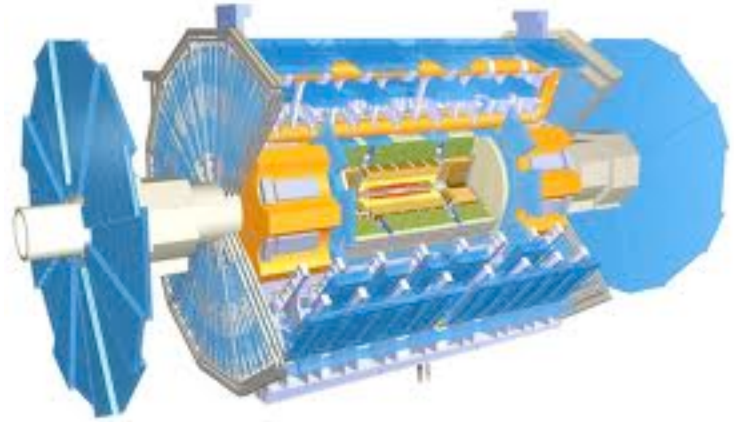

Inclusive and dijet measurements in ATLAS and their relevance for Pdf's

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Standard Model @ LHC 2012
10-13 April HCØ institute Copenhagen

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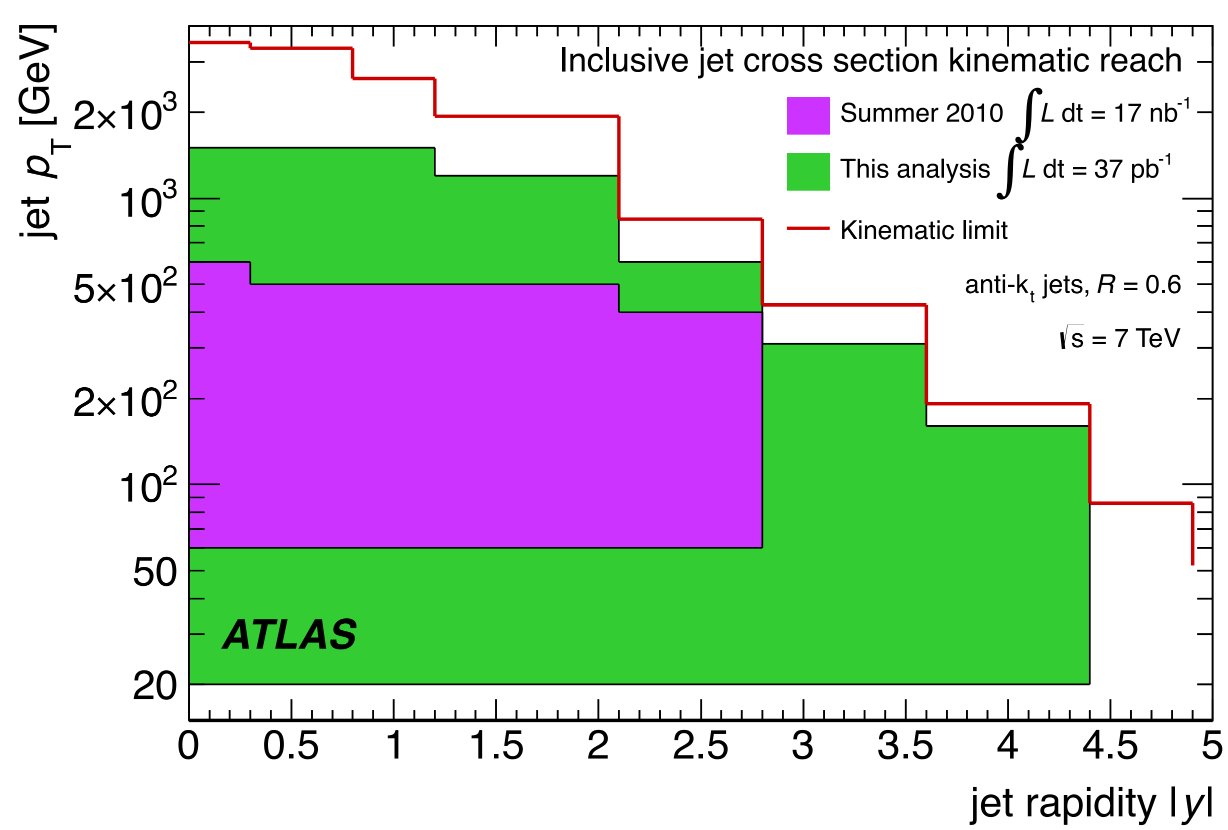
a bit of history

17 nb^{-1}	37 pb^{-1}	4.7 fb^{-1}
Inclusive jet and dijet at $\sqrt{s}$=7 TeV	Inclusive jet and dijet at $\sqrt{s}$=7 TeV	high mass dijet production at $\sqrt{s}$=7 TeV
EPJC 71.1512 arXiv: 1009.5908	Submitted to PRD arXiv: 1112.6297	ATLAS-CONF-2012-021

from the 17 nb^{-1} to the 37 pb^{-1} measurement

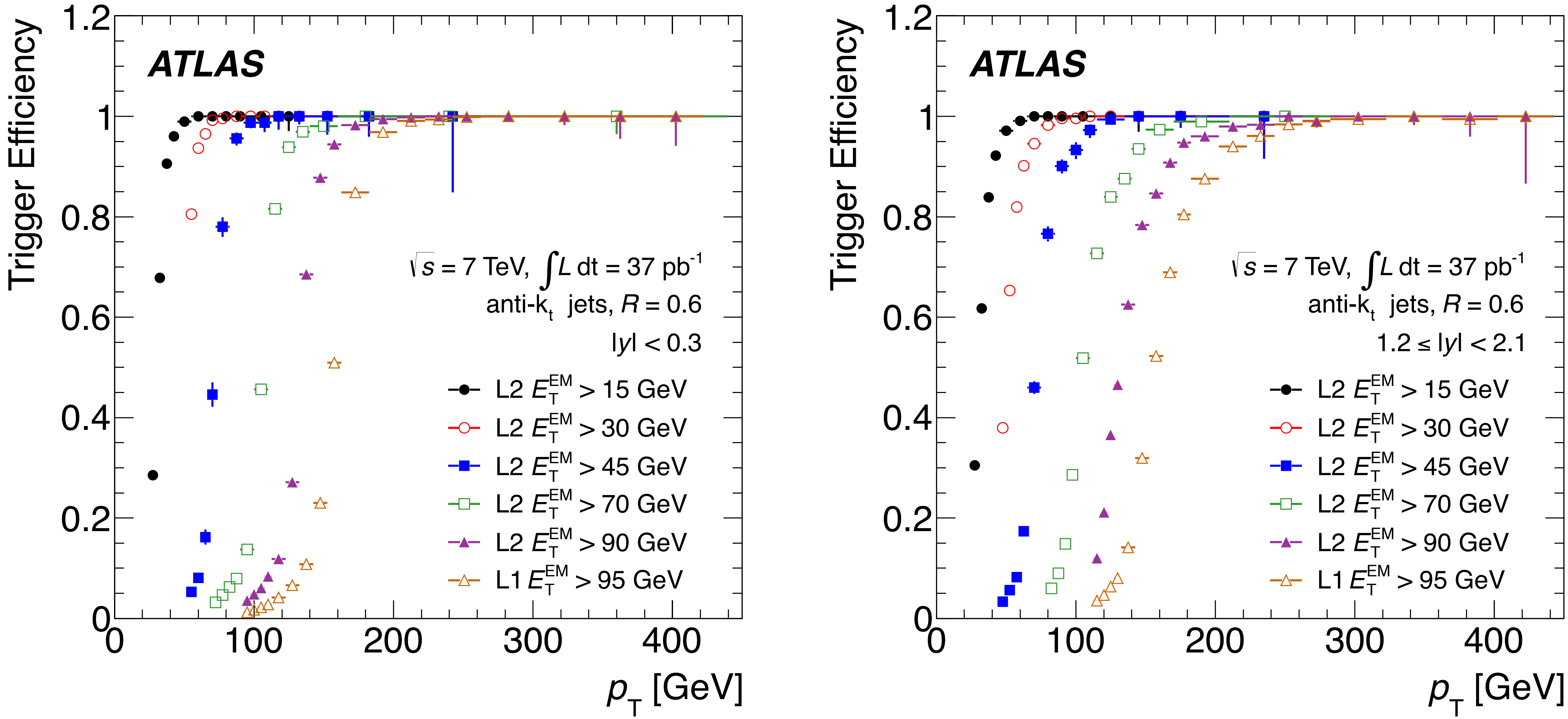
Large new kinematic regime & coherent treatment of inclusive jets and dijet measurements

- 2200 times more integrated luminosity
- Much wider kinematic reach
  - For jet inclusive:
    - At high P_T end : from 600 GeV to 1.5 TeV
    - At low PT end: from 60 GeV to 20 GeV
    - In rapidity: from $|y|<2.8$ to $|y|<4.4$
  - For dijet:
    - From m_{12} 1.8 TeV to 4.8TeV
    - $y^* = |y_1-y_2|/2 < 4.4$ (replacing y_{max})



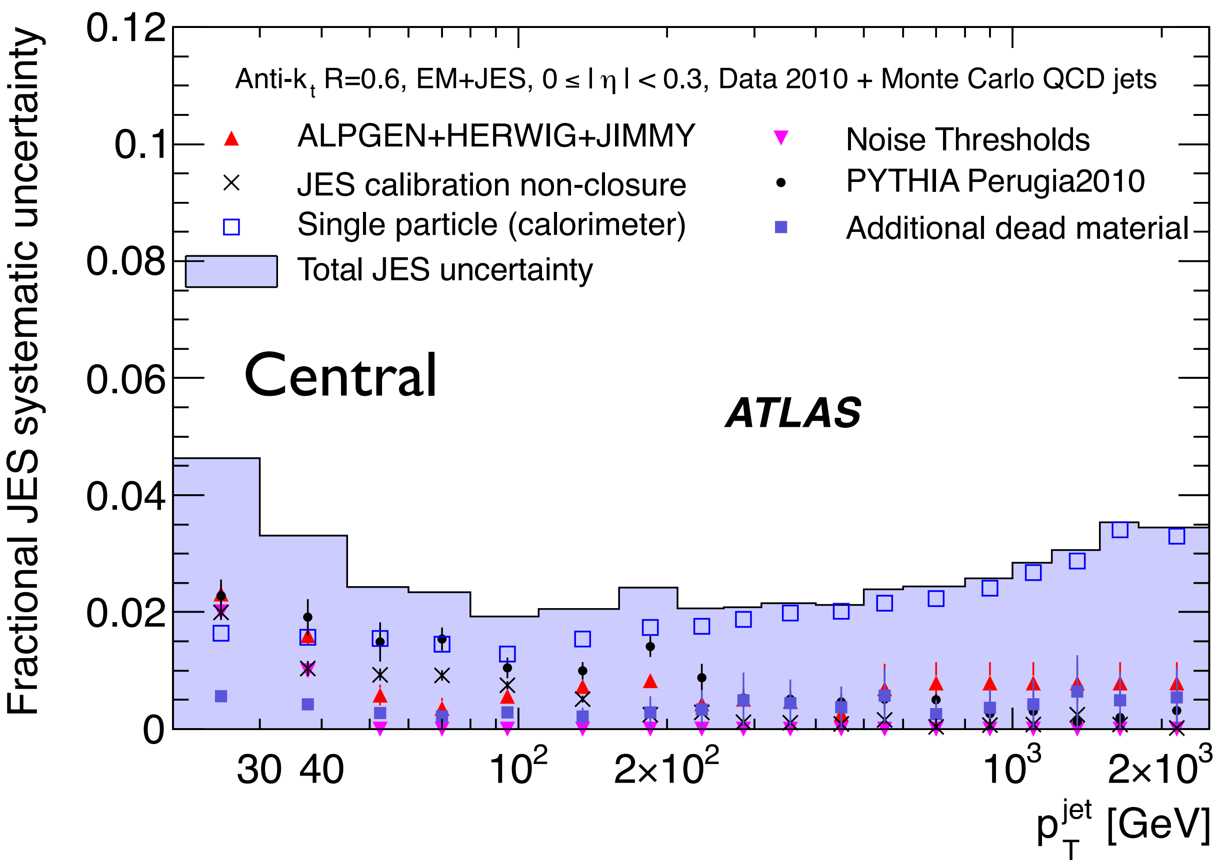
Trigger efficiencies

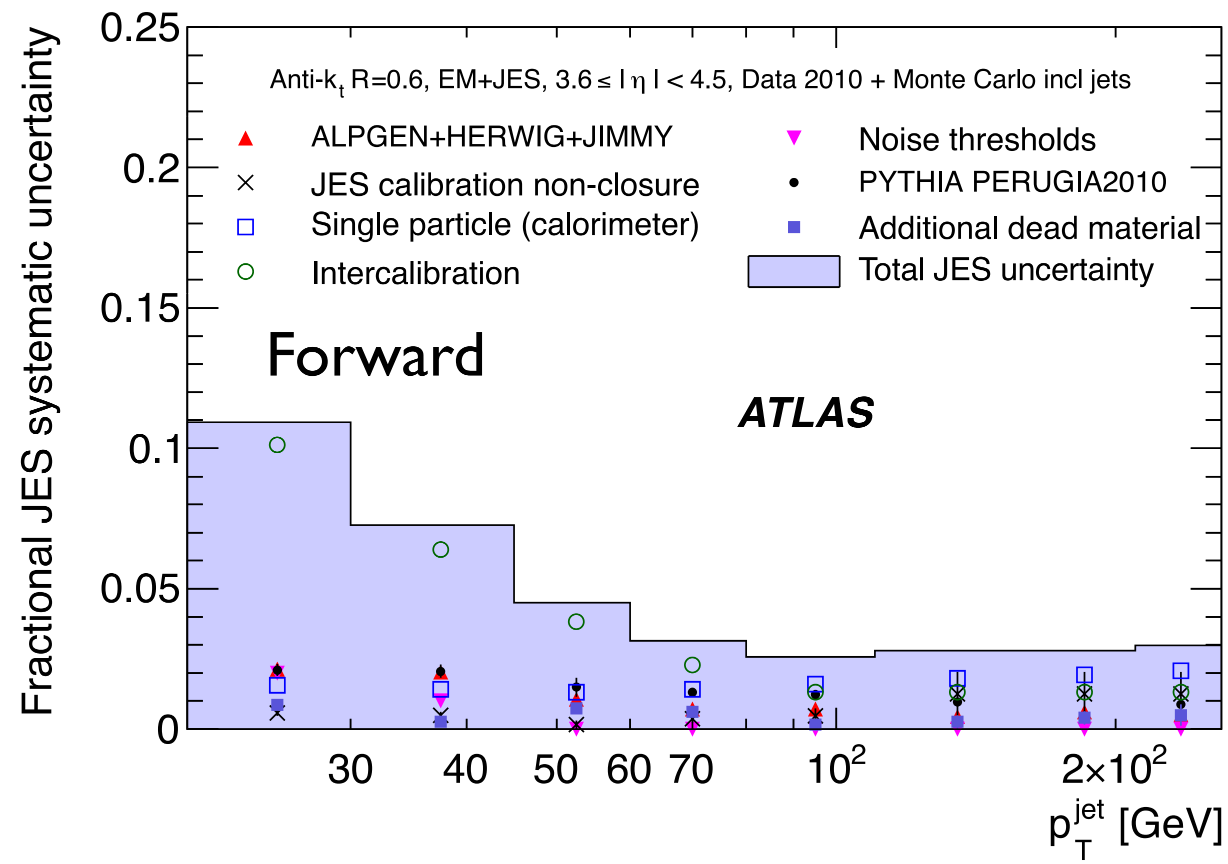
- Inclusive jet (per-jet for dijets) trigger efficiencies determined in-situ using orthogonal and bootstrap methods
- Each trigger used in the region where it is fully efficient



Jet calibration and uncertainty

- Jet calibration:
  - Pile-up correction, origin correction, final energy and η correction
- JES uncertainty:
  - less than 2.5% in the central region for 60-800 GeV jets
  - Calorimeter component dominant in the central region
  - η inter calibration dominant in the forward region (due to MC modeling)





From detector level to particle level

- 3 steps matrix based unfolding method
  - matching (in)efficiency correction at reconstructed level
  - IDS / SVD / bin-by-bin unfolding for jets with matching
  - matching (in)efficiency correction at particle level

Unfolding

- In-situ determination of the shape uncertainty
  - reweight MC by smooth function: improve data/recoMC agreement
  - Unfold the reweighted reconstructed MC
  - Compare with reweighted particle level MC
- Measurement unfolded using **IDS:** smallest bias in the closure test

Unfolding systematics

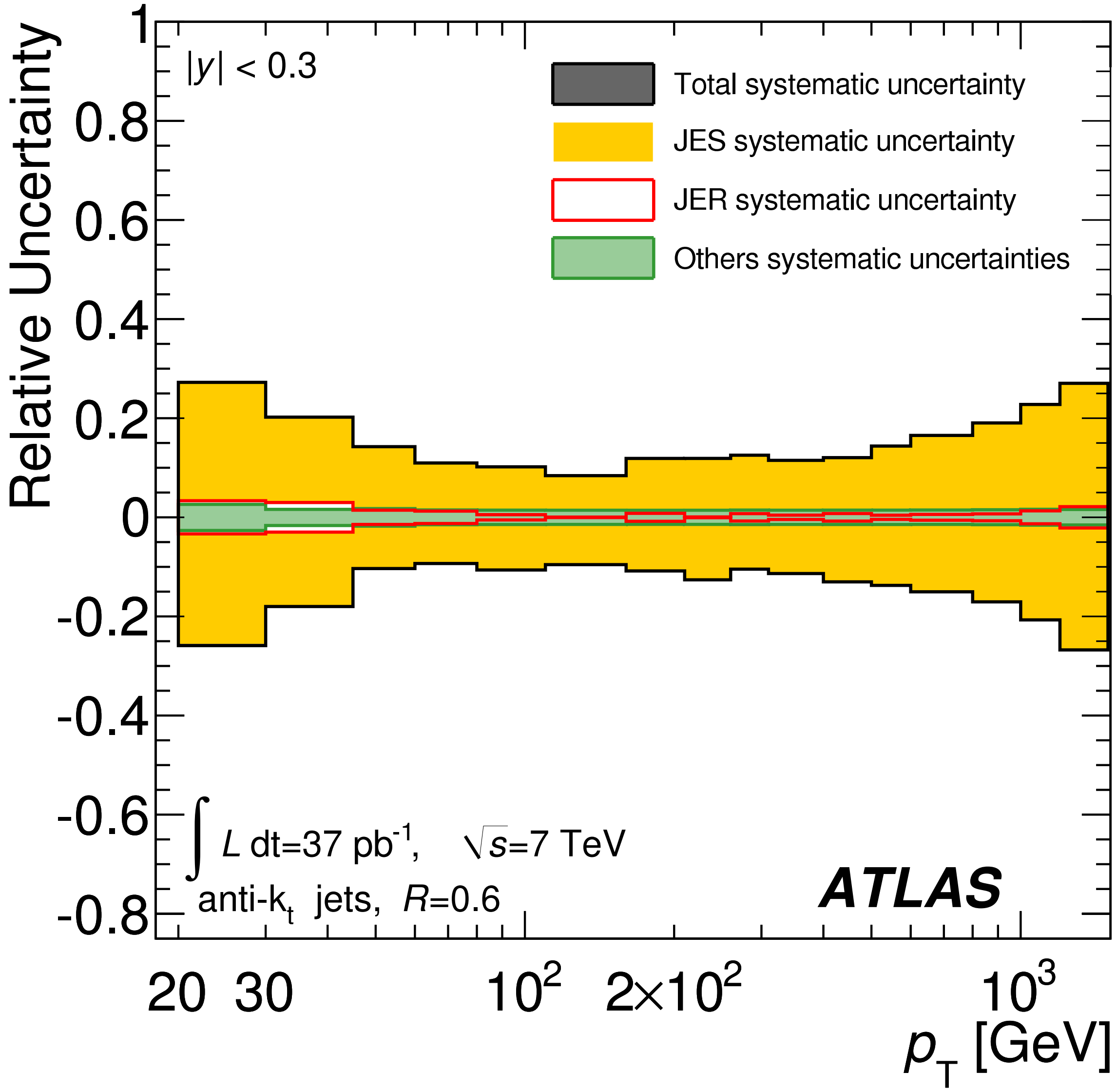
- Full uncertainty propagation:
  - statistical uncertainty (data+MC) using pseudo-experiments
  - Systematic uncertainties using nuisance parameters
    - Asymmetric uncertainties taken into account

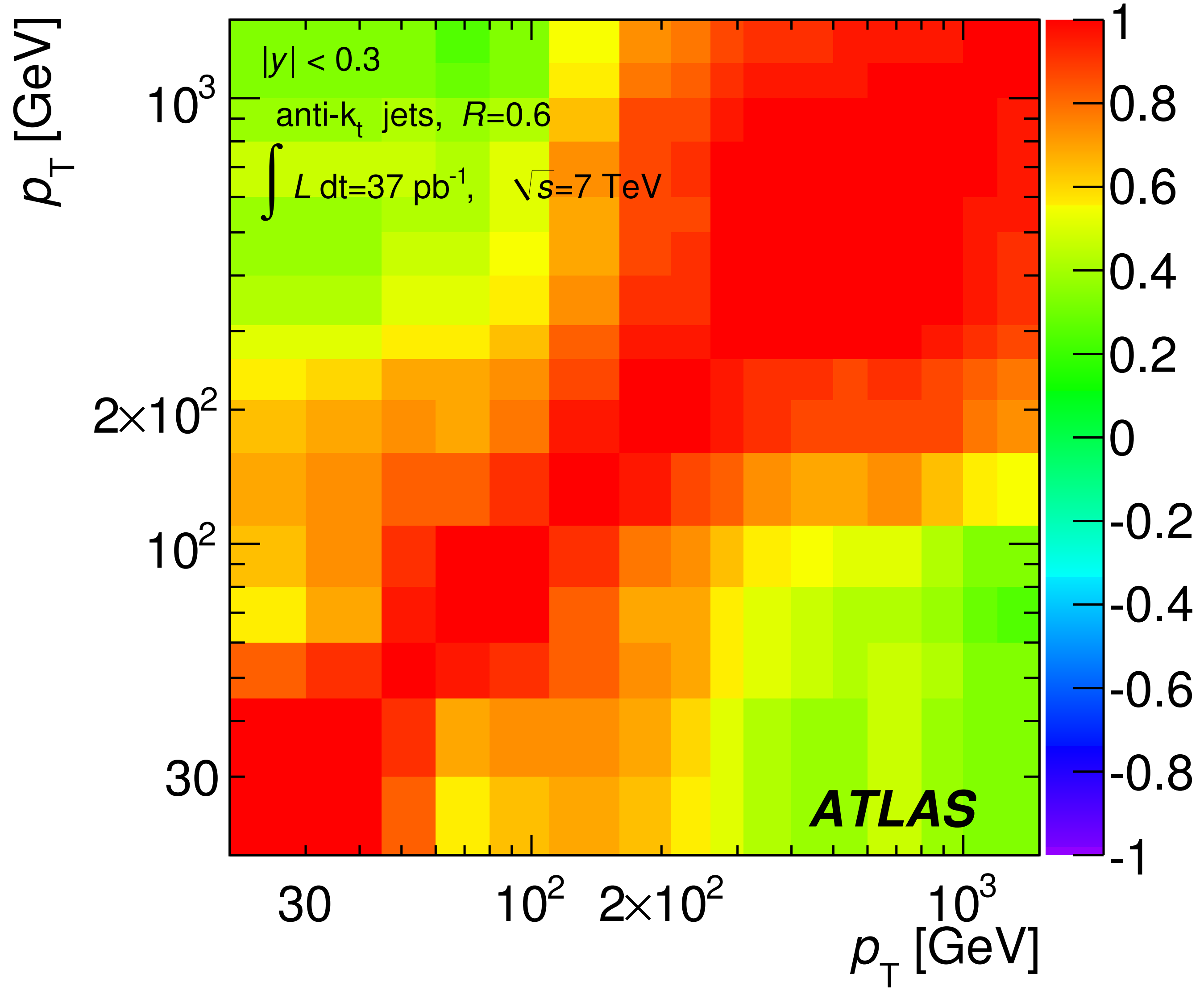
Uncertainty propagation

Systematic uncertainties: central

Largest systematic uncertainty from JES

3.4% uncertainty of the integrated luminosity are not shown here.

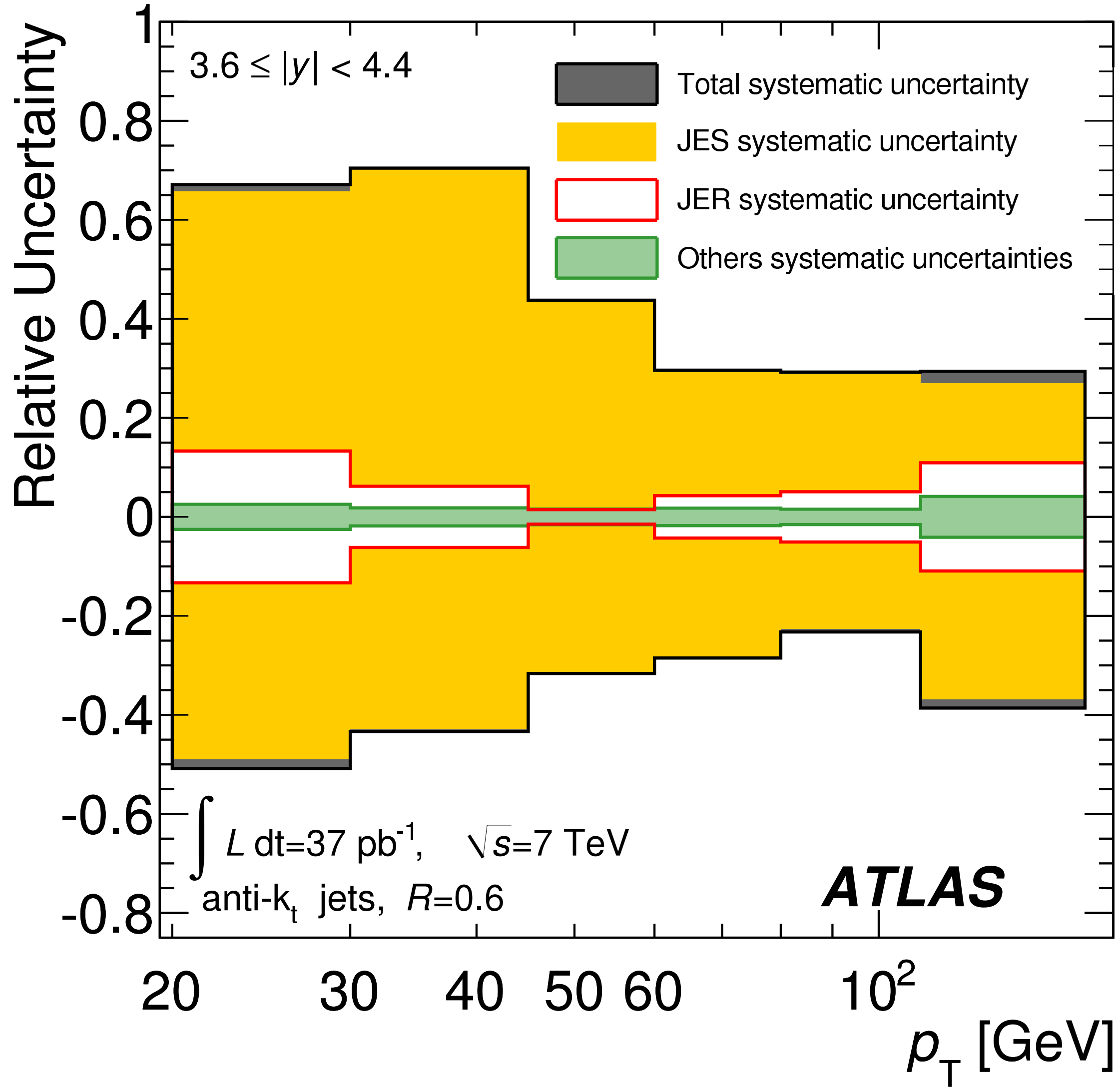


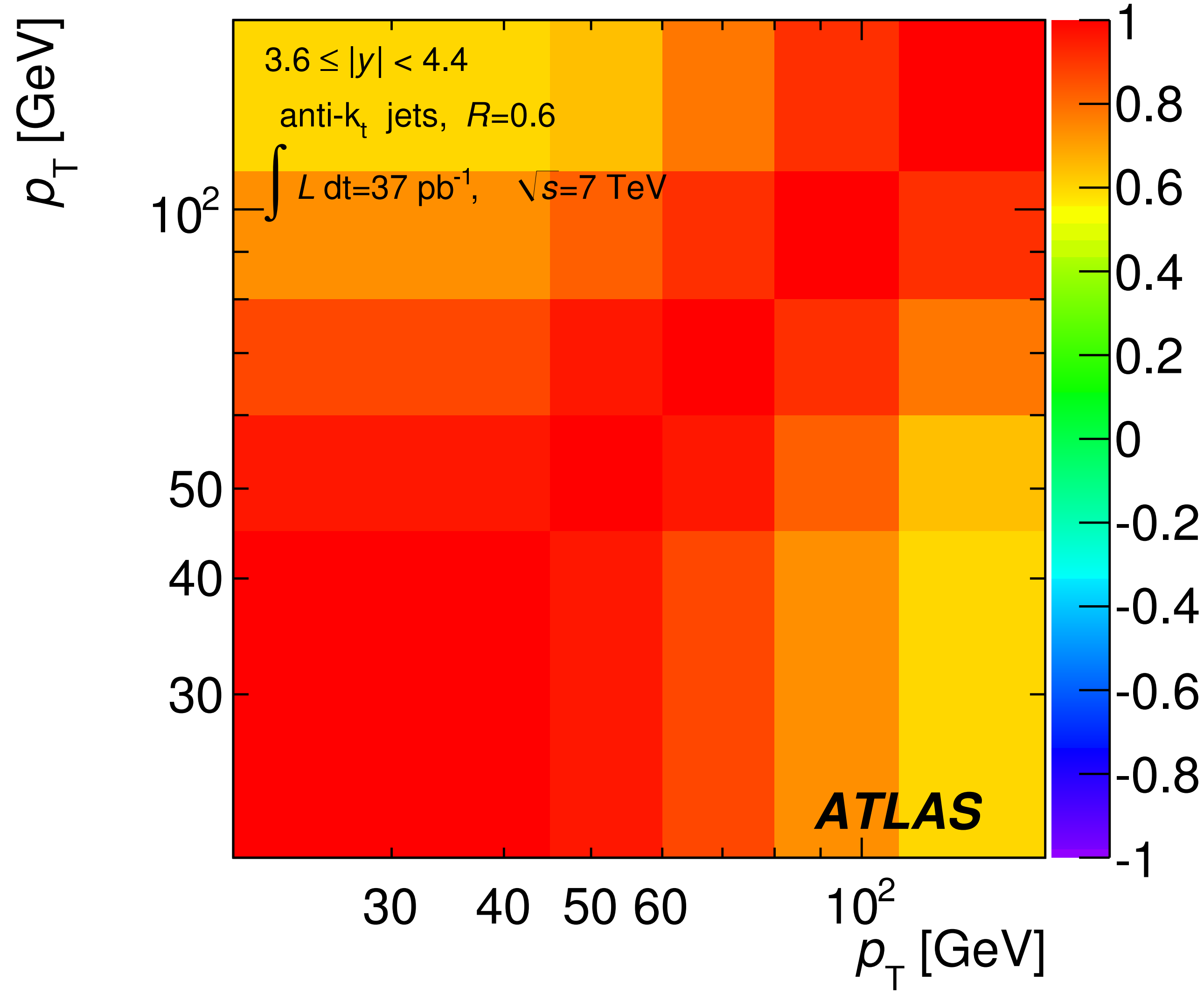


Systematic uncertainties: forward

Largest systematic uncertainty from JES

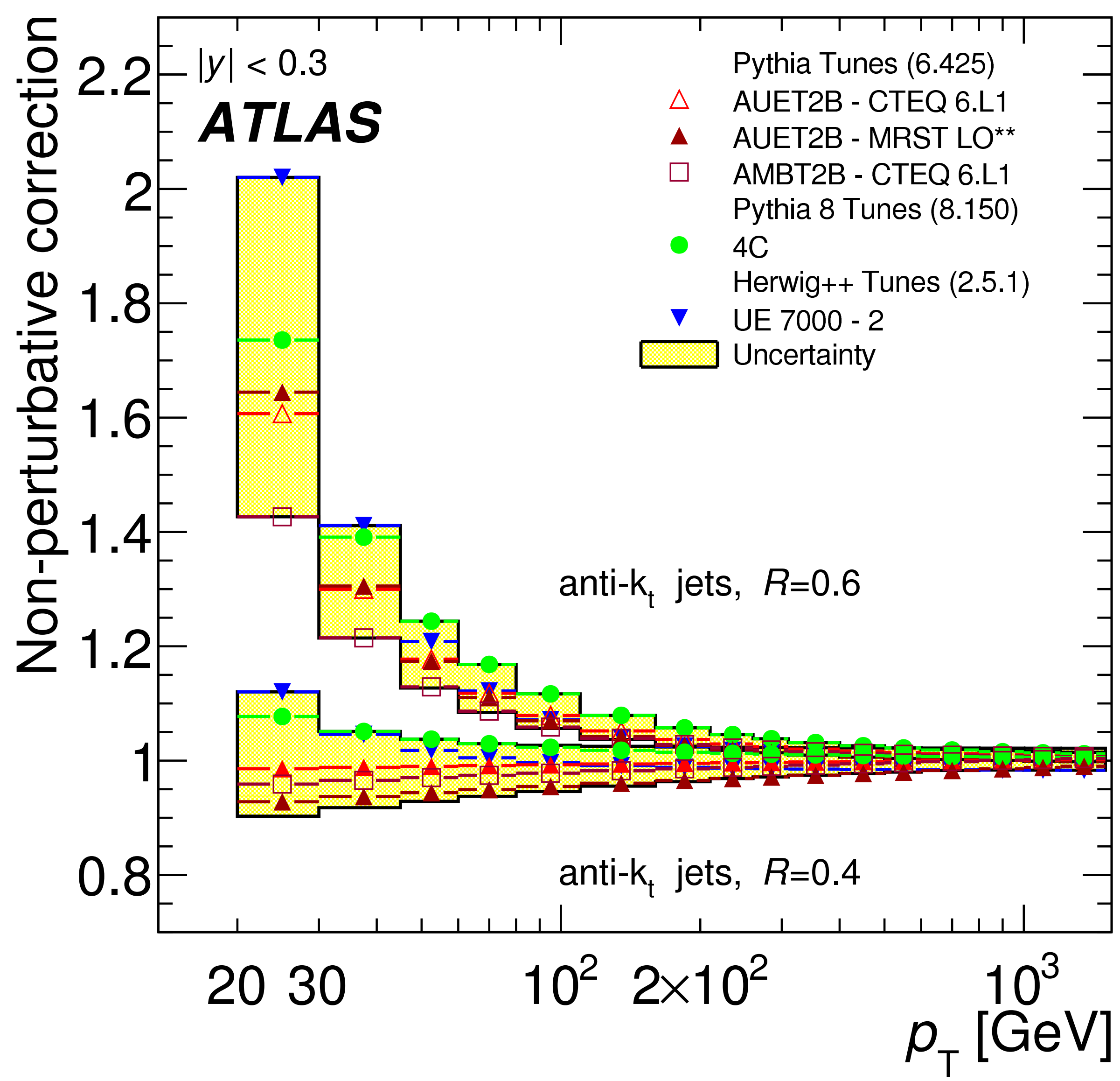
3.4% uncertainty of the integrated luminosity are not shown here.





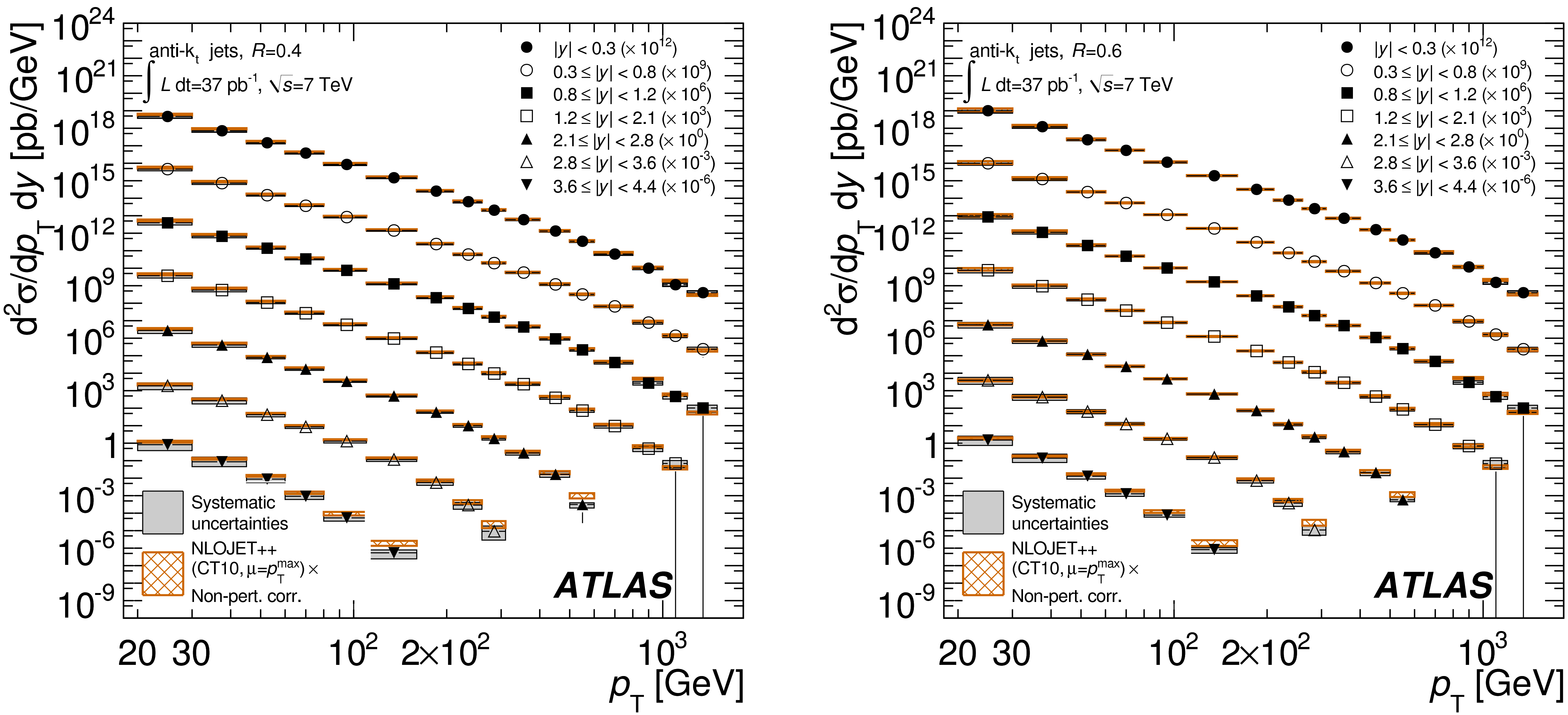
Theoretical uncertainties

- QCD predictions from NLOJET++
- Uncertainties from renormalization & factorization scales, α_S and PDFs via APPLGRID
- Non-perturbative correction applied (bin-by-bin) to parton level NLO cross sections:
  - account for hadronization and UE
  - Derived using Pythia MC10 (AMBT1)
  - Uncertainties envelope of deviations from Pythia tunes (Perugia 0, Perugia 2010, Perugia X) + different MC generators (Herwig++)
  - Additional comparisons to Powheg (NLO ME + PS)



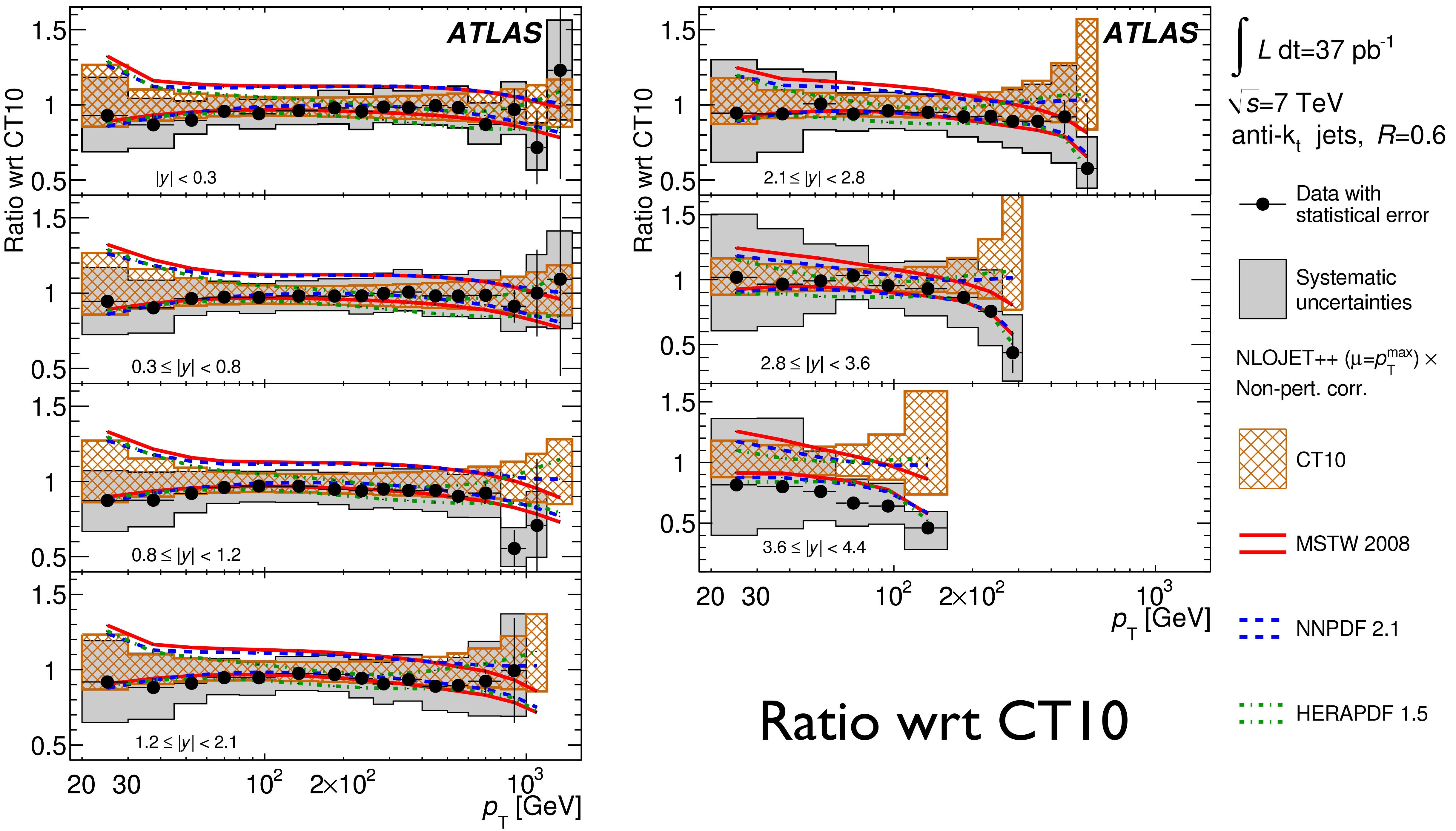
2010 Inclusive jet cross section

Inclusive jet pT cross-section compared to NLO pQCD + non-pert. corrections



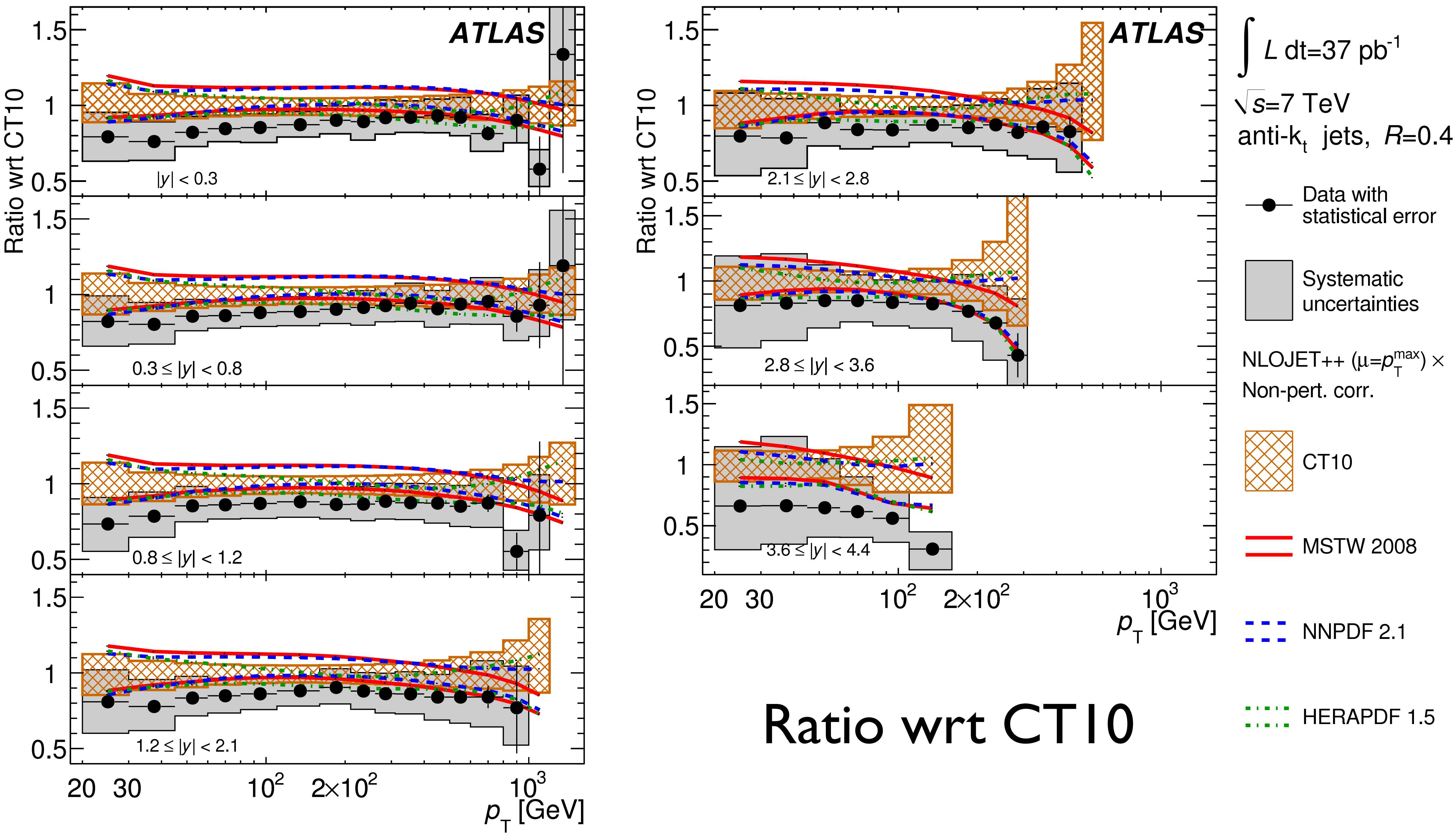
R=0.4 R=0.6

PDF comparisons for R=0.6



Ratio wrt CT10

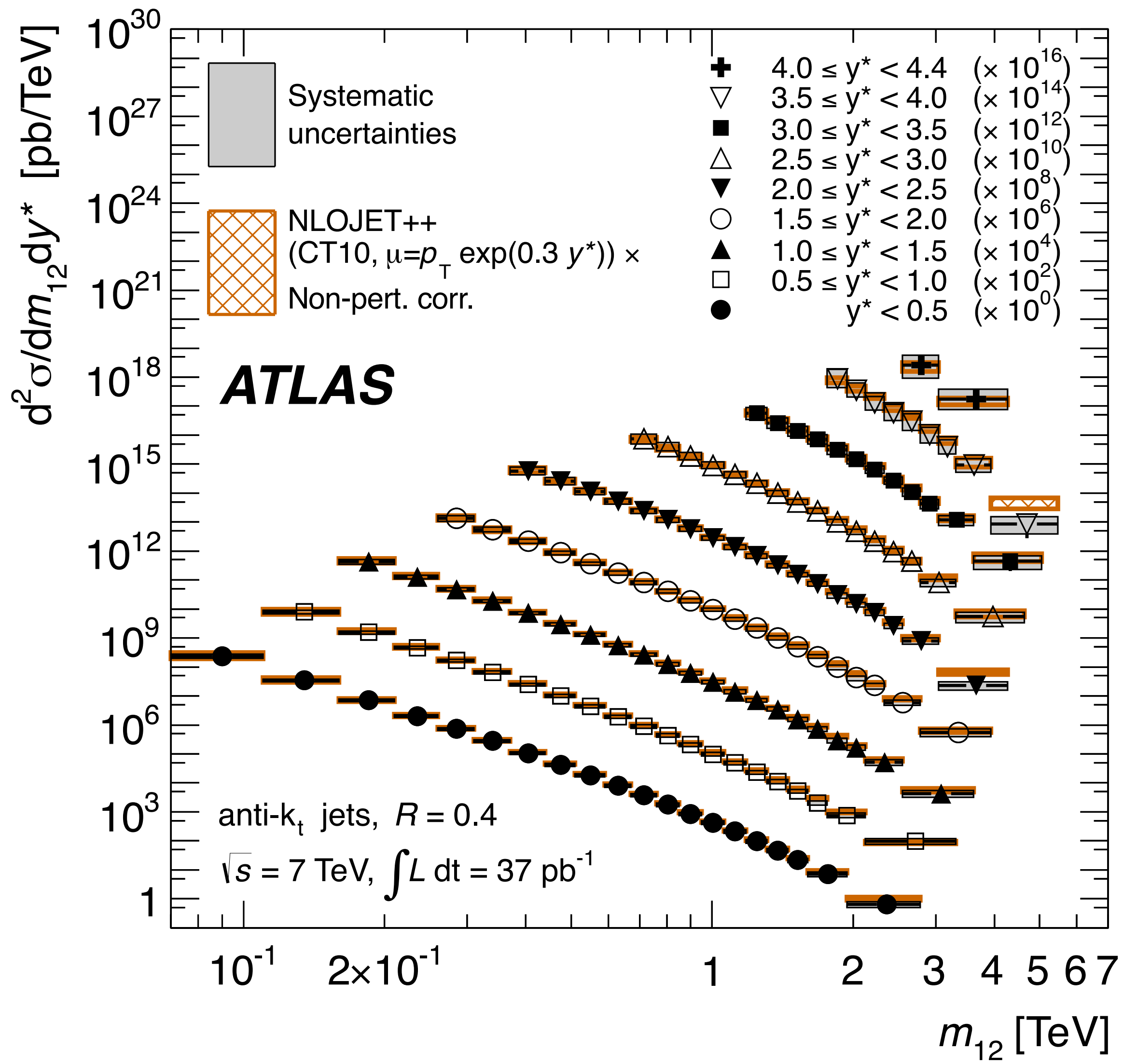
PDF comparisons for R=0.4



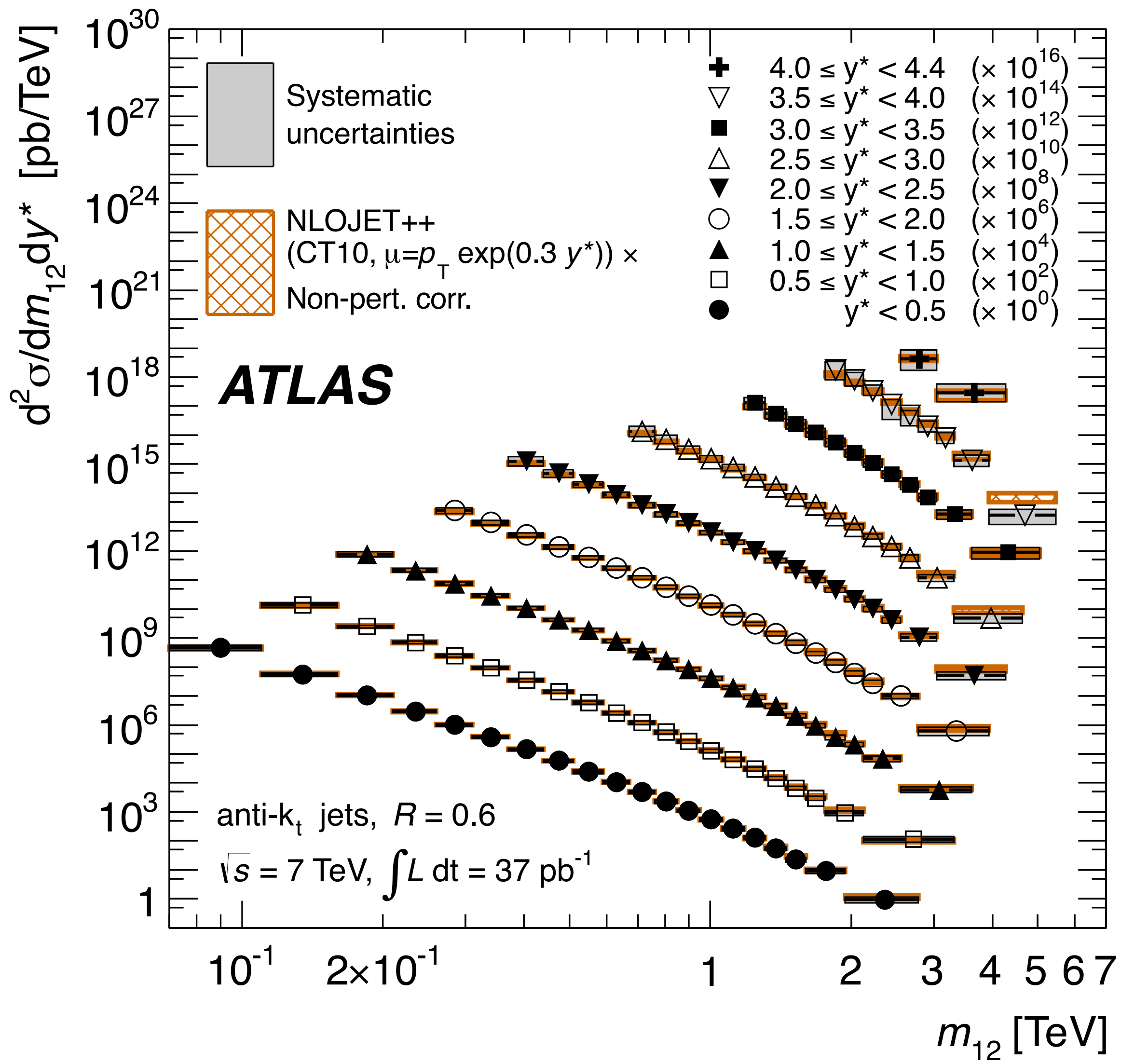
Ratio wrt CT10

2010 Dijet mass spectrum

Dijet mass cross-section compared to NLO pQCD + non-pert. corrections



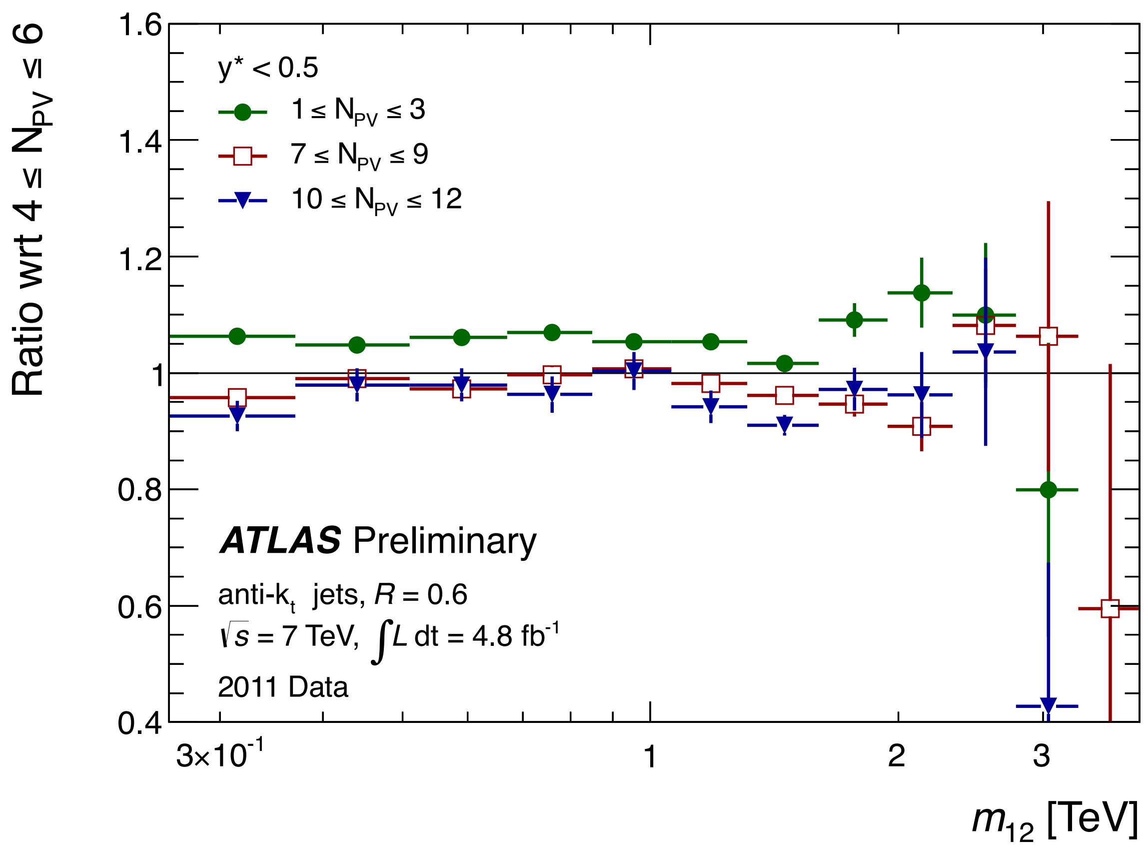
R=0.4

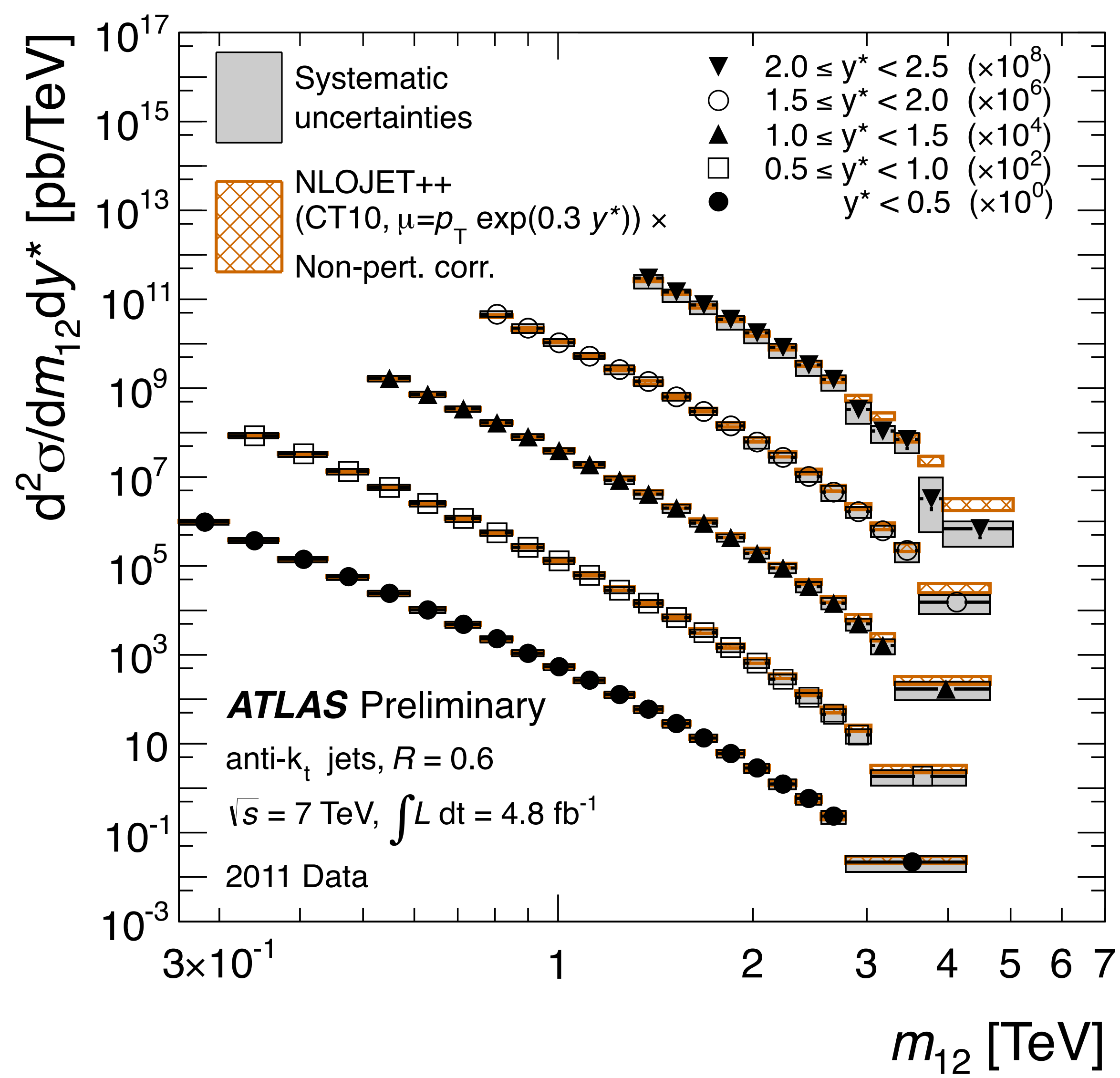


R=0.6

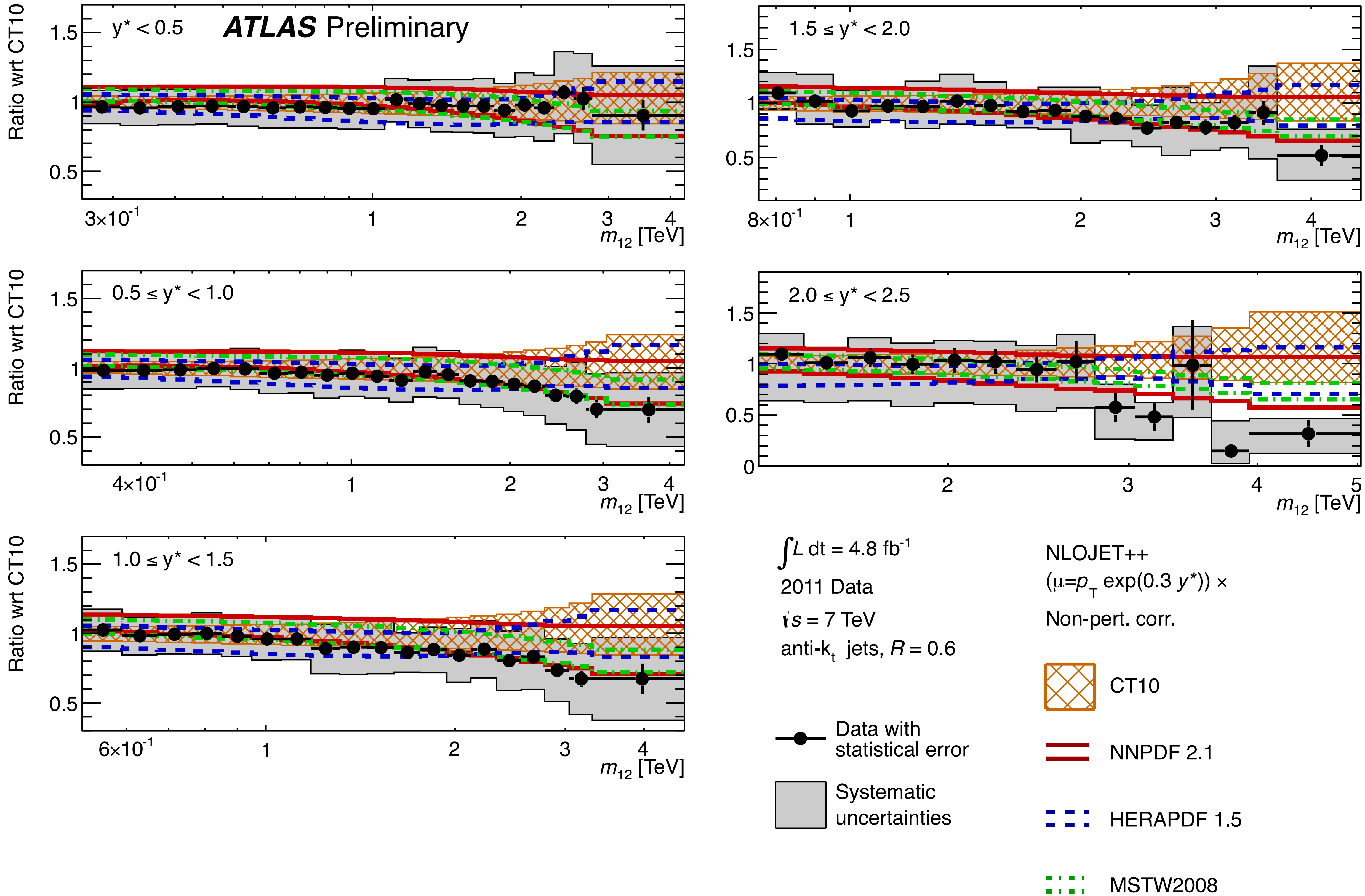
2011 Dijet mass spectrum

Dijet mass cross-section compared to NLO pQCD + non-pert. corrections



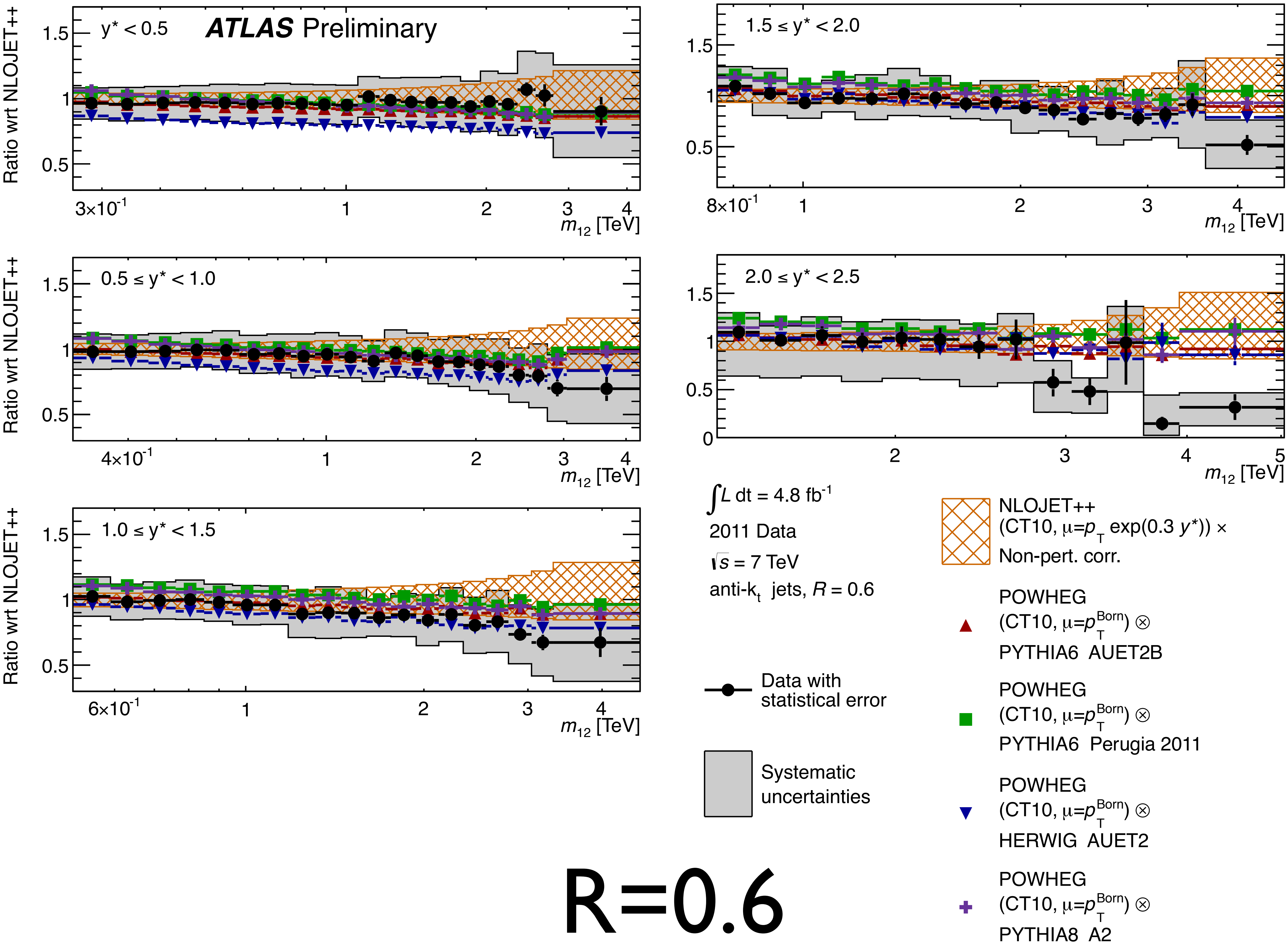


PDF comparisons



R=0.6

POWHEG comparisons



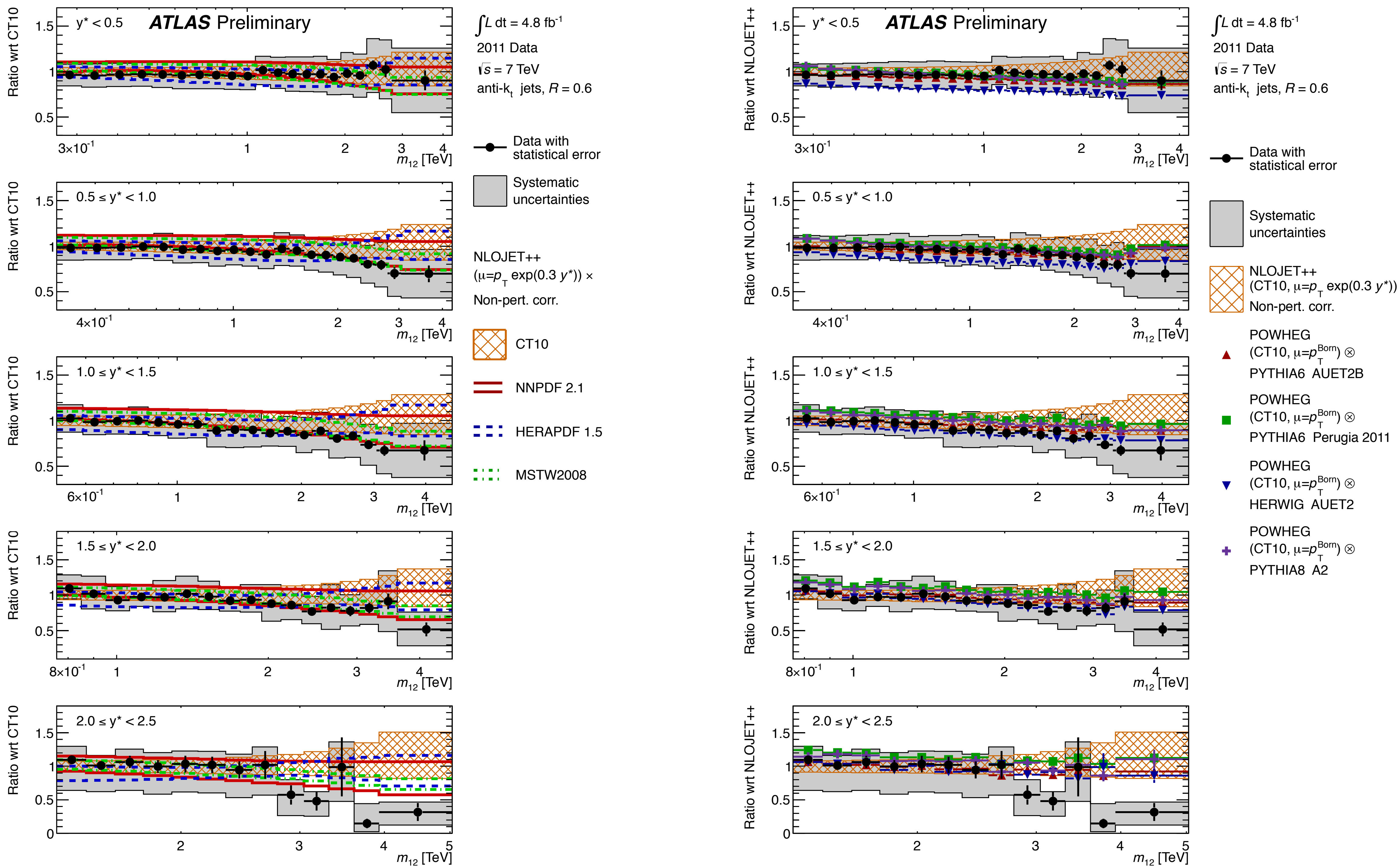
R=0.6

Conclusions

- Measurements of inclusive jet p_T and dijet mass cross sections performed using full 2010 ATLAS dataset of 37 pb^{-1}
- Measurement of the dijet cross section also performed for the full 2011 dataset (4.7 fb^{-1})
- Major extensions to previous EPJC publications
- Measured cross sections corrected for all detector effects
- Full propagation of (asymmetric) uncertainties and correlations
- Comparisons to predictions from NLO pQCD and NLO+parton shower (POWHEG)
  - QCD agrees well with the data across a large kinematic range in jet pT, dijet mass, and rapidity
  - Will help to constrain various PDF sets

Backup

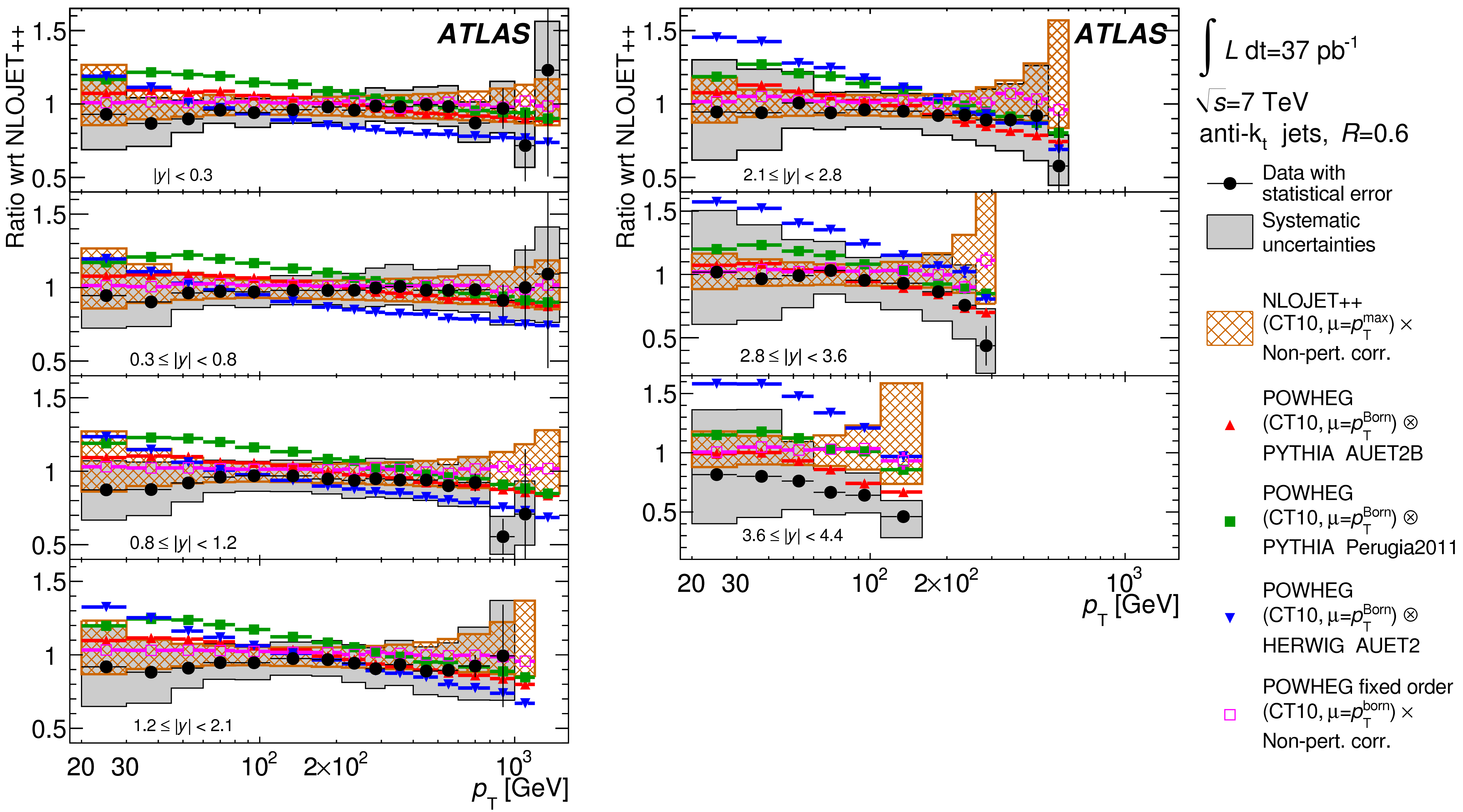
POWHEG&PDF comparisons



R=0.6

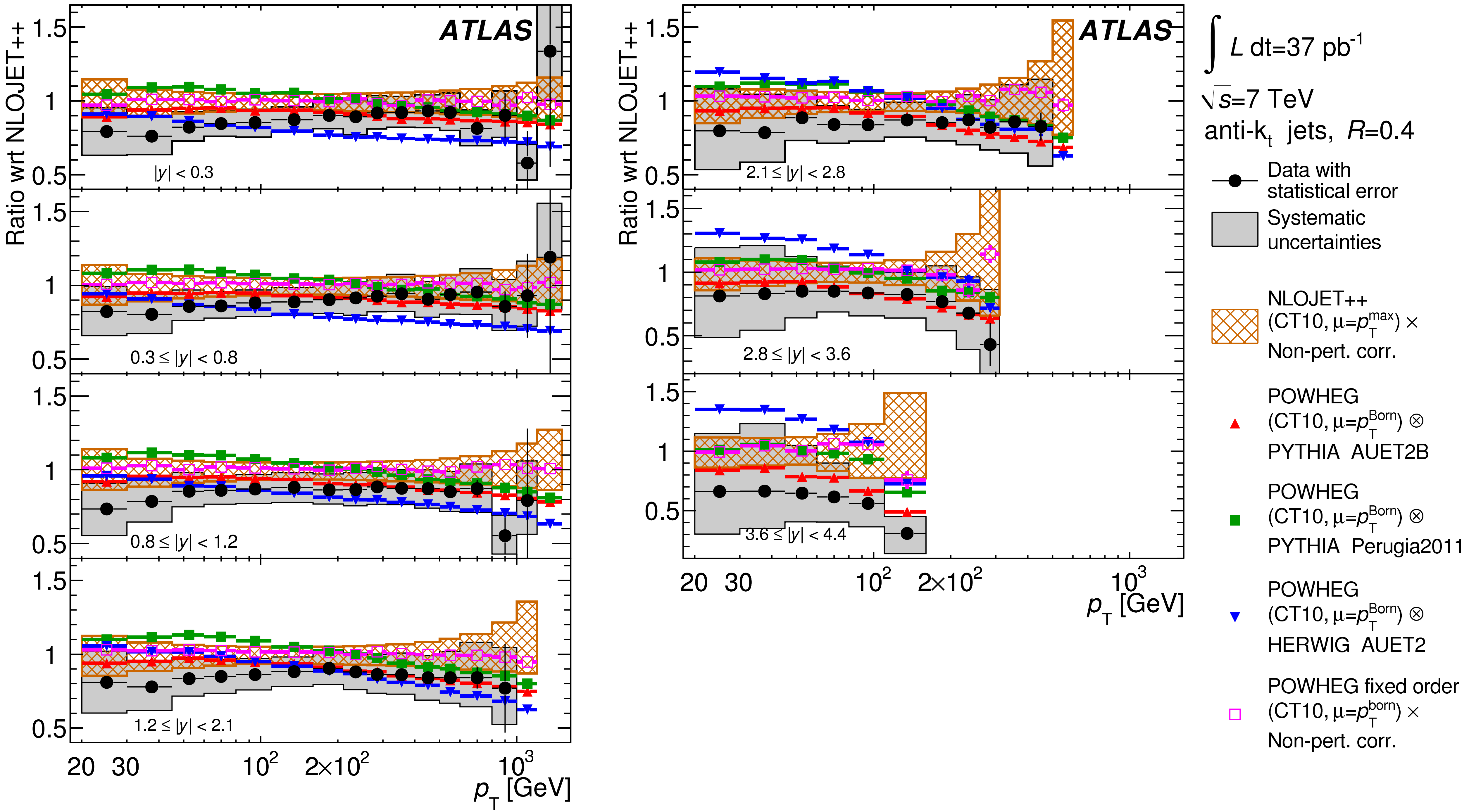
POWHEG comparisons for R=0.6

(NLO matrix element + parton shower)

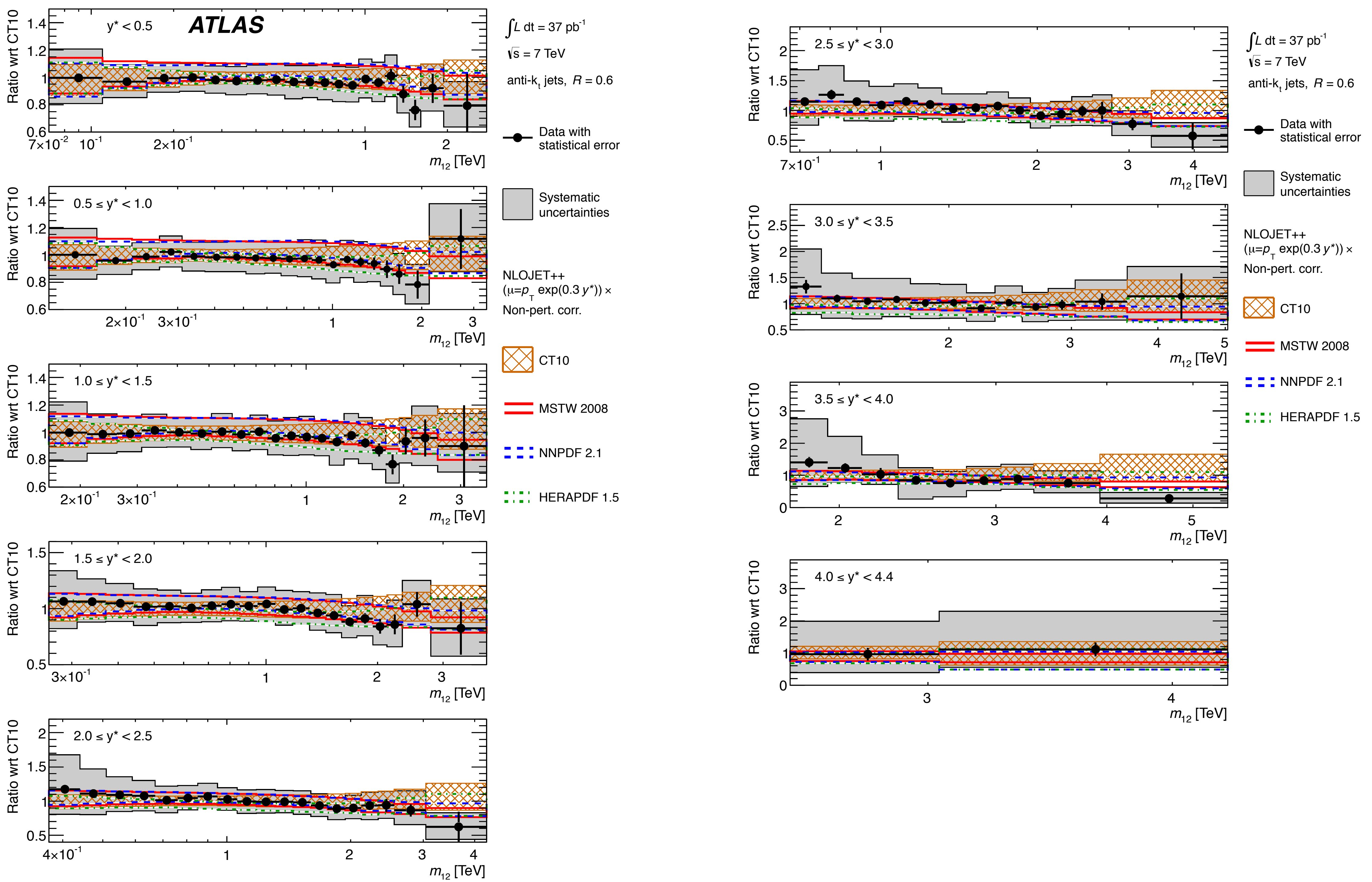


POWHEG comparisons for R=0.4

(NLO matrix element + parton shower)



PDF comparisons for R=0.6
(dijets)



PDF comparisons for R=0.4
(dijets)