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Data Acquisition and Signal Processing for the Gamma Ray Energy Tracking Array (GRETA)

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The Gamma Ray Energy Tracking Array (GRETA) is a $4\text{-}\pi$ detector system, currently under development, capable of determining energy, timing and tracking of multiple gamma-ray interactions inside germanium crystals as demonstrated in GRETINA. Charge sensitive amplifiers instrument the crystals and their outputs are converted using analog to digital converters for real-time digital processing. In this paper, we will present the design of the detector system and data acquisition with respect to the real time components and the modeling in MATLAB of the digital signal processing path used to find the energy and timing of the gamma rays at low and high rates and compare them with the performance of analog readout. We intend to use the experience of GRETINA and these simulations to improve the processing executed in real time in field programmable gate arrays. We will describe the performance of the data acquisition system hardware and the performance of simulated and measured signals under various conditions for the signal processing. In addition, we will describe enhancements to the digital signal processing and their effects on the results.

Minioral

Yes

IEEE Member

Yes

Are you a student?

No

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