HK 33: Instrumentation VII

Zeit: Mittwoch 16:45–19:00 Raum: F 072

Gruppenbericht HK 33.1 Mi 16:45 F 072

Performance of the COMPASS Trigger — •Benjamin Moritz Veit — Institut fuer Kernphysik Universitaet Mainz

The Common Muon Proton Apparatus for Structure and Spectroscopy or short COMPASS is running since 2001 in different setups to study the hadron structure and hadron spectroscopy with high intensity muon and hadron beams.

For the 2016/2017 run a liquid hydrogen target with a 160 Gev/c polarised muon beam is used to extract the Generalized Parton Distributions (GPDs) from beam and spin cross section differences. Thus measurements with positively and negatively charged muons were performed. Stable working conditions for both beam polarities during the whole data taking of ∼200 days are mandatory for the extraction of cross section differences. The performance and stability of the 2016 GPD Trigger setup in comparison to the previous runs will be presented.

HK 33.2 Mi 17:15 F 072

Tracking with the Transition Radiation Detector in the High Level Trigger of ALICE — •Marten Ole Schmidt for the ALICE-Collaboration — Physikalisches Institut, University of Heidelberg

During the LHC Run 2, which started in 2015, unexpected localized cm-scale distortions caused by space-charge were observed in the ALICE Time Projection Chamber (TPC). The distortions are corrected for employing the detectors inside (Inner Tracking System) and outside (Transition Radiation Detector - TRD) the TPC. The correction is currently done within the offline reconstruction procedure.

In order to speed up the reconstruction, it is planned to move parts of the calibration procedure online in the Hight Level Trigger (HLT). As a first step the TRD tracking is implemented in the HLT. For this, TPC tracks are extrapolated towards the TRD and used as seeds for tracking. In contrast to the offline correction procedure, the new tracking algorithm is based on online TRD tracklets instead of clusters. The implementation is also a preparation for LHC Run 3 (beyond 2020) where the whole reconstruction and calibration will be moved online. First results of this tracking algorithm will be presented and the next steps necessary to correct the space charge distortions online in the HLT will be discussed.

HK 33.3 Mi 17:30 F 072

Time based track reconstruction in the CBM experiment — •Timur Ablyazimov[1,2] and Volker Friese[1] for the CBM-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt — [2]LIT JINR, Dubna, Russia

The Compressed Baryonic Matter experiment (CBM) at FAIR is designed to cope with high track-densities and extreme interaction rates of up to 10 MHz. Because of the interaction rates events are unavoidably overlap in time. Accordingly the reconstruction in the CBM experiment becomes possible only taking into account time measurements. This approach was first implemented for the Silicon Tracking System (STS), which is the main tracking detector of the CBM experimental setup. Now the time based reconstruction concept is being extended to other detectors, whose measurements can be used for STS reconstructed tracks extrapolation through the CBM setup.

We will present that status of the time-based simulation and reconstruction for the Time of Flight (TOF) detector. This is because of its excellent time resolution and crucial importance for determining the physical properties of the particles and the particles identification. We are developing approaches for time based hit finding in TOF and for using them for STS tracks extrapolation to the TOF detector.

HK 33.4 Mi 17:45 F 072

Speed up approaches in the Cellular Automaton (CA) track finder — •Grigory Kozlov[1,2] and Ivan Kisel[1,3] for the CBM-Collaboration — [1]Frankfurt Institute for Advanced Studies, Frankfurt am Main, Germany — [2]Joint Institute for Nuclear Research, Dubna, Russia — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

Tracking procedure is an important part of event reconstruction in high energy physics experiments. One of the fastest and efficient track finding algorithm is a cellular automaton. It is used in various experiments including CBM at FAIR and STAR at RHIC. CBM and STAR CA track finders have similar implementations. But standard track finding procedure may be not fast enough for online calculations, especially in case of high particle multiplicity.

In this work we consider several methods to speed up CA track finders in STAR and CBM. Different approaches were implemented and investigated. For instance, grid structure allows us to seriously reduce the number of calculations when hits are combined into segments. Using of multimap for merging of segments help us quickly exclude impossible combinations. In addition, CA track finder was vectorized taking into account scalability for CPUs with SSE, AVX and MIC instructions (128, 256 and 512 bit registers).

Most of used approaches are common and can be easily applied to different versions of CA tracking algorithms.

HK 33.5 Mi 18:00 F 072

New track seeding techniques for the CMS Experiment during Phase-1 — •Felice Pantaleo[1,2], Alexander Schmidt[2], Andreas Meyer[3], Vincenzo Innocente[1], Andreas Pfeiffer[1], and Benedikt Hegner[1] — [1]CERN, Geneva, Switzerland — [2]Hamburg University, Hamburg, Germany — [3]DESY, Hamburg, Germany

Starting from 2019 the Large Hadron Collider will undergo upgrades in order to increase its luminosity. Many of the algorithms executed during track reconstruction scale linearly with the pileup. Others, like seeding, due to the increasing combinatorial complexity, will dominate the execution time, due to their factorial complexity with respect to the pileup. We will show the results of the effort in reducing the effect of pile-up in CMS Tracking by redesigning the seeding with novel algorithms which are intrinsically parallel and by executing these new algorithms on massively parallel architectures.

HK 33.6 Mi 18:15 F 072

Cellular Automaton tracking algorithm for PANDA Forward Tracking System — •Mykhailo Pugach[1,2,4], Ivan Kisel[1,2], and Maksym Zyzak[3] — [1]Goethe-Universität, Frankfurt am Main — [2]Frankfurt Institute for Advanced Studies, Frankfurt am Main — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt — [4]KINR, Kyiv, Ukraine

The Forward Tracking System (FTS) is the tracking detector of PANDA experiment. Located in the dipole magnet, FTS requires a complex yet efficient algorithm capable to reconstruct tracks and determine momentum of charged particles originating from beam-target interactions as well as from secondary vertices. In this talk the Cellular Automaton approach implemented in the PandaRoot-framework is presented in conjunction to the FTS.

Results, problems and perspectives are shown and discussed.

Supported by HIC for FAIR and HGS-HIRe.

HK 33.7 Mi 18:30 F 072

Tracking of charged particles in the central region of the BGO-OD experiment using a cylindrical MWPC* — •Patrick Bauer for the BGO-OD-Collaboration — Physikalisches Institut, Bonn, Nußallee 1

The BGO-OD experiment at the ELSA accelerator facility at Bonn investigates the mechanisms of photoproduction of mesons from nucleons. One focus is associated strangeness production, i.e. $\gamma p \rightarrow (KY)^+$ or $\gamma n \rightarrow (KY)^0$. Generally the strange-particle decays yield multiple charged particles in the final state, as for example $\Lambda K^0 \rightarrow (p\pi^-)(\pi^+\pi^-)$. The capability to reconstruct precise tracks and vertices of reactions and decays is therefore crucial. At BGO-OD, the charged particle trajectories are reconstructed using a cylindrical MWPC, which is surrounding the target cell inside the BGO calorimeter. The reconstruction procedure, as well as its impact on the identification of reaction channels will be presented.

* Supported by the DFG (SFB/TR-16)

HK 33.8 Mi 18:45 F 072

Parallel Algorithms for Online Trackfinding at PANDA — •Ludovico Bianchi[1], Andreas Herten[2], James Ritman[1], and Tobias Stockmanns[1] for the PANDA-Collaboration — [1]IKP — [2]JSC, Forschungszentrum Jülich GmbH, Germany

The PANDA experiment, one of the four scientific pillars of the FAIR facility under construction in Darmstadt, is a next-generation particle detector that will study collisions of antiprotons with beam momenta of 1.5–15 GeV/c on a fixed proton target.

Because of its broad physics scope and the similar signature of signal and background events in the energy region of interest, PANDA's strategy for data acquisition is to continuously record data from the entire detector and use this global information to perform online event reconstruction and selection. A real-time rejection factor of up to 1000 is required to match the incoming data rate to the available offline storage.

Online particle track identification and reconstruction is an essential step, since track information is used as input in all following phases. Online tracking algorithms must ensure a delicate balance between high tracking efficiency and quality, and minimal computational footprint. To satisfy these requirements, a solution based on massively parallel algorithms running on hardware processors such as Graphic Processing Units (GPUs) is under investigation.

The talk will present the core concepts of the novel algorithms being developed for primary trackfinding, along with performance measurements of their physical and computational parameters.