Contribution ID: **142** Type: **Mini Oral and Poster**

Implementation of a double trigger condition based on Charge Comparison and TOF measurement in an FPGA for the NEDA detector array.

Tuesday 23 April 2024 12:35 (20 minutes)

The NEutron Detector Array (NEDA) is designed to improve the sensitivity of gamma-ray spectrometers by enabling the selection of reaction channels by counting evaporated neutrons. The detector cells react with both neutrons and gamma-rays. A double trigger condition system has been implemented in the detector signal digitisation firmware to enhance neutron acquisition and reduce the number of gamma-rays acquired. In the double trigger condition system, two independent triggers are generated: one is based on Charge Comparison (C.C.) and the other on Time-of-Flight (TOF). These triggers can be combined using OR and AND logic, offering four different trigger modes. The system has been evaluated using data from real experiments. The four trigger modes have been applied to the same data and a subsequent offline analysis has been performed. It has been shown that most detected neutrons are preserved with AND mode, and the total gammas are significantly reduced. On the other hand, the OR trigger mode allows increasing the selection of neutrons, compared to the C.C. trigger mode. In addition, it has been demonstrated that if the OR mode is selected, the C.C. threshold can be raised without losing neutrons.
The double trigger condition in NEDA marks a significant leap in spectrometry capabilities. Offering diverse trigger modes (C.C., TOF, AND, and OR) provides researchers detection options, expanding neutron energy detection ranges and enabling control over counting rates. In nuclear physics research, NEDA with its double trigger system elevates precision in identifying reaction channels and enhances data acquisition capabilities.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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Session Classification: Poster A

Track Classification: Data Acquisition and Trigger Architectures