Two-Gluon Correlations in Heavy-Light Ion Collisions

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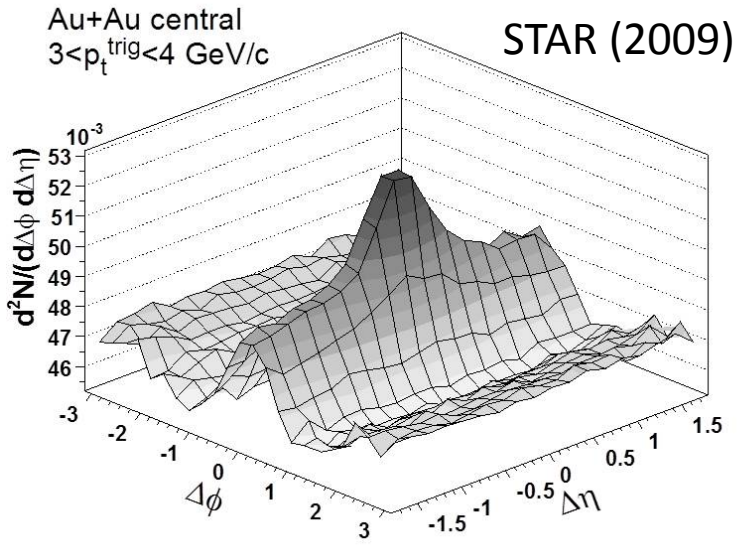
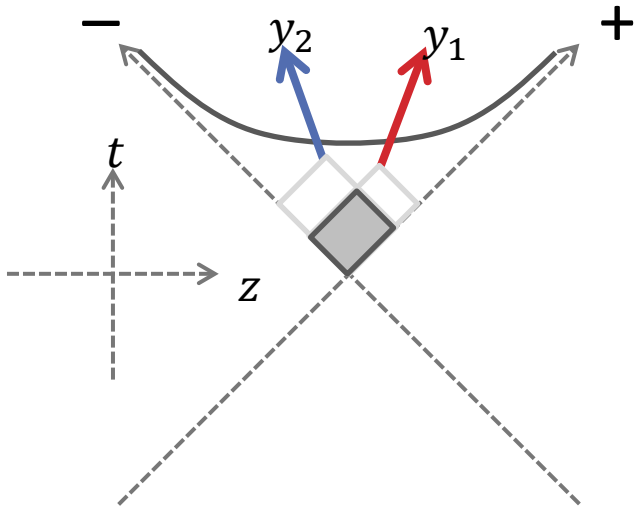
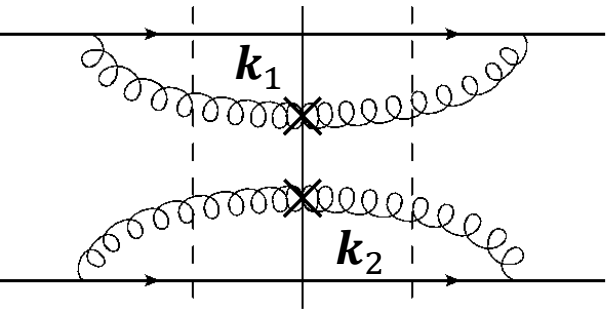


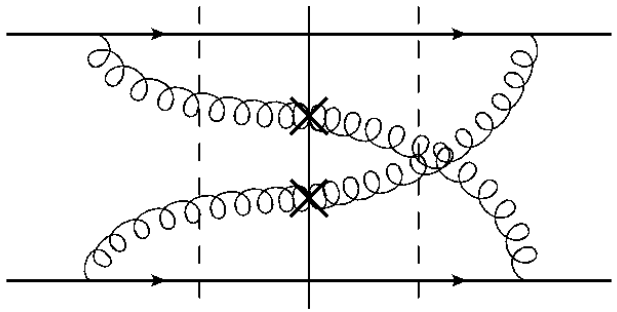
Long-range in rapidity → early time dynamics, Color Glass Condensate (CGC)

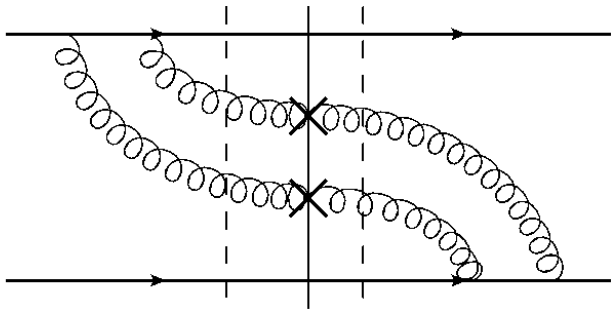


Due to technical constraints we model the AA collision as a heavy(dense)-light(dilute) collision in hopes that the corresponding physics remains true. Since we are in the dilute-dense limit this works for p-Pb as well as d-Au collisions.

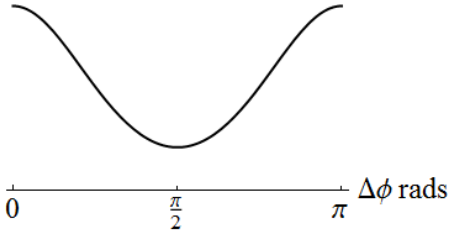
Two-Gluon Azimuthal Correlation Function

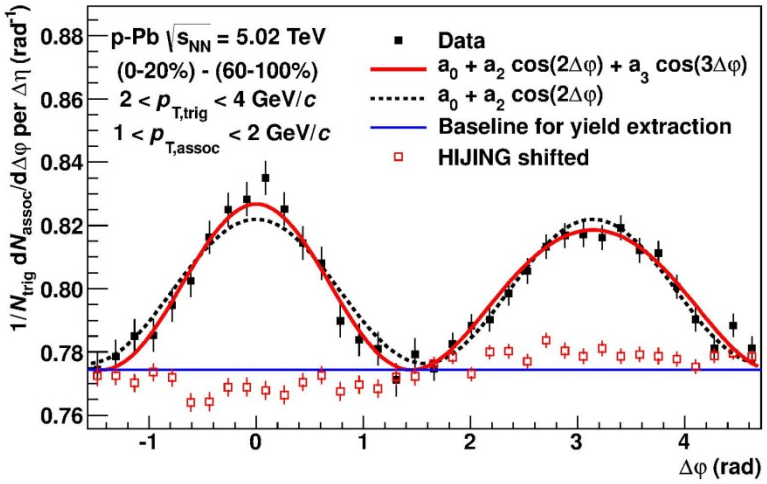




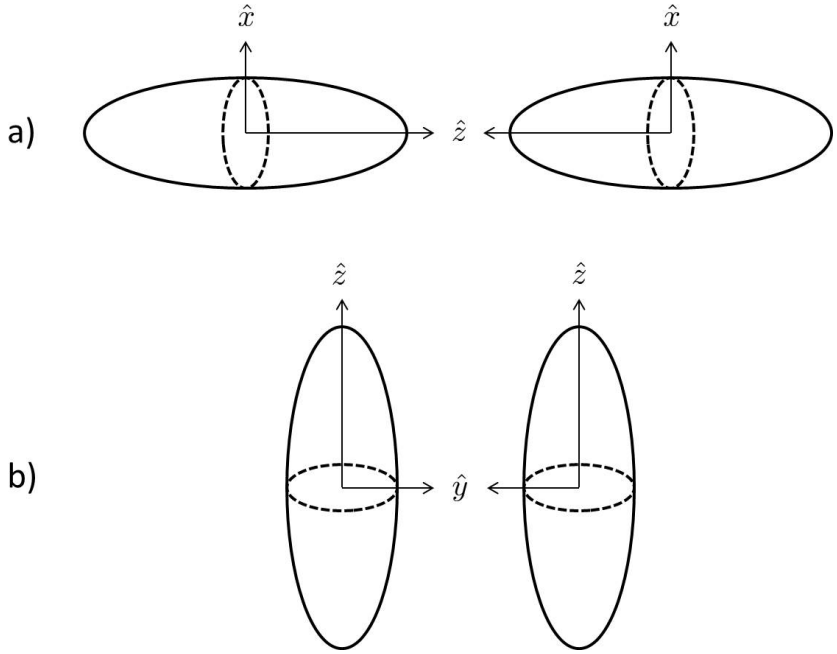


- Properties of the two-gluon correlations
  - Exact $\mathbf{k_2} \rightarrow \mathbf{-k_2}$ symmetry
    $\Rightarrow$ Even harmonics only
  - Enhancements at $\mathbf{k_1 = \pm k_2}$
  - Nearly independent of the rapidity of the gluon pair and of the center-of-mass energy.
- Data from ALICE (2012) in p+Pb shows a double-ridge structure, qualitatively consistent with our result.





Discriminating Between Initial State CGC Correlations and Hydrodynamic Flow



- Tip-tip vs. side-side collisions in U+U
- In CGC the correlation's strength depends on the thickness of the nucleus and not on the transverse shape as is the case for flow.
- Stronger correlations for tip-tip collisions in contrast with elliptic flow.
- Results robust for $\mathbf{k_T} \gg Q_s$ (~2 GeV)

$$\rho(\vec{\boldsymbol{r}}) = \rho_0 \; e^{-\frac{x^2}{R^2} - \frac{y^2}{R^2} - \frac{\lambda^2}{R^2} z^2}$$

$$\frac{C_{tip-tip}(\boldsymbol{k}_1, y_1, \boldsymbol{k}_2, y_2)\big|_{LO}}{C_{side-side}(\boldsymbol{k}_1, y_1, \boldsymbol{k}_2, y_2)\big|_{LO}} = \frac{1}{\lambda} \approx 1.26$$