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Update of a multiphase transport model with modern parton distribution functions and nuclear shadowing

Summary

A multiphase transport (AMPT) model has been successful in explaining a wide range of observables in relativistic heavy ion collisions. In this work, we implement a newer set of free proton parton distribution functions and an impact parameter-dependent nuclear shadowing in the AMPT model. After refitting the parameters of the two-component initial condition model to the experimental data on pp and $p\bar{p}$ total and inelastic cross sections from $\sqrt{s}$ ~ 4 GeV to 13 TeV, we study particle productions in pp and AA collisions. We show that the updated AMPT model with string melting can reasonably describe the overall particle yields and transverse momentum spectra for both pp and AA collisions at RHIC and LHC energies after we introduce a nuclear scaling of the minijet transverse momentum cutoff for AA collisions at LHC energies that is motivated by the color glass condensate. Since heavy flavor and high-pT particles are produced by perturbative-QCD processes and thus directly depend on parton distribution functions of nuclei, the updated AMPT model is expected to provide a more reliable description of these observables.

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