Contribution ID: **585** Type: **Poster**

Scaling and adiabaticity in a rapidly expanding gluon plasma

Wednesday, 6 April 2022 19:14 (4 minutes)

Scaling phenomena, and the associated self-similar evolution, play an important role in characterizing the off-equilibrium evolution of many physical systems. In far-from-equilibrium QCD, the distribution functions of quarks and gluons have been found to have self-similar evolution in terms of a scaling function and scaling exponents [1,2,3]. In this work [4] we use the collision kernel for small-angle QCD scatterings [5,6] as our working example to investigate the connections between self-similar evolution and the dominance of an effective ground state from very early times in the kinetic theory. We find that the adiabatic evolution of the ground state adequately describes the dynamics of the full system for a wide range of initial conditions and naturally explains the emergence of scaling for small-angle scattering. Furthermore, we show that the evolution of the time-dependent scaling exponents follows a renormalization group equation as a function of time and discuss the novelties of its fixed points. As a demonstration of the relevance of these results, we compute the "anomalous dimensions"of the scaling exponents and show that the correction to the BMSS fixed point matches the numerical EKT results of [3].

[1] J. Berges, K. Boguslavski, S. Schlichting and R. Venugopalan, "Turbulent thermalization process in heavy-ion collisions at ultrarelativistic energies,"Phys. Rev. D 89 (2014) 074011
[2] J. Berges, K. Boguslavski, S. Schlichting and R. Venugopalan, "Universal attractor in a highly occupied non-Abelian plasma,"Phys. Rev. D 89 (2014) 114007
[3] A. Mazeliauskas and J. Berges, "Prescaling and far-from-equilibrium hydrodynamics in the quark-gluon plasma,"Phys. Rev. Lett. 122 (2019) 122301
[4] J. Brewer, B. Scheihing-Hitschfeld, Y. Yin "Time-dependent scaling and adiabatic hydrodynamization in Bjorken-expanding gluon plasmas,"(in preparation)
[5] P.B. Arnold, G.D. Moore and L.G. Yaffe, "Effective kinetic theory for high temperature gauge theories," JHEP 01 (2003) 030
[6] A.H. Mueller, "The Boltzmann equation for gluons at early times after a heavy ion collision,"Physics. Lett. B 475 (2000) 220

Primary authors: SCHEIHING HITSCHFELD, Bruno Sebastian (Massachusetts Institute of Technology); BREWER, Jasmine Therese (CERN); YIN, Yi (Institute of modern physics, Chinese Academy of Sciencessti)

Presenter: SCHEIHING HITSCHFELD, Bruno Sebastian (Massachusetts Institute of Technology)

Session Classification: Poster Session 2 T01

Track Classification: Initial state physics and approach to thermal equilibrium