HK 40: Schwerionenkollisionen und QCD Phasen V

Time: Wednesday 16:30–19:00 Location: HS AP

HK 40.1 Wed 16:30 HS AP

Measurement of transverse momentum spectra of identified hadrons from pp and PbPb collisions with the ALICE experiment — •Alexander Kalweit for the ALICE-Collaboration — Institut für Kernphysik, Technische Universität Darmstadt

The ALICE detector at the Large Hadron Collider (LHC) has collected pp data at a center of mass energy of $\sqrt{s} = 900$ GeV and $\sqrt{s} = 7$ TeV as well as PbPb data at $\sqrt{s_{NN}} = 2.76$ TeV. With its excellent particle identification capabilities, the ALICE experiment is measuring transverse momentum spectra of hadrons at these energies and collision systems. Charged kaons, pions, protons, and deuterons can be identified via their specific energy loss in the Time Projection Chamber (TPC) and the Inner Tracking System (ITS) as well as with the Time-of-Flight detector (TOF). Additionally, the weak decay of strange particles allows to detect them via their displaced vertex. Spectral shapes and the integrated yields are presented and discussed along with the various models with a particular focus on strangeness production.

HK 40.2 Wed 16:45 HS AP

Neutral strange hadron reconstruction in *pp* and PbPb collisions at LHC energies — •Simone Schuchmann — Institut für Kernphysik Frankfurt (IKF), Goethe-Universität Frankfurt

Strange particles like Λ and K^0_s are the most abundant neutral strange particles in hadronic collisions. Therefore it is possible to use their invariant mass distributions not only for physics analysis but also for detailed detector performance studies.

This presentation will mainly focus on the impact of the ALICE detector performance on the measurement of Λ and K^0_s masses and widths. In particular, particles reconstructed with the Time Projection Chamber (TPC) and the Inner Tracking System (ITS) have been analysed.
Within this performance analysis the K^0_s width is of greatest interest, because it strongly depends on the momentum resolution. The K^0_s width has been studied as function of $p_\perp$, centrality, polar and azimuthal angles. The width of the Λ is much less sensitive to the resolution, however its mass difference with respect to the $\bar{\Lambda}$ is supposed to reveal overall shifts of the momentum scale due to residual imperfections of the detector calibration.
The results presented in this contribution are based on data sets for *pp* collisions at $\sqrt{s} = 7$ TeV and PbPb collisions at $\sqrt{s_{NN}} = 2.76$ TeV collected in 2010.

HK 40.3 Wed 17:00 HS AP

Measurement of nuclei and antinuclei with the ALICE experiment at the LHC — •Nicole Martin[1,2] and Alexander Kalweit[1,2] for the ALICE-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt — [2]Technische Universität Darmstadt, Hochschulstr. 12, 64289 Darmstadt

The of measurement of nuclei and antinuclei in pp collisions at $\sqrt{s} = 7$ TeV and PbPb collisions at $\sqrt{s_{NN}} = 2.76$ TeV will be presented. These particles are identified using the energy loss (dE/dx) measurements from the Time Projection Chamber. The Inner Tracking System allows a precise determination of the event vertex, by which primary and secondary particles from the detector material can be well separated. The high statistics of pp and PbPb events give a significant number of light nuclei and antinuclei such as (anti)deuterons, (anti)tritons, (anti)^{3}He and possibly (anti)hypertritons. The study of nuclei and antinuclei production will substantially extend the range of hadron masses used to test particle production at the QCD phase boundary, probed in PbPb collisions.

HK 40.4 Wed 17:15 HS AP

Hadron production in p+p, p+Pb and Pb+Pb collisions at the LHC energies with HIJING2.0 model — •Wei-Tian Deng[1], Carsten Greiner[2], Xin-Nian Wang[3,4], Rong Xu[4], and Zhe Xu[1,2] — [1]Frankfurt Institute for Advanced Studies (FIAS), Ruth-Moufang-Str. 1, D-60438 Frankfurt am Main, Germany — [2]Institute for Theoretical Physics Goethe-University, Max-von-Laue-Str. 1, D-60438 Frankfurt am Main, Germany — [3]Nuclear Science Division, MS 70R0319, Lawrence Berkeley National Laboratory, Berkeley, USA — [4]Institute of Particle Physics and Key Laboratory of Quark and Lepton physics, Huazhong Normal University, Wuhan 430079, China

We updated the HIJING Monte Carlo model with the latest parton distribution functions and new set of the parameters in the two-component-model that controls total p+p cross section and the central pseudorapity density. We study hadron spectra and multiplicity distributions using the HIJING 2.0 model and compare to recent experimental data from p + p collisions at the LHC energies. Using a strong gluon shadowing effect, we can also give the prediction about hadron production in p+Pb and Pb+Pb collisions at LHC energies. The recent published LHC experiment results are in good agreement with our predictions within the experimental errors and theoretical uncertainties, including the central rapidity multiplicity and its centrality dependency in Pb+Pb collisions.

HK 40.5 Wed 17:30 HS AP

Event-by-event fluctuations of mean transverse momentum in *pp* collisions at $\sqrt{s} = 900$ GeV and 7 TeV measured by the ALICE experiment — •Stefan Heckel for the ALICE-Collaboration — Goethe-Universität Frankfurt, Institut für Kernphysik, Max-von-Laue-Str. 1, 60438 Frankfurt am Main

Event-by-event fluctuations of the average transverse momentum $\overline{p_T}$ of particle production in heavy ion collisions have been proposed as a probe of phase instabilities near the QCD phase transition. Fluctuation measurements could also provide information about the onset of thermalisation in the system. The corresponding measurement of event-by-event fluctuations in *pp* collisions provides valuable information as a reference measurement for heavy ion collisions. The ALICE experiment at the CERN LHC has measured charged particle production in *pp* collisions at $\sqrt{s} = 900$ GeV and 7 TeV. We present first results on event-by-event fluctuations of $\overline{p_T}$ at these energies. Different approaches will be discussed. The dispersion of the average event transverse momentum $D(\overline{p_T})$ and the two-particle p_T correlator $\langle \Delta p_{T,i}, \Delta p_{T,j} \rangle$ have been studied as a function of the event multiplicity.

HK 40.6 Wed 17:45 HS AP

Analyse der Pionenquelle durch HBT-Interferometrie mit ALICE — •Johanna Gramling für die ALICE-Kollaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Deutschland

ALICE (A Large Ion Collider Experiment), eines der vier großen Experimente am CERN LHC, untersucht hochenergetische Schwerionenkollisionen und Proton-Kollisionen in einem großen Phasenraumbereich mit guter Auflösung auch bei niedrigen Transversalimpulsen.

Analysiert man die Bose-Einstein-Korrelationen identischer Pionen, so können Informationen über die raumzeitliche Ausdehnung der emittierenden Region gewonnen werden. Untersucht man diese in verschiedenen Richtungen in der transversalen Ebene, lassen sich Aussagen über die Form der Region zum Zeitpunkt des Freeze-Out machen, welche durch die Lebensdauer des Systems und den herrschenden Druckgradient beeinflusst wird.

Präsentiert werden erste Ergebnisse für p–p-Kollisionen bei einer Schwerpunktsenergie von $\sqrt{s} = 7$ TeV und Pb–Pb-Kollisionen bei $\sqrt{s_{NN}} = 2.76$ TeV.

HK 40.7 Wed 18:00 HS AP

Analyse von Pseudorapiditäts-Dichtekorrelationen mittels Multiplizitätsverteilungen in pp- und PbPb-Kollisionen mit ALICE — •Maren Hellwig für die ALICE-Kollaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Deutschland

Das Alice-Experiment am CERN LHC hat seit Oktober 2009 Daten in pp-Kollisionen mit Schwerpunktsenergien von 0,9 , 2,36 und 7 TeV und Daten in PbPb-Kollisionen mit $\sqrt{s_{NN}} = 2{,}76$ TeV genommen. Durch die Analyse von Zwei-Teilchen-Dichtekorrelationen in der Pseudorapidität η erhält man eine mögliche Observable für einen Phasenübergang in PbPb-Kollisionen bei LHC Energien. Dabei erwartet man, dass Korrelationen in η durch die Form $\alpha \exp(\frac{-|\eta_1 - \eta_2|}{\xi})$ beschrieben werden. Ein starker Anstieg von ξ nahe der kritischen Temperatur stellt dabei einen Indikator für einen Phasenübergang dar. Diese Korrelationen werden in unterschiedlichen Pseudorapiditätsfenstern in pp-Kollisionen sowie in PbPb-Kollisionen und zusätzlich in unterschiedlichen Zentralitäten untersucht. Man misst dazu die jeweiligen Multiplizitätsver-

teilungen, korrigiert sie mittels einer Entfaltungsmethode und extrahiert die Dichtekorrelation in η. Mittels dieser Methode erhielt man am RHIC bei PHENIX Hinweise auf einen möglichen Phasenübergang. In diesem Vortrag werden ein Überblick über die Entfaltungsmethoden gegeben und erste Ergebnisse für pp- bzw. PbPb-Daten präsentiert.

HK 40.8 Wed 18:15 HS AP

Mini-Jet Activity as Function of Charged Multiplicity — •Eva Sicking for the ALICE-Collaboration — CERN, Geneva, Switzerland — Institut für Kernphysik, University of Münster, Münster, Germany

A Large Ion Collider Experiment (ALICE) is the experiment at the Large Hadron Collider (LHC) optimized for heavy-ion collisions. ALICE is studying pp collisions for not only providing an important reference for heavy-ion measurements but as part of a unique pp physics program. In particular, high multiplicity pp collisions are an interesting field of study of particle production mechanisms.

Here we present the results of a di-hadron angular correlation analysis which has the aim to measure the number of multi-parton interactions and mini-jet fragmentation properties as a function of multiplicity. We discuss the difficulties encountered with standard correlation measurements at high multiplicities and present solutions to cope with these. Results for different center of mass energies are compared and the comparisons between data and different Monte Carlo generators are discussed.

ALICE is supported by BMBF.

HK 40.9 Wed 18:30 HS AP

Underlying Event measurement in pp collisions with the ALICE detector — •Sara Vallero for the ALICE collaboration — Physikalisches Institut , University of Heidelberg

In a hadronic machine a clear jet signature has to be decoupled from the soft or semi-hard bulk of particles originating from beam remnant fragmentation, initial and final state radiation and multi-partonic interactions: the so-called Underlying Event. We studied the underlying activity in two transverse regions azimuthally perpendicular to the leading track in the event. Only charged particles are considered. This characterization provides a baseline for jet studies as well as a closer look into the non-perturbative phenomenology in high energy hadronic collisions and, in particular, it serves as a powerful tool to tune Monte-Carlo event generators. In this talk we describe the correction procedure applied to experimental data in order to eliminate detector-related biases and inefficiencies. Moreover, we summarize the determination of the systematic uncertainties affecting the correction procedure. Finally, we present the fully corrected Underlying Event distributions for pp interactions at collision energies of 900 GeV and 7 TeV.

HK 40.10 Wed 18:45 HS AP

Results of the Quality Assurance for the High Level Trigger Applications for the ALICE TRD — •Theodor Rascanu for the ALICE-Collaboration — Institut für Kernphyisk, Frankfurt, Germany

The ALICE experiment has finished its first year of the search of the Quark-Gluon-Plasma. During its operation each detector of the experiment is continuously producing large amounts of raw data, e.g. 2.5GB/s in the case of the Transition Radiation Detector (TRD). The data of the main ALICE detectors is analyzed online by a High Level Trigger system (HLT). The HLT performs a fast first analysis of the data and preselects interesting or rare events thus the data volume is reduced to a suitable size for the Data Acquisition system (DAQ).

This talk will present the results of the Quality Assureance for the HLT analysis of the ALICE TRD, as compared to both, the offline analysis of real and simulated data. The understanding of variations is crucial for implementing reliable physics triggers.