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Relativistic viscous hydrodynamic modeling of the Quark-Gluon Plasma with ECHO-QGP

Friday, 13 September 2013 18:00 (20 minutes)

We will present ECHO-QGP (Eulerian conservative higher-order
code for QGP), a new (3+1)-dimensional numerical code developed by our team, implementing second-order relativistic viscous hydrodynamics
and conceived for the study of the Quark-Gluon Plasma created in heavy ion collisions. ECHO-QGP features second-order treatment of causal relativistic viscous effects both in Minkowski and in Bjorken coordinates; complete or partial (i.e. with particle ratios fixed at the chemical freeze-out) chemical equilibrium before kinetic freeze-out can be imposed on the EOS for the hadronic phase. We provide initialization routines based both on the optical and on the Monte-Carlo (suited to the simulation of event-by-event fluctuating initial conditions) implementation of the Glauber model. Freeze-out is modeled according to the Cooper-Frye prescription. A snapshot of the several tests performed for the validation of the code will be presented: results always appear accurate, as guaranteed by the combination of the conservative (shock-capturing) approach and the high-order methods employed. Some physics results for particle spectra and flow will be displayed. Finally, we shall extend our investigation to the case of fluctuating lumpy initial conditions, illustrating the ECHO-QGP potentiality to address event-by-event hydrodynamic simulations of nucleus-nucleus (A-A) and proton-nucleus (p-A) collisions, with particular emphasis on the role played by viscosity.

References:
1. L. Del Zanna, V. Chandra, G. Inghirami, V. Rolando, A. Beraudo, A. De Pace, G. Pagliara, A. Drago, F. Becattini, arXiv:1305.7052[nucl-th].

1. L. Del Zanna et al., Astro. Astrophys. 473, 11 (2007).

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