HK 18: Accelerators and Instrumentation I

Time: Monday 16:30–19:00 Location: H-ZO 80

HK 18.1 Mo 16:30 H-ZO 80

Beam identification system of the COMPASS-Experiment — •Prometeusz Jasinski — Institut für Kernphysik, Universität Mainz, Johann-Joachim-Becherweg 45, 55099 Mainz

In order to study the production of exotic mesons the COMPASS experiment at CERN took data with a 190 GeV/c hadron beam in the year 2008. The negative hadron beam contains mainly of pions and a small fraction of about 3% of Kaons. To identify and trigger on the small Kaon component, two beam Cherenkov Detectors with Achromatic Ringfocus, so called CEDAR detectors were installed. In the talk I will present the detector performance of the CEDARs during the 2008 run, including their efficiency and the achieved purity of the Kaon signal. Prospects for the upcoming hadron run in 2009 will also be discussed. Supported by BMBF under the contract 06MZ224

HK 18.2 Mo 16:45 H-ZO 80

A Disc DIRC for PID for the PANDA Experiment at FAIR/GSI — •Tibor Keri for the PANDA-Collaboration — Physics Department, Glasgow, UK

Proton-antiproton annihilation is a unique tool to address fundamental questions of the strong interaction and to explore the structure of the nucleon. The PANDA collaboration proposes to build a state-of-the-art universal detector system to study reactions of anti-protons impinging on a proton or nuclear target internal to the high energy storage ring HESR at the planned FAIR facility at GSI, Darmstadt, Germany. Superior particle identification of charged and neutral particles is mandatory to fulfil PANDA's physics aims. Detectors for particle identification comprise energy measurements in tracking detectors, precision Time-Of-Flight detectors, electromagnetic calorimeters, muon chambers and Cherenkov detectors based on the focussing DIRC principle or on the time-of-propagation principle. The central detector will feature a barrel DIRC covering the central region and a novel disc DIRC providing particle identification apabilities in the forward region. Both DIRC systems will benefit from recent advances in detector technology aiming for a 3D DIRC design. The technical design and the current status of the development for the disc DIRC detector will be presented.

HK 18.3 Mo 17:00 H-ZO 80

The Disc DIRC Cherenkov Detektor at PANDA — •Benno Kröck, Avetik Hayrapetyan, Irina Brodski, Klaus Föhl, Marko Zühlsdorf, Michael Düren, Michael Sporleder, Oliver Merle, Peter Koch, and Peter Schönmeier — II. Physikalisches Institut, Universität Gießen, Gießen, Germany

In the PANDA experiment at FAIR a disc DIRC will provide particle identification in the forward region to cover polar angles between 5 and 22°. Two designs exist. One concept uses two space coordinates to measure the Cherenkov angle while the second one uses one space coordinate and the time of propagation (ToP) of the Cherenkov photons. The ToP design requires fast photon detectors on the ≈ 40 ps level. Dispersion causes different propagation times for different wavelengths and has to be considered. Dichroic mirrors are used to reduce dispersion effects by splitting the Cherenkov spektrum into two or more ranges. The performance of the new detector concept has been evaluated by Monte Carlo simulations and reconstruction studies.

HK 18.4 Mo 17:15 H-ZO 80

Multianoden-Microchannelplate-Photomultiplier für den PANDA-DIRC — •Alexander Britting, Wolfgang Eyrich, Albert Lehmann, Andreas Teufel und Fred Uhlig für die PANDA-Kollaboration — Physikalisches Institut IV, Universität Erlangen-Nürnberg

Für den geplanten PANDA-Detektor des neuen FAIR-Komplexes an der GSI in Darmstadt soll die Teilchenidentifikation von Pionen und Kaonen im wesentlichen durch DIRC-Detektoren (Detection of Internally Reflected Cherenkov Light) erfolgen. Dabei wird der entstehende Cherenkov-Kegel im Medium genutzt und mit Hilfe von Totalreflektion zu den Photosensoren geleitet.

Mit der für den Barrel-DIRC vorgesehenen Abbildungsoptik ist eine Ortsauflösung von ca. 5mm notwendig, um den Cherenkov-Kegel gut zu rekonstruieren. Da sich die Bildebene innerhalb des PANDA-Solenoiden befinden soll, werden ortsauflösende Photomultiplier zur Auslese benötigt, die im Magnetfeld funktionieren. Außerdem soll eine Zeitauflösung von besser als 100 ps erreicht werden, um dispersive Effekte im Radiator zu korrigieren. Als Kandidaten werden großflächige Multianoden-Microchannelplate-Photomultiplier (MCP-PMTs) untersucht. Die Messergebnisse, speziell hinsichtlich Uniformität und Crosstalk-Verhalten der einzelnen Pixel, werden für verschiedene Modelle präsentiert und verglichen.

- Gefördert durch BMBF und GSI -

HK 18.5 Mo 17:30 H-ZO 80

Untersuchung von Microchannel-Plate Photomultipliern für den PANDA DIRC — •Fred Uhlig, Alexander Britting, Wolfgang Eyrich, Albert Lehmann und Andreas Teufel für die PANDA-Kollaboration — Physikalisches Institut IV,Universität Erlangen-Nürnberg

Für das PANDA-Experiment am HESR/FAIR-Komplex der GSI in Darmstadt ist der Einsatz eines DIRC (Detection of Internally Reflected Light) Detektors zur Teilchenidentifikation geplant. Dazu werden die Öffnungswinkel des beim Durchlauf eines relativistischen Teilchens durch einen Radiator emittierten Cherenkov-Kegels bestimmt. Zur Rekonstruktion des Winkels sind zwei Koordinaten notwendig, X-Y oder X-ToP (Time-of-Propagation). Die X-ToP Variante ist eine der Optionen für den Scheiben-DIRC. Für diese Option sind Sensoren notwendig, die eine sehr gute Zeitauflösung von <50 ps für einzelne Photonen in hohen Magnetfeldern bis 2 Tesla erreichen. Außerdem werden niedrige Dunkelzählraten, eine hohe Ratenstabilität und eine lange Lebensdauer verlangt. Bisher gibt es keinen idealen Photosensor, der diese Anforderungen vollständig erfüllt. Als aussichtsreiche Kandidaten werden zur Zeit verschiedenen Modelle von Microchannel-Plate Photomultipliern (MCP-PMTs) untersucht. Unsere neuesten Ergebnisse werden vorgestellt. Ein besonders vielversprechendes Modell von Hamamatsu (R10754-00-L4) wurde speziell für die Anforderungen eines ToP-DIRC für den Belle-Upgrade entwickelt. Die Eigenschaften dieses neuen Multianodensensors wurden im Detail untersucht und werden ebenfalls präsentiert. - Gefördert durch BMBF und GSI-

HK 18.6 Mo 17:45 H-ZO 80

First Test Experiment with a PANDA Disk DIRC Prototype Detector (ToP-design) — •Peter Koch, Irina Brodski, Michael Düren, Klaus Föhl, Avetik Hayrapetian, Benno Kröck, Oliver Merle, Peter Schönmeier, Michael Sporleder, and Marko Zühlsdorf — II. Physikalisches Institut, Universität Giessen, Germany

The Disk DIRC is a forward detector for particle identification in the PANDA experiment at FAIR. It uses the internally reflected Cherenkov light that is emitted by a particle crossing the disk. In the ToP-Design the Time of Propagation of the Cherenkov photons is measured to extract the Cherenkov angle.

A test experiment was done at DESY in Summer 2008 using the 3.5 GeV electron beam. The photons were measured using multichannel plate photomultipliers (MCP-PMTs). The signales were digitized using TDCs with 25 ps resolution. First results are presented.

HK 18.7 Mo 18:00 H-ZO 80

Studies on different MaPMTs for a DIRC detector at the WASA-at-COSY experiment — •Christoph Adolph[1], Jens Bisplinghoff[2], Wolfgang Eyrich[1], Andreas Teufel[1], Cecilia Pizzolotto[1], Adrian Schmidt[1], Christian Vogel[1], Regina Siudak[2], and Kai Ulbrich[2] for the WASA-at-COSY-Collaboration — [1]Physikalisches Institut IV der Universität Erlangen-Nürnberg — [2]Helmholtz Institut für Strahlen- und Kernphysik Universität Bonn

The WASA-at-COSY experiment at the Forschungszentrum Jülich provides a nearly 4π detector including a forward spectrometer for studies on $\eta-$ and $\eta'-$meson decays in proton-proton collisions. Simulations have shown that an additional Detector of Internaly Reflected Cherenkov light (DIRC) in front of the Forward Range Hodoscope will significantly increase the particle identification and energy resolution for both the decayed particles and the background. The light generated inside the DIRC radiator is guided under total internal reflection towards the edge of the radiator where it is focused on a photon readout system by a special optic. For the reconstruction of the Cherenkov angle the photon readout system needs a good spatial resolution. This can be achieved by multi-anode photomultipliers (MaPMT). We report on studies of the characteristics of different MaPMTs (Hamamatsu Type H8500C, H9500 and H6568) and on results from a first test of a DIRC prototype at COSY.

supported by German BMBF and Forschungszentrum Jülich

HK 18.8 Mo 18:15 H-ZO 80

Studies on suface quality of PlexiGlas for a DIRC detector at the WASA-at-COSY experiment — •Adrian Schmidt[1], Christoph Adolph[1], Jens Bisplinghoff[2], Wolfgang Eyrich[1], Andreas Teufel[1], Cecilia Pizzolotto[1], Christian Vogel[1], Regina Siudak[2], and Kai Ulbrich[2] for the WASA-at-COSY-Collaboration — [1]Physikalisches Institut IV der Universität Erlangen-Nürnberg — [2]Helmholtz Institut für Strahlen- und Kernphysik Universität Bonn

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supported by German BMBF and Forschungszentrum Jülich

HK 18.9 Mo 18:30 H-ZO 80

Prototyping a Focussing Lightguide Disc DIRC at WASA for PANDA — •Klaus Föhl, Irina Brodski, Michael Düren, Avetik Hayrapetyan, Benno Kröck, Peter Koch, Oliver Merle, Michael Sporleder, Hasko Stenzel, and M. Zühlsdorf — II. Physikalisches Institut, Universität Giessen, Heinrich-Buff-Ring 16, D-35392 Giessen

For the future PANDA experiment at the FAIR laboratory particle identification is a crucial capability, and the space constraints favour the use of compact DIRC detectors. For the Endcap area in the PANDA Target Spectrometer a novel Focussing Lightguides Disc DIRC is being investigated. The talk will focus on how a prototype could be placed into the existing WASA experiment at COSY, which would inprove the WASA energy resolution for high-energy particles as well as provide proof-of-concept for the PANDA DIRC detector developments.

HK 18.10 Mo 18:45 H-ZO 80

Development of a RICH detector for CBM — •Claudia Hoehne for the CBM-Collaboration — GSI, Darmstadt, Germany

The Compressed Baryonic Matter (CBM) experiment at the Facility for Antiproton and Ion Research (FAIR) at Darmstadt will be a dedicated heavy-ion experiment exploring the intermediate range of the QCD phase diagram with $A + A$ collisions from 10-45 AGeV beam energy. A key observable of the physics program is a precise measurement of low-mass vector mesons and charmonium in their leptonic decay channel. In CBM, electrons will be identified using a gaseous RICH detector combined with several TRD detectors positioned after a system of silicon tracking stations which are located inside a magnetic dipole field.

The concept of the RICH detector, results on R&D as well as feasibility studies in terms of electron efficiency, pion suppression and the invariant mass distributions of low-mass vector mesons and charmonium will be presented. For the RICH detector CO_2 is foreseen as radiator gas. Glass mirrors covered with a reflective Al+MgF_2 coating are developed in cooperation with industry. As photodetector we plan to use MAPMTs coupled to fast, self triggered readout electronics. The usage of wavelengthshifter films is reinvestigated in order to increase the photon conversion efficiency for wavelengths below 300 nm.