

Simple and Scalable Streaming: The GRETA Data Pipeline

Wednesday, 19 May 2021 18:06 (13 minutes)

The Gamma Ray Energy Tracking Array (GRETA) is a state of the art gamma-ray spectrometer being built at Lawrence Berkeley National Laboratory to be first sited at the Facility for Rare Isotope Beams (FRIB) at Michigan State University. A key design requirement for the spectrometer is to perform gamma-ray tracking in near real time. To meet this requirement we have used an inline, streaming approach to signal processing in the GRETA data acquisition system, using a GPU-equipped computing cluster. The data stream will reach 480 thousand events per second at an aggregate data rate of 4 gigabytes per second at full design capacity. We have been able to simplify the architecture of the streaming system greatly by interfacing the FPGA-based detector electronics with the computing cluster using standard network technology. A set of high-performance software components to implement queuing, flow control, event processing and event building have been developed, all in a streaming environment which matches detector performance. Prototypes of all high-performance components have been completed and meet design specifications.

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Session Classification: Streaming

Track Classification: Online Computing