# Measurement of the production cross section for Z/γ* in association with jets in pp collisions at √s = 7 TeV with the ATLAS Detector

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IFAE
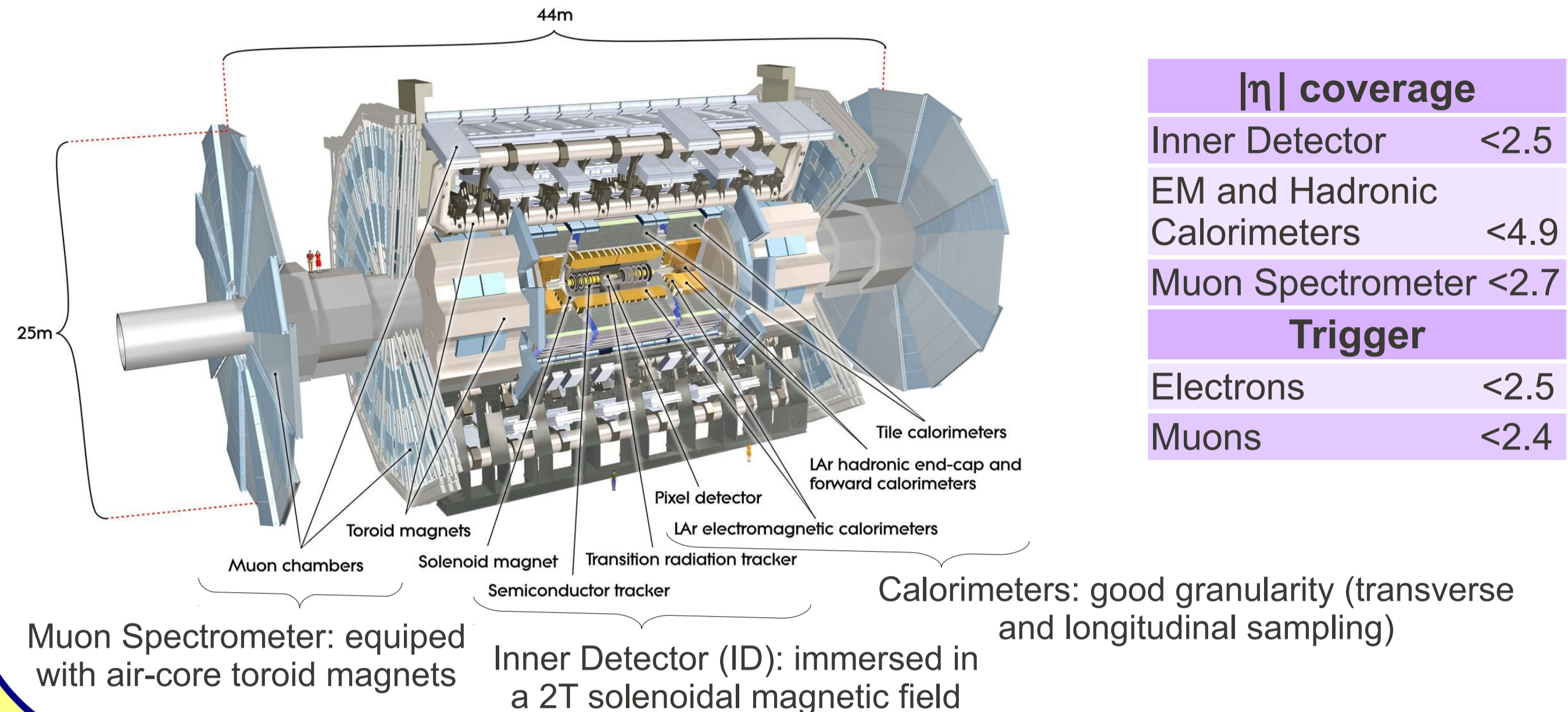Institut de Física d'Altes Energies (Barcelona)

Introduction

The measurement of Z+jets cross section provides a stringent test of pQCD. The MC predictions of Z+jets processes need to be tuned and validated at the unexplored LHC energy domain using data. Z+jets final states are irreducible background for new physics.
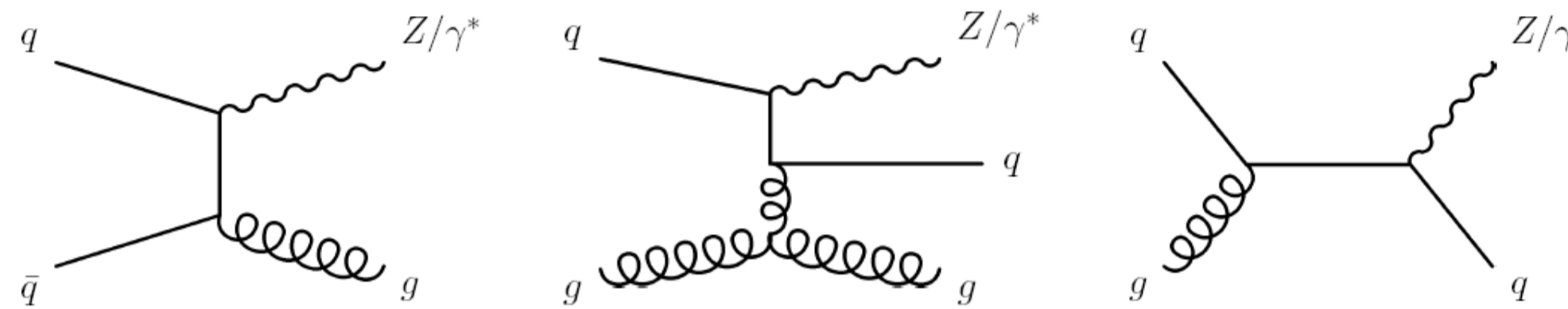
Results are presented using the full 2010 dataset corresponding to an integrated luminosity of **33 pb⁻¹**. Events are selected with a Z/γ* candidate decaying into electrons or muons.

The ATLAS Detector

| $|\eta|$ coverage	
Inner Detector	<2.5
EM and Hadronic Calorimeters	<4.9
Muon Spectrometer	<2.7
Trigger	
Electrons	<2.5
Muons	<2.4

Muon Spectrometer: equiped with air-core toroid magnets

Inner Detector (ID): immersed in a 2T solenoidal magnetic field

Calorimeters: good granularity (transverse and longitudinal sampling)

Event Selection

Trigger on single lepton

Electron	Muon	Jet
E_T>20 GeV	p_T>20 GeV	p_T>30 GeV
$|\eta|$<2.47 (1.37-1.52 excl)	$|\eta|$<2.4	$|\eta|$<2.8 ΔR(jet,lep)>0.5

2 opposite signed leptons
66<M(ll)<116 GeV

Electrons are reconstructed as EM clusters with a matching ID track. Muon candidates require an ID track segment combined with a track in the Muon Spectrometer.

Jet Reconstruction

Anti-Kt jet algorithm with **R=0.4** is used to reconstruct jets from 3-D topological clusters.

$|E_{cell}| > 4\ \sigma_{cell}$
$|E_{cell}| > 2\ \sigma_{cell}$
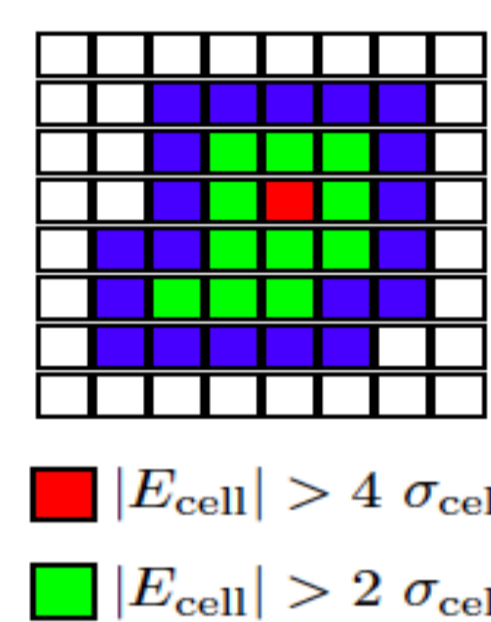
Jet p_T is corrected using MC-based calibration. Jet energy scale is the dominant systematic uncertainty: 10-20% in the cross-section measurement.
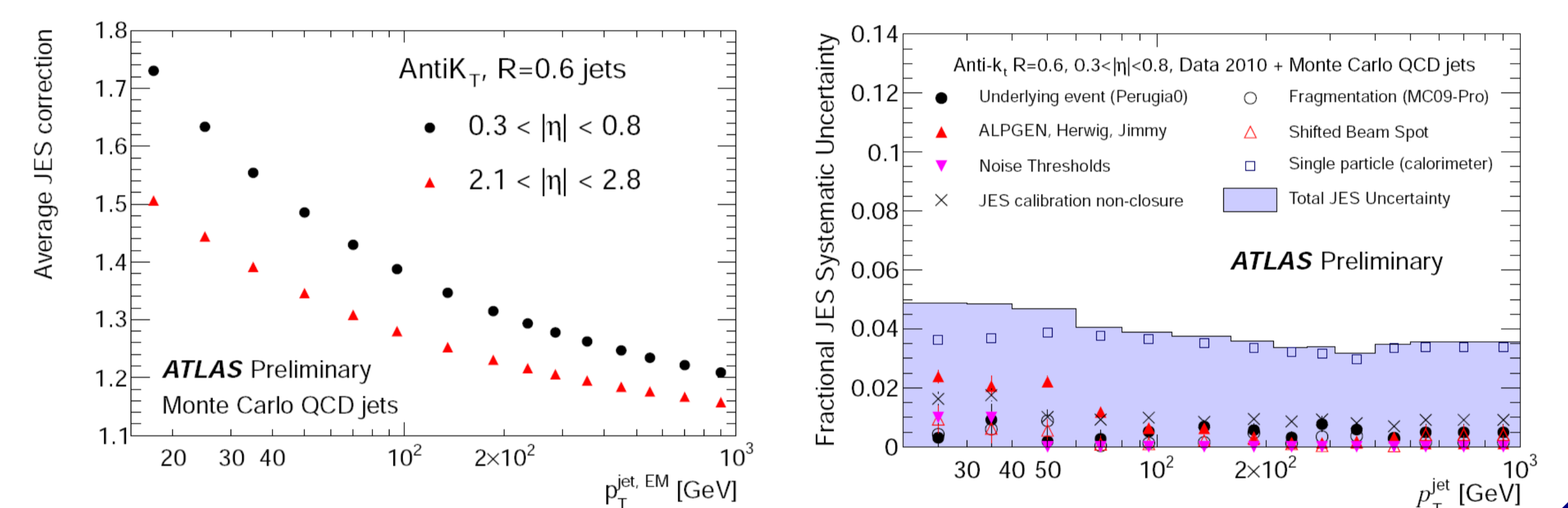
Background

Background contamination is estimated using MC except for dijet background in electron channel, which is estimated using a template fit on orthogonally selected data.

Background level:

6-14% as jet multiplicity increases

1-8% as jet multiplicity increases
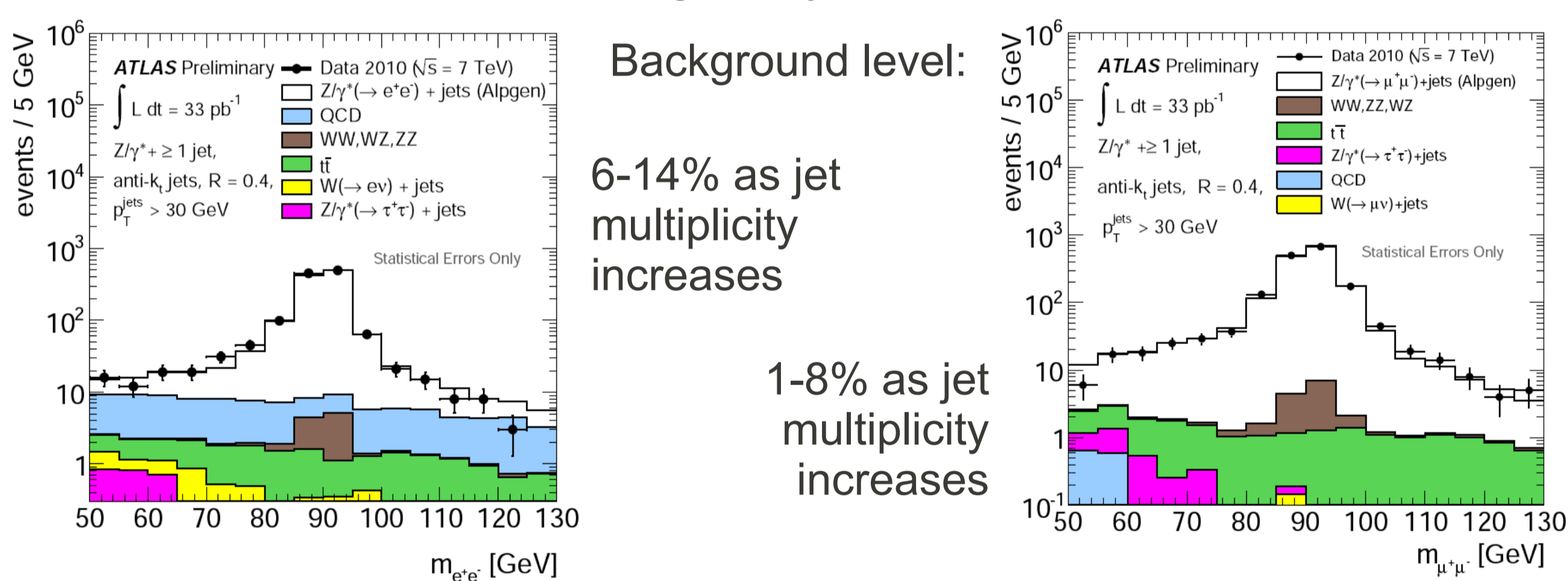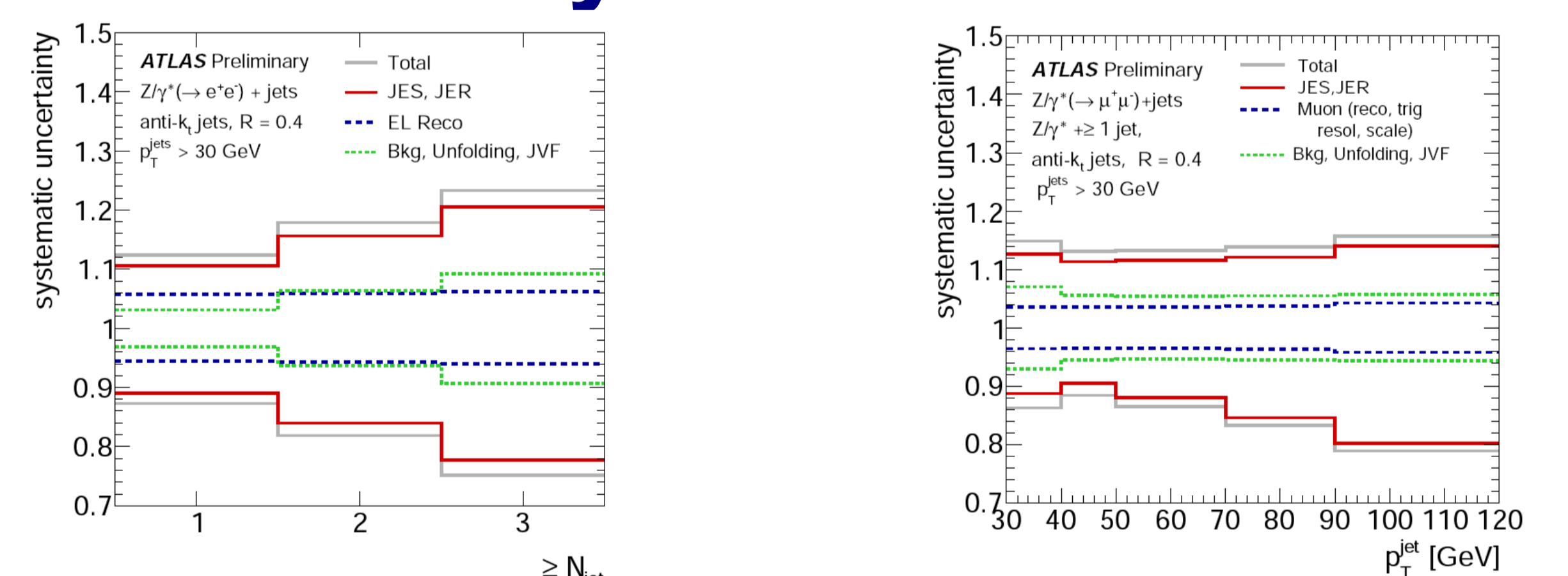
Differential cross-section

$$\frac{d\sigma^{hadr}}{d\alpha} = \frac{N_{data}^{det} - Bg^{det}}{\mathcal{L}} \cdot U_{MC}^{det \rightarrow hadr}(\alpha)$$

Bin-by-bin unfolding based on Alpgen MC samples.

Systematics

Main systematic uncertainties from Jet Energy Scale, lepton reconstruction and unfolding. Total uncertainty between 13 -24% in the number of jets and between 15%-25% in the jet P_T.
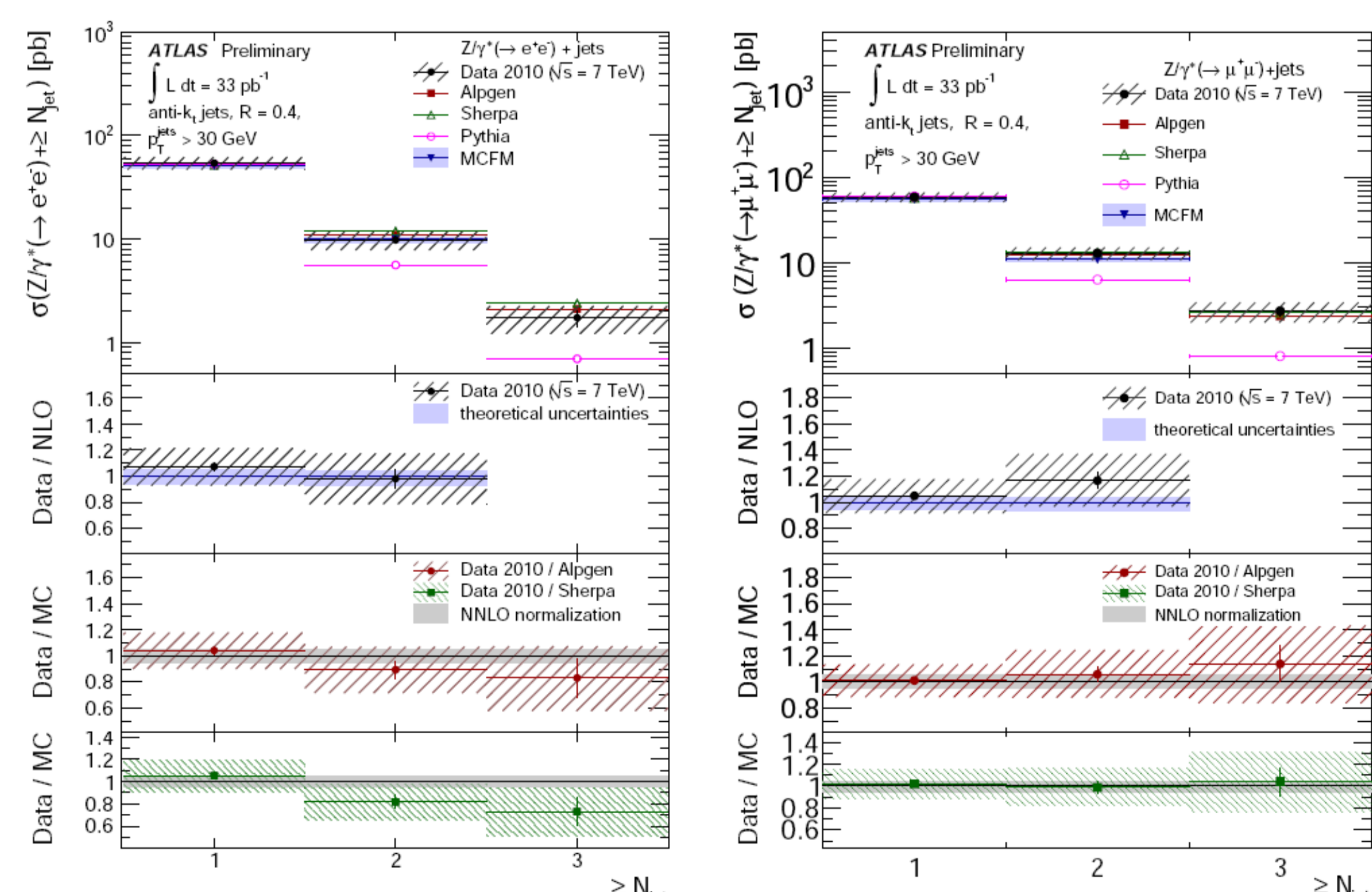
NLO pQCD predictions

Computed with MCFM, CTEQ6.6 PDFs, and renormalization and factorization scale $\mu = H_T/2$ ($H_T \equiv$ scalar sum p_T of all particles). Include non perturbative corrections of the order of 4%. Systematics derived from PDFs, $\alpha_s (M_Z)$ and μ uncertainties are included.

Results

* Results include an additional 3.4% systematic uncertainty on the integrated luminosity.

Measured cross sections are well described by NLO pQCD predictions (+ non perturbative corrections) and by LO+parton shower predictions from ALPGEN and SHERPA.