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Early isotropization of the quark-gluon plasma

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In recent years, the problem of thermalization in Heavy Ion Collision has received much attention, but has yet to be solved.

The issue is the following: on one hand, viscous hydrodynamics simulations suggest that the matter produced in such collisions (called the Quark Gluon Plasma, or QGP) behaves like a nearly perfect fluid, and does so very shortly after the collision (around 1 fm/c). Since hydrodynamics has local thermal equilibrium in its prerequisites, this tends to show that the QGP has thermalized during the very early stages of the collision. On the other hand, theoretical models (based on microscopic theories like the Color Glass Condensate, or CGC) predict that the QGP is very far from local thermal equilibrium at the initial time (among other non-thermal features, its energy-momentum tensor is very anisotropic).

One of the approaches developed to study this non-perturbative problem in QCD is a resummation scheme that amounts to averaging over classical fields, with random initial conditions given by a one loop calculation in the CGC framework.

We present here the results that we obtained by following this approach –the so-called classical statistical approximation or CSA, showing an early isotropization of the system compatible with viscous hydrodynamics. As a final remark, some recently found theoretical limitations of the CSA will be briefly mentioned.

On behalf of collaboration:

None

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