HK 6: Instrumentation II

Time: Monday 16:30–18:15 Location: H5

Group Report HK 6.1 Mon 16:30 H5

The new APD Based Readout of the Crystal Barrel Calorimeter — •Christian Honisch, Peter Klassen, Johannes Müllers, and Martin Urban for the CBELSA/TAPS-Collaboration — HISKP, University of Bonn, Nussallee 14-16, 53115 Bonn

The Crystal Barrel is an electromagnetic calorimeter located at the electron accelerator ELSA. The detector consisting of 1320 CsI(Tl) scintillator modules is used to detect the decay products of baryon resonances, $\vec{\gamma}\vec{n} \to N^* \to n\pi^0 \to n\gamma\gamma$.
To comprehensively study reactions that have no charged particles in the final state, an exchange of the readout electronics was necessary to achieve a high and uniform trigger efficiency for such reactions.
The upgrade was finished in 2017 and this talk gives an overview over the key challenges:
- Fast signals from CsI(Tl) while maintaining a reasonable SNR,
- Clustering in the 26 matrix in 100 ns,
- APD gain measurement and stabilization.
The talk will introduce the new readout and present its achieved performance in prototype tests and the first production beamtimes.

HK 6.2 Mon 17:00 H5

Energy resolution optimization for the $\overline{\text{P}}$ANDA EMC regarding the LAAPD gain — •Kim Tabea Giebenhain for the PANDA-Collaboration — Justus-Liebig-Universität, Gießen, Deutschland

For the future Facility for Antiproton and Ion Research, the $\overline{\text{P}}$ANDA experiment will be a unique opportunity to study proton antiproton collisions. One of the most crucial detector parts is the electromagnetic calorimeter. In order to meet the high precision demands in reconstruction and particle identification, its energy resolution is an important factor. The energy resolution depends on the signal to noise ratio of the front-end, especially at the crucial low energies. To improve the calorimeter performance beyond its design goal, for potential future even more demanding requirements, a study was done to find the optimal bias voltage for the utilized Large Area Avalanche Photo Diodes for energy ranges between 10 MeV and 2 GeV, using a light pulser system to simulate the PWO-II scintillation light. Since the dynamic range of the read-out chain is limited, additional simulation studies were conducted to find out, if the optimum bias voltage can be used for higher beam momenta.

Supported by BMBF, GSI/FAIR, HFHF

HK 6.3 Mon 17:15 H5

APD-Gain optimization for the $\overline{\text{P}}$ANDA Barrel EMC — •Aniko Tim Falk, Markus Moritz, Hans-Georg Zaunick, Kai-Thomas Brinkmann, Valera Dormenev, Kim Tabea Giebenhain, Christopher Hahn, Marvin Peter, Matthias Sachs, and René Schubert for the PANDA-Collaboration — II. Physikalisches Institut, Justus-Liebig-Universität, Gießen

The future electromagnetic calorimeter of the PANDA Experiment will provide an excellent energy resolution over a wide dynamic range. In order to reveal the full potential of its readout, the gain of the APDs can still be further optimized. With the goal to detect high energy photons over a wide energy range from a few dozens of MeV up to 15 GeV, the system must provide a most excellent energy resolution over the whole spectrum whilst maintaining the required dynamic range of the individual readout-electronics. The progress made on this subject over the last two years shall be briefly summarized in this contribution. Various measurements have been made on a complete setup, including an accelerator experiment at MAMI with tagged photons, that is very close to the final read out of the $\overline{\text{P}}$ANDA EMC. To match environmental conditions during operation, the setup was cooled to −25 °C. The analysis of the data is still in progress to this date. This project is supported by BMBF, GSI and HFHF.

HK 6.4 Mon 17:30 H5

Construction and testing of the crystal Zero Degree Detector for BESIII — •Frederic Stieler[1], Achim Denig[1], Peter Drexler[1], Leonard Koch[2], Wolfgang Kühn[2], Werner Lauth[1], Jan Muskalla[1], Saskia Plura[1], Christoph Redmer[1], and Yasemin Schelhaas[1] — [1]Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland — [2]II. Physikalisches Institut, Justus-Liebig-Universität Gießen, Deutschland

The crystal Zero Degree Detector (cZDD) is a proposed addition to the BESIII experiment in China in the near future. In order to measure hadronic cross sections with the Initial State Radiation (ISR) method for a more precise calculation of the hadronic vacuum polarization contribution to the anomalous magnetic moment of the muon, ISR photons have to be detected. Since these photons are mostly emitted at small angles in relation to the colliding particles, the cZDD was conceived to measure ISR at low angles of about 1.5 mrad to 10.4 mrad, that are not covered yet by the already existing detectors at BESIII. In this presentation the construction of the detector as well as test measurements using the read out electronics are presented.

HK 6.5 Mon 17:45 H5

Status report on the progress on the analysis of the NewSUBARU data — •Nikolina Lalić[1], Thomas Aumann[1,2], Martin Baumann[1], Patrick Von Beek[1], Ioana Gheorghe[3], Heiko Scheit[1], and Dmytro Symochko[1] — [1]TU Darmstadt — [2]GSI Helmholtzzentrum — [3]"Horia Hulubei" National Insitute for R&D in Physics and Nuclear Engineering (IFIN-HH), 30 Reactorului 077125 Bucharest-Magurele

The photoneutron cross sections of 112Sn,116Sn,120Sn and 124Sn were measured in(g,xn)reactions, where x =1-4, using a quasi-monochromatic laser Compton-scattering g-ray beam at the NewSUBARU facility. The goal of the experiment is to resolve the long-standing discrepancy of the total and partial cross sections measured by the Livermore and the Saclay groups. Measurements were done with g energies from 8 MeV to 38 MeV. As a neutron counter a detector with a flat-efficiency was used to take advantage of the direct neutron-multiplicity sorting technique. After the cross sections are obtained they will be compared to both data sets.The talk will be focused on current results of the analysis of the data from 2019. measured at NewSUBARU facility.

HK 6.6 Mon 18:00 H5

PANDA backward end-cap calorimeter support system — •David Rodriguez Pineiro[1], Alaa Dbeyssi[1], Frank Maas[1,2,3], Luigi Capozza[1], Oliver Noll[1], Sahra Wolff[1], Peter-Bernd Otte[1], Dong Liu[1], Alexander Christian Geriner[1], Julian Moik[1], and Samet Katilmis[1] for the PANDA-Collaboration — [1]Helmholtz-Institut Mainz, Germany — [2]Institute of Nuclear Physics, Johannes Gutenberg University, Mainz, Germany — [3]Prisma Cluster of Excellence, Mainz, Germany

The PANDA experiment will be one of three experimental pillars at the new accelerator facility FAIR in Darmstadt. The PANDA detector system has been designed to record antiproton annihilations at high rate and with high resolution and thus contribute to the understanding of the strong interaction in the nonperturbative regime. The group in Mainz is constructing the backward end-cap (BWEC) of the PANDA electromagnetic calorimeter, which will be used at the MAMI electron accelerator for a FAIR/Phase0 experiment at Mainz.

In order to mount and calibrate the detector a support system has been designed and built. All mechanical parts (shafts, bearings, connecting elements and a high ratio worm gearbox) have been chosen to comply with a safety factor of about two. It allows for a rotation by 90° changing between assembling position (mounting plate horizontal - crystals vertical) and working position. Both positions will also be used for the calibration with cosmic muons. The mechanical design of the backward end-cap will be discussed.