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Study of skewness and kurtosis of mean transverse momentum fluctuations from a multi-phase transport model at LHC

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The ALICE collaboration has recently reported the first measurements of the skewness and kurtosis of mean transverse momentum fluctuations in Pb–Pb collisions at 5.02 TeV, Xe–Xe collisions at 5.44 TeV, and pp collisions at 5.02 TeV. A positive skewness is observed and attributed to the hydrodynamic evolution of the quark-gluon plasma (QGP) formed in heavy-ion collisions. In this study, we investigate these observables using the multi-phase transport (AMPT) model. We first show that with effective parton and hadron cross sections, the AMPT model successfully reproduce the experimental measurements of skewness and kurtosis across all three collision systems. Next, we investigate the effects of final state interactions by varying the parton cross sections in the model. Notably, when parton and hadron scatterings are effectively switched off, the skewness transitions to negative values in the semi-central to central regions. These findings highlight the crucial role of final-state interactions in generating the positive skewness observed in heavy-ion collisions.

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