# HK 16: Instrumentation III

Time: Tuesday 15:45–17:15 Location: HBR 19: C 1

**Group Report** HK 16.1 Tue 15:45 HBR 19: C 1

**Status of the CBM Micro Vertex Detector** — •Benedikt Gutsche for the CBM-MVD-Collaboration — Goethe-University Frankfurt, Max-von-Laue-Str. 1, 60438 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 planes, operating in the experiment*s target vacuum. The 0.3 * 0.5% *0 thin stations will be equipped with 50 $\mu$m thin Monolithic Active Pixel Sensors called MIMOSIS. This sensor is being developed by IPHC Strasbourg and will provide a spatial and temporal precision of 5 $\mu$m and 5 $\mu$s, respectively, with a peak rate capability of 80 MHz/cm2. This contribution will report on the progress made during the last phase of R&D. A TrbNet-based readout system for the MIMOSIS sen- sor was deployed, that aims to be an affordable and portable DAQ solution for probe testing and quality assessment. The second gen- eration and next-to-final full-size sensor prototype MIMOSIS-2, was released and is being characterized. The 3D-model of the MVD was updated to a more detailed version and an improved integration and re-working technique of the sensors onto the carrier made of highly heat-conductive TPG was introduced. Simulations have been done, like for the reconstruction efficiencies while comparing tracking and vertexing geometries.

HK 16.2 Tue 16:15 HBR 19: C 1

**Status of irradiation studies with MIMOSIS-1 Sensors*** — •Benedict Arnoldi-Meadows for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt

Due to the fixed target geometry of the cbm experiment, its Micro Vertex Detector will be exposed to a strong gradient in terms of total ionizing dose (tid). It is foreseen to equip this detector with cmos Monolithic Active Pixel Sensors called mimosis. This sensor is currently being developed in a R & D project between Goethe-University Frankfurt, iphc Strasbourg and gsi and is supposed to withstand such a radiation dose gradient. This gradient calls for operating pixels on the same sensor being irradiated to tids between 0 and 5 MRad with the same detection threshold and steering parameters.

While the tolerance of the sensor to a uniform radiation dose of 5 MRad was established in earlier studies with the first full-sized protoype called mimosis-1, its tolerance to such strong dose gradients remains to be demonstrated. This contribution will present the results of dedicated laboratory studies with mimosis-1 addressing this issue.

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HK 16.3 Tue 16:30 HBR 19: C 1

**Material budget studies for the ALICE ITS3** — •Simon Gross-Bölting for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg, Germany

During the LHC Long Shutdown 3 (LS3), ALICE plans to replace the innermost three layers of the current Inner Tracking System (ITS2) to a new version. The ITS3 will consist of ultra-thin cylindrically bent silicon sensors, which are held in place by lightweight carbon foam spacers. The carbon foam will be attached to the silicon sensors using glue and carbon fleeces, a material similar to Velcro. Due to the porosity of the fleece, the distribution of the glue layer may vary, especially as capillary effects become significant, and this variability can have an impact on the material budget. Knowing the material budget as precise as possible is crucial for simulating collisions and reconstructing the trajectories of the produced charged particles. To investigate the properties of materials and determine their associated radiation length, test beam experiments are conducted which yield information about the multiple scattering angle of charged particles as they traverse the material under study.

This talk will highlight the preparatory steps taken for an upcoming DESY test beam. The objective is to perform a material budget tomography using electrons on various material samples intended for use in the final ITS3, in order to evaluate the different material budget contributions. To prepare for the analysis a test beam with an Aluminium target as a well-known scatterer has been done with a proton beam in Marburg in fall 2023 and a short overview will be presented.

HK 16.4 Tue 16:45 HBR 19: C 1

**Characterizing the analog signal behavior of APTS chips for ALICE ITS3 Upgrade at the LHC** — •Alexander Musta for the ALICE Germany-Collaboration — Technische Universität München, Munich, Germany

This presentation will discuss the Analog Pixel Testing Structure (APTS) used to test different pixel designs for the upcoming new Inner Tracking System (ITS3) for the ALICE experiment. The underlying motivation for testing these pixel technologies is to find the most suitable silicon detector that minimizes charge sharing, power consumption, and data output. For the ITS3, Monolithic Active Pixel Sensor (MAPS) detectors are envisioned. Different doping structures and pixel sizes are currently under investigation. In this presentation, the most promising doping layout for different pixel sizes called the modified process with a gap, has been investigated. Properties such as capacitance, charge collection efficiency (CCE), mean cluster sizes, and the behavior under different bias voltages for these chips have been studied.

HK 16.5 Tue 17:00 HBR 19: C 1

**The new Cologne CATHEDRAL spectrometer for nuclear lifetime measurements** — •Christoph Fransen, Andrey Blazhev, Felix Dunkel, Arwin Esmaylzadeh, Jan Jolie, Lukas Knafla, Casper-David Lakenbrink, Mario Ley, Richard Novak, Stefan Thiel, Franziskus von Spee, Nigel Warr, and Michael Weinert — Institute for Nuclear Physics, University of Cologne, Germany

A new spectrometer for simultaneous lifetime measurements with Doppler-shift techniques, especially with the recoil-distance Doppler-shift (RDDS) technique, and the fast-timing method was developed for the Cologne FN Tandem accelerator facility. The high $\gamma$-ray efficiency and very compact geometry of the new setup in combination with different charged-particle detector arrays allows to investigate weak reaction channels using particle-$\gamma$-$\gamma$ coincidences. This is crucial both for precise fast-timing measurements and RDDS experiments. Especially for the latter, an advantage can be drawn from the gain in efficiency as with the use of $\gamma$-$\gamma$ coincidence analysis methods [1] any need for assumptions on feeding conditions can be avoided. In particular, the new spectrometer is designed for transfer reactions, but can be also used with other experimental probes, e.g., fusion-evaporation and Coulomb excitation. We will present the results of a commissioning experiment demonstrating the high capabilities of the new setup and show an overview of first experiments.

[1] A. Dewald et al., Prog. Part. Nucl. Phys. 67, (2012) 786