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Some aspects of thermodynamical signatures and phase transitions in relativistic nuclear collisions

In the theory of strong interaction, the quantum chromodynamics (QCD), quarks and gluons at low energy exist in colour singlet states, confined into hadrons. However, under the extreme conditions of high-energy heavy-ion collisions, quark–gluon plasma (QGP) can be formed. This state of matter features deconfined quarks and gluons with colour degrees of freedom. It is believed that such a plasma existed microseconds after the Big Bang, providing a glimpse into the primordial Universe. Since last few decades experiments conducted at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC) have been pivotal in advancing our understanding of the QGP by systematically measuring many of its fundamental properties [1–2]. We analyze the data of AGS and RHIC, which span a broad range of collision energies, ranging from = 1.5 to 200 GeV, systematically to investigate the dynamics of various hadrons produced in the central Au-Au collisions. To analyze the transverse momentum and transverse mass distributions, we evaluate a two-component standard distribution function, realizing a very good representation of the experimental data across these energy regimes.

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