HK 40: Heavy Ion Collision and QCD Phases IX

Zeit: Mittwoch 16:30–18:30 Raum: S1/01 A01

Gruppenbericht HK 40.1 Mi 16:30 S1/01 A01

J/ψ production in p–Pb collisions with ALICE at the LHC — •Michael Winn for the ALICE-Collaboration — Physikalisches Institut, Universitaet Heidelberg

Charmonia are a key observable for deconfinement in nucleus–nucleus collisions at LHC energies. Measurements in proton–nucleus collisions and their comparison with proton–proton collision results provide crucial information on nuclear effects which are also present in the absence of the Quark–Gluon Plasma.

Charmonium production has been measured by ALICE in proton–proton, proton–lead and lead–lead collisions down to $p_{\mathrm{T}} = 0$ both via the dielectron decay channel in the central barrel and via the dimuon decay channel in the forward spectrometer.

In this talk, results on inclusive J/ψ production in proton–lead collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV at midrapidity as function of transverse momentum, centrality and multiplicity will be shown. Comparisons with results at forward and backward rapidity measured by ALICE and with theoretical models will be carried out. Implications of the results for the interpretation of lead–lead results on charmonium at the LHC as well as further prospects will be discussed.

HK 40.2 Mi 17:00 S1/01 A01

Beauty-jet tagging using the track counting method in pp collisions with ALICE at the LHC — •Linus Feldkamp for the ALICE-Collaboration — Westfälische Wilhelms-Universität Münster

Charm and beauty quarks, produced in the early stage of heavy-ion collisions, are ideal probes to study the characteristics of the hot and dense deconfined medium (Quark-Gluon Plasma) formed in these collisions. The radiative energy loss of high energy partons interacting with the medium is expected to be larger for gluons than for quarks, and to depend on the quark mass, with beauty quarks losing less energy than charm quarks, light quarks and gluons. Therefore, a comparison of the modification in the momentum distribution or possibly in the jet shape of beauty-jets with that of light flavour or c-jets in Pb-Pb collisions relative to pp collisions allows to investigate the mass dependence of the energy loss. It also allows to study the redistribution of the lost energy and possible modifications to b-quark fragmentation in the medium. The track counting method exploits the large rϕ-impact parameters, d_0, of B-meson decay products to identify beauty-jets. The signed rϕ-impact parameter, $d_0 = sign(\vec{d_0} \cdot \vec{p}_{\mathrm{jet}}) d_0$, is calculated for each track in the jet cone, where $\vec{d_0}$ is pointing away from the primary vertex. The distribution of the n-th largest d_0 in a jet is sensitive to the flavor of the hadronizing parton and allows to select jets coming form beauty on a statistical basis. In this contribution, we give an overview of the beauty jet measurement using the track counting method with ALICE in pp collisions at $\sqrt{s} = 7$ TeV that will serve as baseline reference for future energy loss studies.

HK 40.3 Mi 17:15 S1/01 A01

Ratios of differential cross sections of heavy-flavour hadron production with ALICE — •Sebastian Hornung for the ALICE-Collaboration — Physikalisches Institut, Heidelberg, Deutschland

Measurements of heavy-flavour hadrons in pp collisions are important to test pertubative Quantum ChromoDynamics and as a reference for measurements in heavy-ion collisions. ALICE has measured several observables in this sector, e.g. p_T-differential cross-sections of prompt D mesons and semi-electronic decays of beauty and charm hadrons at different energies. These measurements are compared to theoretical calculations, like General-Mass Variable Flavour Number Scheme (GM-VFNS) and Fixed-Order plus Next-to-Leading-Logarithms (FONLL), which are affected by large uncertainties caused by renormalisation scale, factorization scale and the heavy quark mass. Because of low statistics, the pp reference spectra for PbPb data are often obtained by extrapolation of data taken at different centre-of-mass energies. This procedure is guided by theory and also affected by large systematic uncertainties. The FONLL authors proposed to consider ratios of cross-sections at different centre-of-mass energies for a substantial reduction of the systematic uncertainties. Therefore, ratios of p_T-differential cross-sections were studied to investigate the possibility to reduce theoretical uncertainties. Such ratios could benefit from the possibility to cancel some systematic errors on the measured data. Simulations with POWHEG are performed to provide an additional theory-based reference. By comparing calculated and measured ratios, sensitivity to the gluon distribution function may be obtained.

HK 40.4 Mi 17:30 S1/01 A01

J/ψ production in Pb-Pb collisions with ALICE at the LHC — •Raul Tonatiuh Jimenez Bustamante[1,2], Pascal Dillenseger[3], and Dennis Weiser[2] for the ALICE-Collaboration — [1]Research Division and ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [2]Physikalisches Institut, Heidelberg Universität, Heidelberg, Germany — [3]Institut für Kernphysik, Goethe-Universität Frankfurt, Frankfurt, Germany

Charmonium production provides insights into and hottest stages of nucleus-nucleus collisions where the formation of a Quark-Gluon Plasma is expected. The ALICE experiment at the CERN LHC has measured charmonium at low transverse momentum (p_{T}). At central rapidity ($|y| < 0.9$) J/ψ is reconstructed via its e^+e^- decay channel, whereas at forward rapidity ($2.5 < y < 4$) J/ψ is reconstructed into $\mu^+\mu^-$ pairs. In this talk the ALICE results in Pb-Pb collisions on the inclusive J/ψ at $\sqrt{s_{NN}}$=2.76 TeV and comparisons to theoretical model calculations will be presented. A first look on the J/ψ analysis in the recent data acquired at $\sqrt{s_{NN}}$=5.02 TeV will be also shown.

HK 40.5 Mi 17:45 S1/01 A01

J/ψ production in pp collisions at $\sqrt{s} = 13$ TeV with ALICE at the LHC — •Steffen Weber for the ALICE-Collaboration — Research Division and ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt — Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt

Charmonium production is a unique probe for the hot and dense deconfined medium created in ultrarelativistic heavy-ion collisions. Produced in the initial hard collisions, the charm and anticharm quarks maintain their identity throughout the lifetime of the medium, whereas the subsequent creation of charmonium states is subject to the influence of the hot medium.

The measurement of J/ψ in pp collisions serves as a baseline for the quantification of hot and dense medium effects in heavy-ion collisions, but it is also an important probe for perturbative and non-perturbative aspects of quantum chromo dynamics, the theory of strong interactions.

The ALICE experiment at CERN has unique capabilities to measure J/ψ production down zero transverse momentum both at midrapidity in the dielectron decay channel and at forward rapidities in the dimuon decay channel.

In this talk a first analysis of J/ψ production at midrapidity in pp collisions at $\sqrt{s} = 13$ TeV will be presented. A comparison to production at $\sqrt{s} = 7$ TeV and prospects on further measurements will be provided.

HK 40.6 Mi 18:00 S1/01 A01

Separation of the Charm- and Beauty Production in p–Pb and Pb–Pb Collisions With ALICE — •Martin Völkl for the ALICE-Collaboration — Physikalisches Institut, Heidelberg

In heavy-ion collisions the energy loss of heavy quarks is an interesting quantity for the investigation of the roperties 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. A comparison of measurements in Pb–Pb and p–Pb collisions helps to separate initial- and final-state effects. The excellent particle identification properties of the ALICE detector and the large branching ratio ($\approx 10\%$) to a final state containing electrons suggest a measurement using semileptonic decay channels. In the analyses presented here, the contributions from charm and beauty are separated statistically using their different impact parameter distributions and empirical estimations of the background. The impact parameter for electrons from hadrons containing a beauty quark is typically larger due to the larger decay length ($c\tau \approx 500\mu$m) of these hadrons. Here, the current results of the analyses of p–Pb at $\sqrt{s_{NN}} = 5.02$ TeV and Pb–Pb at $\sqrt{s_{NN}} = 2.76$ TeV are presented.

HK 40.7 Mi 18:15 S1/01 A01

Influence of parton shadowing on J/psi-to-Drell-Yan ratio at

SPS and FAIR — •Partha Pratim Bhaduri — CBM Department, GSI, Planck Str. 1, 64291 Darmstadt, Germany — Variable Energy Cyclotron Centre, 1/AF Bidhan Nagar, Kolkata - 700064, India

In relativistic heavy-ion collision experiments, J/psi suppression has long been considered as a direct signature of the onset of deconfinement transition leading to the formation of quark-gluon plasma (QGP). In the present work, we have employed a two component model for calculation of J/psi production cross section in nuclear collision. We report our analysis of the available data on J/psi-to-Drell-Yan production cross section ratio in proton-nucleus (p+A) and nucleus-nucleus (A+A) collisions, at SPS energies. For both J/psi and Drell-Yan production, nuclear modifications to the free nucleon structure functions are taken into account. Differences in quark and gluon shadowing leads to a new source of impact parameter dependence of the production ratio. For J/psi, once the final state interaction of the produced cc-bar pairs with the nuclear medium is incorporated, a satisfactory description of the data in both p+A and A+A collisions is obtained. Model calculations are extrapolated to predict the centrality dependence of J/psi-to-Drell-Yan ratio in the FAIR energy domain.