

Factorisation in Diffraction

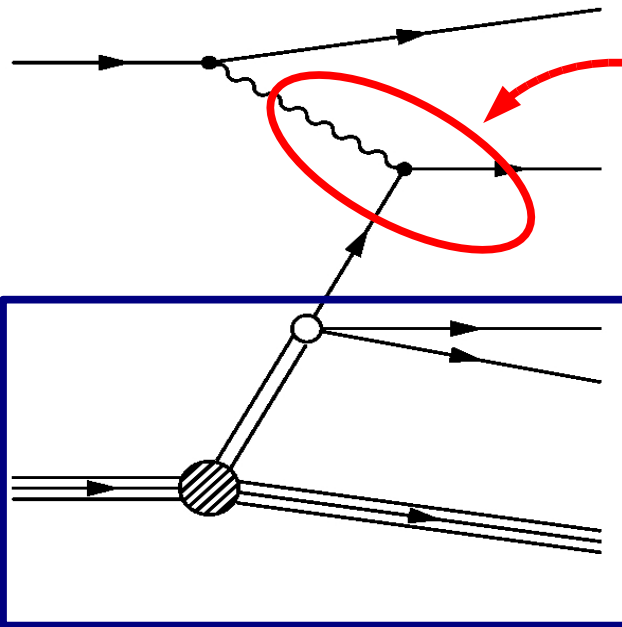


Matthias Mozer

IIHE

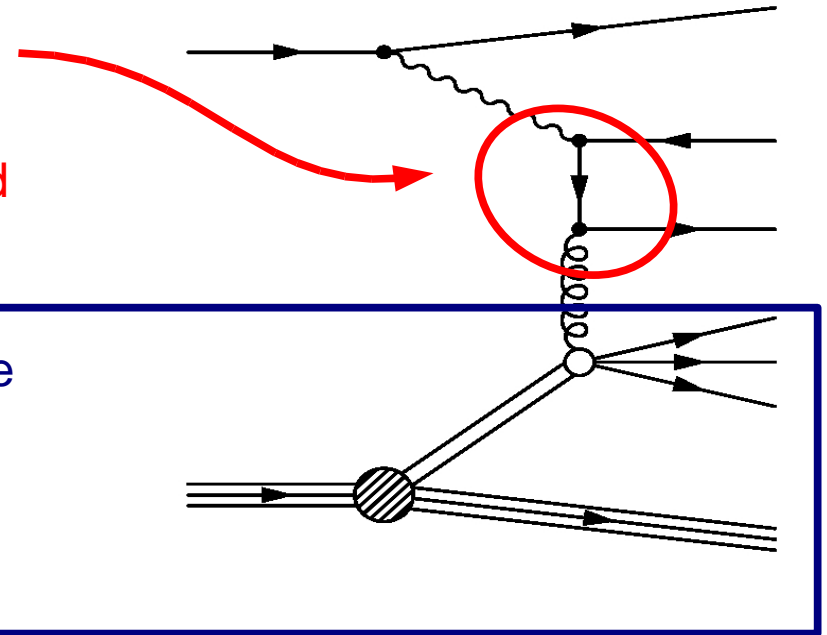
Vrije Universiteit Brussel

Introduction



hard scattering
 QCD-matrix element
 perturbatively calculated
 process-dependent

universal diffractive
 parton densities
 identical for all
 DIS processes



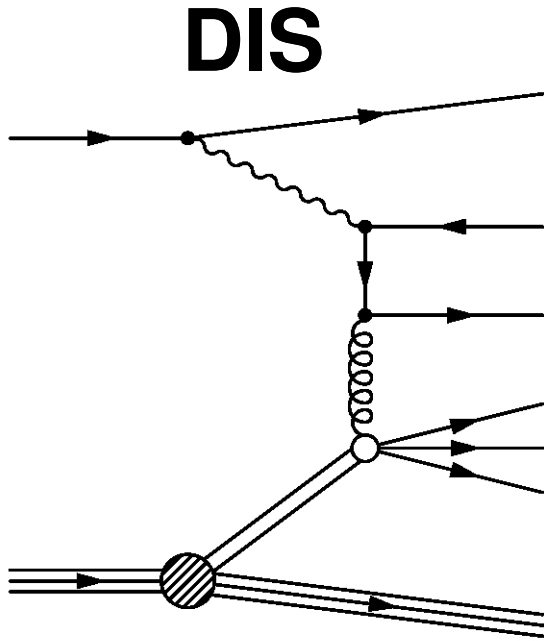
Measurement: F_2^D
 quark measured
 directly

Measurement: $\frac{d\sigma(\text{dijet}/\text{charm})}{dz_{IP}}$
 gluon measured
 directly

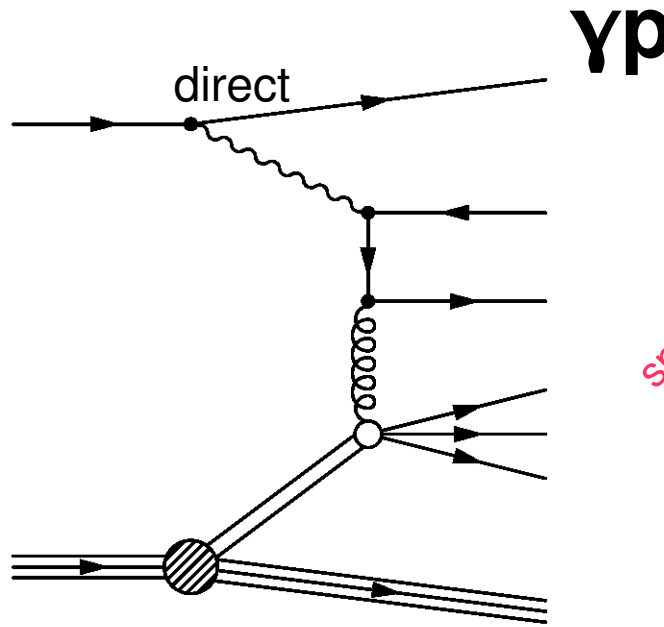
- Factorization valid for DIS, fails in p-p (salvagable?)
- Test factorization: measure PDF's with one process, compare to others
- Improve precision by combining data sets

Factorization

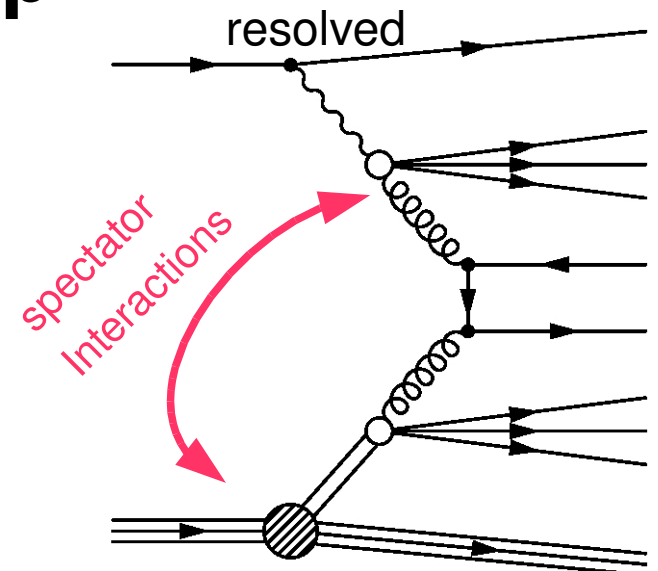
$$\sigma_{diffraction} = \int pdf \cdot \sigma_{parton}$$



expected to hold
(proof by Collins)



holds maybe

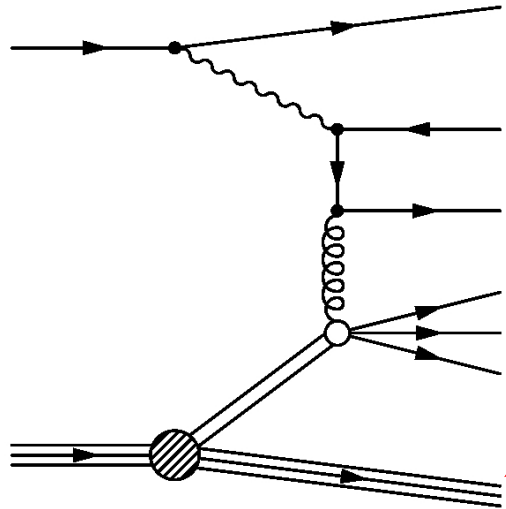


modification essential
to account for
additional hadronic
interactions
(similar to p-p)

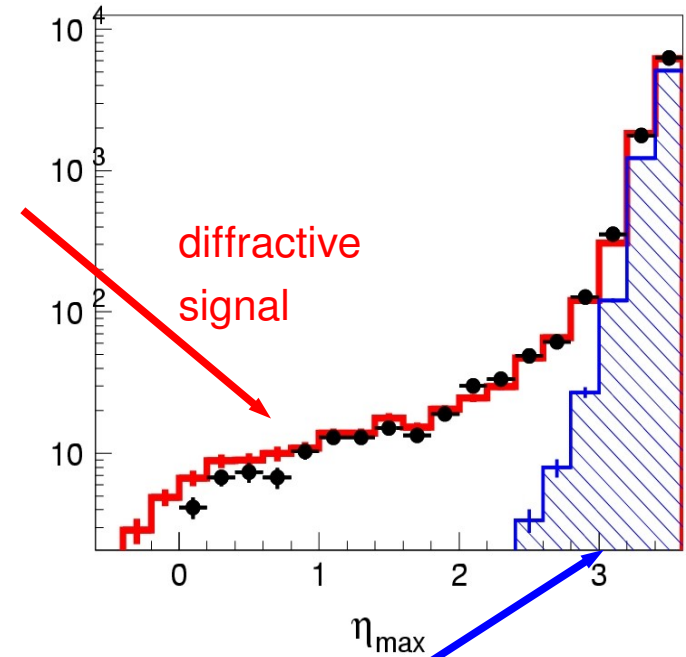
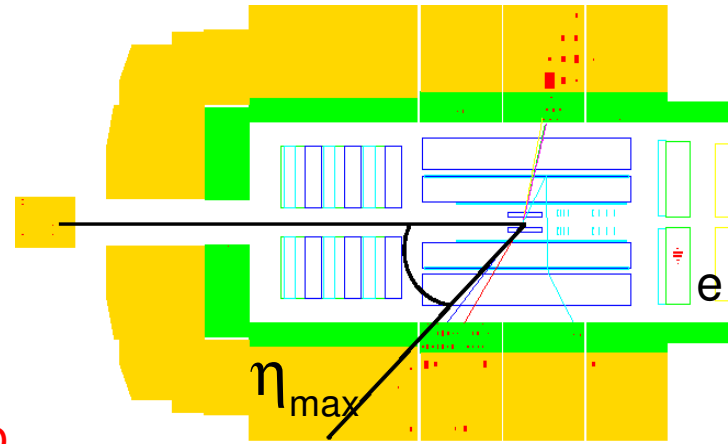
Diffractive Event Selection

(rapidity gap)

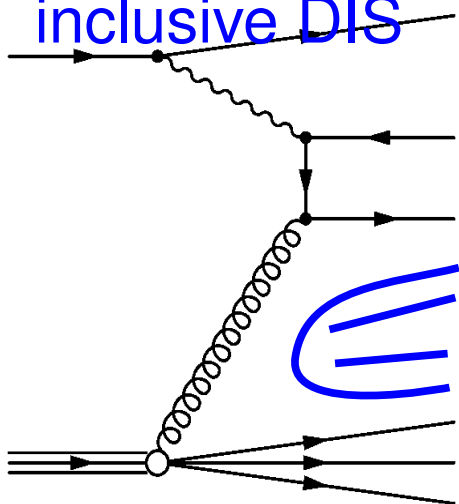
Diffraction



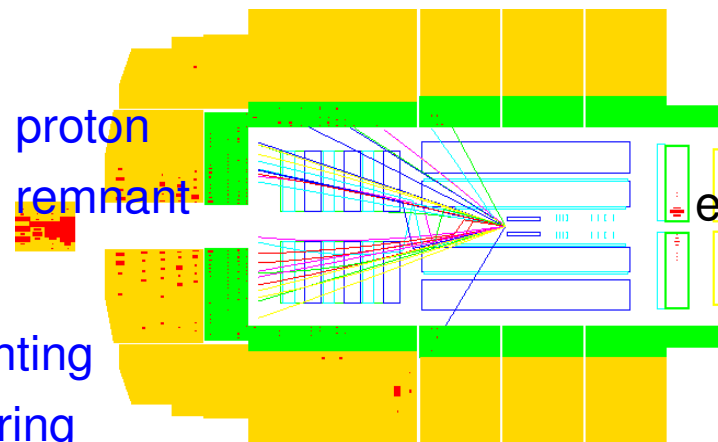
no
color-string



inclusive DIS



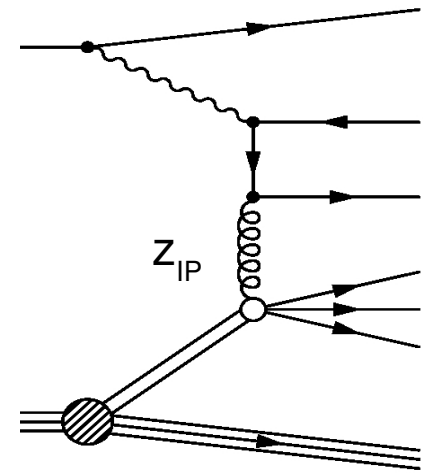
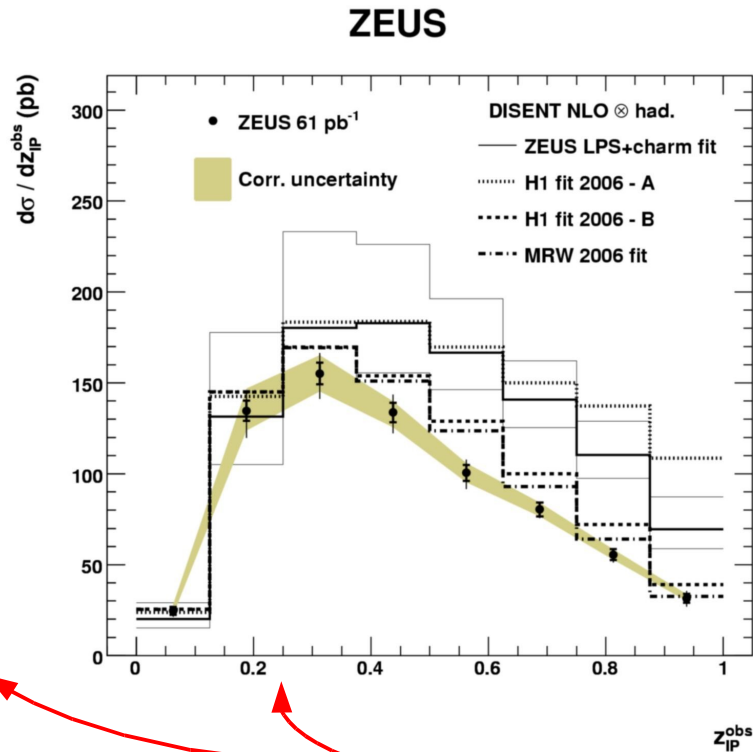
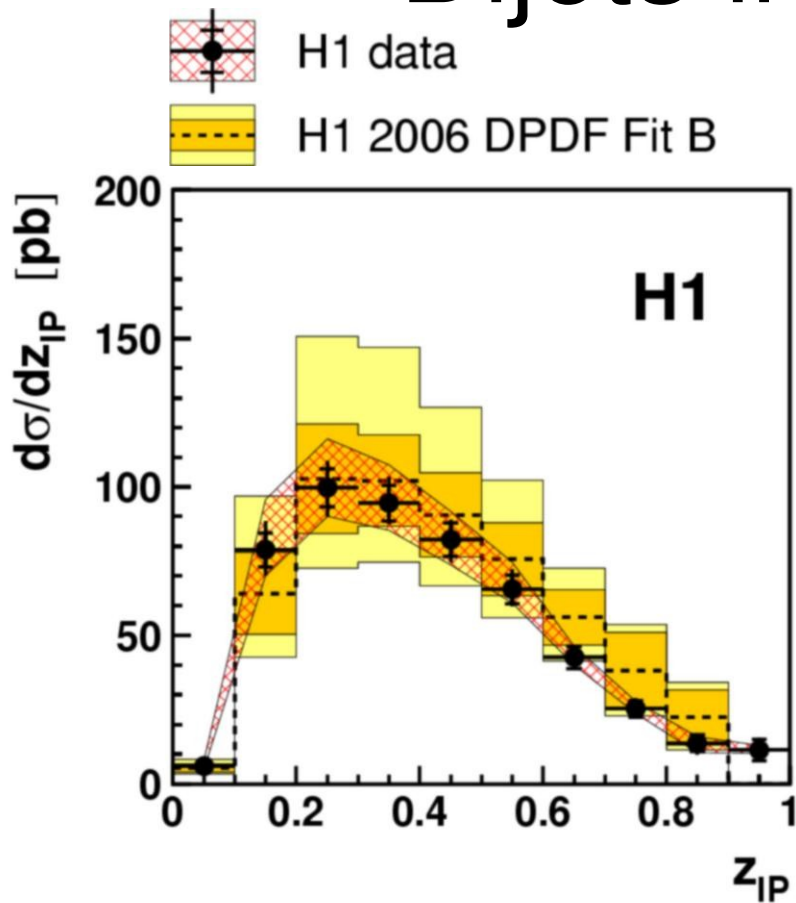
fragmenting
color-string



proton
remnant

non diffractive
background

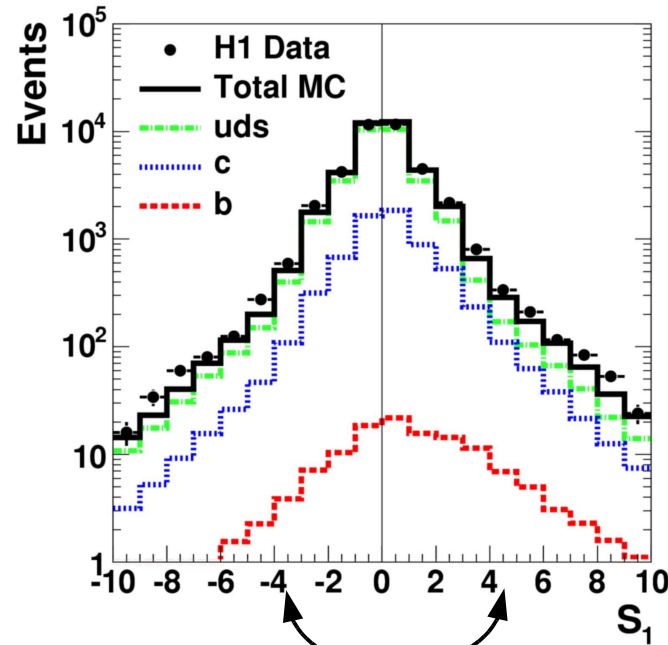
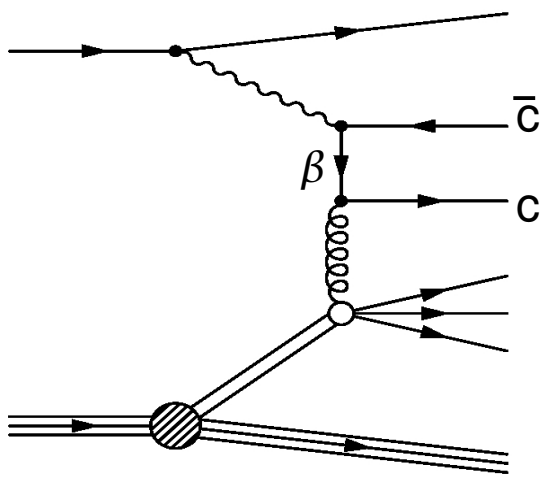
Dijets in Diffractive DIS



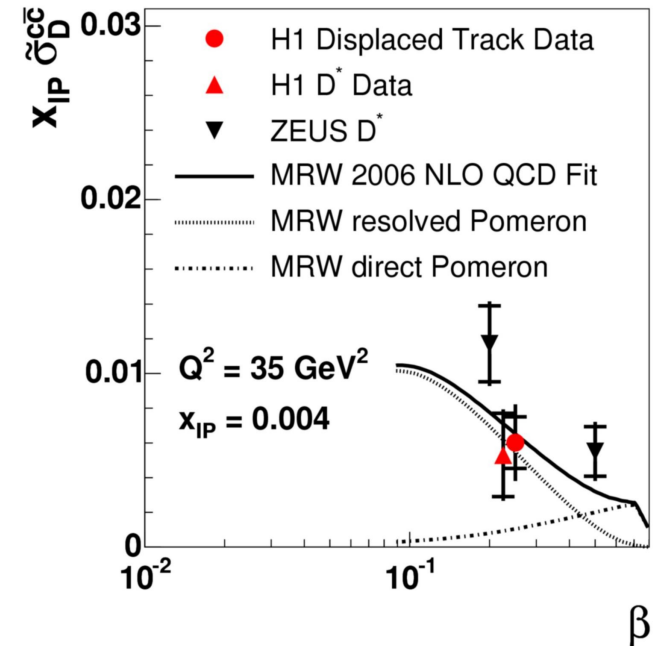
To be published soon

- Good agreement at low z_{IP} (best agreement with H1 Fit 2006 B): Factorisation holds
- Noticeable differences at high z_{IP} : large uncertainties in gluon distribution from inclusive diffraction

Open Charm: Displaced Vertex



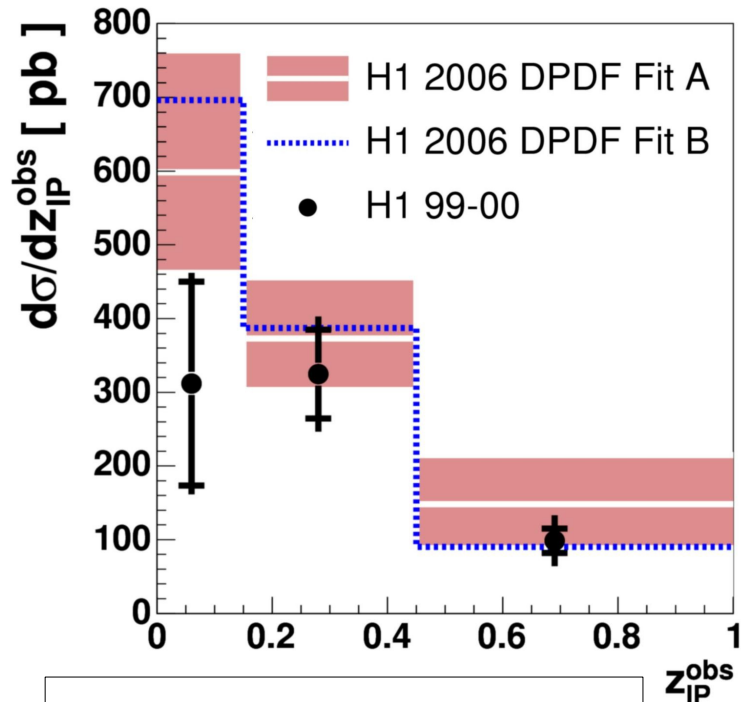
Symmetric for uds
Asymmetric for c and b



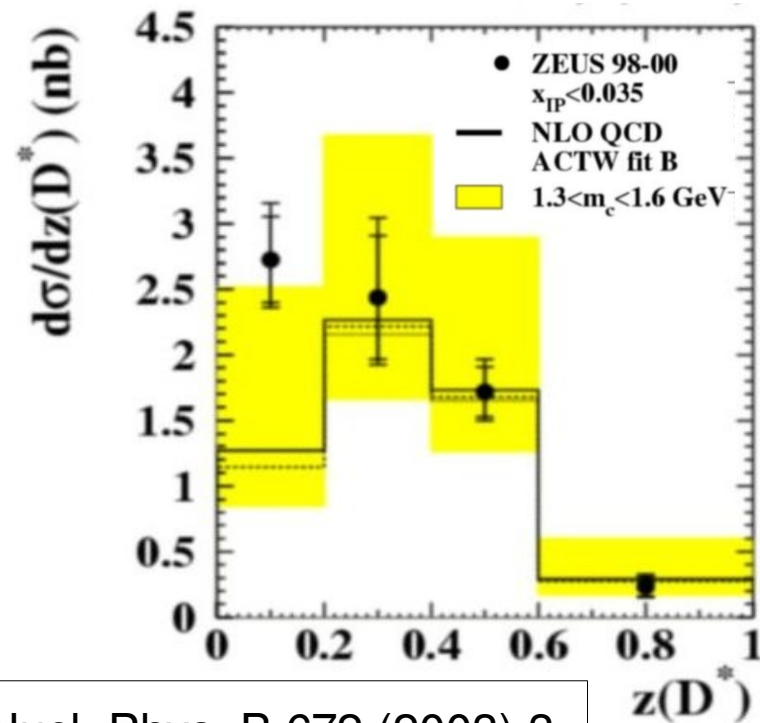
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- Overall good agreement with prediction: Factorisation holds
- Uncertainties mostly uncorrelated to D^* analysis

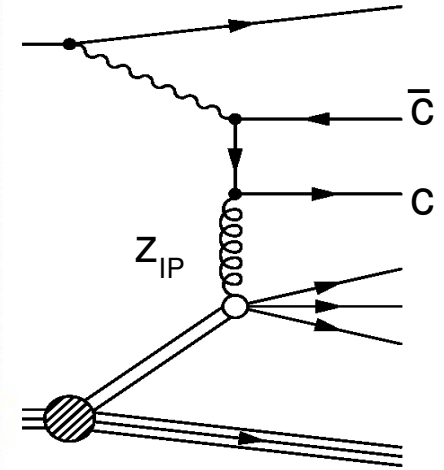
D* in diffractive DIS



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Nucl. Phys. B 672 (2003) 3

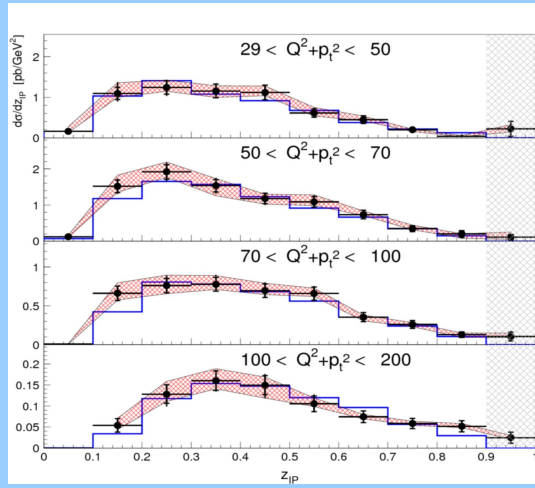


Overall reasonable agreement: Factorisation holds

- All channels good agreement with prediction
 - All channels good agreement between experiments
- => Factorisation holds in DIS**

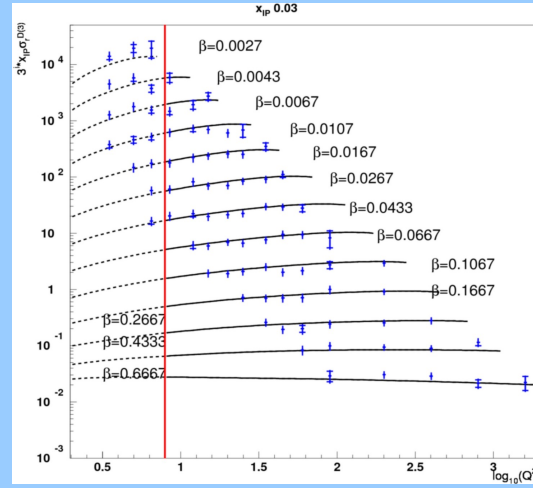
Extraction of Parton-Densities

Data (dijets)
(new H1 results)



Data (F_2^D)

(published H1 results)



- fixed parameters
- $\alpha_s(M_Z)=0.118$
 - Reggeon-structure

- free parameters
- Parton-densities (6)
 - $Ax^B(1-x)^C$
 - Pomeron-Flux (1)
 - Reggeon-norm. (1)

χ^2

DGLAP-evolution
 χ^2 -Minimization

New
Parton-Densities

NLO prediction

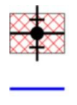
compute F_2^D in NLO

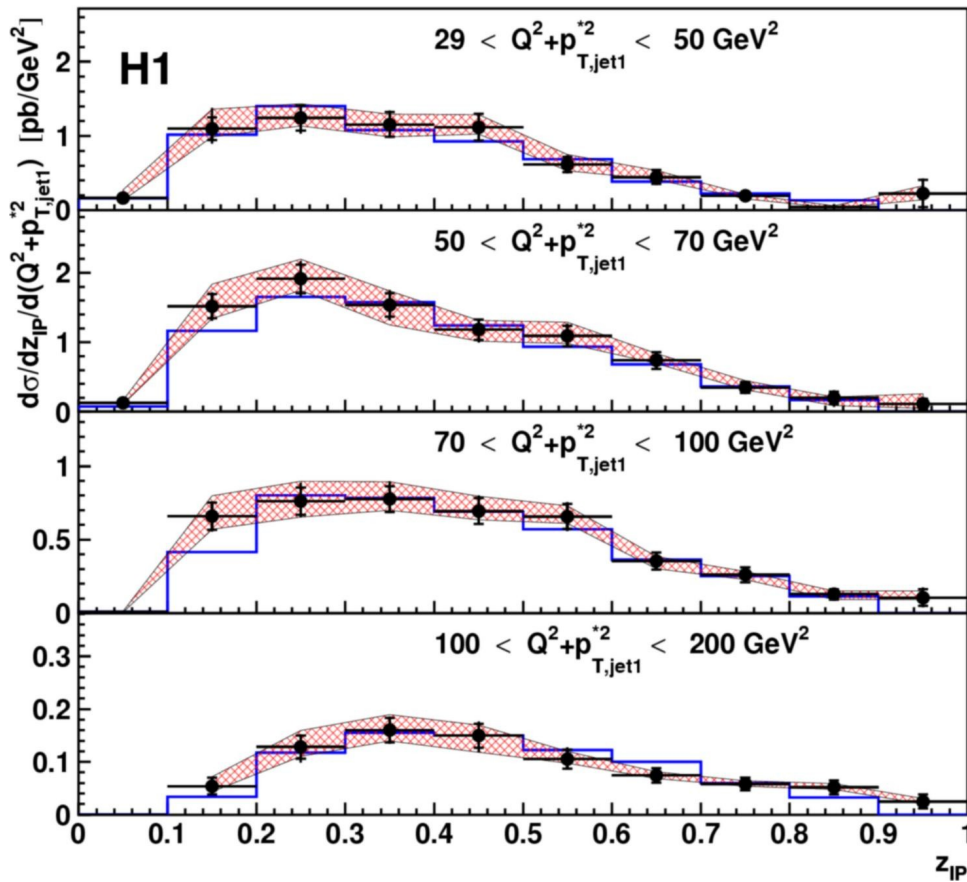
NLO dijet prediction
(parameterized like ZEUS)

DGLAP evolved
parton-densities

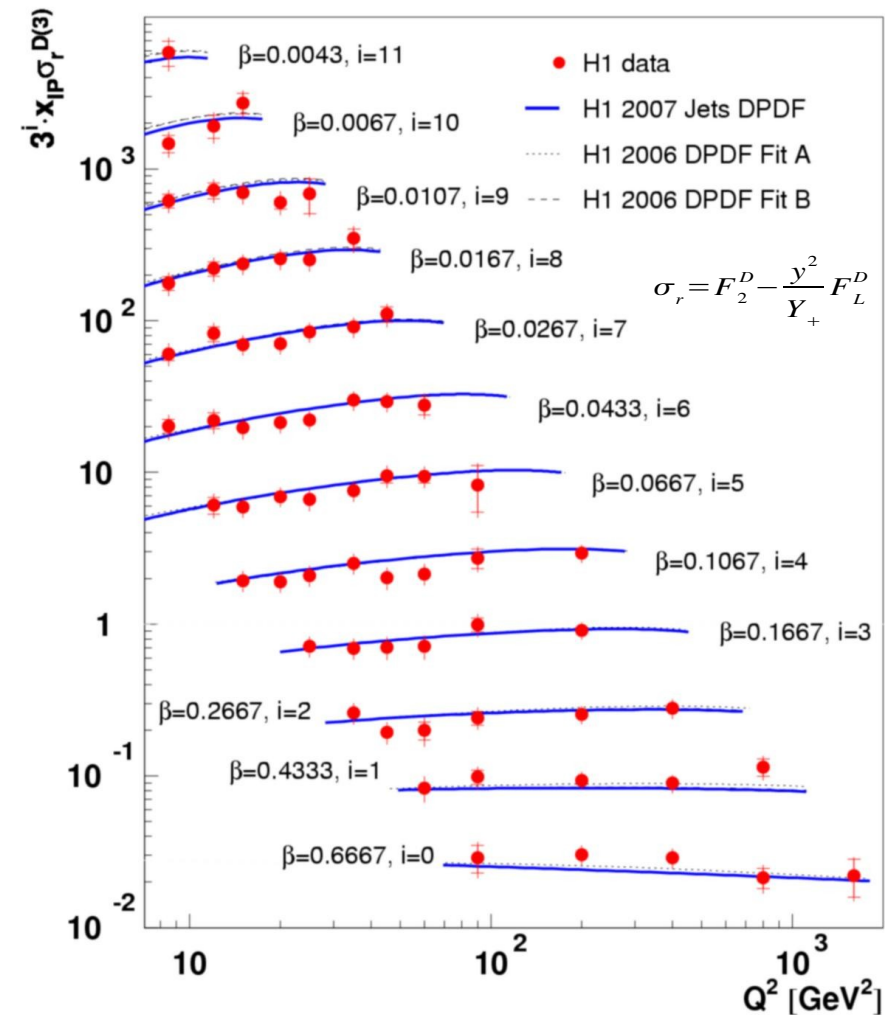
ozer, EPS 2007

Combined Fit (Incl. + Dijets)


 H1 data
 H1 2007 Jets DPDF



Fit describes dijets well



Little difference in description of inclusive data

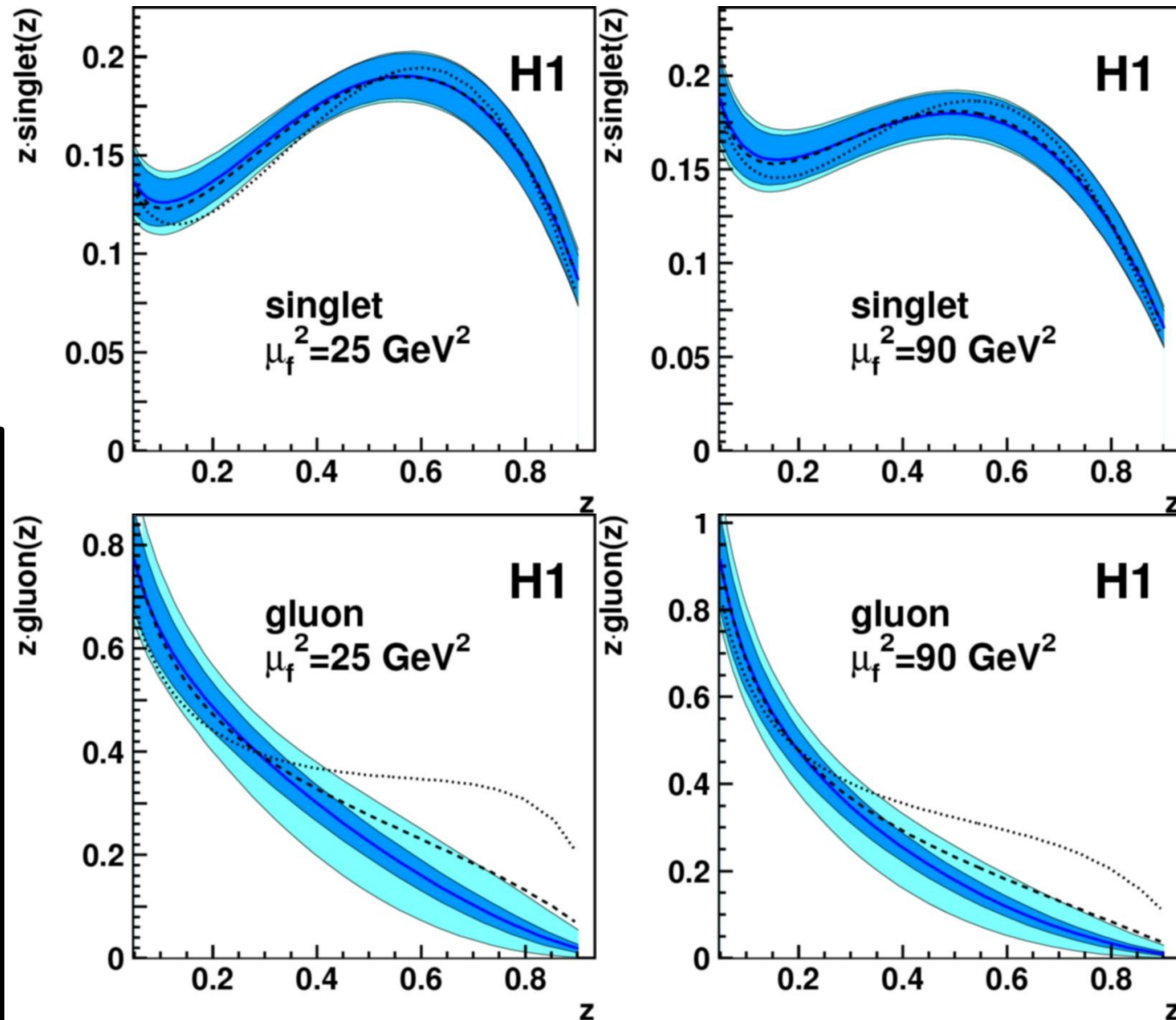
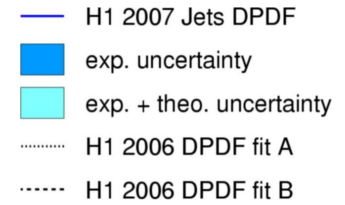
Simultaneous description of Dijets and Inclusive results: Factorization

Improved parton densities

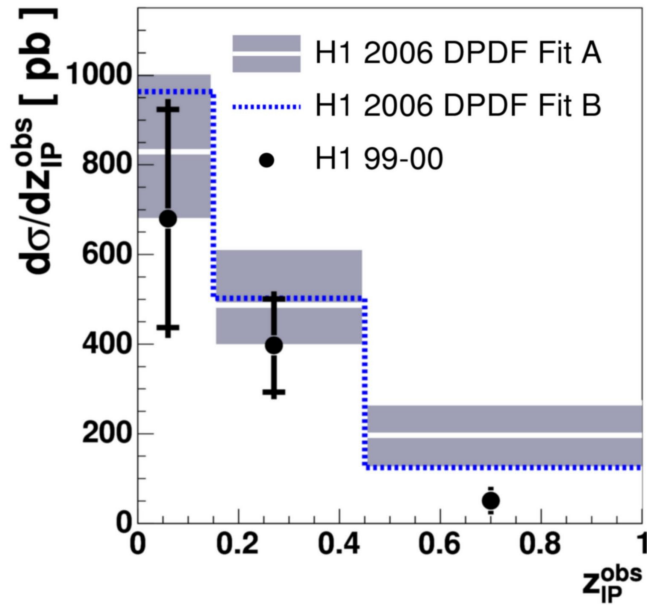
- $\chi^2/\text{ndf}=196/217$
- χ^2/ndf (dijets)=27/36
- χ^2/ndf (F_2^D)=169/190

- $\chi^2(\text{Fit A})=158$
- $\chi^2(\text{Fit B})=164$

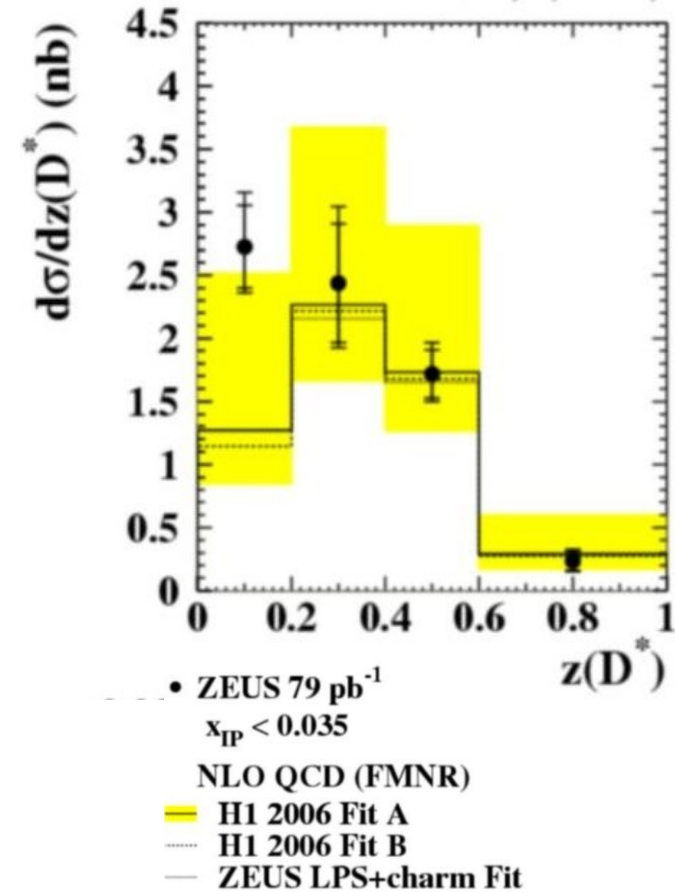
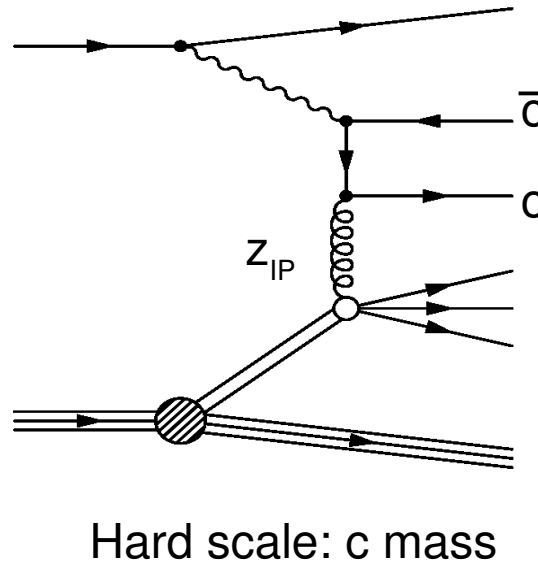
- Good agreement for singlet and low z_{IP} gluon
- Improved determination of high z_{IP} gluon
- Soon to be published



Diffractive D^* in γp



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Accepted by Eur. Phys. J. C

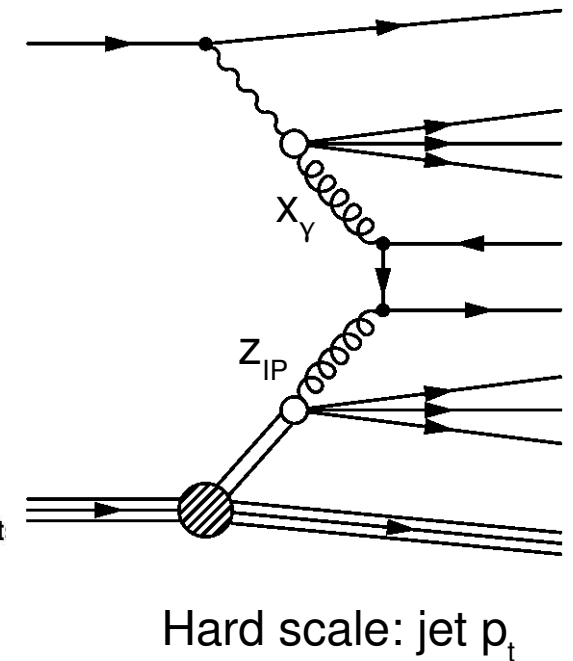
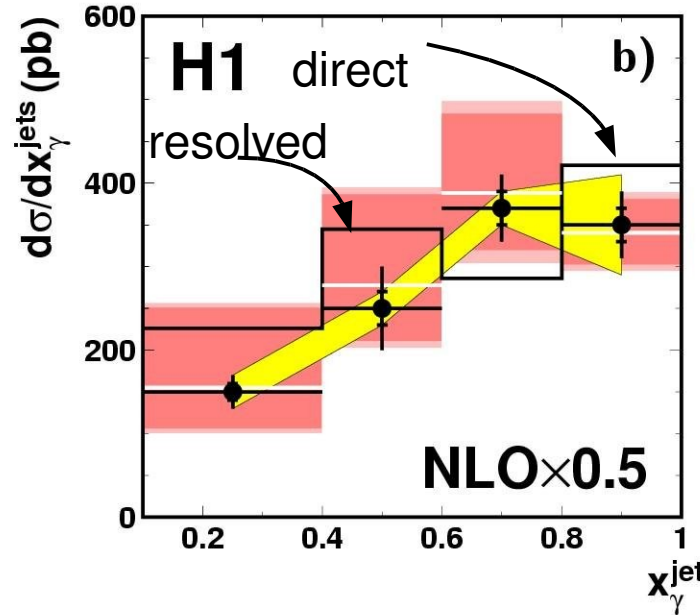
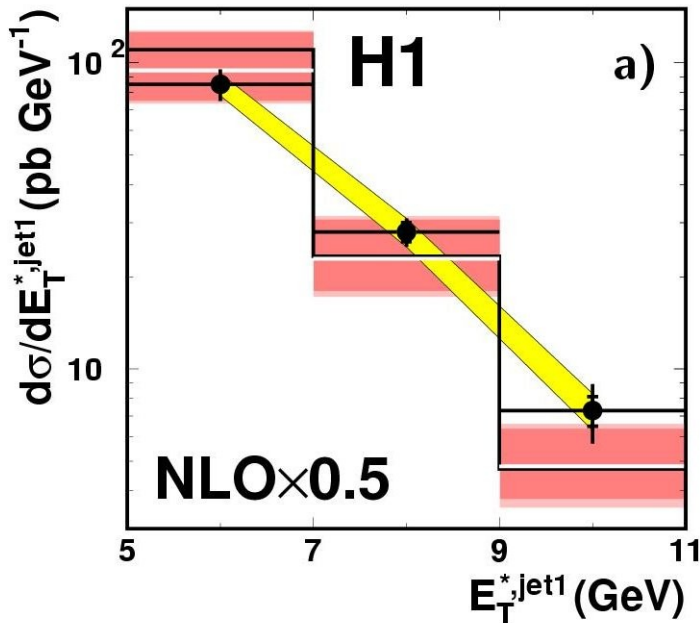
- Reasonable agreement
- Dominated by direct contribution

Dijets in γp

H1 Diffractive Dijet Photoproduction

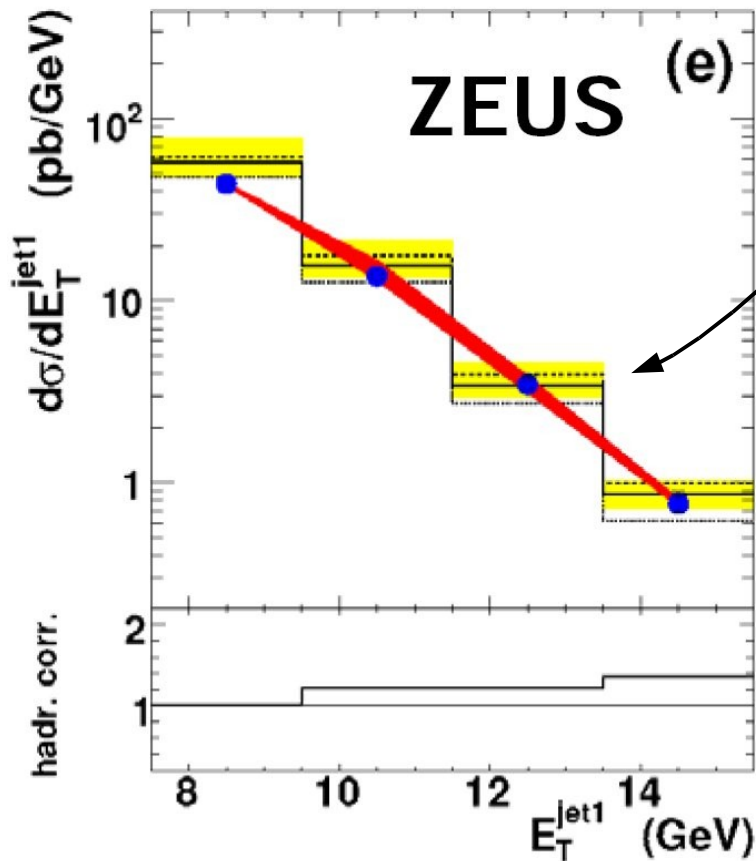
\bullet H1 Data
 \square correlated uncertainty
 H1 2006 Fit B DPDF
 FR NLO $\times (1 + \delta_{\text{had}}) \times 0.5$
 FR NLO $\times 0.5$

Frixiene NLO code
 + hadronization correction
x0.5



- Large violation of naive factorization observed
- Factorization breaking occurs in direct and resolved processes

Dijets in γp

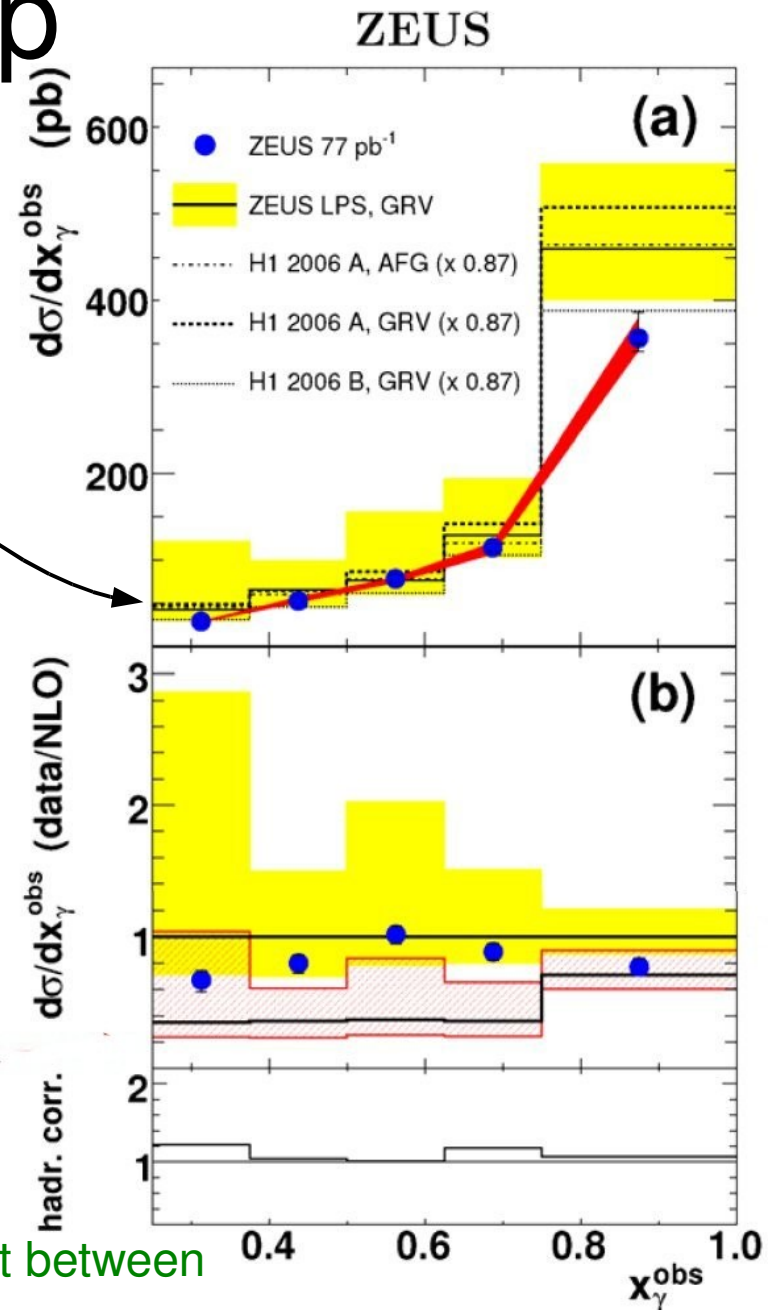


Klasen & Kramer
NLO code

Different E_T ranges
Different reference
calculations

- Reasonable agreement with NLO (80% suppression, but still compatible)
- No preferential suppression of resolved contribution

Agreement between
experiments



Summary:

- DIS:

- factorisation holds



- jet data improves sensitivity to diffractive gluon density



- Photoproduction

- naive factorisation not applicable?



- resolved vs direct contributions, possible suppression unclear

