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Event shape and multiplicity dependence of identified particle production and freeze-out scenario in pp collisions at $\sqrt{s}$ = 13 TeV using PYTHIA8

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Recent observations of Quark-Gluon Plasma (QGP)-like conditions in high-multiplicity pp collisions from ALICE experiment at the LHC warrants an introspection whether to use pp collisions as a baseline measurement to characterize heavy-ion collisions for possible formation of QGP droplets. A double differential study of the identified particle production and freeze-out scenario of the produced system as a function of charged-particle multiplicity and transverse spherocity in pp collisions would shed light into the underlying event dynamics. The light flavored particle production would help to understand the bulk of the system while the heavy flavored hadrons would retain the entire interaction history in QGP. We report a double differential study of both light and heavy-flavored hadron production in pp collisions at $\sqrt{s}$ = 13 TeV as a function of charged-particle multiplicity and transverse spherocity using PYTHIA8 event generator. We also report the possible chemical freeze-out and kinetic freeze-out parameters using Thermal model, Boltzmann-Gibbs blast wave model and Tsallis non-extensive statistics. We observe that, while studying the QGP-like conditions in small systems, one should separate the isotropic events from the spherocity-integrated events, as the production dynamics are different. The present study, while exploring the particle production mechanism in different class of high-multiplicity pp events, paves a way for making proper experimental investigations.

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