HK 57: Instrumentierung

Zeit: Freitag 11:00–13:00 Raum: HZ 9

Gruppenbericht HK 57.1 Fr 11:00 HZ 9

PANDA Luminosity Detector software: preparation for expected challenges — •A. Karavdina[1], A. Denig[1,2], P. Jasinski[1,2], M. Michel[1,2], S. Pflüger[1,2], and M. Fritsch[1,2] for the PANDA-Collaboration — [1]Johannes Gutenberg-Universität Mainz — [2]Helmholtz-Institut Mainz

Precise determination of the luminosity is crucial for planned PANDA experiment (FAIR, Germany). For the luminosity measurement we will exploit the differential cross section of the elastic $\bar{p}p$ scattering in dependence of the scattering angle. The Luminosity Detector (LMD) should have full azimuthal angle acceptance and good spatial resolution to achieve the needed precision for the measurement. These requirement can be succeeded by four planes of thin silicon pixel sensors. In parallel to the prototype construction, the reconstruction software is under development. Monte Carlo based simulation is used to proof the design concept, test the reconstruction under different conditions and study expected distortions of the simulated ideal world by real life effects. Those effects include possible technical problems (e.g. sensor misalignment or broken sensors) as well as challenges not related directly to the LMD set-up (e.g. physical background or radiation damage). Moreover the extraction of the luminosity relies on a sophisticated fit to the data with a combination of the theory model, non-uniform detector resolution and reconstruction efficiency. A special framework was developed to simplify fitting procedure.

In this talk an overview of the reconstruction software concept and studies related to the effects discussed above will be presented.

HK 57.2 Fr 11:30 HZ 9

GPU Implementations of Online Track Finding Algorithms at PANDA — •Andreas Herten[1], Tobias Stockmanns[1], James Ritman[1], Andrew Adinetz[2], Dirk Pleiter[2], and Jiri Kraus[3] for the PANDA-Collaboration — [1]Institut für Kernphysik, Forschungszentrum Jülich GmbH — [2]Jülich Supercomputing Centre, Forschungszentrum Jülich GmbH — [3]NVIDIA GmbH

The PANDA experiment is a hadron physics experiment that will investigate antiproton annihilation in the charm quark mass region. The experiment is now being constructed as one of the main parts of the FAIR facility.

At an event rate of $2 \cdot 10^7$/s a data rate of 200 GB/s is expected. A reduction of three orders of magnitude is required in order to save the data for further offline analysis. Since signal and background processes at PANDA have similar signatures, no hardware-level trigger is foreseen for the experiment. Instead, a fast online event filter is substituting this element. We investigate the possibility of using graphics processing units (GPUs) for the online tracking part of this task. Researched algorithms are a Hough Transform, a track finder involving Riemann surfaces, and the novel, PANDA-specific Triplet Finder.

This talk shows selected advances in the implementations as well as performance evaluations of the GPU tracking algorithms to be used at the PANDA experiment.

HK 57.3 Fr 11:45 HZ 9

Digital timing algorithms applied to fast scintillators response — •Guillermo Fernández Martínez for the R3B-Collaboration — Institut für Kernphysik, TU Darmstadt

The future Facility for Antiproton and Ion Research (FAIR) will house the calorimeter and spectrometer CALIFA, whose design, construction and testing are currently being carried out by the R3B collaboration. The mentioned calorimeter is an array of scintillation detectors displayed in a barrel configuration, which covers the total solid angle. These new fast scintillation materials have been developed in last few years and their main interest lies on their versatility, which allows their use both for applications and fundamental research. In the same way, fast digitizers let the collection of signals at increasingly higher sampling frequencies. Our research takes advantage of these fair properties and is therefore focused on the analysis of digitized pulses for several aims: understanding the behaviour of radiation inside new fast scintillators and the development or improvement of digital algorithms which yield accurate resolution for fast timing and may be also applied to particle identification.

This work is supported by BMBF(06DA9040I, 05P12RDFN8) and HIC for FAIR.

HK 57.4 Fr 12:00 HZ 9

GENFIT - a Generic Track-Fitting Toolkit — •Johannes Rauch[1] and Tobias Schlüter[2] — [1]Technische Universität München — [2]Ludwig-Maximilians-Universität München

GENFIT is an experiment-independent track-fitting toolkit, which combines fitting algorithms, track representations, and measurement geometries into a modular framework. We report on a significantly improved version of GENFIT, based on experience gained in the Belle II, PANDA, and FOPI experiments. Improvements concern the implementation of additional track-fitting algorithms, enhanced implementations of Kalman fitters, enhanced visualization capabilities, and additional implementations of measurement types suited for various kinds of tracking detectors. The data model has been revised, allowing for efficient track merging, smoothing, residual calculation and alignment.

HK 57.5 Fr 12:15 HZ 9

An improved detector response simulation for the CBM Silicon Tracking System — •Hanna Malygina for the CBM-Collaboration — Goethe Universität Frankfurt

The Compressed Baryonic Matter experiment(CBM) at FAIR is designed to explore the QCD phase diagram in the region of high net-baryon densities. As the central detector component the Silicon Tracking System (STS) is based on double-sided micro-strip sensors. To achieve realistic simulations the response of the silicon strip sensors should be precisely included in the digitizer which simulates a complete chain of physical processes caused by charged particles traversing the detector, from charge creation in silicon to a digital output signal. The new version of the STS digitizer comprises in addition non-uniform energy loss distributions (according to the Urban theory), thermal diffusion and charge redistribution over the read-out channels due to interstrip capacitances. To verify the performance of the new digitizer we chose 1 GeV-pions as incident particles, tracks with random impact and inclination from -45^0 to 45^0. We used the center-of-gravity algorithm to reconstruct the clusters. As the most significant effect we identified the non-uniform energy loss along the incident particle track. A comparison between experimental data from LHCb and our simulation is shown.

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HK 57.6 Fr 12:30 HZ 9

FPGA helix tracking algorithm for PANDA — •Yutie Liang[1], Martin Galuska[1], Thomas Gessler[1], Jifeng Hu[1], Wolfgang Kühn[1], Jens Sören Lange[1], David Münchow[1], Björn Spruck[1], and Hua Ye[1,2] for the PANDA-Collaboration — [1]II. Physikalisches, Giessen University, 35392, Germany — [2]Institute of High Energy Physics, Beijing 10049, P. R. China

The PANDA detector is a general-purpose detector for physics with high luminosity cooled antiproton beams, planed to operate at the FAIR facility in Darmstadt, Germany. The central detector includes a silicon Micro Vertex Detector (MVD) and a Straw Tube Tracker (STT). Without any hardware trigger, large amounts of raw data are streaming into the data acquisition system. The data reduction task is performed in the online system by reconstruction algorithms programmed in VHDL (Very High Speed Integrated Circuit Hardware Description Language) on FPGAs (Field Programmable Gate Arrays) as first level and on a farm of GPUs or PCs as a second level. One important part in the system is the online track reconstruction. In this presentation, an online tracking finding algorithm for helix track reconstruction in the solenoidal field is shown. A performance study using C++ and the status of the VHDL implementation will be presented.

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HK 57.7 Fr 12:45 HZ 9

Fission experiments *n*ELBE — •Toni Kögler[1,2], Roland Beyer[2], Roland Hannaske[1,2], Arnd Junghans[2], Ralph Massarczyk[1,2], Ronald Schwengner[2], and Andreas Wagner[2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, 01328 Dresden, Germany

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At the Center for High-Power Radiation Sources at Helmholtz-Zentrum Dresden-Rossendorf fast neutron-induced fission cross section experiments on ^{235}U and ^{242}Pu are investigated by a parallel plate fission ionization chamber. To optimize the chamber parameters extensive GEANT4 simulations with GEF code generated fission observable inputs have been used. Pile-up effects had to be included due to the high α-activity of the plutonium targets. Experimental data from a comparative measurement with PTB's H19 transfer device is presented. Using the HZDR nanosecond pre-amplifier with total signal times of 500 ns reduces the α pile-up and enables a QDC based data processing.