

HK 24: Heavy Ion Collisions and QCD Phases 3

Time: Tuesday 14:30–16:15

Location: T/HS1

Group Report

HK 24.1 Tue 14:30 T/HS1

The CBM Experiment at FAIR — ●CHRISTIAN STURM for the CBM-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The Compressed Baryonic Matter experiment (CBM) is being constructed at the Facility for Antiproton and Ion Research FAIR. Using nucleus-nucleus collisions at beam energies up to 14 A GeV during the first stage and up to 45 AGeV in a second stage, the key objective of CBM is to investigate the QCD phase diagram in the region of high net-baryon-densities. At this region a first order phase transition from hadronic to partonic matter as well as a chiral phase transition is expected, representing a substantial discovery potential at FAIR energies. As a fixed-target experiment CBM is consequently designed to cope with very high interaction rates up to 10 MHz which will allow to study extremely rare probes with high precision which have not been accessible by previous nucleus-nucleus experiments at this energy regime. To achieve the high rate capability CBM will be equipped with fast and radiation hard detectors readout by free-streaming electronics. The high-speed data acquisition system will transport data volumes up to 1 TB/s to a large scale computer farm providing a first level event selection. An overview on the CBM experiment as well as the progress on the detector projects will be given.

Supported by BMBF and HICforFair.

Group Report

HK 24.2 Tue 15:00 T/HS1

Investigating Heavy-Ion Collisions with Neutral Mesons in the ALICE Calorimeters — ●BALDO SAHLMÜLLER for the ALICE-Collaboration — Goethe-Universität Frankfurt

One of the main purposes of the LHC is the investigation of the quark-gluon plasma produced in heavy-ion collisions. In order to interpret such measurements, the initial state of such collisions, i.e. the lead nucleus, and its effects on observables such as the modification of hadron transverse momentum spectra have to be understood. This initial state is studied in p-Pb collisions. Furthermore, pp collisions function as baseline measurement for the aforementioned larger systems and are necessary to extract fundamental parameters such as fragmentation functions.

The π^0 and η mesons can be measured in electromagnetic calorimeters via their two-photon decays. In the first run of the LHC, ALICE comprised two different calorimeters, PHOS and EMCAL, that offer different advantages and the possibility of two independent measurements of the same observables such as the transverse momentum distribution of neutral mesons.

We will present the status of ALICE measurements of neutral mesons with the EMCAL and PHOS detectors. The focus will be on technical aspects of the analyses and present results from pp and p-Pb collisions. Furthermore, we will give an outlook to future measurements in the second LHC run that will start in 2015.

Supported by BMBF and the Helmholtz Association.

HK 24.3 Tue 15:30 T/HS1

Separation of the Charm- and Beauty Production in pp- and Pb-Pb Collisions Using ALICE — ●MARTIN VÖLKL for the ALICE-Collaboration — Universität Heidelberg

In heavy ion collisions the energy loss of heavy quarks is an interesting quantity for the investigation of the properties of the Quark-Gluon Plasma (QGP). Heavy quarks are produced almost exclusively in the initial hard interactions. Thus, they can interact with the surrounding matter throughout its evolution. The heavy quarks form hadrons

which may have electrons as decay products. An approach for the measurement of the energy loss of heavy quarks in the QGP is the comparison of the spectra of such electrons from heavy-ion collisions with those from proton-proton collisions. The implications for the understanding of the QGP can then be analyzed via comparison with theoretical predictions and models. For this, the difference in the result for beauty- and charm quarks is of particular interest due to expected differences in their energy loss. In the analysis presented here, these contributions are separated statistically using their different impact parameter distributions. The impact parameter for electrons from hadrons containing a beauty quark is typically larger due to the larger decay length ($c\tau \approx 500\mu\text{m}$) of the hadrons. The excellent particle identification properties of ALICE allow for a very clean selection of electrons. Here, the current results of the analysis are presented for pp at $\sqrt{s} = 7\text{TeV}$ and Pb-Pb at $\sqrt{s_{NN}} = 2.76\text{TeV}$.

HK 24.4 Tue 15:45 T/HS1

Multiplicity dependence of D^{*+} -meson production in p-Pb collisions with ALICE — ●JEREMY WILKINSON for the ALICE-Collaboration — Physikalisches Institut, Ruprecht-Karls Universität Heidelberg, Deutschland

The heavy-ion programme at ALICE (A Large Ion Collider Experiment) facilitates the study of the hot, high-density state of matter formed in high-energy nuclear collisions. A key probe of this system is the production of heavy quarks, namely charm and beauty. Charm and beauty quarks are produced in the earliest stages of the collision, and experience the full evolution of the system. As well as studying the production of leptons from heavy-flavour decays, ALICE's excellent tracking, vertexing, and particle identification capabilities also allow it to fully reconstruct the hadronic decays of open-charmed D mesons.

Control measurements are made in p-Pb collisions in order to disentangle experimental outcomes arising in the hot and dense medium from those occurring due to initial-state effects. One interesting measurement that can be made in this system is the production of certain particle species as a function of the overall multiplicity of charged particles. Such measurements allow us to investigate the role of multiparton interactions in particle collisions at LHC energies, in particular when compared with similar results in pp collisions.

In this talk, the ALICE measurements of D^{*+} -meson production as a function of charged-particle multiplicity in p-Pb collisions at $\sqrt{s_{NN}} = 5.02\text{ TeV}$ will be presented, along with comparisons with D^0 and D^+ results in p-Pb and pp.

HK 24.5 Tue 16:00 T/HS1

Measurement of electrons from semi-leptonic heavy-flavour hadron decays in p-Pb collisions at $\sqrt{s_{NN}} = 5.02\text{ TeV}$ with the ALICE TRD — ●MARTIN FLECK for the ALICE-Collaboration — Heidelberg University, Deutschland

Heavy quarks (charm and beauty), only produced in the initial hard scattering processes, constitute an important way to probe features of the Quark-Gluon Plasma. However, suppression effects that are seen in Pb-Pb collisions in comparison to p-p results can be regarded as a property of the Quark-Gluon Plasma after non-QGP nuclear effects in the study of proton-nucleus collisions have been quantified. For this purpose the ALICE TPC and TRD were used to measure semi-leptonic decays of heavy-flavoured hadrons, where especially the TRD electron identification capability contributes to the results. The procedure of the analysis of p-Pb LHC data of 2013 is explained and first results are shown.