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Far-from-equilibrium attractors in kinetic theory for a mixture of quark and gluon fluids

Wednesday 10 July 2024 15:00 (20 minutes)

We solve a Boltzmann equation that describes the dynamics of coupled massless quark and gluon fluids undergoing transversally homogeneous boost-invariant expansion. The quark and gluon components are taken to have the same dynamical anisotropy parameter, but we introduce a fugacity parameter that allows quarks to be out of chemical equilibrium, as expected right after the formation of the QGP in heavy-ion collisions. To describe the different collision rates for quarks and gluons we introduce different relaxation times for quarks and gluons, which are related via Casimir scaling. Based on these assumptions, we derive coupled Boltzmann equations that are obeyed by all moments of the distribution functions. We find that both early- and late-time attractors exist for all moments of the distribution functions with the only exception for lower-order moments, whose behavior is not universal during the early stages of the longitudinal expansion. This attractor emerges long before the system reaches the regime where hydrodynamic approximations apply. In addition, we discuss how the shear viscous corrections and scaled entropy density of the fluid mixture evolve and consider the properties of their respective attractors. Finally, the entropy production is also investigated for different initial values of momentum anisotropy and quark abundance.

session

G. Heavy Ion Physics

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