Title:	Estimating the Temperature of Ther- mal QGP Systems
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Abstract: Ultra-relativistic heavy ion collisions at RHIC (Relativistic Heavy Ion Collider) and LHC (Large Hadron Collider) has made it possible to study the state of matter produced un- der extreme conditions of temperature and energy density known as Quark Gluon Plasma (QGP). To explore and investigate the possibility of formation of this new deconfined state of only quarks and gluons, tools of Statistical thermodynamics can be used. We focus on the study of transverse momentum distributions which has proven to be an effective probe for understanding the properties of systems produced in relativistic heavy ion collisions. Our objective is to find an accurate distribution function to approximate the identified parti- cle spectra. Since no function exactly describes the transverse momentum spectra, finding a correct distribution function to describe the spectra is of great interest to present day particle physics community. The classical description of high energy collisions uses statistical mod- els that are based on Boltzmann-Gibbs distribution (BG). In spite of its great success BG statistical mechanics is not completely universal. A class of physical ensembles involving long-range interactions and long-time memories can hardly be treated within this classical framework. Such systems are analyzed using a generalized non-extensive statistical ther- modynamics known as Tsallis statistics. We will be examining both Boltzmann-Gibbs and Tsallis statistical approaches in detail. An extension of Tsallis statistics applicable in high energy physics is explored here in order to study the phase space of particles produced from both soft as well as hard scattering processes occurring in heavy ion collisions using a gen- eralized Tsallis distribution. We carried out analysis for an invariant yield of pions. ROOT, data analysis framework has been used along with MINUIT class for fitting. Results have shown that this new generalized approach gives a successful explanation in a consistent way as compared to earlier approaches. Fit details including the values of temperature and other relevant parameters are also given. Also, the connection of new parameters to physics is explored, and generalized thermodynamics for relativistic particles is derived.

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