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The Initial Flow of Gluon Fields and Its Implications for Heavy Ion Collisions

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We calculate the energy flow of the quasi-classical gluon field at early times in high energy nuclear collisions. We argue that the transverse flow has a rapidity-even component that is similar to collective flow in a fluid and emerges from the QCD analog of Farady's and Ampere's Law, and it has a rapidity-odd component that can be understood from Gauss' Law for gluon fields. While the former leads to the usual radial and elliptic flow phenomena, the rapidity-odd flow term implies directed flow and leads to characteristic flow patterns in asymmetric systems like Cu+Au. A comprehensive study of these unique flow phenomena could lead to novel signatures of color glass. We also discuss a method to calculate initial conditions for a further viscous hydrodynamic evolution from the full energy momentum tensor of the gluon field. This allows us to calculate the phenomenological consequences of the initial gluon field flow. In particular, we show that color glass predicts a rotation of the fireball around the impact vector axis.

Keywords

Initial State, Color Glass Condensate, Collective Flow

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