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An FPGA-based Sampling-ADC Readout for the Crystal Barrel Calorimeter

The CBELSA/TAPS experiment at the electron accelerator ELSA (Bonn) investigates the photoproduction of mesons off protons and neutrons.

Presently the readout of the CsI(Tl)-crystals of the Crystal Barrel calorimeter is being upgraded from a PIN-diode readout to an APD readout to create a fast signal for first-level-triggering.

This will increase the trigger efficiency especially for final states with only neutral particles substantially.

To increase the possible data readout rate, which is currently limited by the digitization stage (LeCroy QDC 1885F) to ca. 2kHz, the implementation of a new Sampling-ADC (SADC) readout is being prepared.

Based on the 64-channel PANDA-SADC, the CB-SADC design was modified and adapted to the needs of the CBELSA/TAPS experiment.

It offers 64 channels in one NIM module, together with modular analog or FPGA-based digital shaping.

The data transfer will be realized by two standard gigabit links.

Using an FPGA together with SADCs provides a multitude of possibilities for online feature extraction, such as the determination of the energy deposited in the crystal, TDC capabilities and pile-up detection and recovery.

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