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Charmonium production in Pb-Pb collisions at forward rapidity in ALICE

Quarkonium production in high-energy lead-lead (Pb-Pb) collisions is a key tool for exploring both the perturbative and non-perturbative aspects of quantum chromodynamics (QCD) calculations.

Charmonia are bound states consisting of a charm and an anti-charm quark. Their production process can be divided into two stages: the creation of the heavy quarks and the formation of the bound state. The first stage occurs during initial hard parton-parton scatterings with large momentum transfer, which can be accurately described using perturbative QCD. The second stage, involving long-distance interactions and soft momentum scales, is a non-perturbative process. Studying the production of $\psi(2S)$ in Pb-Pb collisions is important for understanding how quarkonium states are modified in the quark-gluon plasma. The $\psi(2S)$ is more loosely bound than the J/ψ , and its amount of suppression in the medium can provide insight into the effects of the deconfined medium. The double ratio of $\psi(2S)$ to J/ψ in Pb-Pb relative to pp collisions helps to quantify the differential suppression of these two states, offering a clearer picture of the properties of the quark-gluon plasma and its impact on different charmonium states.

In this poster, we will present the analysis status of inclusive J/ψ and $\psi(2S)$ production at forward rapidity ($2.5 < |y| < 4$), in Pb-Pb collisions at the center-of-mass energy per nucleon pair of $\sqrt{s_{NN}} = 5.36$ TeV. The analysis is based on the data collected in 2023 by the upgraded ALICE detector during LHC Run 3, which provides higher statistics compared to previous data-taking periods. The $\psi(2S)$ -to- J/ψ double ratio will also be reported. The results will be compared to similar measurements from data collected during LHC Run 2.

Category

Experiment

Collaboration (if applicable)

ALICE

Author: GARETTI, Sara (Université Paris-Saclay (FR))

Presenter: GARETTI, Sara (Université Paris-Saclay (FR))

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