HK 7: Instrumentation III

Zeit: Montag 14:00–15:30 Raum: HZO 90

Gruppenbericht HK 7.1 Mo 14:00 HZO 90

Status of the open charm physics program of NA61/SHINE* — •Michael Deveaux for the NA61/SHINE-Collaboration — Goethe Universität Frankfurt am Main

NA61/SHINE aims to study the production of open charm in A+A collision systems at high CERN SPS energies. To do so, the experiment was upgraded with the so-called Small Acceptance Vertex Detector (SAVD). The SAVD consists of four layers of 50 μm thin MIMOSA-26 CMOS sensors and incorporates the electronics of the prototype of the CBM Micro Vertex Detector and the thin carbon fibre ladders developed for the ALICE ITS. The detector was operated successfully during the regular Xe+La data taking of NA61/SHINE in 2017.

We discuss the detector performance and show preliminary results on D^0 relying on data from a 150A GeV/c Pb+Pb commissioning run carried out in December 2016. Moreover, we give an outlook toward the construction of a full, Large Acceptance Vertex Detector (LAVD).

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HK 7.2 Mo 14:30 HZO 90

Optimierung der Betriebseinstellungen des MuPix7-Sensorprototyps — •René Hagdorn für die Mu3e-Kollaboration — Universität Heidelberg, Physikalisches Institut, jetzt an der Ruhr-Universität Bochum, Institut für Experimentalphysik I

Das Mu3e-Experiment wird mit einer Sensitivität von einem in 10^{16} Myonzerfällen nach dem im Standardmodell untersagten leptonfamilienzahlverletzenden Prozess $\mu^+ \to e^+e^-e^+$ suchen. Ein beobachtetes Signal wäre ein klarer Hinweis auf Neue Physik. Um Streueffekte im Detektor gering zu halten, soll der Spurdetektor aus 50 μm dünnen Siliziumpixelsensoren basierend auf dem Konzept der hochspannungsbetriebenen monolithischen aktiven Pixelsensoren (HV-MAPS) bestehen. Die vorgesehene Heliumgaskühlung des Detektors ist auf eine maximale Kühlleistung von 400 mW/cm^2 ausgelegt, was den erlaubten Energieverbrauch der Sensoren limitiert.

Die Betriebseinstellungen des MuPix7-Sensorprototyps wurden in Labormessungen systematisch optimiert und während einer Teststrahlkampagne validiert. Es wurde eine optimale Einstellung mit einem Energieverbrauch von ca. 275 mW/cm^2 gefunden, die gleichzeitig einen breiten Arbeitsbereich mit Effizienzen von mehr als 99 % und ein verbessertes Signal-zu-Rausch-Verhältnis gegnüber vorherigen Betriebseinstellungen bietet. Zudem wurde mit dem MuPix7 ein Verfahren entwickelt, mit dem effizienzähnliche Werte in einer Labormessung bestimmt werden können, was die Planung und den Ablauf künftiger Effizienzmessungen während der Strahlzeiten vereinfacht.

HK 7.3 Mo 14:45 HZO 90

Status of the read-out system of the Belle II pixel detector — •Andrei Rabusov, Igor Konorov, Dmytro Levit, Stefan Huber, and Stephan Paul — Technische Universität München

The new experiment Belle II at the SuperKEKB e^+e^- collider at KEK, Tsukuba, Japan will start by late 2018 to continue searches of the New Physics in heavy flavor sector. In comparison to the previous detector Belle the new one is equipped with the pixel detector, which consist of 40 detector modules. The functionality of the pixel detector is studied during Phase II (period from November 2017 to May 2018) using only 4 modules installed inside the detector volume. In this report I present the current status of the Belle II pixel detector read-out system. The report will include the latest read-out scheme and results of Phase II commissioning with the corresponding laboratory tests. I will show in the first time the final version of the system architecture which achieves 20 Gb/s read-out speed test. Additionally, I will present the clustering algorithm based on moving window method, subevent building and the study of the effect on the average event size in case of overlapping triggers of two different data formats used in the read-out system: clustered and zero-suppressed data formats.

HK 7.4 Mo 15:00 HZO 90

Towards an EPICS based Detector Control System for the CBM Micro Vertex Detector — •Philipp Klaus for the CBM-MVD-Collaboration — Goethe-Universität, Frankfurt

The Compressed Baryonic Matter experiment at FAIR (CBM) is a dedicated fix-target experiment designed to explore the QCD phase diagram in the region of high net-baryon density. Operating the CBM Micro Vertex Detector requires a well integrated dedicated Detector Control System (DCS) to guarantee maximum detector performance. The main aspects that require control and monitoring comprise powering, vacuum conditions, the cooling system, the detector positioning, and diagnostic information from the readout/DAQ. The Experimental Physics and Industrial Control System (EPICS) was chosen to implement the DCS. A full-fledged control user interface will be provided in a Control System Studio (CSS) environment, complemented by a monitoring-only real-time web interface.

This constribution will present the status of the MVD DCS excercised with an actual prototype called PRESTO.

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HK 7.5 Mo 15:15 HZO 90

Evaluation of Innovative Cooling Concepts with High-Performance Carbon Materials for Vertex Detectors operated in Vacuum — •Daniela Mijatovic for the CBM-MVD-Collaboration — Goethe-Universität

Operating high-precision vertex detectors in vacuum, like the Micro Vertex Detector (MVD) in the CBM experiment at FAIR, calls for trading off the cooling performance against the material budget to guarantee high-quality tracking performance. Vertex detectors operating in vacuum have to fulfill additional requirements, among them an excellent cooling performance as convective cooling is absent. As a consequence, high-performance, carbon-based materials are used for sensor carriers following the concept of heat conduction to guide the heat dissipated by the sensors to dedicated heat sinks located outside the geometrical detector acceptance. Sensor carrier materials based on pyrolytic graphite (e.g. Thermal Pyrolythic Graphite (TPG)) were systematically characterized. To do so, a standardized vacuum test stands with IR thermography was set up to quantitatively examine the thermal performance of the MVD modules in vacuum.

This contribution presents our work in designing and testing innovative carrier material assemblies to efficiently cool ultra-thin vertex detectors in the context of constructing the Micro-Vertex-Detector of CBM at the future FAIR facility.

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