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Exploring strangeness and resonance production mechanism using EPOS4 hydrodynamical model

The measurement of strangeness production is a key tool for understanding the hot, dense matter created in relativistic heavy-ion collisions. The production of strange hadrons is enhanced in heavy-ion collisions due to thermal gluon saturation, while it is suppressed in small systems due to canonical suppression, as supported by canonical models. Despite being one of the earliest signatures of quark-gluon plasma formation, the strangeness enhancement is in debate till today. Hadronic resonances like \(\rho(770)ˆ0\), \(Kˆ*(890)ˆ0\), \(\phi(1020)\), \(\Lambda(1520)\), and \(\Xi(1530)ˆ0\) are sensitive probes of the hadronic phase, the stage between chemical and kinetic freeze-out. Their yields, relative to stable particles, alter with collision centrality depending on their lifetimes, and offer insights into the properties of hadronic phase. Moreover, baryon-to-meson ratios provide valuable information on different production mechanisms involved in their formation, which further requires theoretical exploration. This study presents the ratio of strange to non-strange hadrons, resonance-to-non-resonance ratios, hadronic phase lifetime estimates, and baryon-to-meson \(\it{p}*{T}\) differential ratios in pp collisions at \(\sqrt{\it{s}} = 13.6\) TeV and Pb-Pb collisions at \(\sqrt{\it{s}*{\text{NN}}} = 5.36\) TeV using the EPOS4 hydrodynamical model, the highest energies recorded at the LHC, offering a basis for future data comparisons.

Category

Theory

Collaboration (if applicable)

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