HK 36: Instrumentation VIII

Time: Wednesday 17:30–19:00 Location: SR Exp1A Chemie

Group Report HK 36.1 Wed 17:30 SR Exp1A Chemie

Status of the CBM Micro Vertex Detector* — •Julio Andary for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt

The Compressed Baryonic Matter (CBM) Experiment will be a core experiment of the future FAIR facility. Its Micro Vertex Detector (MVD) will be composed of four planes, operating in the experiment's target vacuum. The $0.3-0.5\%$ X_0 thin stations will be equipped with Monolithic Active Pixel Sensors MIMOSIS. This sensor is being developed by IPHC Strasbourg and will provide a spatial and temporal precision of 5 μm and 5 μs, respectively, with a peak rate capability of 80 MHz/cm^2.

This contribution will report on the progress made during the concluding phase of R&D. The last prototype full-scale pixel sensors MIMOSIS-2.1 has been successfully validated in several beam tests. Sensors featuring the novel 50 μm epitaxial layer showed very promising results. The sensor and detector integration has been substantially detailed, accompanied by CFD simulations on cooling performance, approaching the final engineering design. Besides the TRB-based stand-alone readout, most relevant for probe testing of the sensors, the CBM-DAQ compatible readout has been prototyped and will be commissioned in the next mCBM beam test, employing the new mMVD detector module. Detector performance simulations have been conducted to further characterize the final detector setup and update the response of the sensors to ionizing particles.

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HK 36.2 Wed 18:00 SR Exp1A Chemie

Silicon Semiconductor Detectors: DPTS and BabyMOSS — •Tim Stellhorn — Institut für Kernphysik, Münster

In my talk, I will shortly present two different types of Monolithic Active Pixel Sensors (MAPS): the Digital Pixel Test Structure (DPTS) and the Monolithic Stitched Sensor (MOSS). Both serve as prototypes for an upgrade of the Inner Tracking System (ITS) in the ALICE detector. In this upgrade, silicon sensors with a thickness of 50 μm and a surface of $26 \cdot 10\,\mathrm{cm}^2$ will be produced by applying the stitching technology. With this thinness, it is possible to bend the sensors into a truly cylindrical shape with a distance of 2 mm around the beam pipe. This will improve the tracking efficiency and pointing resolution of ALICE.

I will discuss different properties such as the efficiency and the fake-hit-rate of both prototypes under various settings as well as the possibilities for particle identification with the DPTS chip. Furthermore, I will present results of testbeams performed with a babyMOSS telescope at PS at CERN and at ELSA in Bonn.

HK 36.3 Wed 18:15 SR Exp1A Chemie

Readout electronics and module design of MADHAT — •Malte Grönbeck for the ALICE Germany-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik — Forschungs- und Technologiezentrum Detektorphysik

The ALICE experiment plans a completely new tracking detector based on silicon MAPS technology manufactored in the 65 nm production node as part of the ALICE 3 upgrade for Long Shutdown 4 of the LHC. The size of the whole active area is planned to be 60 m^2 large, with the Outer Tracker spanning 45 m^2.

To reach the material budget target of less than 1% X_0 per layer, open questions like cooling solutions, mechanical structures and electronics have to be answered. A simple sensor prototype MADHAT (Mechanical Assessment Design for Heat And Thermal solutions), mechanically identical to the final sensor, but with integrated heating elements and temperature probes, was developed to study the temperature distribution in the final detector assembly and to assess different mechanical designs of the circuit board that houses the sensor.

This talk will present the readout electronics of MADHAT and discuss different design options of a module prototype for the ALICE 3 Outer Tracker.

This work is supported by BMBF.

HK 36.4 Wed 18:30 SR Exp1A Chemie

Readout Electronics for the Micro Vertex Detector of the PANDA Experiment — •Marvin Peter[1], Kai-Thomas Brinkmann[1], Hans-Georg Zaunick[1], Raphael Ratz[1], Nils Tröll[1], Michele Caselle[2], Giovanni Mazza[3], and Daniela Calvo[3] for the PANDA-Collaboration — [1]II. Physikalisches Institut, Justus-Liebig-Universität Giessen — [2]Karlsruhe Institute of Technology — [3]Istituto Nazionale di Fisica Nucleare - Sezione di Torino

The Micro-Vertex-Detector (MVD) is a tracking detector at the center of the PANDA experiment, closest to the interaction point. To read out the strip sensors of the MVD, the Torino Amplifier for silicon Strip detectors (ToASt) ASIC was developed by INFN in Turin. This chip provides 64-channel self-triggered readout based on the Time-over-Threshold principle. This presentation will provide an overview of the MVD's current status, with an emphasis on the integration of the ASIC with the sensors, the progress in the overall readout system development, and results from recent beam time measurements. Additionally, we will highlight the latest advancements in the characterization of the ASIC. *Supported by BMBF.*

HK 36.5 Wed 18:45 SR Exp1A Chemie

Investigating bent MAPS sensors — •Berkin Ulukutlu for the ALICE Germany-Collaboration — Technische Universität München, Munich, Germany

The ALICE experiment at CERN is upgrading its Inner Tracking System (ITS) as part of the ITS3 project, which replaces the innermost tracking layers with wafer-scale, cylindrically bent Monolithic Active Pixel Sensors (MAPS). The implementation of bent silicon detectors at this scale is unprecedented and requires extensive R&D to address challenges associated with the geometry. This presentation will focus on studies of the effects of bending on sensor performance, carried out using bent ALPIDE sensors currently deployed in the ITS2. Laboratory and test beam measurements confirm that sensor bending does not degrade tracking performance. Studies of charge-sharing behavior and alignment strategies further support the feasibility of using bent detectors in high-energy and nuclear physics applications. Furthermore, the ongoing development of a beam telescope featuring babyMOSS sensors, prototype sensors produced for ITS3 in 65 nm technology, in a bent configuration, will also be presented.

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