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Development of multi-channel high time resolution DAQ system for TOT-ASIC

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We have developed a multi-channel high time resolution DAQ system for TOT (time over threshold)-ASIC. The developed FPGA based DAQ has 144 channels per board with an ethernet readout for measuring the energy and timing information simultaneously. The measured time resolution of the developed DAQ board is up to 62.5 ps and should be possible to achieve up to 15.625 ps in the future. This simultaneous energy and time measuring DAQ with TOT-ASIC will be useful for many radiation detection applications, such as PET and Compton imaging.

As the first stage of the development, we have developed a DAQ with a 1ns time resolution using the DDR method. It was demonstrated that the time coincidence method can be used to capture the electron-positron pair of 22Na. We obtained two-dimensional cross-section images of the divided positions between two detectors arranged 8×8 facing each other. It is confirmed that all data on several boards are compared with each other.

As the second stage development, we have developed DAQs with time resolutions of 125 ps and 62.5 ps by a delay line method. From the measurement with different lengths of the coaxial cable, the length of 10 cm is sufficiently identified.

For synchronizing the time of data on many boards, we have adopted a T0 signal which consists of a rising edge for strict time coincidence and subsequent identification time data and is distributed to all boards. All data can be compared with each other with time resolution accuracy.

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No

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No

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