# HK 8: Heavy-Ion Collisions and QCD Phases I

Time: Monday 16:45–18:15 Location: HBR 62: EG 03

**Group Report** HK 8.1 Mon 16:45 HBR 62: EG 03

**Probing hadronisation effects with heavy-flavour particles with ALICE at the LHC** — •Jeremy Wilkinson for the ALICE Germany-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Deutschland

The study of heavy-quark (charm and beauty) hadronisation has recently become a major topic of interest at the CERN LHC. Typically, the fragmentation functions that describe the evolution from a bare heavy quark to a bound hadronic state were assumed to apply universally. However, measurements of the relative production rates of charm baryons and mesons at the LHC have challenged this assumption, indicating that the hadronisation of heavy-flavour quarks in collider experiments is dependent on the collision system.

In this contribution, the most recent results from the ALICE Collaboration on the hadronisation of heavy-flavour particles at the LHC will be presented. Measurements of prompt and non-prompt $\Lambda_c^+$-baryon production in pp and p–Pb collisions are used to investigate the hadronisation of charm and beauty baryons. The production of the $\Xi_c^0$ baryon was measured in p–Pb collisions at midrapidity for the first time. The available measurements of prompt ground-state charm hadrons in p–Pb collisions were combined to compute the charm fragmentation fractions and total charm cross section at midrapidity. Recent measurements of $\Omega_c^0$ production in semileptonic decays are presented along with the determination of its relative branching fractions. Finally, a brief overview of the current status of heavy-flavour measurements using data from Run 3 of the LHC is presented.

HK 8.2 Mon 17:15 HBR 62: EG 03

**Charmed baryon measurements in proton-proton collisions at $\sqrt{s}$ = 13.6 TeV with the ALICE experiment in Run 3** — •Federica Zanone for the ALICE Germany-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Germany

At LHC energies, charmed-baryons are copiously produced. Moreover, the recent upgrade of the ALICE experiment allows to operate at an increased interaction rate and in continuous readout mode, thus allowing for collecting a significantly larger data set compared to Run 2. This opens a new dimension of precise charmed-baryon measurements in several decay channels, helping to shed light on the mechanisms responsible for the production and decay of these particles. This topic became of crucial interest after recent studies by ALICE challenged the assumptions of the universality of charm hadronization processes across different collision systems. Moreover, the decay of charmed baryons is still poorly understood. Measurements of corresponding branching ratios pose a challenge to all models.

In this picture, the measurements of $\Xi_c^0 \rightarrow \Xi^+\pi^-$ and of the Cabibbo-suppressed decays $\Omega_c^0 \rightarrow \Xi^+\pi^-$ (SCS) and $\Omega_c^0 \rightarrow \Xi^+K^-$ (DCS) play a key role. To address these challenging analyses, ALICE relies on the implementation of dedicated triggers, thus allowing for the exploration of a data sample that is about 300 times larger than the previous data set but at the same time applying an efficient data storage procedure. We present recent results from Run 3.

HK 8.3 Mon 17:30 HBR 62: EG 03

**Reconstruction of heavy-flavor hadrons with ALICE in Run 3** — •Phil Lennart Stahlhut for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg

Heavy-flavor hadrons are sensitive probes for the quark-gluon plasma, a hot nuclear matter state produced at extremely high temperatures and/or densities, like the ones reached in heavy-ion collisions at the CERN LHC. Therefore, measurements of heavy-flavor hadron production in proton-proton collisions are a crucial reference for production measurements in heavy-ion collisions, while also providing an important test of perturbative quantum chromodynamics.

The reconstruction of short-lived particles and their corresponding decay vertices can be performed with the Kalman Filter Particle package. It provides a full description of the decay particle both at its production and decay vertex and includes the complete treatment of tracking and vertexing uncertainties. Moreover, the KF Particle package supports the use of geometrical, mass and topological constraints in the reconstruction process and is suitable even for high-density track environments.

This contribution will outline recent developments of the reconstruction and selection workflow of heavy-flavor hadrons in $O^2$Physics, the new analysis software framework for ALICE in Run 3, and selected results from proton-proton collisions.

HK 8.4 Mon 17:45 HBR 62: EG 03

**Charmonium production measurement at midrapidity using TRD-triggered data in ALICE** — •Jinjoo Seo — Physikalisches Institut Universität Heidelberg

Quarkonium production is considered one of the golden probes of the quark-gluon plasma (QGP) formation in heavy-ion collisions. Due to their large mass, the production of heavy-quarks is governed by hard scales of QCD, while the formation of the bound quarkonium state involves soft QCD scales. Quarkonium productions in pp collision is essential to provide a baseline for Pb–Pb results, and also useful for investigating the production mechanisms. The $\psi$(2S) production relative to J/$\psi$ is observable with discriminating power between the two quarkonium production models. Thanks to the ALICE online single-electron triggers from the Transition Radiation Detector (TRD), the $\psi$(2S) signal can be extracted at midrapidity in the dielectron channel.

In this contribution, the J/$\psi$ and $\psi$(2S) productions and the excited-to-ground state yield ratio ($\psi$(2S)-to-J/$\psi$) at midrapidity with the TRD-triggered data measured in ALICE in pp collisions at $\sqrt{s}$ = 13 TeV will be shown.

HK 8.5 Mon 18:00 HBR 62: EG 03

**Charmonia production and dissociation within microscopic Langevin simulations** — •Naomi Oei[1], Juan Torres-Rincon[2], Hendrik van Hees[1], and Carsten Greiner[1] — [1]Goethe University, Frankfurt, Germany — [2]Universitat de Barcelona, Barcelona, Spain

The investigation of heavy quarkonia can give insight into processes that occur during the evolution of the quark-gluon plasma and therefore allows conclusions about the properties of the medium. One advantage of theoretical approaches is that heavy quarks can be treated non-relativistically due to their large masses. We choose a classical model to describe charm and anticharm quarks as Brownian particles in the background medium of light quarks and gluons. Their motion and the interaction with the medium are based on a Fokker-Planck equation, which can be realized with Langevin simulations, quantifying how position and momentum of the quarks change due to random kicks from the medium. The heavy quarks interact over a Coulomb-like potential to form bound states, which can later dissociate again due to interactions with the medium. Therefore dissociation and regeneration of charmonium states can be described. The medium evolution is parametrized by a transversally expanding, boost invariant fireball. Box simulations at fixed temperature and volume are used to verify that the system reaches the expected thermal distribution in the equilibrium limit and to test bound state properties. Within the fireball model, the initial momentum distribution of the pairs results from the PYTHIA event-generator and the elliptic flow of charm and anticharm quarks as well as of charmonia is studied at RHIC and at LHC energy.