



# **Discriminative Distributions for Diffraction**

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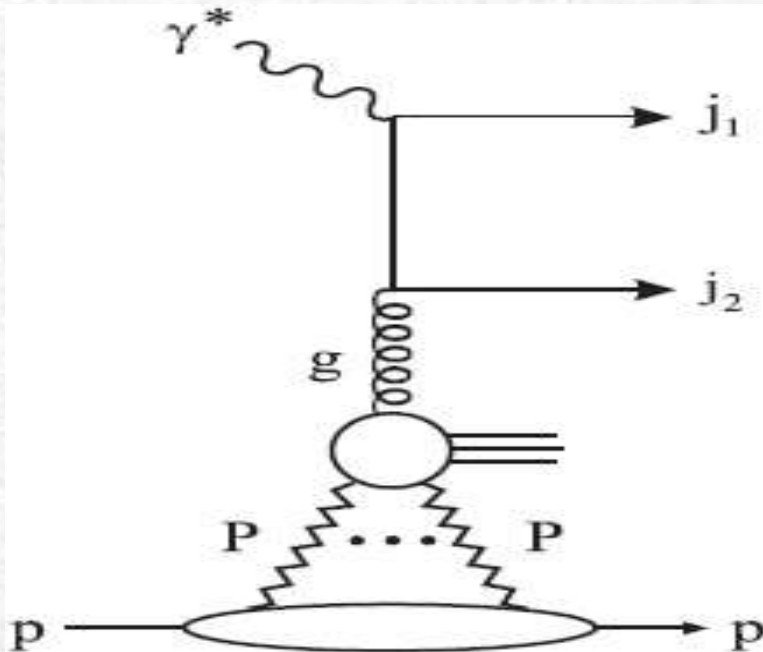
HERA-LHC-Workshop

17 January 2005



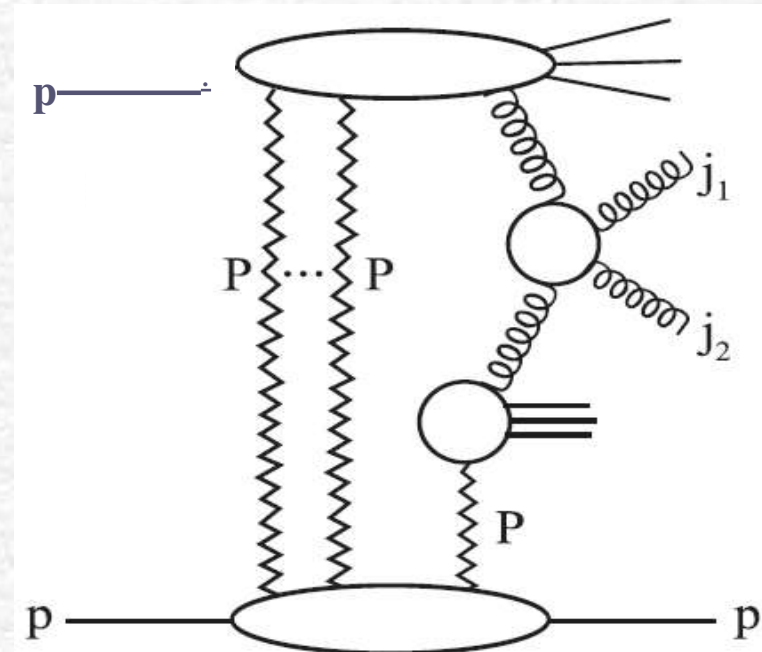
# Multi-Pomeron Exchanges

Deep Inelastic Scattering:



→ Modified Regge trajectory

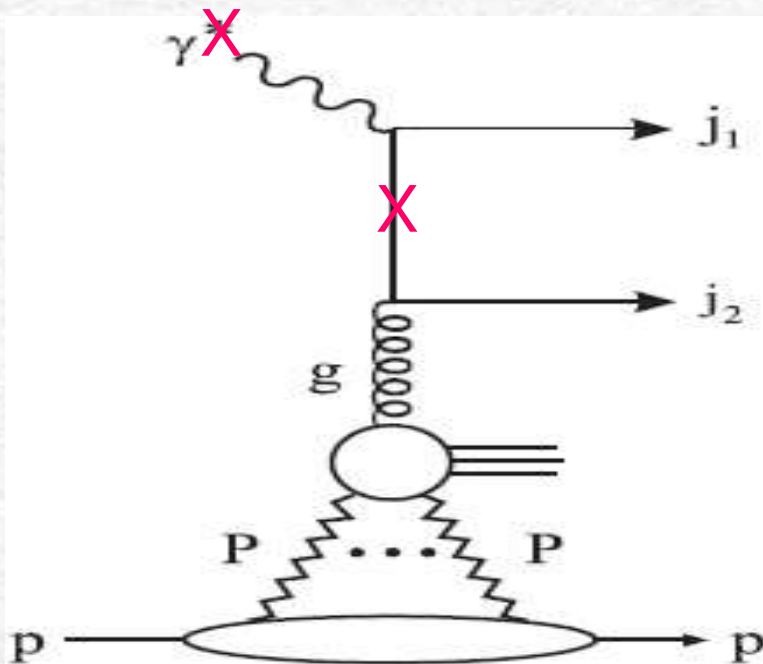
Hadroproduction:



→ Factorization breaking

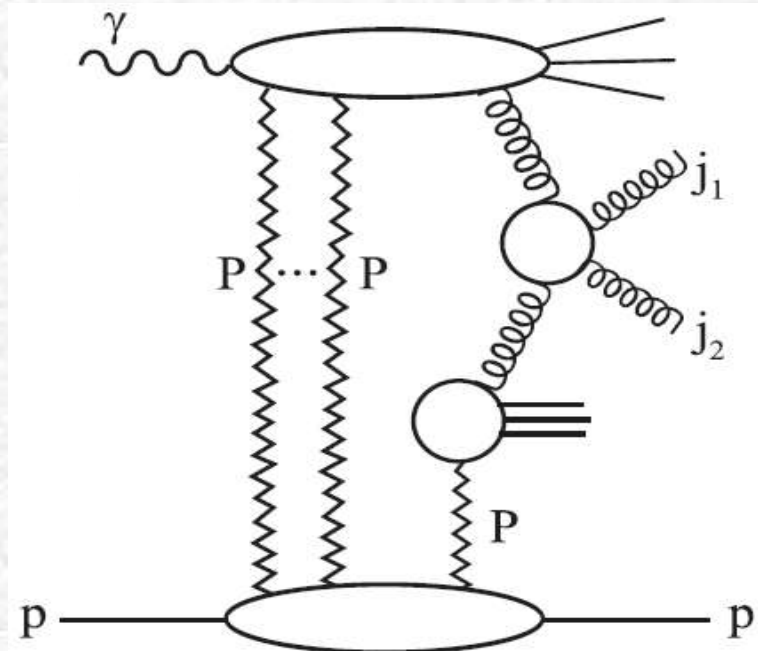
# Multi-Pomeron Exchanges

Direct Photoproduction:



→ Modified Regge trajectory

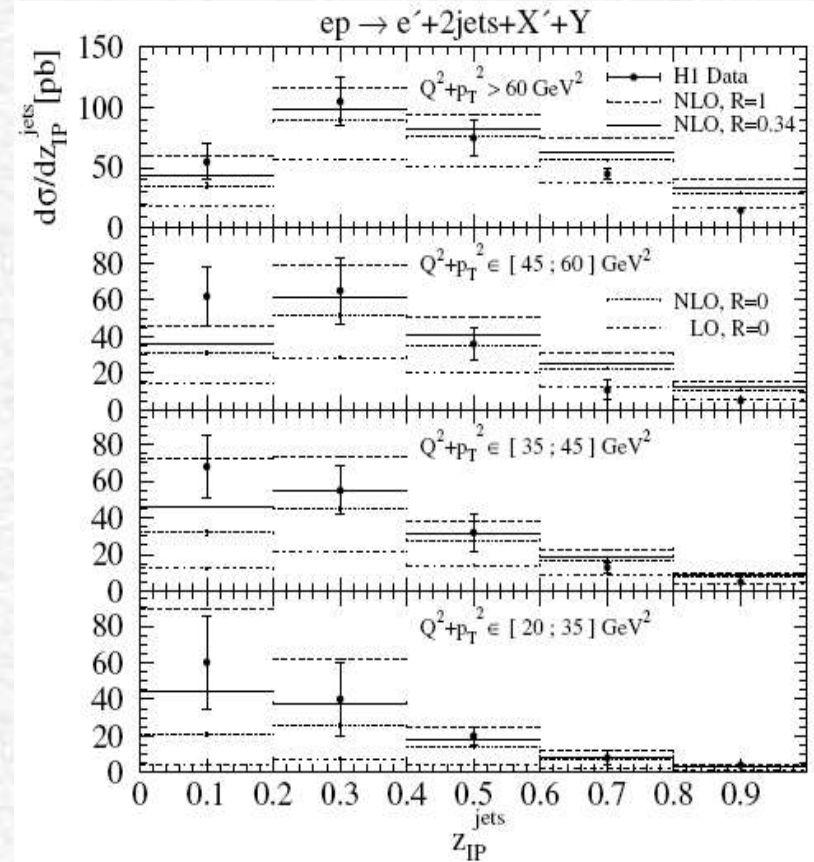
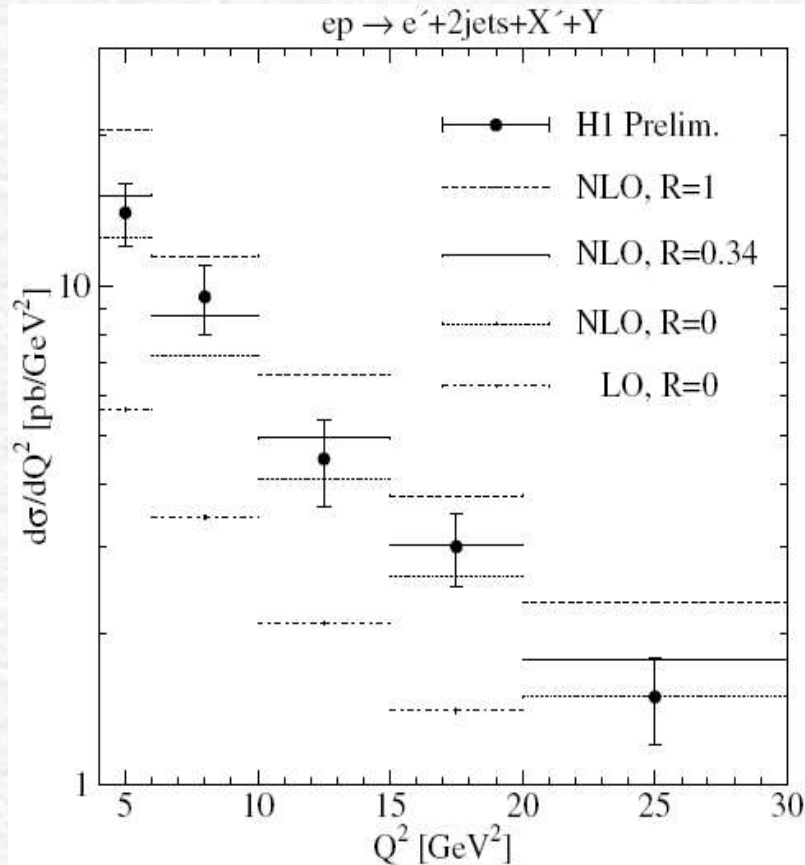
Resolved Photoproduction:



→ Factorization breaking

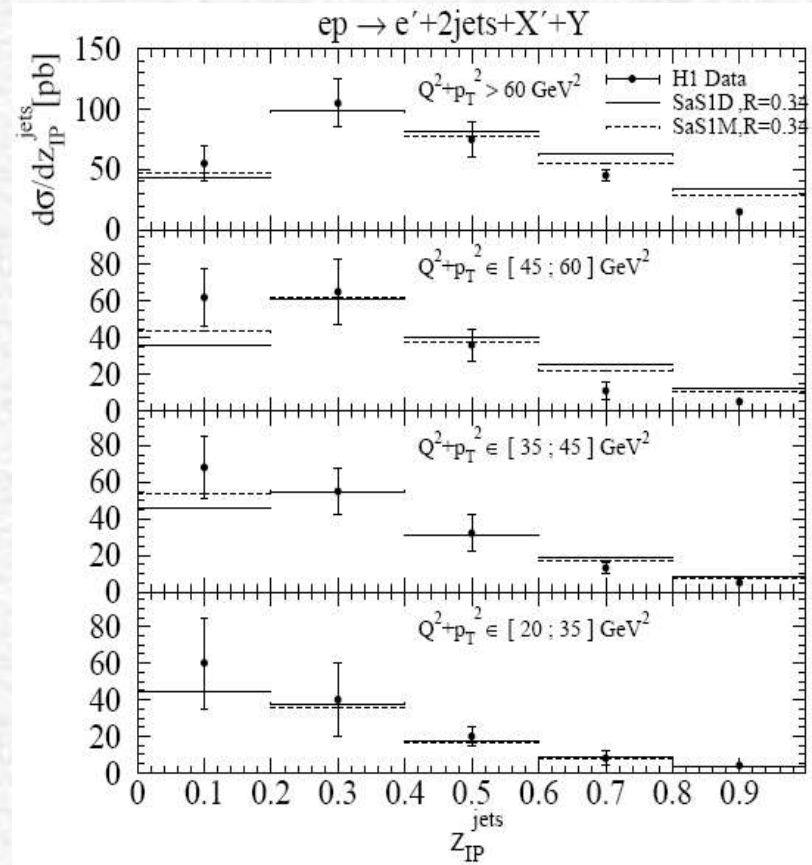
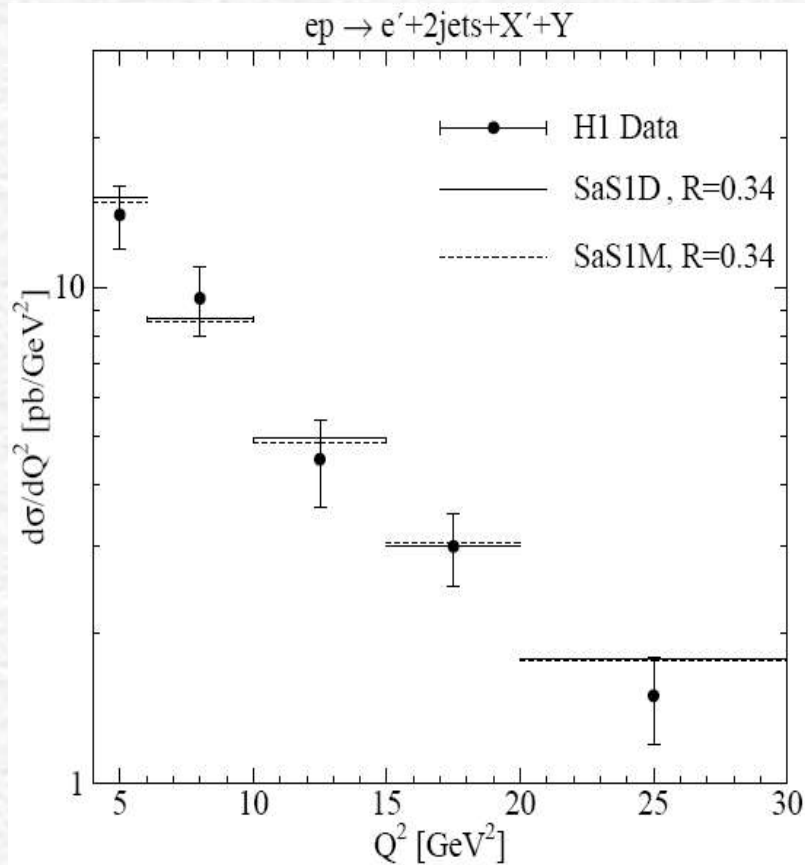
# Diffractive Low- $Q^2$ Dijet Production

Phys. Rev. Lett. 93 (2004) 232002



# Diffractive Low- $Q^2$ Dijet Production

## Factorization Scheme Dependence



# Diffractive Low- $Q^2$ Dijet Production

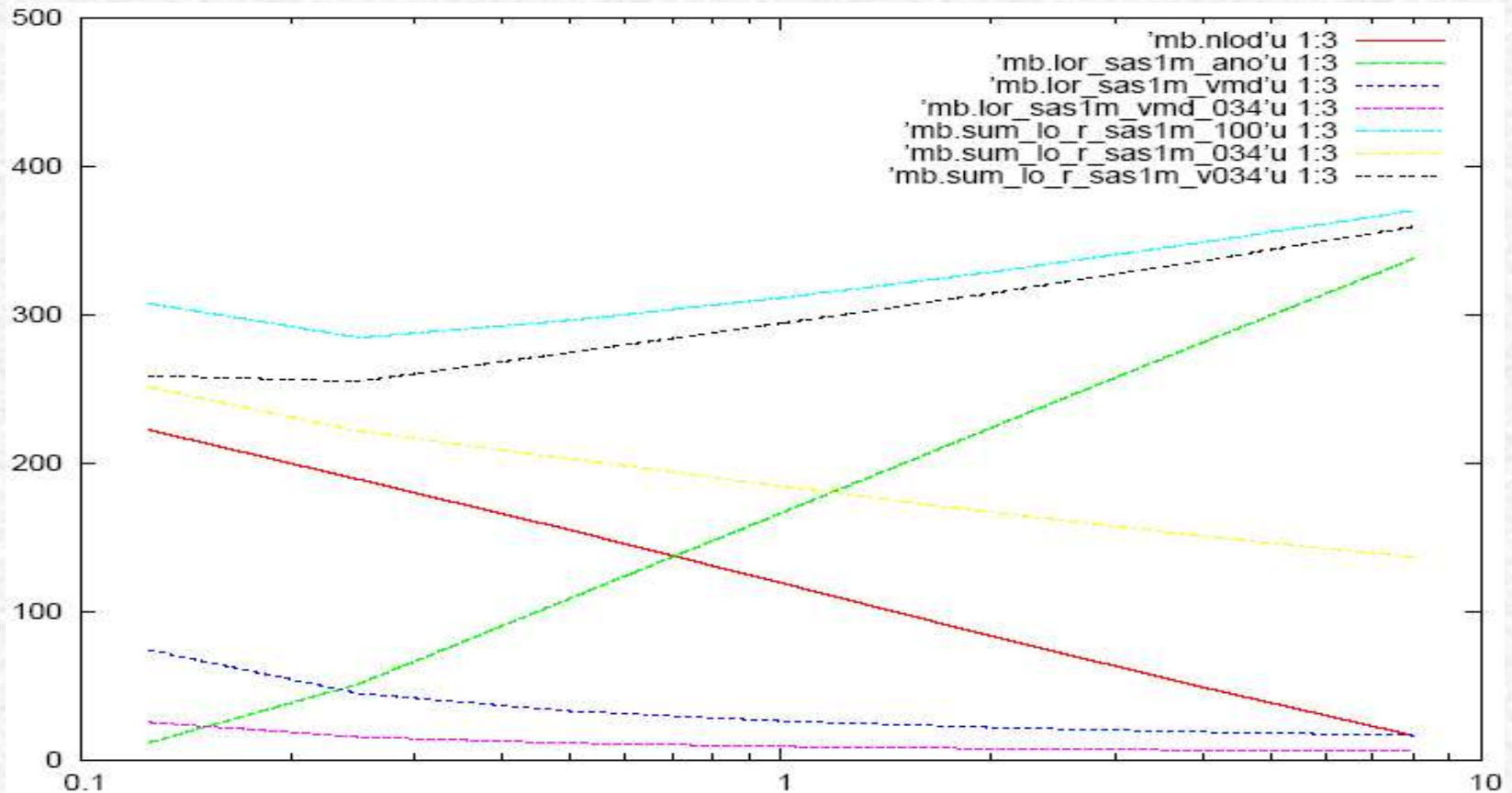
## Components of Photon Distribution Functions

- ☞ SaS parameterizations allow separation
- ☞ VMD component suppressed
  - $10^{-4}$  for  $Q^2 \approx 70 \text{ GeV}^2$
  - $10^{-2}$  for  $Q^2 \approx 5 \text{ GeV}^2$
- ☞ Anomalous component dominates
  - Direct higher order contributions
- ☞ Known from inclusive low- $Q^2$

production

# Diffractive Dijet Photoproduction

## Factorization Scale Dependence



# Photoproduction Observables

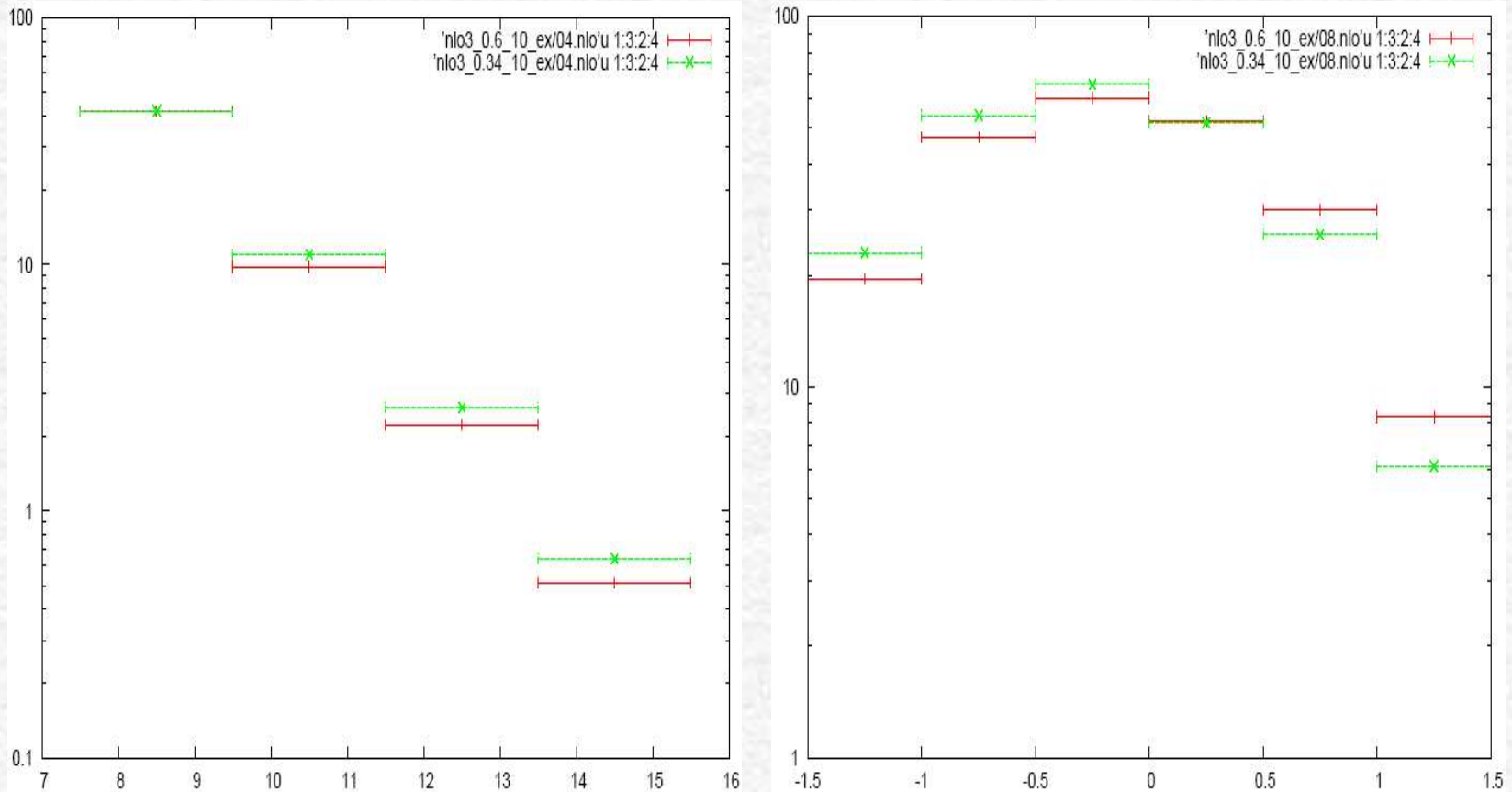
No electron, hadronic reconstruction only!

- ☞ Calculated partons / measured hadrons:
  - 4-momenta  $P_i^\mu = E(1, \sin\theta \cos\phi, \sin\theta \sin\phi, \cos\theta)$
- ☞ Jet definition:  $k_T$ -algorithm
  - $E_T^{1,2,(3)}, \eta^{1,2,(3)}$
- ☞ Reconstructed observables:
  - $M_X$ : All 4-momenta, except for electron and proton
  - $x_\gamma^{\text{obs}}, z_{\text{IP}}^{\text{obs}}$ : 2 leading jets only  $\neq$  true  $x_\gamma, z_{\text{IP}}$
- ☞ Mismatch of definitions:
  - Large hadronization corrections (no 3-jet in MC)
  - Bad agreement theory / experiment



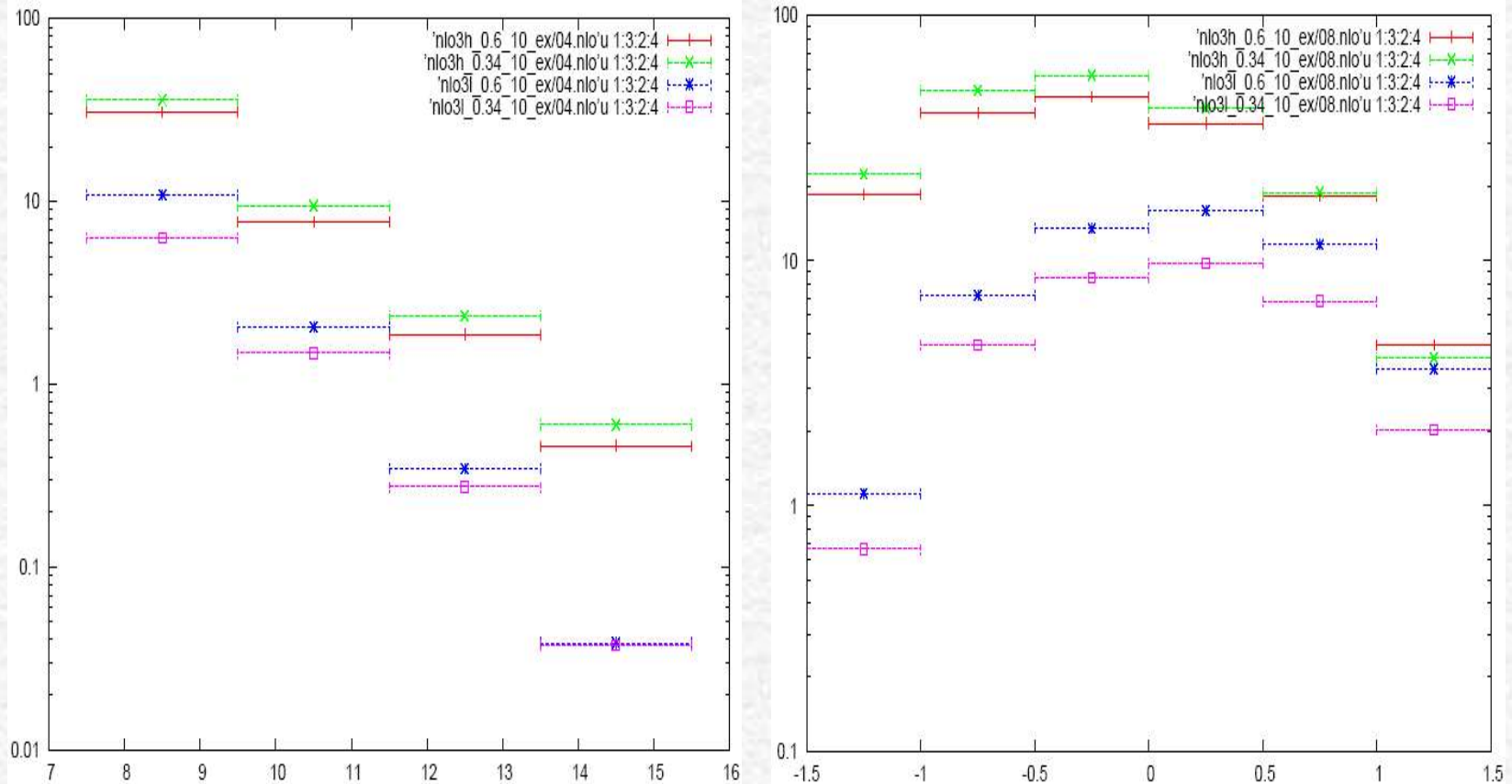
# Leading Jet $E_T$ and $\eta$

Calculated for all  $x_\gamma^{\text{obs}}$



# Leading Jet $E_T$ and $\eta$

Separated for  $x_\gamma^{\text{obs}} > 0.75$  and  $< 0.75$



# Conclusions

## Experiments:

- ☞ Make data and parton densities available
- ☞ Reanalyze dijets in photoproduction for higher  $E_T$
- ☞ Measure ratios of diffractive/inclusive cross sections (at high  $E_T$ )
  - Photon PDF uncertainties cancel
  - 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