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Data-driven measurements of the total beauty productions in pp, p-Pb and Pb-Pb collisions at the LHC

The production of beauty hadrons in proton-proton (pp), proton-lead (p-Pb), and lead-lead (Pb-Pb) collisions offers critical insights into heavy-flavor hadrons production mechanisms across different collision systems. In pp collisions, beauty hadron production can be used to test the predictions of perturbative Quantum Chromodynamics (pQCD), providing constraints on parton distribution functions and hadronization processes. In p-Pb collisions, beauty quarks serve as sensitive probes of cold nuclear matter effects such as shadowing, while in Pb-Pb collisions, they offer an excellent probe of the quark-gluon plasma (QGP) dynamics and its evolution throughout different stages in heavy-ion collision. This work presents a Bayesian unfolding data-driven measurements of the open beauty hadron production, utilizing ALICE and LHCb data to recover full kinematic information from the measured non-prompt D^0 and non-prompt J/ψ . The beauty hadron production cross sections are found to be perfectly consistent across different decay channels and from two Collaborations. The precision of new results significantly improves upon worldwide measurements. This method has been validated in pp collision at $\sqrt{s} = 5.02$ and 13 TeV [1].

In this talk, the data-driven measurements of the p_T -integrated and differential open beauty production cross section $d\sigma/dydp_T$, $d\sigma/dy$, and the total $b\bar{b}$ cross section $\sigma_{b\bar{b}}$ in pp, p-Pb and Pb-Pb collision at midrapidity at LHC energies will be reported. Additionally, we will discuss nuclear modification factors R_{pA} and R_{AA} in p-Pb and Pb-Pb at $\sqrt{s_{NN}} = 5.02$ TeV, respectively. All the results will be discussed in comparison with existing measurements and theoretical calculations.

Reference:

[1] X.Bai et. al, JHEP11(2024)018, arXiv.2405.01444v2

Category

Experiment

Collaboration (if applicable)

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