HK 56: Instrumentierung

Zeit: Freitag 11:00–12:45 Raum: HZ 8

Gruppenbericht HK 56.1 Fr 11:00 HZ 8

Low noise and low power preamplifiers for large area avalanche photodiodes - results from the testing of a mass prodcution series with an automatized test system — •Irakli Keshelashvili — University of Basel

Modern, high precision EM calorimeters need to run at very high count-rates, require good time and energy resolution, and large dynamic ranges. In addition, newly developed FPGA systems allow the construction of very dedicated experimental triggers in order to select efficiently reactions with low cross sections among high overall reaction rates. Avalanche Photo Diodes (APD's) are used in many of such systems, in particular when magnetic fields are involved. A disadvantage is their relatively low gain which together with other requirements is a challenge for the preamplifier design. Our group has developed special Low Noise / Low Power (LNP) preamplifiers for this purpose. The LNP preamplifier will be used for the upgrade of the Crystal Barrel detector (planned at begining of 2014) at the Bonn ELSA accelerator, mainly aiming at a good time resolution capability (existing readout is with photodiodes without timing information), while conserving the good energy resolution. The ˜1400 CsI scintillator modules will be equipped with double large area APDs for which special temperature compensation of the gain is necessary. Similar preamplifiers have been also developed by our group for the readout of the PANDA EMC forward end-cap. We report the results from the testing of the first 1500 channels of the preamplifiers for the Crystal Barrel experiment using a specially developed automatized test system.

HK 56.2 Fr 11:30 HZ 8

Commissioning of the Tagger Electronics for the BGO-OD experiment — •Francesco Messi for the BGO-OD-Collaboration — Physikalisches Institut, Uni-Bonn

The BGO-OD experiment, presently at a commissioning phase at the electron accelerator ELSA at Bonn University, is intended for the systematic investigation of the photo-production of mesons. The experiment is using bremsstrahlung photons from an electron beam incident upon a radiator. The photon energy is measured via the momentum analysis of the electrons in a magnetic "tagging" spectrometer. The electrons are detected in a 120 channel plastic scintillator hodoscope with a rate up to 10MHz per single channel and 50MHz for the total detector. A coincidence between two neighboring channels is required to suppress background. In addition to the measurement of the photon energy, the hodoscope provides time information for coincidence measurements. New tagger electronics were developed and are now installed. The characteristics and the performance of the new Read-Out Electronics will be presented.

HK 56.3 Fr 11:45 HZ 8

Correction of differential nonlinearities in Analog-to-digital converters used for digital γ-ray spectroscopy — •Michael Weinert[1], Andreas Hennig[1], Wolfgang Hennig[2], Nigel Warr[1], Gheorghe Pascovici[1], and Andreas Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne — [2]XIA LLC, Hayward CA 94544

Many experiments in nuclear structure and nuclear astrophysics demand for a spectroscopy setup with a high dynamic energy range while maintaining decent count rates. In such experiments conducted at the Cologne HORUS γ-ray spectrometer which is equipped with a fully digitized data acquisition system severe peak broadening and double peak structures in the energy spectra have been observed. These spectral distortions originate from the differential nonlinearity (DNL) of the Analog-to-digital converters used for digitizing the preamplifier signals. A correction method for this DNL using standard calibration sources and artificial pulser signals will be presented as well as an offline correction algorithm. The algorithm is capable of removing double peak structures and increasing the energy resolution for broadened peaks while achieving a better linearity in energy calibration compared to the uncorrected data.

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HK 56.4 Fr 12:00 HZ 8

Entwicklung eines Triggerdetektors für vorwärtsgerichtete Protonen — •Marc Hillenbrand für die A2-Kollaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

Die A2 Kollaboration am Mainzer Mikrotron MAMI untersucht photoinduzierte Reaktionen an Nukleonen und Kernen sowie Zerfälle von Mesonen (η, η', ω), die mit hoher Rate an MAMI erzeugt werden können. Die wichtigsten Komponenten des Detektorsystems der A2 Kollaboration sind ein Spektrometer zur Energiemarkierung von Bremsstrahlsungsphotonen ("Tagger"), sowie die beiden Kalorimeter Crystal Ball und TAPS.

In diesem Vortrag wird ein Szintillationsdetektor zur schnellen Unterscheidung langsamer Protonen von minimal ionisierenden Teilchen vorgestellt. Dieser soll zur Definition eines Triggersignals für die Photoproduktion von η' Mesonen in Schwellennähe dienen. Der Aufbau und Test des Detektors sowie der geplante Einsatz im Trigger werden diskutiert.

HK 56.5 Fr 12:15 HZ 8

Development of a Feature Extraction Pre-Procesing Stage for the CBM-TRD — •Cruz de Jesus Garcia Chavez and Udo Kebschull for the CBM-Collaboration — Infrastructure and Computer Systems in Data Processing (IRI), Frankfurt University, 60325 Frankfurt am Main, Germany

The feature extraction is a data pre-processing stage of the proposed data acquisition chain (DAQ) for the CBM-TRD experiment at FAIR, aiming to deliver event-filtered and bandwidth-reduced data to the First Level Event Selection (FLES).

The TRD detector of the CBM experiment will be conformed of about 24,000 SPADIC 1.0 front-end chips. The SPADIC 1.0 can deliver full time-bin signals plus useful metadata. In order to efficiently pre-process the data coming from multiple TRD detectors and to deliver only useful and event-filtered information to the FLES, a feature extraction firmware has been developed in order to process multiple SPADIC 1.0 chips. The feature extraction firmware implements multiple algorithms in order to find regions of interest within time-bin signals. Algorithms such as peak-finding, charge integration, center of gravity and time-over threshold were implemented for online analysis. On the other hand, a local clustering algorithm allows to find cluster members and to implement even further data reduction algorithms. This contribution presents an overview of the development and implementation of the feature extraction firmware based in a SysCore3 FPGA development board for the CBM-TRD experiment, as well as its performance in a laboratory setup.

HK 56.6 Fr 12:30 HZ 8

Concepts for Pre-Assemply Data Acquisition for the PANDA Experiment* — •Milan Wagner, Thomas Gessler, Wolfgang Kühn, Sören Lange, and Björn Spruck for the PANDA-Collaboration — JLU Gießen

The $\overline{\text{P}}$ANDA detector will be a located at the high energy storage ring (HESR), at the facility for anti protons and ion research (FAIR) in Darmstadt, Germany. It will operate with a very high interaction rate of up to 20 MHz, in a free streaming mode without hardware trigger. Data filtering will be performed by complete online event recontruction with a highly parallelized farm of FPGAs as first level and on a farm fo GPUs or PCs as a second level. The requirement is a background reduction by a factor of ¿1000. Parts of the $\overline{\text{P}}$ANDA detector will be pre-assembled and tested at the Forschungszentrum Jülich, before being transported to GSI at a later stage. The data acquisition (DAQ) system for the pre-assembly comprises of a Synchronization Of Data Acquisition (SODA) source, up to 9 Trigger and Readout Boards (TRB) based on a Lattice ECP3 FPGAs, for data concentration, and up to 4 Compute Nodes (CN), for event building and filtering. A CN is a xTCA-compliant board based on a Virtex-5 FX70T FPGA, with a μTCA-formcator. It is equipped with 2x2 GB DDR2 RAM, one GB/Ethernet and 4x6.25 Gb/s optical links. In this contribution, we present the DAQ system for the pre-assembly for $\overline{\text{P}}$ANDA, which will have up to 207 optical links as inputs and Gb/Ethernet as output.

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