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EPOS4 model predictions for global observables in Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.36 TeV

The study of the Quark-Gluon Plasma (QGP), a deconfined state of nuclear matter, remains a central focus of high-energy heavy-ion collision experiments. Light-flavor hadrons act as essential probes of the QGP, offering insights into its bulk properties. In particular, the pseudorapidity density of charged particles, which reflects the energy density achieved in such collisions, serves as a key global observable. Its dependence on the number of participant nucleons (N_{part}) provides sensitivity to the underlying particle production mechanisms, characterized by the interplay between soft-QCD processes scaling with N_{part} and hard-QCD processes, which scale with the number of binary collisions (N_{coll}).
The transverse momentum (p_T) spectra of identified hadrons further elucidate the system's transverse expansion and constrain the kinetic freeze-out conditions of the fireball. Mean p_T and integrated particle yields probe the interplay between particle production and collective dynamics. At high p_T, the observed suppression of hadrons in nucleus–nucleus (A–A) collisions relative to proton–proton (pp) collisions, quantified via the nuclear modification factor R_{AA}, is consistent with substantial energy loss of hard-scattered partons traversing the QGP.

In this study, we present EPOS4 model predictions for Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.36 TeV, focusing on the pseudorapidity density of charged particles across a wide range and for various centralities. We also report transverse momentum spectra, mean p_T, yields, and R_{AA} for pions, kaons, and (anti-)protons as functions of centrality. Kinetic freeze-out parameters are extracted using combined Blast-Wave fits to the identified hadron spectra. Where available, our results are compared with the experimental data at $\sqrt{s_{NN}}$ = 5.02 TeV and recent measurements at 5.36 TeV from ALICE and CMS; in other cases, predictions are provided. The centrality dependence of these observables reveals trends that are consistent with those observed at lower energy collisions at RHIC and the LHC.

Secondary track

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