# Is Factorization Broken?

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HERA-LHC Workshop

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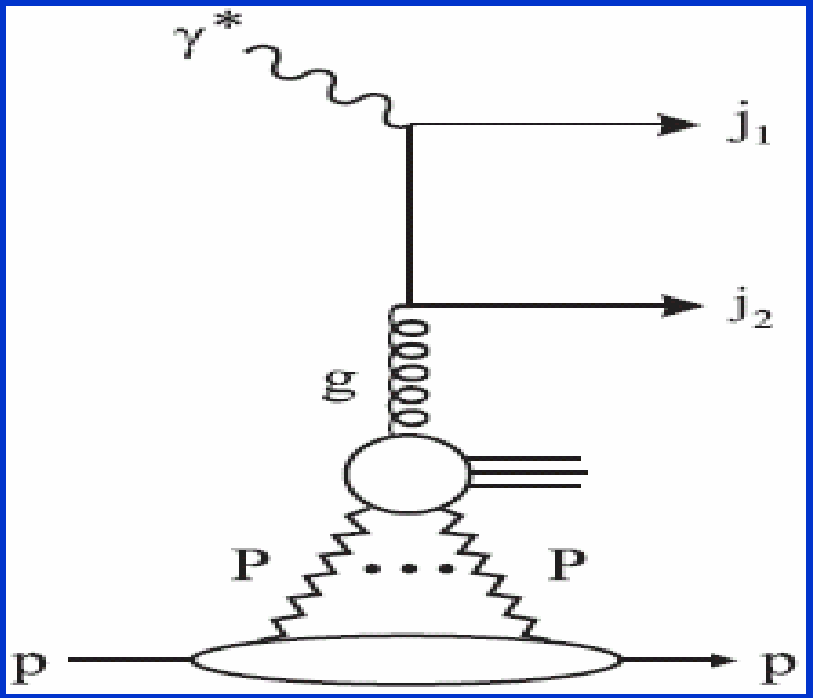
- Theory: ``Though shalt not suppress the direct contribution.‘‘
- Experiment: ``We can do that anyway and fit our data!‘‘

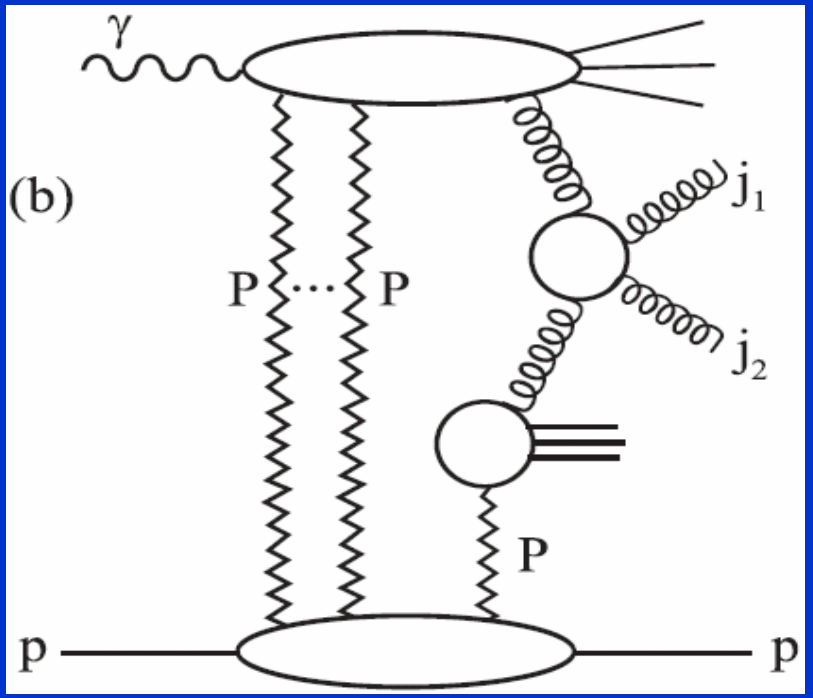
# Multi-Pomeron Exchanges

Direct photoproduction:



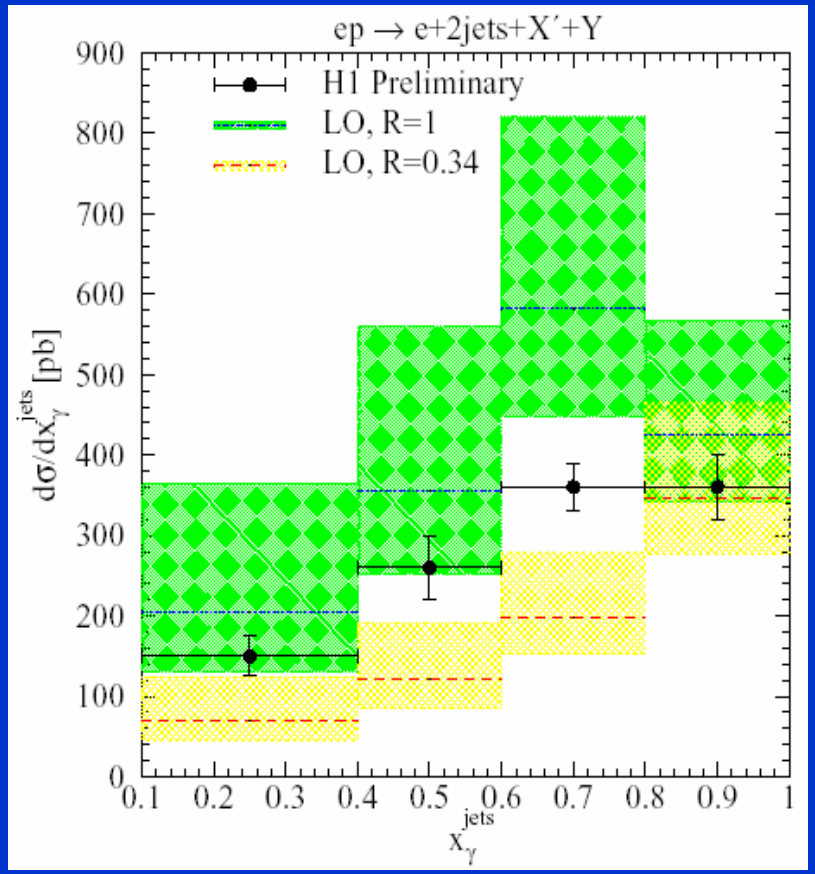

→ Modification of the Regge trajectory

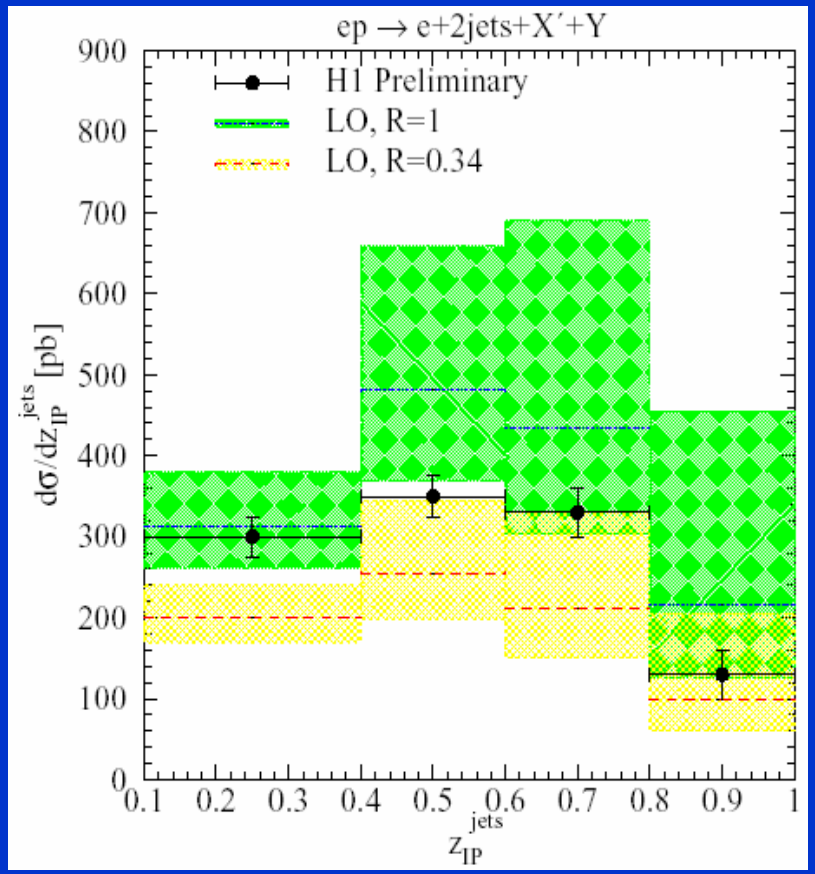
Resolved photoproduction:



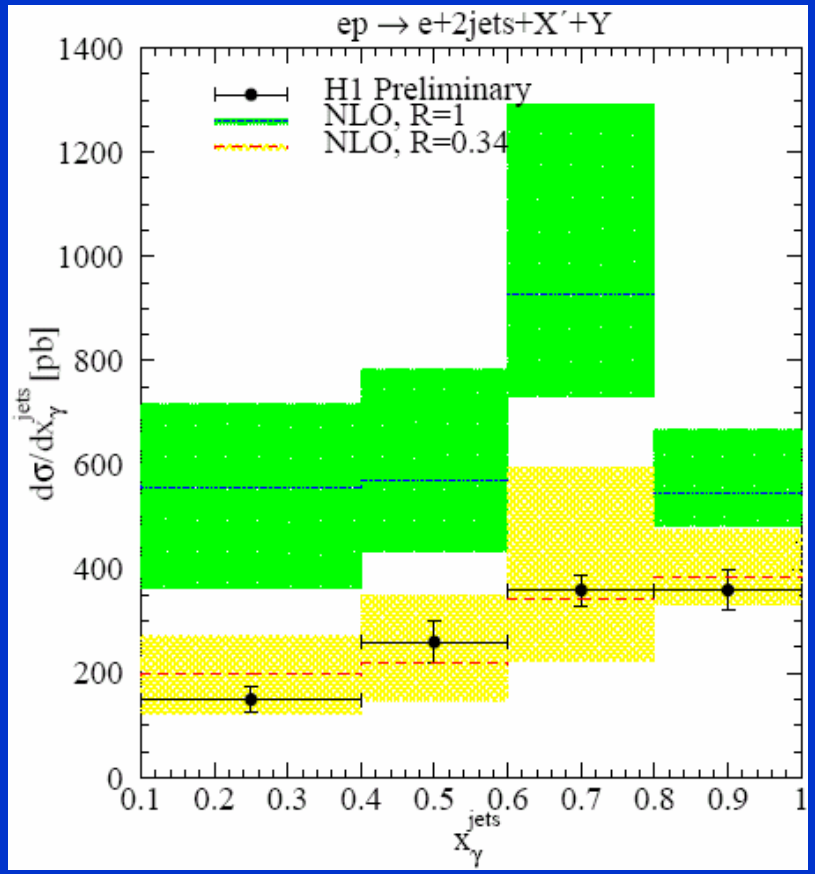

→ Factorization breaking

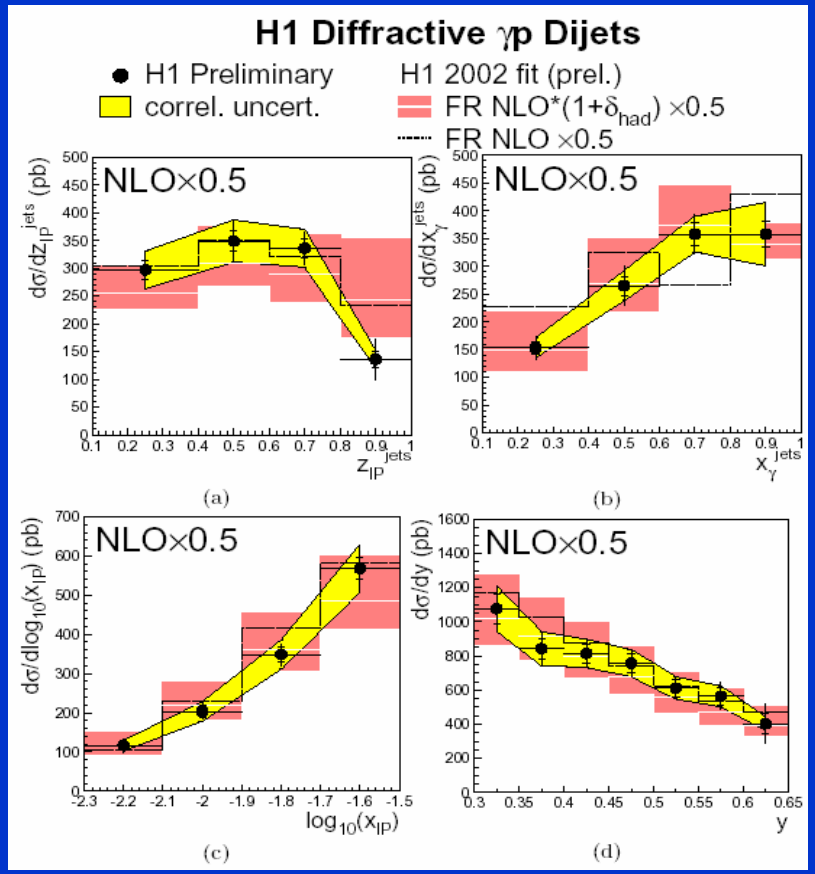
# Photoproduction at LO: No Evidence for Factorization Breaking



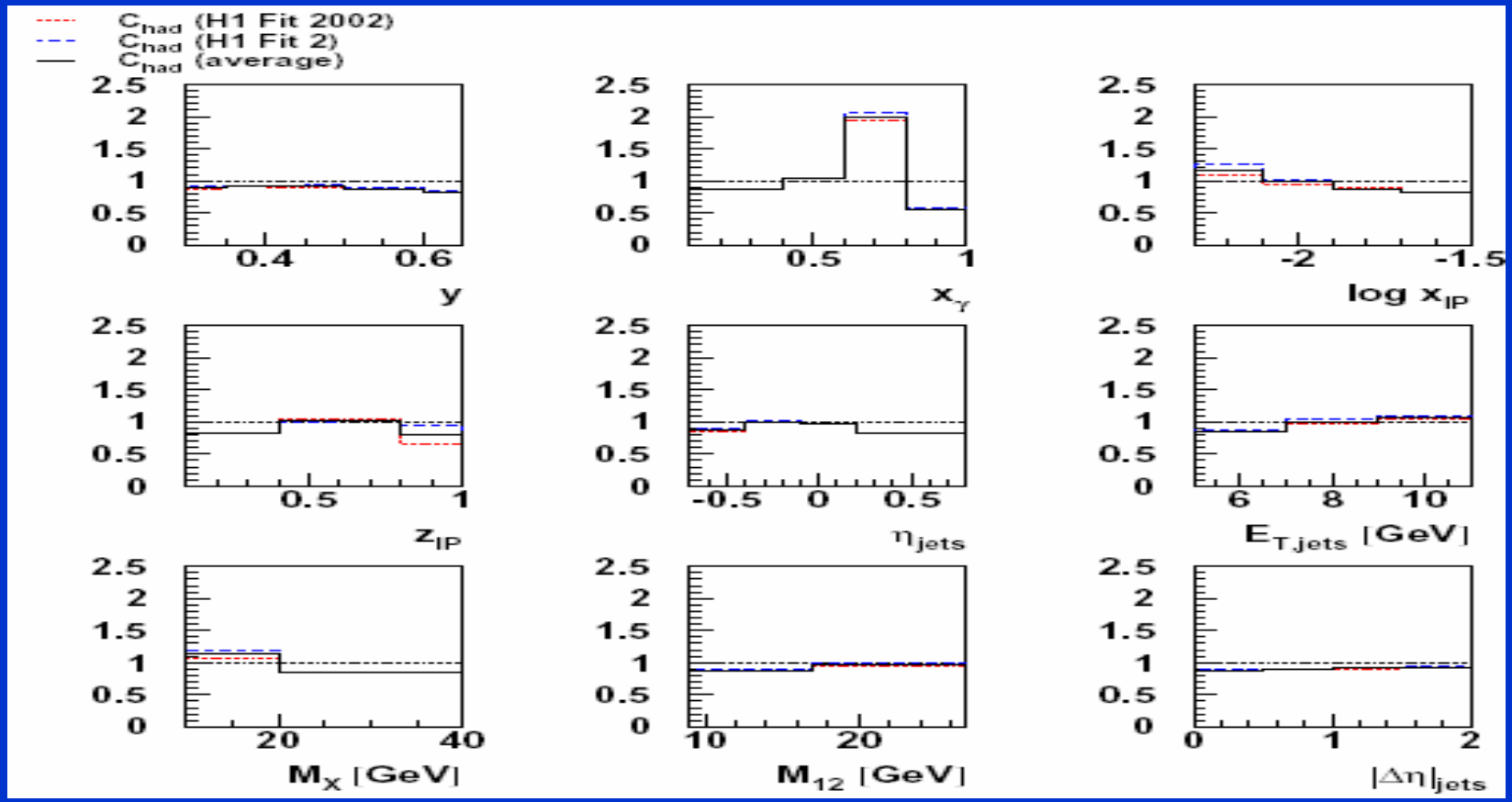



# Photoproduction at NLO: Large K-Factor ↔ Survival Probability

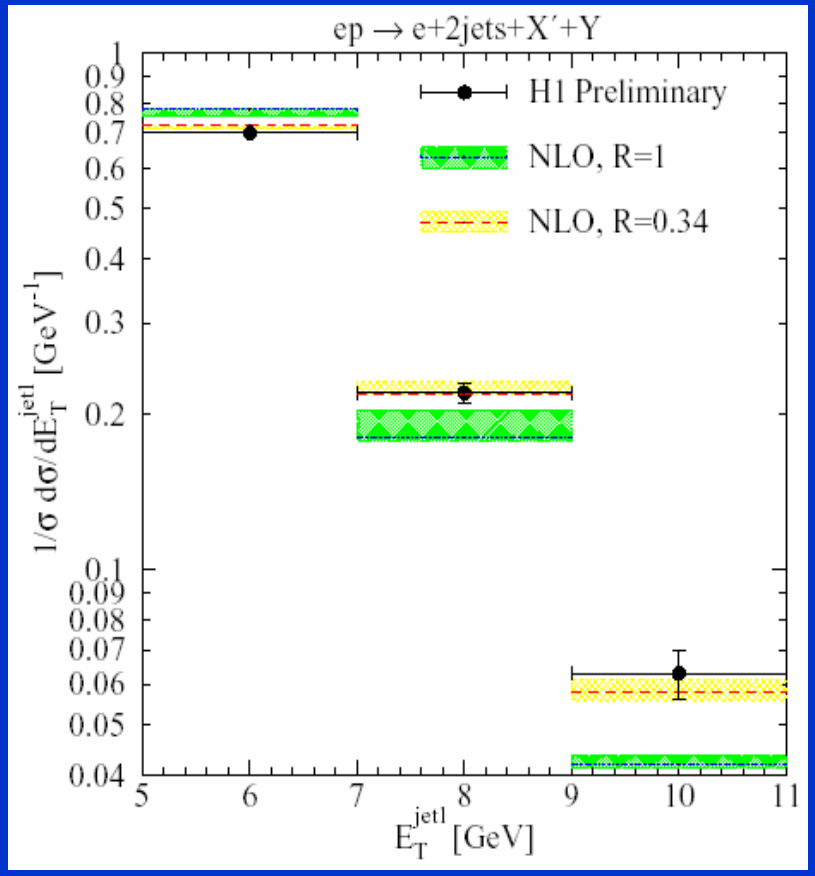


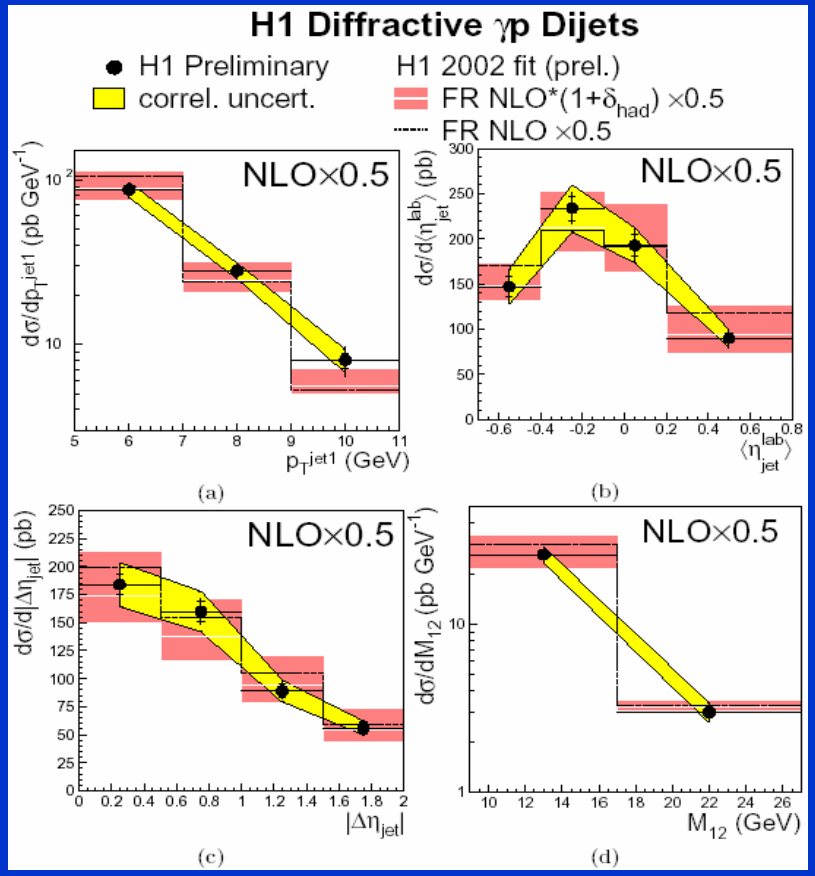



# Hadronization Corrections: Observable- and Model-Dependent

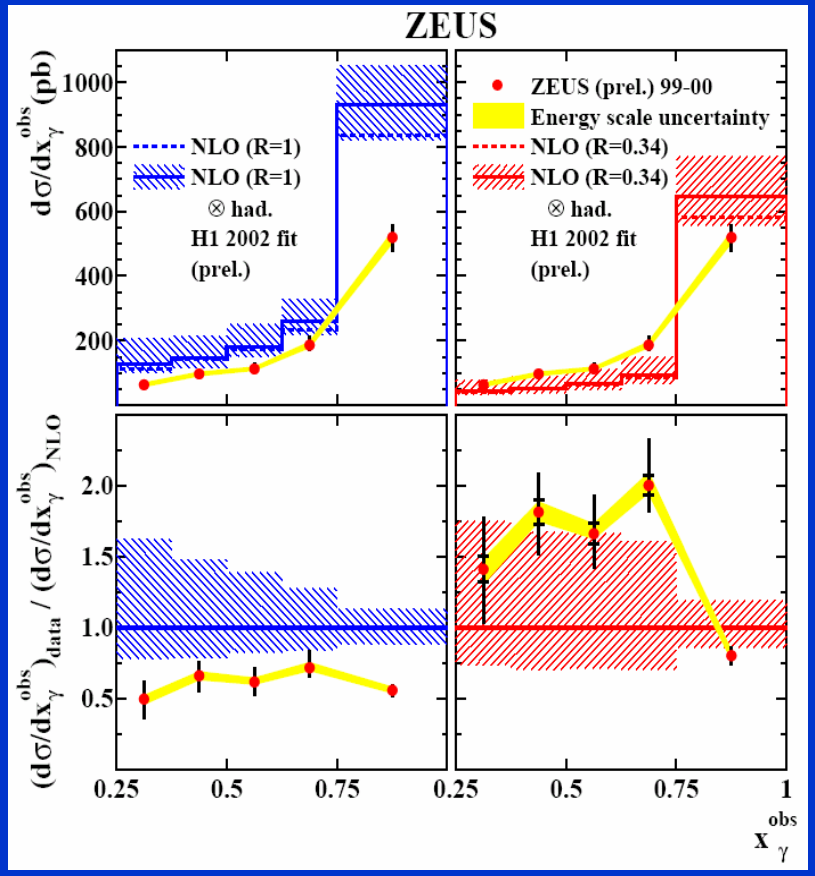


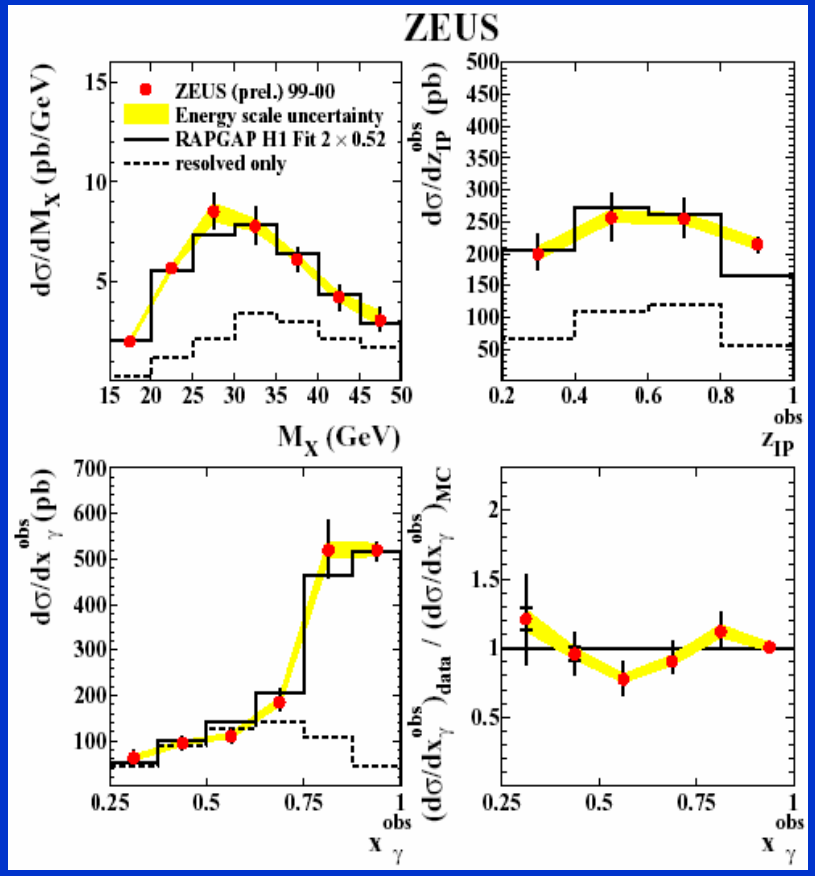
# Direct Photoproduction: Should Dominate at Large $E_T$



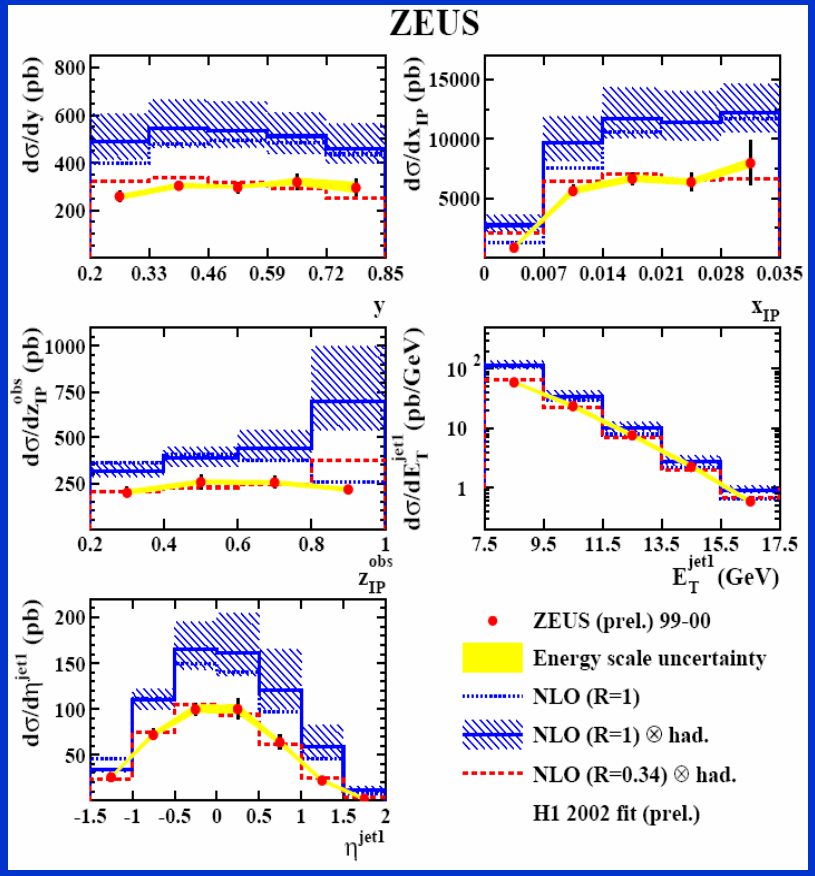



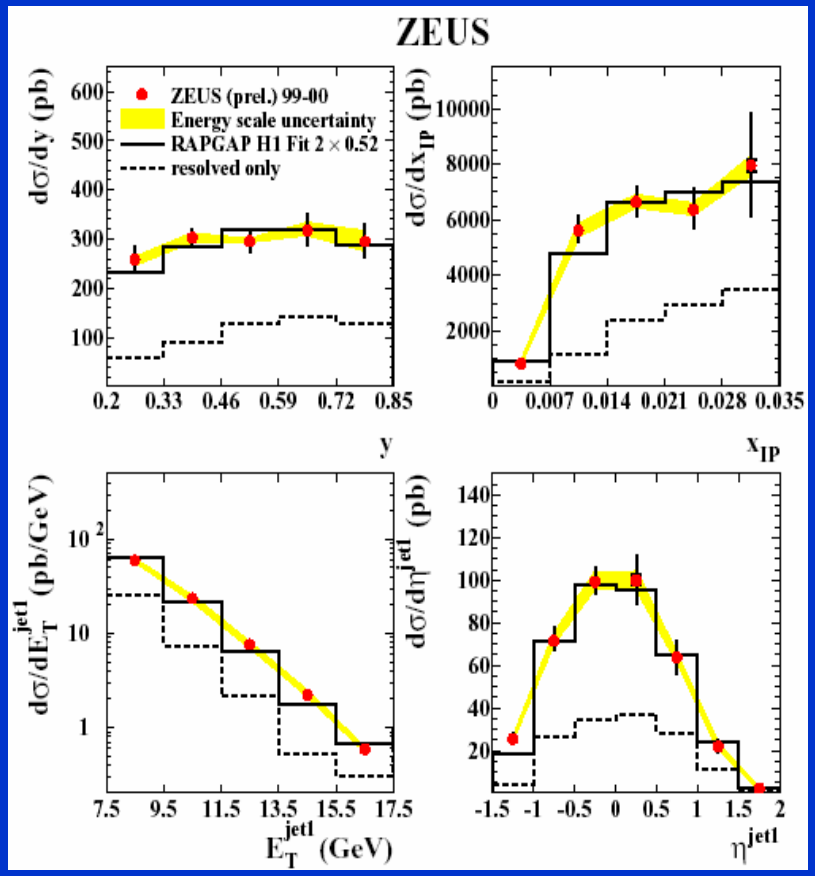
# ZEUS Analysis (1)



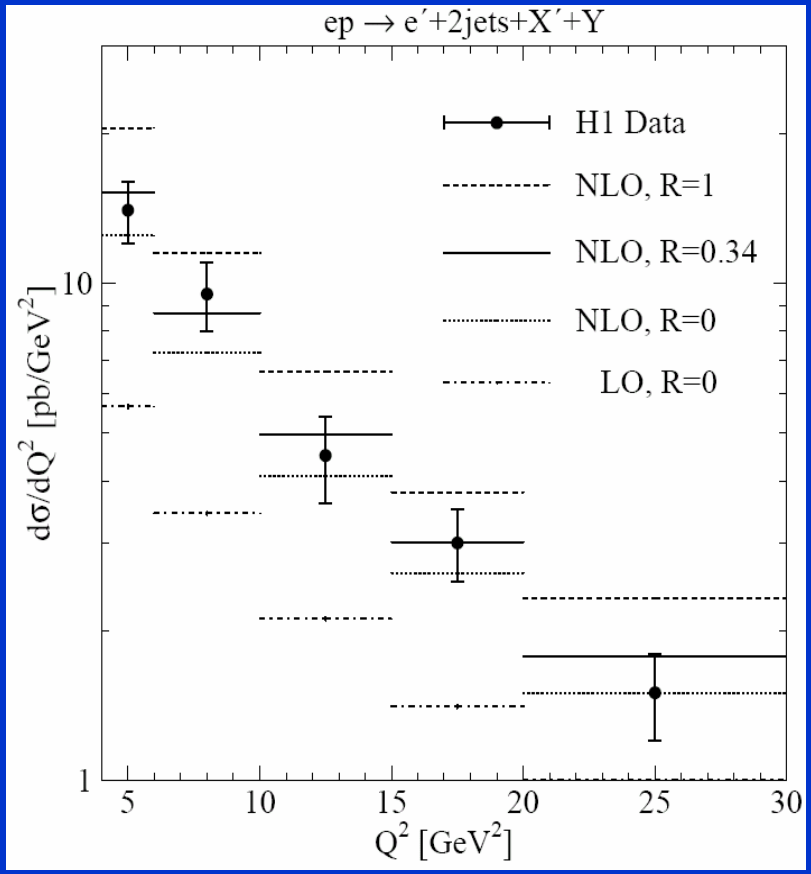



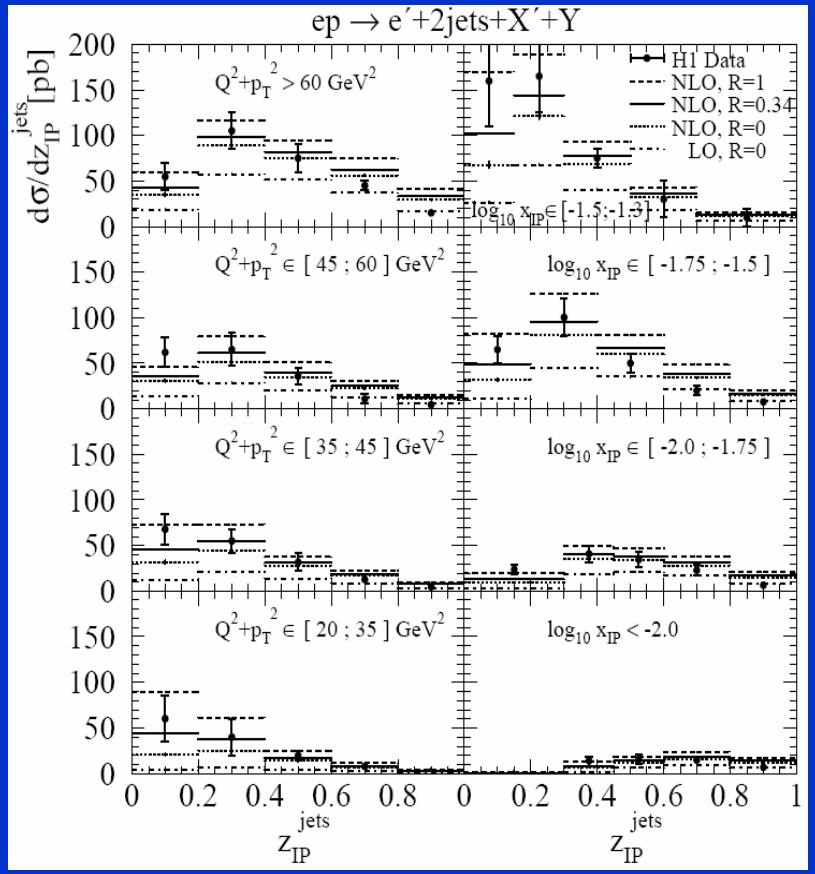
# ZEUS Analysis (2)



# High- to Low-$Q^2$ Transition in DIS: From Factorization to its Breaking



# Discussion

H1 photoproduction: FR (although KK available since 01/04)

- No theoretical motivation for direct suppression
- Separate direct/resolved by $x_\gamma$ <> 0.9
- Do not suppress resolved for $x_\gamma$ > 0.9 by R=0.34

ZEUS photoproduction: KK

- LO Monte Carlo, known to be unreliable in normalization
- Conclusion based only on $x_\gamma$ observable

H1 DIS: DDISENT

- DDISENT, based on $x_{IP}$-slicing, no convolution
- Fixed renormalization scale
- Direct only known to be insufficient for forward jets

# Outlook

Experiments:

- Make data and parton densities available -- soon!
- Reanalyze dijets in photoproduction for higher $E_T$
- Measure ratios of diffractive/inclusive cross sections (at high $E_T$)
  $\rightarrow$ Photon PDF uncertainties cancel
  $\rightarrow$ Hadronization corrections cancel
- Analyze dijets in DIS (ZEUS)

Theory:

- Understand hadronization corrections
- Repeat NLO analyses with ZEUS and MRW partons
- Examine other, more discriminative observables