Beitrag ID: **256** Typ: **Talk**

A novel saturation-based 3+1D initial state model for Heavy Ion Collisions

Mittwoch, 29. März 2023 14:00 (20 Minuten)

We present a new 3+1D resolved model for the initial state of ultrarelativistic Heavy-Ion collisions, based on the $k_\perp$-factorized Color Glass Condensate hybrid approach [1-4]. This new model responds to the need for a rapidity-resolved initial-state Monte Carlo event generator which can deposit the relevant conserved charges (energy, charge and baryon densities) both in the midrapidity and forward/backward regions of the collision. This event-by-event generator computes the gluon and (anti-) quark phase-space densities using the IP-Sat model, from where the relevant conserved charges can be computed directly. In the present work we have included the leading order contributions to the light flavor parton densities. As a feature, the model can be systematically improved in the future by adding next-to-leading order calculations (in the CGC hybrid framework), and extended to lower energies by including sub-eikonal corrections the channels included. We present relevant observables, such as the eccentricities and flow decorrelation, as tests of this new approach.

References:
[1] O. Garcia-Montero, H. Elfner and S. Schlichting. *In preparation.*
[2]T. Lappi and S. Schlichting, Phys. Rev. D 97, 034034 (2018), arXiv:1708.08625 [hep-ph].
[3] T. Lappi and H. Mäntysaari, Phys. Rev. D 88, 114020 (2013), arXiv:1309.6963 [hep-ph]
[4] H. Mäntysaari, *Scattering off the Color Glass Condensate*, Ph.D. thesis, Jyvaskyla U. (2015), arXiv:1506.07313 [hep-ph].

Experiment/Theory

Theory/Phenomenology

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Sitzung Einordnung: Parallel: Early-Time Dynamics & nPDFs

Track Klassifizierung: Early time dynamics and nuclear PDFs