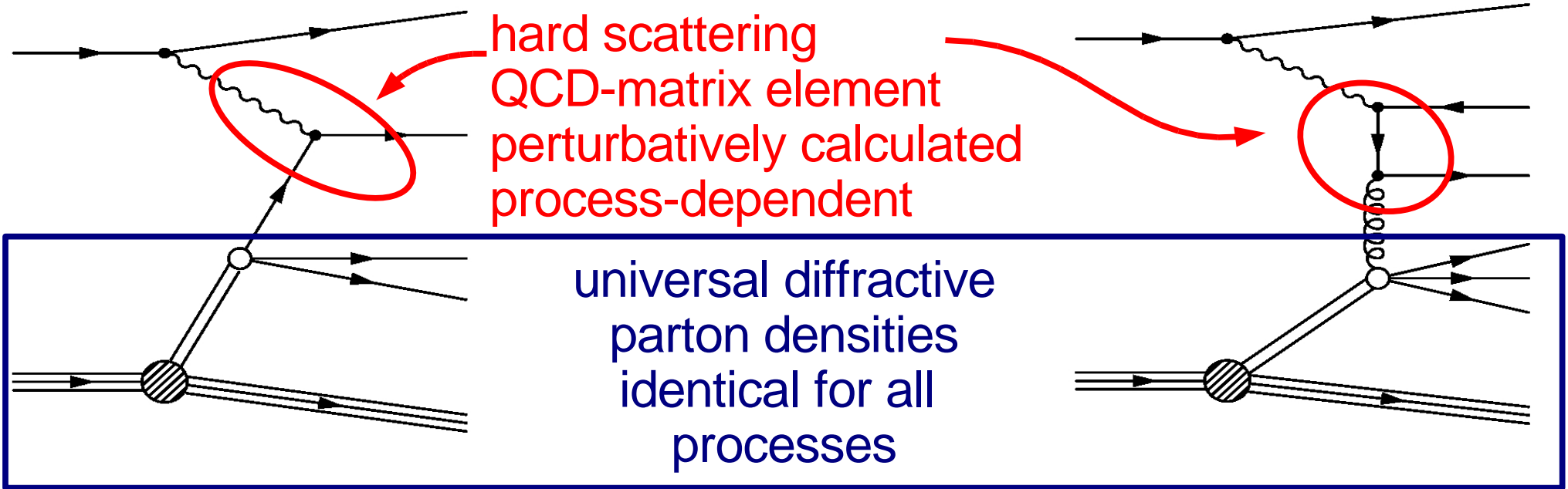


Diffractive Charm and Dijet Production at H1



Matthias Mozer
Physikalisches Institut
Universität Heidelberg

Introduction



Measurement: F_2^D
quark dominates

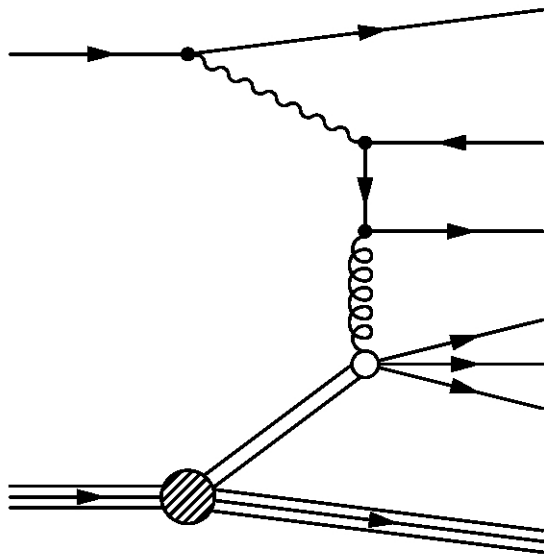
Measurement: $\frac{d\sigma(\text{dijet}/\text{charm})}{dz_{IP}}$
gluon dominates

- Test factorization: measure PDF's with one process, compare to others
- Improve precision by combining data sets

Factorization

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

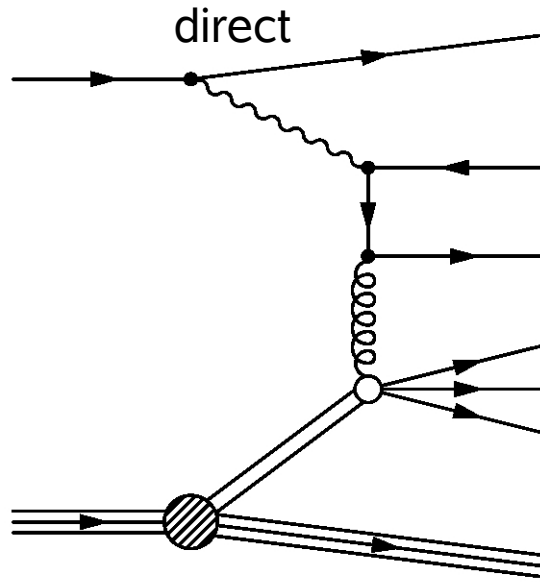
DIS



expected to hold
(proof by collins)

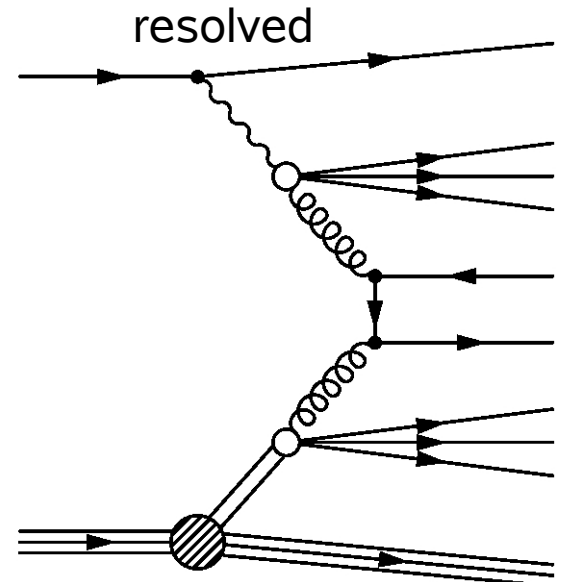
recent results for
dijet and charm
production

γp



holds maybe

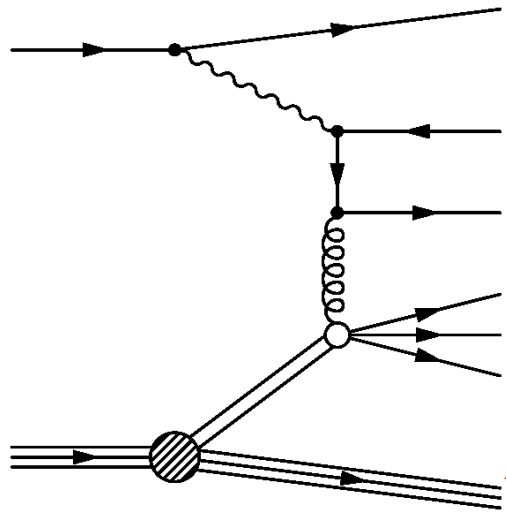
recent results for charm
production, not so recent for dijets



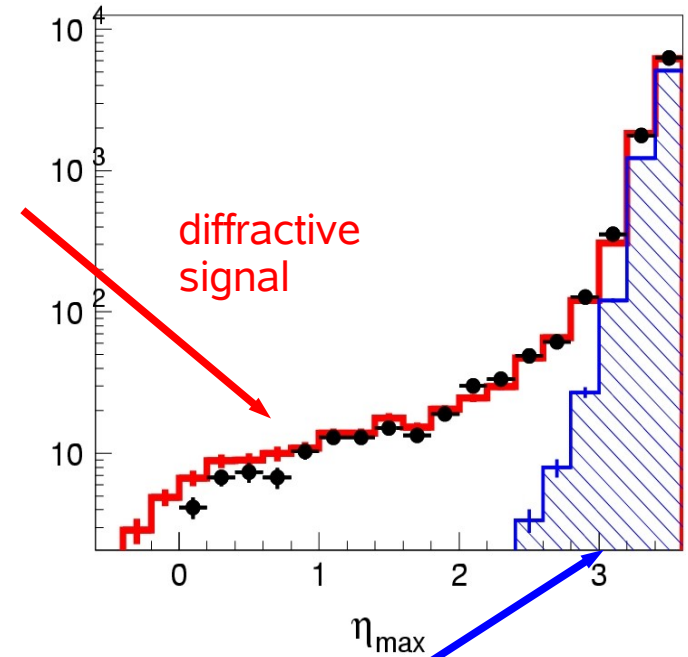
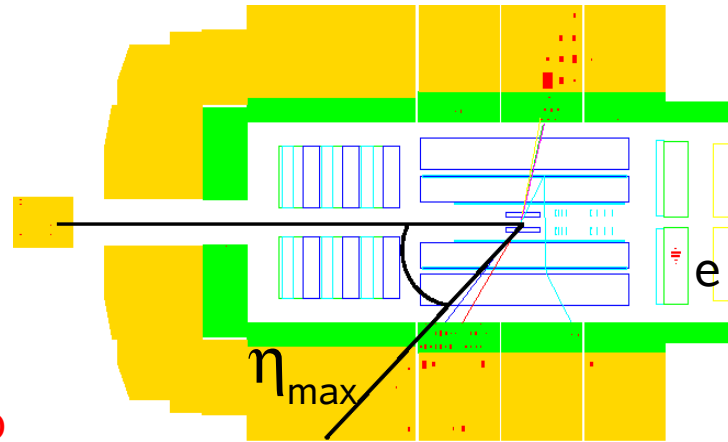
modification essential
to account for
additional hadronic
interactions

Diffractive Event Selection (rapidity gap)

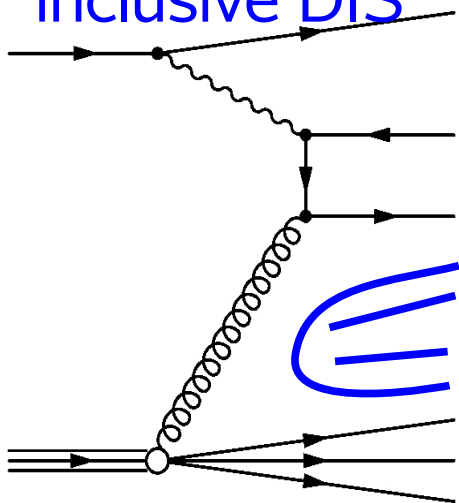
Diffraction



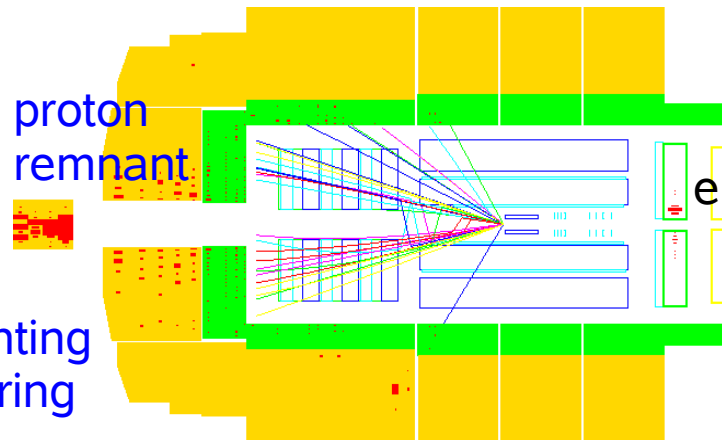
no color-string



inclusive DIS

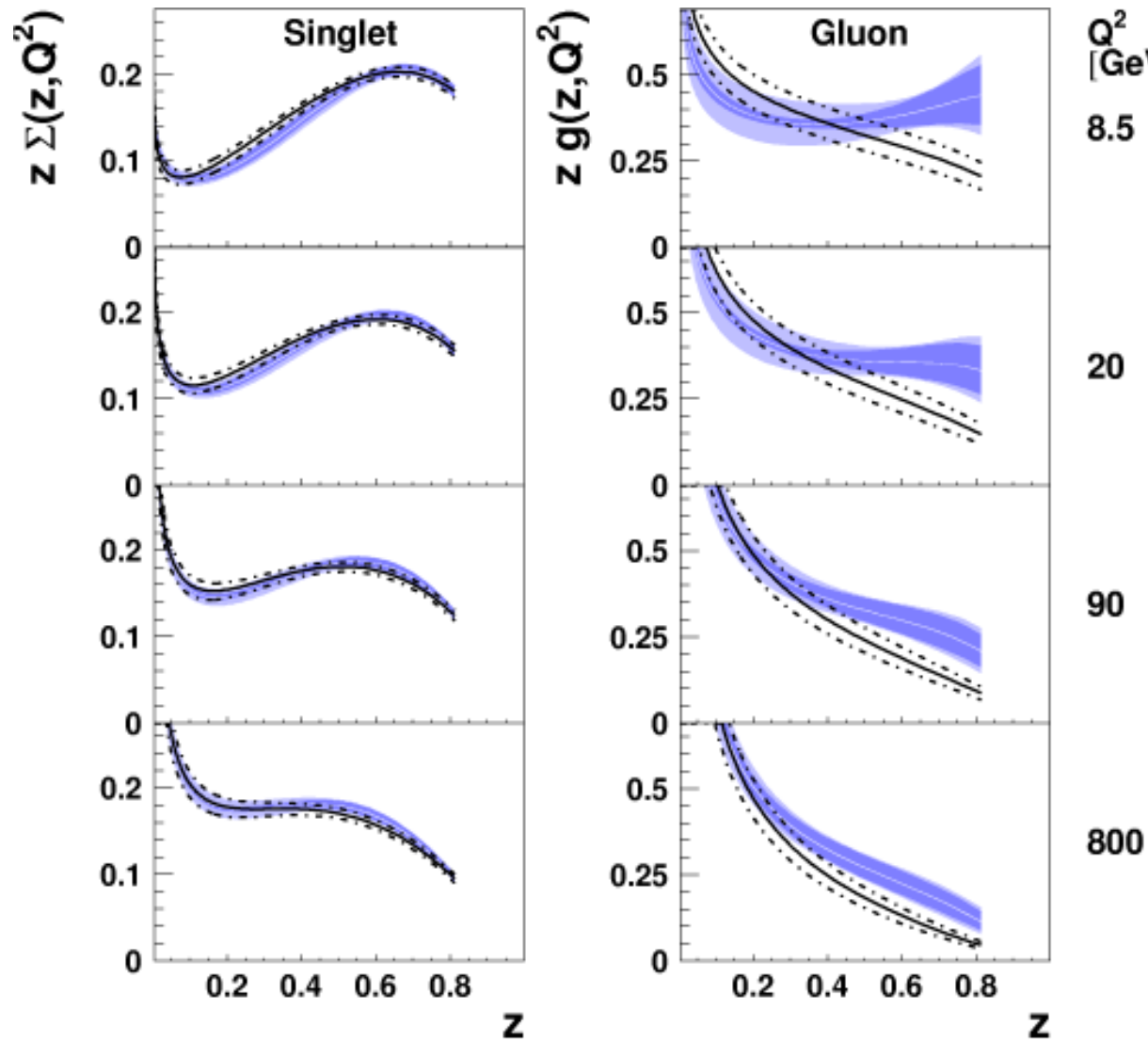


fragmenting color-string



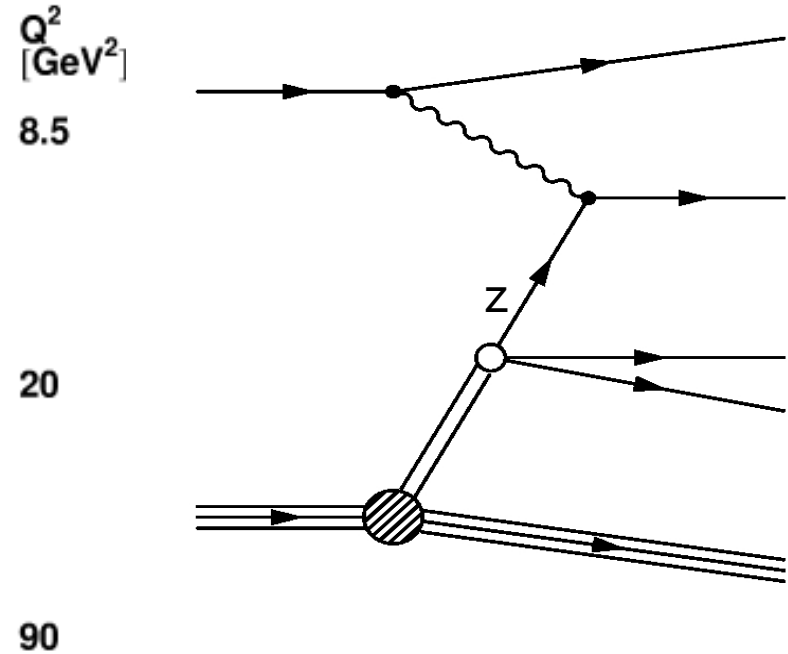
non diffractive background

Diffractive Parton Densities



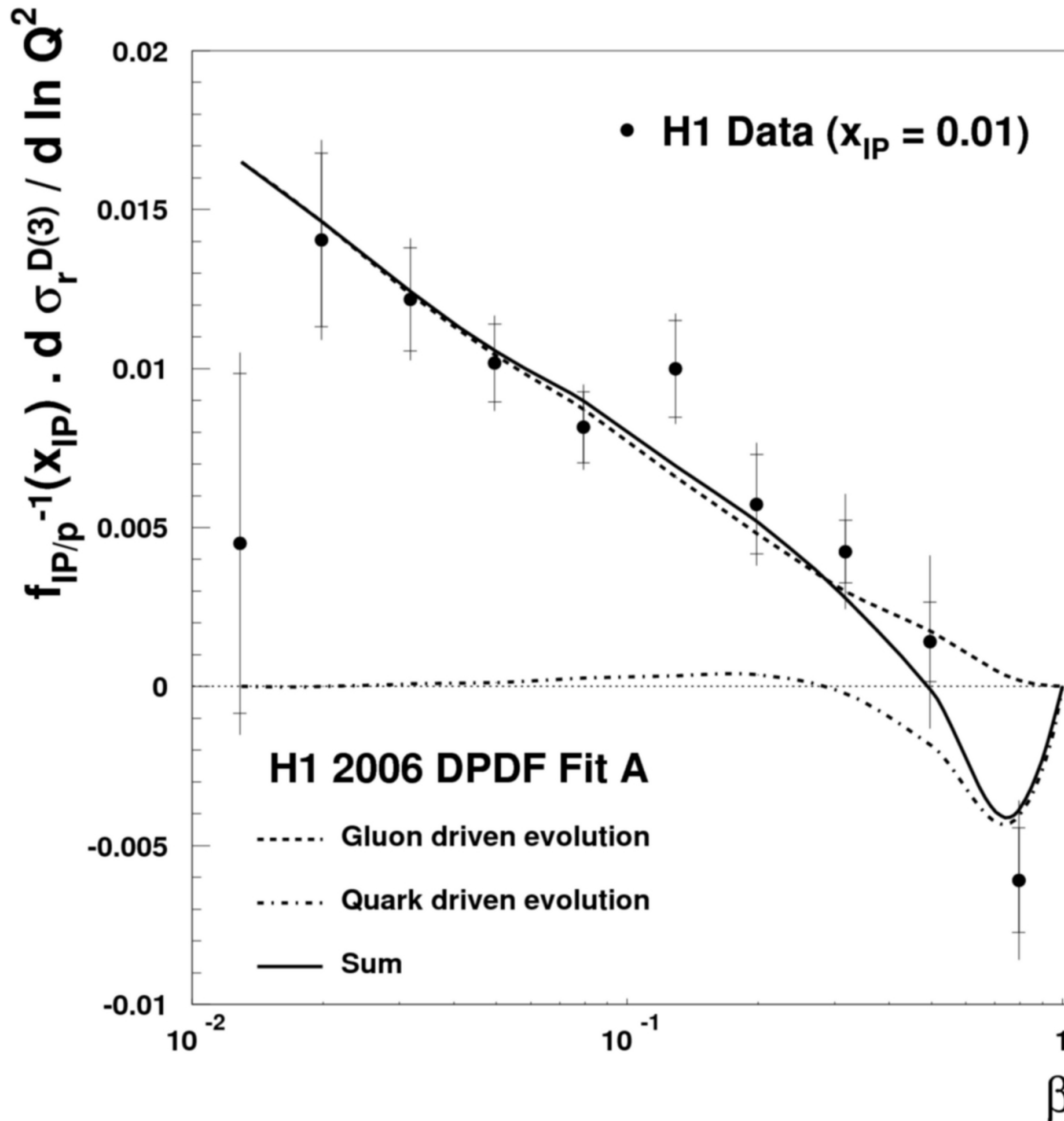
H1 2006 DPDF Fit A
 (exp. error)
 (exp.+theor. error)

H1 2006 DPDF Fit B
 (exp.+theor. error)



- H1 DPDF fit A/B extracted from inclusive diffractive scattering
- Quark density well constrained
- Gluon less well determined, especially at high z
- Large systematic uncertainties at high z

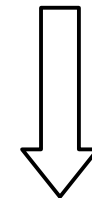
Scaling Violations



gluon density derived from scaling violations

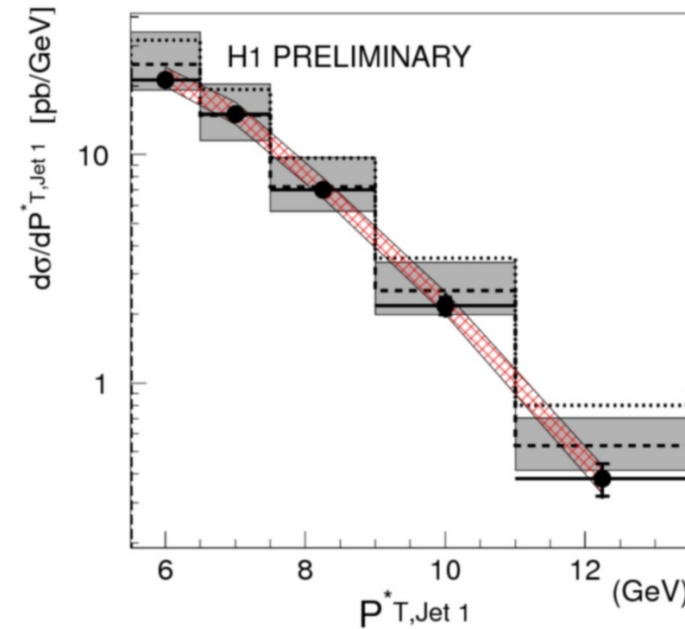
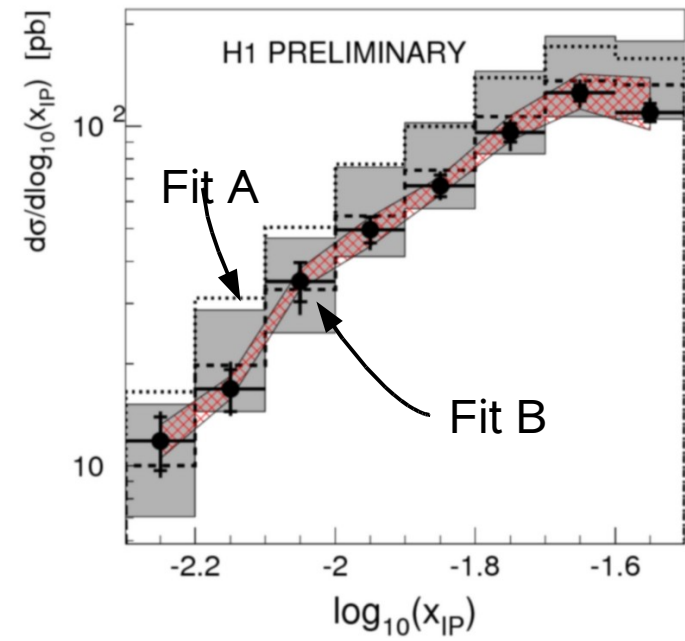
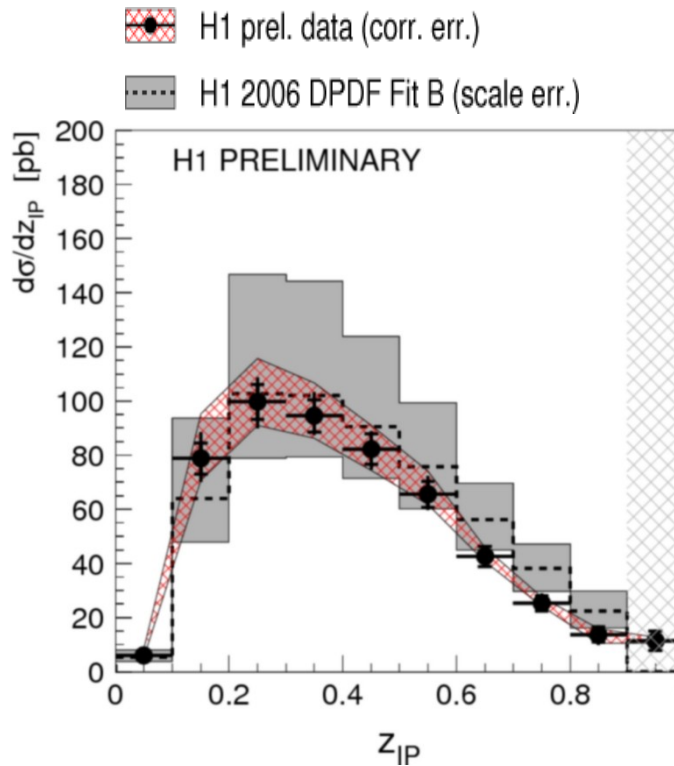
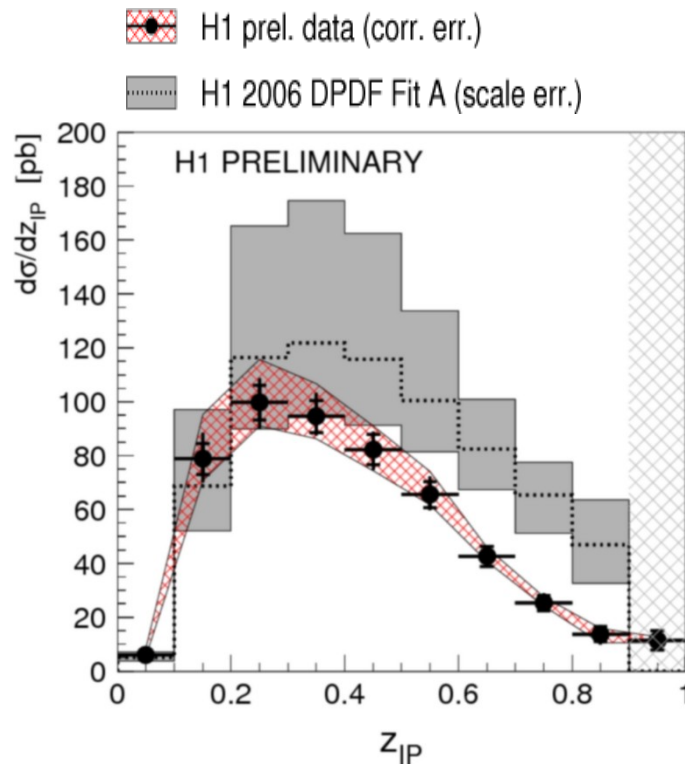


scaling violations at high z dominated by quark contribution



large uncertainties

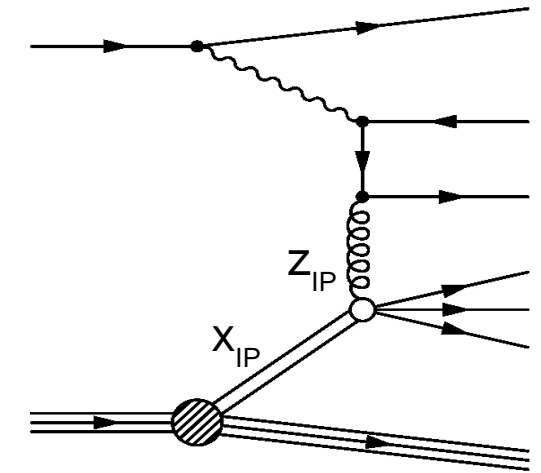
Dijets in Diffractive DIS



Selection:

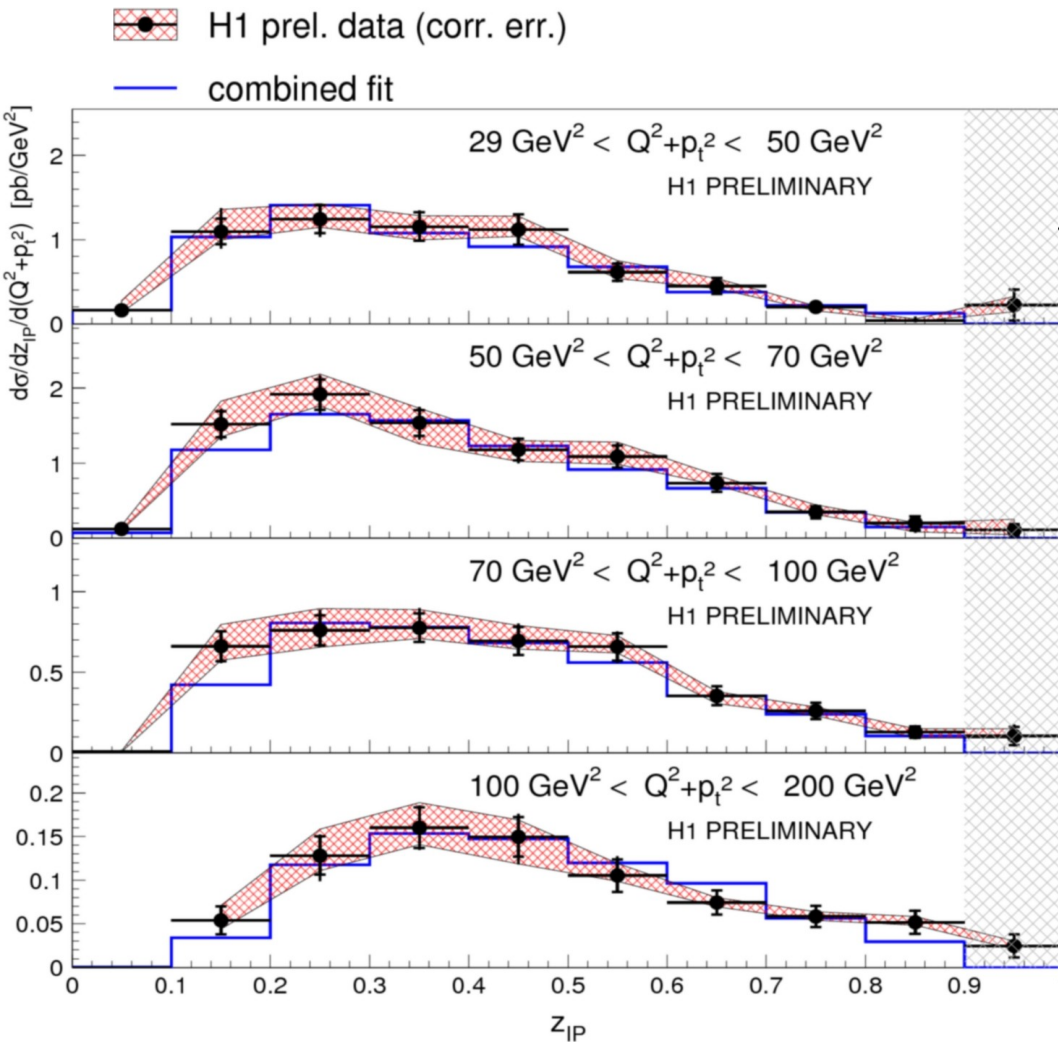
- incl k_t in γp cms
- $4 < Q^2 < 80 \text{ GeV}^2$
- $0.1 < y < 0.7$
- $p_{t1} > 5.5, p_{t2} > 4.5 \text{ GeV}$

- nlojet++ (Z. Nagy)
- DPDFs H1 2006 Fit A&B
- $\mu^2 = Q^2 + p_t^2$

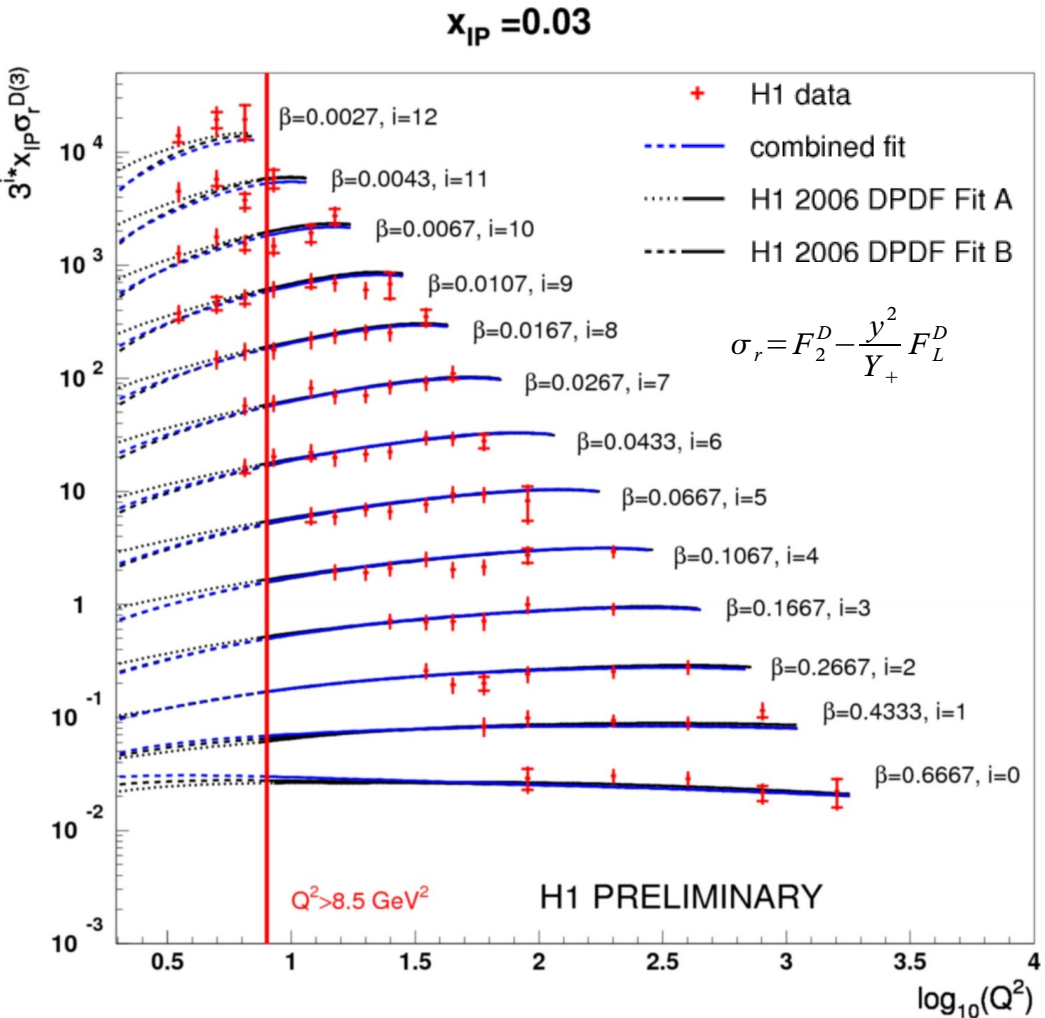


- Problematic at high z_{IP}
- Fit B better than Fit A

Combined Fit (Incl. + Dijets)



Fit describes dijets well



Little difference in description of inclusive data

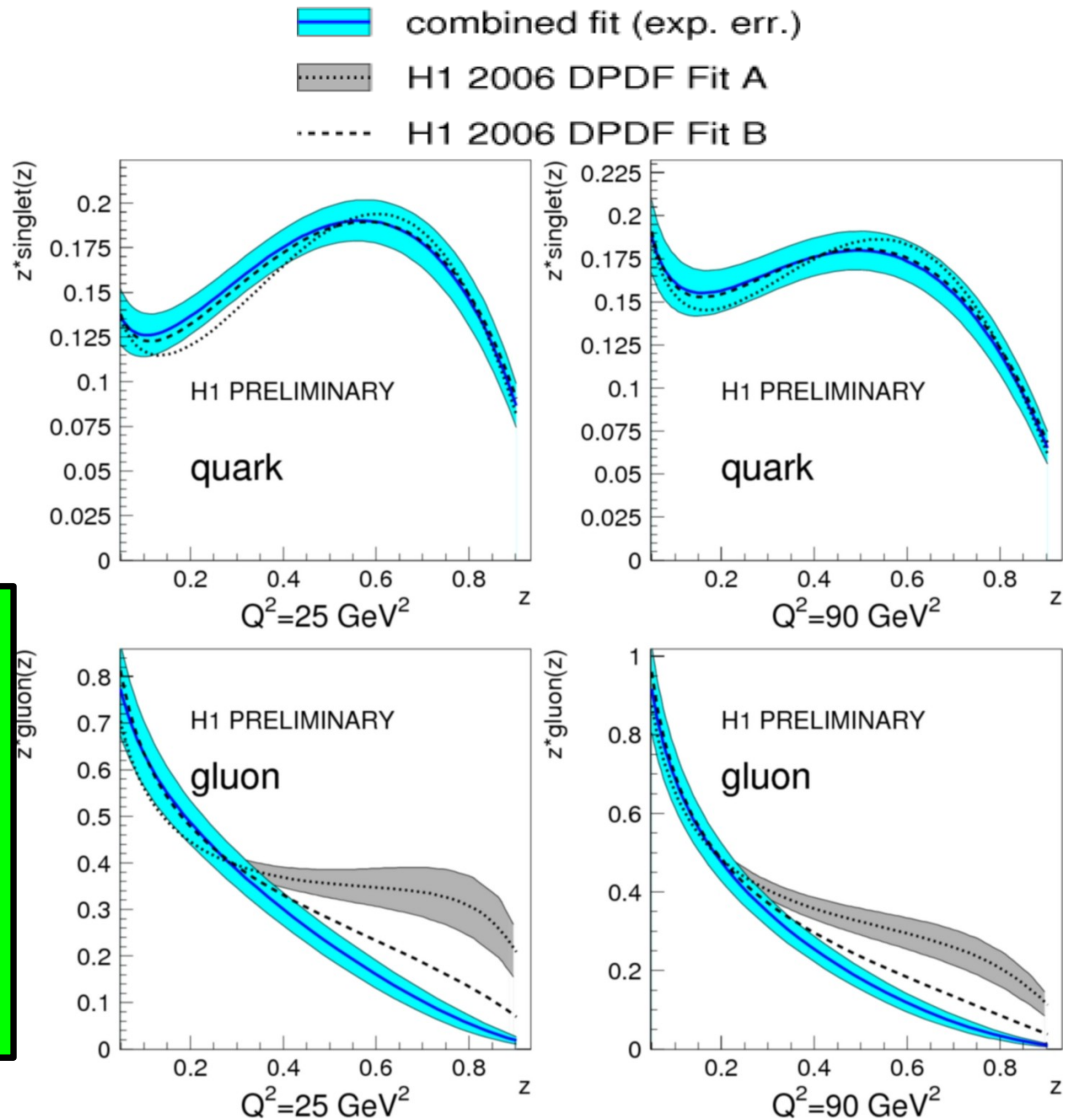
Simultaneous description of Dijets and Inclusive results: Factorization

Improved parton densities

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

• good agreement for singlet and low z_{IP} gluon

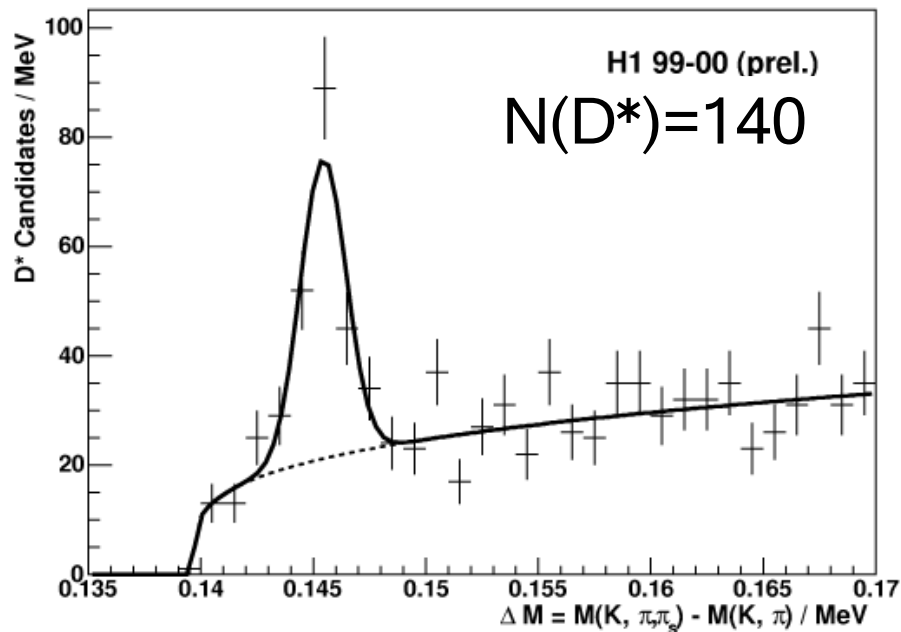
• improved measurement of high z_{IP} gluon



Diffraction Charm Production in DIS

D* selection

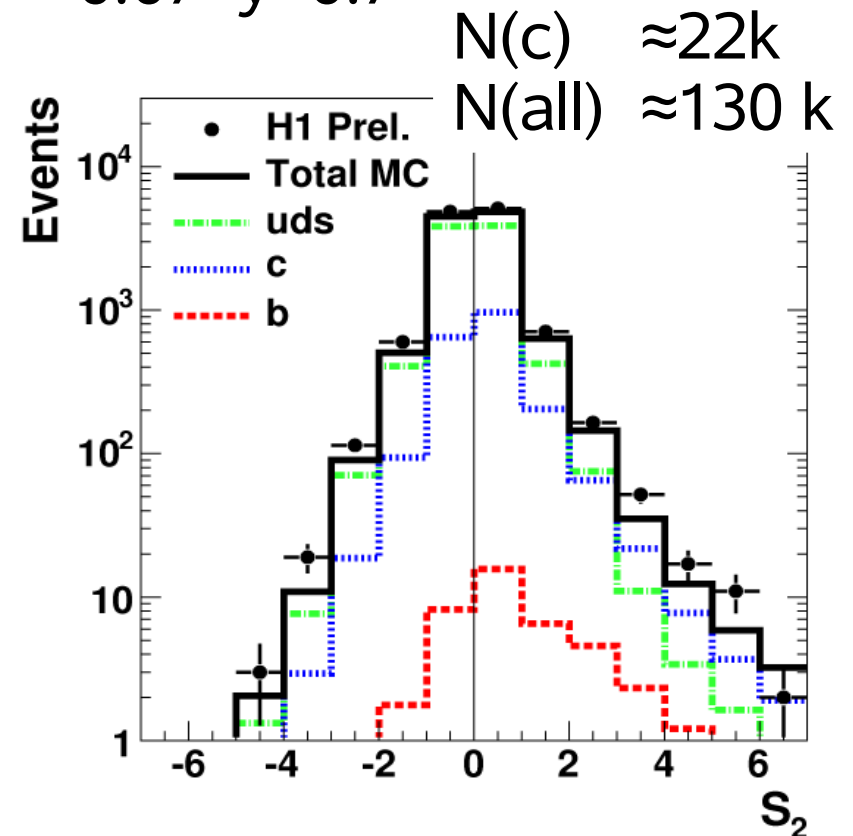
- $D^* \rightarrow K\pi\pi_s$
- $2 < Q^2 < 100 \text{ GeV}^2$
- $0.05 < y < 0.7$



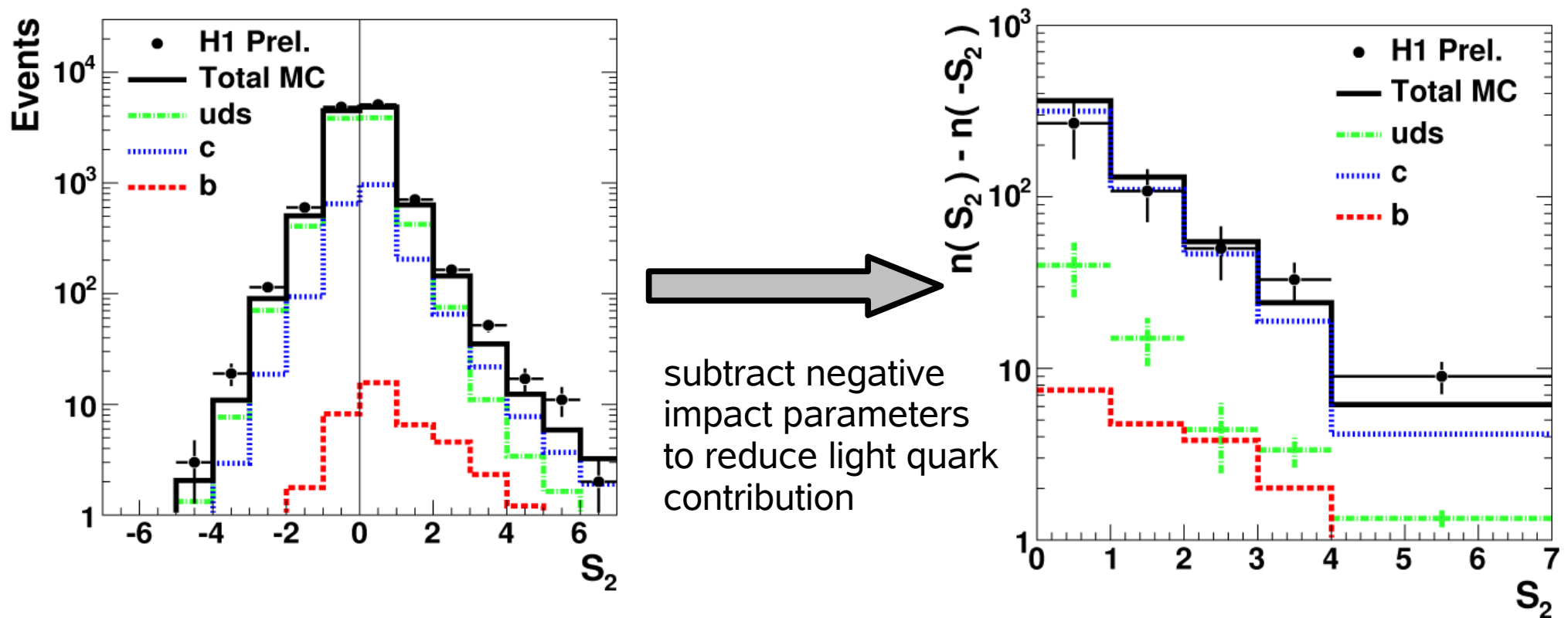
Charm is typically produced at lower z than dijets

Displaced track selection

- tracks displaced from primary vertex
- $15 < Q^2 < 100 \text{ GeV}^2$
- $0.07 < y < 0.7$



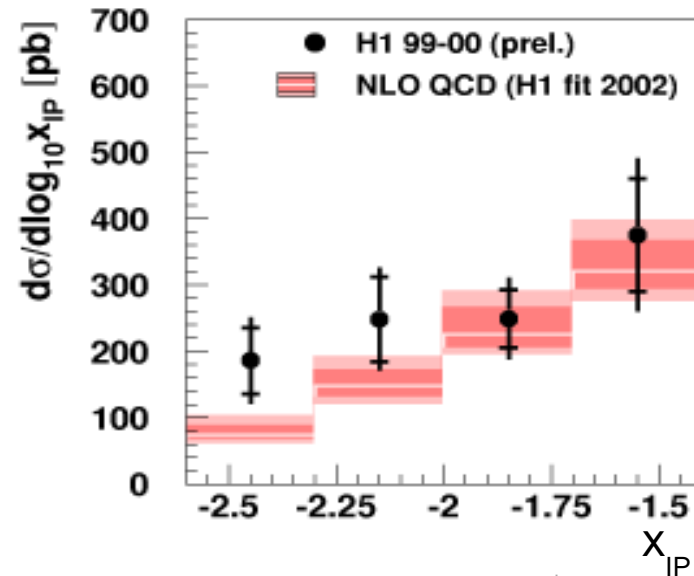
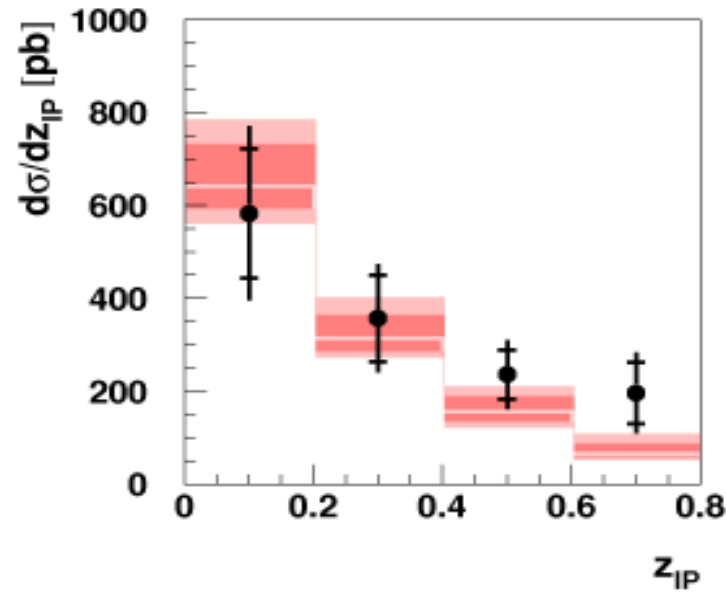
Displaced Vertex Analysis



- First analysis of this kind for diffraction
- beauty fraction fixed from Monte Carlo (increased systematic uncertainties)

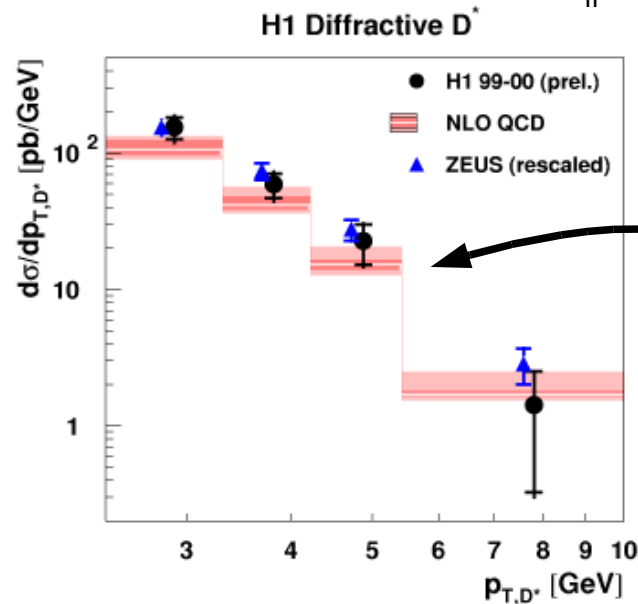
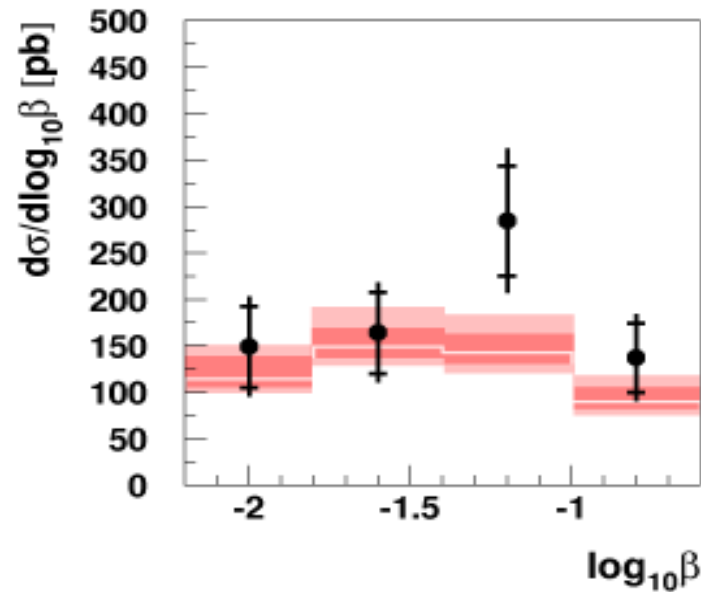
Diffractional D^* in DIS

H1 Diffractional D^*



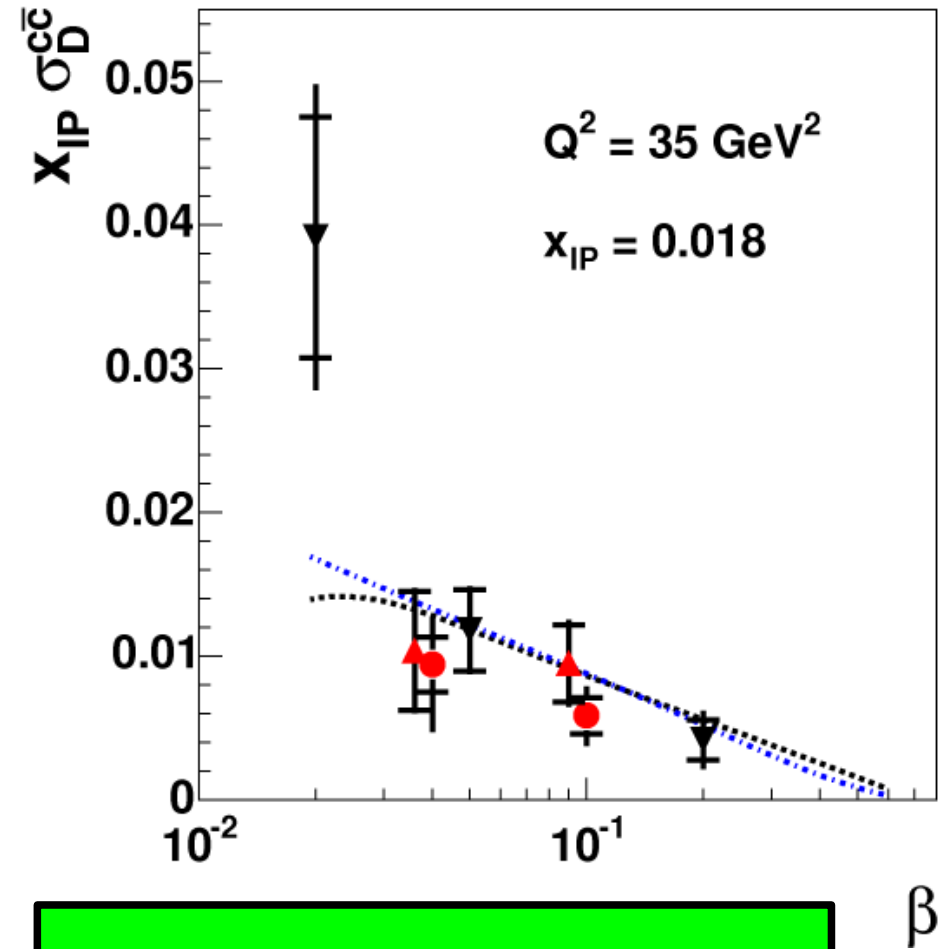
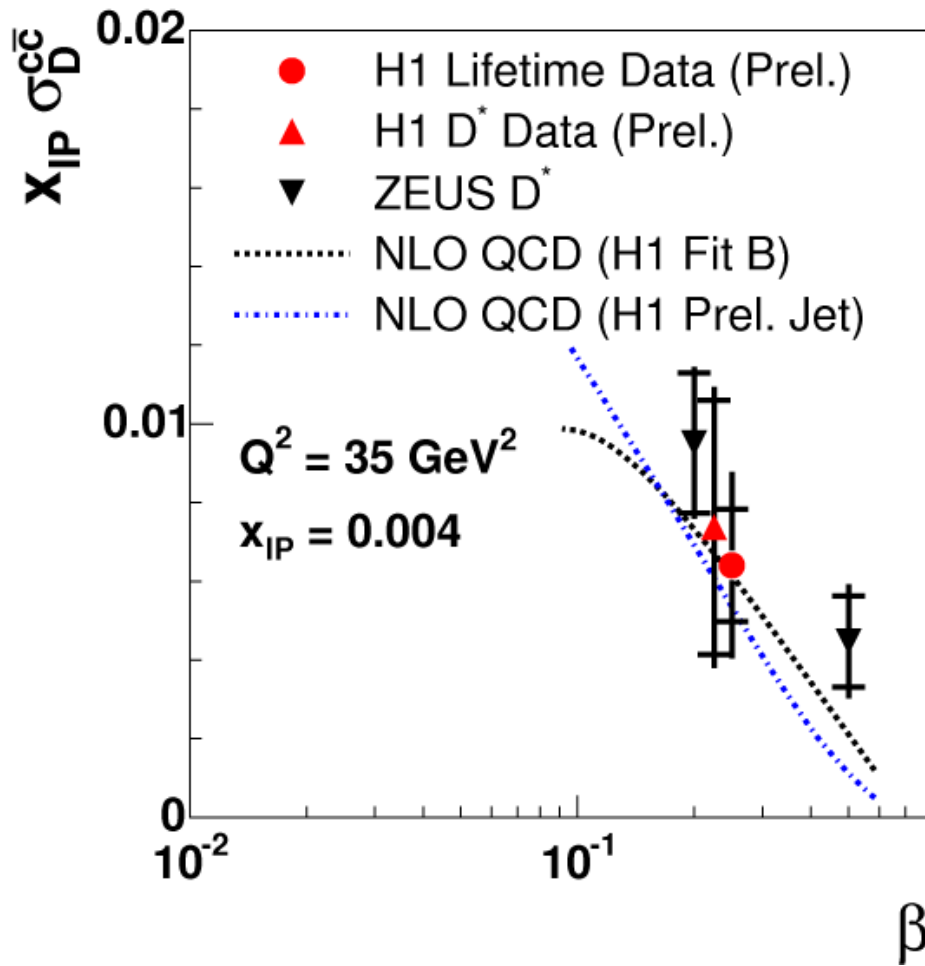
- NLO: HVQDIS (massive scheme)
- DPDF: H1 fit 2002
- $\mu^2 = m_c^2 + Q^2$

Good agreement between data and NLO prediction



Good agreement between H1 and ZEUS

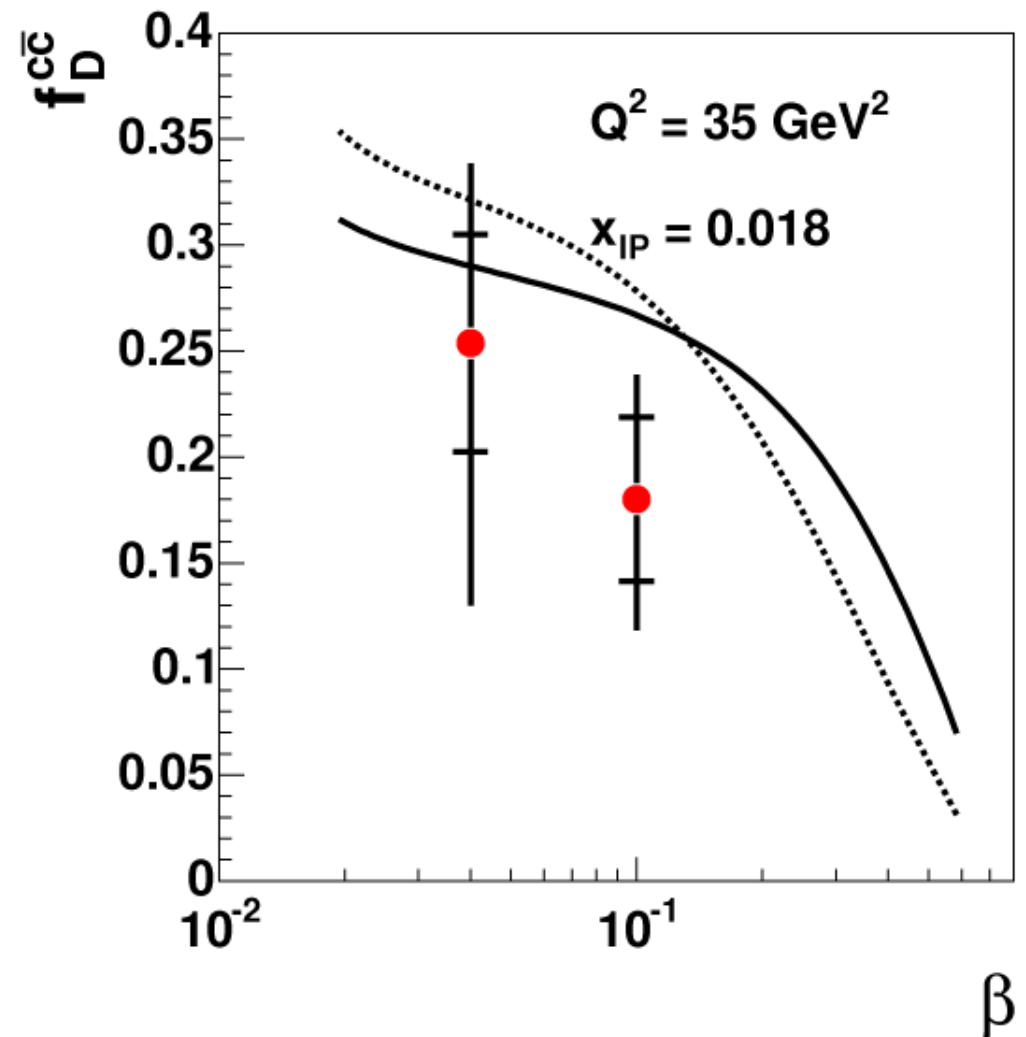
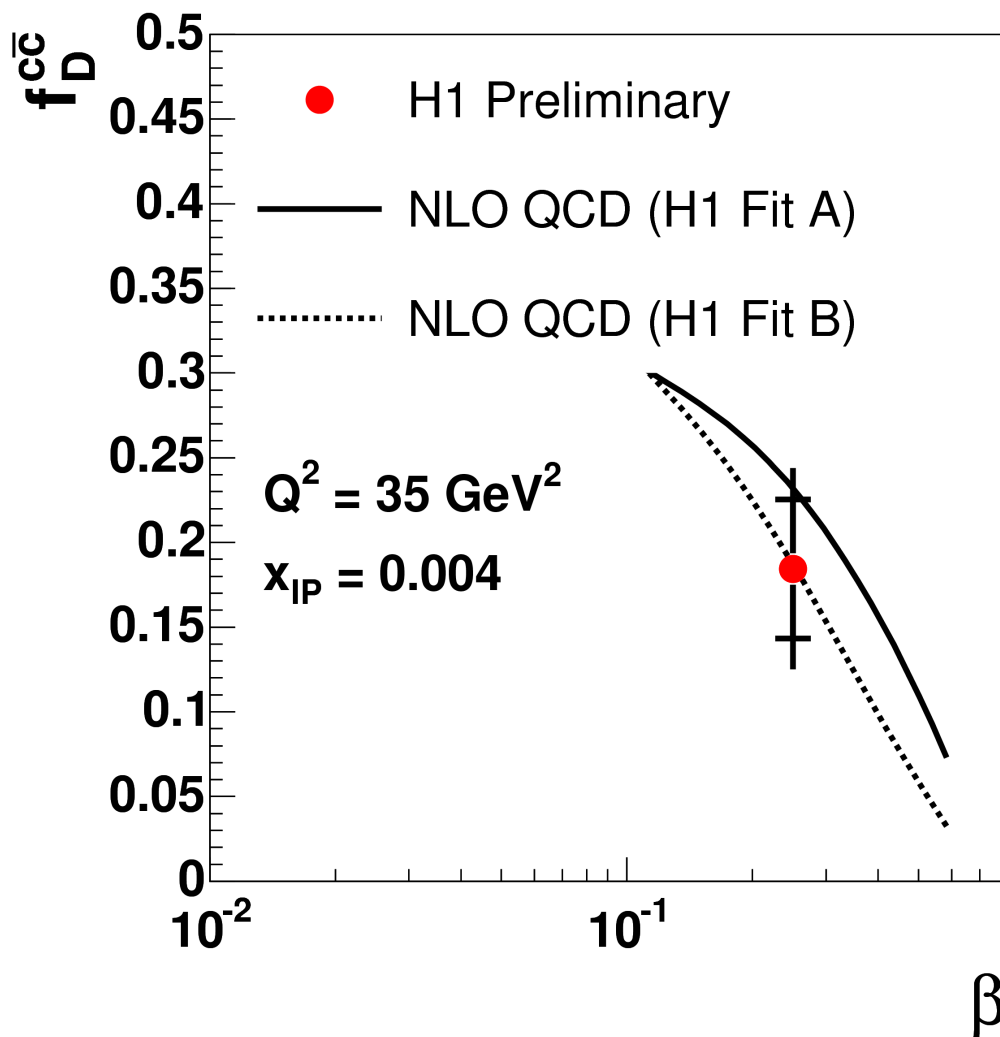
$F_2^D(\text{charm})$



- NLO: massive scheme
- $\mu = 2m_c$
- DPDF's: H1 2006 Fit B and H1 combined fit (prel.)

- good agreement between data and NLO \rightarrow factorization
- good agreement between H1 and ZEUS

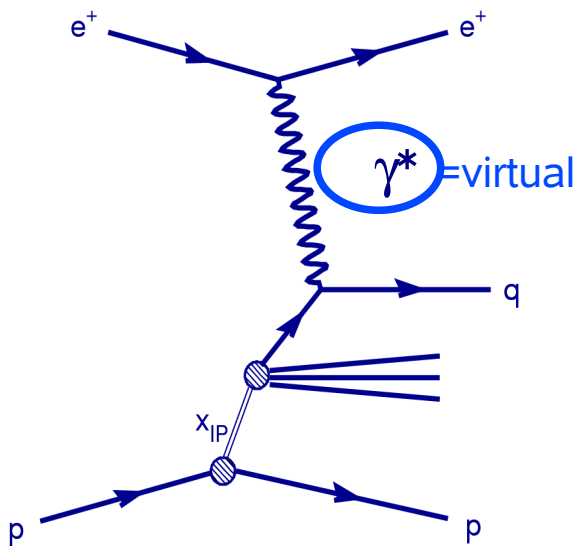
Charm Contribution to F_2^D



- displaced track method
- similar charm fraction as for inclusive scattering

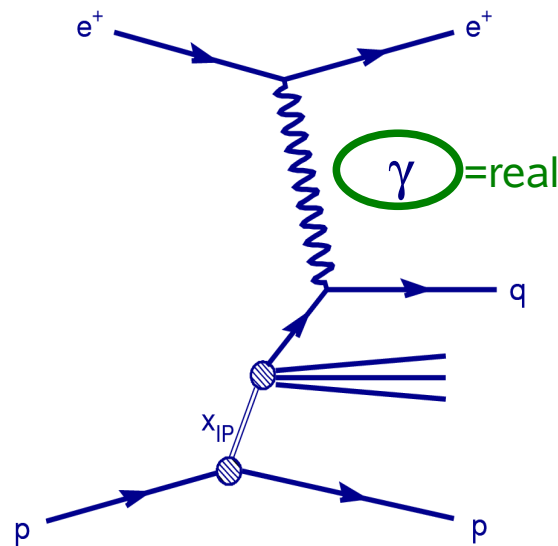
γp : the Transition to Hadron-Hadron

DIS

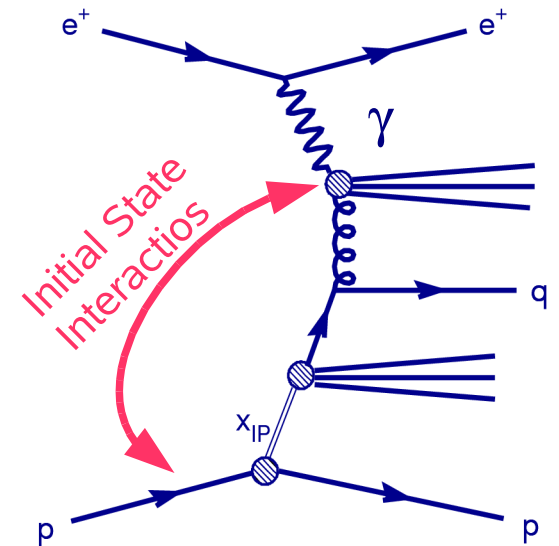


Lepton-Hadron

Photoproduction (γp)



Photon-Hadron

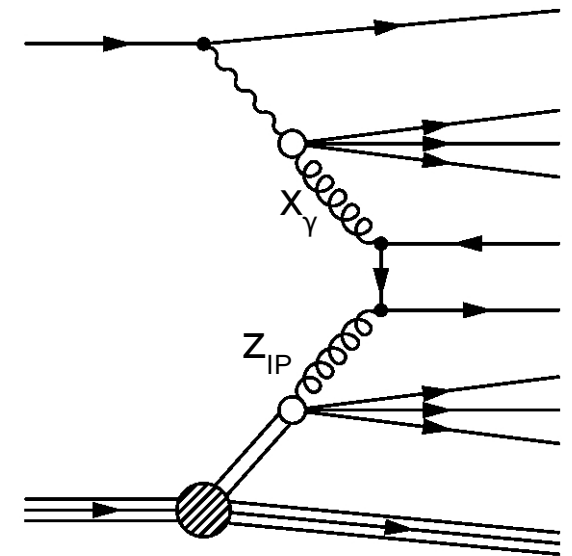
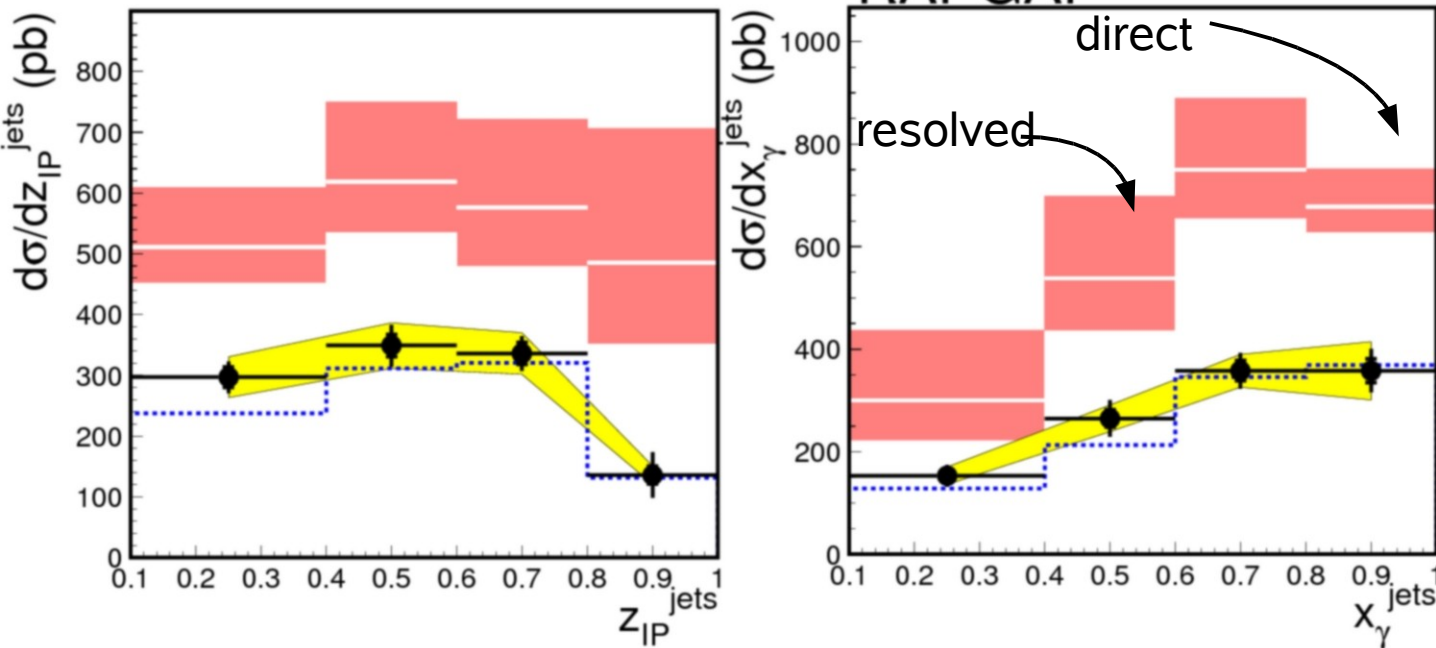


Hadron-Hadron

Dijets in γp

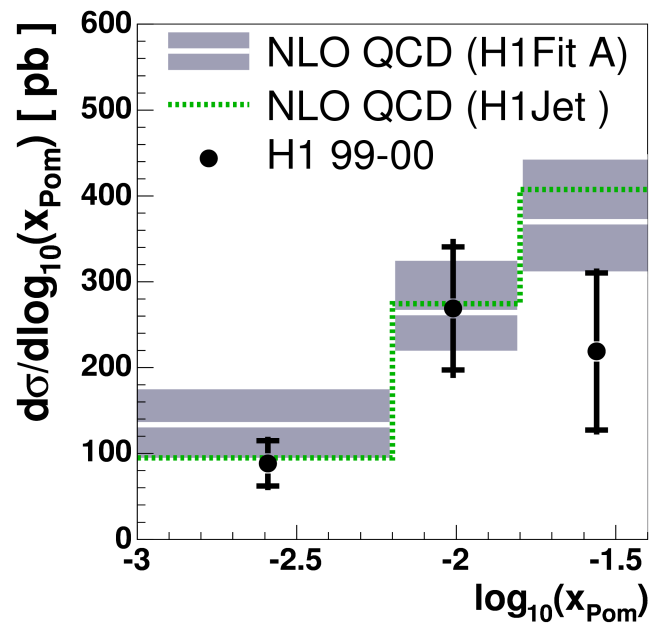
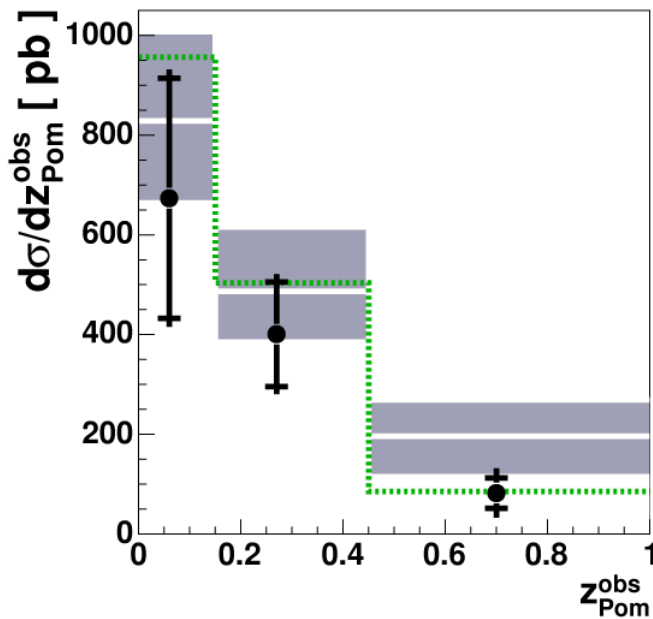
H1 Diffractive γp Dijets

- H1 Preliminary
- correl. uncert.
- H1 2002 fit (prel.)
- FR NLO*($1+\delta_{had}$)
- ⋯ RAPGAP

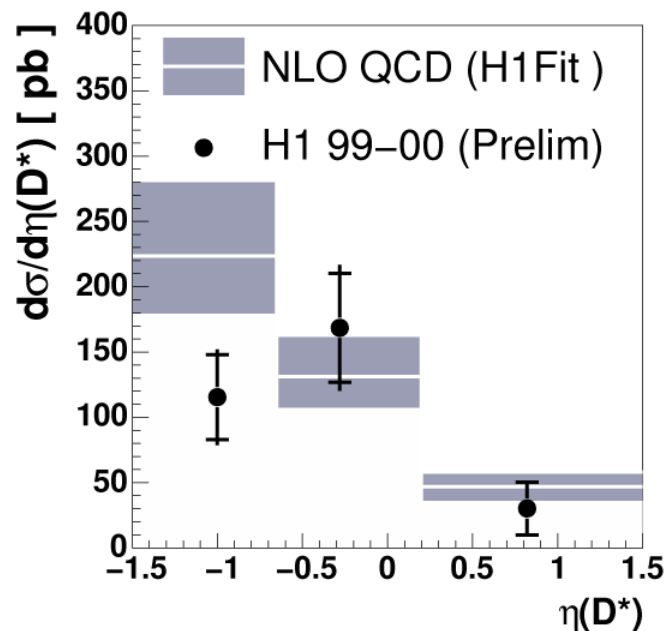
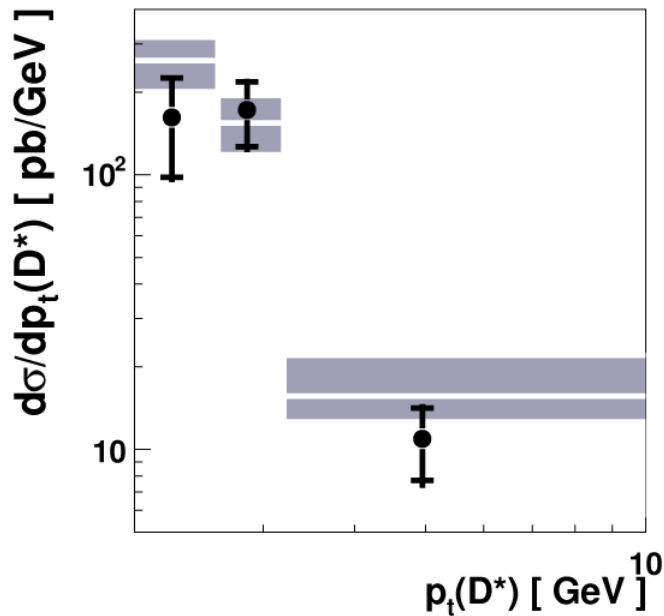


- large violation of naive factorization observed
- factorization breaking occurs in direct and resolved processes

D* in γp (Comparison to NLO)



- NLO: Frixione et al. (massive scheme)
- DPDF's: H1 2006 fitA
H1 combined fit(prel.)
- $\mu^2 = m_c^2$







Overall good agreement with NLO prediction



Factorization confirmed

large uncertainties

Summary: Status of Factorization

	DIS	γp
charm		
dijets		

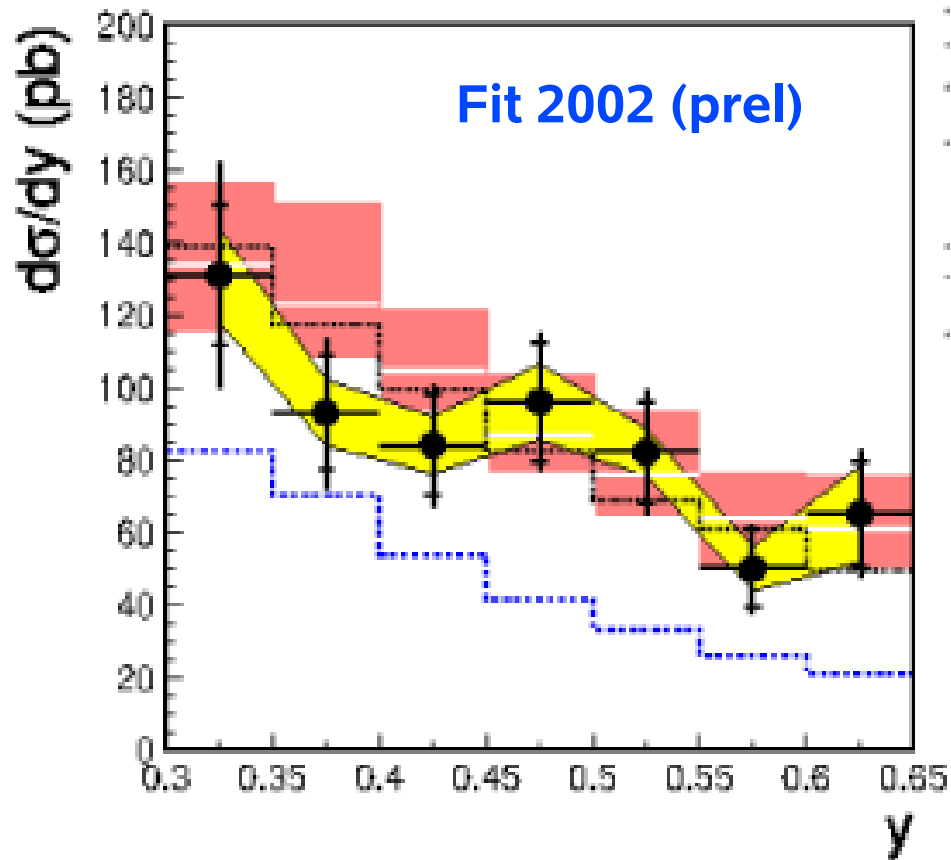
low statistics,
large NLO uncertainty

breakdown observed in
direct and resolved γp

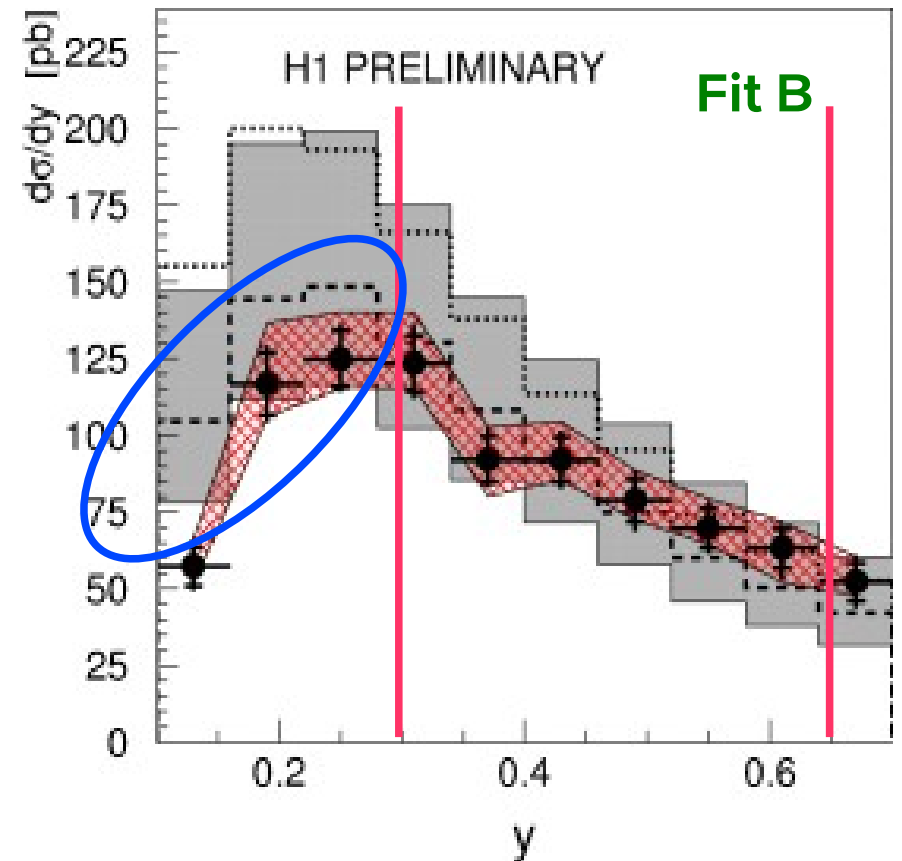
improvement in
DPDF's due to
inclusion of dijet data

Backup: Old vs. New Jets

Old Dijet Data:



New Dijet Data:



extended y -range particularly sensitive