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Non-extensive Stastistics Motivated Fragmentation for Hadron Production in High-Energy Collsisons

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A global theoretical description of hadron's transverse momentum spectra in high-energy particle collisions is still an open question today. However, identified hadron spectra measured in the experiments can be described well with non-extensive statistical approach. This method is motivated by the fact that, negative binomial (NBD) multiplicity of the particle number distribution results the measured Tsallis–Pareto particle energy distribution [1; 2].

Theoretical analysis of the identified hadron spectra led us to understand the micro- and macroscopical processes by comparing parameters of the hadronization models. The Tsallis–Pareto distribution describes perfectly the hadron spectra for all particle- and collision-energies Ref. [3; 4]. The values of the
parameters of the fitted distributions correspond to the expected properties of the colliding systems, like particle multiplicities and finite size effects.

We investigated the calculated and simulated hadron spectra in proton-proton collisions and we determined the parameters of the Tsallis–Pareto distributions. We
have shown also, that these results correspond with the experimental data.
Investigating the values and energy dependence of the parameters, motivated us to make a new parametrization of the fragmentation functions, which idea fit nicely to the non-extensive phenomena of a possible novel hadronization model Ref. [5].

Testing this non-extensive-based fragmentation, we included it to a perturbative QCD calculation and compares the results to other fragmentation parametrization and experimental data. Our results are pointed out that our theoretical model corresponds to the experimental data, confirming the non-extensive, Tsallis-like fragmentation parametrization.

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