BFKL catch up!

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Outline

Please note

- no sharpe distinction between the blocks
- I apologize for dropping and drastically condensing.

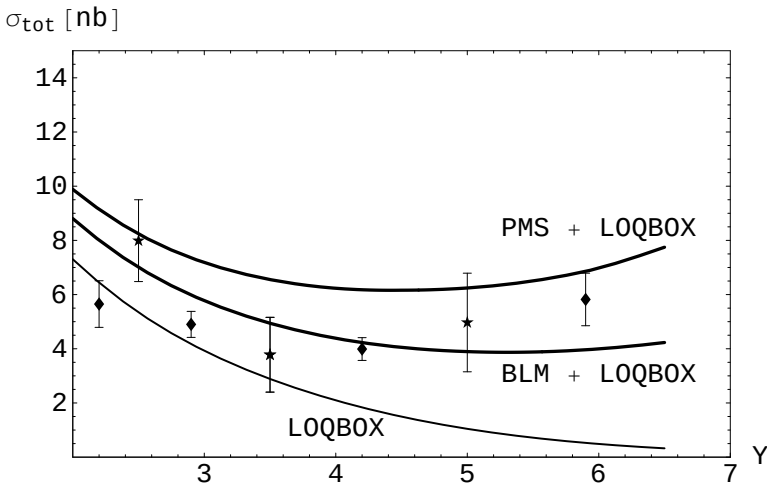
Introduction

perturbative QCD = expansion in coupling α_s

- large but ordered scales (e.g. $s \gg |t| \gg \Lambda^2_{\mathrm{QCD}}$) $\rightsquigarrow$ large logs $(\log s/t)$ for each additional emission in multi Regge kinematics $\rightsquigarrow$ compensating smallness of α_s
- need to resum terms $\sim (\alpha_s \log s/t)^n$
  $\rightsquigarrow$ LO **B**alitsky-**F**adin-**K**uraev-**L**ipatov equation ['75-'78]
- resummation of terms $\sim \alpha_s(\alpha_s \log s/t)^n$
  $\rightsquigarrow$ NLO BFKL equation ['98]

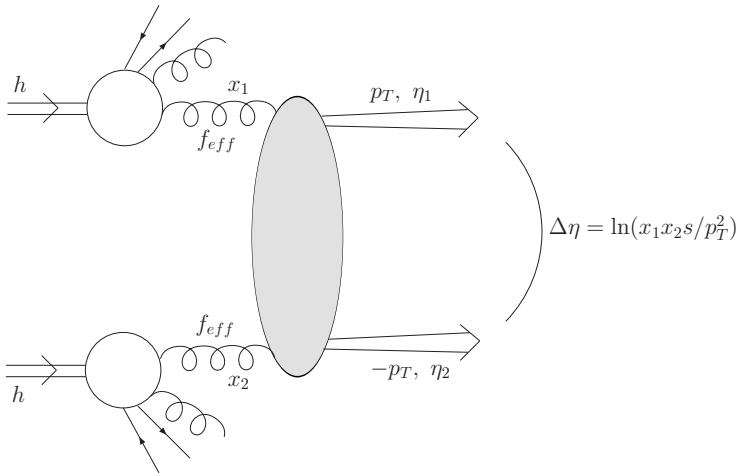
$\gamma^*\gamma^*$

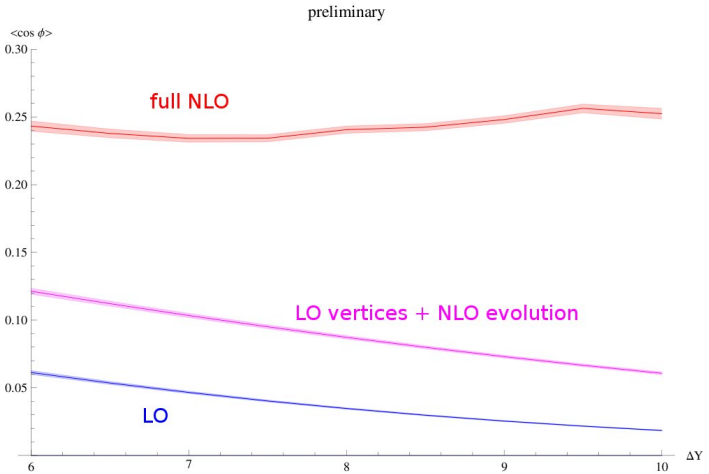
- [Caporale, Papa, Sabio Vera]: $\gamma^*\gamma^* \to VV$ at NLO BFKL with collinear improvement $\longrightarrow$ more 'sensible' energy scales
- [Caporale, Ivanov, Papa]: σ_{tot} NLO BFKL Green's function with (N)LO impact factor + quark box



Forward Jets

- [Chevallier, Kepka, Marquet, Royon]: Fwd jets with rapidity gap, NLO BFKL, good agreement with Tevatron data
- Mueller-Navelet jets
  - NLO BFKL Green's function + LO vertices [Marquet, Royon; Sabio Vera, Schwennsen]
  - full NLO BFKL under work [Colferai, Schwennsen, Szymanowski, Wallon]





Discrete Pomeron

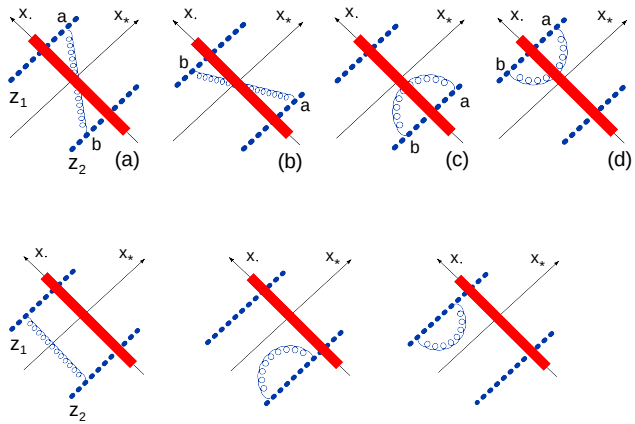
Talk by Douglas Ross

Central In-/Exclusive Production

already well covered in this conference

Möbius Representation

- [Baltisky, Chrilli]: NLO evolution of color dipoles
  - for conformal invariance in $\mathcal{N}=4$ counterterms are needed because of non-conformal regularization
- [Fadin, Fiore, Grabovsky, Papa]: NLO non-forward BFKL kernel in Möbius Representation
  - non conformal terms not only due to β_0
  - not unambigously defined: (s_0, $\hat{\mathcal{K}}_{\mathrm{NLO}} \to \hat{\mathcal{K}}_{\mathrm{NLO}} - [\hat{\mathcal{K}}_{\mathrm{LO}}, \hat{\mathcal{O}}]$) $\to$ hope
- Now: agreement for forward BFKL



Running Coupling

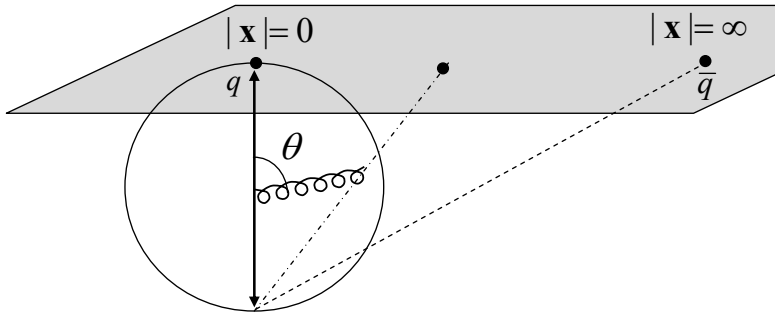
NLO BFKL not conformal $\Rightarrow$ LO eigen functions $(k^2)^\gamma$ are not eigen functions of NLO kernel, how to handle?

- eigenvalue $\omega(\gamma)$ becomes operator
- [Bondarenko]: $(k^2)^\gamma \longrightarrow (k^2)^{\gamma - \frac{\alpha_s \beta_0}{4\pi}}$ conformal after expansion
- [Ross]: involved numerical estimation of NLO eigen functions

no completely satisfactory solution so far

Not Quite Pigeonholable

- [Avsar, Hatta, Matsuro]: soft gluon away from jets in e^+e^- annihilation related to BFKL equation in coordinate space
- [Motyka, Staśto]: exact kinematics in LCPT for dipole evolution
  $\rightsquigarrow$ suppression of large dipoles
  $\rightsquigarrow$ most singular terms of NLL reproduced



Odderon

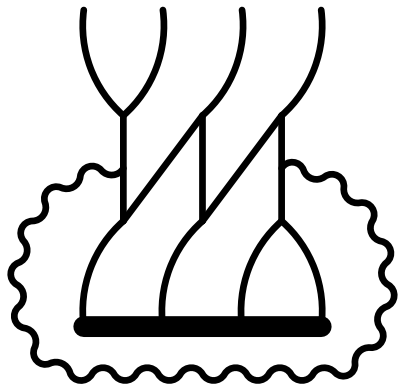
Solutions to the BKP-Equation at LO: JW-Odderon (intercept<1), BLV-Odderon (intercept$=1$)

- [Braun]: BLV-Odderon keeps intercept$=1$ if running copuling introduced via bootstrap relation
- [Staśto]: BLV-Odderon keeps intercept$=1$ beyond LO (using ω-expansion)
- [Brower, Djurić, Tan]: counterpart of Odderon in IIB on $AdS_5 \times S^5$: Kalb-Ramond field $B_{\mu\nu}$
  - also 2 Odderons in the strong t'Hooft coupling: intercept$= 1 - \frac{m_{AdS}^2}{2\sqrt{\lambda}} + \mathcal{O}(1/\lambda)$, where $m_{AdS,1} = 0$, $m_{AdS,2} = 16$
- [Bzdak, Motyka, Szymanowski, Cudell; Pire, Schwennsen, Szymanowski, Wallon]: proposals to look for perturbative Odderon

Wrapping corrections in $\mathcal{N} = 4$ SUSY

Asymptotic Bethe ansatz [Beisert, Staudacher] for anomalous dimension expected to fail if perturbation order $\geq$ length of operator. Simplest example: Konishi operator wrappping corrections needed at g^8

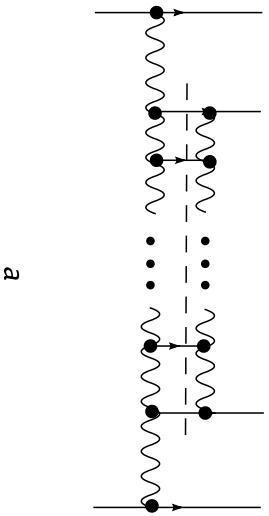
- result has to meet pole structure of BFKL [Kotikov, Lipatov, Rej, Staudacher, Velizhanin] ('all order result!')
- confirmed by [Fiamberti, Santambrogio, Sieg, Zanon; Velizhanin; Bajnok, Janik, Łukowski]



BDS

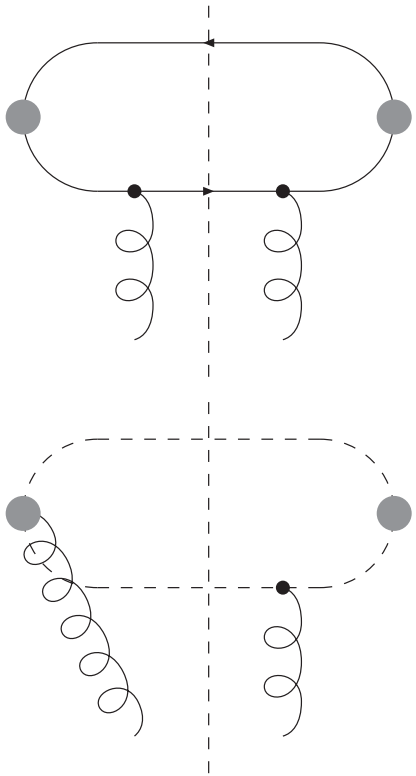
Bern Dixon Smirnov ansatz for MHV scattering amplitude $A_n = A_n^{(\mathrm{Born})} e^{M_n}$ misses terms for $n \geq 6$ [Drummond, Henn, Korchemsky, Sokatchev; Alday, Maldacena]

- [Bartels, Lipatov, Sabio Vera; Del Duca, Duhr, Glover; Brower, Nastase, Schnitzer, Tan] BDS does not reproduce MRK amplitude for $n = 6$, missing cut contribution
- en passant: ingredients for NNLO BFKL Kernel in $\mathcal{N} = 4$ assembled



more progress in $\mathcal{N} = 4$

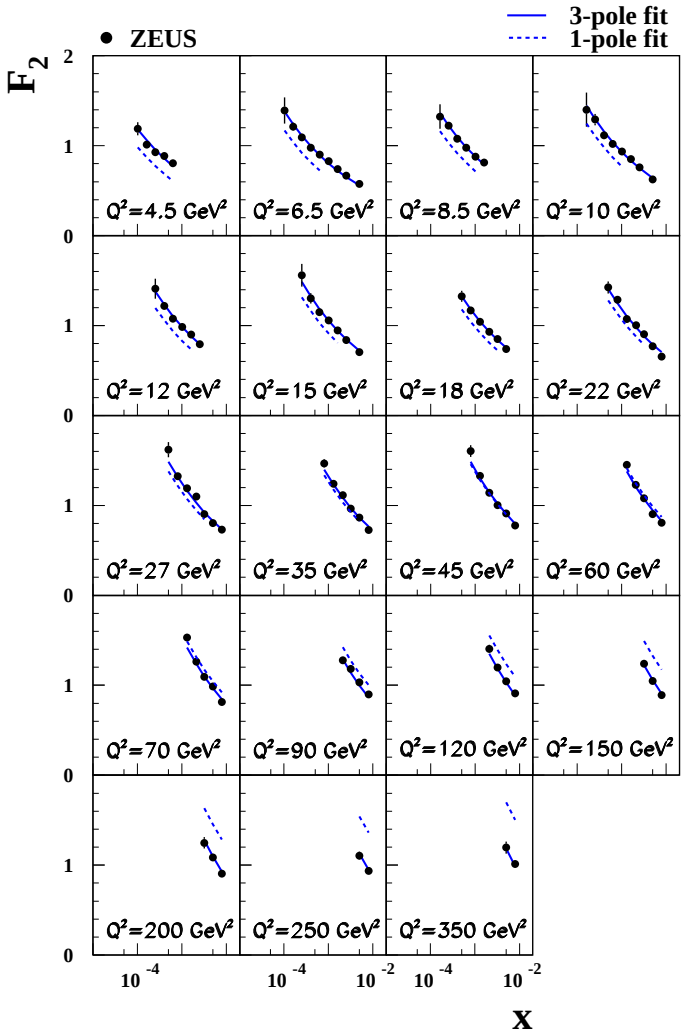
- [Bartels, Mischler, Salvadore]: R-Current impact factors (as counterpart to γ^*-IF in QCD), starting point for more studies on Pomeron-Gravity duality
- [Bartels, Hentschinski, Mischler]: Triple-Pomeron vertex, ... more to come
- [Gómez, Gunnesson, Hernández]: more on connection between BFKL and spin chain (still many conjectures)



~~Summary~~

Discrete Pomeron [Talk on Wednesday]

- running coupling: series of Regge poles + fixed phase encoding IR behavior instead of Regge cut
- work of [Ellis, Kowalski, Ross]: Fit of NLO renormalization-group-improved BFKL Pomeron to H1 data
- good agreement already for 3 poles
- for a more realistic proton impact factor: need a lot of poles



Central In-/Exclusive Production

- [Levin, Miller]: background to inclusive *WH* production
- [Andersen, Del Duca, White]: advanced FKL-based MC for inclusive Higgs production
- [Cudell, Dechambre, Hernández, Ivanov]: exclusive dijet production $\longrightarrow$ dominated by non-perturbative region dominates