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Temperature fluctuations of the medium formed in pp collisions

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Abstract

We determine the temperature fluctuations associated with the particle production in pp collisions through the derivation of the string tension distribution corresponding to the QCD-based Hagedorn function, frequently used to fit the transverse momentum spectrum. The identified string tension fluctuations are heavy tailed, behaving similarly to the q-Gaussian distribution. After the convolution with the Schwinger mechanism, both approaches correctly describe the entire pT spectrum. This approach is the onset for the nonthermal description of the particle production in ultrarelativistic pp collisions, exhibiting temperature fluctuations on small regions of the medium where the particles are created. By analyzing the data of pp collisions at $\sqrt{s} = 13$ TeV, we found that the average temperature associated with the Higgs boson production is around 85 times greater than the estimated value for the pT spectum of charged particles. Our results show that the Higgs boson production exhibits the largest deviation from the thermal description.

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