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Investigations of event-by-event fluctuations of mean transverse momentum ($\langle p_{\mathrm{T}} \rangle$) in pp collisions at $\sqrt{s}$= 13 TeV with PYTHIA8 and HERWIG7 models

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The study of event-by-event mean transverse momentum ($\langle p_{\mathrm{T}} \rangle$) fluctuations is reported in terms of the integral two-particle correlator ($\langle \Delta p_{\mathrm{T}} \Delta p_{\mathrm{T}} \rangle$) and skewness of the event-wise $\langle p_{\mathrm{T}} \rangle$ distribution in proton−proton (pp) collisions at $\sqrt{s} = 13$ TeV. The simulations were carried out using the Monte Carlo event generators PYTHIA8 and HERWIG7. Charged particles with transverse momentum (p_{T}) and pseudo-rapidity (η) ranges $0.15 \leq p_{\mathrm{T}} \leq 2.0$ GeV/c and $|\eta| \leq 0.8$ were taken into the consideration. The correlator $\langle \Delta p_{\mathrm{T}} \Delta p_{\mathrm{T}} \rangle$ is observed to follow distinct declining trends with the average charged particle multiplicity ($\langle N_{\mathrm{ch}} \rangle$) for PYTHIA8 and HERWIG7 models. Furthermore, both models yield positive finite skewness in low-multiplicity events. The observables are additionally studied using the transverse spherocity estimator (S_0) to comprehend the relative contributions of hard scattering (jets) and soft multi-partonic interactions (MPI) to the observed fluctuations. The comparative measurements using these models would help in understanding the fluctuation dynamics and constraint the particle productions in such models.

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