HK 5: Instrumentation

Zeit: Montag 14:00–16:00 Raum: P 3

Gruppenbericht HK 5.1 Mo 14:00 P 3

Testmessungen mit einem Prototypen der Vorwärtsendkappe des elektromagnetischen Kalorimeters des PANDA-Experiments — •Malte Albrecht für die PANDA-Kollaboration — Ruhr-Universität Bochum

An der im Bau befindlichen Beschleunigeranlage FAIR wird am Antiproton-Speicherring HESR das PANDA-Experiment aufgebaut. Die Antiprotonen aus dem HESR-Beschleuniger werden mit Impulsen zwischen 1,5 und 15 GeV/c auf ein ruhendes Wasserstofftarget geschossen, wobei eine maximale Luminosität von $2 \cdot 10^{32}\mathrm{cm}^{-2}\mathrm{s}^{-1}$ erreicht wird. Das elektromagnetische Kalorimeter für das PANDA-Experiment wird mit Bleiwolframat-Kristallen bestückt, welche auf $-25°$C heruntergekühlt werden, um die Lichtausbeute zu erhöhen. Mit dem Kalorimeter werden später Photonenenergien bis 15 GeV gemessen. Die durchschnittliche Ereignisrate bei der maximalen Luminosität wird für die strahlnächsten Kristalle des Kalorimeters bei $5 \cdot 10^5\,\mathrm{s}^{-1}$ liegen.

Ein aus 216 Kristallen bestehender Prototyp der Vorwärtsendkappe wurde aufgebaut und getestet. Ergebnisse der Teststrahlzeiten am SPS-Beschleuniger am CERN sowie am ELSA-Beschleuniger in Bonn werden vorgestellt. Während am CERN bei den für PANDA höchsten Energien (bis 15 GeV) gemessen wurde, zielten die Messungen am ELSA-Beschleuniger vor allem auf hohe Ereignisraten von bis zu 2 MHz ab.

Gefördert durch das BMBF und die EU.

HK 5.2 Mo 14:30 P 3

Response of the Prototype for the PANDA Barrel EMC to 15 GeV Positrons* — •Markus Moritz, Daniel Bremer, Tobias Eissner, Peter Drexler, and Rainer Novotny for the PANDA-Collaboration — 2. Physikalisches Institut, Universität Giessen

The electromagnetic calorimeter of the PANDA target spectrometer is one of the central detector components to achieve the proposed physical goals, in particular due to the expected performance and efficiency for photons and electrons over a extremely wide energy range. Beside a good energy resolution of the device based on lead tungstate, it is necessary as well to achieve a sufficient position and time information. Therefore, detailed tests of prototypes are necessary. The talk will present the results of a test performed at CERN SPS with the prototype PROTO60, which represents a subsection of the barrel detector and consists of a 6 × 10 matrix of tapered crystals. A 15 GeV positron beam was used impinging at different positions. The report describes the analysis procedure, including the calibration with cosmic muons and muon beam, algorithms for position reconstruction and applied corrections. It finally summarizes the achieved results with respect to energy, position and time resolution.

*Work supported by BMBF, GSI and HIC for FAIR

HK 5.3 Mo 14:45 P 3

Tests von Photodetektoren für das PANDA-EMC — •Tobias Triffterer für die PANDA-Kollaboration — Ruhr-Universität Bochum

Für die Vorwärts-Endkappe des elektromagnetischen Kalorimeters des PANDA-Detektors am zukünftigen Antiprotonen-Speicherring HESR an FAIR werden Einzelkristallraten von bis zu $2 \cdot 10^6\,\mathrm{s}^{-1}$ erwartet, welche die in einem Magnetfeld von bis zu 1,2 T betriebenen Photodetektoren verarbeiten können müssen. Daher wurden vier Typen von Photodetektoren (Vakuum-Phototrioden, Vakuum-Phototetroden von zwei verschiedenen Herstellern sowie Avalanche-Photodioden) auf ihre Eignung untersucht. Dabei wurde die gesamte Auslesekette vom Photodetektor über den Vorverstärker und Shaper bis zum ADC getestet.

Die Ergebnisse von Ratentests mit einem Lichtpulser im Labor sowie von Strahltests mit getaggten Photonen am ELSA-Beschleuniger in Bonn mit Raten von $100{\cdot}10^3\ \mathrm{s}^{-1}$ bis $1{,}8{\cdot}10^6\ \mathrm{s}^{-1}$ sowie die Ergebnisse von Labortests in einem Magnetfeld von 1,7 T werden präsentiert. Basierend auf den Messergebnissen konnte die Ausleseelektronik optimiert werden.

Gefördert durch das BMBF und die EU.

HK 5.4 Mo 15:00 P 3

Aspects and Implementation of Stimulated Recovery for the PANDA EMC * — •Till Kuske, Valera Dormenev, Rainer Novotny, and Rene Schubert for the PANDA-Collaboration — Justus-Liebig Universität, Gießen

The future Electromagnetic Calorimeter (EMC) of the PANDA detector at FAIR will be based on a new generation of lead tungstate crystals (PWO-II). It is optimized to measure particle energies from 10 GeV down to 10-20 MeV. The operating temperature of the EMC will be -25°C. Due to the operation in a strong radiation environment one of the most critical parameter of PWO-II is radiation hardness. The radiation damage of PWO-II can be compensated by spontaneous relaxation of the color centers via thermo-activation. The process is strongly suppressed at -25°C, which is limiting the energy resolution of the EMC. The recovery process can be accelerated by illumination of the crystal with light even in the infrared region. The new results of the stimulated recovery under light illumination with different intensity in parallel (online mode) and after (offline mode) γ-irradiation at different temperatures is presented. The possible implementation of the stimulated recovery in both modes for the PANDA EMC is discussed. A recovery model based on the results will be presented.

*The work is supported by BMBF.

HK 5.5 Mo 15:15 P 3

Investigation of PANDA EMC modules in a realistic high rate environment — •Marcel Werner, Wolfgang Kühn, Sören Lange, and Björn Spruck for the PANDA-Collaboration — II. Physikalisches Institut, JLU Gießen

The PANDA experiment is expected to start its physics program within the next decade with the goal to study hadron physics in the charm region. The experiment imposes high requirements on the performance of the single detector parts of PANDA, tests of the detector subsystems are indispensable.

The installation of a Zero Degree Detector (ZDD) at the Bes III experiment, Beijing, China, using PANDA-type PWO crystals with the purpose of studying the radiative return, offers a unique opportunity to study the PANDA EMC DAQ chain in detail in a realistic high rate environment. As the available space for the ZDD at Bes III is very small and therefore the energy resolution of the ZDD is limited, the knowledge of the photon impact at the ZDD is of importance since it determines the event structure in the Bes III detector. Also online event processing using DSP-algorithms, matching Bes III detector information and ZDD information, to pick out events of interest is necessary to handle the expected event rates (O(MHz)). The Compute Node developed for PANDA by the Institute of High Energy Physics (IHEP) at Beijing and the university of Giessen is suitable to handle these tasks.

This work was supported in part by BMBF under grant number 06GI 9107I PANDA and HIC For FAIR.

HK 5.6 Mo 15:30 P 3

Characterisation of a 3x3 Prototype of the Forward Shashlyk EMC of the PANDA detector with photons up to 770 MeV — Stefan Diehl[1], Daniel Bremer[1], Peter Drexler[1], Pavel Semenov[2], •Rainer Novotny[1], Tobias Eissner[1], and Valery Dormenev[1] for the PANDA-Collaboration — [1]2nd Physics Institute, University Giessen, Germany — [2]IHEP Protvino, Russia

The PANDA detector at the future FAIR facility will be used for hadron physics experiments with cooled antiprotons. The detection of high-energetic photons up to 15GeV energy is one of the main tasks, since most of the envisaged physics channels are accompanied by primary or secondary photons. Therefore, a nearly 4 π coverage is mandatory Complementary to the Target-EMC, comprised of $PbWO_4$ scintillation crystals, the most forward region is covered by a sampling calorimeter of Shashlyk-type. The individual modules consists of several layers of led and plastic scintillator tiles, which are sandwiched together and read out via wavelength shifting (WLS) fibers which are guided through the holes in the lead and scintillator layers, respectively, and read out by photomultipliers at the rear end. The talk will present the results of a response test of a 3x3 prototype matrix developed and build at BTCP, Protvino. The measurement was performed with tagged photons in the energy range between 100 and 770MeV, respectively, at the Mainz Mictrotron (MAMI). The talk will focus primarily on the energy resolution depending on the point of impact of the photon beam. The results are compared to Monte-Carlo simu-

lations and complementary studies at several GeV energy.

HK 5.7 Mo 15:45 P 3

Performances of the HADES electromagnetic calorimeter* — •Kirill Lapidus for the HADES-Collaboration — TU München, Boltzmannstr. 2, 85748 Garching, Germany

The **H**igh **A**cceptance **Di**-**E**lectron **S**pectrometer is a multipurpose detector located at the GSI Helmholtzzentrum. An electromagnetic calorimeter for the HADES experiment is currently under construction. The calorimeter allows to reconstruct photons and improves the purity of the electron/positron identification at high momenta ($p > 0.5$ GeV/c).

Realistic simulations of the calorimeter performance, based on results of experimental tests, will be presented. First, it will be shown that the proposed calorimeter gives access to a variety of interesting physics channels, including production of rare strange resonances, in pion-proton and proton-proton reactions. Afterwards, π^0, η reconstruction and the electron-pion separation in heavy-ion reactions at 2–8 AGeV will be discussed.

*Supported by BMBF and Excellence Cluster "Universe".