsBox server, to implement the FFT-based multi-harmonic spectral analysis needed to set up and monitor the stochastic and electron cooling processes. Longitudinal beam properties, such as mean momentum and momentum spread, are also derived to evaluate and log the machine performance.
This paper describes the implementation of the system and its integration within the CERN control system, achieved using the Front-End Software Architecture (FESA) framework and a graphics co-processor directly installed in the Front-End computer (FEC), running a real-time operating system environment.
Preliminary results of its usage in the Extra Low ENergy Antiproton (ELENA) ring and next steps to process bunched beam spectra are also presented.

Footnotes

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