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A comparison of thermodynamical properties in high multiplicity pp and heavy ion collision

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Studying the QCD matter produced under extreme condition of temperature and density called Quark Gluon Plasma (QGP) is among the important goals of ongoing as well as upcoming particle physics experiments. QGP state is so far believed to be formed only in heavy ion collision and not in the pp collision. Unlike heavy ion collision, pp collision does not create QGP and hence the data from pp collision is being used to set a baseline to study the QGP formation in heavy ion collision. However, recent results from high multiplicity pp collision show some effects that are so far considered typical of heavy-ion collision. ALICE experiment in 2017 reported an enhancement in production of strange hadrons that may be a signature of QGP formation in high multiplicity pp collision. This result demonstrated the similarity in underlying physics mechanism that is responsible for particle production in high multiplicity pp and heavy ion collision opening up a new avenue in high energy physics to search for QGP state. With the availability of data at different multiplicities and energies, it may be interesting to analyse variation of different thermodynamical properties with multiplicity in pp collision and compare it with the variation shown by data from heavy ion collision experiment. \

We will present a comparative study of thermodynamical properties obtained from transverse momentum spectra (p_T) of charged hadrons produced in heavy ion collision as well as in high multiplicity pp collision. Non extensive parameter q is a thermodynamical parameter which indicates how much a system deviate from thermal equilibrium. We will discuss interesting results related to the variation of parameter q with centrality as well as multiplicitiy over different p_T -range. We will also discuss the effect of hard processes on q parameter in pp and heavy ion collision.

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