Contribution ID: **744** Type: **Poster**

Towards a kinetic theory event generator for (heavy) ion collisions

Wednesday 6 April 2022 19:02 (4 minutes)

Recently observed signs of collectivity in small systems has highlighted the need for a better understanding of equilibration in small and large collisions systems. In search of this, the QCD effective kinetic theory formulated by Arnold, Moore and Yaffe (AMY) [1] has emerged as a promising candidate. In order to bridge the gap between theory and experiments we develop a parton cascade that implements the AMY kinetic theory, i.e. solves the Boltzmann equation with the full AMY kernels (elastic scattering and splitting/merging processes) by explicitly simulating the evolution of a parton ensemble. It is constructed in a fully Lorentz invariant way by using a method pioneered in [2], which also underlies the parton cascade PCPC [3]. A complication arises from quantities like the screening mass, that enter the AMY kernels and are defined as integrals over the phase space densities. We develop a method for extracting these locally from the parton ensemble without the need for further information. We first study the thermal equilibrium and compare our results to other numerical solutions of the AMY theory. Given the complexity of the AMY kernels and the additional challenges of translating them into a Lorentz invariant parton cascade, this is a non-trivial step. The thermal equilibrium case will form the basis for a full event generator for collisions of light and heavy ions.

[1] Peter Brockway Arnold, Guy D. Moore, and Laurence G. Yaffe. “Effective kinetic theory for high temperature gauge theories”. JHEP 01 (2003), p. 030. doi:10.1088/1126-6708/2003/01/030. arXiv:hep-ph/0209353.

[2] G. Peter, D. Behrens, and C. C. Noack. “Poincare covariant particle dynamics. 1: Intranuclear cascade model”. Phys. Rev. C 49 (1994), pp. 3253–3265. doi:10.1103/PhysRevC.49.3253.

[3] V. Borchers et al. “A Poincare covariant parton cascade model for ultra-relativistic heavy ion reactions”. Phys. Rev. C 62 (2000), p. 064903. doi:10.1103/PhysRevC.62.064903. arXiv:hep-ph/0006038.

Primary authors: TÖRNKVIST, Robin (Lund University); ZAPP, Korinna

Presenter: TÖRNKVIST, Robin (Lund University)

Session Classification: Poster Session 2 T01

Track Classification: Initial state physics and approach to thermal equilibrium