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Initial conditions in Bjorken expansion from causality

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Relativistic hydrodynamics has been successful in describing space-time evolution of matter created in high-energy nuclear collisions. One conventionally assumes that created matter becomes fluids all at once at a certain initial time. It is, however, not at all trivial from which stage after the collision the fluid picture can be applied. Whether non-linear hydrodynamic equations obey the causality depends on how far the system is away from local thermal equilibrium. Thus, for the system to be causal, initial conditions must be close to the equilibrium state. In this talk, we apply the conditions obtained from causality to the conformal theory in a one-dimensionally expanding system, analyze how far the system can be away from local thermal equilibrium and constrain initial conditions so that the system can obey causality during the evolution. This sheds light on the understanding of initial stages in high-energy nuclear collisions.

Theory / experiment

Theory

Group or collaboration name

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