

## HK 11: Heavy-Ion Collisions and QCD Phases II

Zeit: Montag 16:30–18:30

Raum: HS 15

**Gruppenbericht**

HK 11.1 Mo 16:30 HS 15  
 **$J/\psi$  measurements at mid-rapidity with ALICE at the LHC**  
 — ●MARKUS K. KÖHLER for the ALICE-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Germany

The charmonium state  $J/\psi$  is a fruitful and intriguing probe to investigate the evolution of strongly interacting matter in heavy-ion collisions. The production of charm-quark pairs and their hadronisation are well separated in the space-time evolution of the collision and provide a wealth of information of the underlying QCD dynamics from the dense to the eventually dilute system.

The ALICE detector system can measure  $J/\psi$  production at mid- and forward rapidity down to zero  $p_T$ . In this contribution, recent results on  $J/\psi$  production are shown with the focus being placed on measurements at mid-rapidity in pp and PbPb collisions at a centre-of-mass energy of 5.02 TeV per nucleon pair collected in LHC run2.  $J/\psi$  production as a function of rapidity, transverse momentum and for the case of PbPb collisions- centrality are presented and compared with available model calculations.

HK 11.2 Mo 17:00 HS 15  
**Measurement of Angular Correlations between Heavy-Flavour Electrons and Charged Particles in pp Collisions at  $\sqrt{s} = 13$  TeV with ALICE - Process and Multiplicity Dependence**  
 — ●FLORIAN HERRMANN for the ALICE-Collaboration — Institut für Kernphysik, Universität Münster

Heavy flavour quarks (charm and beauty) are of special interest for the study of the Quark-Gluon Plasma (QGP) as they are predominantly produced in the initial hard-scattering processes and participate in the entire evolution of the system. Moreover, heavy flavour production is well under control of perturbative QCD. Thus, heavy flavours are an excellent probe to study pQCD in small systems as well as parton in medium energy loss and transport mechanisms in nuclear collisions by measuring, for instance, the spectra, angular correlations or the nuclear modification factor  $R_{AA}$ . Experimentally, heavy flavours are often investigated using measurements of electrons from heavy-flavour hadron decays. These electrons can be separated statistically from the background and their angular correlations with other heavy flavour electrons or with charged particles can be studied. In this talk, we will present a current approach to measure two-particle correlations of heavy flavour electrons with charged particles biased to higher  $p_T$  ( $> 2$  GeV) or with the leading particle in pp collisions at  $\sqrt{s} = 13$  TeV with the ALICE experiment. Monte Carlo calculations with POWHEG and PYTHIA 8 show the sensitivity of this observable on multiplicity and production mechanisms. – Supported by DFG GRK2149.

HK 11.3 Mo 17:15 HS 15  
**Study of the charm quark production mechanisms through angular correlation of dielectrons in pp collisions at  $\sqrt{s} = 13$  TeV**  
 — ●HERMANN DEGENHARDT for the ALICE-Collaboration — Excellence Cluster Universe, TUM, Munich, Germany

The aim of relativistic heavy-ion collisions is to investigate the properties of the Quark-Gluon Plasma (QGP) that is formed at high-enough temperatures and/or densities. Heavy-quarks, i.e. charm and beauty, are very useful probes for the characterization of the QGP since they are produced at the early stages of the collisions via initial hard scatterings. To quantify the QGP effects, it is important to understand the heavy-quark production in pp collisions first. In particular, the production mechanisms of charm quarks can be studied through their angular correlations which is inherited by their decay products, such as electrons.

In the leading order the heavy-flavour pair is created back to back through flavour creation. On the other hand, higher order processes like flavour excitation and gluon splitting create pairs with different angular correlation functions. While gluon splitting produces pairs with small angles, flavour excitation processes produce pairs without preferred angular correlation. In this talk we present the current analysis of angular distribution functions between correlated heavy-flavour electron-positron pairs in proton-proton collisions at a centre of mass energy  $\sqrt{s} = 13$  TeV and the comparison with simulated mechanisms processes obtained by PYTHIA.

HK 11.4 Mo 17:30 HS 15

**Reconstruction of Beauty Jets in Proton-Proton Collisions at  $\sqrt{s} = 13$  TeV with ALICE** — ●KATHARINA GARNER for the ALICE-Collaboration — Westfälische Wilhelms-Universität Münster, Germany

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, signed 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. First steps of an analysis on signed impact parameter distributions for tracks from within light-flavour, charm- and bottom jets in 13 TeV proton-proton collisions are presented.

HK 11.5 Mo 17:45 HS 15  
**Measurements of non-prompt  $J/\Psi$  production in Pb-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV with ALICE**  
 — ●XIAOZHI BAI for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

Heavy quarks are an excellent probe to study the strongly interacting Quark-Gluon Plasma (QGP) created in high-energy heavy-ion collisions. Due to their large masses, charm and beauty quarks are mainly produced via initial hard partonic scattering processes, and thus experience the entire evolution of the QGP medium. Measurements of heavy-flavour production have advanced our understanding on the properties of the QGP. At LHC energies, the inclusive  $J/\Psi$  yield contains a significant non-prompt contribution from beauty-hadron decays. Due to the longer lifetime of beauty hadrons compared to the QGP lifetime, non-prompt  $J/\Psi$  do not suffer from color screening in the QGP medium. Instead, the non-prompt  $J/\Psi$  are affected the beauty quark energy loss in the hot and dense QCD medium.

In this talk, the analysis status of the non-prompt  $J/\Psi$  production measured via dielectron decay channel ( $J/\Psi \rightarrow e^+e^-$ ) at mid-rapidity in Pb-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV with ALICE will be shown. The related physics message will be discussed as well.

HK 11.6 Mo 18:00 HS 15  
**Multiplicity dependence of  $J/\psi$  production in proton-proton collisions at  $\sqrt{s} = 13$  TeV with ALICE at the LHC**  
 — ●STEFFEN GEORG WEBER for the ALICE-Collaboration — Westfälische Wilhelms-Universität Münster

The hadronic production of charmonium in proton-proton collisions is a complex and intrinsically multi-scale process. The dependence of  $J/\psi$  production on the event multiplicity is of special interest, since it relates the hard-scale  $c\bar{c}$  production with the soft-scale physics of light-flavour particle production. Insights into the influence of multiple-parton interactions (MPI) on charmonium production can be obtained.

In this talk the measurement of  $J/\psi$  production at mid-rapidity in transverse-momentum intervals as a function of the charged-particle multiplicity in pp collisions at  $\sqrt{s} = 13$  TeV performed with ALICE at the LHC will be presented. The influence of a rapidity gap between the  $J/\psi$  signal and the multiplicity is investigated. The results are compared to theoretical model predictions and interpreted based on simulation studies with the PYTHIA 8 event generator in terms of MPI, color reconnection and auto-correlation effects.

HK 11.7 Mo 18:15 HS 15  
**Measurement of  $J/\psi$  production in p-Pb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV with ALICE**  
 — ●MINJUNG KIM for the ALICE-Collaboration — Physikalisches Institut, Universität Heidelberg

The measurement of  $J/\psi$  production in p-Pb collisions is an essential probe to study possible cold-nuclear-matter effects as well as final state mechanisms, the  $J/\psi$  which can affect production. In ALICE (A Large Ion Collider Experiment),  $J/\psi$  production is measured at mid-rapidity via the dielectron decay channel and at forward rapidity via the dimuon decay channel. Especially, at mid-rapidity, the contribution of  $J/\psi$  from weak decays of beauty hadrons (non-prompt  $J/\psi$ ), can

be separately measured thanks to the excellent primary and secondary vertex resolution of the Inner Tracking System (ITS). In the recent data taking period (Run 2), using the electron trigger of the Transition Radiation Detector (TRD), an enriched data sample of high- $p_T$

electron candidates was collected.

In this presentation, we will show the status of the inclusive and non-prompt  $J/\psi$  measurements in p-Pb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV recorded with the TRD electron trigger.