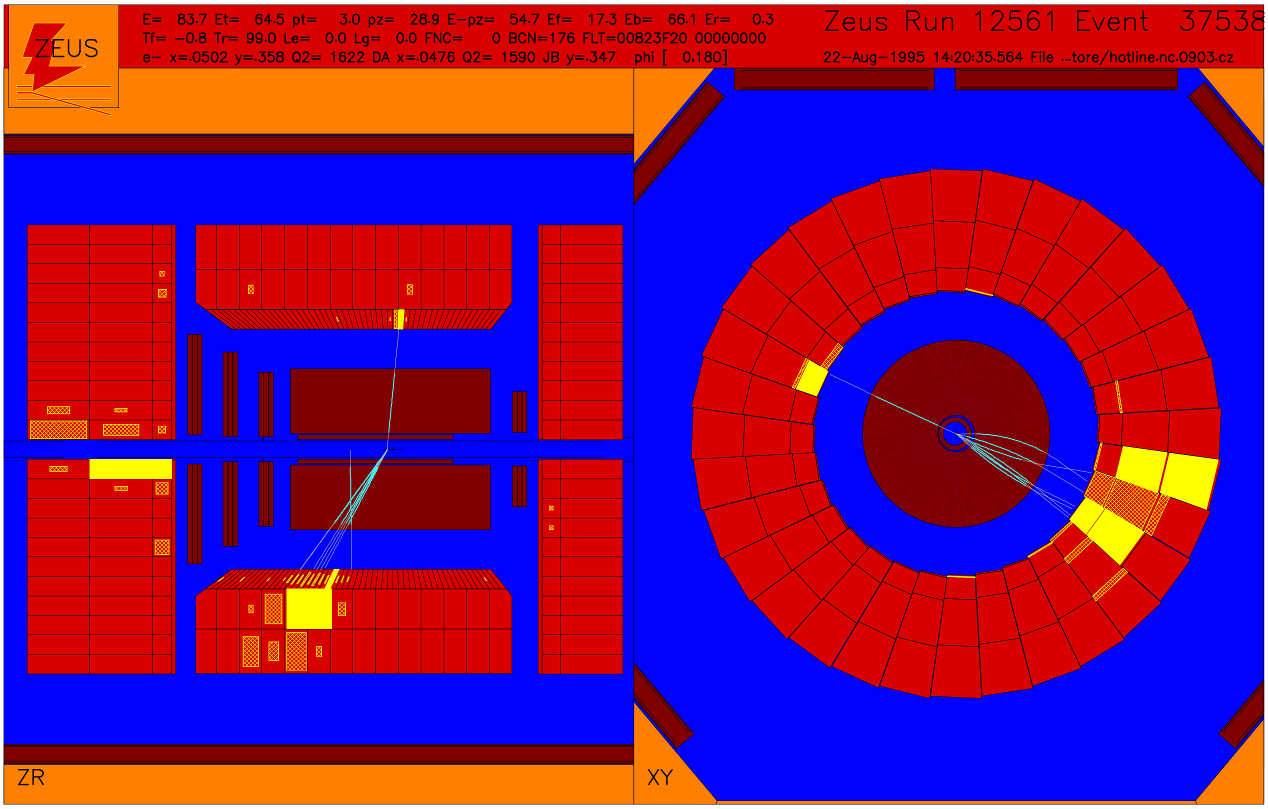
Jets in D.I.S. at HERA

Joachim Meyer

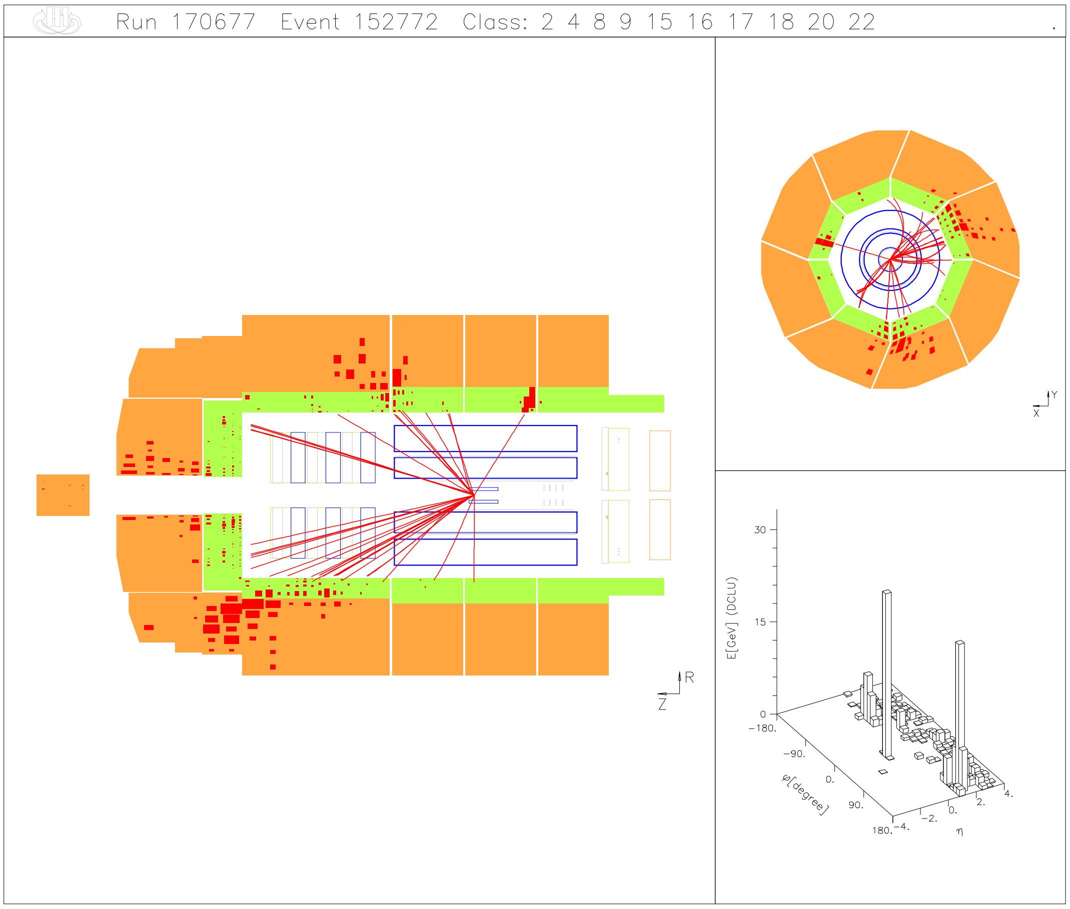
DESY and CERN

- **Inclusive Jets**
- **Dijets**
- **Trijets**
- **Conclusions**

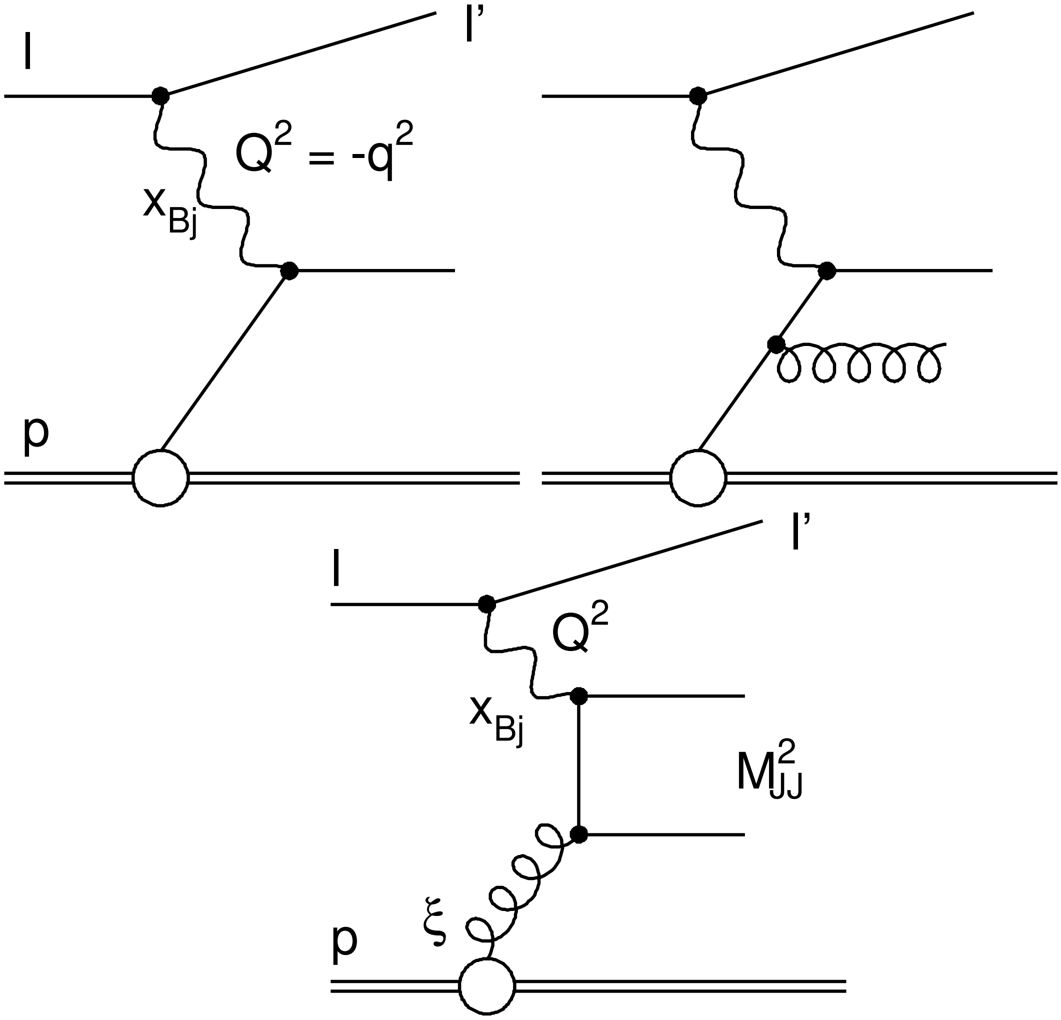
Jetevent in ZEUS Detector



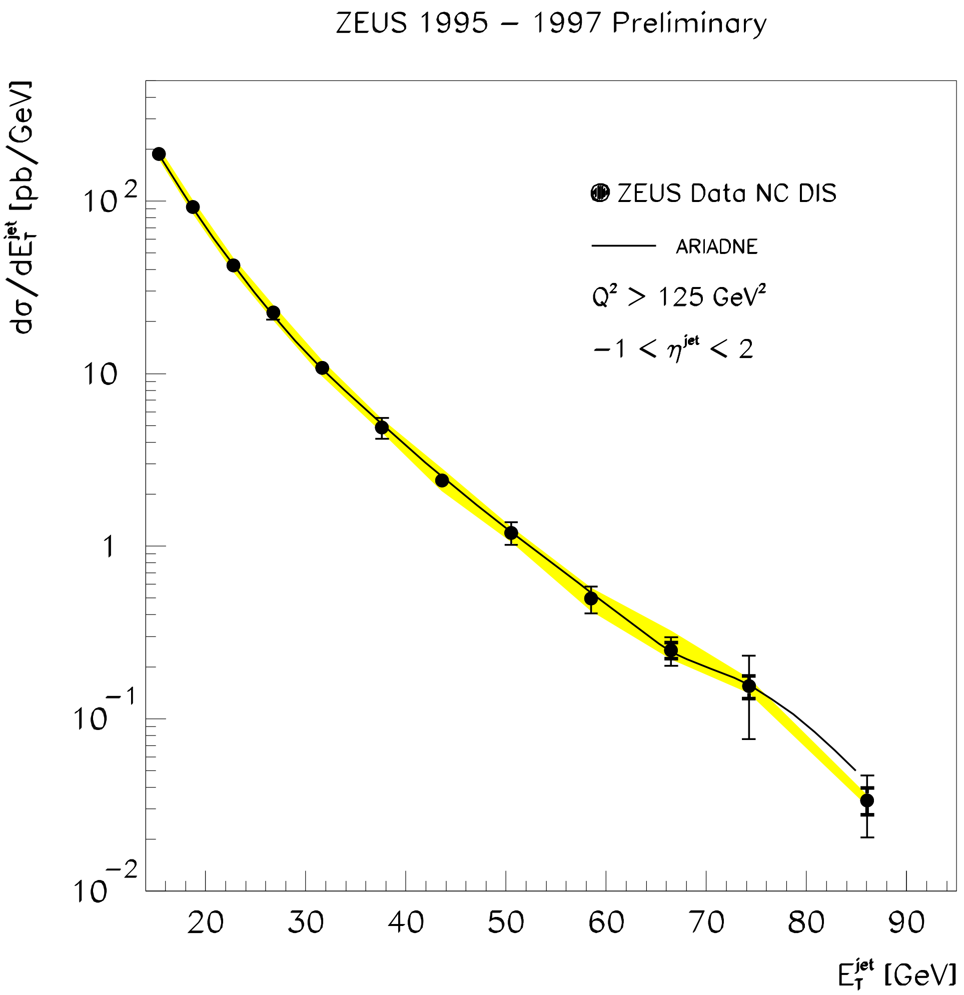
Di-Jetevent in H1 Detector



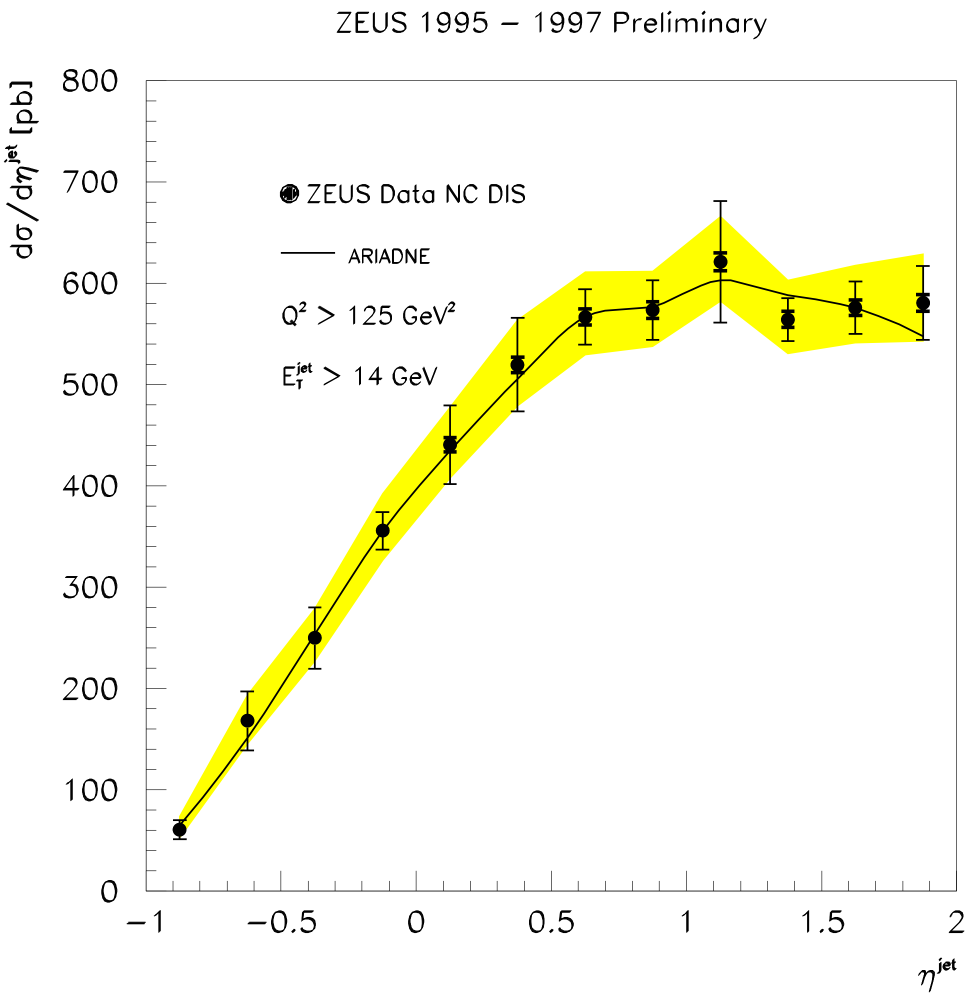
Jets at HERA



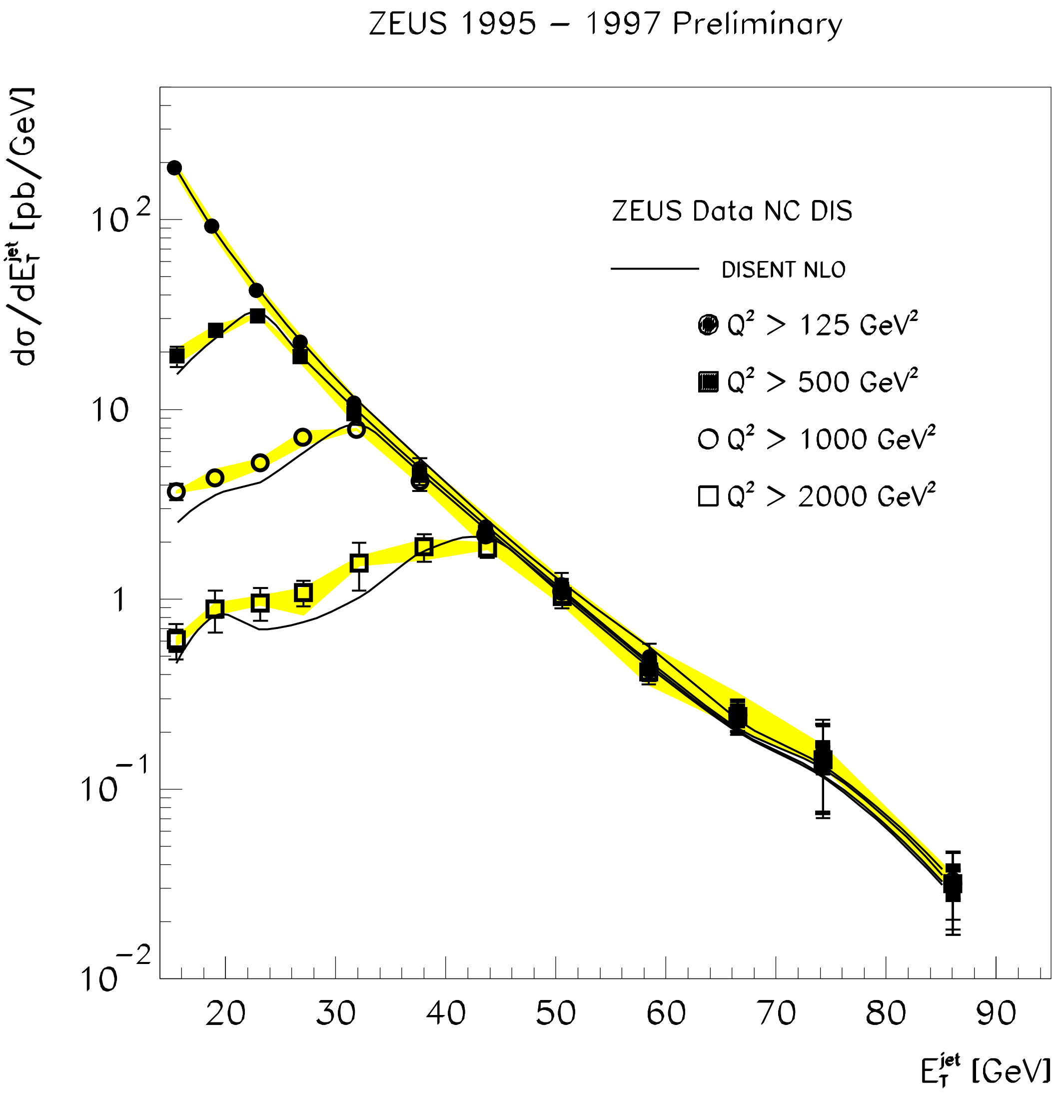
Inclusive Jets



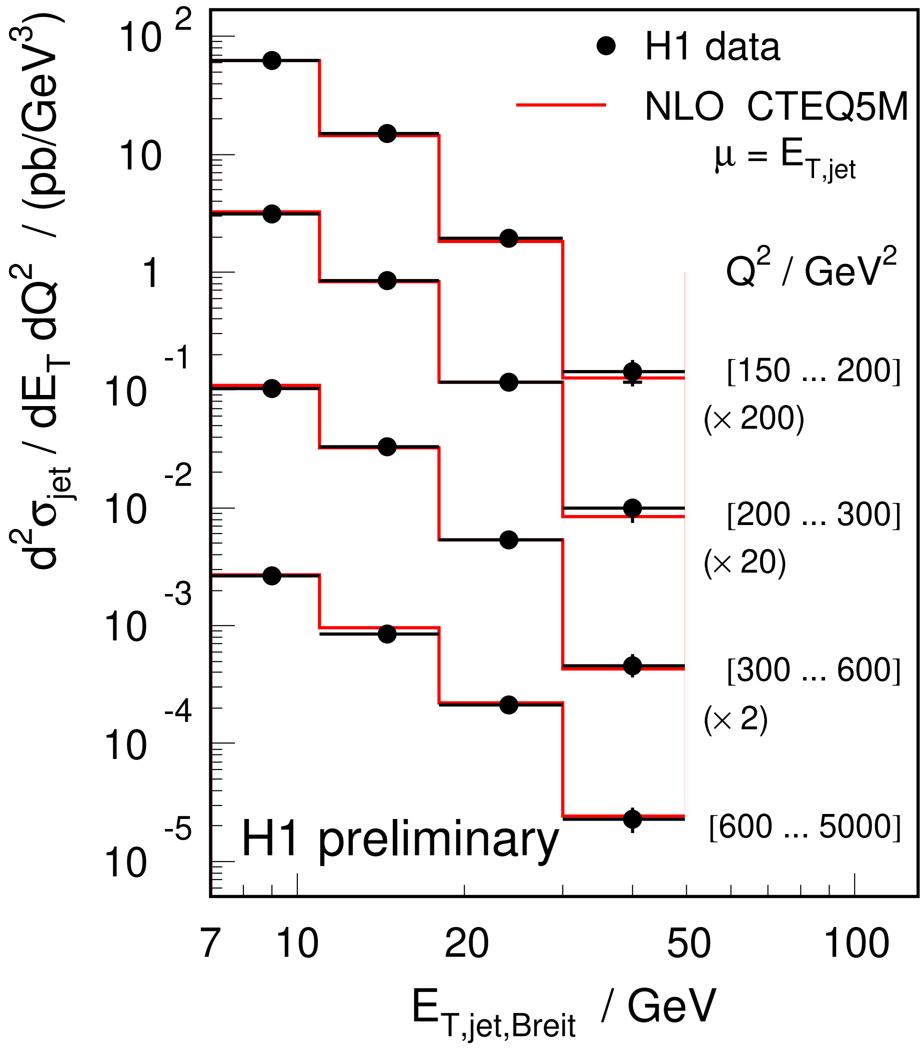
Inclusive Jets



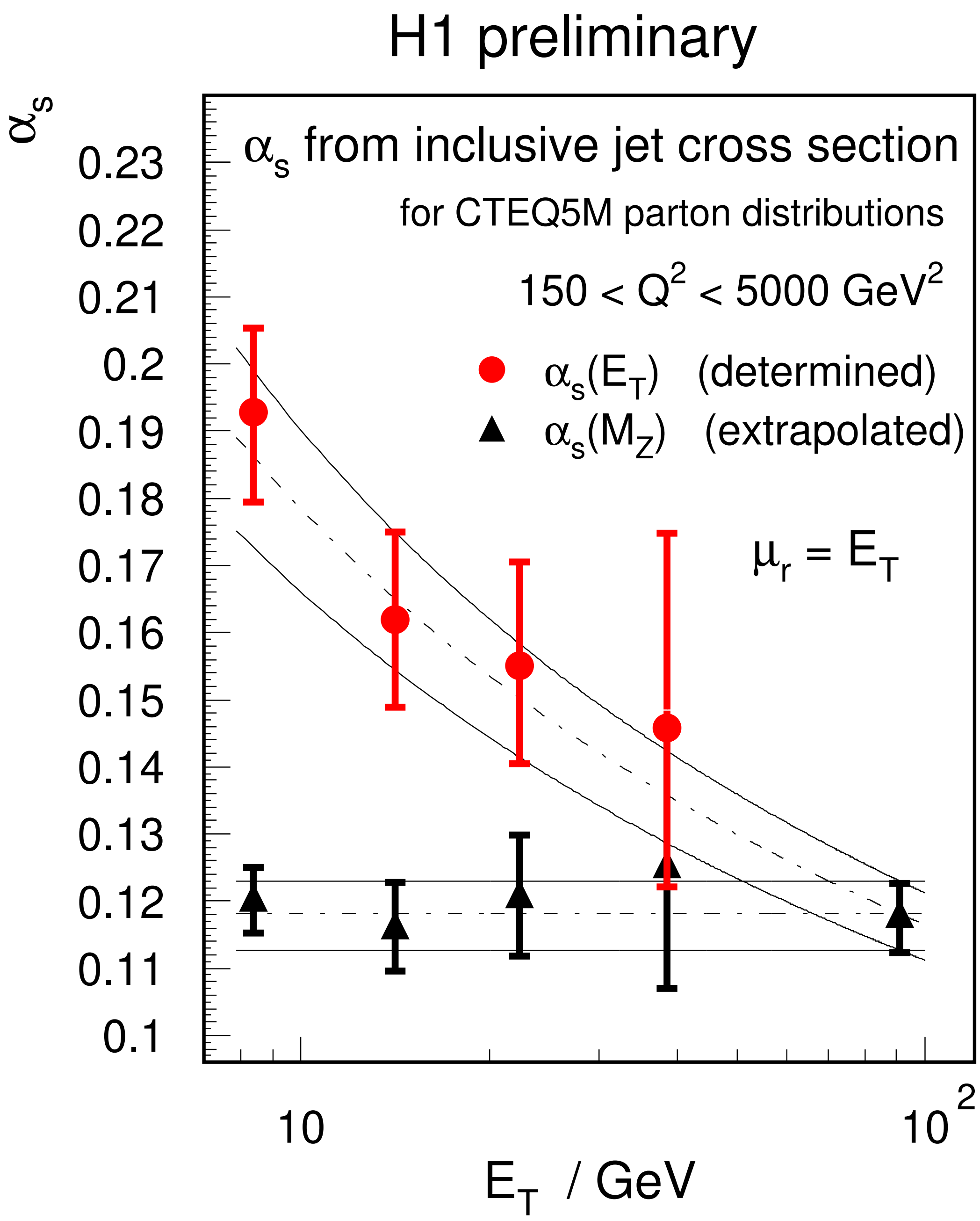
Inclusive Jets



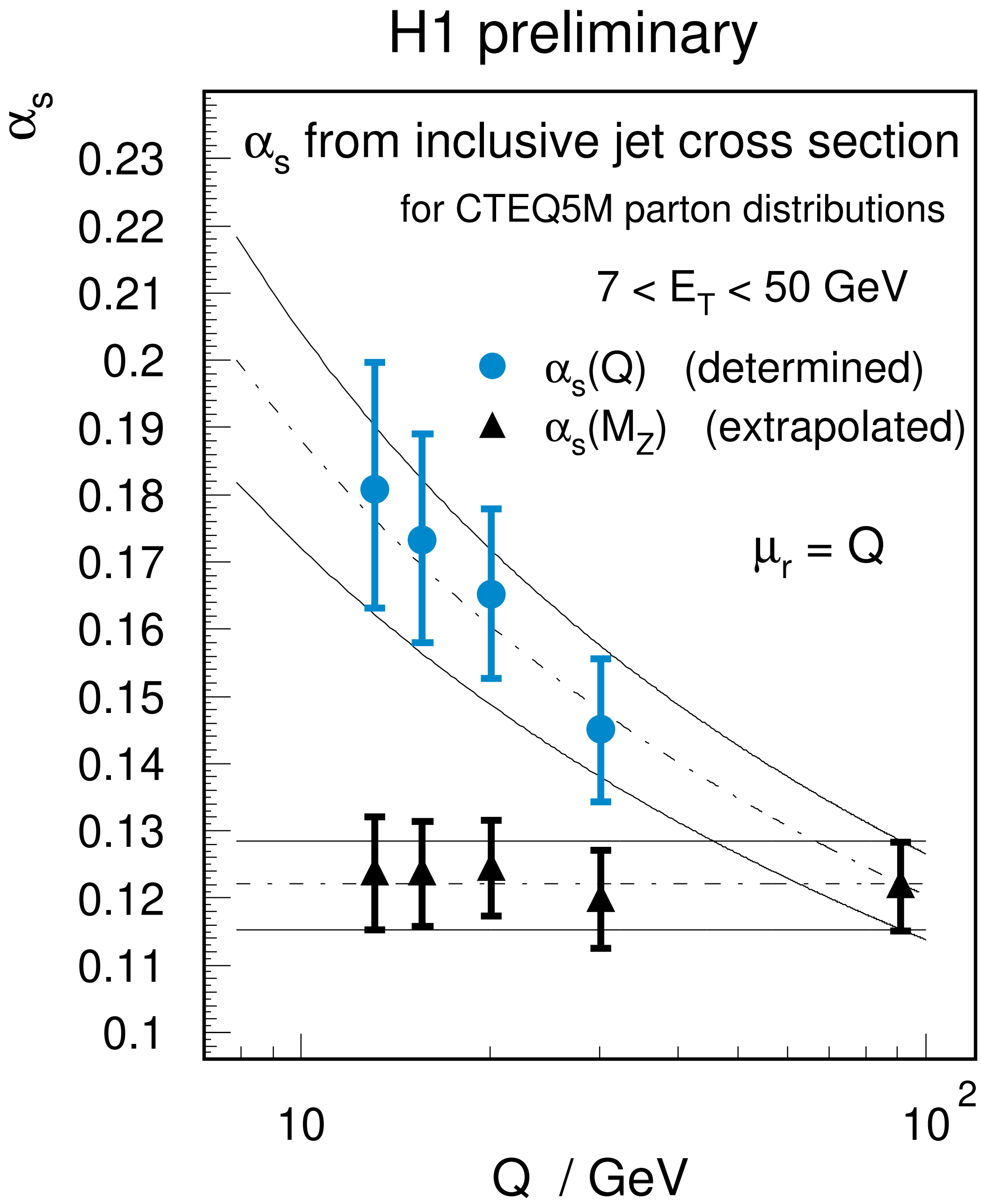
Inclusive Jets



Inclusive Jets



Inclusive Jets



Inclusive Jets

H1 preliminary

α_s determination from DIS jet production

Inclusive Jet Cross Section $\quad \dfrac{d^2\sigma_{jet}}{dE_{T,Breit}\, dQ^2}$

inclusive $k_\perp$ algorithm in Breit frame

$\mu_r = E_T$

$\alpha_s(M_Z) = 0.1181 \pm 0.0030\ \text{(exp)}\ {}^{+0.0039}_{-0.0046}\ \text{(theo)}\ {}^{+0.0036}_{-0.0015}\ \text{(pdf)}$

$\mu_r = Q$

$\alpha_s(M_Z) = 0.1221 \pm 0.0034\ \text{(exp)}\ {}^{+0.0054}_{-0.0059}\ \text{(theo)}\ {}^{+0.0033}_{-0.0016}\ \text{(pdf)}$

Dijet Rate $\quad \dfrac{1}{N_{DIS}} \dfrac{dn_{dijet}}{dy_2}$

$\mu_r = Q$ $\quad k_\perp$ algorithm for DIS in Breit frame

$\alpha_s(M_Z) = 0.1189\ {}^{+0.0064}_{-0.0081}\ \text{(exp)}\ {}^{+0.0059}_{-0.0046}\ \text{(theo)}\ {}^{+0.0013}_{-0.0055}\ \text{(pdf)}$

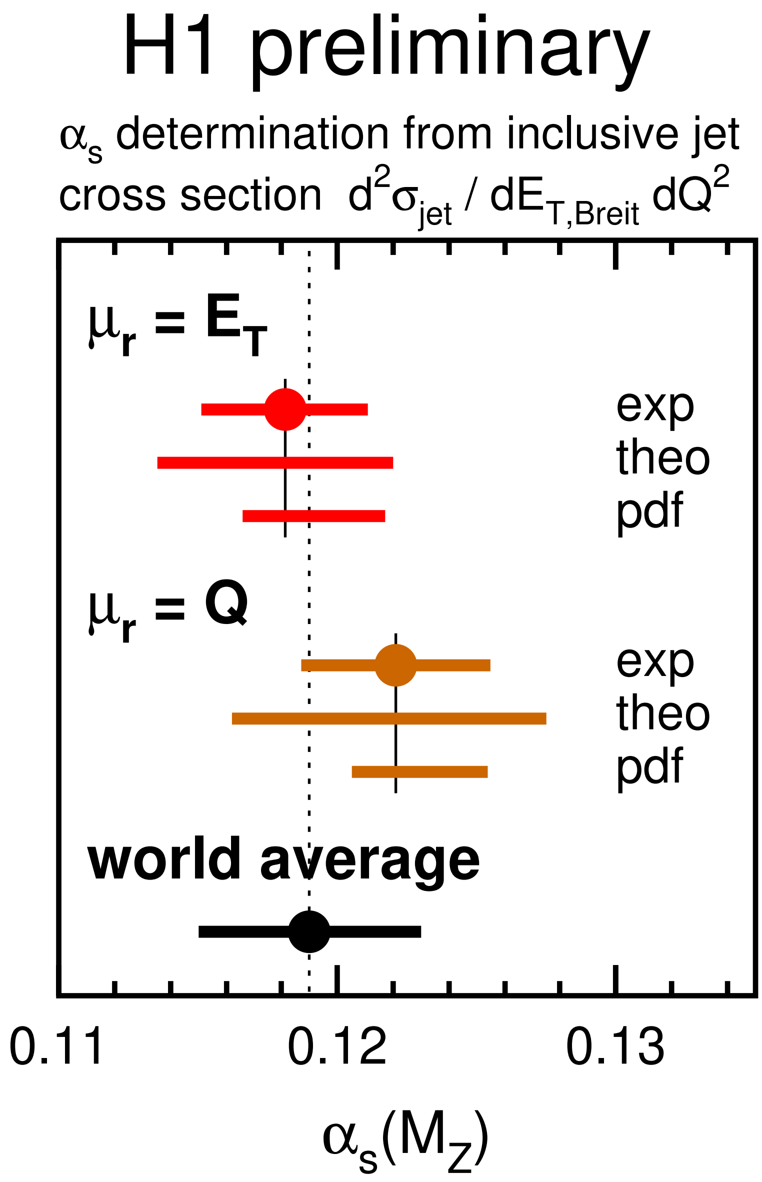
$\mu_r = Q$ $\quad$ modified Durham algorithm in laboratory frame

$\alpha_s(M_Z) = 0.1143\ {}^{+0.0075}_{-0.0089}\ \text{(exp)}\ {}^{+0.0074}_{-0.0064}\ \text{(theo)}\ {}^{+0.0008}_{-0.0054}\ \text{(pdf)}$

World Average

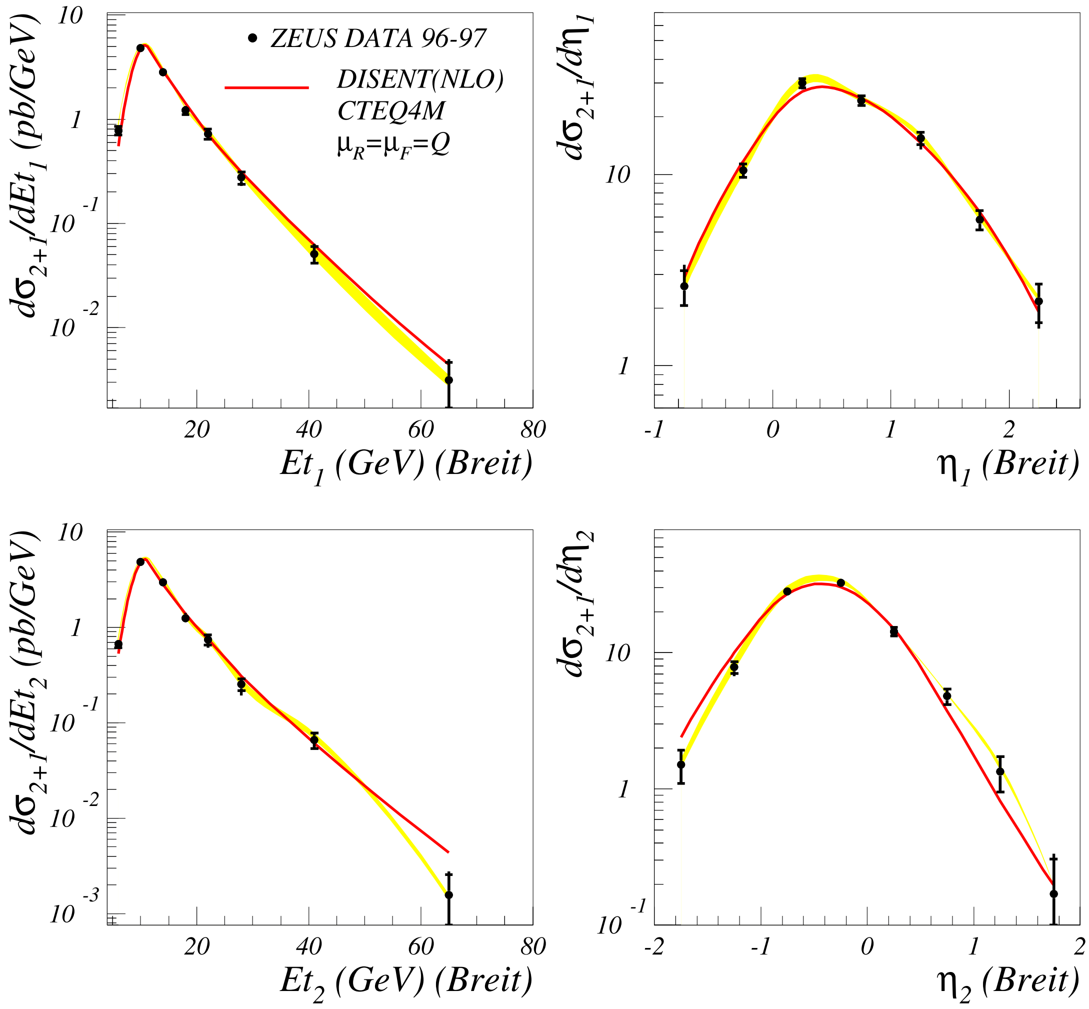
$\alpha_s(M_Z) = 0.119 \pm 0.004$ $\quad$ (S. Bethke hep-ex/9812026)

Inclusive Jets



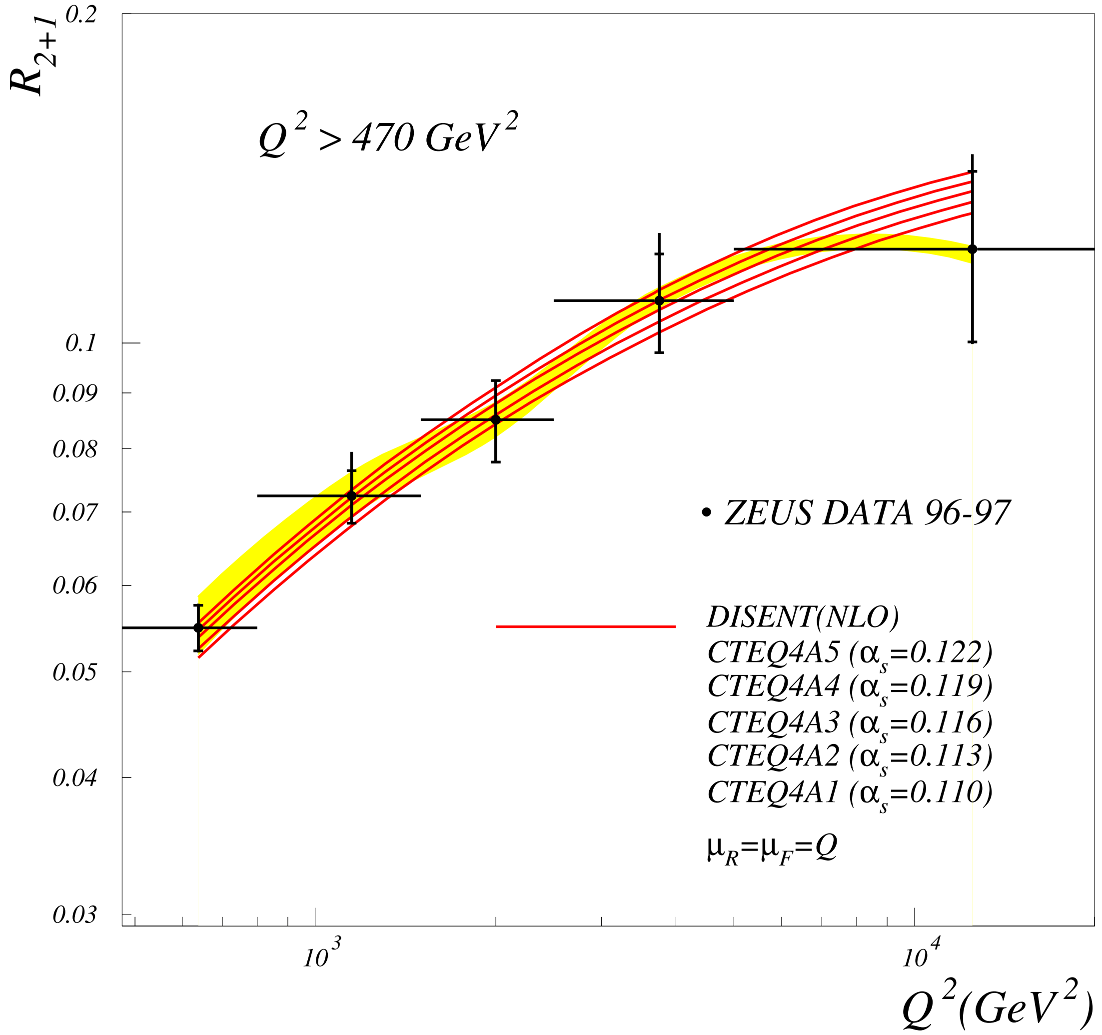
Di-Jets

ZEUS 96-97 PRELIMINARY

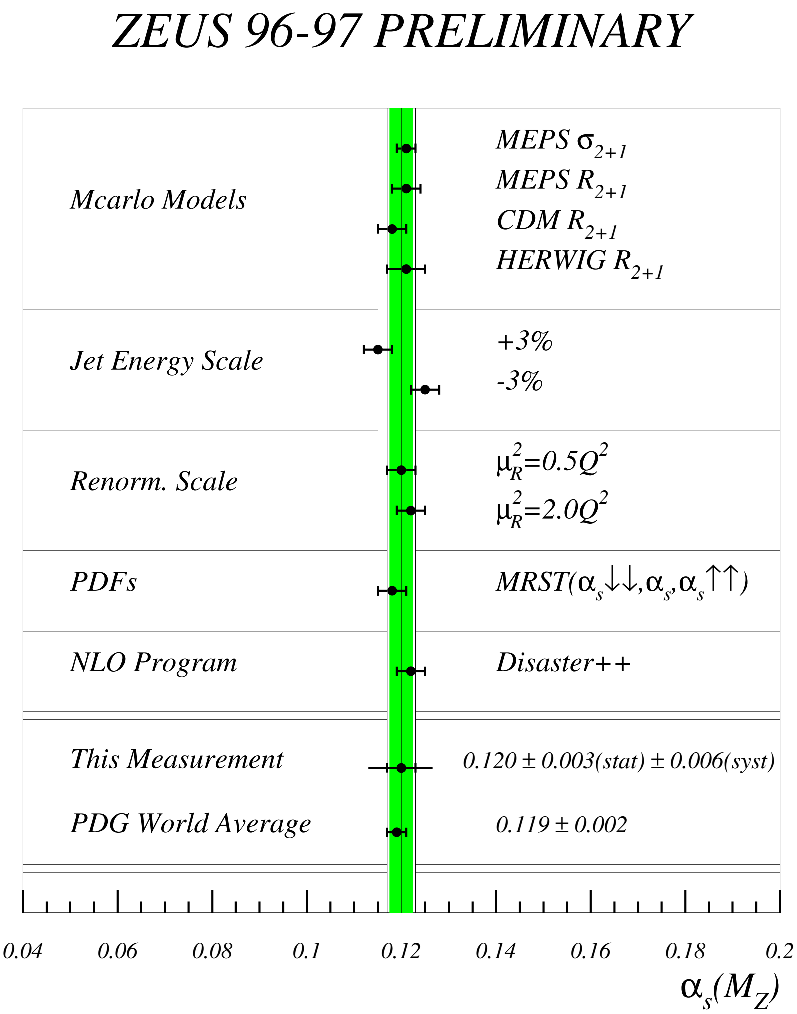


Di-Jets

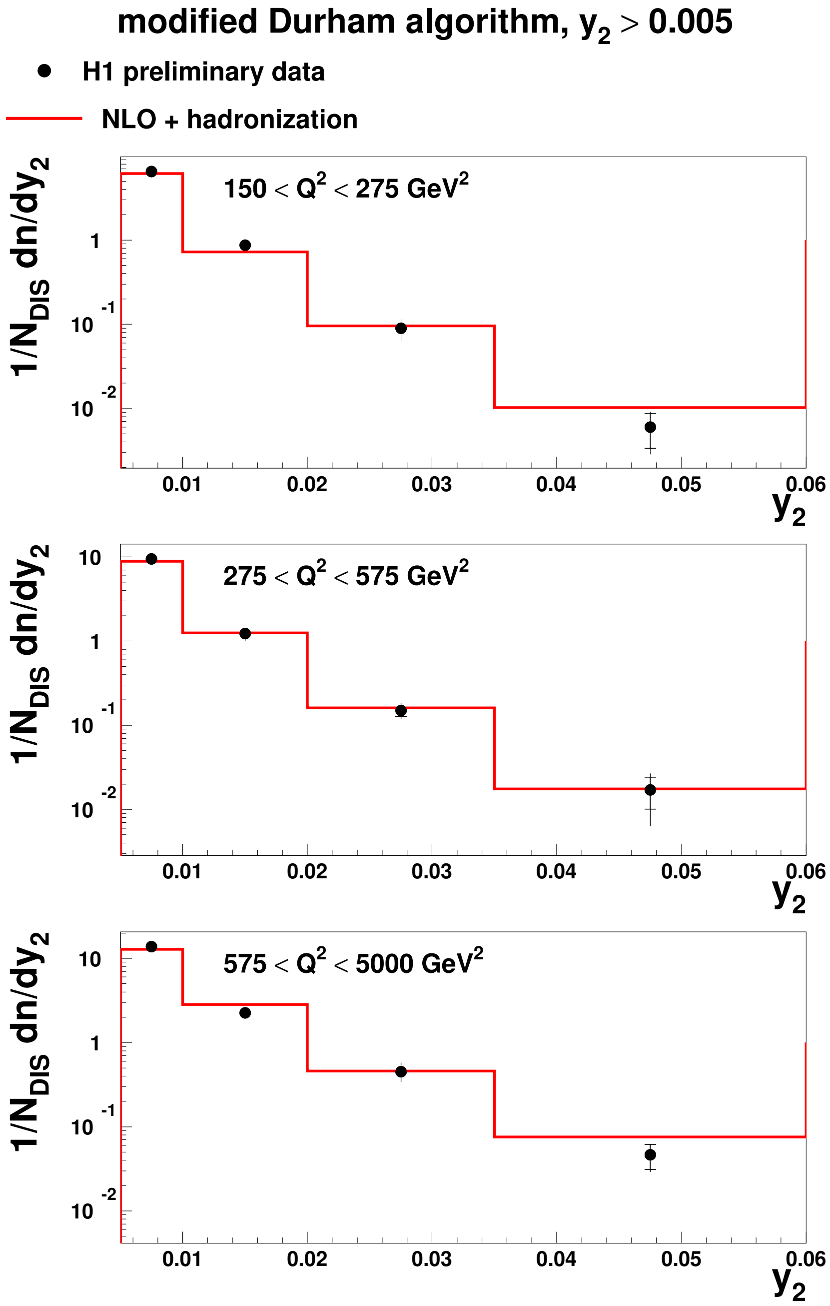
ZEUS 96-97 PRELIMINARY



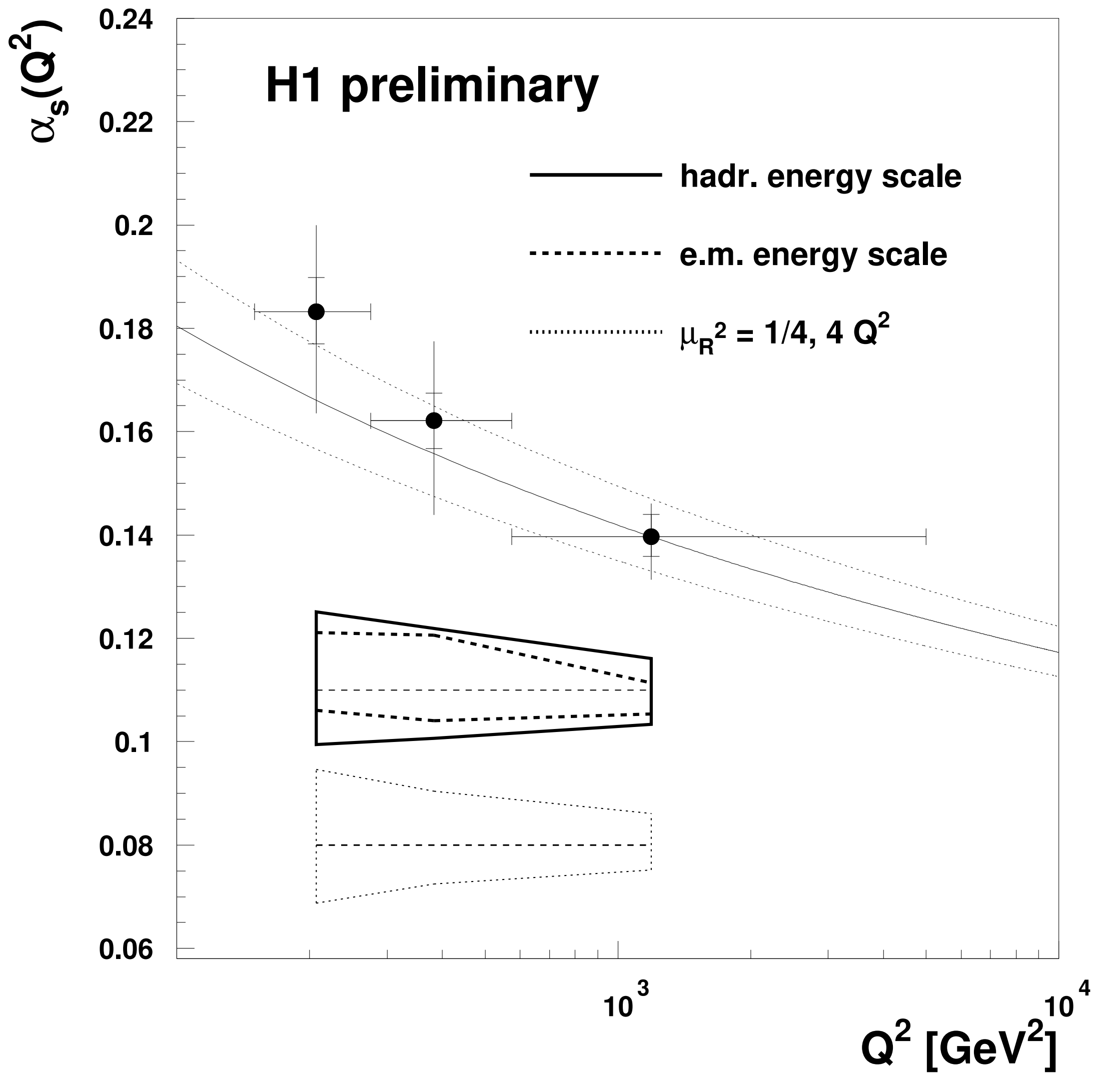
Di-Jets


ZEUS 96-97 PRELIMINARY
Mcarlo Models
MEPS σ_{2+1}
MEPS R_{2+1}
CDM R_{2+1}
HERWIG R_{2+1}
Jet Energy Scale
+3%
-3%
Renorm. Scale
$\mu_R^2=0.5Q^2$
$\mu_R^2=2.0Q^2$
PDFs
MRST($\alpha_s\downarrow\downarrow,\alpha_s,\alpha_s\uparrow\uparrow$)
NLO Program
Disaster++
This Measurement
0.120 ± 0.003(stat) ± 0.006(syst)
PDG World Average
0.119 ± 0.002
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
$\alpha_s(M_Z)$

Di-Jets


modified Durham algorithm, $y_2 > 0.005$
H1 preliminary data
NLO + hadronization
$150 < Q^2 < 275$ GeV^2
$275 < Q^2 < 575$ GeV^2
$575 < Q^2 < 5000$ GeV^2
$1/N_{DIS}\ dn/dy_2$
y_2

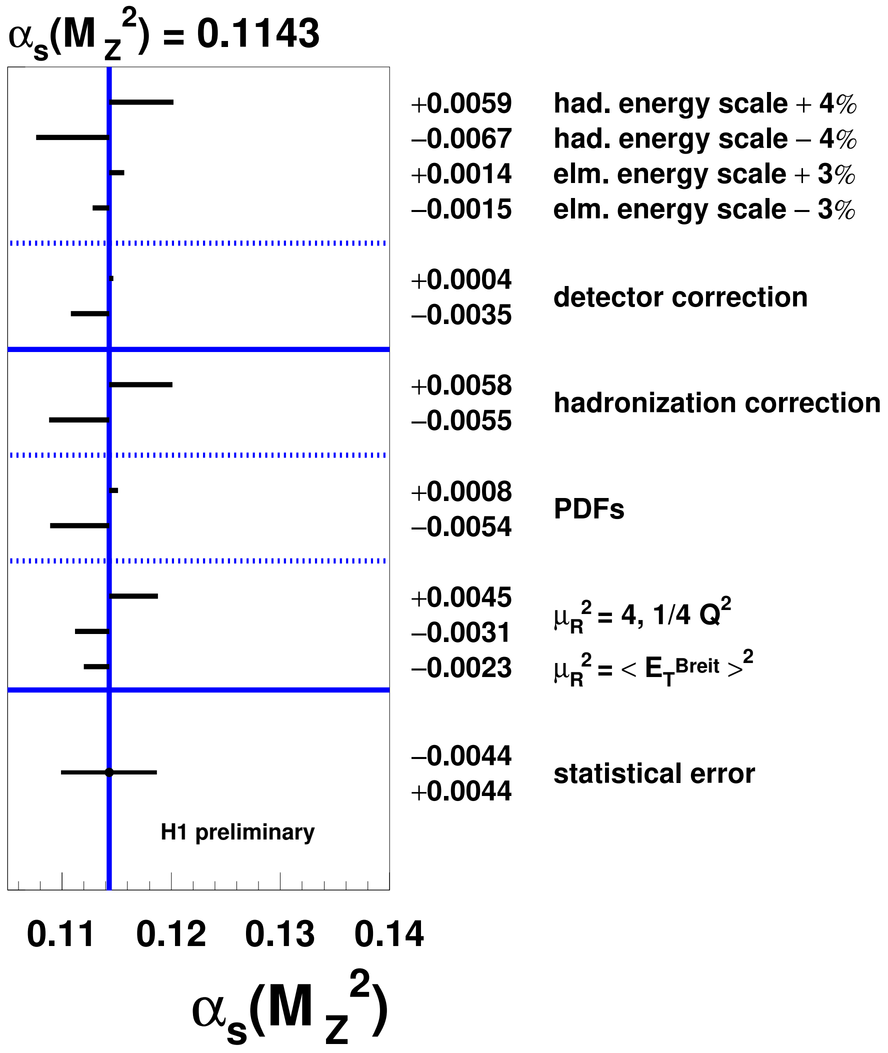
Di-Jets



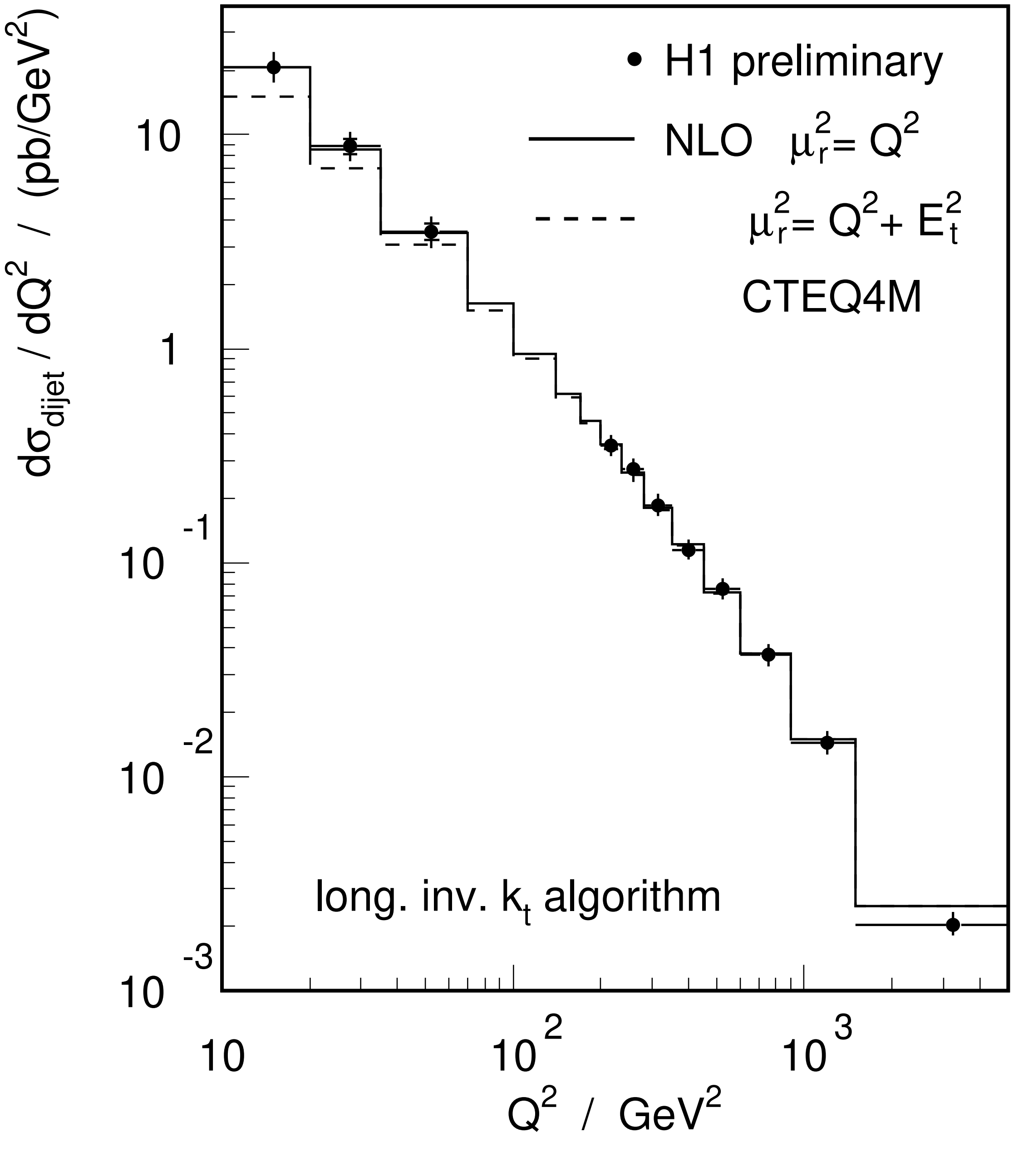
H1 preliminary
hadr. energy scale
e.m. energy scale
μ_R^2 = 1/4, 4 Q^2
$\alpha_s(Q^2)$
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
10^3
10^4
Q^2 [GeV^2]

Di-Jets

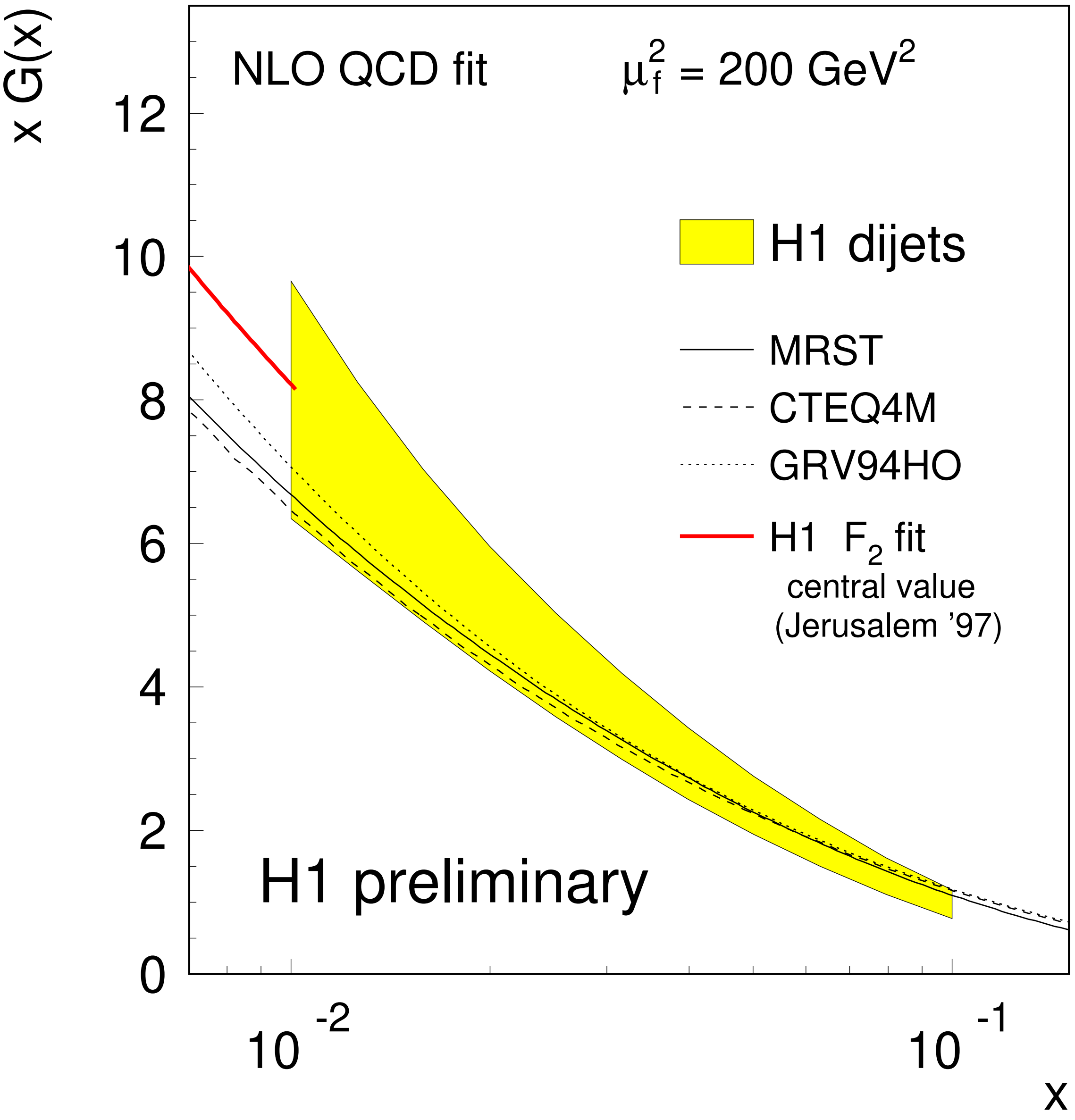
mod. Durham algorithm, $575 < Q^2 < 5000$ GeV^2



Dijets

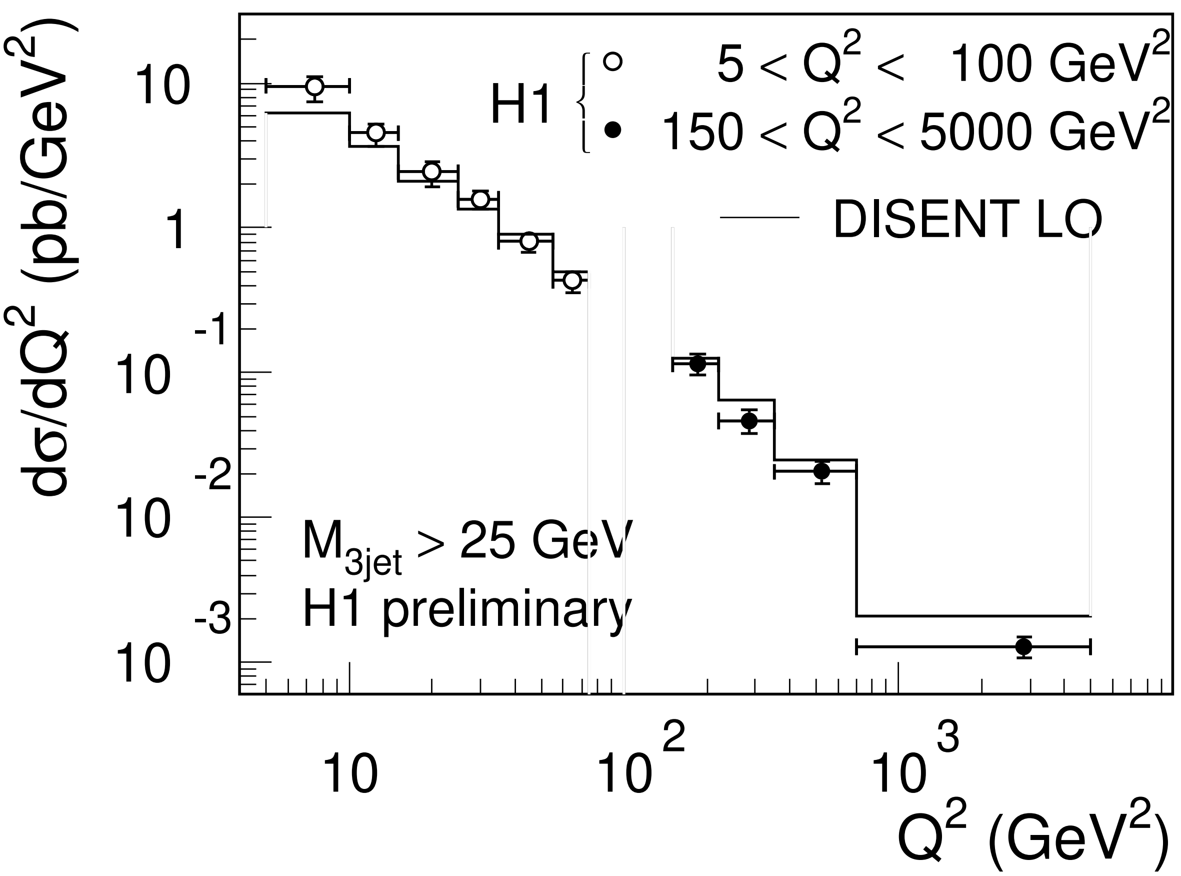

H1 preliminary
NLO $\mu_r^2 = Q^2$
$\mu_r^2 = Q^2 + E_t^2$
CTEQ4M
long. inv. k_t algorithm
$d\sigma_{dijet} / dQ^2$ / (pb/GeV^2)
Q^2 / GeV^2
10
1
10^{-1}
10^{-2}
10^{-3}
10^2
10^3

Dijets



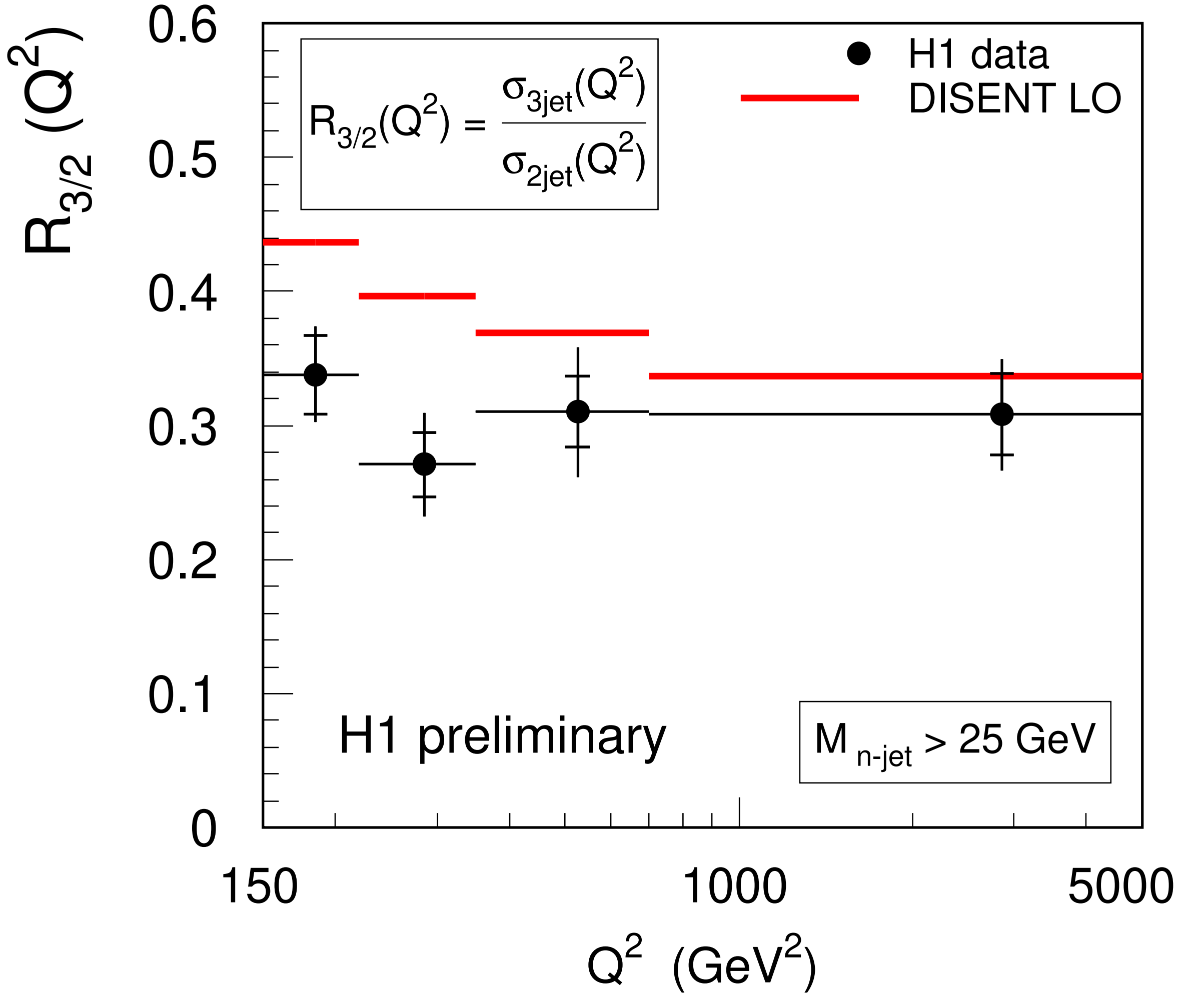
x G(x)
NLO QCD fit
μ_f^2 = 200 GeV^2
H1 dijets
MRST
CTEQ4M
GRV94HO
H1 F_2 fit
central value
(Jerusalem '97)
H1 preliminary
0
2
4
6
8
10
12
10^{-2}
10^{-1}
x

Tri-Jets



H1
5 < Q2 < 100 GeV2
150 < Q2 < 5000 GeV2
DISENT LO
M3jet > 25 GeV
H1 preliminary
dσ/dQ2 (pb/GeV2)
Q2 (GeV2)

Tri-Jets



$R_{3/2}(Q^2)$
$R_{3/2}(Q^2) = \frac{\sigma_{3jet}(Q^2)}{\sigma_{2jet}(Q^2)}$
H1 data
DISENT LO
H1 preliminary
$M_{n\text{-}jet} > 25$ GeV
0.6
0.5
0.4
0.3
0.2
0.1
0
150
1000
5000
Q^2 (GeV^2)