HK 24: Instrumentation V

Zeit: Dienstag 14:00–16:00 Raum: HS 11

HK 24.1 Di 14:00 HS 11

Development of a High Rate Neutron Polarimeter — •Rouven Spreckels — Institute for Nuclear Physics in Mainz, Germany

A high rate neutron polarimeter is being developed by the A1 collaboration at the Institute for Nuclear Physics in Mainz, Germany extending their three-spectrometer apparatus at MAMI. To meet the high rate capability and timing precision requirements, the signals of the plastic scintillators are discriminated by custom-made front-end electronics based on the ultrafast multi-channel NINO ASIC in single-ended mode, encoding the signal time-over-threshold into the output signal width. Digitization is performed by TRB3 boards with multi-hit capability covering a total of 574 channels. Their FPGA-based high precision TDCs measure leading as well as trailing edges of the NINO output signals and generate triggers on configurable veto and coincidence conditions with negligible dead time and hardware resources compared with conventional ADCs or sampling ASICs. The precise time-over-threshold information allows walk corrections and background suppression by reconstructing the signal amplitudes to deduce the related energy deposits. Initial tests of the readout electronics, using the 855 MeV electron beam of MAMI, show promising results fulfilling our expectations with a timing precision of about 240 ps being constant up to about 2.5 Mcps. A full test of the whole setup in its final stage will be performed in January 2019. Preliminary results from the commissioning experiments will be discussed in March 2019 at the DPG Spring Meeting in Munich.

HK 24.2 Di 14:15 HS 11

Evaluation of different feature extraction methods for the CBM-TRD. — •Florian Roether for the CBM-Collaboration — Institut für Kernphysik, Frankfurt, Deutschland

The Compressed Baryonic Matter (CBM) experiment at the Facility for Antiproton and Ion Research (FAIR) will explore the QCD phase-diagram in the region of high net-baryon densities. The Transition Radiation Detector (TRD) with its multi-layer-design will provide electron identification and contribute to particle tracking as well as the identification of light nuclei.

The detector signals will be digitized by the Self-triggered Pulse Amplification and Digitization ASIC (SPADIC), collected by the GBTx based Readout Board (ROB) and pre-processed by the Data Processing Board (DPB). This process of time ordering and feature extraction of the raw data stream is crucial for the subsequent processing and data storage.

The SPADIC allows to set a mask which defines what part of the time evolution of the signal is read out. This requires different algorithms to extract the information of interest, like e.g. position and energy deposition out of the raw data stream. In this talk the focus will be on the evaluation of different feature extraction methods based on data from simulations and a DESY test beam campaign performed in 2017.

This work is supported by BMBF-grant 05P15RFFC1.

HK 24.3 Di 14:30 HS 11

The HADES electromagnetic calorimeter upgrade: commissioning with Ag beam* — •Adrian Rost for the HADES-Collaboration — TU Darmstadt

The HADES spectrometer is located at the SIS18 accelerator at the GSI Helmholtzzentrum für Schwerionenforschung GmbH in Darmstadt. The new electromagnetic calorimeter (ECAL) detector, which is based on lead-glass modules. For February and March 2019 a physics production beam time is planed. The calorimeter enables photon measurements. Thus neutral mesons (π^0, η, ω), which are essential for interpretation of dilepton data, will be measured. Furthermore, photon measurement is of a large interest for the HADES strangeness program. The read-out system is based on the PaDiWa-AMPS2 Q2ToT (Charge-to-Time-over-Threshold) front-end board for the well established TRB3 (Trigger and Read-out Board - version 3) platform. The needed discriminators, the high precision TDCs (Time-to-Digital-Converters) and the data acquisition functionality are implemented with the help of FPGAs (Field Programmable Gate Arrays). In this contribution the performance of the detector under beam conditions will be shown. Special emphasis will be put on the read-out system and its performance.

This work has been supported by the DFG through GRK 2128 and VH-NG-823.

HK 24.4 Di 14:45 HS 11

Shadow Readout – Glowing VME Backplanes — Michael Munch[1], Jesper H. Jensen[1], •Bastian Löher[2,3], Hans T. Törnqvist[2,3], and Håkan T. Johansson[4] — [1]Department of Physics and Astronomy, Aarhus University, Denmark — [2]Institut für Kernphysik, Technische Universität Darmstadt, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [4]Department of Physics, Chalmers University of Technology, Sweden

The accepted trigger rate of modular electronics (e.g. VME) is limited by the per-cycle deadtime. Conventional multi-event readout employs on-module multi-event-buffers to make DMA transfers feasible and reduce the average deadtime. In this talk a generic implementation of a shadow readout scheme is presented, which continuously empties the module buffers into local RAM. This method is capable of reducing the average dead-time to the limit of the module conversion time (few μs) and allows accepted trigger rates beyond 100 kHz with conventional hardware. It has been used successfully during the last HIE-ISOLDE beam-time and is continuously running since April at the Aarhus 5MV Van de Graaff accelerator. *Supported by the GSI-TU Darmstadt cooperation agreement.

HK 24.5 Di 15:00 HS 11

The free-streaming readout chain for the Silicon Tracking System of the CBM experiment — •Adrian Rodriguez Rodriguez for the CBM-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The Compressed Baryonic Matter (CBM) experiment at the FAIR facility will explore the QCD phase diagram at very high baryon densities, where a first order phase transition from hadronic to partonic matter as well as a chiral phase transition is expected to occur. The Silicon Tracking System (STS) is its essential tracking component, designed to measure up to 1000 particles in A+A collision at rates up to 10 MHz and to achieve a momentum resolution better than 2% inside a 1 Tm dipole magnetic field. With its 1.8 million readout channels, the STS poses the most demanding requirements regarding bandwidth and density of all CBM detectors. The STS readout chain consists of: (1) detector frontend boards with custom ASICs (STS-XYTER), (2) readout boards (ROB) for data aggregation from many electrical links and conversion to optical data transmission, and (3) FPGA based common readout interface (CRI) for data preprocessing, time slice building and interfacing to slow and fast control. In the framework of the miniCBM campaign at SIS18 in GSI, the STS will deploy a prototype of its readout chain. This opportunity will allow to evaluate detector performance and to test integration with other subsystems under realistic experimental conditions. This presentation aims to show an overview of the development status of the readout components and the first test results of the system.

HK 24.6 Di 15:15 HS 11

A Sampling ADC-Readout for the Crystal Barrel Calorimeter - Pile-Up Detection and Recovery — •Jan Schultes for the CBELSA/TAPS-Collaboration — HISKP, Universität Bonn

The Crystal Barrel Calorimeter consists of 1320 CsI(Tl) scintillating crystals, which are, after a recent upgrade, read out by APDs. The signals are digitized using Fastbus QDCs. In preparation of replacing the QDCs by FPGA-controlled sampling ADCs, these sampling ADCs are already used in addition in the high rate forward direction. This offers possibilities to perform on-line pile-up detection and subsequent recovery, thus allowing to reach even higher rates without a loss of data quality in the main calorimeter.

Specifically developed methods and approaches to detect and recover pile-up are presented and very promising first results are discussed.

HK 24.7 Di 15:30 HS 11

Development of detector read-out electronics for the P2 experiment at MESA — •Rahima Krini[1], Sebastian Baunack[1], Dominik Becker[1], Michael Gericke[2], Frank Maas[1,3,4], and David Rodriguez Pineiro[3] for the P2-Collaboration — [1]Institute for

Nuclear Physics, Mainz, Germany — [2]University of Manitoba, Canada — [3]Helmholtz Institute Mainz, Germany — [4]PRISMA Cluster of Excellence, Mainz

The Mainz Energy recovering Superconducting Accelerator (MESA) is being built at the Institute for Nuclear Physics in Mainz. At MESA the P2 experiment is planned for a precision measurement of the weak mixing angle. It presents the most challenging parity-violation experiment with a relative uncertainty of $\frac{\Delta A^{PV}}{A^{PV}} \approx 2.41\,\%$.

The small asymmetries $\mathcal{O}(10^{-9})$ and the high precision require very high statistics and therefore a long measurement time. The Cherenkov ring detector consists of fused silica bars equipped with photomultiplier tubes with high quantum efficiency. The challenge is to control the integrating detector signal chain and all sources of electronics noise within the whole experimental P2 set-up. The first preliminary results of the main front-end components will be presented.

HK 24.8 Di 15:45 HS 11

Beam test results of the DiRICH based readout system for H12700 MAPMTs — •Vivek Patel, Christian Pauly, Karl - Heinz Kampert, and Joerg Foertsch — University of Wuppertal

The HADES RICH detecter has been fully upgraded using H12700 Multi Anode Photomultiplier Tube (MAPMT) from Hamamatsu and a DiRICH based readout system. A total of 428 MAPMTs and 856 DiRICHs are installed in the upgraded HADES RICH. This upgraded RICH will see its first beam in March 2019. The new FPGA based DiRICH readout chain has been developed as a joint effort of the CBM-, HADES- and TRB- collaborations and might also be used by PANDA DIRC and fRICH detectors. The new readout concept has been extensively tested over the last two years before finalizing the design prior to mass production for HADES RICH. In November 2017 this readout system was tested under real beam conditions at the COSY accelerator at the Juelich research facility. The talk will focus on analysis results of the test beam data from COSY particulary focusing on deriving proper time over threshold (ToT) information and later using it to suppress crosstalk from neighbouring MAPMT pixel. We will also present the improvement in Cherenkov ring reconstruction by using the ToT information.

Supported by BMBF grant 05P15PXFCA, and GSI.