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Nuclear modification factor and flow measurements of quarkonia in p-Pb and Pb-Pb collisions with ALICE at LHC

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Heavy quarks are produced in the earliest stages of a nucleus-nucleus collision and therefore are an important tool to study the subsequent high energy-density medium formed in relativistic heavy-ion collisions. Over the last few decades major efforts have been undertaken in order to understand the properties of the quark-gluon plasma (QGP) using quarkonia. The extent of medium modification for heavy-quark production in heavy-ion collisions is measured in terms of the nuclear modification factor $R_{\rm AA}$. However, modifications of quarkonium production may also occur due to cold nuclear matter (CNM) effects such as shadowing of nuclear parton distribution function, gluon saturation and others. In recent data, strong suppression patterns have been seen in Υ $R_{\rm AA}$ whereas a recombination of individual charm quarks as dominant production mechanism for charmonium states, in particular J/ψ for low transverse momentum and most central collisions. These individual charm quarks are expected to be (at least partially) equilibrated and together with initial anisotropies from the collision geometry result in a positive J/psi elliptic flow. At higher transverse momentum, the J/ψ elliptic flow in high-multiplicity p-Pb collisions shows values similar to those from Pb-Pb collisions, suggesting a common production mechanism in this kinematic region.

ALICE J/ψ and Υ $R_{\rm AA}$ results for Pb-Pb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV will be presented as a function of centrality, $p_{\rm T}$ and rapidity. The inclusive as well as prompt and non-prompt J/ψ production will be discussed for the $R_{\rm AA}$ measurement at mid-rapidity for p-Pb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV. The CNM effects will be also explored for the Υ and ψ(2S) in p-Pb collisions at $\sqrt{s_{\rm NN}}$ = 8.16 TeV. The $p_{\rm T}$-differential inclusive J/ψ elliptic flow at mid-rapidity ($|y| < 0.9$) will be shown together with the J/ψ elliptic and triangular flow at forward rapidity ($2.5 < y < 4$) in Pb-Pb collisions. These results will be compared to $\Upsilon(1S)$ elliptic flow in Pb-Pb collisions. In addition, measurements of J/ψ elliptic flow in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV and 8.16 TeV will be presented at forward ($2.03 < y < 3.53$) and backward ($-4.46 < y < -2.96$) rapidity.
Finally, the ALICE results will be compared with those obtained by other LHC experiments and the current theoretical interpretation of the results will be also discussed.

Collaboration (if applicable)

ALICE

Track

Heavy Flavor and Quarkonia

Contribution type

Contributed Talk

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