

Investigation of dynamical fluctuations of pions at different centralities in pp collisions at $\sqrt{s} = 5.02$ TeV using AMPT model : An in-depth analysis with factorial correlator

The work represents the bin-bin correlation using factorial correlator in pp interactions at $\sqrt{s} = 5.02$ TeV taking into account the pseudorapidity dependence and centrality i.e. from most central to mid-central (0-10%, 10-20%, 20-30%, 30-40%, 40-50%) and Minimum bias (MB) events. To generate data sets, the study uses the Monte Carlo-based heavy-ion event generator called A Multi-Phase Transport (AMPT) model in string-melting and default mode. In this study, we have considered the pseudorapidity interval of width twelve (i.e. $\Delta\eta = 12$) around the peak of the η distribution for the generated data samples of pp collisions by the AMPT model at c.m. energy $\sqrt{s} = 5.02$ TeV for different centrality. To analyze the properties of the factorial correlators at different bin widths, the considered phase space has been subdivided into 40 and 20 bins of widths $\delta\eta = 0.3$ and 0.6 respectively. The slope values are extracted from the linear fit in the region $0.3 \leq D \leq 3$, and $0.6 \leq D \leq 6$ for bin width $\delta\eta = 0.3$ and 0.6 respectively for various order of the factorial correlators. The data shows strong correlation with decreasing bin-bin separation D , supporting the validity of log-normal approximation and α model. It also demonstrates the strength of the correlation from most central to mid-central is consistent with log normal approximation. It is interesting to note that with change in $\delta\eta$, no major substantial difference has been observed from most central to mid-central and MB events.

Authors: BISWAS, Tumpa (Cooch Behar Panchanan Barma University); Mr DHAR, Dibakar (Cooch Behar Panchanan Barma University); HALDAR, Prabir Kumar (Cooch Behar Panchanan Barma University (IN))

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