HK 15: Heavy-Ion Collisions and QCD Phases III

Time: Tuesday 17:00–18:30 Location: J-HS F

Group Report HK 15.1 Tue 17:00 J-HS F

Measurements of charm-baryon production with ALICE at the LHC — •Andrea Dubla for the ALICE-Collaboration — GSI Helmholtz Center for Heavy Ion Research

Heavy quarks (charm and beauty) are an effective tool to study the properties of the Quark-Gluon Plasma (QGP) formed in heavy-ion collisions at the LHC. Due to their large masses, they are produced during the early stages of the collisions in hard-scattering processes, on a time scale shorter than the QGP formation time. Thus, they experience the whole evolution of the system.

The measurement of charm baryons and mesons allows the baryon-to-meson ratio to be evaluated, probing hadronisation and thermalisation mechanisms of charm quarks in the medium. In particular, the baryon-to-meson ratio is expected to be enhanced if charm quarks hadronise via recombination with the surrounding light quarks in the QGP.

The ALICE detector is well suited to reconstruct charm baryons down to low transverse momentum thanks to the excellent tracking and particle identification capabilities. In this contribution, new ALICE results on charm-meson and baryon production in Pb-Pb and in pp collisions will be shown. In the pp system, the measurement of Λ_c and Ξ_c^0 production will be discussed. In the Pb-Pb system, the measurement of Λ_c production, the nuclear modification factor and the Λ_c/D^0 ratio will be discussed together with the comparison with similar results in smaller collision systems. Moreover, the comparison of the results to theoretical models will be shown.

HK 15.2 Tue 17:30 J-HS F

Charmed hadron production at LHC energies with the statistical hadronisation model — Anton Andronic[1], Peter Braun-Munzinger[2], •Markus K. Köhler[3], Krzysztof Redlich[4], and Johanna Stachel[3] — [1]Westfälische Wilhelms-Universität Münster, Institut für Kernphysik, Münster, Germany — [2]Research Division and ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [3]Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany — [4]University of Wrocław, Institute of Theoretical Physics, 50-204 Wrocław, Poland

We present p_{T}-integrated and p_{T}-differential yields of charmonium states and baryon over meson ratios of open charmed hadrons at LHC energies within the framework of the statistical hadronisation model. It is demonstrated that the statistical hadronisation model reproduces available data at LHC energies. Predictions for exotic charmonium states of potential measurements in future LHC runs will be shown.

HK 15.3 Tue 17:45 J-HS F

Particle reconstruction with the KF package to study charmed baryons — •Carolina Reetz for the ALICE-Collaboration — Heidelberg University

The study of charmed baryon production in proton-proton (pp) collisions is a crucial step on the way of understanding charm hadronisation processes in the presence of a Quark-Gluon Plasma (QGP) state, which is expected to be created in heavy-ion collisions.

The hadronic decay of the Ξ_c^0 baryon is the subject of the studies presented in this contribution. The complex decay topology includes the decay hyperons Ξ and Λ: its reconstruction is performed with the help of the KF Particle package, developed in the context of the CBM experiment. The package supports the reconstruction of full particle decay chains, exploiting the use of various constrained fits and including the complete treatment of tracking and vertexing uncertainties. These features are of crucial importance in the search for rare signals.

Different selection criteria related to the reconstruction of the Λ and Ξ decays are investigated. This study provides the validation of the KF Particle package for the reconstruction of decay topologies in ALICE and its implementation in the ALICE software framework.

HK 15.4 Tue 18:00 J-HS F

Ξ_c^0 reconstruction in pp collisions with ALICE — •jianhui zhu for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The high collision energies available at the LHC allow for an abundant production of heavy quarks (charm and beauty), which are sensitive probes for investigating the properties of the Quark-Gluon Plasma (QGP) formed in high-energy heavy-ion collisions. Due to their large masses, they are produced in initial hard parton scattering processes on a timescale shorter than the QGP formation time and experience the whole system evolution. There have been extensive researches regarding the production of charm mesons in order to investigate the interactions of charm quarks with the QGP constituents and the transport properties of the medium. The measurement of charm-baryon production, and in particular the baryon-to-meson ratios, provides unique information on hadronisation mechanisms, constraining the role of coalescence and testing the universality of the fragmentation function.

Measurements of charm-baryon production in pp collisions are important to set up a benchmark for Pb-Pb collisions and provide essential tests of pQCD calculations and models of charm hadronisation process. In this presentation, the p_{T} differential cross section times branching ratio of the Ξ_c^0 baryon measured in the decay channel $\Xi_c^0 \to \mathrm{e}\Xi\nu$ and the status of the Ξ_c^0 baryon reconstruction via the hadronic decay channel $\Xi_c^0 \to \pi^+\Xi^-$ (and its charge conjugate) in pp collisions using Kalman Filter (KF) Particle package combined with machine learning technique will be reported.

HK 15.5 Tue 18:15 J-HS F

Reconstruction of Bottom Jets in Proton-Proton Collisions at $\sqrt{s} = 13$ TeV with ALICE — •Katharina Garner for the ALICE-Collaboration — Westfälische Wilhelms-Universität Münster

When traversing the Quark-Gluon Plasma (QGP), partons lose energy via collisional and radiative processes. For both types of processes, the amount of lost energy depends on the particle mass and manifests in a reduced jet multiplicity in heavy-ion collisions with respect to proton-proton collisions, for which no QGP is expected to form. A detailed knowledge about not only the light-flavour but also the charm and bottom jet production in proton-proton collisions is thus inevitable for further investigations on particle energy losses.

Since B mesons have much larger life-times compared to other hadrons, transverse impact parameter spectra, as a measure for the distance between particle tracks and the primary vertex, offer a great opportunity to investigate the bottom jet production. Results of an analysis on the performance of two bottom jet selection algorithms, the Track Counting and the Track Probability Tagger based on impact parameter spectra, will be presented for 13 TeV proton-proton collisions.