HK 21: Instrumentierung

Zeit: Dienstag 14:00–15:30 Raum: HZ 8

Gruppenbericht HK 21.1 Di 14:00 HZ 8

ALICE TRD On-line Tracking and Trigger Performance

— •Felix Rettig[1], Jochen Klein[2], and Uwe Westerhoff[3] for the ALICE-Collaboration — [1]FIAS, Universität Frankfurt — [2]Physikalisches Institut, Universität Heidelberg — [3]IKP, Universität Münster

The Transition Radiation Detector (TRD) in A Large Ion Collider Experiment (ALICE) at the LHC consists of 6 layers of tracking chambers and covers a pseudo-rapidity range of ± 0.9. Presently, 13 out of 18 azimuthal sectors are installed. The completion is planned during the first long LHC shutdown in 2013/14.

We will discuss how a hardware Level-1 trigger, about 8 us after an interaction, is derived by this detector. Chamber-wise track segments from fast on-detector reconstruction are read out with position, angle and PID information. In the Global Tracking Unit, these tracklets are merged to a track and used for the reconstruction of transverse momenta and electron identification of individual tracks. These tracks form the basis for versatile and flexible trigger conditions, s.a. single high-pt hadron, single high-pt electron, di-electron (J/Psi, Upsilon) and at least n close high-pt tracks (jet).

After a period of minimum bias data-taking, rare triggers are now used in ALICE. The TRD contributes a jet trigger and two electron triggers. We will discuss the tracking performance and report on our experience on the TRD-based triggers.

HK 21.2 Di 14:30 HZ 8

The RCU2: Readout Electronics Consolidation for the ALICE TPC in Run2

— •Attilio Tarantola for the ALICE-Collaboration — Institut für Kernphysik Frankfurt

The Time-Projection Chamber (TPC) is the main device for charged particle tracking and identification of the ALICE experiment at CERN. The Multi Wire Proportional Chambers on both endplates of the TPC contain segmented cathode planes with a total of 557 568 pads, which are read out by custom electronics. The sampling of the signals provides 3-D information of the trajectory of the particle tracks and their energy loss. The LHC is currently being upgraded, in order to increase energies and luminosities of the beams: in the next data taking period, Run2 (2015-2018), the data readout rate for the ALICE central barrel detectors is planned to increase to 400Hz for Pb-Pb collisions at low dead time, while a maximum event size of 70MB is foreseen for central collisions.

The present TPC readout control unit (RCU) is going to be replaced with a new readout system, RCU2, which will be able to achieve the new requirements in terms of data readout speed and radiation tolerance. The RCU2 board will interface the already existing ALICE data acquisition and trigger systems with the TPC Front End Cards. In this contribution we present the status of the RCU2 upgrade, the features of the new hardware components, the developed firmware as well as the selection of the radiation tolerant components and the employed fault tolerance techniques. (Work supported by BMBF and the Helmholtz Association).

HK 21.3 Di 14:45 HZ 8

The PASTA Chip - A Free-Running Readout ASIC for Silicon Strip Sensors in PANDA

— •André Goerres[1], Tobias Stockmanns[1], James Ritman[1], and Angelo Rivetti[2] for the PANDA-Collaboration — [1]Institut für Kernphysik, Forschungszentrum Jülich, **Jülich**, Germany — [2]INFN Sezione di Torino, **Torino**, Italy

The PANDA experiment is a multi purpose detector, investigating hadron physics in the charm quark mass regime. It is one of the main experiments at the future FAIR accelerator facility, using $\bar{p}p$ annihilations from a 1.5-15 GeV/c anti-proton beam. Because of the broad physics spectrum and the similarity of event and background signals, PANDA does not rely on a hardware-level trigger decision.

The innermost of PANDA's sub-systems is the Micro Vertex Detector (MVD), consisting of silicon pixel and strip sensors. The latter will be read out by a specialized, free-running readout front-end called PANDA Strip ASIC (PASTA).

It has to face a high event rate of up to 40 kHz/ch in an radiation-intense environment. To fulfill the MVD's requirements, it has to give accurate timing information to incoming events (< 10 ns) and determine the collected charge with an 8-bit precision. The design has to meet cooling and placing restrictions, leading to a very low power consumption (< 4 mW/ch) and limited dimensions. Therefore, a simple, time-based readout approach is chosen.

In this talk, the conceptual design of the front-end will be presented.

HK 21.4 Di 15:00 HZ 8

The Next Generation CBM MVD Front-end Electronics

— •Michael Wiebusch, Jan Michel, and Joachim Stroth — Goethe-Universität, Frankfurt

The Micro Vertex Detector (MVD) for the CBM experiment is a highly granular precision tracking device. Due to the ambitious requirements regarding spatial resolution, radiation hardness, read-out speed and material budget, monolithic active pixel sensors (MAPS) are the most suited detector technology for this purpose. A full read-out chain for these sensors was designed and successfully prototyped in a test experiment at CERN/SPS in November 2012. However, it also revealed some weaknesses of the scheme, motivating a new and advanced revision of read-out electronics. In this scope, the system moved to a more capable FPGA platform and a next generation front-end electronics was designed and produced. Among others, the new design features a set of additional configuration and monitoring capabilities which will be used to optimize the concept of biasing and routing critical analog signals to the sensor. The main challenge is the distance between active electronics and the sensor which is constrained by radiation levels and the in-vacuum operation of the MVD. This contribution will present and evaluate the new front-end electronics design compared to the old concept, including first performance results. *This work is supported by BMBF (05P12RFFC7), HIC for FAIR, EMMI, and GSI.

HK 21.5 Di 15:15 HZ 8

The next generation of frontend readout at COMPASS-II

— •Tobias Grussenmeyer, Maximilian Büchele, Horst Fischer, Matthias Gorzellik, Florian Herrmann, Philipp Jörg, Kay Königsmann, Paul Kremser, and Sebastian Schopferer — Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

The GANDALF framework, a high precision, high performance detector readout system, capable of highspeed pulse and logic signal digitization, has been extended by a new mezzanine card with optical connectors. Using the GTP transceivers of the Spartan-6 SLX45T on the mezzanine card in a special configuration allows high speed data transmission to frontend electronics with fixed latency. In the reverse direction, measured data is transmitted at the maximum speed of 3 GBit/s.

At the COMPASS-II experiment at CERN SPS this will be used for the TDC frontend readout of new driftchambers and RICH Thick-GEM detectors.

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