Initial conditions and space-time scales in relativistic heavy ion collisions.

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The space-time picture of the hadron emission versus initial energy density and transverse flow profiles is analyzed within hydro-kinetic model for A+A collisions. The model treats the formation of hadronic spectra as a result of continues process of particle liberation which is analyzed within Boltzmann equations in generalized relaxation time approximation [1]. It accounts for the particle escape probability and back reaction of particle emission on hydrodynamic evolution [2]. We study which type of initial conditions and equation of state (EoS) are preferred in view of current RHIC data. It is found that observed relatively small increase of interferometry radii with energy (so called RHIC HBT puzzle) is caused by

- developing of the initial transverse flows at early pre-thermal partonic stage [3]. The formation of such flows is calculated within Color Glass Condensate picture;
- relatively hard EoS corresponding to cross-over, not first order phase transition, between hadron and quark-gluon matter at top RHIC energies;
- earlier emission of hadrons, as compare with sudden freeze-out picture based on Landau/Cooper-Frye prescription, because escape probability accounts for whole particle trajectory in rapidly expanding surrounding, but not mean free pass at freeze-out temperature.

Within the hydro-kinetic picture of the evolution the successful description of the hadronic spectra and interferometry radii for RHIC energies is done and corresponding predictions for central nucleus-nucleus collisions at LHC energies is presented [4].

References

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