Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV in a multiphase transport model

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We have studied [1] the multiplicity and elliptic flow of charged particles produced in Pb-Pb collisions at center of mass energy $\sqrt{s}_{NN} = 2.76$ TeV from the Large Hadron Collider in a multiphase transport (AMPT) model [2]. With the standard parameters in the HIJING model [3], which is used as initial conditions for subsequent partonic and hadronic scatterings in the AMPT model, the resulting multiplicity of final charged particles at mid-pseudorapidity is consistent with the experimental data measured by the ALICE Collaboration as shown in the left window of Fig. 1. This value is increased by about 25% if we turn off the final-state partonic and hadronic scatterings. Because of final-state scatterings, particular those among partons, the final elliptic flow of charged hadrons is also consistent with the ALICE data as shown in the right window of Fig. 1, if we use a smaller but more isotropic parton scattering cross section than previously used in the AMPT model for describing the charged hadron elliptic flow in heavy ion collisions at the Relativistic Heavy Ion Collider. We have further found that the transverse momentum spectra of charged particles as well as the centrality dependence of their multiplicity density and the elliptic flow are also in reasonable agreement with the ALICE data. Moreover, we have made predictions on the multiplicities, transverse momentum spectra and elliptic flows of identified hadrons such as protons, kaons and pions.
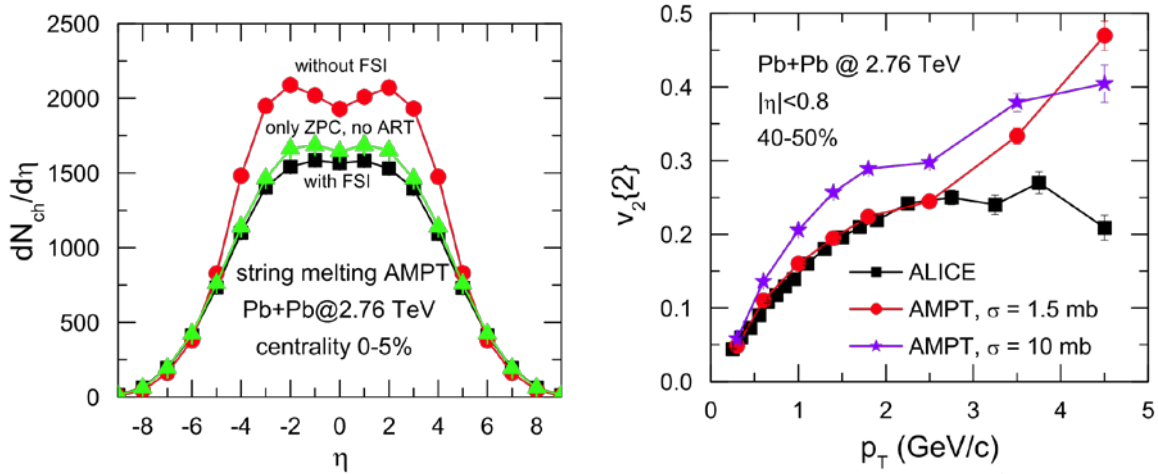

FIG. 1. Left window: Pseudorapidity distribution of charged particles in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV and centrality of 0-5% from the AMPT model with both final-state partonic and hadronic scatterings (filled squares), with only partonic scatterings (filled triangles), and without final-state interactions (filled circles). Right window: Transverse momentum dependence of the elliptic flow obtained from the two-particle cumulant method for charged particles in the same reaction as in the left window at 40-50% centrality from the AMPT model with string melting using a parton scattering cross section of 1.5 mb (filled circles) or 10 mb (filled stars). Corresponding experimental data from Ref.[4] are shown by filled squares.

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