Rapidity gap survival in enhanced Pomeron scheme

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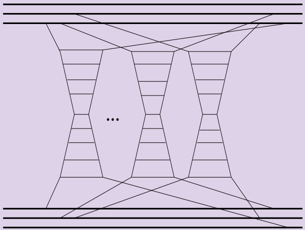
Framework: Reggeon Field Theory (RFT)

- high energy collisions:
  multiple scattering processes
- 'real' multiparton interactions – via multiple production of dijets
- also 'soft' (small p_t) scattering
- virtual (elastic) rescatterings (required by unitarity)
- soft/hard diffraction



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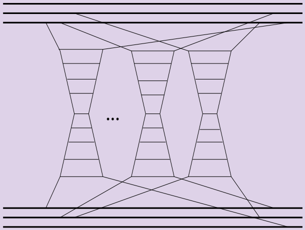
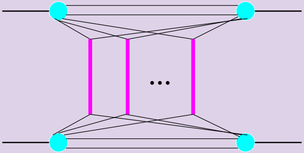


Basic approach: treatment of soft & hard processes in RFT

- 'elementary' cascades = Pomerons
- requires Pomeron amplitude &
  Pomeron-hadron vertices



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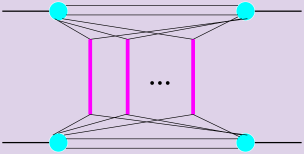
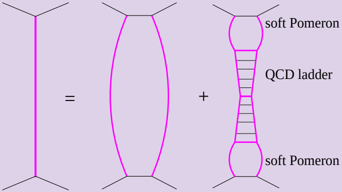


Hard processes included using 'semihard Pomeron' approach *[Drescher et al., PR350 (2001) 93]*

- soft Pomerons to describe soft (parts of) cascades ($p_t^2 < Q_0^2$)
  - ⇒ transverse expansion governed by the Pomeron slope
- DGLAP for hard cascades
- taken together: 'general Pomeron'
- Q_0 – just a technical border between the two treatments



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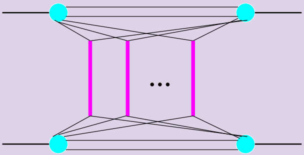

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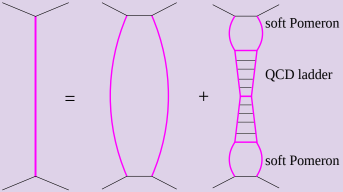

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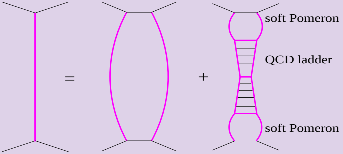

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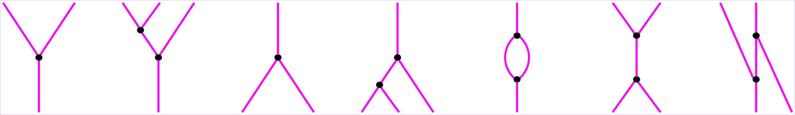

thick lines = Pomerons = 'elementary' parton cascades

- NB: 'soft' $\mathbb{PP}$-coupling assumed

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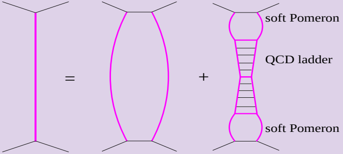

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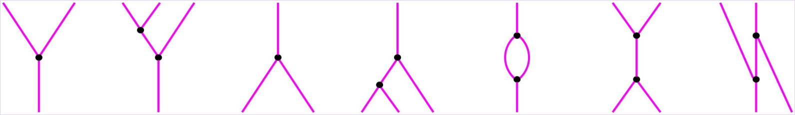

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- NB: 'soft' $\mathbb{PP}$-coupling assumed
- enhanced graphs resummed to all orders (both for uncut & cut diagrams) *[SO, PLB636 (2006) 40, PRD77 (2008) 034009]*

Framework: Reggeon Field Theory (RFT)

Good-Walker-like scheme used for low mass diffraction

- $|p\rangle = \sum_i \sqrt{C_i} |i\rangle$, C_i - partial weight for el. scatt. eigenstate $|i\rangle$
- two eigenstates: i) large & dilute (low parton density, large radius), ii) small & dense (high parton density, small radius)
- all multi-Pomeron contributions averaged over the eigenstates
- small size eigenstates: sampled more rarely (small area) but have stronger multiple scattering (higher parton density)
- NB: high mass diffraction – from (cut) enhanced diagrams

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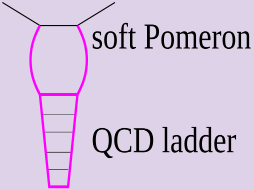
PDFs & diffractive PDFs in DIS

Proton PDFs neglecting absorption (low x limit)



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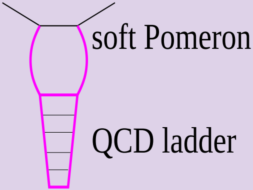

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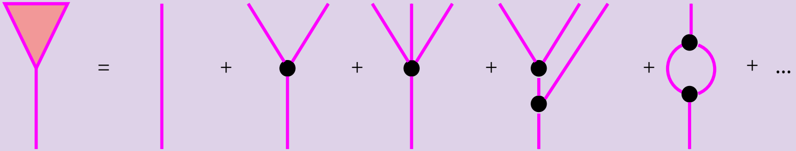

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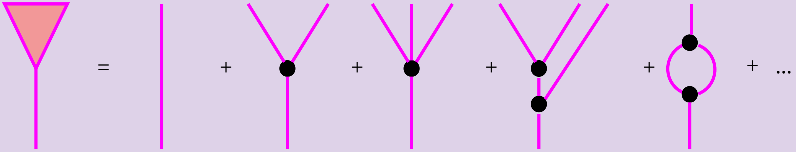

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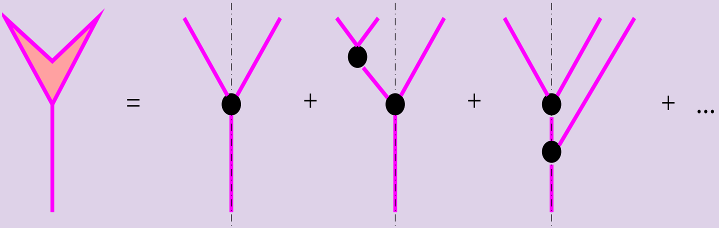
dPDFs: unitarity cuts of the "triangles", characterized by diffractive topologies



Dijet & diffractive dijet production in pp collisions

Many additional effects in the proton-proton case

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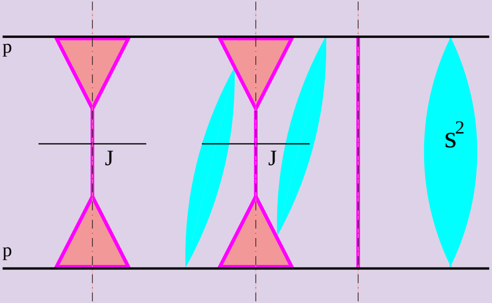
- accompanaing soft production
- (virtual) elastic rescatterings (eikonal S^2 factor)



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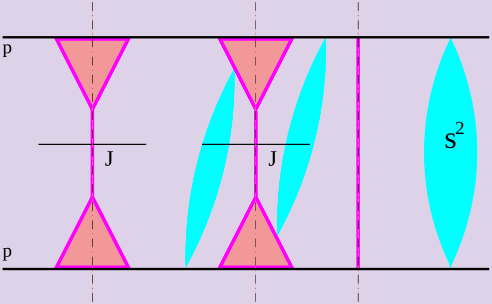
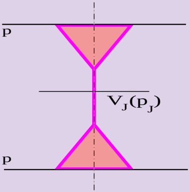
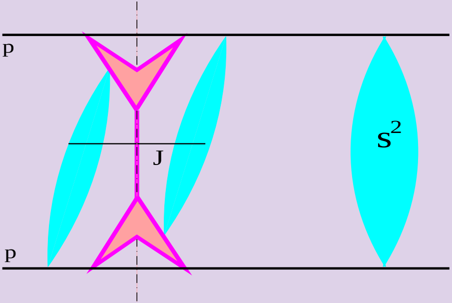


All those effects cancel for inclusive jet spectra

- thanks to the AGK-cancellations, the end result is described by Kancheli-Mueller graphs
- expressed via the universal PDFs studied in DIS



No such cancellations hold for diffractive dijet production



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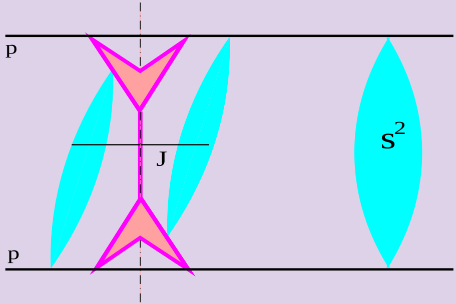
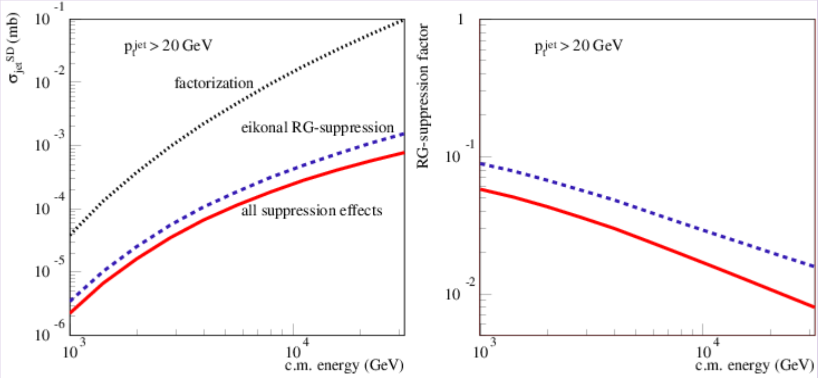


- ⇒ study relative roles of different absorptive effects
- using default parameters of the QGSJET-II model *[SO, PRD83 (2011) 014018]*

Rapidity gap suppression for diffractive dijet production

$\sqrt{s}$-dependence of $\sigma_{pp}^{SD(jet)}$ for $p_t^{jet} > 20$ GeV, $\xi < 0.1$ ($y_{gap} = -\ln\xi$)



- strong suppression by the eikonal factor
- suppression by enhanced graphs – just a correction

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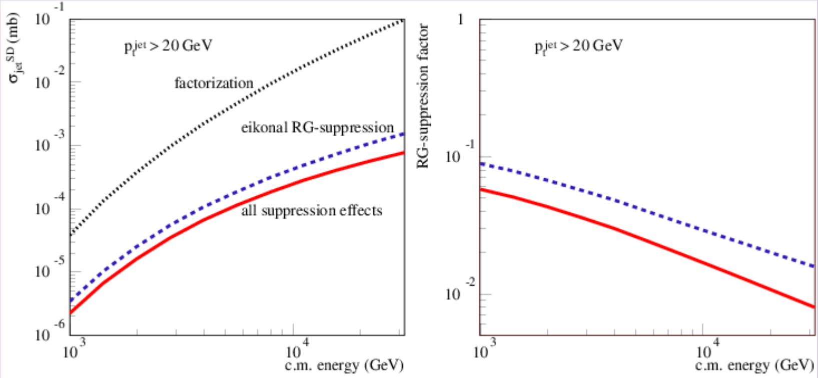

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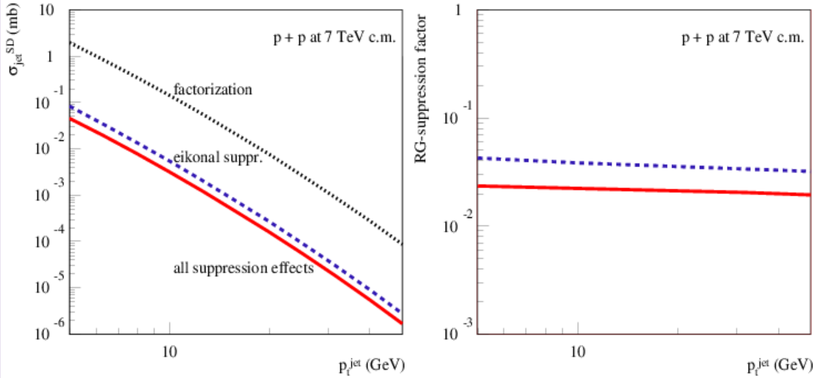

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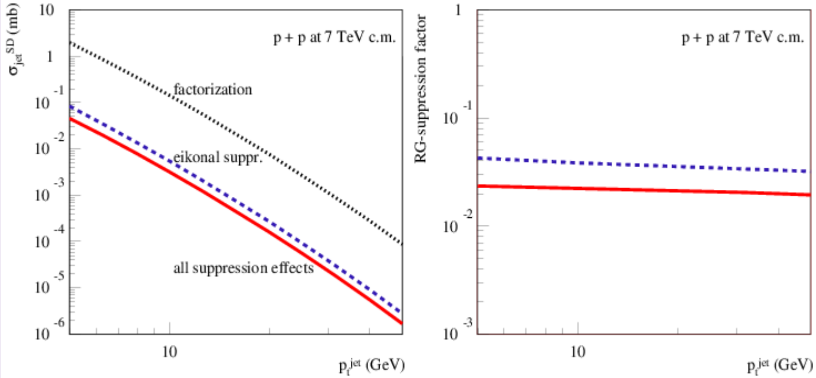

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- too strong (almost by order of magnitude) compared to CMS & ATLAS results?!

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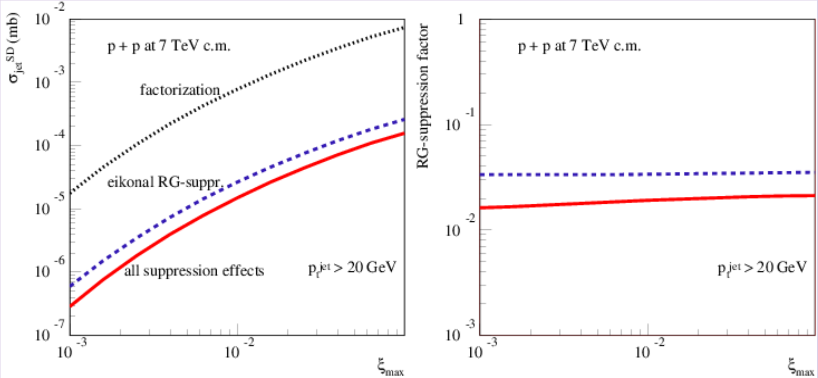
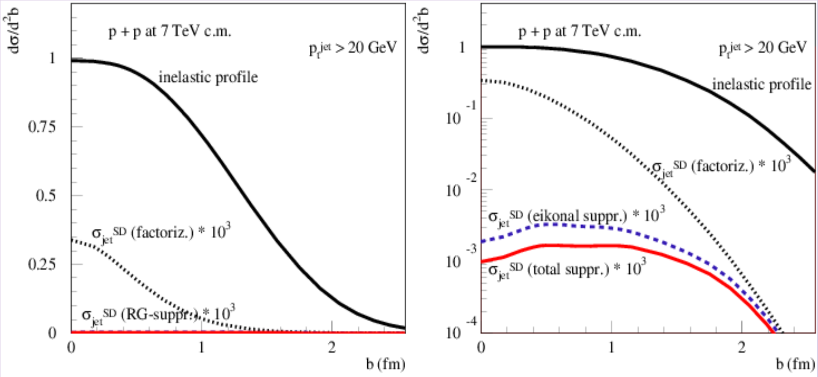


- rap-gap suppression: weakly depends on the size of the gap

Rapidity gap suppression for diffractive dijet production

Why: much smaller slope for dijet SD compared to the elastic slope



- diffractive dijets produced in the "black" region
  ⇒ suppressed by many orders of magnitude
- no way to shift dijet production outside the "black" domain (small slope)

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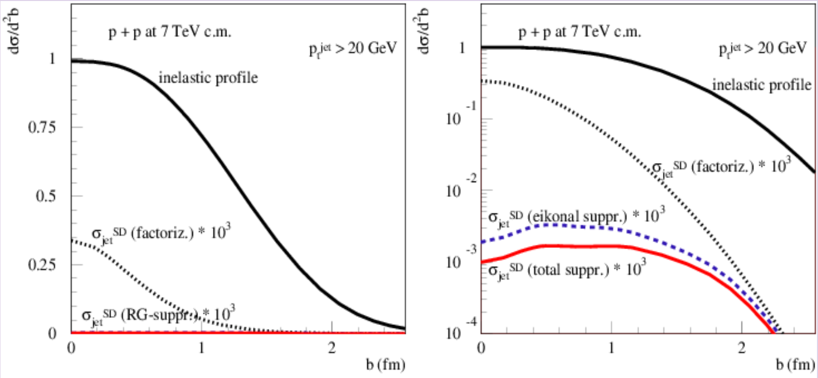

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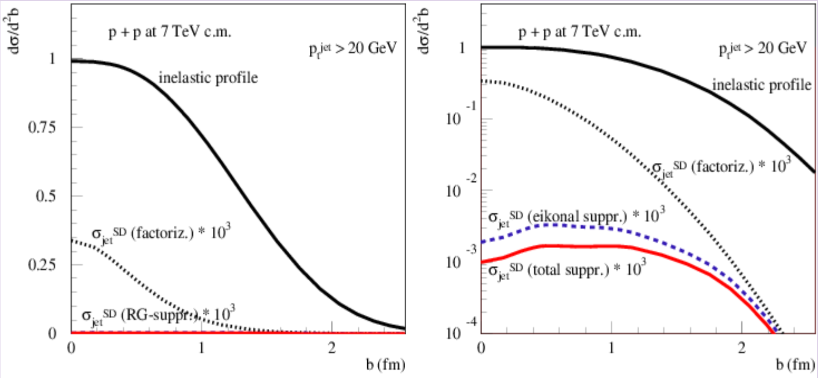

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