

Studying QCD production mechanisms and medium effects on quarkonia formation with ALICE

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Charmonia is a valuable tool for investigating nuclear matter under extreme conditions, particularly within the strongly interacting medium formed during heavy-ion collisions. At the high energies of the LHC, the regeneration process, driven by the plentiful production of charm quarks, has been found to significantly impact the observed charmonium characteristics. It is important to conduct comprehensive production measurements including both ground and excited states of charmonia to distinguish among various regeneration scenarios considered in theoretical frameworks. In particular, the $\psi(2S)$ production relative to J/ψ is a physical observable with strong discriminating power between the possible regeneration scenarios in Pb-Pb collisions. Additionally, the study of quarkonium production in proton-proton (pp) collisions serves as a crucial tool for exploring both perturbative and non-perturbative aspects of quantum chromodynamics (QCD) calculations. Moreover, it establishes a foundational reference for interpreting results obtained in Pb-Pb collisions and it is a key measurement to distinguish among the available quarkonium production models in pp and p-Pb systems. In this contribution, preliminary findings of the double ratio of $\psi(2S)$ -to- J/ψ as well as the inclusive J/ψ yield in pp collisions at a center-of-mass energy of $\sqrt{s} = 13.6$ TeV measured by the ALICE Collaboration will be presented and compared with existing model calculations.

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