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Higher order cumulants of net-particle distributions in pp collisions at $\sqrt{s}$ = 13 TeV using Pythia and Herwig

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Higher order cumulants of the distributions of conserved quantities, like net-charge, net-baryon and net-strangeness in heavy-ion collisions, are regarded as sensitive observables to determine the freeze-out parameters and the nature of phase transitions at the LHC energies. Recently, several experimental results suggest the possible formation of QGP medium in high-multiplicity pp collisions. Therefore, baseline measurements of the higher order cumulants of the net-particle distributions in pp collisions are essential to compare with the experimental results for understanding the dynamics of small systems. In this work, we report the first and a detailed Monte-Carlo study of the measurements of cumulants and their ratios for net-charge, net-hadron, net-kaon, net-baryon, and net-proton distributions in pp collisions at $\sqrt{s}$=13 TeV using pQCD models like Pythia8 and Herwig. We also discuss the effect of different particle production mechanisms, kinematic acceptance, and volume fluctuations on higher-order cumulants. This simulation study will serve as a baseline for the upcoming measurements at the LHC. Additionally, it will shed more light on the measurement of cumulants and the connection between small systems and heavy-ion collisions at the LHC.

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