HK 7: Instrumentation I

Zeit: Montag 14:00–15:30 Raum: S1/01 A2

Gruppenbericht HK 7.1 Mo 14:00 S1/01 A2

Vacuum-Compatible, Ultra-Low Material Budget MVD for the CBM Experiment. — •Michal KOZIEL for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt

The Compressed Baryonic Matter Experiment (CBM) is one of the core experiments of the future FAIR facility. It will explore the phase diagram of strongly interacting matter in the regime of high net baryon densities with numerous probes, among them open charm. The Micro Vertex Detector (MVD) will contribute to the secondary vertex determination on a 10 μm scale, background rejection in dielectron spectroscopy and reconstruction of weak decays. The detector comprises up to four stations placed next to the target and inside vacuum. The stations are populated with 50 μm thin, highly-granular Monolithic Active Pixel Sensors, featuring a spatial resolution of <5 μm, a readout speed of few 10 μs/frame, a radiation tolerance of $>10^{13} n_{eq}/cm^2$ and 3 Mrad. This contribution focuses on the next and the last step before a final detector production, that is the precursor of the third CBM-MVD station hosting 15 CMOS sensors. We will report on the status of the project and the first results of the MVD precursor characterization, with a emphasis on lessons learned for the assembly phase.

HK 7.2 Mo 14:30 S1/01 A2

The PASTA chip for the silicon micro strip sensor of the PANDA MVD — •Alberto Riccardi[1], Kai-Thomas Brinkmann[1], Valentino Di Pietro[1], Tommaso Quagli[1], James Ritman[2], Angelo Rivetti[3], Manuel Rolo[3], Robert Schnell[1], Tobias Stockmanns[2], André Zambanini[2], and Hans-Georg Zaunick[1] for the PANDA-Collaboration — [1]II. Physikalisches Institut Justus-Liebig-Universität Giessen, Giessen, Germany — [2]Forschungszentrum Jülich — [3]INFN Sezione di Torino, Torino, Italy

In the Micro Vertex Detector, which is the innermost detector of PANDA, there are two different types of sensors: hybrid pixel and double sided micro strips. My work is focused on the development of the ASIC readout for the strips, which in the PANDA experiment must cope with a hit rate up to 50 kHz per channel. The energy loss measurement of the particles crossing the silicon sensor is obtained by implementing the Time over Threshold technique.

The first PASTA (PANDA Strip ASIC) prototype is based on a Time to Digital Converter with an analog clock interpolator which combines good time resolution with a low power consumption. A full size chip was developed in a 0.11μm CMOS technology and delivered in Autumn 2015. It features 64 channels with both analog and digital parts, a digital global controller, LVDS drivers and integrated bias.

In the presentation, an overview of PASTA and the results of the first tests will be presented.

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HK 7.3 Mo 14:45 S1/01 A2

On drift fields in CMOS Monolithic Active Pixel Sensors* — •Michael Deveaux for the CBM-MVD-Collaboration — Goethe-Universität, Frankfurt

CMOS Monolithic Active Pixel Sensors (MAPS) combine an excellent spatial resolution of few μm with a very low material budget of 0.05% X_0. To extend their radiation tolerance to the level needed for future experiments like e.g. CBM, it is regularly considered to deplete their active volume.

We will discuss the limits of this strategy accounting for the specific features of the sensing elements of MAPS. Moreover, we introduce an alternative approach to generate the drift fields needed to provoke a faster charge collection by means of doping gradients.

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HK 7.4 Mo 15:00 S1/01 A2

Optical quality assurance procedures for the sensors of CBM STS Detector — •Evgeny Lavrik for the CBM-Collaboration — Physikalisches Institut der Universität Tübingen, Deutschland

The Compressed Baryonic Matter (CBM) experiment at FAIR aims to study the properties of nuclear matter at high net-baryon densities. The Silicon Tracking System (STS) is the key detector to reconstruct charged particle tracks created in heavy-ion interactions. In order to assure the quality of about 1300 silicon sensors, highly efficient and highly automated procedures need to be developed.

In this contribution we report on a microscope camera based optical inspection system, used to scan along the individual sensors to recognize and classify sensor defects. Examples of these defects are: photo-resist residues, top metallization layer lithography defects, surface scratches. In order to separate and classify these defects various image-processing algorithms are used, including: pattern recognition, object classification etc.

HK 7.5 Mo 15:15 S1/01 A2

Quality assurance tests of the CBM Silicon Tracking System sensors with an infrared laser — •Maksym Teklishyn for the CBM-Collaboration — FAIR GmbH, Darmstadt — KINR, Kyiv, Ukraine

Double-sided 300 μm thick silicon microstrip sensors are planned to be used in the Silicon Tracking System (STS) of the future CBM experiment. Different tools, including an infrared laser, are used to induce charge in the sensor medium to study the sensor response. We use present installation to develop a procedure for the sensor quality assurance during mass production. The precise positioning of the laser spot allows to make a clear judgment about the sensor interstrip gap response which provides information about the charge distribution inside the sensor medium. Results are compared with the model estimations.

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