Dijet production with a veto on additional central jet activity

(a five minute overview)

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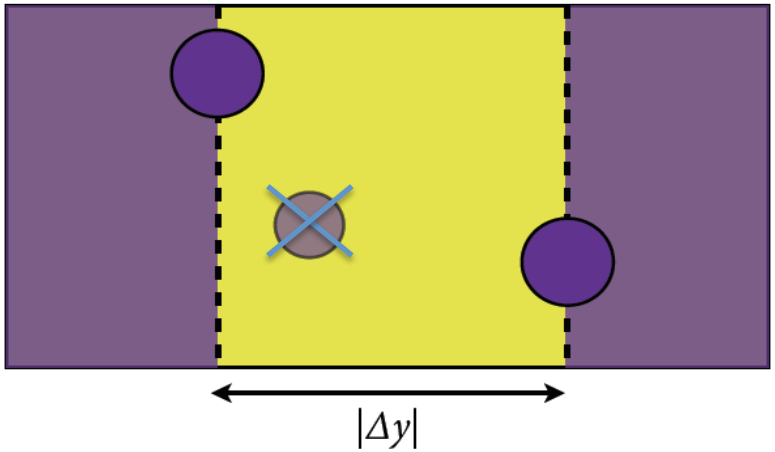
Measurement details

- Anti-k_T algorithm used to reconstruct jets [R=0.6].
- Jets required to have p_T>20GeV and rapidity |y|< 4.4 (well understood Jet Energy Scale).

- **Dijet system** defined as the two highest p_T jets in the event*.
  - Mean p_T of these jets ($\overline{p}_T$) required to be greater than 50GeV (trigger reasons).
  - This defines the **inclusive event sample**

- **Gap events** defined as the subset of events that do not contain an additional jet, with p_T above the veto scale (Q_0=20GeV), in the rapidity interval between the boundary jets.

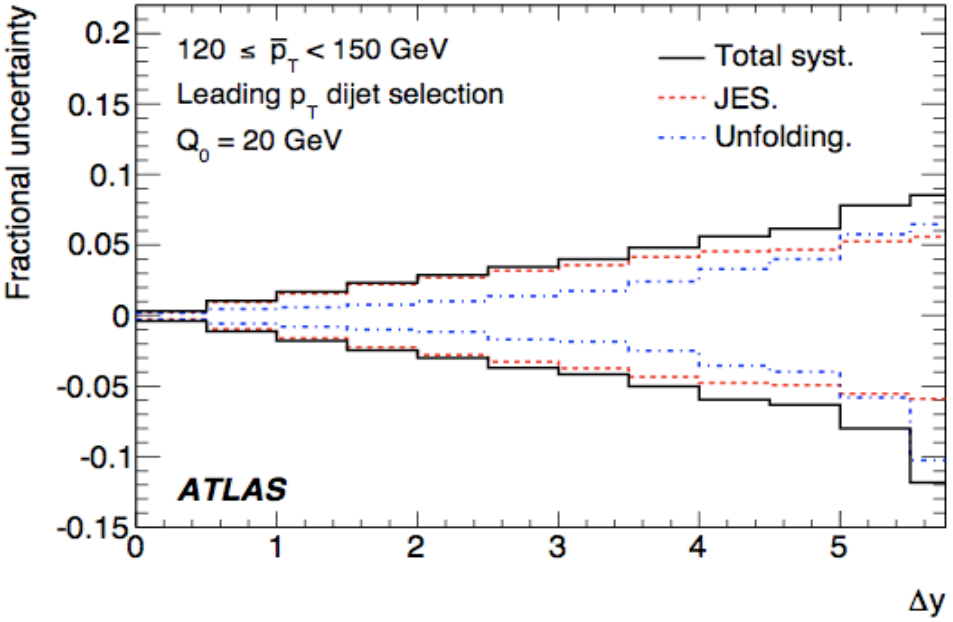


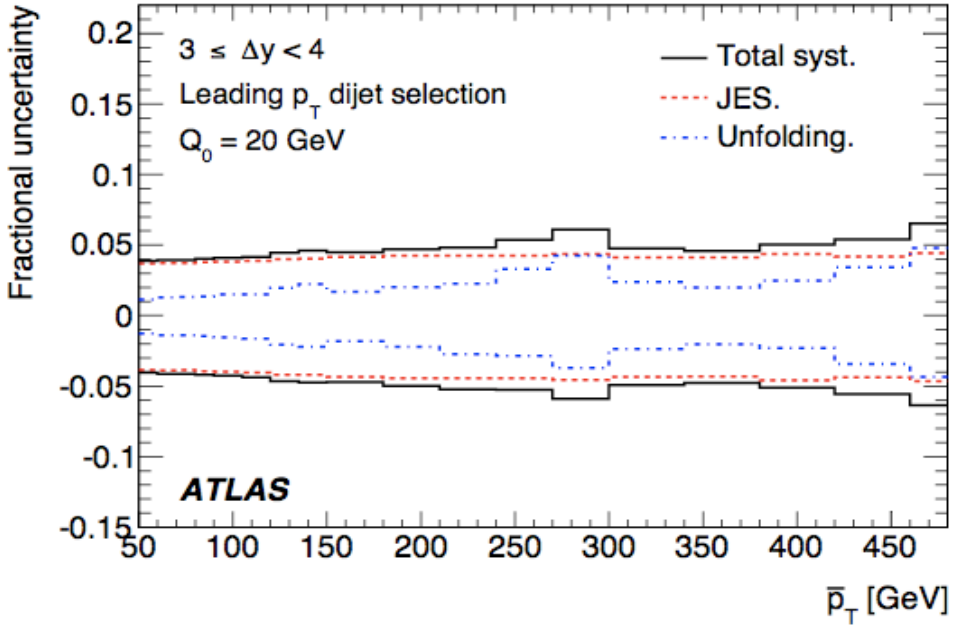
$$\textbf{Gap fraction} = \frac{\mathbf{N(gap)}}{\mathbf{N(inclusive)}}$$

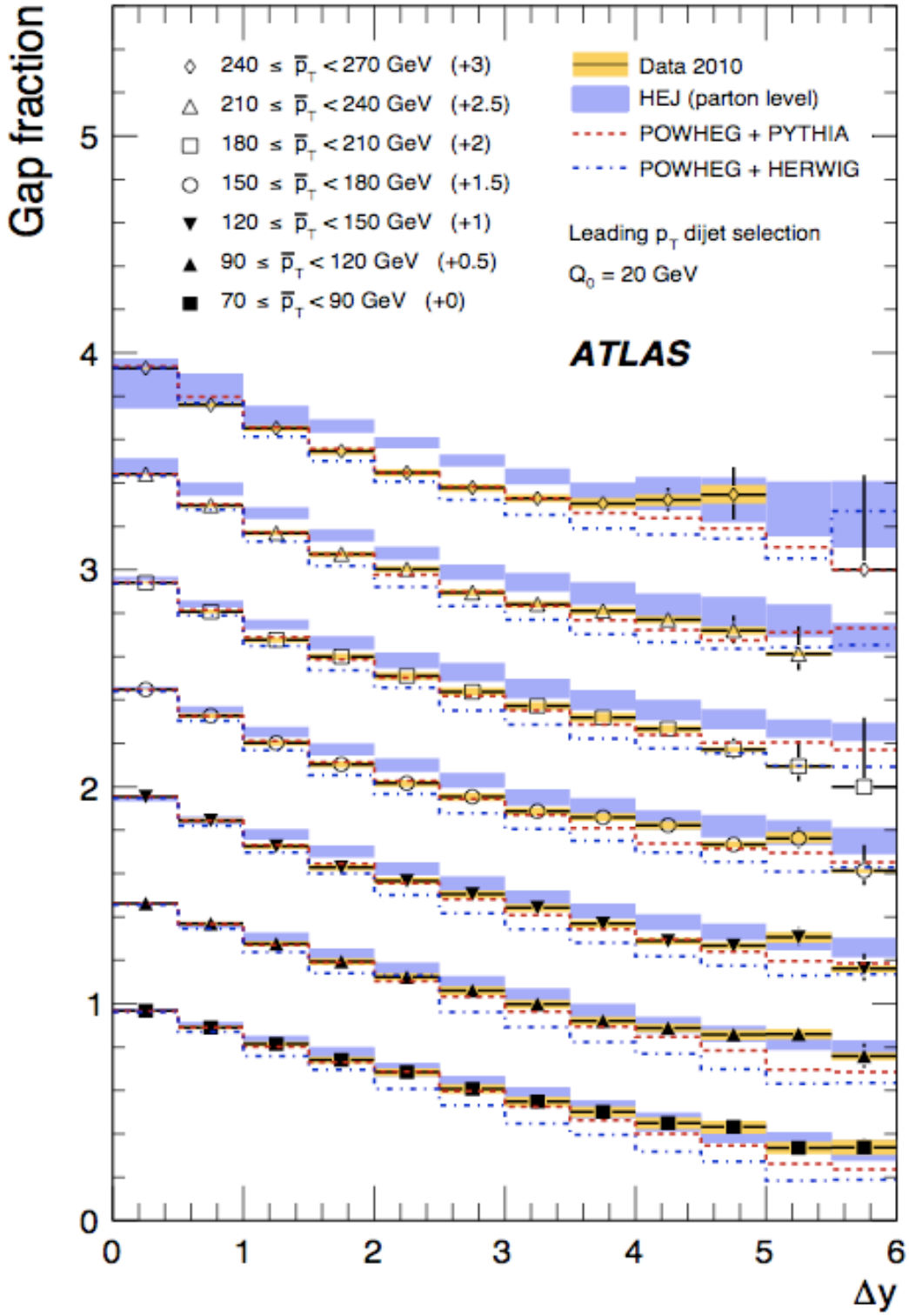
*also published results with dijet system defined as the most forward/backward jets in the event (not shown today)

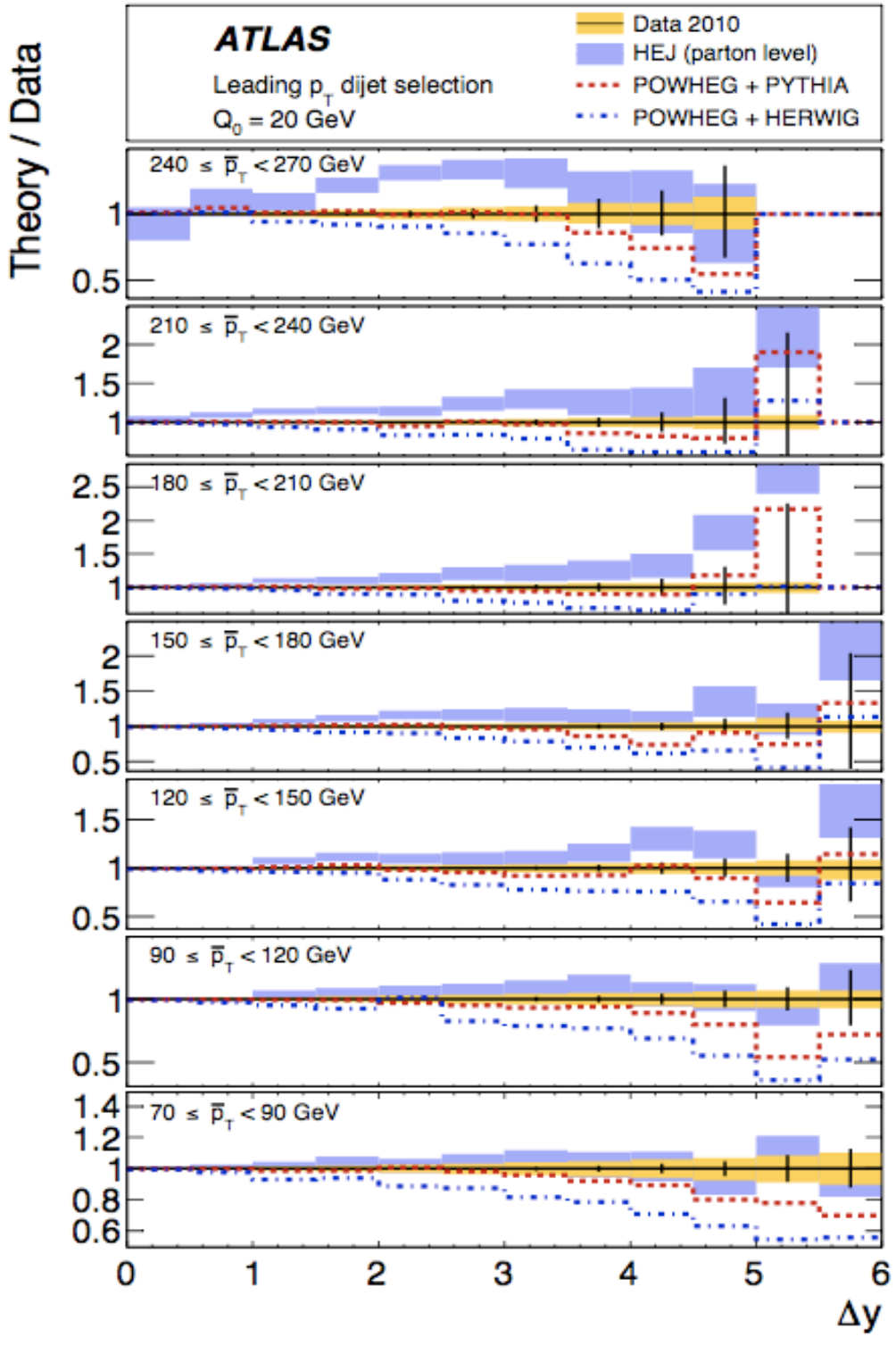
Example breakdown of experimental uncertainties

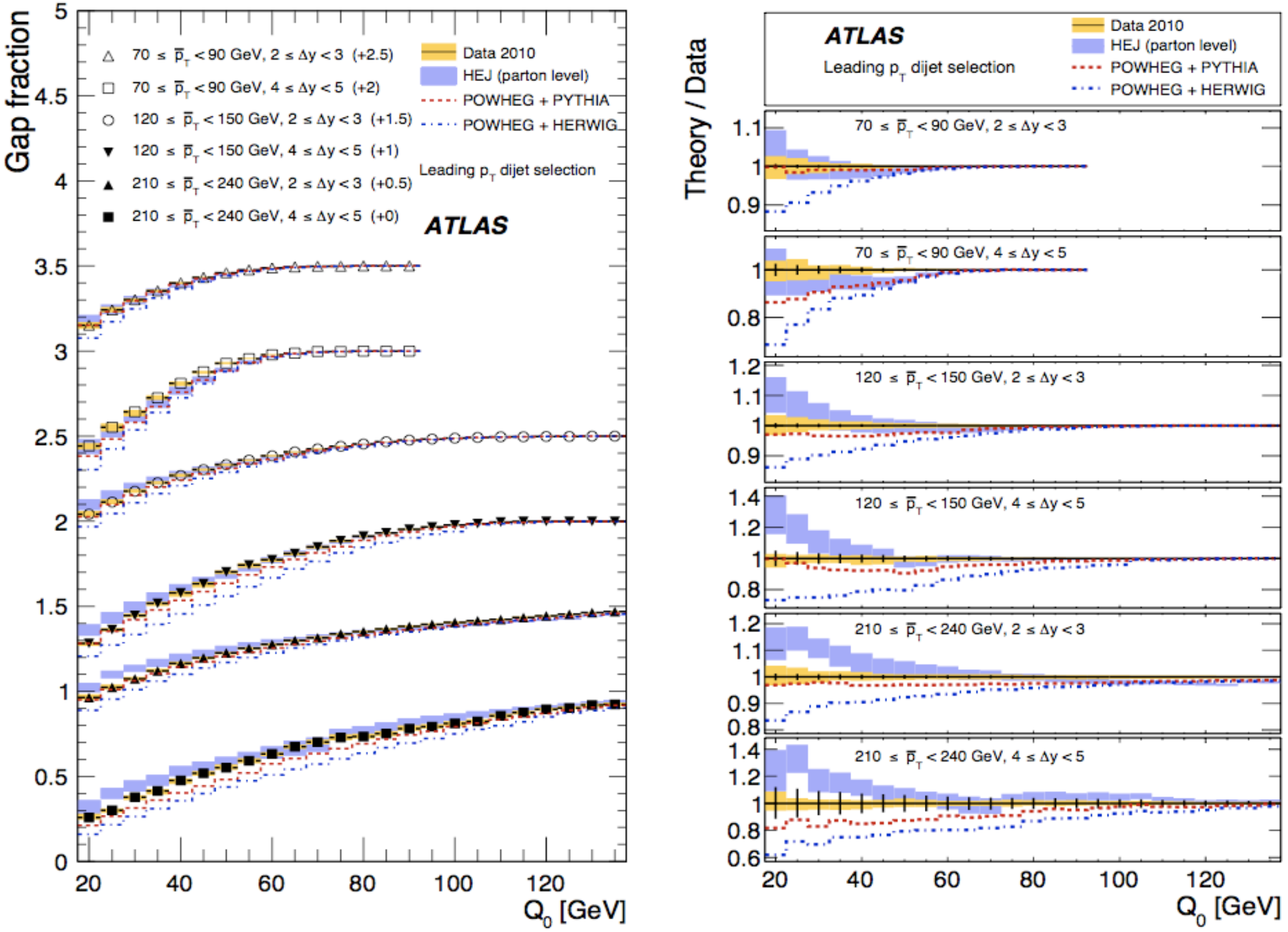
- Dominant systematic uncertainty in the measurement comes from
  - the jet energy scale
  - the physics/detector modelling for the simulated events used to correct for detector effects





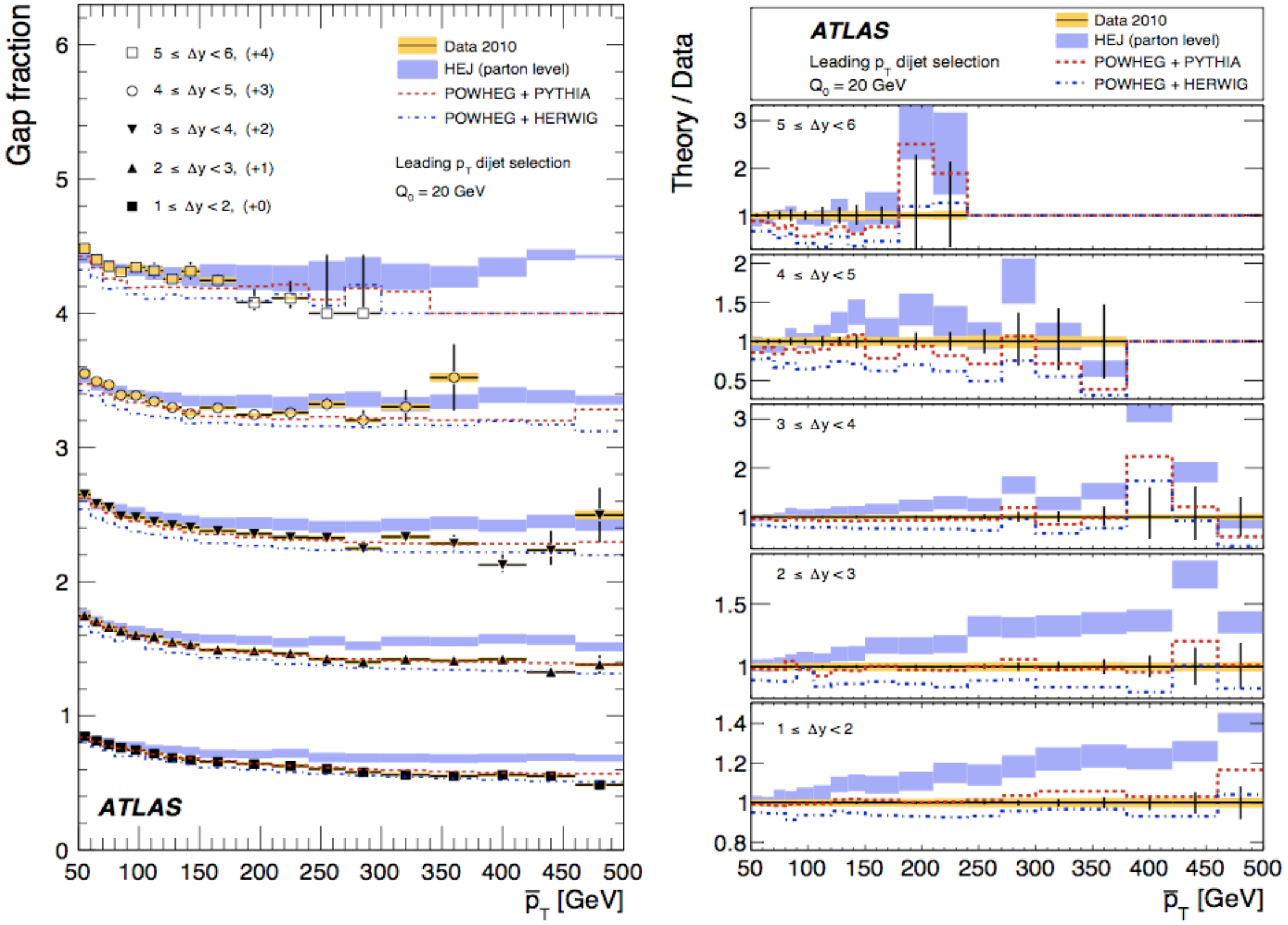

Gap fraction
240 ≤ p̄T < 270 GeV (+3)
210 ≤ p̄T < 240 GeV (+2.5)
180 ≤ p̄T < 210 GeV (+2)
150 ≤ p̄T < 180 GeV (+1.5)
120 ≤ p̄T < 150 GeV (+1)
90 ≤ p̄T < 120 GeV (+0.5)
70 ≤ p̄T < 90 GeV (+0)
Data 2010
HEJ (parton level)
POWHEG + PYTHIA
POWHEG + HERWIG
Leading pT dijet selection
Q0 = 20 GeV
ATLAS
Δy


Theory / Data
ATLAS
Leading pT dijet selection
Q0 = 20 GeV
Data 2010
HEJ (parton level)
POWHEG + PYTHIA
POWHEG + HERWIG
240 ≤ p̄T < 270 GeV
210 ≤ p̄T < 240 GeV
180 ≤ p̄T < 210 GeV
150 ≤ p̄T < 180 GeV
120 ≤ p̄T < 150 GeV
90 ≤ p̄T < 120 GeV
70 ≤ p̄T < 90 GeV
Δy


Gap fraction
Theory / Data
ATLAS
Leading p_T dijet selection
Data 2010
HEJ (parton level)
POWHEG + PYTHIA
POWHEG + HERWIG
70 ≤ p̄_T < 90 GeV, 2 ≤ Δy < 3 (+2.5)
70 ≤ p̄_T < 90 GeV, 4 ≤ Δy < 5 (+2)
120 ≤ p̄_T < 150 GeV, 2 ≤ Δy < 3 (+1.5)
120 ≤ p̄_T < 150 GeV, 4 ≤ Δy < 5 (+1)
210 ≤ p̄_T < 240 GeV, 2 ≤ Δy < 3 (+0.5)
210 ≤ p̄_T < 240 GeV, 4 ≤ Δy < 5 (+0)
Q_0 [GeV]

Summary of ATLAS measurement……

- The uncertainty on the data is typically much smaller than the spread of theory predictions.
- Data compared to POWHEG prediction: NLO-plus-parton-shower (for soft and collinear resummation)
  - POWHEG describes data well as $\bar{\mathbf{p}}_{\mathrm{T}}/\mathbf{Q_0}$ increases, but not as Δy increases.
- Data compared to HEJ predictions: all-order prediction for hard wide-angle emissions
  - HEJ describes data well as Δy increases, but not as $\bar{\mathbf{p}}_{\mathrm{T}}/\mathbf{Q_0}$ increases.


Gap fraction
5 ≤ Δy < 6, (+4)
4 ≤ Δy < 5, (+3)
3 ≤ Δy < 4, (+2)
2 ≤ Δy < 3, (+1)
1 ≤ Δy < 2, (+0)
Data 2010
HEJ (parton level)
POWHEG + PYTHIA
POWHEG + HERWIG
Leading p_T dijet selection
Q_0 = 20 GeV
ATLAS
p_T [GeV]
Theory / Data
ATLAS
Leading p_T dijet selection
Q_0 = 20 GeV
Data 2010
HEJ (parton level)
POWHEG + PYTHIA
POWHEG + HERWIG
5 ≤ Δy < 6
4 ≤ Δy < 5
3 ≤ Δy < 4
2 ≤ Δy < 3
1 ≤ Δy < 2
p_T [GeV]