HK 34: Instrumentation X

Time: Wednesday 15:45–17:15 Location: SCH/A251

Group Report HK 34.1 Wed 15:45 SCH/A251

Status of the CBM Micro Vertex Detector* — •Benedict Arnoldi-Meadows for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt am Main

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 stations, operating in the experiment's target vacuum. The $0.3 - 0.5\%$ X_0 thin stations will be equipped with 50 μm thin, highly granular Monolithic Active Pixel Sensors called MIMOSIS. MIMOSIS 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.

The first full-size prototype MIMOSIS-1 was intensely tested for in-beam performance, radiation tolerance and robustness to Single Event Effects. The results of the tests will be summarized and the implications for the next and final prototype MIMOSIS-2, which has been submitted, will be discussed. Moreover, a status of the efforts with regard to integration and cooling in vacuum towards the final MVD will be given.

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HK 34.2 Wed 16:15 SCH/A251

Characterization of APTS, a MAPS prototype fabricated in 65 nm CMOS technology for the ALICE ITS3 upgrade — •David Schledewitz for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg — GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt — European Organization for Nuclear Research (CERN), Geneva, Switzerland

For the next detector upgrade of the ALICE experiment, an extensive R&D program is carried out for the vertex detector to minimize the material budget and reduce the distance to the interaction point. From the currently installed ALICE Inner Tracking System (ITS2), the innermost three out of the seven layers of Monolithic Active Pixel sensors (MAPS) will be replaced. The proposed upgrade (ITS3) is based on curved, wafer-scale, ultra-thin silicon MAPS with a truly cylindrical geometry. The foreseen technology for this upgrade is the 65 nm CMOS imaging process by TowerJazz Panasonic Semiconductor Company, allowing the production of wafer-scale pixel sensors on 300 mm diameter wafers using stitching.

One of the current prototypes to evaluate the detection performance and radiation hardness of the technology is the Analog Pixel Test Structure (APTS). In particular, a set of 4 x 4 pixel matrices with parallel, analog readout realized in various geometries are used to characterize the parameter space of the technology. This contribution intends to provide an overview of the APTS, covering performance results from testbeam campaigns and laboratory measurements.

HK 34.3 Wed 16:30 SCH/A251

Characterisation of irradiated Digital Pixel Test Structures produced in 65 nm TPSCo CMOS process — •Pascal Becht for the ALICE Germany-Collaboration — Physikalisches Institut Universität Heidelberg

The future upgraded ALICE Inner Tracking System (ITS3) features wafer-scale, ultra-thin and truly cylindrical Monolithic Active Pixel Sensors (MAPS) as its innermost three layers around the beampipe. New sensors for this effort are intended to be produced in 65 nm CMOS technology in order to benefit from the smaller feature size and the larger commercially available wafers.

With the goal of qualifying this technology for the application in MAPS, an extensive R&D programme is ongoing. In view of a new pixel sensor for the ITS3, a Digital Pixel Test Structure (DPTS) has been designed and produced. Multiple of these prototypes are characterized in laboratory measurements and beam test campaigns at DESY and CERN. In order to evaluate the effects of radiation damage, some sensors have been neutron irradiated to different levels ranging from 10^{13} 1 MeV $\mathrm{n_{eq}cm^{-2}}$ to 10^{16} 1 MeV $\mathrm{n_{eq}cm^{-2}}$. Furthermore, several prototypes have been subject to an X-ray source and thereby received doses up to 100 kGy.

Detection efficiency and position resolution of the DPTS sensors are presented to characterize their performance. The outcome of these studies demonstrates the feasibility of the 65 nm CMOS technology for the application in future MAPS-based detectors.

HK 34.4 Wed 16:45 SCH/A251

ALPIDE Monolitic Active Pixel Sensors at GSI — •Martin Bajzek[1,2], Oleg Kiselev[1], Ivan Mukha[1], Christoph Scheidenberger[1,2], Luke Rose[3], Bastian Löher[1], and Andrea Jedele[1,4] for the R3B-Collaboration — [1]GSI, Darmstadt, Germany — [2]JLU, Gießen, Germany — [3]University of York, York, United Kingdom — [4]TU Darmstadt, Darmstadt, Germany

Precise particle tracking is important for complete kinematic reconstruction which gives insight into decay modes, cross-sections and excited states of exotic particles. In particular, tracking is important for the purpose of in-flight decay spectroscopy and particle identification.

We discuss the results of the on-going integration and adaptation of the ALPIDE Monolitic Active Pixel Sensors to be used for vertex reconstruction and tracking of charged particles in nuclear physics experiment at R3B and Super-FRS EC at GSI. This work was supported by GSI Erasmus scholarship.

HK 34.5 Wed 17:00 SCH/A251

Simulation studies for the Forward Conversion Tracker of ALICE 3 in run 5 — •Casper van Veen for the ALICE Germany-Collaboration — Physikalisches Institut Heidelberg, Heidelberg, Germany

During the Long Shutdown 4 of the LHC (LS4), the ALICE experiment will be upgraded to ALICE 3. Along with an advanced silicon-based tracking system placed closer to the interaction point, ALICE 3 will also come equipped with a Forward Conversion Tracker (FCT) which will measure the transverse momentum of soft photons in the forward direction. In the soft photon regime, the bremsstrahlung spectrum can be computed in a model- and process-independent way by Low*s theorem. Most previous experiments have observed a soft photon excess on top of what is expected by Low*s theorem, but some did not observe this excess at all. This makes the experimental status of the existence of the excess unclear. The FCT, an array of silicon layers, will provide a way to measure these photons via the photon conversion method. The FCT will be provided with an unprecedented position resolution from these silicon trackers which should result in a very clean photon identification.

This talk will give an overview of the current studies of the FCT and provide an overview of the upcoming challenges.