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Exploring hadronic resonances through EPOS4 model: A study of particle interactions and spectra

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Hadronic resonances are interesting candidates to study the properties of the hadronic phase, which is the time span between the chemical and kinetic freeze-outs, formed during the evolution of relativistic heavy-ion collisions. Due to their short lifetimes, comparable to the lifetime of hadronic phase ($\sim$10 − 12 fm/c), they decay in the hadronic phase and their decay products undergo rescattering or regeneration within the hadronic gas. Thus, the yields of the hadronic resonances alter than what was originally produced before the chemical freeze-out. This change in their yield, which is extensively studied to understand the properties of the hadronic phase, depends upon the lifeime of the decaying resonance, the interaction cross-sections of its decay daughters, and the lifetime of the hadronic phase. \\
In this study, we explore the production yields of hadronic resonances by simulating pp, p−Pb and Pb−Pb collisions at various centre of mass energies using the latest EPOS4 model. The EPOS4 model employs a comprehensive scheme for simulating high-energy particle collisions, which includes primary interactions based on S-Matrix theory, secondary interactions using a core-corona separation approach, hydrodynamic evolution, micro-canonical hadronization, and a final hadronic afterburner using UrQMD. This scheme allows for the simulation of parallel scatterings and accurately models the complex dynamics of high-energy particle collisions, thus providing some new understanding of a deep connection between four basic concepts in pp and AA collisions: parallel scattering, energy conservation, factorization, and saturation. We measure the transverse momentum spectra (p_{T}), energy dependence of resonance production, ratio of yield of resonance particles to their corresponding stable particles, nuclear modification factor (R_{pA} and R_{AA}) for various hadronic resonances of different lifetimes and compare the results with the data available from the ALICE experiment at CERN.

Category

Theory

Collaboration (if applicable)

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