HK 14: Instrumentation 6

Time: Monday 17:00–19:00 Location: M/HS4

Group Report HK 14.1 Mon 17:00 M/HS4

The PANDA backward calorimeter — Heybat Ahmadi[1,2], Samer Ahmed[2], •Luigi Capozza[2,3], Alaa Dbeyssi[2,3], Malte Deiseroth[1,2], Bertold Fröhlich[2,3], Dmitry Khaneft[1,2], Dexu Lin[2,3], Frank Maas[2,3], María Carmen Mora Espí[2,3], Cristina Morales Morales[2,3], Oliver Noll[1,2], David Rodríguez Piñeiro[2,3], Roserio Valente[1,2], Manuel Zambrana[1,2], and Iris Zimmermann[2,3] — [1]Johannes Gutenberg-Universität Mainz — [2]Helmholtz-Institut Mainz — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH

The PANDA experiment at FAIR is being devised for a broad physics programme in hadron structure and spectroscopy. Full and accurate reconstruction of scattering events, reliable particle identification and an almost complete solid angle coverage are required. An important tool for meeting this requirements will be the electromagnetic calorimeter (EMC). It is required to measure particle energies ranging from some MeVs to several GeVs with a relative resolution of $1\% \oplus 2\%/\sqrt{E/\mathrm{GeV}}$, assuring a compact geometry and radiation hardness at the same time. For these reasons $PbWO_4$ was chosen as scintillation material. The whole calorimeter has been designed in three sections: a forward end-cap, a central barrel and a backward end-cap (BWEC). The BWEC, under development at Mainz, will cover scattering polar angles between 140° and 170° and will be made of 524 $PbWO_4$ crystals. The scintillation light will be detected by large area avalanche photodiodes which will be read out by customised front-end ASIC chips. A status report on the development of the BWEC will be given in this contribution.

HK 14.2 Mon 17:30 M/HS4

Response of a Close to Final Prototype for the Barrel of the PANDA Electromagnetic Calorimeter to Photons at Energies below 1 GeV — •Christoph Rosenbaum[1], Stefan Diehl[1], Valery Dormenev[1], Peter Drexler[1], Myroslav Kavatsyuk[2], Till Kuske[1], Svetlana Nazarenko[1], Rainer W. Novotny[1], Phillippe Rosier[3], Andrej Ryantzev[4], Peter Wieczorek[5], Andrea Wilms[5], and Hans-Georg Zaunick[1] — [1]II. Physikalisches Instiut, University Gießen — [2]KVI Groningen, The Netherlands — [3]IPN Orsay, France — [4]IHEP Protvino, Russia — [5]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt

The EMC of the PANDA detector is one of the central components to achieve the proposed physical goals. The barrel part of the EMC will consist of more than 11,000 lead tungstate (PWO-II) crystals operated at -25°C to achieve the required performance over the complete energy range. The most recent prototype PROTO120 represents a larger section of a barrel slice, containing the most tapered crystals. The readout is performed with two rectangular large area APDs per crystal, which are read out separately via the specially developed APFEL-ASIC, providing a large dynamic range, low power consumption and optimized shaping. The present contribution will show the response of the PROTO120 to photons in the energy range below 800 MeV. It will focus on the performance of the ASIC under real conditions and describe the analysis procedure including the signal extraction and obtained energy resolution using the information from both APDs. * The Work is supported by BMBF, GSI and HIC for FAIR

HK 14.3 Mon 17:45 M/HS4

Neutral particle identification with the BGO crystal calorimeter of the BGO-OD experiment — •Georg Scheluchin for the BGO-OD-Collaboration — Physikalisches Institut, Nussallee 12, D-53115 Bonn

The aim of the BGO-OD experiment is the systematic investigation of nonstrange and strange meson photoproduction. The setup combines a large aperture forward magnetic spectrometer and a central BGO crystal calorimeter with almost 4π acceptance. The BGO calorimeter consists of 480 scintillator crystals with individual SADC readouts. An additional inner barrel of scintillator strips allows charged particle identification.

Accurate identification of neutral mesons is made by the characterization of electromagnetic showers from decay photons. Multiple particle hits in the BGO calorimeter can lead to overlapping showers, reducing the efficiency in particle identification and accuracy in momentum reconstruction.

An improved algorithm to disentangle overlapping showers with the BGO calorimeter will be presented. The algorithm is tested with both simulated and experimental data.

Supported by DFG (SFB/TR-16).

HK 14.4 Mon 18:00 M/HS4

Background suppression in phoswich detectors — •Anna-Lena Hartig[1], Michael Bendel[2], Guillermo Fernández Martínez[1], Roman Gernhäuser[2], Alexander Ignatov[1], Enrique Nácher[3], Thorsten Kröll[1], Han-Bum Rhee[1], and Olof Tengblad[3] for the R3B-Collaboration — [1]Institut für Kernphysik, TU Darmstadt, Germany — [2]Physik-Dept. E12, TU München, Germany — [3]CSIC, Madrid, Spain

As part of the R3B set-up, CALIFA is supposed to detect γ-rays as well as light charged particles and will cover the entire target region. While the barrel part is currently assembled, a design for the Endcap was recently proposed. It will be mainly formed out of CsI crystals, whereas the smaller polar angles will be covered by phoswich detectors. These detectors consist of $LaBr_3$(Ce) and $LaCl_3$(Ce) crystals which are optically coupled. A simulation for protons at expected energies makes it possible to apply cuts on the measured kinematics in order to identify significant part of the background stemming from nuclear reactions. The method and the result for the background suppression will be presented for phoswich detectors.

Supported by BMBF under contracts 06DA90240I, 05P12RDFN8, 05P12WOFNF, and by HIC for FAIR.

HK 14.5 Mon 18:15 M/HS4

Aufbau und Betrieb einer Teststation zur Vorkalibration der Detektormodule für die Vorwärtsendkappe des elektromagnetischen Kalorimeters des PANDA - Experimentes — •Matthias Kube, Ulrike Thoma, Christoph Schmidt, Merlin Rossbach und Christoph Wendel für die PANDA-Kollaboration — HISKP, Universität Bonn, Germany

Die Vorwärtsendkappe des im Aufbau befindlichen elektromagnetischen Kalorimeters des PANDA-Experimentes wird aus 3856 $PbWO_4$-II Kristallen bestehen. 16 Kristalle bilden mit ihren Photosensoren, einer Kohlefaserhaltestruktur und der dazugehörigen Aluminiumhalterung ein Detektorsubmodul. Jedes einzelne der 268 Detektorsubmodule soll vor dem Einbau in die Vorwärtsendkappe einem finalen Funktionstest und einer Vorkalibration mittels Höhenstrahlung unterzogen werden. Dazu wurden zwei Teststationen aufgebaut in denen die Detektorsubmodule unter Experimentbedingungen bei -25°C in einer Klimakammer getestet werden können. Die hierbei verwendeten kompakten Triggerdetektoren bestehen aus Szintillatorplättchen, die in ihrer Größe an die Kristalle angepasst sind und mit SiPMs ausgelesen werden. Die SiPMs bieten hierbei viele Vorteile gegenüber konventionell eingesetzten Photomultipliern, die im Vortrag diskutiert werden. Im Vortrag wird weiterhin auf den Aufbau und Betrieb der Triggerdetektoren, auf die Ergebnisse der durchgeführten Effizienzmessungen sowie auf die ersten Ergebnisse der Detektorsubmodultests eingegangen.

Gefördert durch das BMBF

HK 14.6 Mon 18:30 M/HS4

Das Lichtpulsersystem für das $\bar{\mathrm{P}}$ANDA-Kalorimeter — •Patrick Musiol für die PANDA-Kollaboration — Institut für Experimentalphysik 1 — Ruhr-Universität Bochum

Das $\bar{\mathrm{P}}$ANDA-Experiment wird an der sich im Bau befindlichen Beschleunigeranlage FAIR am Antiprotonen-Speicherring HESR an der GSI in Darmstadt aufgebaut. Zur Monitorierung der Detektorresponse des mit ca. 16000 Bleiwolframatkristallen bestückten elektromagnetischen Kalorimeters wurde ein Lichtpulsersystem entwickelt. Das System besteht aus drei unterschiedlichen LEDs (blau, rot und grün) um zu unterscheiden, durch welche Komponente (Kristall bzw. Photodetektor und Elektronik) eine Veränderung der Response hevorgerufen wird, wobei die blaue LED Wellenlänge und Pulsform ähnlich dem des Szintillationslichtes von Bleiwolframat erzeugt. Zur Variation der Lichtintensität (entsprechend 10 MeV bis 15 GeV deponierter Energie im Kristall) werden kompakte LCDs der Firma LC-Tec verwendet. Vorgestellt wird die Funktionsweise des Lichtpulsersystems, Ergebnisse zur Homogenität der Abschwächung und Abschwächungskennlinien der verwendeten LCDs sowie der mechanische Aufbau inkl. Lichtleitfasern.

Gefördert durch das BMBF mit Förderkennzeichen 05P12PCFP5 und das FZ Jülich.

HK 14.7 Mon 18:45 M/HS4

A New Avalanche Photo Diode Based Readout for the Crystal Barrel Calorimeter — •Martin Urban for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Nussallee 14-16, 53115 Bonn

The CBELSA/TAPS experiment at ELSA has proven successful in the measurement of double polarization observables in meson photoproduction off protons and neutrons. To be able to measure purely neutral reactions on a polarized neutron target with high efficiency, the main calorimeter consisting of 1320 CsI(Tl) crystals has to be integrated into the first level trigger.

Key requirement to achieve this goal is an exchange of the existing PIN photo diode by a new avalanche photo diode (APD) readout. The main advantage of the new readout system is that it will provide timing information which allows a fast trigger signal. The energy resolution will remain compatible to the previous system.

Besides the development of automated test routines for the front end electronics, the characterization of all APDs was successfully accomplished in Bonn. After tests with a 3x3 CsI(Tl) crystal matrix at the tagged photon beam facilities at ELSA and MAMI the first half of the Crystal Barrel was upgraded in 2014. This talk shows the result of the latest test measurements including the gain stabilization of the new APD readout electronics and presents the progress of the ongoing upgrade.

Supported by the Deutsche Forschungsgemeischaft (SFB/TR16) and Schweizerischer Nationalfonds.