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Space-time structure of 3+1D color fields in heavy-ion collisions

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We perform an analytic calculation of the 3+1D structure of the initial state in heavy-ion collisions by considering the collision of longitudinally extended nuclei in the dilute limit of the Color Glass Condensate effective field theory of high-energy QCD. Based on general analytic expressions for the color fields in the future light cone, we compute the non-trivial rapidity profiles of the transverse pressure at early times. We validate our (semi-) analytic results against non-perturbative 3+1D classical Yang-Mills simulations [2,3] and discuss prospects for the development of 3+1D initial state models based on our calculation.

[1] A. Ipp, D. Müller, S. Schlichting and P. Singh, arxiv:2109.05028

[2] S. Schlichting, P. Singh, 3-D structure of the Glasma initial state –Breaking boost-invariance by collisions of extended shock waves in classical Yang-Mills theory, Phys. Rev. D 103 (1) (2021) 014003.

[3] A. Ipp, D. Müller, Broken boost invariance in the Glasma via finite nuclei thickness, Phys. Lett. B 771 (2017) 74–79.

Primary authors: IPP, Andreas; SINGH, Pragma; MUELLER, David (TU Wien); SCHLICHTING, Soeren (Universität Bielefeld)

Presenter: MUELLER, David (TU Wien)

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