HK 3: Instrumentation 2

Time: Monday 14:30–16:30 Location: M/HS2

Group Report HK 3.1 Mon 14:30 M/HS2

The ALICE TPC, a high resolution device for ultra-high particle multiplicities - past, present and future — •Marian Ivanov for the ALICE-Collaboration — Planckstraße 1, 64291 Darmstadt, GSI Helmholtzzentrum für Schwerionenforschung GmbH

The Time Projection Chamber (TPC) of the ALICE apparatus is a large 3-dimensional tracking and particle identification device for ultra-high multiplicity collision events. It has been operated successfully at the Large Hadron Collider (LHC) at CERN, recording data from pp, p-Pb, and Pb-Pb collisions. Presently, LHC is in its first long shutdown (LS1), the next round of data taking will start in summer 2015 at or close to the LHC design energy and luminosity. During the second long shutdown (LS2), LHC will undergo a further increase in the Pb-Pb luminosity together with a major upgrade of ALICE. After the upgrade, the ALICE TPC will operate with Pb-Pb collisions at an interaction rate of 50 kHz. We present the performance in operation, calibration and reconstruction with the ALICE TPC together with ongoing work and plans for the near future and the coming 10 years.

HK 3.2 Mon 15:00 M/HS2

Online Calibration of the ALICE-TPC in LHC-Run 2 — •Ivan Vorobyev for the ALICE-Collaboration — Technische Universität München, Excellence Cluster Universe

The Time Projection Chamber (TPC) is the main tracking detector at the ALICE Experiment at the LHC. Its performance and calibration directly influence the calibration of other detectors in the ALICE central barrel. To address this issue during the first LHC running period, a two-step offline calibration was employed, in which first the TPC and then the other detectors were calibrated. However, such a scheme will not be feasible for the Run 3 period, because the TPC will run in a continuous readout mode, producing a vast amount of data that needs to be significantly compressed on the fly for data storage. This will require the calibration step to run online within the High Level Trigger environment. In this talk, the online calibration concept and the implementation for the ALICE-TPC already in Run 2 will be discussed.

HK 3.3 Mon 15:15 M/HS2

Backtracking algorithm for dilepton reconstruction with HADES — •Patrick Sellheim for the HADES-Collaboration — Goethe-Universität Frankfurt

The High Acceptance Di-Electron Spectrometer (HADES) at the GSI Helmholtzzentrum für Schwerionenforschung investigates dilepton and strangeness production in elementary and heavy-ion collisions. Events recorded in Au+Au collisions at a beam energy of 1.23 GeV/u have the highest multiplicities measured with HADES so far. The track reconstruction and particle identification in the high track density environment are hence very challenging.

In case of dileptons a Ring Imaging Cherenkov detector is essential since it is the most important detector component for single lepton identification. Its main purpose is the separation of electrons and positrons from the large background of charged hadrons produced in heavy-ion collisions. In order to further improve the purity and efficiency of the electron sample, a new backtracking algorithm using information provided by the HADES tracking detectors is applied. This new approach offers gains in efficiency for leptons and especially for detection of partially reconstructed pairs with small opening angle. In this contribution the strategy of the backtracking approach and its performance in Au+Au data will be shown.

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HK 3.4 Mon 15:30 M/HS2

Online 4-Dimensional Event Reconstruction in the CBM Experiment — •Valentina Akishina[1,2,3] and Ivan Kisel[1,2,4] for the CBM-Collaboration — [1]Goethe-Universität Frankfurt, Frankfurt am Main, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [3]Joint Institute for Nuclear Research, Dubna, Russia — [4]Frankfurt Institute for Advanced Studies, Frankfurt am Main, Germany

The heavy-ion experiment CBM will focus on the measurement of rare probes at interaction rates up to 10 MHz with data flow of up to 1 TB/s. The free-running data acquisition, delivering a stream of untriggered detector data, requires full event reconstruction and selection to be performed online not only in space, but also in time. The First-Level Event Selection package consists of several modules: track finding, track fitting, short-lived particles finding, event building and event selection.

For track reconstruction the Cellular Automaton (CA) method is used, which allows to reconstruct tracks with high efficiency in a time-slice and perform event building. The time-based CA track finder allows to resolve tracks from a time-slice in event-corresponding groups. The algorithm is intrinsically local and the implementation is both vectorized and parallelized between CPU cores. The CA track finder shows a strong scalability on many-core systems. The speed-up factor of 10.6 on a CPU with 10 hyper-threaded physical cores was achieved.

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HK 3.5 Mon 15:45 M/HS2

Luminositätsbestimmung mit dem PANDA Luminositätsdetektor — •Stefan Pflüger[1,2], Florian Feldbauer[1,2], Miriam Fritsch[1,2], Prometeusz Jasinski[1,2], Anastasia Karavdina[1], Roman Klasen[1,2], Heinrich Leithoff[1,2], Stephan Maldaner[1,2], Mathias Michel[1,2], Christof Motzko[1,2] und Tobias Weber[1,2] — [1]Johannes Gutenberg-Universität Mainz — [2]Helmholtz Institut Mainz

Das PANDA Experiment, das am neuen Beschleunigerkomplex FAIR in Darmstadt entsteht, ist für Hadronspektroskopie optimiert. Im Vordergrund steht die Suche nach neuen Zuständen und die präzise Vermessung bereits entdeckter Zustände, z.B. des X(3872). Die erforderliche Präzision für diese Messungen kann nur mit Hilfe der Energie-Scan-Methode erreicht werden. Wichtig für die Normierung der Messpunkte untereinander ist die genaue Messung der Luminosität.

Die Luminosität wird bei PANDA mittels elastischer Antiproton-Proton-Streuung, im Winkelbereich von 3-8 mrad gemessen. Der Luminositätsdetektor befindet sich hinter dem PANDA-Spektrometer und besteht aus 4 Ebenen mit Silizium-Pixel-Detektoren (HV-MAPS) die Teilchenspuren registrieren. Im Anschluss an die Spurrekonstruktion der elastisch gestreuten Antiprotonen wird die integrierte Luminosität extrahiert. Systematische Unsicherheiten bei der geometrischen Akzeptanz, Detektorauflösung und Lage und Form des Antiprotonenstrahls sowie des Targetstrahls haben maßgeblichen Einfluss auf die Genauigkeit der Luminositätsmessung und werden in diesem Beitrag vorgestellt.

HK 3.6 Mon 16:00 M/HS2

Survey und Alignment am PANDA-Luminositätsdetektor — •Roman Klasen[1,2], Florian Feldbauer[1,2], Miriam Fritsch[1,2], Prometeusz Jasinski[1,2], Anastasia Karavdina[2], Heinrich Leithoff[1,2], Stephan Maldaner[1,2], Mathias Michel[1,2], Christof Motzko[1,2], Stefan Pflüger[1,2] und Tobias Weber[1,2] für die PANDA-Kollaboration — [1]Helmholtz-Institut Mainz — [2]Johannes-Gutenberg Universität Mainz

Mit dem PANDA-Experiment am Antiproton-Spreicherring HESR an FAIR in Darmstadt sollen Fragen der Hadronenphysik beantwortet werden. Mit der Energy-Scan-Methode werden die Parameter z.B. die Breite oder Linienform bekannter oder bisher unbekannter Resonanzen präzise vermessen. Zur Normierung der einzelnen Messpunkte eines Scans ist die präzise Messung der Luminosität Voraussetzung.

Da die Luminosität anhand der Winkelverteilung der elastischen Antiproton-Proton-Streuung bestimmt wird, ist die exakte Kenntnis der Lage der Sensoren des Detektors notwendig. In diesem Vortrag wird ein Überblick über die technischen Herausforderungen bei der Positionsbestimmung der einzelnen Detektorkomponenten gegeben. Außerdem werden die Methoden zur Bestimmung und Korrektur (Alignment) von mechanischen Ungenauigkeiten anhand deren Auswirkung auf die systematische Unsicherheit bei der Bestimmung der Luminosität diskutiert.

HK 3.7 Mon 16:15 M/HS2

Commissioning of the KOALA Experiment by Proton Beam at COSY — •Qiang Hu[1,2], Huagen Xu[2], and James Ritman[2] — [1]Institute of Modern Physics,CAS,Lanzhou,730000,China — [2]Forschungszentrum Juelich,52425 Juelich,Germany

The KOALA Experiment at HESR is dedicated to measure counts of antiproton-proton elastic scattering in a large range of squared 4-momentum transfer, t, from 0.0008 to 0.1 GeV^2. The goal of the KOALA Experiment is to determine the antiproton-proton elastic scattering forward parameters (i.e. σ_{tot}, ρ and b) to save as a calibration for the $\overline{\text{P}}$ANDA luminosity detector. The scattered antiprotons will be measured by tracking detectors in the forward angle region and the recoil protons will be detected with energy detectors near polar angles of 90°. One recoil arm has been built and commissioned at COSY by measuring proton-proton elastic scattering in the beam momentum region from 1.7 to 3.2 GeV/c. The data at beam momentum of 2.8 GeV/c and 3.2 GeV/c have been analyzed. Preliminary results of the analysis will be presented.