Inclusive Jet Production in Low Q^2 DIS

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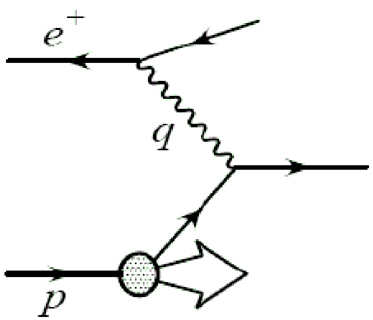
on behalf of the H1 Collaboration

- **Motivation**
- **Event Selection**
- **Results**
- **Conclusion**

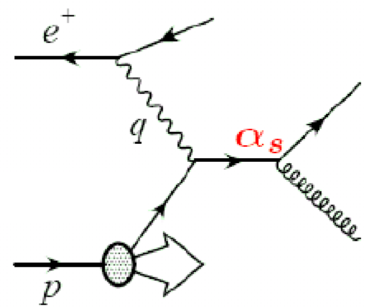
Motivation

- **High Statistics**
- **IR safety**
- **few non-perturbative complications**

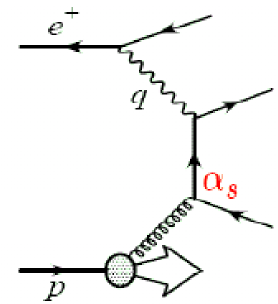
➔ **This investigation gives information on how low in Q^2 and E_t we can use theory.**



Born Term



QCD Compton



Boson Gluon fusion

Jet Event Selection (Low Q^2 NC events)

Data sample:

HERA-1 (1999-2000), Lumi=43.6 pb^{-1}

Phase Space

- **$5 < Q^2 < 100$ GeV^2**
- **$0.2 < y < 0.7$**

Jet Selection

- **In the Breit reference frame. Inclusive k_t algorithm**
- **$E_t > 5$ GeV (in the Breit frame)**
- **$-1.0 < \eta_{(lab)} < 2.5$ (in the lab frame)**

  (range in which jets are well contained in the acceptance of the H1-LAr calorimeter)

Total about 150.000 events

Control, Correction, Systematic

- Monte Carlo files used for control & corrections
  - DJANGOH (CDM)
  - RAPGAP (ME + PS)
  - HERACLES for QED radiation correction
- Bins chosen to have stability and purity ≥ 50%
- Bin-to-bin correction procedure for
  - Detector&QED: 1.3 – 1.9
  - Hadronization: 1.1 – 1.2

Comparison with theory

- Results compared with NLO pQCD
  - NLOJet++ with CTEQ6.1M
  - $\overline{MS}$ scheme for five quarks flavours
- Uncertainties on NLO predictions estimated from:

- scale uncertainties: variation of factorization μ_f=Q and renormalization μ_r=E_t scales by factors 2 and ½

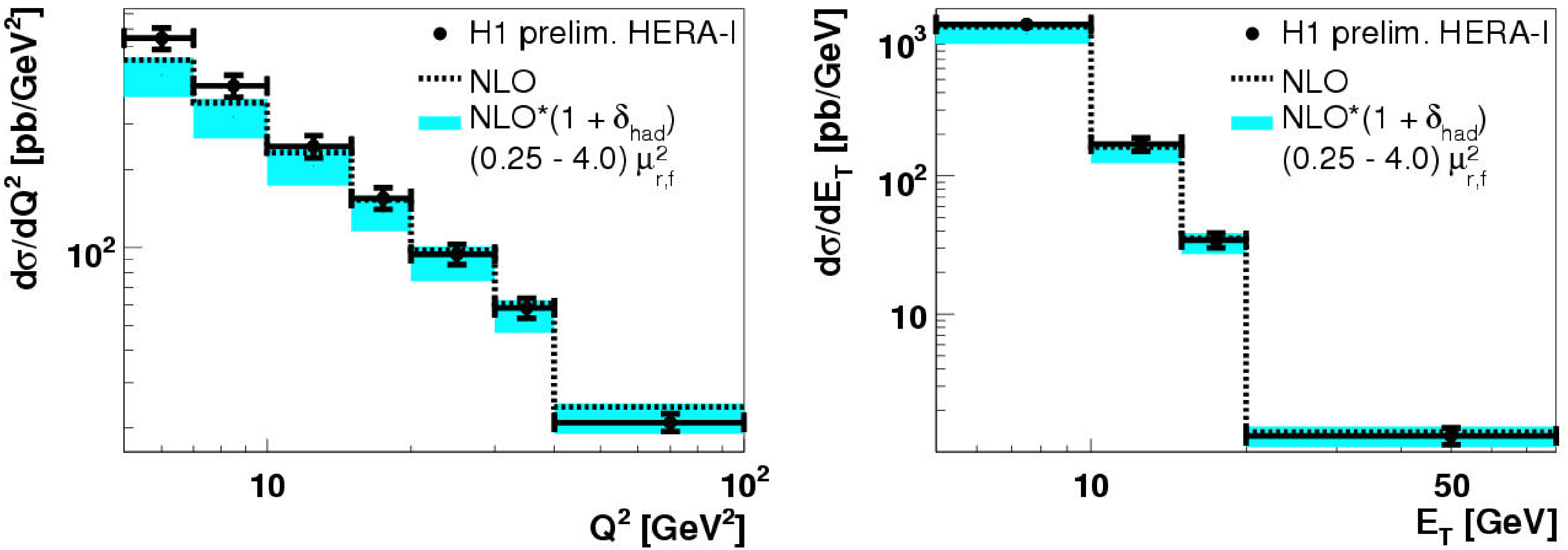
- PDF uncertainties- use 40 eigenvectors of CTEQ6.1M

- vary $\alpha_s(M_z)$ from 0.116 to 0.120

Results

Single and double differential cross sections vs. E_t and Q^2 for inclusive jets are measured.

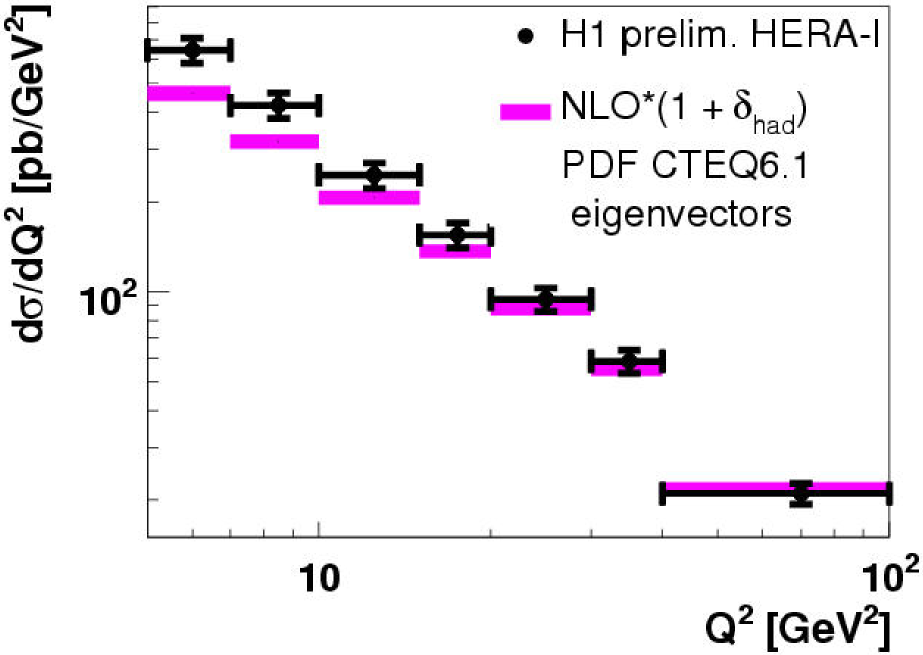
H1 Inclusive Jet Cross Sections $\frac{d\sigma}{dQ^2}$, $\frac{d\sigma}{dE_T}$

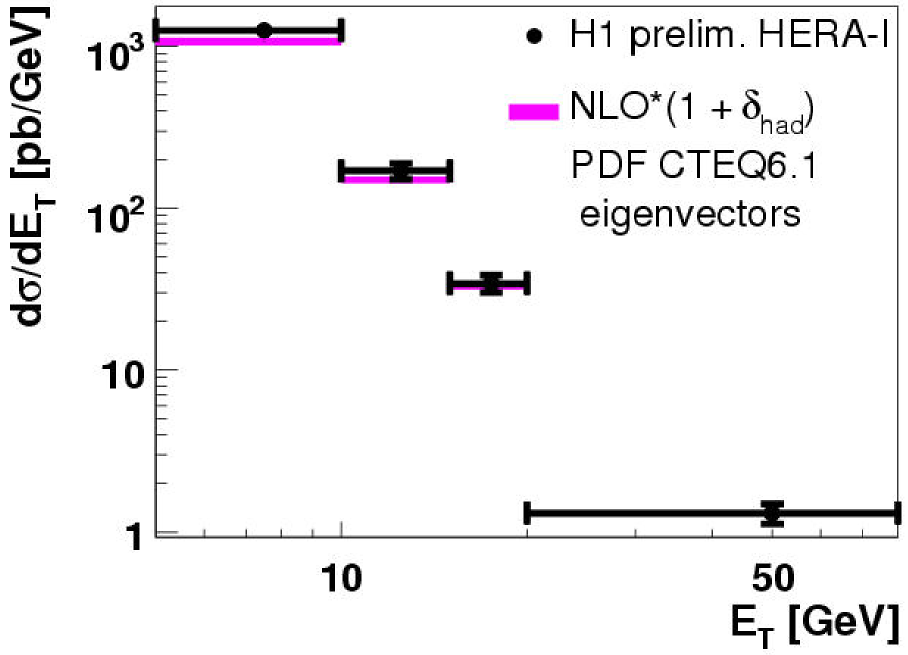


Factorization μ_f=Q and renormalization μ_r=E_t scales varied by factors 2 and ½ to estimate scale uncertainties ➔ ~20%.

NLO describes well for Q^2 > 10 GeV^2 or E_t > 10 GeV within uncertainties

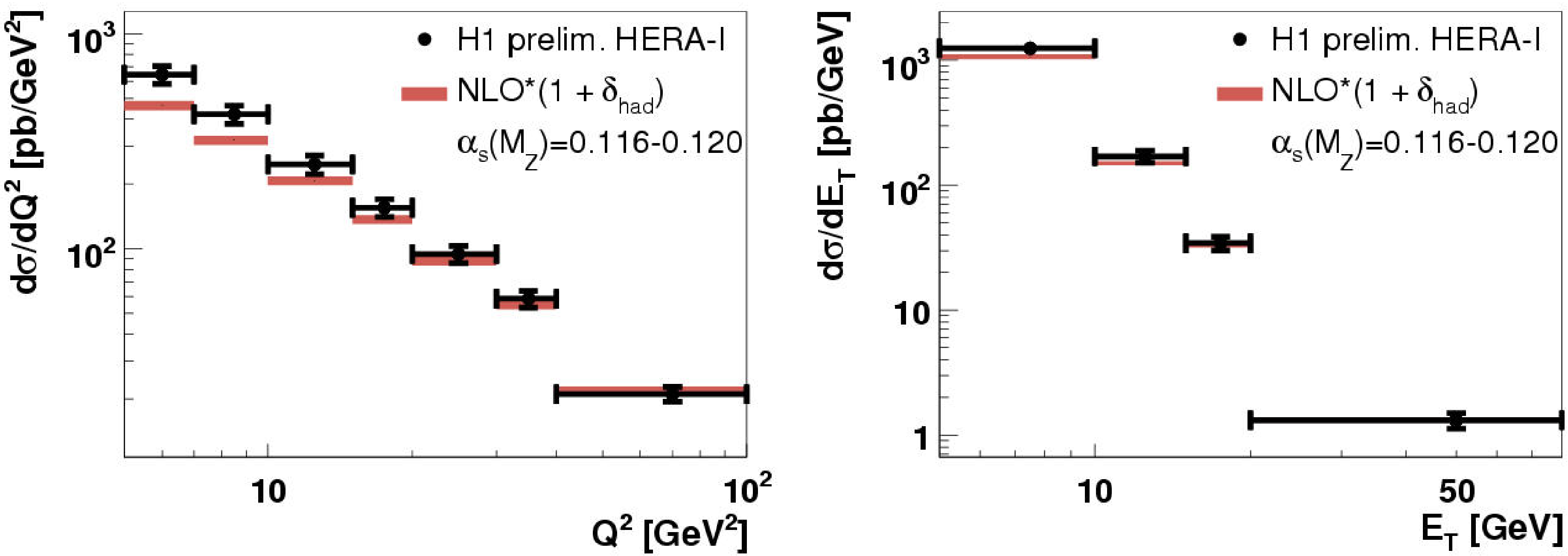
H1 Inclusive Jet Cross Sections $\frac{d\sigma}{dQ^2}$, $\frac{d\sigma}{dE_T}$





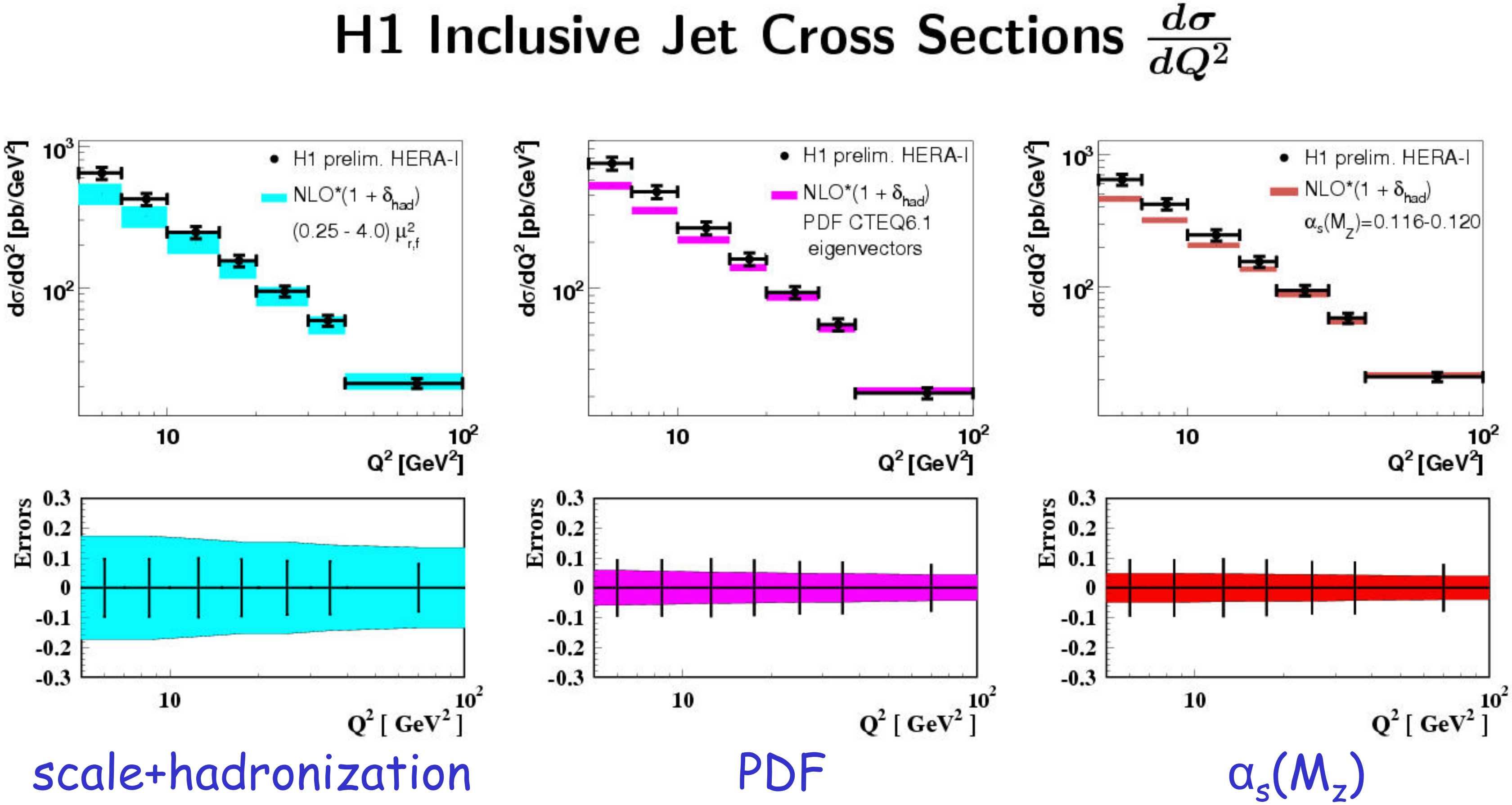
Variation of 40 eigenvectors of CTEQ6.1M gives PDF uncertainties ➔~ 6%

H1 Inclusive Jet Cross Sections $\frac{d\sigma}{dQ^2}$, $\frac{d\sigma}{dE_T}$



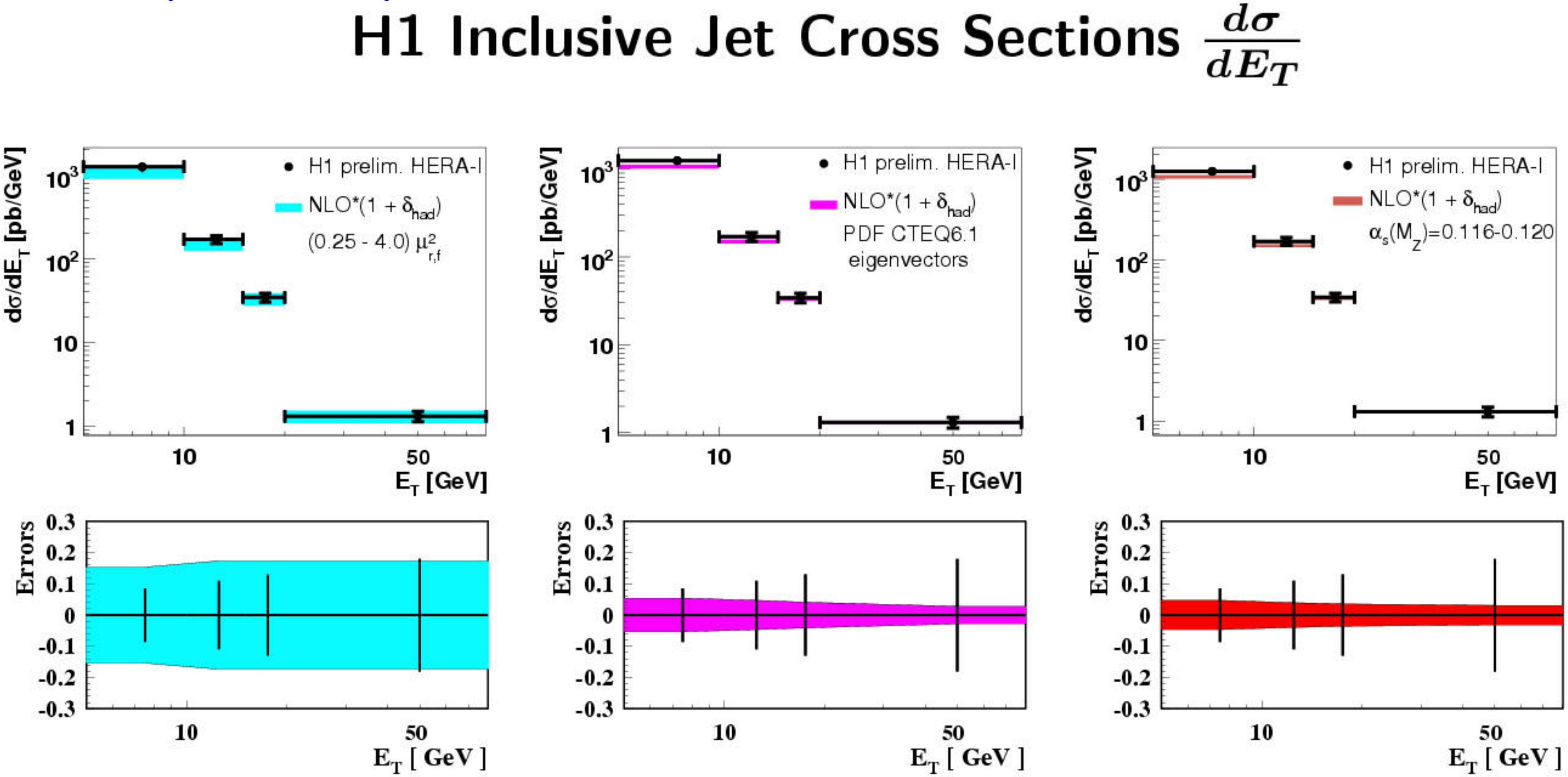
Variation of $\alpha_s(M_z)$ from 0.116 to 0.120 gives up to ➔ ~ 5% uncertainties

Inclusive cross-sections vs. Q^2: compare experimental and theoretical uncertainties



Main uncertainties in NLO are from scale variation.

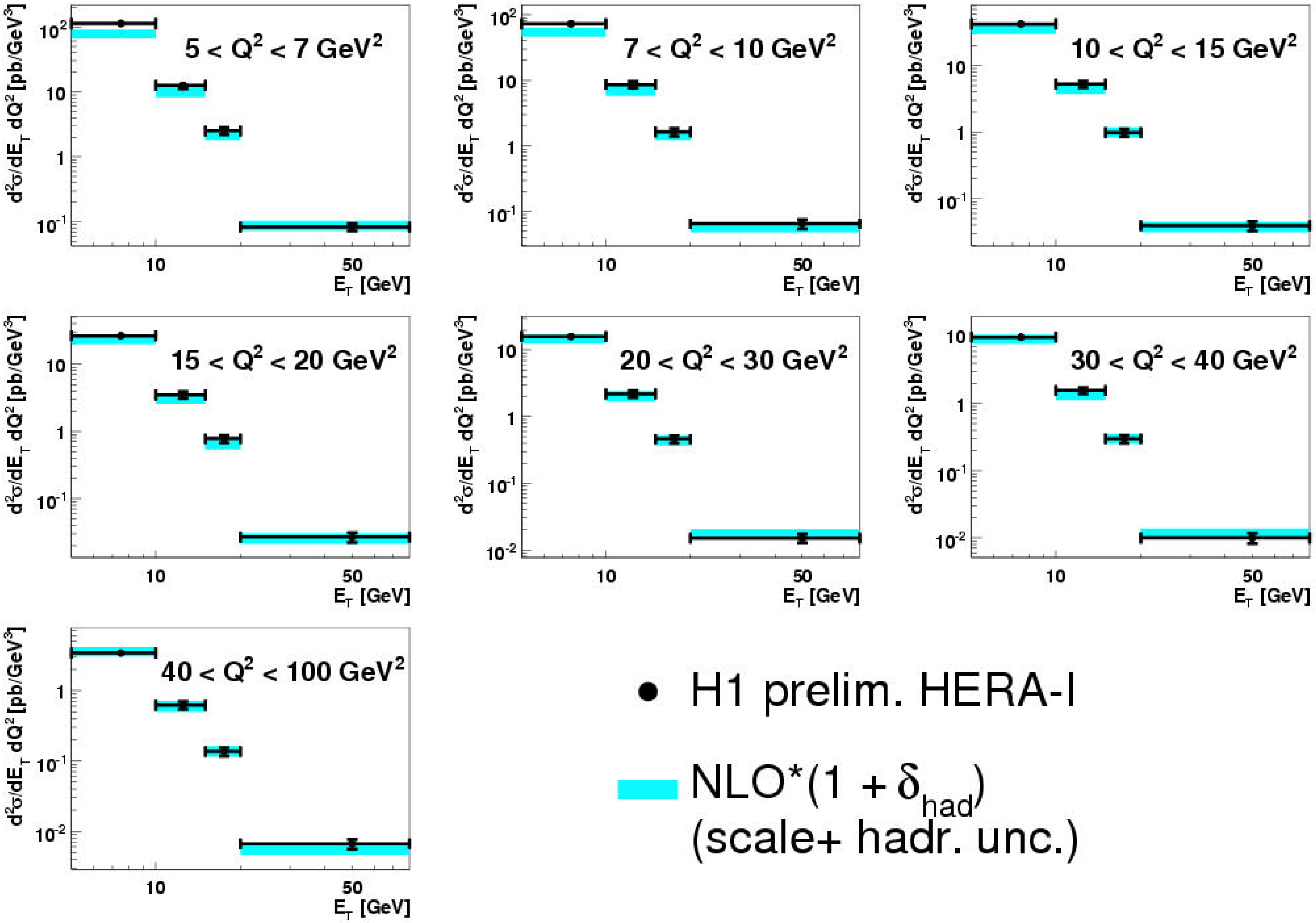
Inclusive cross-sections vs. E_t: compare experimental and theoretical uncertainties



scale+hadronization PDF $\alpha_s(M_z)$

Main uncertainties in NLO are from scale variation.

H1 Inclusive Jet Cross Sections $\frac{d^2\sigma}{dQ^2 dE_T}$



NLO describes well if Q^2 or E_t not too small

Conclusion

- New measurements of inclusive jet cross sections at low Q^2 with reduced statistical and systematic uncertainties are presented
- Good agreement with NLO pQCD calculations for inclusive jet cross sections at $Q^2 > 10$ GeV^2 or $E_t > 10$ GeV
- Uncertainties are dominated by scale variation effects → need for next order of pQCD calculations (NNLO)