HK 14: Instrumentation IV

Time: Monday 16:00–17:30 Location: HK-H3

Group Report HK 14.1 Mon 16:00 HK-H3

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 will be composed from four stations and operate in the target vacuum. Its mission is to reject background in di-electron spectroscopy and to reconstruct weak decays of multi-strange baryons and open charm created in the up to 10 MHz p+p and up to 100 kHz Au+Au collisions of the fixed target experiment. The $0.3 - 0.5\%$ X_0 thin stations will be equipped with 50 μm thin, highly granular Monolithic Active Pixel Sensors named MIMOSIS, which are being designed by the IPHC Strasbourg and will combine a spatial and time resolution of 5 μm and 5 μs, respectively, with a peak rate capability of 80 MHz/cm^2.

We discuss first results from tests of the MIMOSIS-1 full size sensor prototype, which was irradiated with doses up to 3×10^{14} n_{eq}/cm^2 and 5 MRad and tested hereafter at DESY and the CERN-SPS. Moreover, the status of the R&D on detector integration will be summarized.

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Group Report HK 14.2 Mon 16:30 HK-H3

The LHCb Upgrade II Plans with focus on the MightyTracker — •Klaas Padeken[1], Sebastian Neubert[1], and LHCb MightyTracker group[2] — [1]Rheinische Friedrich-Wilhelms Universität Bonn — [2]CERN

For the HL-LHC the LHCb Collaboration plans a major Upgrade in the long shutdown 4 (2031) to increase the instantaneous luminosity from $2 \cdot 10^{33}$ cm^{-2}s^{-1} to $1.5 \cdot 10^{34}$ cm^{-2}s^{-1} with streaming, triggerless output. This requires a major redesign of a few subdetectors. This talk will focus on MightyTracker, which will replace the current SciFi Tracker with a hybrid detector, comprised of HV-CMOS pixel sensors surrounding the beampipe and scililating fibers further outside. This will be the largest CMOS detector with a total of 18 m^2 of active area. The current developments and plans will be presented.

HK 14.3 Mon 17:00 HK-H3

Material budget imaging of carbon foam support structures using ALPIDE sensors — •Bogdan Mihail Blidaru for the ALICE-Collaboration — Physikalisches Institut, Heidelberg University, Germany

During the next LHC Long Shutdown, ALICE plans to replace the three innermost layers of the recently upgraded Inner Tracking System (ITS2) with a novel vertex detector based on wafer-scale, ultra-thin, truly cylindrical Monolithic Active Pixel Sensors (MAPS). The new sensors will be thinned down to 20-40 μm, featuring an unprecedented low material budget of less than 0.05% x/X$_0$ per layer and will be arranged concentrically around the beam pipe, as close as 18 mm from the interaction point.

To reach such ultra low material budget levels, the routing of power and signals will be integrated onto the sensor and the water cooling and mechanical support will be removed. A series of ultra-lightweight half-ring spacers, made of open cell carbon foam will be instead used in the active area. They will be inserted between the sensor layers to define their relative radial position and offer mechanical support.

To study the effects of scattering, carbon foam wedges of different proposed materials are tested in a high-resolution ALPIDE telescope using electron beams in the GeV-range at the DESY Test Beam Facility. The material budget is estimated with good accuracy by measuring the position-resolved scattering angle distribution of the beam particles. The foam structure is properly resolved and good agreement between expectations and data is found.

HK 14.4 Mon 17:15 HK-H3

Sensor tests for the PANDA Micro-Vertex-Detector — •Nils Tröll for the PANDA-Collaboration — II. Physikalisches Institut, Giessen, Germany

Double sided silicon strip detectors are part of the Micro-Vertex-Detector (MVD), which is the innermost detector of PANDA. High resolution track measurements are to be carried out to investigate the strong interaction in particular.

Methods for accuracy measurements on test structures of the silicon-strip-sensors will be presented. These techniques and full-sensor measurements are used for characterization and quality testing of the final MVD sensors. In addition, radiation tolerance characterization on silicon diodes using a neutron source will be shown.