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Exploring Event-by-Event p_{T} Fluctuations in pp Collisions at $\sqrt{s} = 13$ TeV: An Insights from ALICE

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Event-by-event fluctuations of the mean transverse momentum (p_{T}) of relativistic charged particles are analyzed using the two-particle correlator, $\sqrt{C_m}/M(p_{\mathrm{T}})_m$ which quantifies the correlations strength in units of the mean p_{T} in proton-proton collision at $\sqrt{s} = 13$ TeV in ALICE both for Minimum Bias and and High-multiplicity triggered events. The non-monotonic variations in p_{T} correlations with changing energy could serve as a signature of QGP formation. A comprehensive investigation across soft, intermediate, and hard p_{T} regions could provide crucial insights into both equilibrium (e.g., thermal radial flow) and non-equilibrium (e.g., jet/minijet) contributions to p_{T} fluctuations. The dependence of the correlator on particle multiplicity for different p_{T} window widths and positions is explored. The correlator values are found to decrease with increasing charged particle density, following a power-law behavior similar to observations in both small and large systems at lower energies. Additionally, the influence of p_{T} range on the power-law coefficient is studied and results are compared with predictions from Monte Carlo models, such as PYTHIA (pQCD string model) and EPOS (core-corona model), to enhance understanding of the underlying mechanisms driving p_{T} fluctuations.

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