HK 46: Heavy-Ion Collisions and QCD Phases IX

Time: Wednesday 17:30–19:00 Location: SCH/A216

Group Report HK 46.1 Wed 17:30 SCH/A216

Open heavy-flavour hadron production from small to large collision systems at the LHC with ALICE in Run 2 and beyond — •Annalena Kalteyer for the ALICE Germany-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

This talk will present the latest measurements performed by the group for heavy-flavour baryon production at midrapidity in pp, p–Pb and Pb–Pb collisions at the LHC. Small collision systems, like pp, allow for precision measurements of rare particle species, and they can serve as a reference for heavy-ion collisions. Proton-lead collisions are in particular useful to study cold nuclear matter effects, and with Pb–Pb systems we study heavy-flavour production in heavy-ion collisions and their interaction with the quark-gluon plasma.
We will show the measurement of Λ_c^+ down to $p_T = 0$ in pp and p–Pb collisions, together with the obtained nuclear modification factor, thanks to the recently measured Λ_c^+ also in Pb–Pb collisions. Furthermore, due to sophisticated machine learning techniques, it was possible to gain indirect information on beauty baryon production by measuring Λ_c^+ coming from the decay of beauty hadrons, both in pp and p–Pb collisions. Finally, results of heavy charm baryons, such as $\Xi_c^{0,+}$ and Ω_c^0, will be discussed. Since data taking in Run 3 at the LHC started in July 2022, we will show a first look on Run 3 data, plus some studies on vertex determination with the KFParticle package and heavy-flavour triggers for rare particles and beauty hadrons.

HK 46.2 Wed 18:00 SCH/A216

Ω_c^0 production in pp collisions at $\sqrt{s}$ = 13 TeV with ALICE — •Tiantian Cheng for the ALICE Germany-Collaboration — Central China Normal University(CCNU), Wuhan, China — GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany

Recent measurements of the production of charm hadrons at midrapidity in pp collisions at $\sqrt{s} = 5.02$ TeV showed that the baryon-to-meson yield ratios are significantly higher than those measured in e^+e^- collisions for different charm-baryon species. These observations suggest that the charm fragmentation fractions are not universal and depend on the collision systems. In this talk, the new measurement of the p_T-differential cross section times branching ratio of the Ω_c^0 baryon measured in the decay channels $\Omega_c^0 \to e\Omega\nu$ and $\Omega_c^0 \to \pi\Omega$ in pp collisions at $\sqrt{s}$ = 13 TeV will be reported. The measurement of the Ω_c^0 baryon, containing 2 strange quarks, gives further constraints on charm-quark hadronisation models. The final result will be compared with theoretical calculations.

HK 46.3 Wed 18:15 SCH/A216

Charm production in proton–proton collisions at $\sqrt{s} = 13$ TeV measured with the ALICE detector — •Carolina Reetz for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg — GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt

Recent measurements of charm fragmentation fractions of single charm ground state hadrons at midrapidity in proton–proton (pp) collisions at $\sqrt{s} = 5.02$ TeV at the LHC significantly differ from the values obtained in e^+e^- and ep collisions. Therefore the assumption of universality of the charm-to-hadron fragmentation fractions across different collision systems might not be fully supported.
New p_T-integrated cross section measurements of prompt D^0, D^+, D_s^+, D^{*+}, Λ_c^+ and Ξ_c^+ in pp collisions at $\sqrt{s} = 13$ TeV are presented. The relative abundance of the different charm hadron species, which is sensitive to hadronization mechanisms, is shown and compared to model calculations. The presented charm hadron cross section measurements are used to evaluate the charm fragmentation fractions and the total charm production cross section at midrapidity in pp collisions at $\sqrt{s} = 13$ TeV. The new measurement of the Ξ_c^+ production cross section down to low transverse momenta is extrapolated to $p_T = 0$ for the first time. The Ξ_c^+ fragmentation fraction is calculated and the contribution is included in the total charm production cross section.

HK 46.4 Wed 18:30 SCH/A216

Reconstruction of displaced decay vertices in an inhomogeneous magnetic field with a Kalman Filter based tracking algorithm at HADES — •Mirco Parschau for the HADES-Collaboration — Goethe University Frankfurt am Main

The high interaction rate, fixed target experiment HADES at GSI, located in Darmstadt, Germany, investigates collisions of heavy-ion, proton and secondary pion beams with a target material. Hyperons are one of the key observables for both heavy-ion and elementary collisions. The challenge is to detect displaced vertices with good accuracy without having a dedicated vertex detector, by employing state-of-the-art techniques.

In this contribution we discuss a newly developed tracking algorithm that uses a Kalman Filter to further boost the track reconstruction performance and the reconstruction of displaced vertices from hyperons.

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HK 46.5 Wed 18:45 SCH/A216

Performance test of the KF Particle vertexing package for open heavy flavour baryon reconstruction with the ALICE detector — •Phil Stahlhut for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg

The study of charm baryon production is crucial to understand charm hadronisation processes in a parton-rich environment. In order to extract signal even in low transverse momentum (p_T) regions where the signal-to-background ratio is rapidly decreasing, a precise vertex reconstruction is of upmost importance.

The Kalman Filter Particle package gives a fast reconstruction of complex decay topologies providing a full description of the decay particle both at its production and decay vertex. It is suitable even for high-density track environments. In addition to that, the KF Particle package supports the use of geometrical, mass and topological constraints in the reconstruction process and includes the complete treatment of tracking and vertexing uncertainties.

In this work, the KF Particle package was used to reconstruct the Ξ_c^+ baryon from its decay to $\Xi^-\pi^+\pi^+$ in simulated proton–proton collisions at a center-of-mass energy of $\sqrt{s} = 13$ TeV. This contribution will demonstrate the effect of geometrical, mass and topological constraints on the secondary vertex, p_T and mass resolution of the reconstructed Ξ_c^+ baryon.