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Implementation of the Trigger, Timing, and Control Link for Data Acquisition with the Pixie-Net XL

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A common problem in larger nuclear physics experiments is the distribution of clocks and triggers between multiple types and instances of detector readout electronics. Measurements of the time difference of multiple, coincident interactions in separate radiation detectors, to sub-nanosecond precision, require the data to be time stamped with high accuracy across the system. In addition, background events may have to be suppressed to limit data acquisition to available bandwidth and storage.
Clocks and triggers are traditionally distributed through dedicated cabling. Techniques such as the IEEE 1588 Precision Time Protocol and its high accuracy profile (White Rabbit) can distribute clocks and time/date through generic Ethernet data connections, but do not easily allow sharing of triggers for data acquisition. In contrast, the Trigger, Timing, and Control Link (TTCL) has been developed as a method to distribute both clock and trigger through generic fiber with a specific data exchange protocol. TTCL has been adopted for several experiments and facilities since 2008 and is supported by a variety of readout electronics designs. The related interface described here is compatible with Digital Gammasphere and GRETA.
Specifically, we implemented TTCL for the Pixie Net XL detector readout electronics. A TTCL interface board de-serializes the incoming TTCL data stream, extracts the embedded clock for digitization and time stamping on the Pixie-Net XL, and decodes triggers for the pulse processing logic. We describe design and testing of the interface board, how TTCL triggers can be used to conditionally record events, and report the time resolution of coincident events.

Minioral

Yes

IEEE Member

Yes

Are you a student?

No

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