HK 30: Instrumentation VI

Time: Wednesday 14:00–16:00 Location: J-HS D

Group Report HK 30.1 Wed 14:00 J-HS D

Status of the Barrel and Disc DIRC detectors at PANDA — •Merlin Böhm for the PANDA-Collaboration — Physikalisches Institut, Universität Erlangen-Nürnberg

One of the main experiments at FAIR is PANDA, where high intensity antiprotons annihilate with protons in a momentum range of 1.5-15 GeV/c. For this experiment an excellent π/K separation with $\geq 3\sigma$ is required. Two ring imaging Cherenkov detectors of the DIRC-type (Detection of Internally Reflected Cherenkov light) will be built. The Barrel DIRC surrounds the interaction region, covering polar angles from 22° to 140°. The Endcap Disc DIRC (EDD) is placed in the forward beam direction and covers polar angles from 5° to 22°. The Barrel DIRC is based on the BaBar and SuperB FDIRC designs with key improvements like lenses, prisms, and ultra-fast sensors, the EDD is a novel design. The radiators of both DIRCs are made from precisely polished fused silica glass to conserve the Cherenkov angle during many internal reflections and to maximize the photon transport efficiency. The photons are guided to readout planes by a lens and prism or by focusing elements and are detected by lifetime-enhanced MCP-PMTs, read out by FPGA-based TRB boards and TOFPET ASICs. This talk will give an overview of the designs, performance, and status of both DIRCs. The advanced and cost-optimized technical designs of the DIRCs are finalized and the TDRs are now completed. Mass production of components has been started for the Barrel DIRC, a first quadrant of the EDD will soon be under construction. - Funded by BMBF and GSI -

HK 30.2 Wed 14:30 J-HS D

The PANDA Disc DIRC Project — •Ilknur Köseoglu[1,2], Simon Bodenschatz[1], Lisa Brück[1], Michael Düren[1], Avetik Hayrapetyan[1], Jan Hofmann[1], Sophie Kegel[1], Jhonatan Pereira de Lira[1], and Mustafa Schmidt[1] for the PANDA-Collaboration — [1]II. Physikalisches Institut, Justus Liebig University of Giessen, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The fixed target experiment PANDA at the new Facility for Antiproton and Ion Research (FAIR) near Darmstadt/Germany is planned to investigate fundamental questions of hadron physics by using an antiproton beam with a momentum range of 1.5 to 15 GeV/c. In order to achieve an excellent particle identification (PID) for the polar angle range from 5° to 22°, a novel disc shaped Endcap Disc DIRC (EDD) has been developed to perform a π/K separation with at least 3 σ up to 4 GeV/c particle momenta. The Cherenkov radiator of the EDD is a 2 cm thin plate of synthetic fused silica, divided into 4 identical independent quadrants. They will be polished with highest precision in order to conserve the Cherenkov angle during the light propagation to the outer rim. The light guides and light sensors, that are lifetime enhanced Microchannel Plate PMTs (MCP-PMTs), are positioned at the outer rim to detect the signal with an ASIC-based readout system. A full size quadrant was delivered in August 2019, and the precision of the optical system has been investigated using a laser system. After accomplishment of the quality measurements, the Cherenkov radiation will be measured in the Giessen Cosmic Station (GCS).

HK 30.3 Wed 14:45 J-HS D

Commissioning of the GlueX DIRC at JLab — Ahmed Ali[1,2], •Roman Dzhygadlo[1], Klaus Peters[1,2], and Jochen Schwiening[1] for the GlueX-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt — [2]Goethe-Universität Frankfurt

The GlueX experiment at Jefferson Laboratory aims to perform quantitative tests of non-perturbative QCD by studying the spectrum of light-quark mesons and baryons. A Detector of Internally Reflected Cherenkov light (DIRC) was recently installed to enhance the particle identification (PID) capability of the GlueX experiment by providing clean π/K separation up to 4 GeV/c momentum in the forward region (θ<11 degree), which will allow the study of hybrid mesons decaying into kaon final states with significantly higher efficiency and purity.

The new PID system is build using radiators from the decommissioned BaBar DIRC counter, combined with new compact photon cameras based on the SuperB FDIRC concept. The first half of the system was successfully installed and commissioned in early 2019. Commissioning of the complete GlueX DIRC with beam is scheduled for December 2019. We will discuss the status of the DIRC detector and its performance during commissioning.

HK 30.4 Wed 15:00 J-HS D

Performance of the mRICH detector in the mCBM experiment at SIS18 — •Adrian Amatus Weber for the CBM-Collaboration — Justus-Liebig Universität Giessen

The Compressed Baryonic Matter (CBM) experiment is a key experiment of the upcoming FAIR facility next to GSI in Darmstadt and part of the C.B.M. pillar. The CBM experiment will measure the QGP phase diagram at high net baryonic densities with high interaction rates of up to 10MHz and a free streaming detector readout in combination with advanced online reconstruction and selection methods.

The Ring Imaging Cherenkov (RICH) detector is a central part of CBM with highly advanced readout electronics and excellent PID capabilities. As an important step towards the final CBM experiment a prototype of the RICH detector, the mRICH, was build to test the performance and reliability of the readout concept in a common free streaming readout with other CBM detector prototypes in the mCBM experiment at GSI. The mRICH detector is based on the newly developed DiRICH front end electronics, which is already used in the HADES RICH detector, in combination with two aerogel radiator blocks. The common free streaming readout with the mRICH was successfully tested in march 2019 in Ag+Au collisions at 1.58 AGeV.

The readout concept of the mRICH as well as performance with respect to time and spacial correlations to the other subdetectors will be presented in this talk.

HK 30.5 Wed 15:15 J-HS D

HADES RICH upgrade and performance — •Jörg Förtsch and Christian Pauly for the HADES-Collaboration — Bergische Universität Wuppertal

The HADES experiment at GSI in Darmstadt is studying baryonic matter at low temperatures in pion, proton and heavy ion induced reactions on both light and heavy nuclei. In 2018 / 2019 a major detector upgrade has been carried out including a new MAPMT based photon detector for the RICH, which replaced the old CsI+MWPC based VUV photon camera. Readout of the new photon detector is accomplished using the DiRICH readout chain which aims in particular on good timing precision.

The upgraded RICH detector has been successfully operated in a very successful 4 week measurement campaign of Ag+Ag collisions at 1.58A GeV.

We have studied the performance of the RICH detector with respect to electron identification efficiency and timing precision. We present the upgrade and show first results on the performance.

The work has been supported by BMBF (05P19PXFCA), GSI and HIC for FAIR.

HK 30.6 Wed 15:30 J-HS D

Development of a Ronchi Test at the CBM-RICH Mirrors — •Cornelius Feier-Riesen[1] and Semen Lebedev[2] for the CBM-Collaboration — [1]Justus-Liebig-Universität Gießen — [2]GSI Darmstadt

The CBM (Compressed Baryonic Matter) experiment is designed to explore the QCD Phase Diagram at moderate temperatures and high net-baryon densities. CBM will be located at the future FAIR facility in Darmstadt/Germany. The detector is designed to record, trigger and analyze reaction rates up to 10 MHz for p+p, p+A and A+A collisions.

The CBM RICH (Ring Imaging Cherenkov) detector will distinguish pions from electrons. The conically emitted Cherenkov photons are reflected by the CBM RICH mirrors onto the photon detector plane. The RICH has two spherical mirror planes, each mirror plane consisting of 40 (5 * 8) single squared mirror tiles. Since the photon yield is very small it is of great importance to ensure that the mirrors will map the photons with very high accuracy onto the PMT plane.

In this talk, the development of a Ronchi test for the CBM RICH mirrors will be presented. This test determines the local geometry of the surface, more precisely its deviation from an ideal sphere.

HK 30.7 Wed 15:45 J-HS D

Radiator Studies with CBM-TRD Prototypes in Testbeams at DESY — •Adrian Meyer-Ahrens for the CBM-Collaboration — Institut für Kernphysik, Münster, Deutschland

The Transition Radiation Detector (TRD) is a part of the Compressed Baryonic Matter (CBM) experiment at FAIR. The detector is composed of a radiator, consisting of layers of irregular polyethylene (PE) foam foils, and a multi-wire proportional chamber (MWPC). For the CBM-TRD's main tasks, especially for electron identification with a high suppression of pions, a high yield of TR generated by electrons passing through the radiator is crucial. In a dedicated testbeam campaign, two CBM-TRD prototypes were set up at DESY in August of 2019 and tested with electron beams using various radiator thicknesses.

In this talk, analysis results concerning the performance of the detector in this testbeam campaign will be presented. This work is supported by BMBF grant 05P19PMFC1 and the GSI F&E programme.