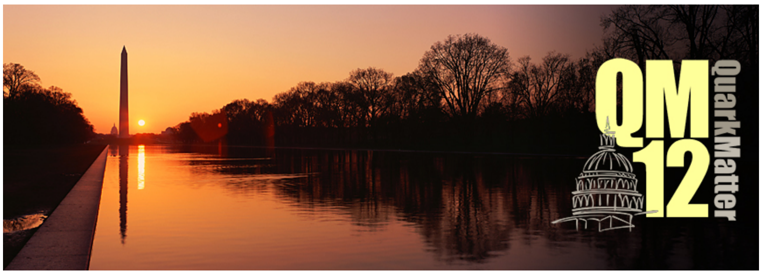

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Initial conditions for fluid dynamics from a parton cascade model

Thursday, August 16, 2012 4:00 PM (2 hours)

The initial conditions play a fundamental role in the fluid-dynamical modeling of the quark-gluon plasma (QGP) created in ultrarelativistic heavy-ion collisions. Many observables that are important in determining the properties of the QGP, such
as elliptic flow (v2) and triangular flow (v3), appear to be generated mainly from the initial geometry of the energy density profile. Since the initial conditions remain undetermined, it introduces a large uncertainty in the extraction of the
properties of the QGP.

Typically it is assumed that the matter thermalizes and fluid dynamics can be applied after time of the order of 1 fm/c after the initial nuclear collision. However, the matter itself can be created much earlier, and it undergoes pre-equilibrium evolution
before fluid dynamics can be applied. In this work, we estimate the impact of the pre-equilibrium evolution of the QGP on the initial conditions for fluid dynamics using a parton cascade model.

For the initial conditions for the pre-equilibrium evolution we use a realistic 6−dimensional parametrization of the initial single-particle distribution function $f(x,p)$ that reflect, e.g. the observed rapidity and multiplicity distributions at RHIC and LHC.
Then, we solve the time evolution of this distribution using the relativistic Boltzmann equation, up to times of the order of 1 fm/c, for various values of partonic cross sections. The relativistic Boltzmann equation is solved using the
BAMPS algorithm Ref. [1].

The main advantage of our approach is that we are able to compute, not only the energy density distribution at $t = 1$ fm, but also the velocity and shear-stress tensor profiles, which, so far, are mostly unknown.

[1] Z. Xu and C. Greiner, Phys. Rev. C 71 (2005) 064901; Phys. Rev. C 76, 024911 (2007).

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