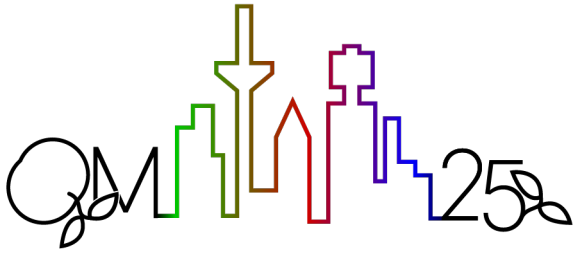

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Monte Carlo EKRT event generator for initializing 3+1 D fluid dynamics in high energy nuclear collisions

We present a novel Monte-Carlo implementation of the EKRT model, MC-EKRT, for computing partonic initial states in high-energy nuclear collisions [1]. Our new MC-EKRT event generator is based on collinearly factorized, dynamically fluctuating pQCD minijet production, supplemented with a saturation conjecture that controls the low-p_T particle production. Previously, the EKRT model has been very successful in describing low-p_T observables at mid-rapidity in heavy-ion collisions at the LHC and RHIC energies [2,3]. As novel features, our new MC implementation gives a full 3-dimensional initial state event-by-event, includes dynamical minijet-multiplicity fluctuations in the saturation and particle production, introduces a new type of spatially dependent fluctuating nuclear parton distribution functions, and accounts for the conservation of energy/momentum and valence-quark number. We show, by averaging a large set of event-by-event MC-EKRT initial conditions for 3+1 dimensional hydrodynamical evolution, that we obtain a good agreement with the rapidity-dependent multiplicity and elliptic flow data for LHC Pb+Pb and RHIC 200 GeV Au+Au collisions. This suggests that the same saturation mechanism that has successfully explained the mid-rapidity observables, works well also at larger rapidities. As a further application of MC-EKRT, we also study event-by-event fluctuations and decorrelations of initial eccentricities.

[1] M. Kuha, J. Auvinen, K. J. Eskola, H. Hirvonen, Y. Kanakubo, H. Niemi, arXiv:2406.17592 [hep-ph]
[2] H. Niemi, K. J. Eskola and R. Paatelainen, Phys. Rev. C 93, no.2, 024907 (2016)
[3] H. Hirvonen, K. J. Eskola and H. Niemi, Phys. Rev. C 106, no.4, 044913 (2022)

Category

Theory

Collaboration (if applicable)

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