The following simple form of the invariant yield is used:

\[ n(p_T, \eta) = A \times (1 + E(p_T) - p_T)^{-q} \]

where \( n(p_T, \eta) \) is the number of particles, \( A \) is the amplitude incorporating the irrelevant spin, mass energy, and constant factors as well as the invariant volume, \( E(p_T) = \sqrt{p_T^2 + m^2} \) is the transverse mass, \( p_T = \sqrt{(m^2 + p_L^2)} \) is the one-particle energy in the co-moving coordinate system, \( v \) is the radial flow velocity, \( n = 1/\sqrt{1 - v^2} \) is the Lorentz-factor, \( T \) is a parameter with temperature unit and finally \( n=T-q \) is the non-extensivity parameter, characterizing the temperature fluctuations.

The parameters and curves fitted on the experimental “minimum bias” (in the sense that there is no event multiplicity classification) data

The fit is good on the investigated \( p_T \) range for all hadrons.

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The radial flow velocity is not zero and also increases with the multiplicity, but also with different rates: at low multiplicity the pions (with the smallest mass) have the smallest \( q \), but it increases rapidly with the increasing multiplicity.

The rate of increase in the case of protons and kaons are approximately the same.

The amplitude is increasing for each hadron species with the multiplicity.

The value of \( q \) is much higher than those of the heavier hadrons, which indicates that with increasing multiplicity the number of the produced pions grows faster than the number of kaons and protons.

The parameter \( n_T \) which is sensitive to the event size and may serve as a multiplicity dependent parameter in the non-extensive hadronization model is investigated with HIJING++ + results.

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Non-Extensive Hadronization

Our goal is to study the transverse momentum spectra of identified hadrons with Tsallis-Pareto type distributions, revealing non-trivial dependences on the center-of-mass energy, the hadron mass and the event multiplicity (i.e. on the size of the system).

Blast-wave assumptions: the fireball is azimuthally symmetric and expanding with a radial flow velocity (in units of \( c = 1 \))

The freeze-out occurs instantly on a hypersurface according to the Cooper-Frye formulation at a given freeze-out temperature

\[ T \rightarrow \text{important to have a solid advantage of the power of HIJING++ and} \]

extract the parameters from wide range of event multiplicity classes at the tuned \( \sqrt{s} = 7 \text{ TeV} \) center of mass energy.

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Using the non-extensive hadronization framework we aim to investigate the multiplicity dependence of the Tsallis-Pareto parameters. We take advantage of the power of HIJING++ and extract the parameters from wide range of event multiplicity classes at the tuned \( \sqrt{s} = 7 \text{ TeV} \) center-of-

mass energy.

The event classes of the HIJING++ + run are classified as the multiplicity ranges:

Using this event classification, we calculated the mid-rapidity transverse momentum spectra of charge averaged pions, kaons, and protons in INEL+O events in the \( 0.1 \text{ GeV/c} < p_T < 20 \text{ GeV/c} \) region, generating ZOOM events.

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