Contribution ID: **321** Type: **Poster**

Causal and stable third-order fluid dynamics

Friday 8 April 2022 14:40 (4 minutes)

Second-order theories of fluid dynamics have been successfully employed to describe the time evolution of the hot and dense matter produced in heavy-ion collisions. Nevertheless, it has been shown that the inclusion of terms that are asymptotically of third order in gradients may be required to describe the dynamics of a fluid in the extreme conditions present at the early stages of these collisions [1]. For this purpose, third-order formulations of relativistic dissipative fluid dynamics were also developed [2]. Recently, a linear stability analysis was performed for such theories and it was demonstrated that they are intrinsically acausal and unstable [3]. In this contribution, we derive linearly causal and stable third-order fluid-dynamical equations from the Boltzmann equation using the method of moments. We show that we recover the theory proposed in Ref. [2] when certain relaxation times are taken to zero, but this limiting procedure is forbidden by causality and stability conditions. Finally, we compare the solutions of our novel theory with those of Boltzmann equation in 0+1 Bjorken flow and show that they are in good agreement.

[1] A. Jaiswal, Phys. Rev. C 87, 051901 (2013).
[2] A. Jaiswal, Phys. Rev. C 88, 021903 (2013).
[3] C. V. Brito and G. S. Denicol, arXiv:[2107.10319]

Authors: BRITO, Caio (Universidade Federal Fluminense); DENICOL, Gabriel (Universidade Federal Fluminense)

Presenter: BRITO, Caio (Universidade Federal Fluminense)

Session Classification: Poster Session 3 T12_1

Track Classification: New theoretical developments