HK 30: Instrumentation 10

Time: Tuesday 17:00–18:30 Location: M/HS1

Group Report HK 30.1 Tue 17:00 M/HS1

Status of the CBM Micro Vertex Detector — •Michal Koziel for the CBM-MVD-Collaboration — Goethe-Universität

The fixed-target experiment CBM at FAIR will explore the phase diagram of strongly interacting matter in the regime of highest net baryon densities with numerous probes, among them open charm. For the reconstruction of open charm hadrons with the CBM experiment a Micro Vertex Detector (MVD) with an excellent spatial resolution of the secondary decay vertex is required. Hence, a material budget of a few 0.1% X0 is mandatory for the individual detector stations positioned downstream in close vicinity to the target. To reduce multiple scattering, the MVD operates in vacuum, which poses challenging requirements on both, the power dissipation of the sensors and the integration concept. Here one should mention the selection of high-performance materials providing the mechanical support and cooling for the 0.05 mm thin sensors, establishing the sensor quality assessment procedures as well as defining the sensor integration. In addition, a substantial progress with respect to sensor development will be reported, mainly to the studies on their radiation hardness. Also, the 2nd generation of the sensor control and read-out based on TRBv3 standard has been commissioned. In this contribution we will highlight several activities that have been successfully accomplished, which enable us to define the start version of the CBM MVD.***This work has been supported by BMBF (05P12RFFC7), GSI, HIC for FAIR, EU-FP7 HadronPhysics3.***

HK 30.2 Tue 17:30 M/HS1

A time digitizer for the microstrip detectors of the PANDA MVD — •Alberto Riccardi[1], Kai-Thomas Brinkmann[1], Valentino Di Pietro[1], Sara Garbolino[2], Angelo Rivetti[2], and Manuel Rolo[2] for the PANDA-Collaboration — [1]II. Physikalisches Institut Justus-Liebig-Universität Giessen, Giessen, Germany — [2]INFN Sezione di Torino, Torino, Italy

In nuclear detectors the information on the energy of the particle is usually obtained by measuring the amplitude of the signal delivered by the sensor. The low voltage power supply used in modern deep submicron technologies constrain the maximum dynamic range of the ADC. Still, the energy information can be obtained with time-based techniques, in which the energy is associated with the duration of the signal through the Time over Threshold method. This work is focused on the PANDA Micro Vertex Detector and explores the possibility of applying a time-based readout approach for the microstip sensors. In PANDA , the strip system must cope with hit rates up to 50 kHz per channel. Therefore, the front-end output must be relatively short, this implies that the clock resolution is not enough to measure the signal duration, so it is necessary to use a Time to Digital Converter. The front-end and the TDC structure are designed in a 0.11μm CMOS process. The TDC chosen is based on an analog clock interpolator because it combines good time resolution with a fairly simple implementation and low power consumption. In the presentation an overview of the analog part of the PASTA (PANDA strip ASIC) will be presented. Supported by BMBF, HIC for FAIR and JCHP.

HK 30.3 Tue 17:45 M/HS1

The Front-End Amplifier for the Silicon Microstrip Sensors of the PANDA MVD — •Valentino Di Pietro[1], Kai-Thomas Brinkmann[1], Alberto Riccardi[1], Angelo Rivetti[2], and Manuel Rolo[2] — [1]II. Physikalisches Institut, JLU Gießen, Germany — [2]INFN Sezione di Torino, Italy

The most common readout systems designed for the nuclear physics detectors are based on amplitude measurements. The information that needs to be preserved is the charge delivered by a particle hitting the sensor. The electronic chain employed in these cases is made from two main building blocks: front-end amplifier and ADC. One of the issues associated with the implementation of such an architecture in scaled CMOS technologies is the dynamic range, because the charge information is extrapolated through the sampling of the peak of the front-end output signal. It is therefore interesting to explore the possibility of using time-based architectures offering better performances from that point of view. In fact, in these topologies the linearity between the charge and the signal duration can be maintained even if some building blocks in the chain saturate. The main drawback is the loss in resolution since a duration measurement involves the difference between two time measurements. This work will present the design of a front-end optimized for fast Time-over-Threshold applications. The circuit has been developed for the microstrip detectors of the PANDA experiment. The key features of the front-end amplifier will be illustrated and both schematic level and post-layout simulations will be discussed. Supported by BMBF, HIC for FAIR and JCHP.

HK 30.4 Tue 18:00 M/HS1

The GBT based readout concept for the Silicon Tracking System of the CBM experiment — •Joerg Lehnert for the CBM-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The Silicon Tracking System (STS) of the CBM experiment at FAIR is designed to handle interaction rates up to 10 MHz with hundreds of tracks in fixed target heavy ion collisions of up to 35 AGeV.

STS data will be read out from 14000 ASICs on 1800 frontend boards (FEBs) with a total of 1.8 million channels operating at rates from below 15 up to 1000 kHz and located in the STS detector box inside the CBM magnet with challenging conditions in terms of available space, radiation, magnetic field and temperature.

ASICs from 1, 2 or 5 FEBs operated at varying sensor potential will be connected via AC-coupled 320 MHz LVDS links to a readout board (ROB) employing radiation hard GBTX and Versatile Link components developed at CERN for data aggregation and optical readout. The approximately 1000 ROBs will be located inside the STS detector box, 4000 optical links will be routed from there to the subsequent FPGA based CBM data processing board (DPB).

The concept of the GBT based readout including connection scheme and custom protocol will be presented and an outlook on the ROB prototype will be given.

HK 30.5 Tue 18:15 M/HS1

Position Sensitive Silicon Detectors in the R^{3}B-Setup — •Ina Syndikus, Stefanos Paschalis, and Marina Petri for the R3B-Collaboration — Institut für Kernphysik, Technische Universität Darmstadt

At the R^{3}B setup at the GSI Helmholtzzentrum für Schwerionenforschung GmbH in Darmstadt kinematically complete measurements of reactions with relativistic radioactive beams are feasible. The kinematically complete measurements require a variety of detection systems, which combined can deliver information on all particles involved in the reaction. An essential part of these measurements is the unambiguous event by event identification and tracking of the incoming beam particles and the outgoing, heavy reaction products. Among others, several position sensitive silicon detectors are used to measure the charge of the particles and the fragments before and after the target as well as their position. We present the results for the position and energy resolution of these detectors from alpha-particle measurement as well as in-beam experiments measured with digital electronics.

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