# HK 57: Instrumentierung XI

Zeit: Donnerstag 16:30–19:00 Raum: HG VIII

**Gruppenbericht** HK 57.1 Do 16:30 HG VIII

**Status of the CBM Micro Vertex Detector*** — •Michael Deveaux for the CBM-MVD-Collaboration — Institut für Kernphysik, Goethe Universität Frankfurt am Main

The CBM-Experiment will study the phase diagram of hadronic matter in the region of highest baryonic densities. For a first time in this energy regime, the hot and dense fireball will be investigated with a broad set of probes, among them open charm. Separating those rare particles from the rich background formed in the 10-40 AGeV heavy ion collisions calls for a micro vertex detector (MVD) with a unprecedented performance in terms of spatial resolution (few $\mu$m), low material budget ($\lesssim 0.3\ X_0$), high radiation hardness and outstanding rate capability.

We will show the concept of this detector, which will presumably base on CMOS-Monolithic Active Pixel Sensors, and discuss our achievements in the fields of detector integration and sensor R&D.
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HK 57.2 Do 17:00 HG VIII

**Beam tests with first prototypes of the CBM Silicon Tracking System.** — •Anton Lymanets for the CBM-Collaboration — FIAS, University of Frankfurt, Germany

The CBM experiment will explore the QCD phase diagram at high net baryon densities and moderate temperatures. Its key component - the silicon tracking system STS - will reconstruct the trajectories of all charged particles created in collisions of heavy ions with a nuclear target, at typical beam energies of 25 GeV/nucleon. The fast readout required for CBM's high interaction rates of up to 10 MHz will be based on self-triggering front-end electronics.

We constructed a beam telescope consisting of 3 stations with CBM microstrip test detectors. In each tracking station, the 2 × 256 orthogonal strips of 50 $\mu$m pitch are read out with 4 self-triggering n-XYTER front-end chips. The telescope was tested at GSI in a 2 GeV proton beam and provided tracking information to further CBM detector prototype systems (GEM and RICH) operated in the same experiment. Results from the in-beam test and complementary calibrations will be presented, including the performance of the self-triggering chip, its baseline stabilization, and signal-to noise measurements.

* Supported by EU-FP7 HadronPhysics2

HK 57.3 Do 17:15 HG VIII

**Systematische Studien zur Optimierung des PANDA-Luminositätsmonitorsystems** — •Mathias Michel, Achim Denig und Miriam Fritsch für die PANDA-Kollaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

Die Luminosität des PANDA-Experimentes am geplanten Antiprotonenbeschleuniger HESR (FAIR, Darmstadt) soll mit Hilfe der elastischen Antiproton-Proton-Streuung bei extremen Vorwärtswinkeln (3-8 mrad) gemessen werden. Hierbei wird ausgenutzt, dass die elastische Streuung im Bereich sehr kleiner Impulsüberträge und damit kleiner Streuwinkel exakt berechnet werden kann und nicht auf Messungen basiert, die im Impulsbereich von PANDA nur unzureichend vorliegen. Die Messung des Winkels der gestreuten Antiprotonen wird mit vier Lagen Silizium-Mikrostreifendetektoren durchgeführt.

Für die Kenntnis der Luminosität im Bereich weniger Prozent ist neben der theoretischen Rechnung der Einfluss verschiedener Parameter wie Detektordicke, Streifenabstand, Coulomb-Streuung, Rauschen und Rekonstruktion maßgebend. Der Einfluss der einzelnen Parameter auf die zu erwartende Auflösung wurde anhand von Monte-Carlo-Simulationen untersucht und wird vorgestellt.

gefördert durch HGF und BMBF

HK 57.4 Do 17:30 HG VIII

**Performance Studies of the PANDA Luminosity Monitor** — •Tsitohaina Randriamalala, James Ritman, Tobias Stockmanns, and Huagen Xu for the PANDA-Collaboration — Institute für Kernphysik, Forchungszentrum Jülich, Germany.

One of the main goals of the PANDA experiment at the FAIR facility is to measure the width of charmonium states with unprecedented precision by doing resonance scans of formation reactions in antiproton-proton annihilation. A good luminosity monitoring is crucial for this. Our studies are focused on monitoring the luminosity via the measurement of Coulomb scattering at small polar angles. As a consequence, the corresponding telescope is designed to have an angular acceptance of 3 to 8 mrad and will use high resolution silicon strip sensors. An overview of the basic concept and Monte Carlo based performance studies within the PANDARoot framework will be described. Simulations have been done for a prototype detector consisting of 4 planes of double-sided silicon strips, each consisting of 4 wafers of (2x5x0.03)cm with 50micron pitch arranged radially to the beam axis situated at about 10.5m. The influence of the beam and target sizes, and the beam emittance on the measurement will be also presented.

Supported in part by DAAD and FZ-Juelich

HK 57.5 Do 17:45 HG VIII

**Stimulated recovery of radiation damage of PWO-II crystals** — •Till Kuske, Valera Dormenev, and Rainer Novotny — II. Physikalisches Institut JLU Giessen

To receive and maintain sufficient energy resolution the electromagnetic target calorimeter of PANDA at the FAIR facility will rely on the stabile operation of the new generation lead tungstate scintillation crystals (PWO-II) at the temperature of T= -25 °C. During operation the performance will continuously degrade due to accumulating radiation damage. Therefore, the radiation hardness of the crystals is a crucial factor. Recent investigations have shown that the radiation damage imposed by $\gamma$-rays can be significantly cured applying the mechanism of stimulated recovery, which was observed for the first time for $PbWO_4$. This rather fast recovery method is based on the illumination of the crystal with photons in a wide spectral range even using infrared light up to 1400nm wavelength. The stimulated recovery could be applied in parrallel to compensate the damaging process since the proposed photosensors would not be sensitive to the external light. The ongoing tests have shown very promising results at room and low temperatures. Ongoing studies focus on the understanding of the mechanism and are elaborating a concept for the future implementation into the calorimeter. The report will give an overview of the obtained results. The work supported by BMBF and GSI.

HK 57.6 Do 18:00 HG VIII

**Performance of the Performance of the PROTO60 - Prototype for the PANDA Barrel EMC** — •Daniel Bremer, Peter Drexler, Markus Moritz, and Rainer Novotny — II. Physikalisches Institut, Universität Giessen

The electromagnetic calorimeter of the PANDA target spectrometer is one of the central detector components to achieve the proposed physical goals, inparticular due to the expected performance and efficiency for photons and electrons over a extremely wide energy range. Beside a good energy resolution of the device based on lead tungstate, it is necessary as well to achieve a sufficient position and time information. Therefore, detailed tests of prototypes are necessary. The talk will present the excellent results of a test performed at the tagged photon facility of MAMI Mainz with the prototype PROTO60, which represents a subsection of the barrel detector and consists of a 6 × 10 matrix of tapered crystals. A tagged photon beam with energies between 0.15 GeV and 1.4 GeV was used impinging at different beam position. The report describes the analysis procedure, including the calibration with cosmic muons, algorithms for position reconstruction and applied corrections. It finally summarizes the achieved results with respect to energy, position and time resolution.

HK 57.7 Do 18:15 HG VIII

**Aufbau der Triggerfähigkeit für das Crystal-Barrel-Kalorimeter mit einer neuen APD-Auslese** — •Christian Honisch für die CBELSA/TAPS-Kollaboration — HISKP, Universität Bonn, Nussallee 14-16 53115 Bonn

Am CBELSA/TAPS-Experiment werden durch Photoproduktion Doppelpolarisationsobservablen im Rahmen der Baryonenspektroskopie gemessen sowie Eigenschaften von Mesonen untersucht.

Um das Messprogramm auf vollständig neutrale Reaktionen erweitern zu können, wird das Hauptkalorimeter durch einen Umbau in den Primär-Trigger eingebunden. Dadurch lässt sich die Sensitivität des Triggers auf neutrale Teilchen auf bis zu 96% des Raumwinkels ausdehnen.

Um eine Triggerschwelle eines Energieeintrags von 10 MeV pro

CsI(Tl)-Kristall mit einer hinreichend kurzen Latenz zu erreichen, wird die bestehende PIN-Photodioden-Auslese des Kalorimeters durch eine Avalanche-Photodioden-Auslese (APD) ersetzt.

Für einzelne Kristalle des Kalorimeters wurden Prototypen mit unterschiedlichen APDs aufgebaut, verschiedene Ankopplungsmethoden getestet und mit einer Photomultiplier-Auslese sowie mit einer PIN-Photodiodenauslese verglichen.

Die hier erreichbare Latenz und Zeitauflösung sowie die Energieauflösung der APD-Auslese wurde gemessen.

Dieser Vortrag stellt die Ergebnisse dieser Untersuchungen vor.

Gefördert durch die Deutsche Forschungsgemeinschaft (SFB/TR 16).

HK 57.8 Do 18:30 HG VIII

**Performance studies of the CBM Silicon Tracking System** — •Anna Kotynia for the CBM-Collaboration — GSI Darmstadt

One of the most challenging fields of modern high-energy physics is exploration of the phase diagram of strongly interacting matter. In order to study the dynamics of phase diagram at high net baryon densities, the CBM experiment will be performed with high-energy nucleus-nucleus collisions. Efficient charged particle tracking and high momentum resolution is one of the central performance requirements for the CBM Silicon Tracking System (STS). The aim of ongoing layout studies is to design a highly granular and low mass detector system that can track the 1000 charged particles that are typically generated in Au+Au collisions at 25 GeV/u projectile energy. A low mass detector is required to achieve a momentum resolution down to 1%. The STS layout comprises eight detector stations fully based on micro-strip detectors. The stations have a ladder structure and are build of 300 $\mu$m thick double-sided silicon micro-strip sensors with horizontal size of 6 cm and a strip pitch of 60 $\mu$m. The strip length was matched to a maximum occupancy of less than 5% and results in a vertical size of one sensor from 2 to 18 cm.

We will present the concept of STS geometry, tools used for simulation of realistic detector responce together with discussion about results of such simulations.

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HK 57.9 Do 18:45 HG VIII

**Testmessungen für einen Spurdetektor für das Crystal-Barrel-Experiment an ELSA** — •Alexander Winnebeck für die GEM-TPC-Kollaboration — HISKP Universität Bonn, Nussallee 14-16, D-53115 Bonn

Das Crystal-Barrel-Experiment an ELSA betreibt Baryonenspektroskopie mittels Meson-Photoproduktion. Das derzeitige Detektorsystem ist optimal geeignet zum Nachweis von Photonen, welche beim Zerfall von neutralen Mesonen wie dem $\pi^0$- und dem $\eta$-Meson entstehen.
Dieser Vortrag wird das Potential des Crystal-Barrel-Experiments mit integriertem Spurdetektor zeigen. Ferner wird der Stand der Implementierung eines solchen Detektors sowie Ergebnisse von Testmessungen einer Prototyp-TPC an einem Elektronenstrahl vorgestellt.
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