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Simple analytical solutions of relativistic hydrodynamics with longitudinal accelerating flow

Thursday, 20 December 2018 16:30 (15 minutes)

We will present new, exact, finite solutions of relativistic hydrodynamics for longitudinally expanding fireballs for arbitrary constant value of the speed of sound (CKCJ). These new solutions generalize earlier, longitudinally finite, exact solutions, from an unrealistic to a reasonable equation of state, characterized by a temperature independent (average) value of the speed of sound. Observables such as the rapidity density and the pseudorapidity density are evaluated analytically, resulting in simple and easy to fit formulae that can be matched to the high energy proton–proton and heavy ion collision data at RHIC and LHC. In the longitudinally boost-invariant limit, these new solutions approach the Hwa–Bjorken solution and the corresponding rapidity distributions approach a rapidity˜plateaux.

Also, we will present a perturbative solution of viscous hydrodynamics which included the longitudinal acceleration. The charged-particle's final state spectrum is derived from an analytic perturbative solution for the relativistic viscous hydrodynamics. By taking into account the longitudinal acceleration effect in relativistic viscous hydrodynamics, the pseudorapidity spectrum describes well the nucleus-nucleus colliding systems at RHIC and LHC. Based on both the extracted longitudinal acceleration parameters λ^* and a phenomenological description of the λ^*, the charged-particle's pseudorapidity distributions for $\sqrt{s_{NN}}$ = 5.44 TeV Xe+Xe collisions are computed from the final state expression in a limited space-time rapidity η_s region.

Summary

We published above results at Phys. Rev. C 97, 064906

https://journals.aps.org/prc/abstract/10.1103/PhysRevC.97.064906

and Universe 2018, 4(6), 69 (analytical solutions for ideal hydroddynamics)
http://www.mdpi.com/2218-1997/4/6/69

and a paper accepted by Chinese Physics C
https://arxiv.org/abs/1808.10287

and two papers submitted to APPB
https://arxiv.org/abs/1806.05750
https://arxiv.org/pdf/1806.06794.pdf

Sessions (parallel only)

Heavy Ions

Type

Parallel talk

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