

HK 24: Heavy-Ion Collisions and QCD Phases V

Time: Tuesday 16:00–17:30

Location: HK-H1

Group Report

HK 24.1 Tue 16:00 HK-H1

Measurements of J/ψ production at midrapidity with ALICE at the LHC — ●MINJUNG KIM for the ALICE-Collaboration — Physikalisches Institut, Universität Heidelberg, Heidelberg, Germany

The measurement of J/ψ production in heavy-ion collisions has been used as a valuable tool to study the properties of the quark-gluon plasma (QGP) since charm quarks are mainly produced via initial hard scatterings. Especially at LHC energies, the production of low transverse momentum J/ψ , which can be measured precisely with the ALICE (A Large Ion Collider Experiment) detector, is sensitive to the regeneration mechanism. Measurements of J/ψ production in p*Pb collisions provide an opportunity to study cold-nuclear-matter effects as well as possible final state mechanisms, which can modify its production with respect to the one in pp collisions.

Based on the electron identification capability provided by the Time Projection Chamber (TPC) installed at midrapidity, J/ψ production is measured via the dielectron decay channel in ALICE. In addition, it is possible to statistically separate the contribution of J/ψ from a weak decays of beauty hadrons (non-prompt J/ψ) using the long life time of beauty hadrons, relying on excellent track pointing resolution provided by the Inner Tracking System (ITS).

In this presentation, we will show latest measurements of J/ψ production in p-Pb and Pb-Pb collisions at midrapidity by ALICE, in comparison with theoretical calculations.

HK 24.2 Tue 16:30 HK-H1

J/ψ identification in ALICE with XGBoost — ●LASSE BASSERMANN for the ALICE-Collaboration — Physikalisches Institut der Universität Heidelberg

In ALICE (A Large Ion Collider Experiment), J/ψ meson production is analyzed at midrapidity via the decay to an electron-positron-pair. Until now this identification was done by hand using a cut-based-method, which assumes that electrons, if they match certain parameters, originate from the decay of a J/ψ meson. Another method to identify J/ψ mesons could be through machine learning algorithms, such as XGBoost. XGBoost is an open-source software that provides machine learning algorithms using a gradient boosting framework, where an ensemble of weak prediction models is used.

In this poster the first steps of implementing an XGBoost algorithm for identifying J/ψ mesons are presented. This includes the first adaptations of the algorithm to the data used as well as the selection of the data. First comparisons with the cut-based method are discussed.

HK 24.3 Tue 16:45 HK-H1

J/ψ production as a function of charged-particle multiplicity in pp collisions at the LHC — ●AILEC DE LA CARIDAD BELL HECHAVARRIA for the ALICE-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

The increase of the inclusive J/ψ yields as a function of charged-particle multiplicity was found to be stronger than linear in previous ALICE publications, where both J/ψ and the charged-particle multiplicity were measured at midrapidity. The causes for this behavior have been investigated in previous studies with PYTHIA8 and attributed to possible auto-correlation effects. Insight on this effect could be gained by measuring the charged-particle multiplicity in three azimuth regions relative to the direction of the J/ψ .

Data collected with ALICE at the LHC during Run 2 is used to investigate the relative J/ψ yield, measured at mid-rapidity ($|y| < 0.9$) in

its di-electron decay channel and as a function of the charged-particle multiplicity, in various regions of the azimuthal angle with respect to the emission of the J/ψ meson.

In this contribution, new measurements of this correlation performed in pp collisions at $\sqrt{s}=13$ TeV will be shown.

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HK 24.4 Tue 17:00 HK-H1

J/ψ production as a function of the event multiplicity in p-Pb collisions at the LHC — ●TABEA EDER for the ALICE-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

Previous ALICE results indicate a stronger than linear increase of the inclusive normalized J/ψ yield with charged-particle multiplicity, both measured at mid-rapidity, in proton-lead collisions at $\sqrt{s_{NN}} = 5.02$ TeV. The corresponding ALICE results on proton-proton collisions at $\sqrt{s} = 13$ TeV provide a clearer picture of a stronger than linear increase.

In PYTHIA8, this behavior has been associated with auto-correlation effects in proton-proton collisions. This has been achieved by investigating the multiplicity dependence of J/ψ production in different regions of the azimuthal angle, which is the difference between the J/ψ meson and the charged particle emission angle. For proton-lead collisions, no results on these distributions for the J/ψ meson are available yet.

In this talk first results on the multiplicity dependence of the normalized J/ψ yield for proton-lead collision in regions of the azimuthal angle will be presented, using ALICE data at $\sqrt{s_{NN}} = 5.02$ TeV recorded during the LHC data taking Run 2 in 2016.

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HK 24.5 Tue 17:15 HK-H1

Measurement of J/ψ polarization in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ALICE muon spectrometer — ●FEDERICA ZANONE for the ALICE-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Germany

ALICE is the experiment at the CERN LHC devoted to the study of quark-gluon plasma, but it is also well suited to perform other QCD studies, such as the investigation of quarkonium polarization.

Polarization is the measure of the degree to which the spin of a particle is aligned with respect to a chosen axis and reflects the process responsible for its production. At present theoretical models have difficulties in explaining both the quarkonium production cross section and polarization, so precise results from experiments are necessary to better constrain the theory approaches. The polarization of a vector meson, such as J/ψ , can be experimentally determined by measuring the angular distribution of its decay products since such distributions can be expressed in terms of the eigenvalues corresponding to the mother angular momentum eigenstates. This study focuses on the decay channel $J/\psi \rightarrow \mu^+ \mu^-$ in the pseudorapidity region $-4.0 < \eta < -2.5$ and addresses the highest J/ψ statistics sample collected so far by ALICE in pp collisions. This analysis provides the measurement of J/ψ polarization parameters as a function of p_T in the helicity and Collins-Soper reference frames and investigates the range $p_T < 15$ GeV/c, extending, for the first time, the measurement down to $p_T = 0$. Comparisons of the results to previous measurements both in pp and PbPb collisions, as well as to theoretical models, are provided, too.