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Study the particle transverse-mementum spectra at LHC with nonextensive statistics

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The hydro-dynamic inspried thermal approach - Blast-Wave (BW) model - implemented with non-equilibrium Tsallis statistics has gained increasing interest (and application) in high-energy heavy-ion physics. With the come out of recent LHC results on particle production of various species, we find it a good opportunity to use this approach to interpret the data. The transverse-momentum spectra, from both $p+p$ and Pb+Pb collisions, are systematically studied within the Tsallis Blast-Wave (TBW) model, and compared to the RHIC results. Good agreement between the data and the fit is achieved over a broad kinetic range - 0-10 GeV/c for $p+p$ collisions from 200 to 7000 GeV, and 0-5 GeV/c for Pb+Pb collisions at 2.76 TeV.

From the fit the kinetic freeze-out temperature T, the average radial flow velocity <β> and the parameter q, which is a measure of the degree of non-equilibrium of the system, can be extracted. The evolution of these parameters with collision energy and centrality will be presented. For $p+p$ collisions, the radial flow is found to be consistent with zero at beam energy below 900 GeV and increases to ~ 0.3 at 7 TeV. For Pb+Pb collisions, the TBW model illustrates better fit stability compared with the normal BW model. The centrality dependence of T, <β> and q are demonstrated. A detailed fit to non-strange, single-strange and multi-strange particle species separately will be given. The multi-strange particle shows distinct characteristics at kinetic freeze-out comapred to the non-strange and single-stranged particles. Together with the observations at lower energy, the physics implication of the particle production during the fireball evolution in heavy-ion collisions will be discussed.

On behalf of collaboration:

NONE

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