

Photoproduction of Dijets with High Transverse Momenta at HERA

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Introduction

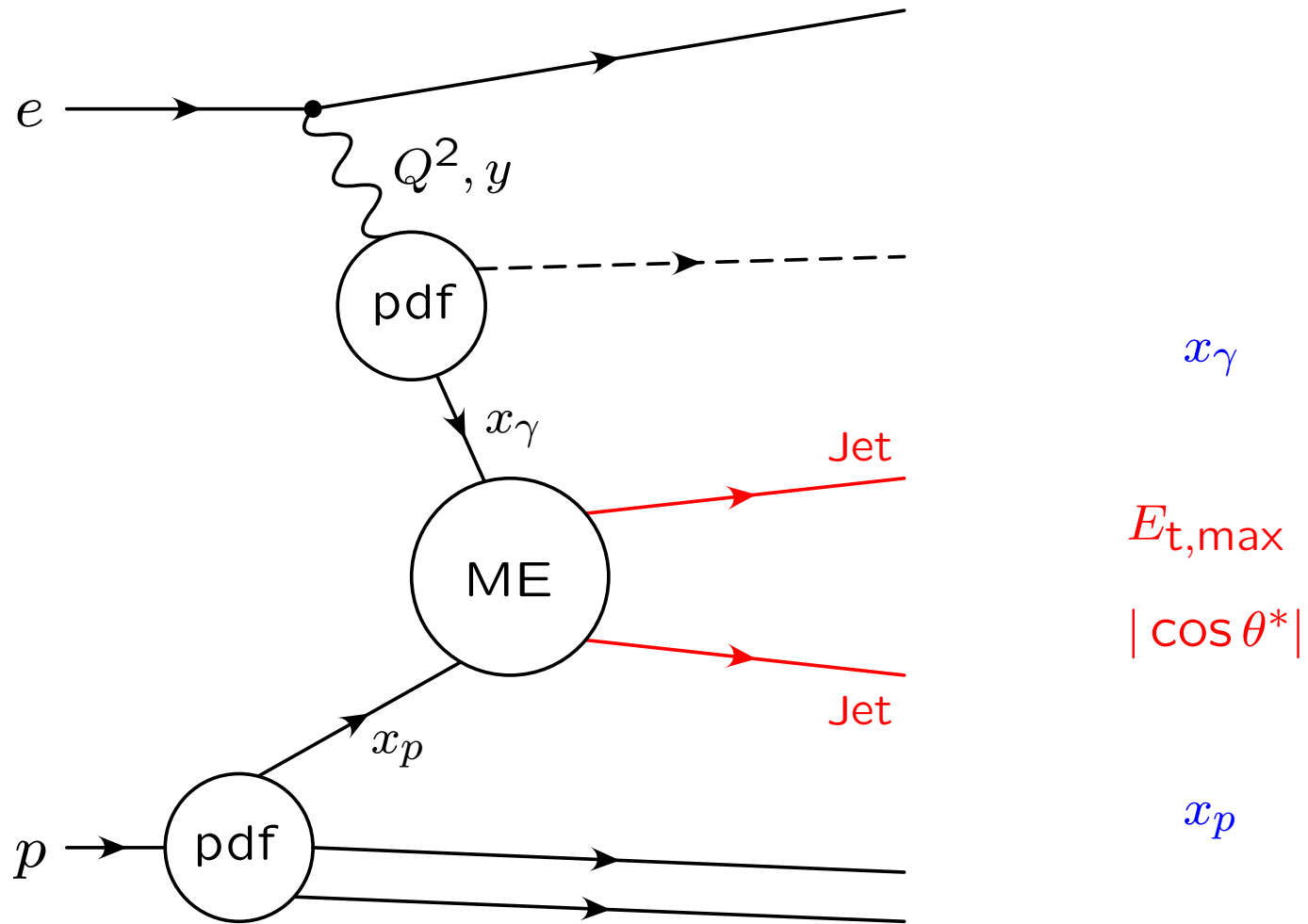
Measurement of Dijets

Cross Sections

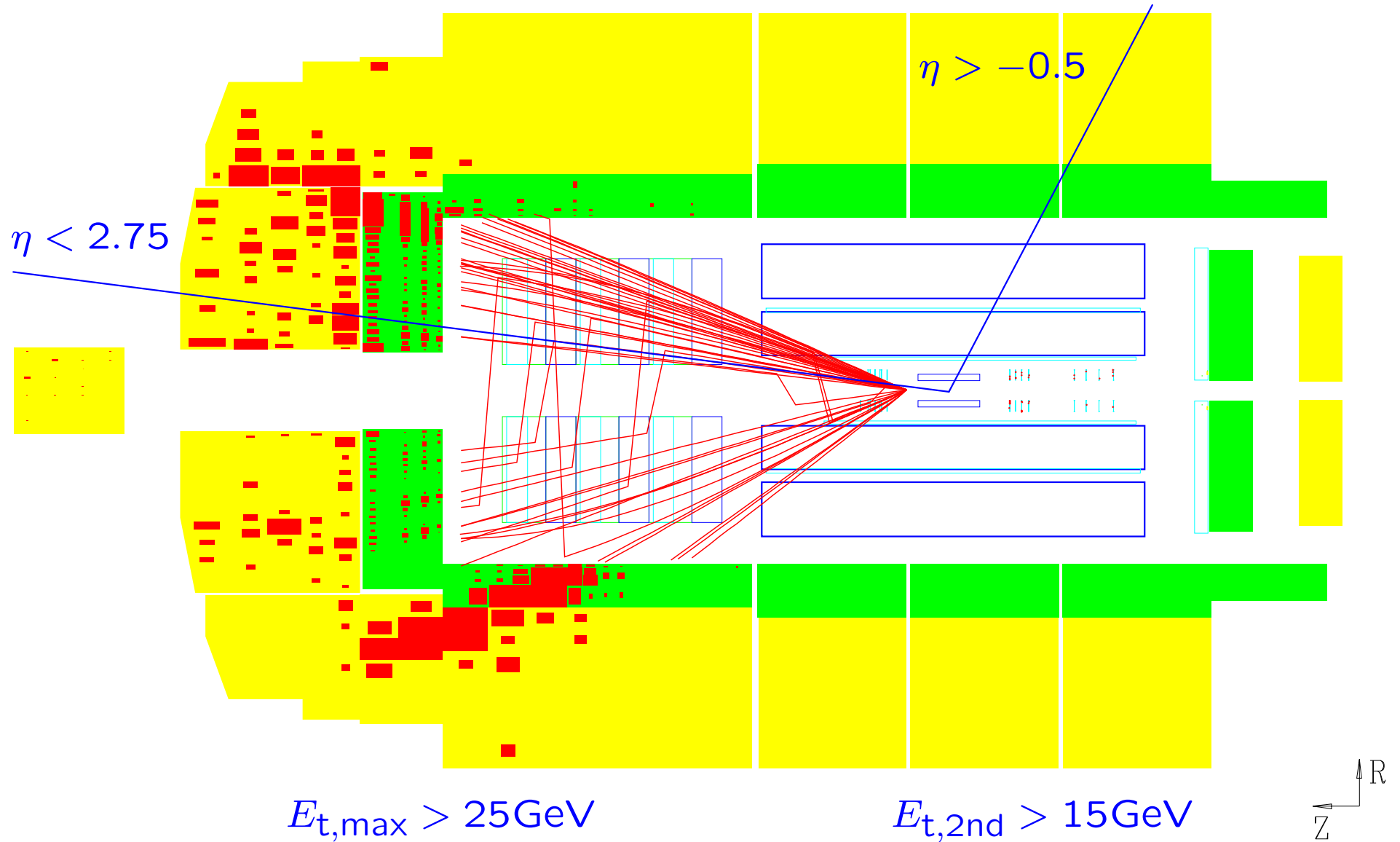
Dijet Topologies



Photoproduction of Dijets at HERA



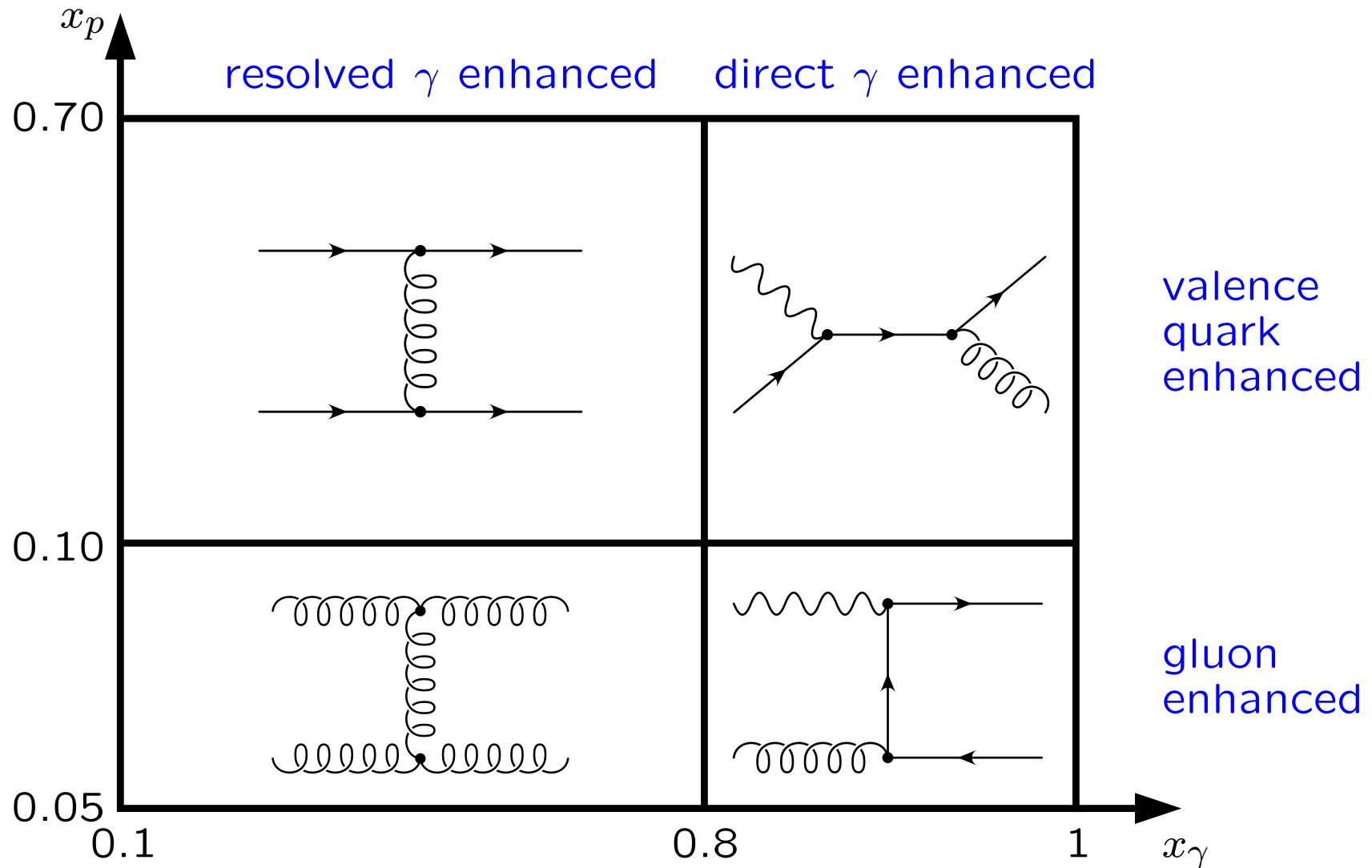
Dijets in the H1 Detector



Analysis Overview

	hep-ex/0603014
dataset	1999-2000 66.6 pb^{-1}
cms energy	$\sqrt{s} = 318 \text{ GeV}$
electron kinematics	$Q^2 < 1 \text{ GeV}^2$ $0.1 < y < 0.9$
jet energy	$E_{t,\text{max}} > 25 \text{ GeV}$ $E_{t,2\text{nd}} > 15 \text{ GeV}$
jet angle	$-0.5 < \eta_{\text{jet}} < 2.75$
γ momentum fraction	$0.1 < x_{\gamma} < 1.0$
p momentum fraction	$0.05 < x_p < 0.7$
total error	$7 - 20\%$

Kinematic regions



QCD Models

NLO prediction: Frixione and Ridolfi

- subtraction method
- proton pdf: CTEQ6M (MRST2001)
- photon pdf: GRV-HO (AFG-HO)
- hadronisation correction with PYTHIA/HERWIG

Pythia: Lund string fragmentation

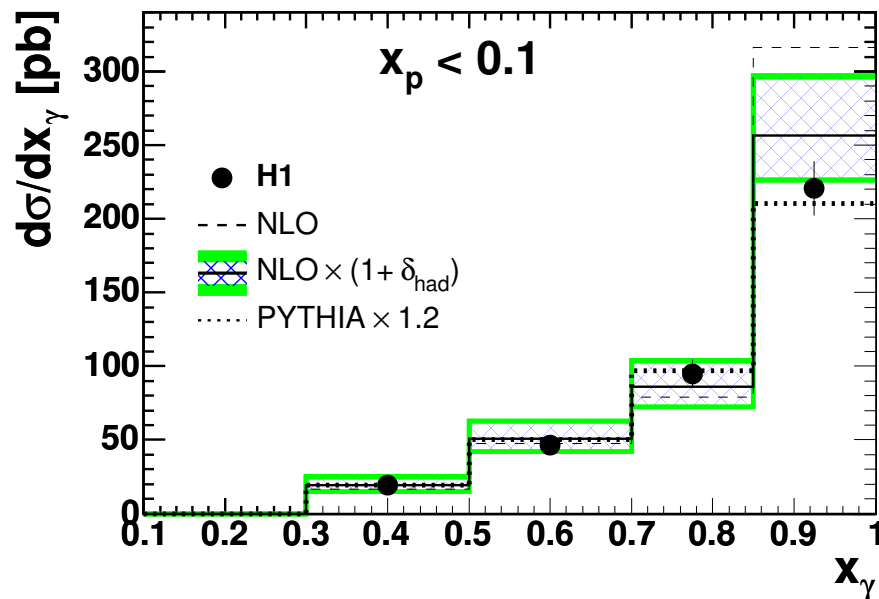
- normalisation factor 1.2 needed
- proton pdf: CTEQ5L
- photon pdf: GRV-LO

Herwig: cluster fragmentation (not shown)

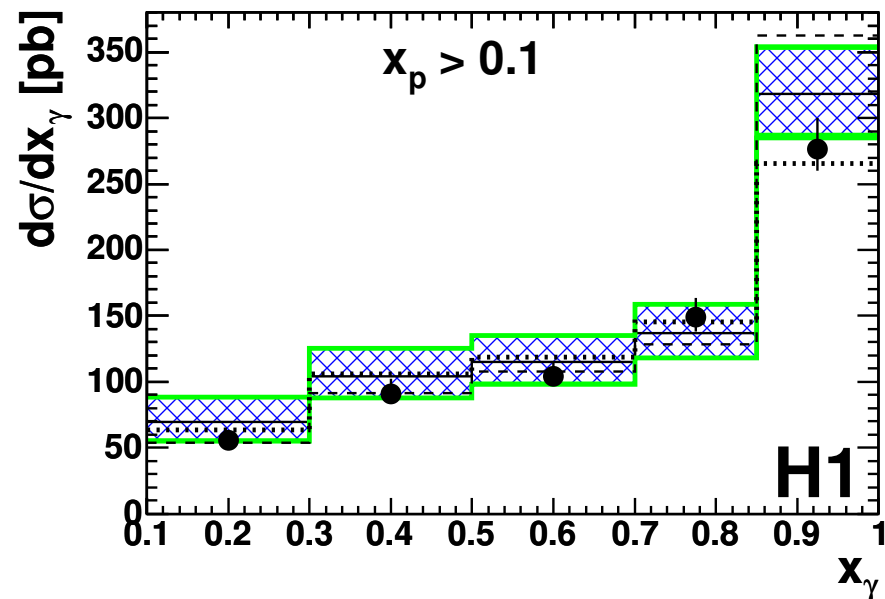
- similar to PYTHIA
- normalisation factor 1.55 needed

Cross Section: Photon Momentum Fraction

- NLO inner error band: scale uncertainty
- NLO outer error band: total uncertainty (scale, pdf, hadronisation)

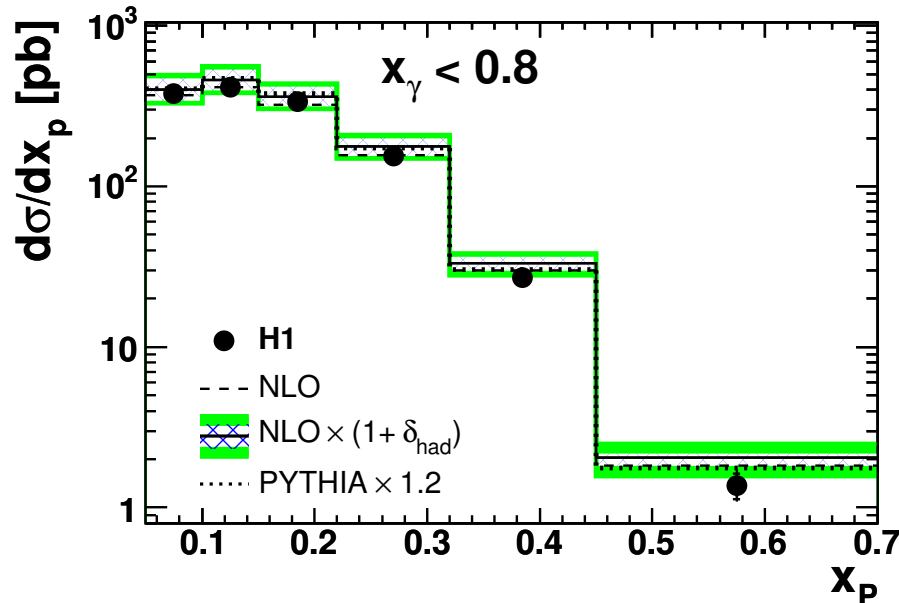


small x_p :
gluon enhanced

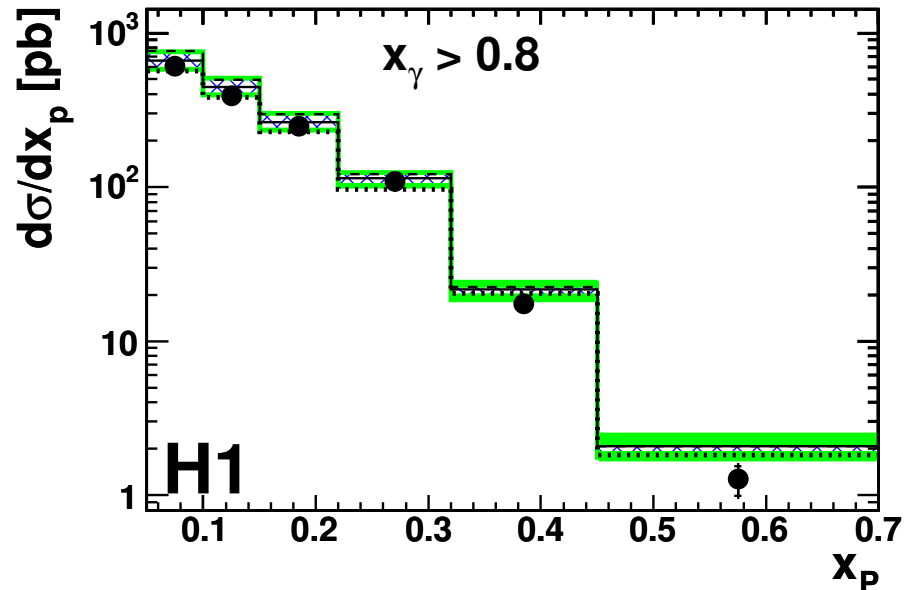


large x_p :
valence quark enhanced

Cross Section: Proton Momentum Fraction



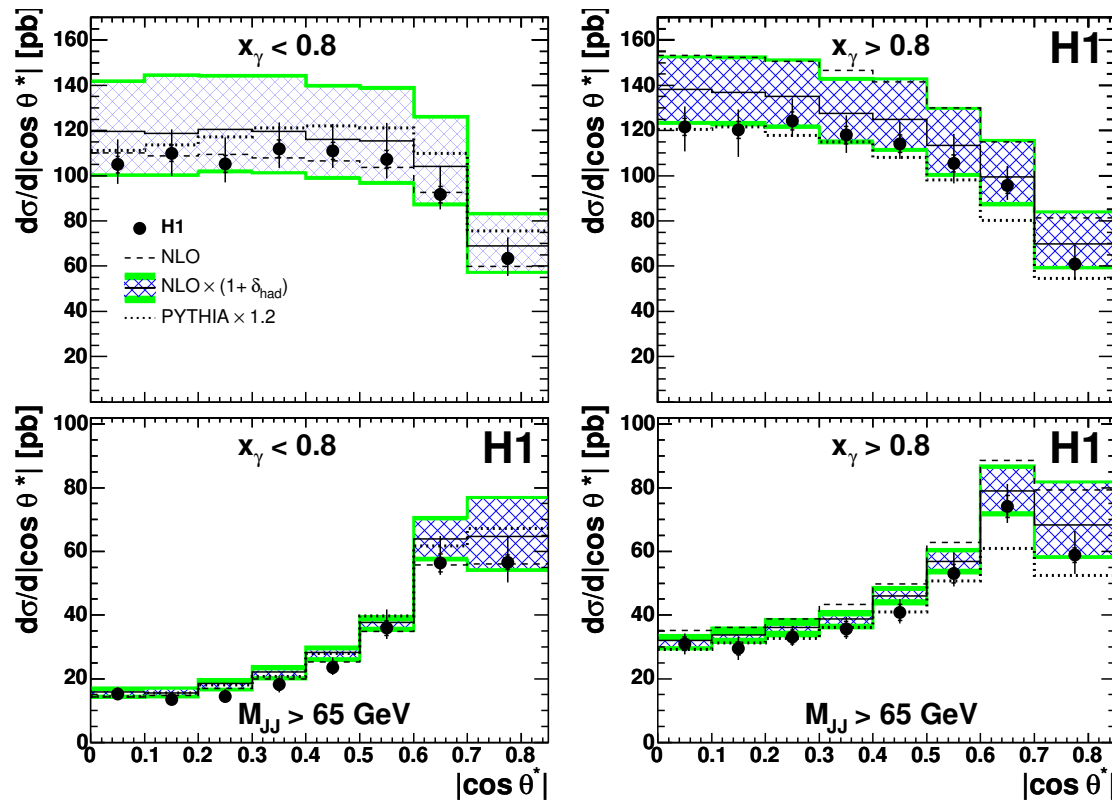
small x_γ :
resolved photon enhanced



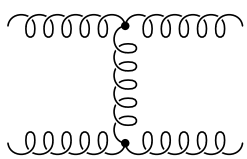
large x_γ :
direct photon enhanced

- good description by MC and NLO prediction
- in general NLO uncertainty dominated by scale uncertainty
- at large x_p NLO uncertainty dominated by pdf uncertainty

Cross Section: CMS Opening Angle



- shape dominated by jet phase space
- large scale uncertainty
- invariant dijet mass cut reduces phase space effect & scale uncertainty

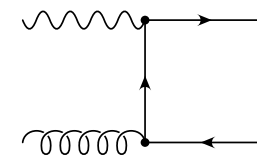


gluon propagator

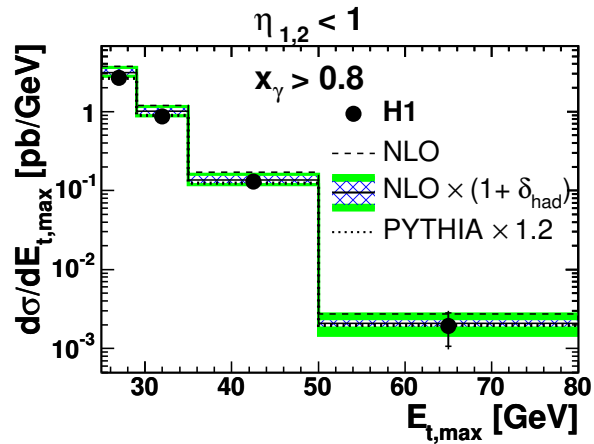
$$\frac{1}{(1 - |\cos\theta^*|)^2}$$

quark propagator

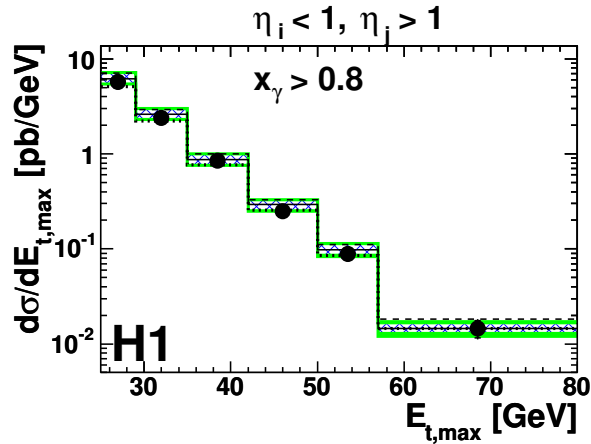
$$\frac{1}{(1 - |\cos\theta^*|)}$$



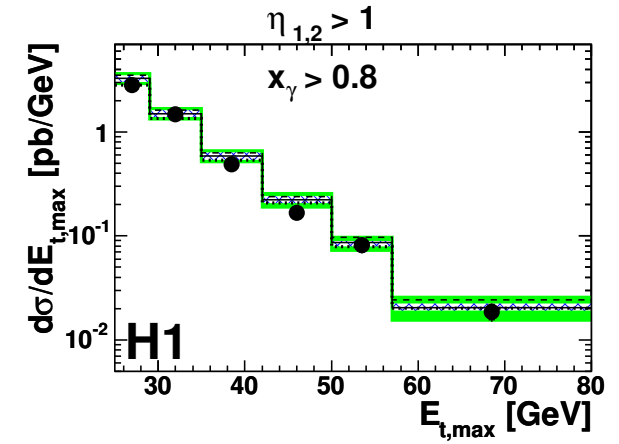
Jet Topologies: Transverse Jet Energy



'backward-backward'



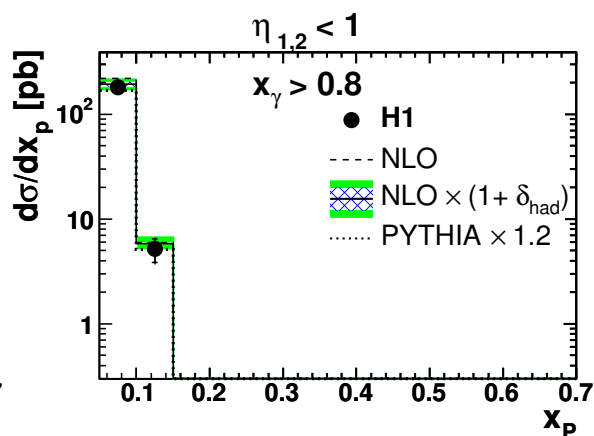
'forward-backward'



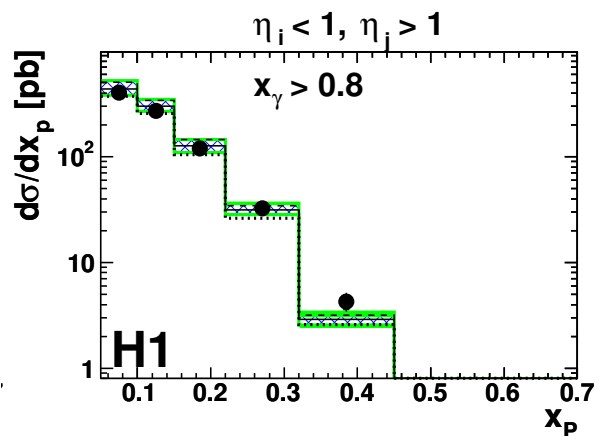
'forward-forward'

- direct photon enhanced region shown, similar distributions in the resolved enhanced region
- hardest E_t spectrum in the forward-forward sample
- sensitivity to proton parton densities, especially at high E_t

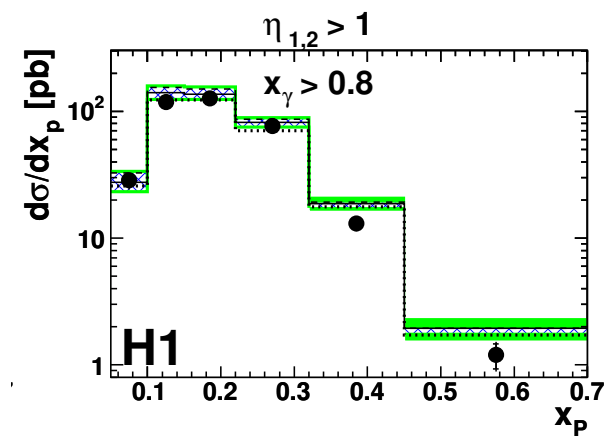
Jet Topologies: Proton Momentum Fraction



‘backward-backward’



‘forward-backward’



‘forward-forward’

- direct photon enhanced region shown, similar distributions in the resolved enhanced region
- largest x_p reachable in the forward-forward sample
- sensitivity to proton parton densities at large x_p , largest influence due to gluon density

Conclusions

- new measurement of high E_t dijet photoproduction in extended x_p range
- good agreement with LO MCs and NLO predictions
- sensitivity to proton parton density functions, especially at large x_p

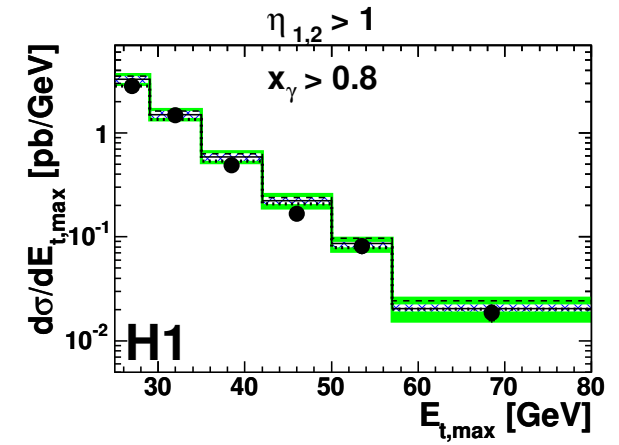
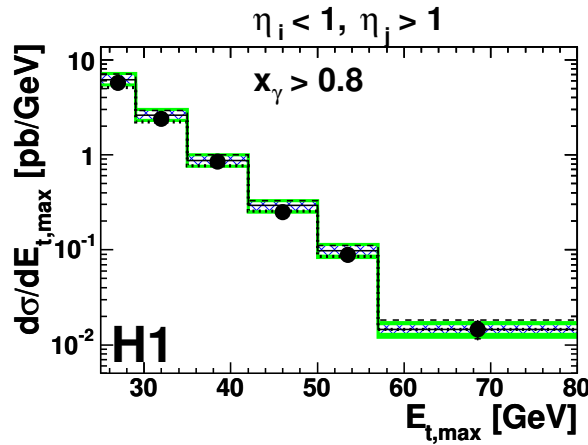
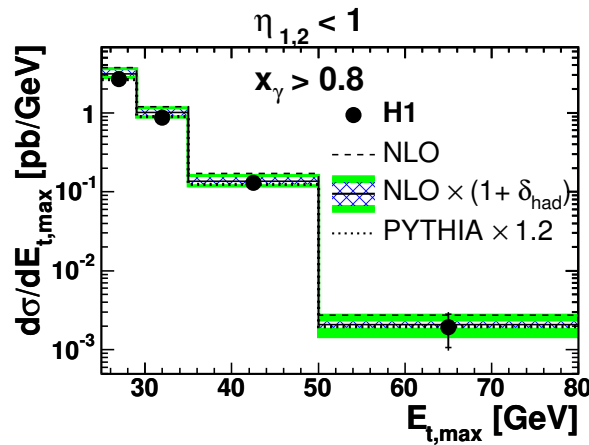
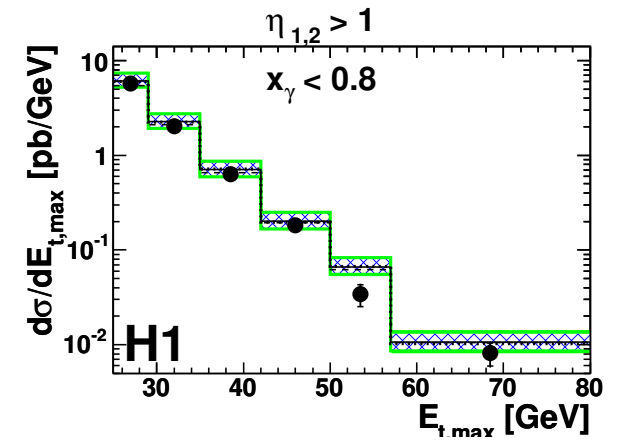
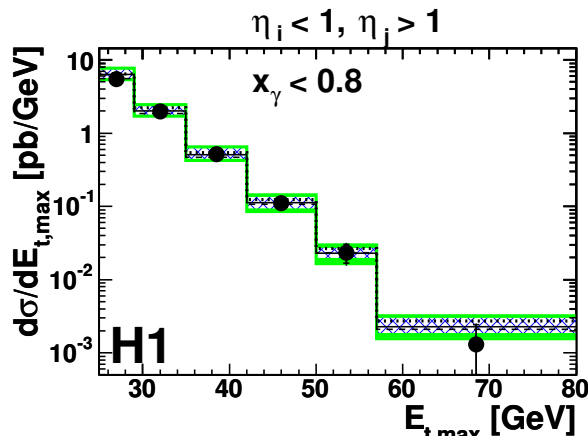
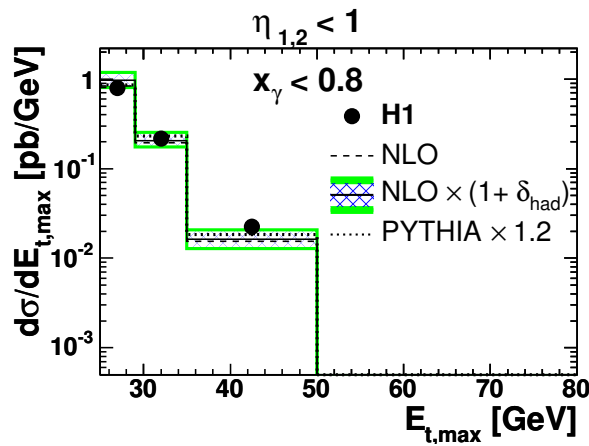
⇒ data available for pdf fits

Backup slides

Comparison to previous analysis

	old analysis Eur. Phys. J. C 25 (2002) 13	this analysis hep-ex/0603014
dataset	1995-1997 34.9 pb ⁻¹	1999-2000 66.6 pb ⁻¹
cms energy	$\sqrt{s} = 300 \text{ GeV}$	$\sqrt{s} = 318 \text{ GeV}$
electron kinematics	$Q^2 < 1 \text{ GeV}^2$ $0.1 < y < 0.9$	$Q^2 < 1 \text{ GeV}^2$ $0.1 < y < 0.9$
jet energy	$E_{t,\text{max}} > 25 \text{ GeV}$ $E_{t,2\text{nd}} > 15 \text{ GeV}$	$E_{t,\text{max}} > 25 \text{ GeV}$ $E_{t,2\text{nd}} > 15 \text{ GeV}$
jet angle	$-0.5 < \eta_{\text{jet}} < 2.5$	$-0.5 < \eta_{\text{jet}} < 2.75$
γ mom. fraction	$0.1 < x_\gamma < 1.0$	$0.1 < x_\gamma < 1.0$
p mom. fraction	$0.05 < x_p < 0.6$	$0.05 < x_p < 0.7$
total error	10 – 30%	7 – 20%

Transverse Jet Energy

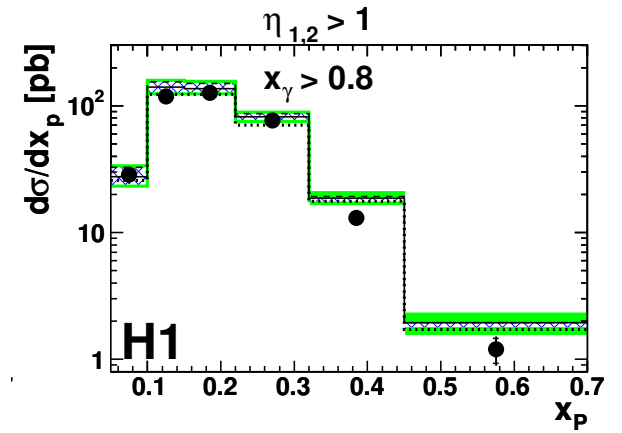
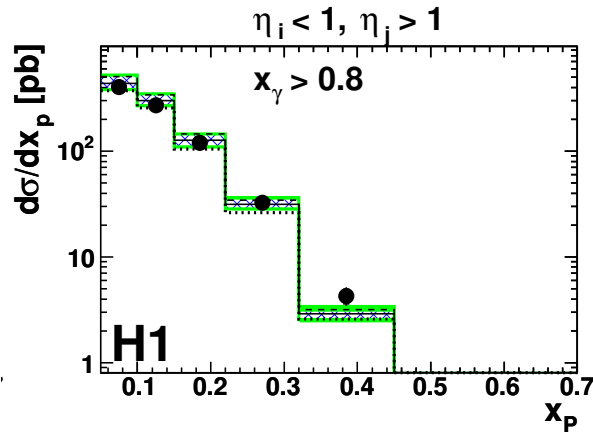
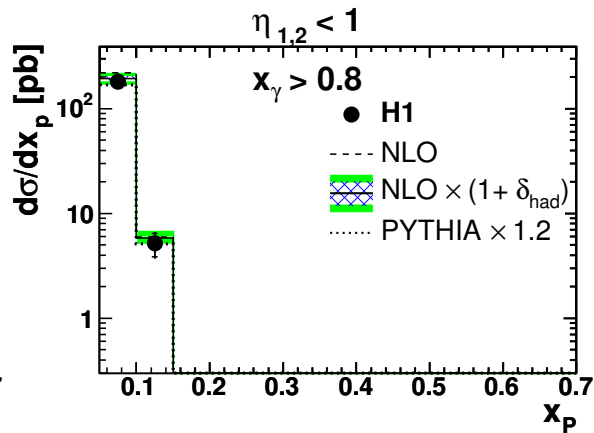
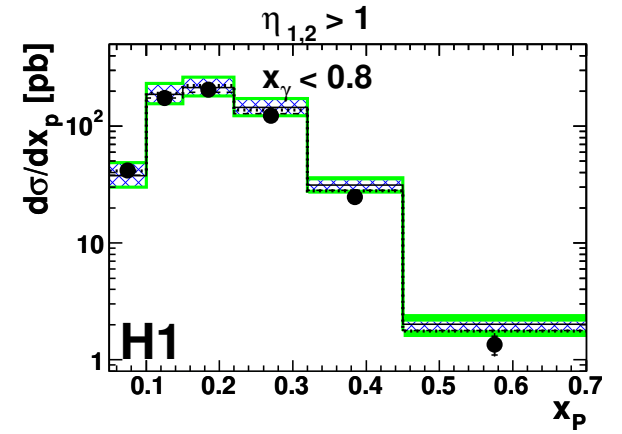
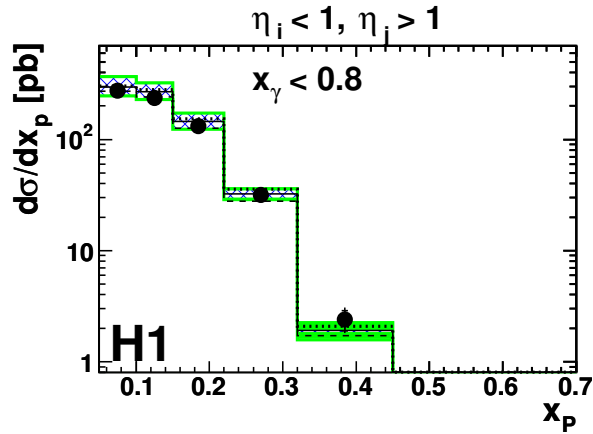
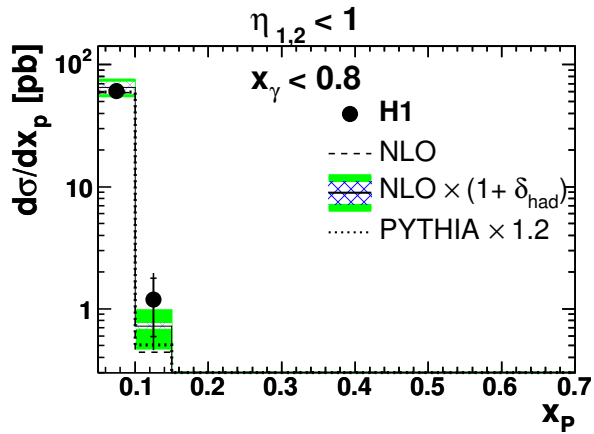


'backward-backward'

'forward-backward'

'forward-forward'

Proton Momentum Fraction



'backward-backward'

'forward-backward'

'forward-forward'

Cross Section Influence of CTEQ6M Eigenvectors

