HK 20: Instrumentation VII

Zeit: Dienstag 14:00–16:00 Raum: HZO 80

Gruppenbericht HK 20.1 Di 14:00 HZO 80

Towards new analog read-out electronics for the HADES drift chamber system — •Michael Wiebusch for the HADES-Collaboration — Goethe-Universität, Frankfurt

Track reconstruction in HADES is realized with 24 planar, low-mass drift chambers (MDC). About 27000 drift cells provide both, precise spatial information of track hit points and energy loss information. In order to handle high rates and track densities expected at the future SIS100 accellerator at FAIR, an upgrade of the MDC system is mandatory. Besides employing an advanced FPGA based TDC concept, this involves new analog front-end electronics, as the original analog read-out ASIC (ASD8) is no longer procurable. A promising replacement read-out chip candidate is the PASTTREC ASIC (developed at Jagiellonian University, Krakow), which is currently at the focus of our investigations. To assess its compatibility with MDC, PASTTREC was challanged in three different test environments (alongside with the ASD8 ASIC for reference): A cosmic muon tracking set-up at GSI detector lab, a 2.7 MeV/c proton beam test at COSY (FZ Jülich) and a UV LASER set-up at Helmholtz-Zentrum Dresden-Rossendorf. Emphasis is placed on assessing the timing precision of the joint system comprising detector and front-end electronics. The latter set-up, in addition, allows to study drift cell properties due to its unique ability to map the drift-time w.r.t. position over the entire cell. This contribution will present and compare the results of the abovementioned measurements. This work has been supported by BMBF (05P15RFFCA), GSI and HIC for FAIR.

HK 20.2 Di 14:30 HZO 80

The COMPASS trigger for Drell-Yan Measurement 2018 — •Benjamin Veit — for the COMPASS Collaboration, Institut für Kernphysik, Mainz, Germany

In 2018 the COMPASS experiment measures double-muon-production in the reaction of negative pions of 190 GeV/c with a polarized ammonia target. This process is called Drell-Yan process. The final state consists of two oppositely charged muons and a hadronic state. The hadrons and remaining beam pions are removed by an absorber directly behind the target, the remaining muon pairs are detected in the double stage COMPASS spectrometer. For a symmetric acceptance for positive and negative muons, the muon trigger system has to be modified. The setup and monitoring of the COMPASS muon trigger system for the 2018 run will be presented.

HK 20.3 Di 14:45 HZO 80

Tests of the Hit-Detection ASIC V2.0 for the PANDA EMC at FAIR — S. Ahmed[1,2], L. Capozza[1], A. Dbeyssi[1], H. Deppe[4], H. Flemming[4], •P. Grasemann[1,2], F. Maas[1,2,3,4], O. Noll[1,2], D. Rodriguez Pinerio[1], P. Wieczorek[4], S. Wolff[1,2], M. Zambrana[1,2], and I. Zimmermann[1,2] — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany — [4]GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany

The PANDA experiment at the upcoming FAIR accelerator facility will study antiproton annihilation reactions at antiproton beam momenta from 1.5 GeV/c up to 15 GeV/c. With its modular multi purpose detector system it will be able to observe a variety of physics channels. The electromagnetic process group at HI-Mainz is developing the backward end-cap of the electromagnetic calorimeter.

For this prototype, the original design foresees that analogue signals are guided over several meters to the analog-digital converters.

The so-called Hit-Detection ASIC is a multichannel sampling digitizer with additional internal digital signal processing based on an analogue transient recorder with subsequent pipeline ADC.

This setup will eliminate the need for line driver electronics and reduce the amount of signal cables not only for the backward end-cap but especially for the barrel part of the EMC.

In the talk the promising results of the characterization of the Hit-Detection ASIC in its current version will be shown.

HK 20.4 Di 15:00 HZO 80

Recent projects based on the TRB DAQ framework — •Jan Michel — Goethe-Universität, Frankfurt

The TRB data acquisition system was originally developed for the last upgrade of the HADES detector at GSI. Its development started more than 10 years ago, but in the meantime this project has evolved into a full eco system of hard- and software projects. We want to highlight some of the recent developments:

The FPGA-based TDC implementation with a precision down to 10 ps (achieved with offline calibration) can now be equipped with in-FPGA online calibration simplifying the overall data taking effort while still achieving a very good precision of 30 ps.

To name a few of the current projects, a team at TU Munich prepares to employ TRB3sc boards for PMT read-out in the deep-sea STRAW experiment in a depth of 2.6 km. Groups from Wuppertal, Gießen and GSI finalized their system of electronics for RICH detectors which will be installed at FAIR phase-0 experiments in the next months.

In Frankfurt, the TRB3sc/TrbNet framework is being used for characterizing the performance of the first prototype sensor (Mimosis-0) for the future CBM Micro-Vertex-Detector.

This work has been supported by various BMBF grants, GSI and HIC for FAIR.

HK 20.5 Di 15:15 HZO 80

Toward a demonstrator of the free-streaming data acquisition system for the CBM experiment at FAIR — •Pierre-Alain Loizeau and David Emschermann for the CBM-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The Compressed Baryonic Matter experiment (CBM) will be based at the new Facility for Antiproton and Ion Research (FAIR), which will deliver heavy-ion beams up to energies of 14 A GeV. In nucleus-nucleus collisions at these beam energies strongly interacting matter with densities up to 10 times normal nuclear matter is expected to be produced. The key objective of CBM is to investigate the QCD phase diagram in the region of high baryon-densities. CBM is designed to cope with very high interaction rates up to 10 MHz. This will allow to perform high precision measurements of extremely rare probes which have not been accessible by previous nucleus-nucleus experiments in this energy regime. To achieve the high rate capability CBM will be equipped with fast and radiation hard detectors employing free-streaming readout electronics. A prototype high-speed Data Acquisition (DAQ) system was used for some of CBM subsystems in 2016 and 2017, based on a combination of microTCA (uTCA) and PCIe FPGA boards. A full prototype of the DAQ system using in addition the CERN radiation hard ASIC GBTX will be used for the phase 1 of the *mCBM@SIS18* ("mini-CBM") setup in 2018. For *mCBM* phase 2 in 2019, it will be upgraded to a close to final demonstrator system with a single PCIe board replacing the uTCA and PCIe ones. We will report on the progress in the preparation of these DAQ setups.

HK 20.6 Di 15:30 HZO 80

Beam test results for new DIRICH readout chain for MAPMTs and MCPs — •Vivek Patel, Joerg Foertsch, Karl - Heinz Kampert, and Christian Pauly for the CBM-Collaboration — Bergische Universitaet Wuppertal, Gauss Strasse 20,Wuppertal

The CBM RICH detector and the upgraded HADES RICH detector, will use Hamamatsu H12700 MAPMTs for photon detection. In a common effort of the HADES-, CBM-, and PANDA- collaborations, a new FPGA-based readout scheme for these MAPMTs (and for MCPs) is being developed, focussing on excellent timing precision limited only by the Transit Time spread of the sensors (MAPMTs: 300ps, MCPs: 60 ps). The core element of this development is the 32ch DiRICH module. Signal discriminination, time-over-threshold measurement, as well as digital data handling are all implemented on a single Lattice ECP5 FPGA, providing a cost-effective and highly compact solution. It also has a low power consumption (12mW/amplifier, 50mW per channel). First prototypes of the DIRICH module were obtained last year and were throughly tested and are now ready for mass production. In November 2017 this DiRICH concept was tested at COSY under real beam conditions along with H12700 MAPMTs in a small prototype setup. In this talk we will present first results from the analysis of beam test data, focussing in particular on efficiency and ToT usage for crosstalk suppression. In addition we will also discuss the effect of a Wavelength Shifting coating (WLS) of the MAPMTs Supported by : BMBF grant 05P15PXFCA, and GSI.

HK 20.7 Di 15:45 HZO 80

Structure of the $\overline{\text{P}}$ANDA Detector Control System — •Tobias Triffterer for the PANDA-Collaboration — Institut für Experimentalphysik I, Ruhr-Universität Bochum, Bochum, Germany

The $\overline{\text{P}}$ANDA experiment is a pillar of the Facility for Antiproton and Ion Research (FAIR) which is currently under construction in Darmstadt, Germany. $\overline{\text{P}}$ANDA will investigate open questions in hadron physics by studying the collision of antiprotons in the momentum range from 1.5 GeV/c to 15 GeV/c with a fixed target.

The $\overline{\text{P}}$ANDA detector consists of 30 subsystems which all depend on several kinds of services (like high voltage, low voltage, cooling, gas etc.) to operate properly. The purpose of a detector control system (DCS) is to monitor and control all these devices, report to the crew on shift and provide insight to subsystem experts to solve any occuring problem. In addition, it programs the front-end devices with the necessary calibration parameters to operate properly.

The control software for an individual subsystem gets created by the $\overline{\text{P}}$ANDA members responsible for said subsystem, but in addition components like the operator interfaces, the alarm system and the archiving system are managed by a dedicated Controls Group within the $\overline{\text{P}}$ANDA Collaboration.

This talk explores the challenges in bringing together heterogenic software components for a variety of different tasks and illustrates the way the $\overline{\text{P}}$ANDA Collaboration is solving these challenges, e. g. by dividing the DCS into layers and independent subnetworks.

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