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Analytical Results for the Tsallis Thermodynamic Variables in a Hot and Dense System

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Abstract content
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Based on recent findings, we analytically investigate the thermodynamic variables of a hot and dense system, in the framework of the Tsallis non-extensive statistics.

After a brief review, we first recall the massless limits which then serve as benchmarks. Afterwards, we present the exact massive thermodynamic results, valid for all values of the q -parameter — characterizing the non-extensivity of the system. Finally, we compare our results to their analogs in the so-called Boltzmann-Gibbs statistics. A special emphasis is put on the method, used in order to perform these computations, which allows to reduce cumbersome momentum integrals into ones containing simpler ones, resulting in analytic representations in terms of the Hypergeometric functions.

Our analytic results, agreeing extremely well with the corresponding numerical estimates, happen to substantially simplify calculations within the Tsallis framework. The latter being extensively used in various different fields of Science, the LHC phenomenology for example, we hope to enlighten a number of possible applications.

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