Diiscussion session:Low x and diffraction

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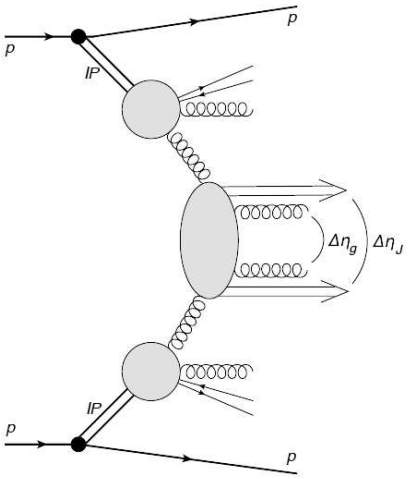
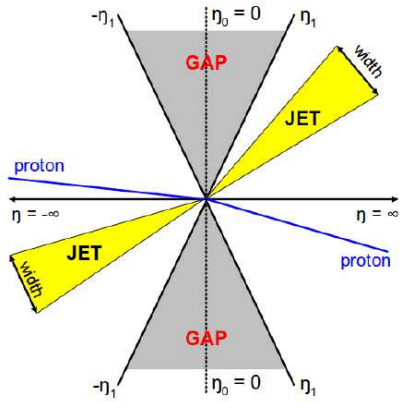
Contents:

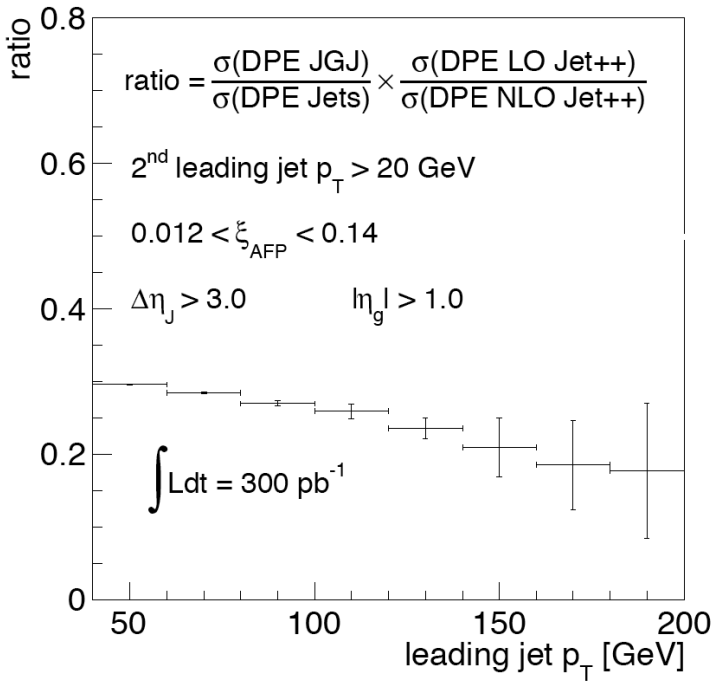
- Elastic cross section: the need for 2 TeV data, non-exponential cross section
- Survival probability: high mass? gluon vs photon exchanges?
- Proton dissociation? Tag vs rapidity gaps?
- Factorization?
- higher order claculation in diffraction?
- MC tuning?

Looking for BFKL dynamics / saturation?

- Mueller Navelet jets
- Jet gap jets in diffraction or not

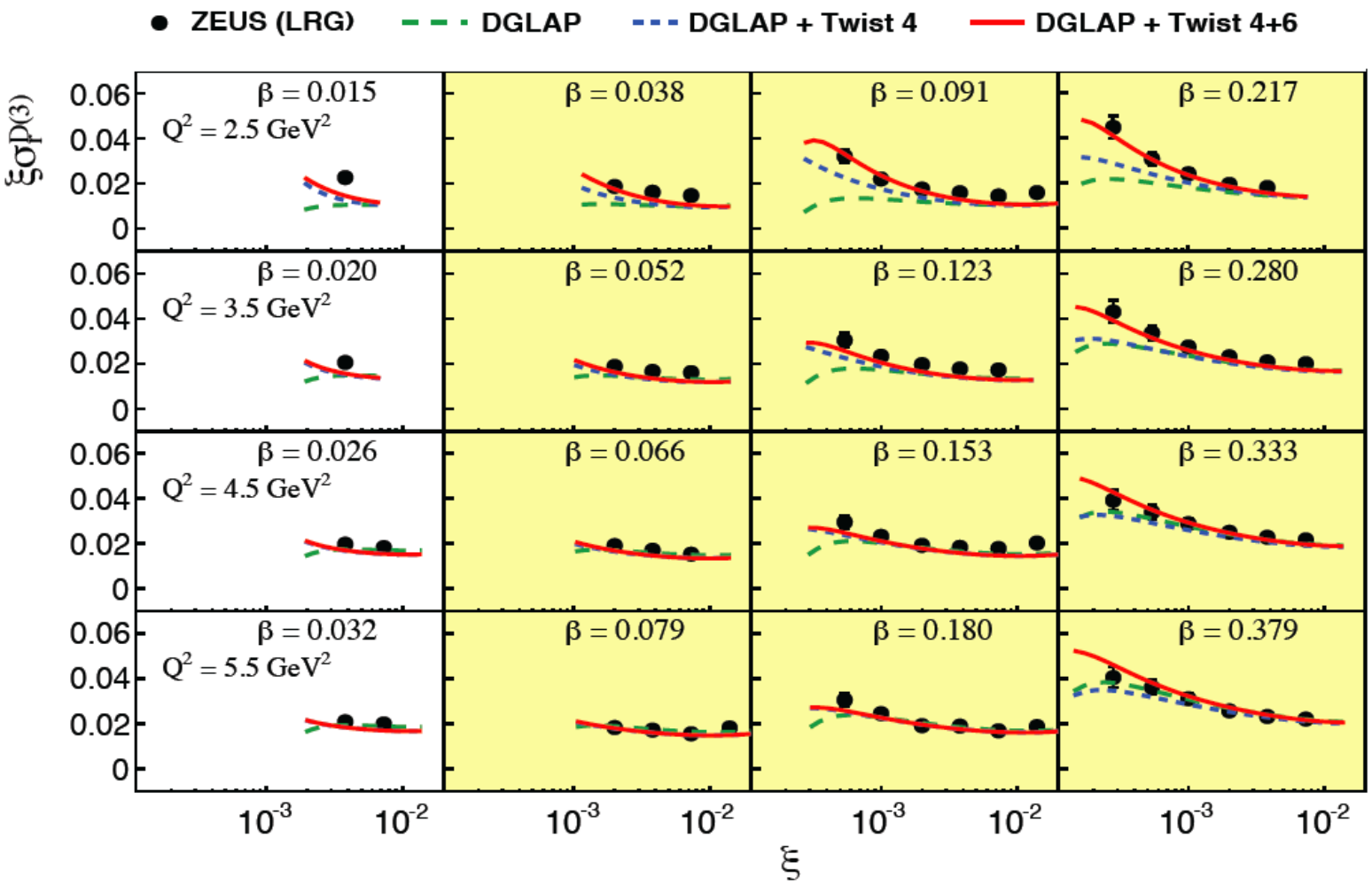






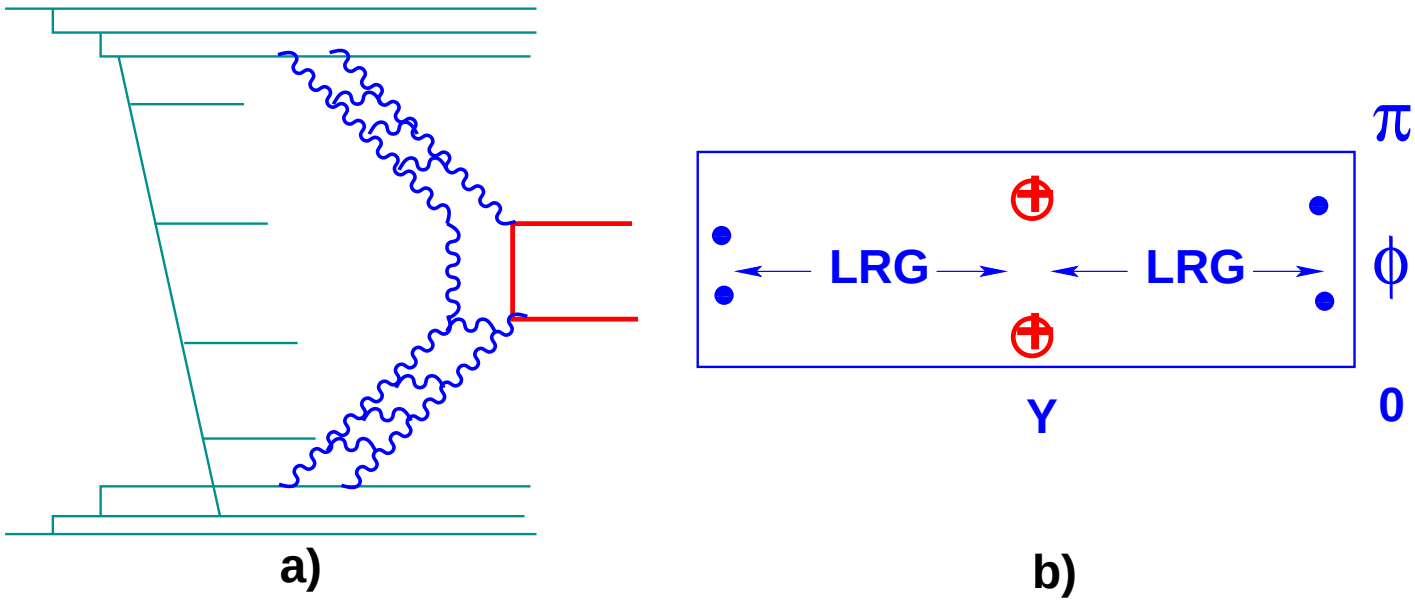
Higher twist contributions

- Diffractive data at HERA cannot be described at low Q^2: higher twists 4 and 6 evaluated by dipole saturation model (Motyka, Sadzikowski, Slaminski)
- Improves the fit at low Q^2: higher order calculations needed? dependence on A? energy? Can we see this at the LHC? Dedicated measurements?.



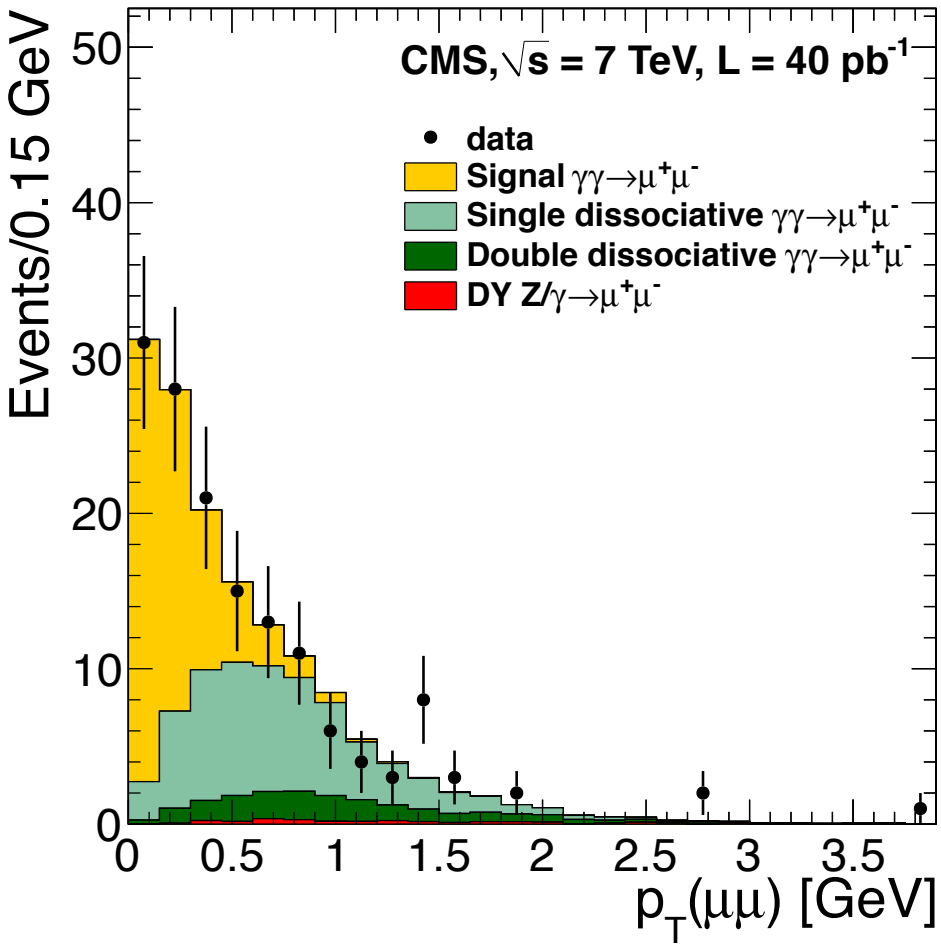
Hard diffraction: survival probability/factorization

- LHC/HERA photoproduction: Factorisation is not expected to hold: soft gluon exchanges in initial/final states
- Survival probability: Probability that there is no soft additional interaction, that the diffractive event is kept
- Value of survival probability assumed in these studies: Computation of survival probabilities? Order f magnitide: 0.03 at 14 TeV for QCD exchanges, 0.9 for photon exchanges
- MC: Superchic 2 for exclusive observables
- Experimental observables (how to distnagle PDF from survival effects)? Ratio of cross section adressing the same kinematical space...



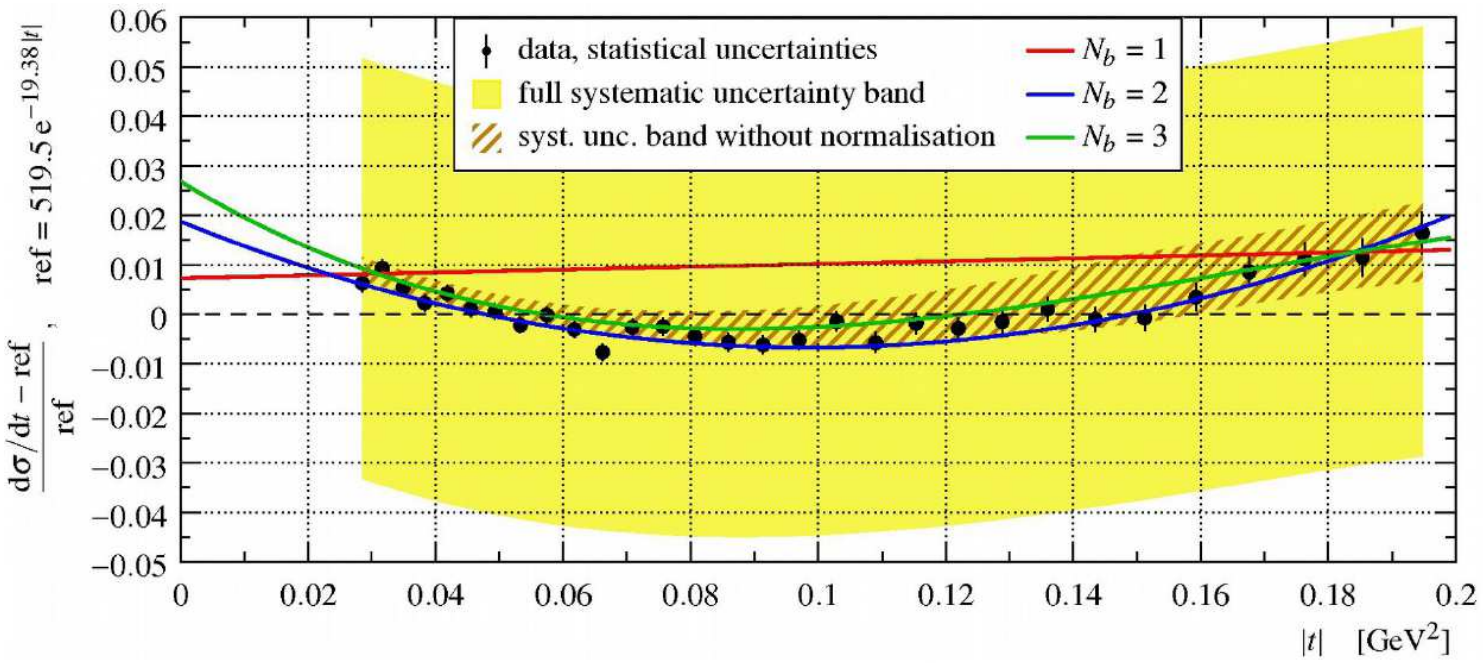
Proton dissociation

- At HERA: about 20% difference
- Can be measured at the LHC: Compare rapidity gap and tag methods
- Low mass di-lepton production in CMS: important contribution of proton dissociation



- Proton dissociation in Alice (higher masses): negligible...

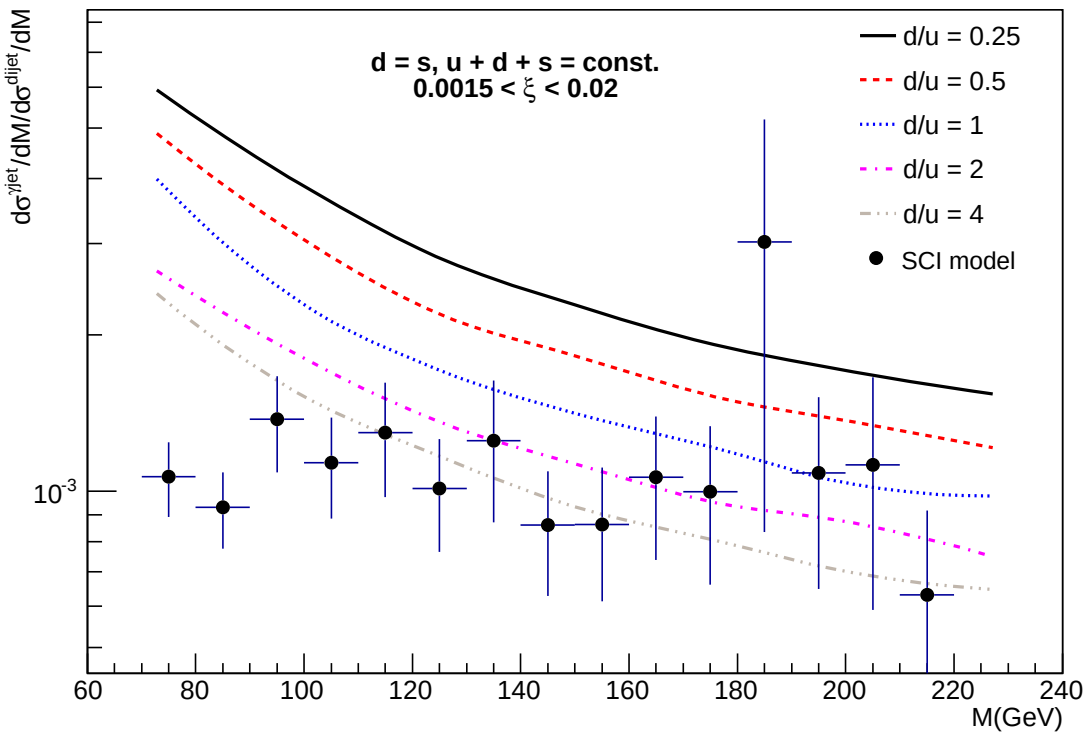
pp scattering at 8/13 TeV: non-exponential form



- Exponential fit: $d\sigma/dt = A\exp(-B(t)|t|)$
- Pure exponential form ($N_b = 1$) excluded at 7.2 σ
  - $N_b = 1$ $B = b_1$, reference
  - $N_b = 2$, $B = b_1 + b_2 t$
  - $N_b = 3$, $B = b_1 + b_2 t + b_3 t^2$
  - See Nucl. Phys. B 899 (2015) 527-546

Additional topics

- MC tuning for diffraction: which best variables to be used?
- MC tuning for different QCD dynamics (BFKL), which variables to be used, in which domain?
- MC tuning: which additional data? LHCf data taken, but might need proton-oxygen data for cosmic ray tuning?
- Exclusive production of χ_C? Differences between KMR and Szczurek et al. predictions
- sensitivity to other model in diffraction: soft color interactions (cf Grzegorsz's talk)
- AOB?



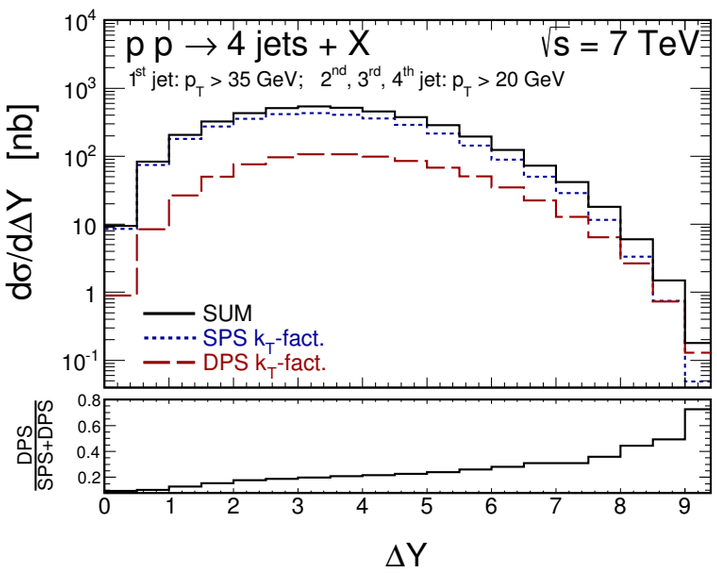
Discussion WG4 (theory)

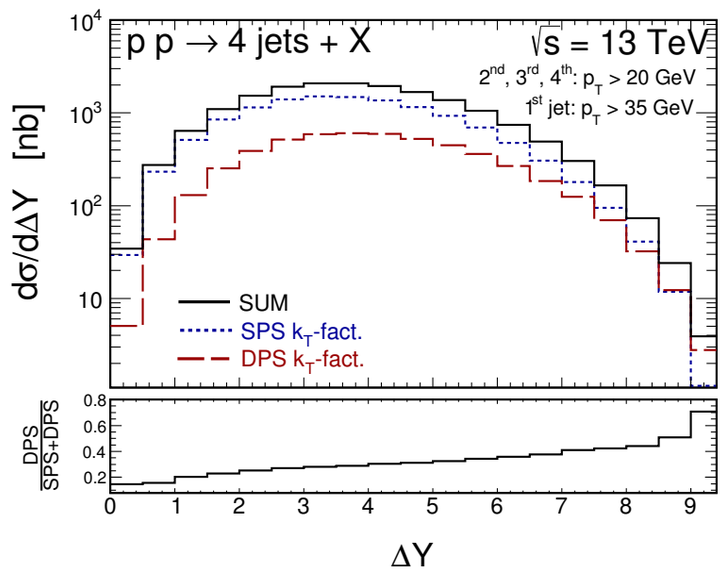
MPI San Cristobal de las Casas, Chiapas, MX

Martin Hentschinski
ICN-UNAM & BUAP

Pinning down double parton scattering: large rapidity separation

K. Kutak, R. Maciula, M.S., A. Szczurek, A. van Hameren
Phys.Rev. D94 (2016) no.1, 014019





- It is interesting to look for kinematic variables which could make DPS apparent.
- The maximum rapidity separation in the four jet sample is one such variable, especially at 13 GeV.
- for $\Delta Y > 6$ the total cross section is dominated by DPS.

ΔY> 6 is classical BFKL region (resummation): is it needed to take such effects into account? Could they enhance the SPS contribution?

from Piotr's talks

Direct study of minijet suppression

Summary:

- HEF/IDDT do not produce significant small p_T suppression, despite the internal gluon k_T
- The suppression is very similar to the one produced by Pythia with the 'hard' events (this is actually quite intuitive)
- For larger p_T the enhancement in HEF (but not IDDT) with respect to collinear result is very similar to Pythia with MPIs

$\Rightarrow$ MPIs are power corrections which are present in HEF (where this enhancement comes from $K_T > \overline{p}_T$), where $\overline{p}_T = (p_{T1} + p_{T2})/2$

Idea: study sensitivity to large dijet imbalance to look for MPI effects

- define $\tau = K_T/\overline{p}_T$ and simply consider $d\sigma/d\tau$
- p_T of dijets $> 25\,\mathrm{GeV}$ (to be within the hard regime)
- study an impact of MPIs (by playing with $p_{T0}\,(s)$)