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Energy dependence of transverse momentum fluctuations in Au+Au collisions from a multiphase transport model

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Event-by-event mean transverse momentum fluctuations (<⊠T>) serve as a sensitive probe of initial state overlap geometry and energy density fluctuations in relativistic heavy-ion collisions. We present a systematic investigation of <⊠T> fluctuations in Au+Au collisions at 3.0–19.6 GeV, examining their centrality and energy dependence with the framework of an improved multiphase transport (AMPT) model. The centrality dependence of the ⊠T cumulants up to fourth order deviates significantly from simple powering-law scaling. Scaled cumulants are performed, with variances aligning well with the trends observed in the experimental data. Employing a two-subevent method, short-range correlations are slightly suppressed compared to the standard approach. Furthermore, baryons exhibit more pronounced <⊠T> fluctuations than mesons, potentially attributable to the effect of radial flow. These results provide referenced insights into the role of initial state fluctuations across different energies in heavy-ion collisions.
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