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Analytic and Semi-Analytic Calculations for Color Glass in the Weak Field Limit

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The classical field approximation to Color Glass Condensate for two colliding nuclei has been solved in the literature using numerical methods and recursive analytic solution. In the weak field limit, analytic solutions in transverse momentum space have also been known for some time. Based on the latter, we derive expressions for the space-time dependence of classical gluon 2-point functions $\langle F_{\mu\nu}(x_\alpha)F_{\kappa\lambda}(y_\beta) \rangle$ in the weak-field limit. For the McLerran-Venugopalan (MV) model, in many cases these expressions are shown to lead to solutions in closed analytic forms valid at all times. We also propose an alternative model which maintains UV-regularity by accounting for local correlations between color charges in the transverse plane, and softens the dependence on the IR-regulator by properly enforcing global color neutrality. The new model allows for a straight forward calculation of the time dependence of the gluon energy momentum tensor in early nuclear collisions in the weak field limit. We also discuss the initial motion of the nuclei after the collision and the momentum broadening coefficient at early times.

Category

Theory

Collaboration (if applicable)

Primary author: ROBICHEAUX, Stephen

Co-author: FRIES, Rainer (Texas A&M University)

Presenter: ROBICHEAUX, Stephen

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