HK 21: Instrumentation 7

Time: Tuesday 14:30–16:30 Location: M/HS1

Group Report HK 21.1 Tue 14:30 M/HS1

Der PANDA-Luminositätsdetektor — •Christof Motzko[1,2], Miriam Fritsch[1,2], Florian Feldbauer[1,2], Prometeusz Jasinski[1,2], Anastasia Karavdina[2], Roman Klasen[1,2], Heinrich Leithoff[1,2], Stephan Maldaner[1,2], Mathias Michel[1,2], Stefan Pflüger[1,2] und Tobias Weber[1,2] für die PANDA-Kollaboration — [1]Helmholtz-Institut Mainz — [2]Johannes-Gutenberg Universität Mainz

Das PANDA-Experiment, welches im Antiproton-Speicherring HESR an der Beschleunigeranlage FAIR in Darmstadt stehen wird, ist für Fragen der Hadronenphysik optimiert. Mit dieser Anlage wird es möglich sein, neue Zustände zu entdecken und die Linienform dieser wie auch bereits bekannter Zustände sehr präzise zu vermessen. Zur Normierung der dafür verwendeten Energie-Scan-Messungen wird die Kenntnis der Luminosität benötigt.

Die Luminosität wird bei PANDA anhand der Winkelverteilung der elastischen Antiproton-Proton-Streuung bestimmt. Zur Minimierung der Unsicherheit in der Bestimmung der Luminosität durch Kleinwinkelstreuung und Modellannahmen werden die 4 Sensorebenen des Luminositätsdetektor 11 m strahlabwärts vom Wechselwirkungspunkt nahe der Strahlachse (Polarwinkelbereich 3-8 mrad) im Vakuum platziert. Die Ebenen sind verfahrbar montiert und mit HV-MAPS bestückt, die auf hochwärmeleitenden CVD-Diamantscheiben aufgebracht werden. Angestrebt ist eine absolute Messgenauigkeit von 3 %. Das Konzept des Luminositätsdetektors wird vorgestellt und dabei technische Aspekte wie Vakuumsystem, Kühlung und Elektronik diskutiert.

HK 21.2 Tue 15:00 M/HS1

Quality Assurance of double-sided silicon microstrip sensors for the Silicon Tracking System in the CBM experiment at FAIR — •Pavel Larionov for the CBM-Collaboration — Goethe Universität, Frankfurt

The Silicon Tracking System (STS) is the core tracking detector of the CBM experiment at FAIR. The system's task is to reconstruct the trajectories of the charged particles produced in the beam-target interactions, provide their momentum determination, and enable the detection of decay topologies. The STS will comprise 1220 double-sided silicon microstrip sensors. After production each sensor will go through a number of Quality Assurance procedures to verify their validity for performance in the STS and also to confirm the manufacturer's data. In this talk, results of the quality assurance procedures that are being applied to the latest STS prototype sensors, including detailed tests of the quality of each single strip, long-term stability and preparations for volume tests during series production, will be presented. Supported by HIC for FAIR, HGS-HIRe and H-QM.

HK 21.3 Tue 15:15 M/HS1

Characterization of silicon micro-strip sensors with a pulsed infra-red laser system for the CBM experiment at FAIR — •Pradeep Ghosh[1,2] and Jürgen Eschke[2,3] for the CBM-Collaboration — [1]Goethe University, Frankfurt am Main — [2]GSI Helmholtz Center for Heavy Ion Research GmbH, Darmstadt — [3]Facility for Anti-proton and Ion Research, GmbH, Darmstadt

The Silicon Tracking System (STS) of the CBM experiment at FAIR is composed of 8 tracking stations comprising of 1292 double-sided silicon micro-strip sensors. A Laser Test System (LTS) has been developed for the quality assurance of prototype sensors. The aim is to scan sensors with a pulsed infra-red laser driven by step motor to determine the charge sharing in-between strips and to measure qualitative uniformity of the sensor response over the whole active area. Several prototype sensors with strip pitch of 50 and 58 μm have been tested, as well as a prototype module with realistic mechanical arrangement of sensor and read-out cables. The LTS is designed to measure sensor response in an automatized procedure across the sensor with focused laser beam (spot-size $\approx$ 12 μm , wavelength = 1060 nm). The pulse with duration ($\approx$ 10 ns) and power ($\approx$ 5 mW) of the laser pulses is selected such, that the absorption of the laser light in the 300 μm thick silicon sensors produces a number of about 24000 electrons, which is similar to the charge created by minimum ionizing particles (MIP) in these sensors. Results from laser scans of prototype sensors and detector module will be reported.

The work is supported by HGS-HIRe, H-QM and HIC-for-FAIR.

HK 21.4 Tue 15:30 M/HS1

Radiation hardness of CMOS Monolithic Active Pixel Sensors manufactured in a 0.18 μm CMOS process* — •Benjamin Linnik for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt

CMOS Monolithic Active Pixels Sensors (MAPS) are considered as the technology of choice for various vertex detectors in particle and heavy-ion physics including the STAR HFT, the upgrade of the ALICE ITS, the future ILC detectors and the CBM experiment at FAIR.

To match the requirements of those detectors, their hardness to radiation is being improved, among others in a joined research activity of the Goethe University Frankfurt and the IPHC Strasbourg.

It was assumed that combining an improved high resistivity ($1 - 8$ kΩcm) sensitive medium with the features of a 0.18 μm CMOS process, is suited to reach substantial improvements in terms of radiation hardness as compared to earlier sensor designs. This strategy was tested with a novel generation of sensor prototypes named MIMOSA-32 and MIMOSA-34. We show results on the radiation hardness of those sensors and discuss its impact on the design of future vertex detectors.

*This work has been supported by BMBF (05P12RFFC7), GSI, HGS-HIRe and HIC for FAIR.

HK 21.5 Tue 15:45 M/HS1

Next generation digitizer for CMOS MAPS — •Philipp Sitzmann für die CBM-MVD-Kollaboration — Goethe-Universtiät Frankfurt

Mit Hilfe des CBM-Experiment an der FAIR Beschleunigeranlage in Darmstadt soll hadronische Materie bei hohen Nettobaryonendicht untersucht werden. Hierzu sollen seltene Sonden wie Open-Charm und Di-Leptonen zum Einsatz kommen. Der Micro-Vertex-Detektor (MVD) von CBM soll den den kombinatorischen Hintergrund für bei der Rekonstruktion dieser Teilchen reduzieren. Die Simulationssoftware für den MVD und die ihm zugrunde liegenden CMOS Monolithic Active Pixel Sensoren wird kontinuierlich verbessert, um einen Test der zu entwickelnden Datenanalyse-Algorithmen zu ermöglichen und die Konsequenzen von Designentscheidungen abzuschätzen. Hierzu wurde ein sehr modularers Softwarepaket entwickelt, welches die Eigenschaften der Sensoren sowie des MVD im Detail darstellt und mit geringem Aufwand an die Fortschritte der Sensor- und Detektorentwicklung angepasst werden kann. Das Modell und erste Ergebnisse werden vorgestellt und diskutiert.

This work has been supported by BMBF (05P12RFFC7), GSI and HIC for FAIR.

HK 21.6 Tue 16:00 M/HS1

Mosaic diamond based detector for MIPs detection, T0 determination and triggering in HADES. — Jerzy Pietraszko and •Wolfgang Koenig for the HADES-Collaboration — GSI Helmholtzzentum für Schwerionenforschung GmbH, Darmstadt

The CVD based diamond detectors were successfully used for HI detection in HADES already in 2001. In the following experiments the polycrystalline diamond material showed very good performance (time resolution below 50 ps sigma) and stable long term operation.

Detection of the minimum ionising particles (MIPs) by means of the diamond detectors is a challenging task mainly because of very small energy deposit in the diamond material. In this case the single crystalline CVD diamond material has to be used which is well known for its excellent charge collection efficiency (almost 100 %) and for its very good timing properties. For pion induced experiments at HADES a large area, segmented, position sensitive, operated in vacuum detector was developed. The construction of the detector will be presented along with the requirements and the obtained performance.

*This work has been supported by BMBF (06 FY 9100 I), HIC for FAIR, EMMI and GSI

HK 21.7 Tue 16:15 M/HS1

A tracking system for a secondary pion beam at the HADES spectrometer — •Joana Wirth[1,2], Laura Fabbietti[1,2], Rafal Lalik[1,2], and Ludwig Maier[1] for the HADES-Collaboration — [1]Physik Deparment of the TUM (E12), Garching — [2]Exellence Cluster "Universe", Garching

For the secondary pion beam campaign with the HADES spectrometer at GSI, Darmstadt, a beam tracking system has been developed, in order to achieve the momentum measurement of each individual pion with a momentum resolution below 0.5%. A primary Nitrogen beam impacting on a Beryllium production target produces a secondary pion beam strongly defocused in position and momentum, which is transported along the chicane to the experimental area. The overall spread in momentum is only limited by the beamline acceptance, leading to momentum offsets up to 8% of the central beam momentum.

The system is based on two tracking stations consisting each of a double-sided silicon strip detector read out by the self-triggered n-XYTER ASCI chip, completed by the TRB3 board on which the trigger logic is implemented.

In this talk we are showing the performance of our beam detectors during the proton test beam of 1.9 GeV in the terms of the momentum reconstruction of known momentum, set by the accelerator, as well as the recent result accomplished throughout the pion beam campaign.

* supported by BMBF 05P12WOGHH and Excellence Cluster "Universe"