HK 44: Instrumentation XII

Zeit: Mittwoch 16:30–18:15 Raum: S1/01 A2

Gruppenbericht HK 44.1 Mi 16:30 S1/01 A2

The Transition Radiation Detector of the CBM Experiment at FAIR — •Cyrano Bergmann — Institut für Kernphysik WWU, Münster, Deutschland

The Compressed Baryonic Matter (CBM) experiment is a fixed target heavy-ion experiment at the future FAIR accelerator facility. The CBM Transition Radiation Detector (TRD) is one of the key detectors to provide electron identification above momenta of 1 GeV/c and charged particle tracking. Due its capability to identify charged particles via their specific energy loss, the TRD in addition will provide valuable information for the measurement of fragments. These requirements can be fulfilled with a $XeCO_2$ based Multi-Wire Proportional Counter (MWPC) detector in combination with an adequate radiator. The default MWPC is composed of a symmetric amplification area of 7 mm thickness, followed by a 5 mm drift region to enhance the TR-photon absorption probability in the active gas volume. This geometry provides also efficient and fast signal creation, as well as read-out, of the order of 200 μs per charged particle track. The performance of this detector is maximized by reducing the material budget between the radiator and gas volume to a minimum. The full detector at SIS100 will be composed of 200 modules in 2 sizes. To limit cost and production time the number of various module types is limited to 6 types and 4 types of Front End Board (FEB) flavors are required.

An overview of the design and performance of the TRD detector will be given.

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HK 44.2 Mi 17:00 S1/01 A2

Detector performance tests for the CBM TRD — •Martin Kohn — Institut für Kernphysik, WWU Münster, Deutschland

The Compressed Baryonic Matter (CBM) experiment is a fixed target heavy-ion experiment at the future FAIR accelerator facility. The CBM Transition Radiation Detector (TRD) is one of the key detectors to provide electron identification and charged particle tracking. With the construction phase of the detector nearing, we will present results of the detector obtained with a close to final prototype. These results were achieved in measurements at CERN PS in 2014 and SPS in 2015.

HK 44.3 Mi 17:15 S1/01 A2

Design and Test of the Real Size Prototypes for the CBM-TRD in Frankfurt — •milad tanha for the CBM-Collaboration — Institut für Kernphysik, Frankfurt, Germany

The Compressed Baryonic Matter (CBM) experiment is planned to explore the QCD phase diagram in the region of high net-baryon densities using high-energy nucleus-nucleus collisions at the Facility for Antiproton and Ion Research (FAIR) in Darmstadt. The Transition Radiation Detector (TRD) will be used to track charged particle and identify electrons.

At the Institute for Nuclear Physics in Frankfurt (IKF), we design, develop and test real size TRD prototypes with different thicknesses and structures e.g. alternating wire-planes. In this talk, we will present the research and development of TRD prototypes and using realistic readout chain. We will show some results from tests at the CERN-PS and the corresponding results (e.g. pad response function and rate stability of the chamber) will be discussed.

HK 44.4 Mi 17:30 S1/01 A2

A fast high-voltage current-peak detection system for the ALICE Transition Radiation Detector — •Robert Verclas for the ALICE-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg

During LHC operation in run 1, the gaseous detectors of ALICE occasionally experienced simultaneous trips in their high voltage which affected the majority of the high voltage channels. These trips are caused by large anode currents in the detector and are potentially related to LHC machine operations. We developed and installed a fast current-peak detection system for the ALICE Transition Radiation Detector. This system is based on FPGA technology and monitors 144 out 522 high voltage channels minimally invasively at a maximum readout rate of 2 MHz. It is an integral part of the LHC beam monitoring system. We report on the latest status.

HK 44.5 Mi 17:45 S1/01 A2

Electron identification performance of the now completely installed ALICE TRD and its potential for J/ψ measurements in Run 2 — •Pascal Dillenseger, Christoph Blume, and Julian Book for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The study of J/ψ production in ultrarelativistic heavy-ion collisions provides information about deconfinement in matter under extreme conditions. The ALICE experiment at the LHC is able to measure the e^+e^- J/ψ decay channel at mid-rapidity ($|y| < 0.9$) and down to $p_{\mathrm{T}} = 0$. One of the main challenges in this channel is the hadronic background in the sample of electron candidates. The excellent PID performance of ALICE during Run 1, mainly by the measurement of dE/dx in the large TPC, will be further improved by the Transition Radiation Detector (TRD) in Run 2, which has recently started. This has become possible after the completion of the TRD during the Long Shutdown 1. In this presentation, the PID methods and the performance of the full TRD and its impact on the J/ψ measurement in Run 2 will be discussed.

HK 44.6 Mi 18:00 S1/01 A2

Bau eines Teststandes für MAPMT-Serientests* — •Jörg Förtsch für die CBM-Kollaboration — Bergische Universität Wuppertal

Eine wesentliche Komponente des CBM-Detektors am FAIR ist ein Ring-abbildender Cherenkov-Detektor (RICH). Im RICH-Detektor sollen die Cherenkov-Photonen ortsaufgelöst mittels MAPMTs des Typs HAMAMATSU H12700-03 detektiert werden. Diese MAPMTs verbinden einen klar differenzierbaren Single-Photon-Peak (PV ca. 1.5:1) mit einer guten Effizienz im UV-Bereich (QE @300nm ca. 30%). Die insgesamt 1000 MAPMTs müssen zur späteren bestmöglichen Positionierung auf der Detektorfläche charakterisiert werden. Hierzu wird ein dedizierter Teststand aufgebaut, mit dem mittels positionsaufgelöster Beleuchtung der MAPMTs mit "einzelnen" Photonen verschiedene Eigenschaften der MAPMTs untersucht werden können. Die Kombination aus einem LED-Pulser, einer selbstgetriggerter Datenauslese (mittels eines nXYter ASIC) und einem automatisierten XY-Tisch erlaubt eine Erfassung vieler Charakteristika in nur einem Messdurchlauf. Zu diesen Messgrößen gehören z.B. Verstärkung (pro Pixel), effiziente Fläche, Dunkelrate und Afterpulsing. Weitere Messungen, die unabhängig von diesem Teststand durchgeführt werden sollen, umfassen sowohl die Quanteneffizienz als auch den Dunkelstrom der Photokathode. Der Aufbau, die Charakteristika und erste Ergebnisse werden in diesem Vortrag dargestellt.

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