Z(→e⁺e⁻)+jets analysis: A first look at 7 TeV FDMC samples

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V+jets meeting
(November 13, 2009)

Following the big picture outlined by V+jets

From Rick Cavanaugh's talk on Sept 16

Objectives for Very First Paper

- Measurement of total cross-section (7 Tev? 10 TeV? Both?)

$\sigma(\geq n)$ and $\dfrac{\sigma(\geq n)}{\sigma(\geq n-1)}$ $\qquad n = 1, 2, 3$

Simple counting experiment

Objectives for following papers

- Measurements of differential cross-sections w.r.t. jet quantities

$$\frac{d\sigma}{dp_T^{\mathtt{jet}}};\ \frac{d\sigma}{dy^{\mathtt{jet}}};\ \frac{d\sigma}{dM_{ij}^{\mathtt{dijet}}};\ \frac{d\sigma}{d(dR_{ij}^{\mathtt{dijet}})} \qquad n = 1, 2, 3$$

We have started aligning our efforts along these lines. Here I show examples of both types of measurements using 100 pb^{-1} FDMC sample of $Z(\rightarrow e^+e^-)$+jets events generated assuming c.m. energies of 7 TeV and 10 TeV.

Summer09 FDMC ZeeJet Pythia samples

Signal samples

DBS entry: **/ZeeJet_Pt<bin>/Summer09-MC_31X_V3-v1/GEN-SIM-RECO**
/ZeeJet_Pt<bin>/Summer09-MC_31X_V3_7TeV-v1/GEN-SIM-RECO

where, the generator $\hat{p}_T$ bins are (in units of GeV/c):

0−15, 15−20, 20−30, 30−50, 50−80, 80−120, 120−170, 170−230, 230−300, 300−∞

We combine these samples weighting by the production cross section for each bin

Background samples

QCD_EMenriched_Pt 20to30, 30to80, 80to170
QCD_BCtoE_Pt 20to30, 30to80, 80to170
Wenu, ttbar, photon+jet

at 7 TeV and 10 TeV

These LO samples have been well-tested by the POG.

In today's presentation, I will show the distributions for signal events only. A complete analysis including backgrounds will follow later.

Baseline event selection for today's plots

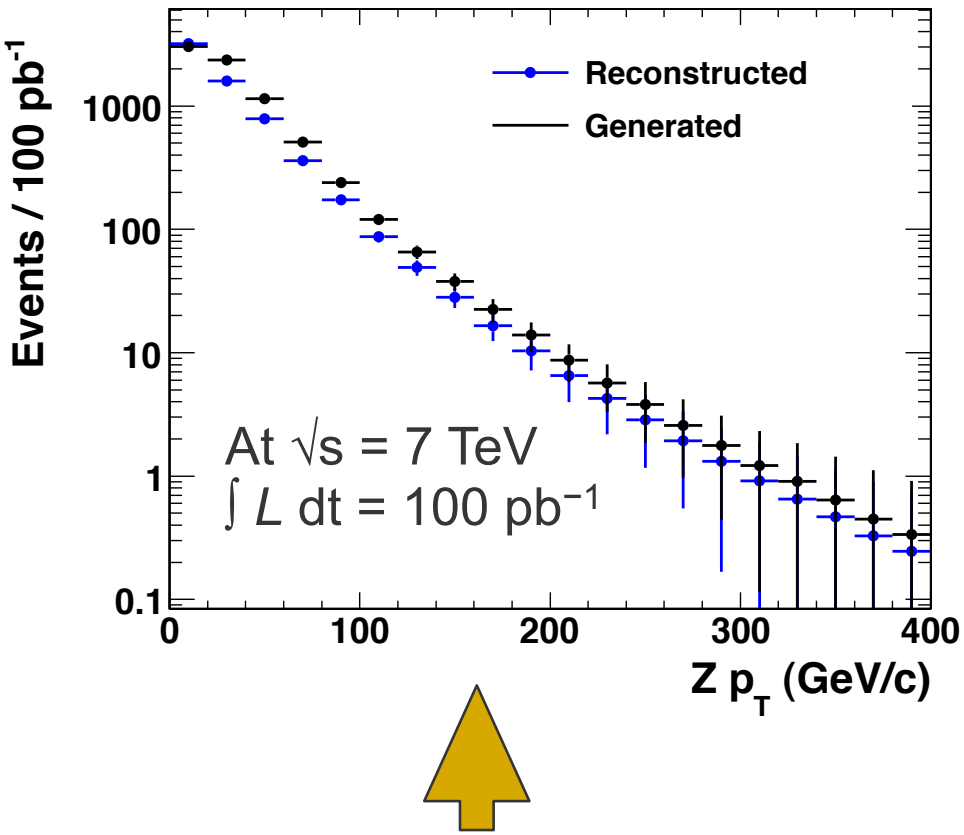
✓**Use standard *Egamma* POG electron Id and isolation**
✓**Use *JetMET* provided CaloJets, pfJets, and GenJets**

✦$Z \rightarrow e^+e^-$ reconstruction
- $|m_{ee} - M_Z| < 10$ GeV/c^2
- Electrons
  - super cluster matched to track (*gsfElectrons*)
  - $p_T > 20$ GeV/c
  - within ECAL and tracker acceptance:
    $|\eta| < 1.44$ (barrel) OR $1.56 < |\eta| < 2.5$ (endcaps)
  - loose isolation
  - "Robust Loose" electron id

✦Jets (***anti-kT5***: CaloJets, GenJets, pfJets)
- in the barrel or endcaps: $|\eta_{Jet}| < 3$
- $p_T > 20$ GeV/c (corrected p_T)

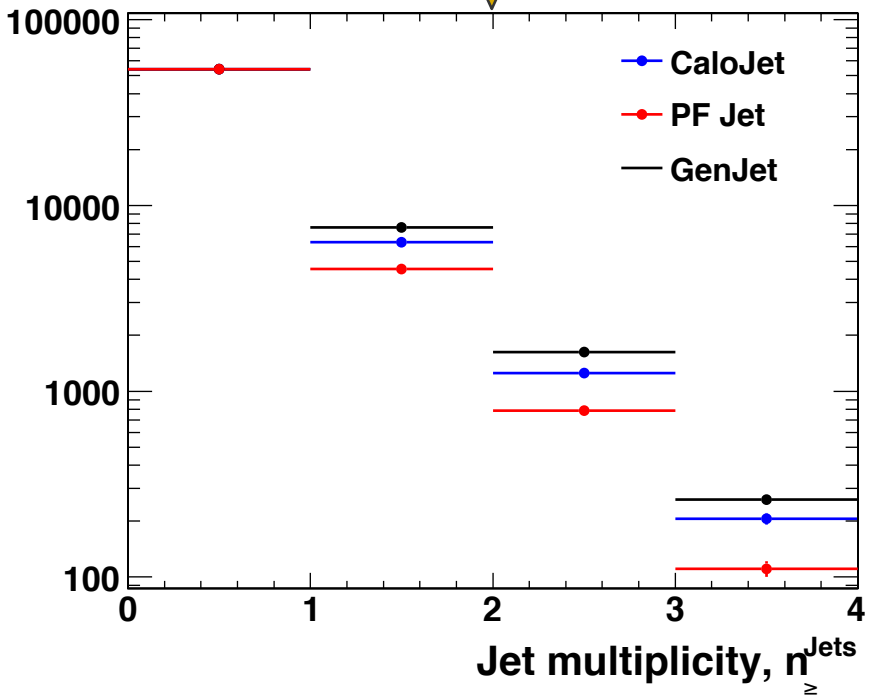
[CaloJets used are fully corrected, the pfJets used here are not]

7 TeV: Z p_T and Jet multiplicity

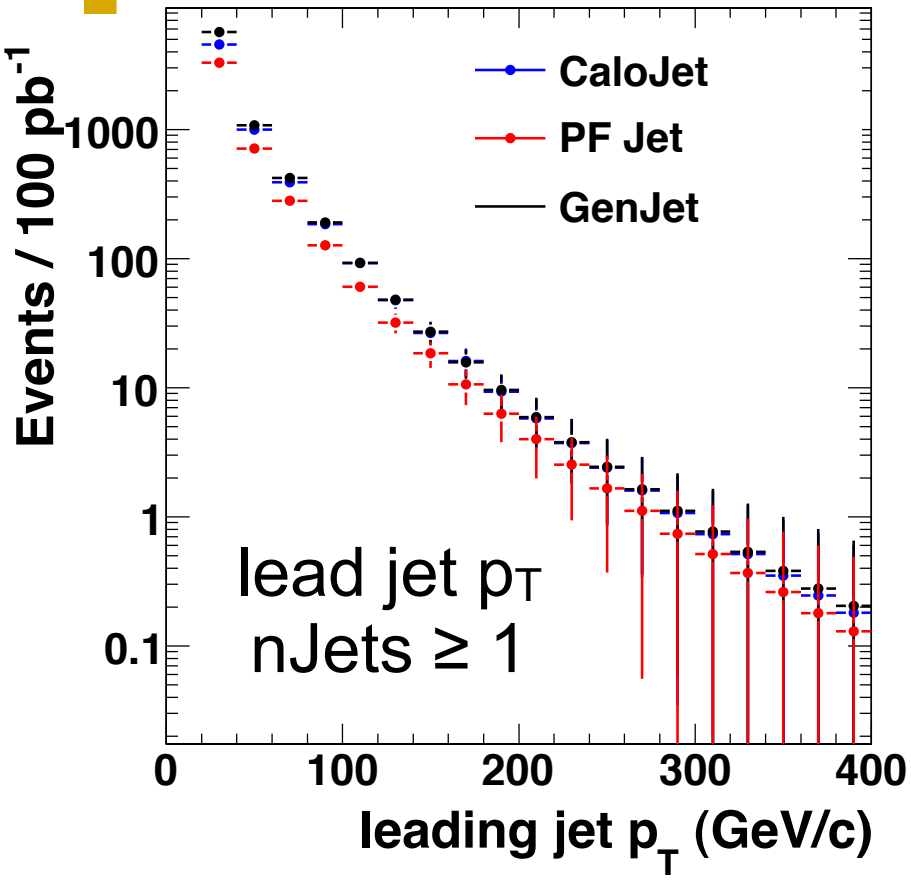


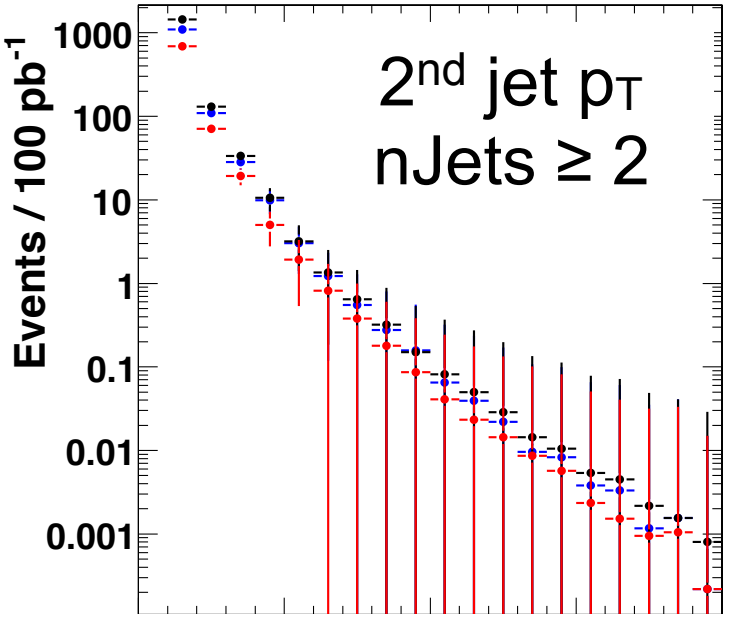
✦data up to p_T = 200 GeV/c.
✦Total events ≈ 7000.

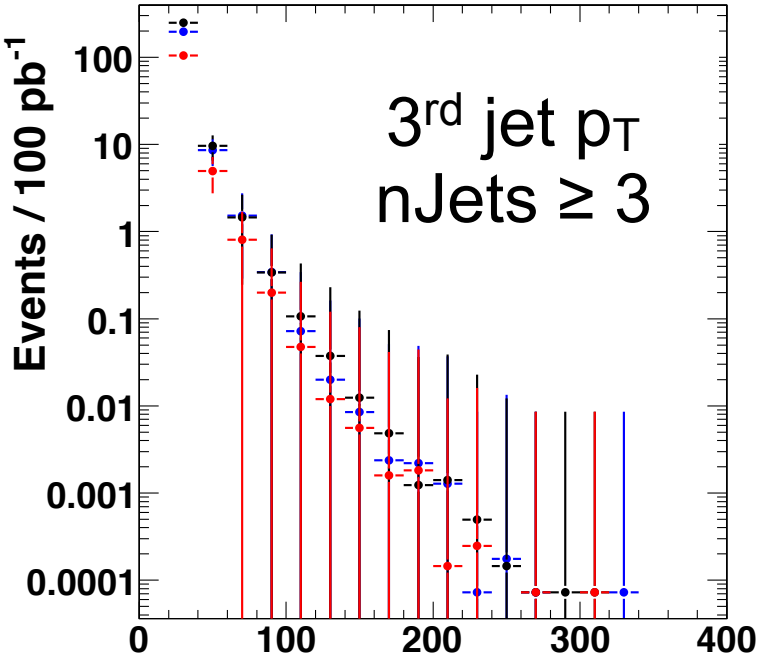
✦The N/N+1 jet ratio, integrated over entire sample is ~ 0.15−0.25
✦At 100 pb^{-1}, expect ~6000 Z+1 jet, 1000 Z+2jet, 200 Z+3 jet events



7 TeV: Jet p_T distribution

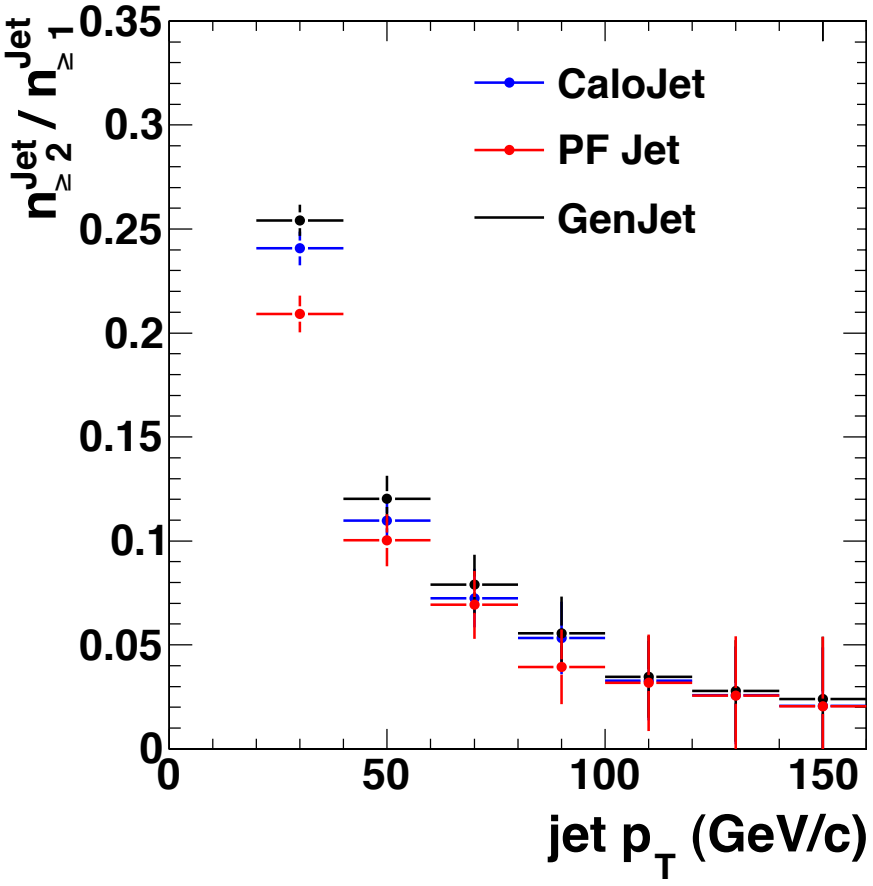


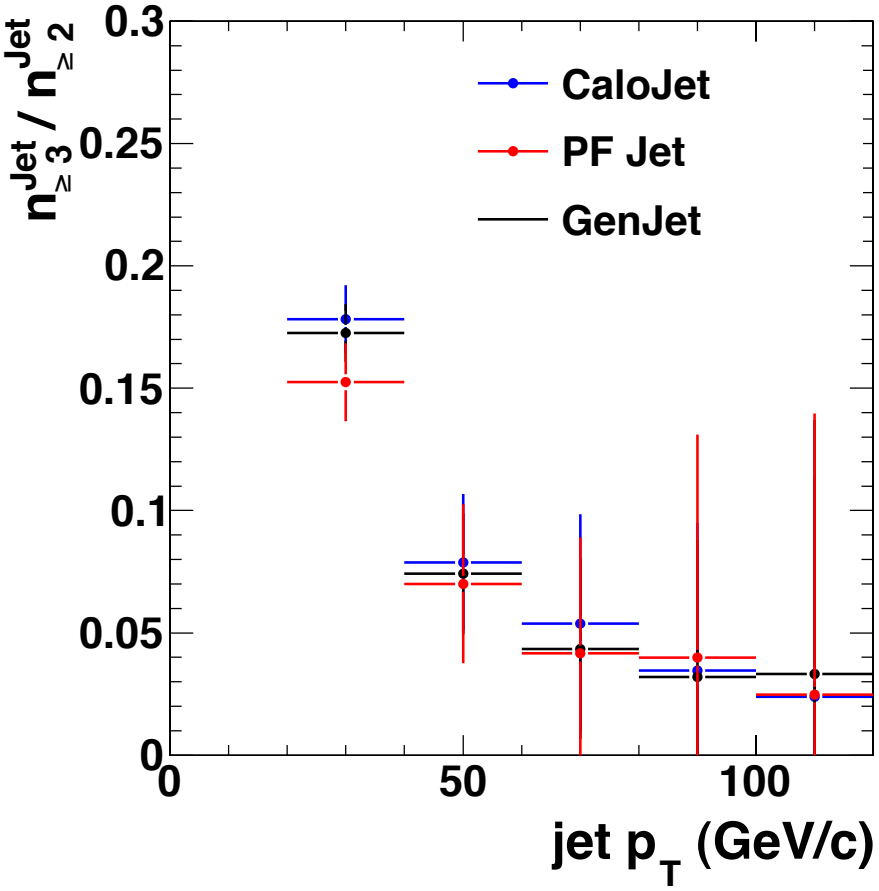




- 2nd jet up to $p_T \approx 100$ GeV/c
- 3rd jet up to $p_T \approx 50$ GeV/c
- No meaningful 4th jet p_T with 100 pb^{-1}

7 TeV: N+1 / N jet ratio

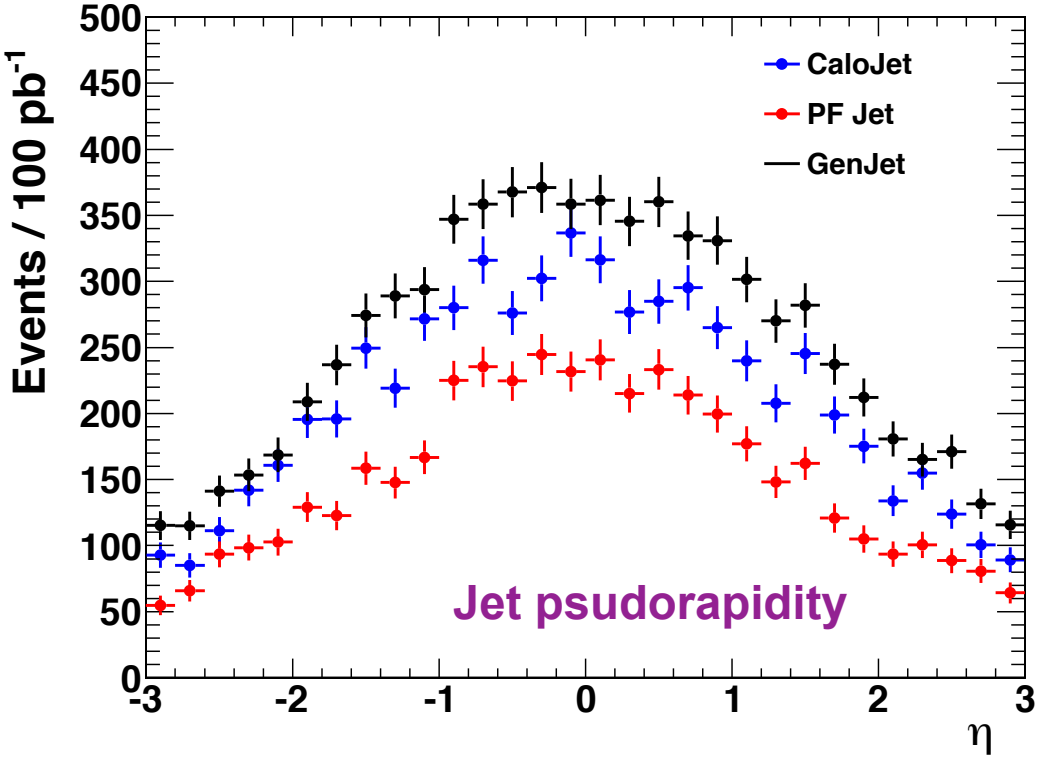


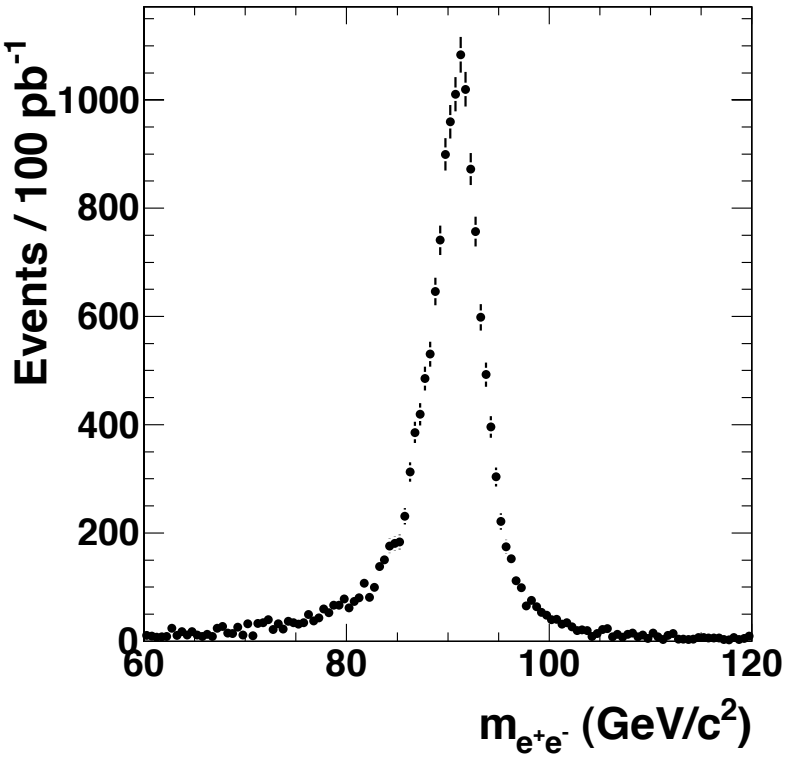


 # events with ≥ 2 jets
 # events with ≥1 jets

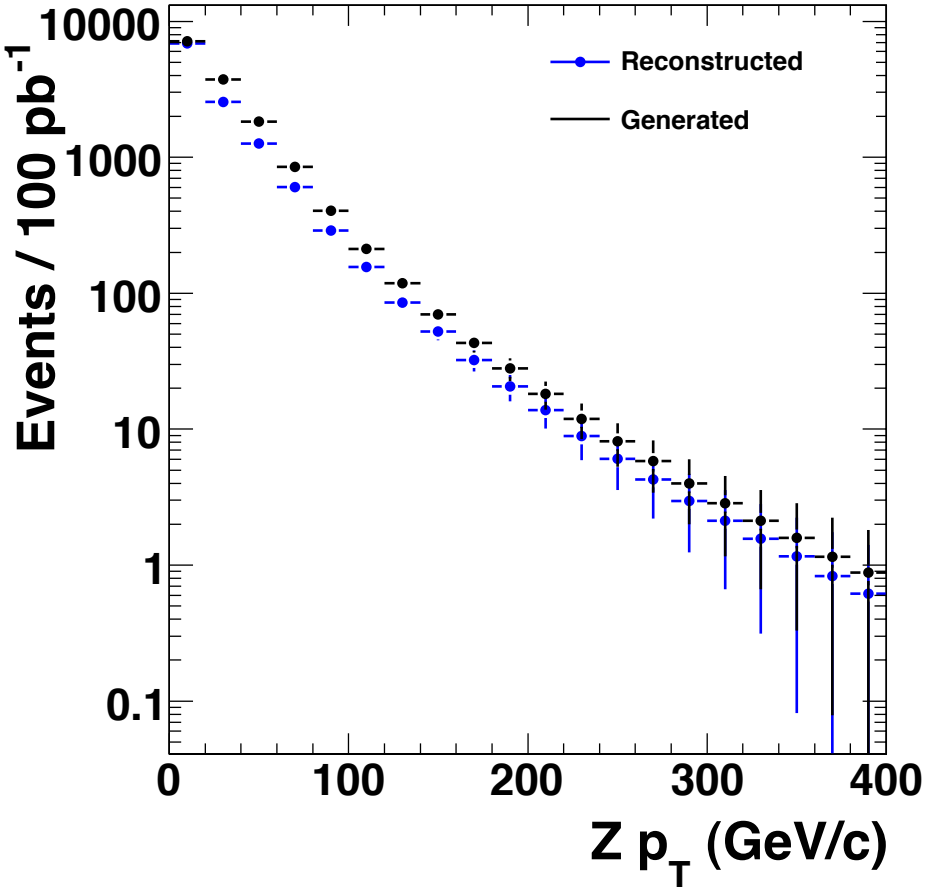
 # events with ≥ 3 jets
 # events with ≥2 jets

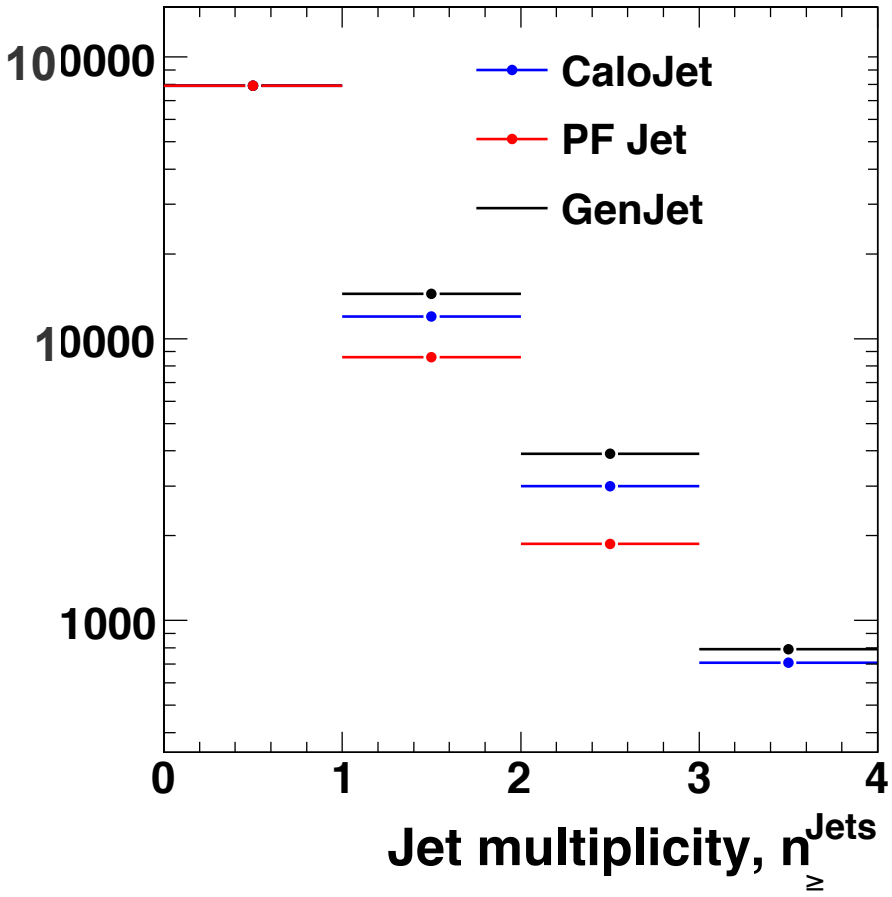
7 TeV: Some other distributions



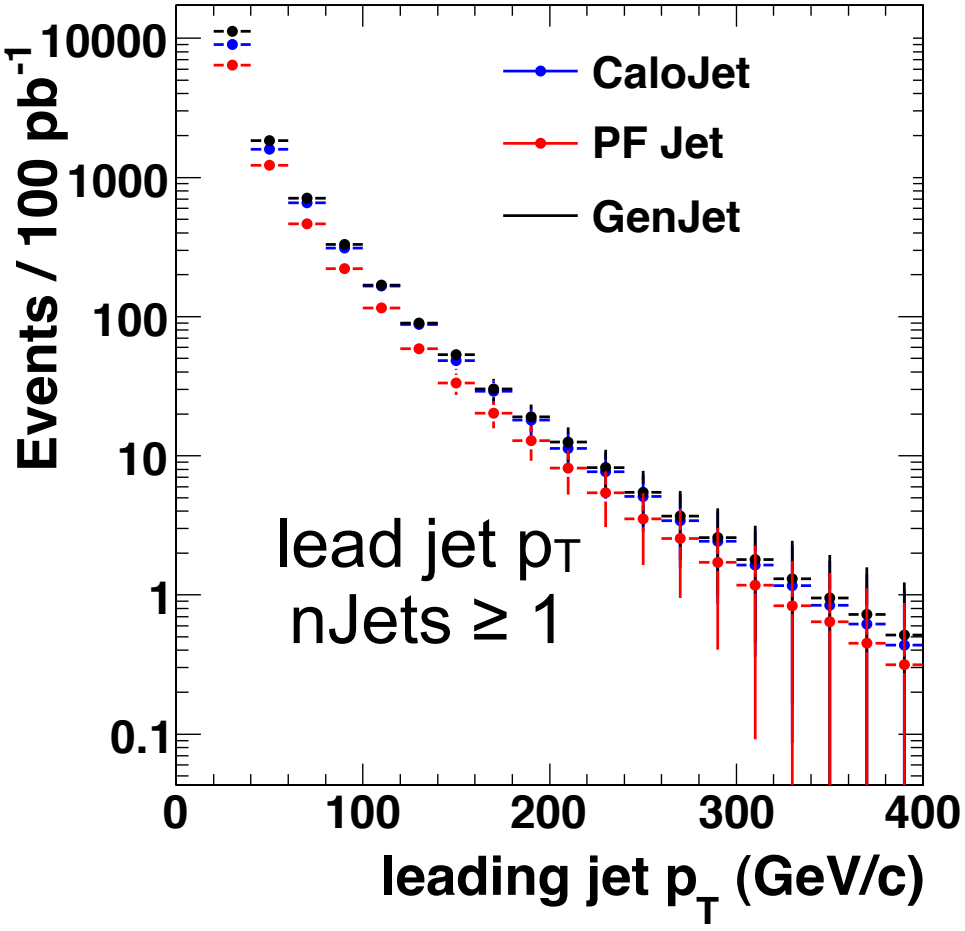


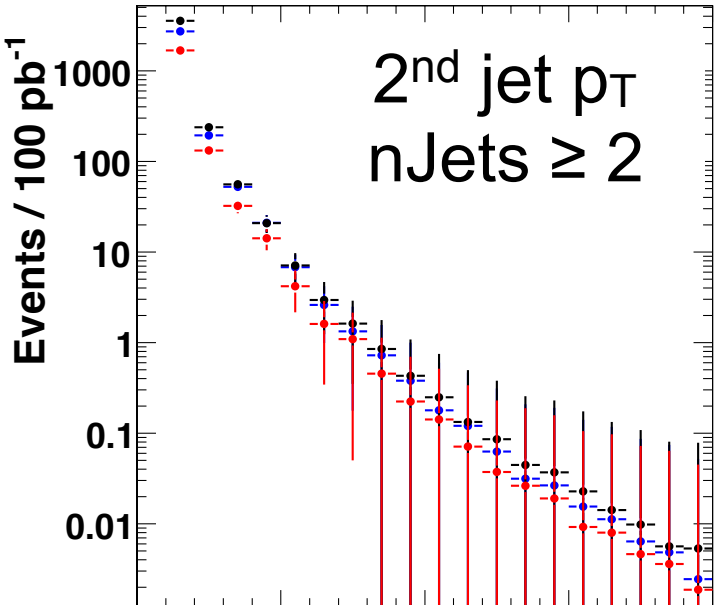
10TeV: Z p_T and Jet multiplicity

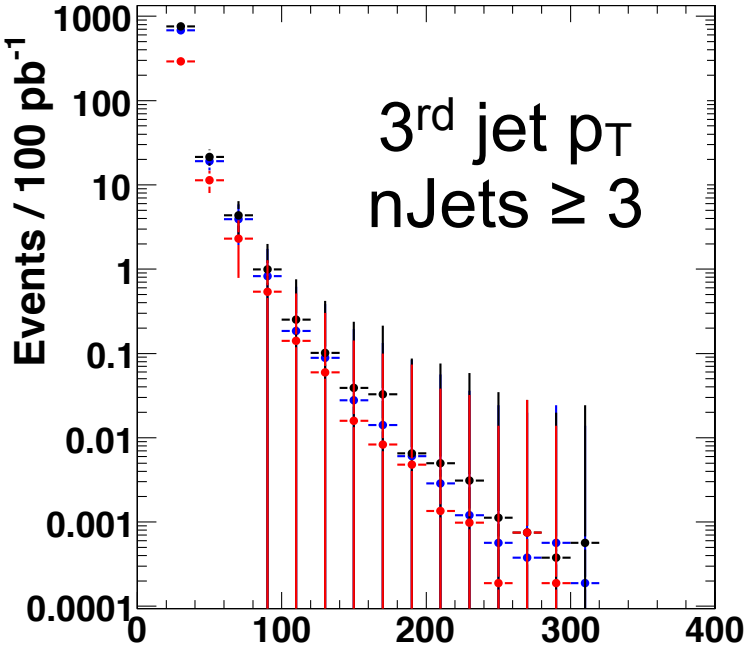




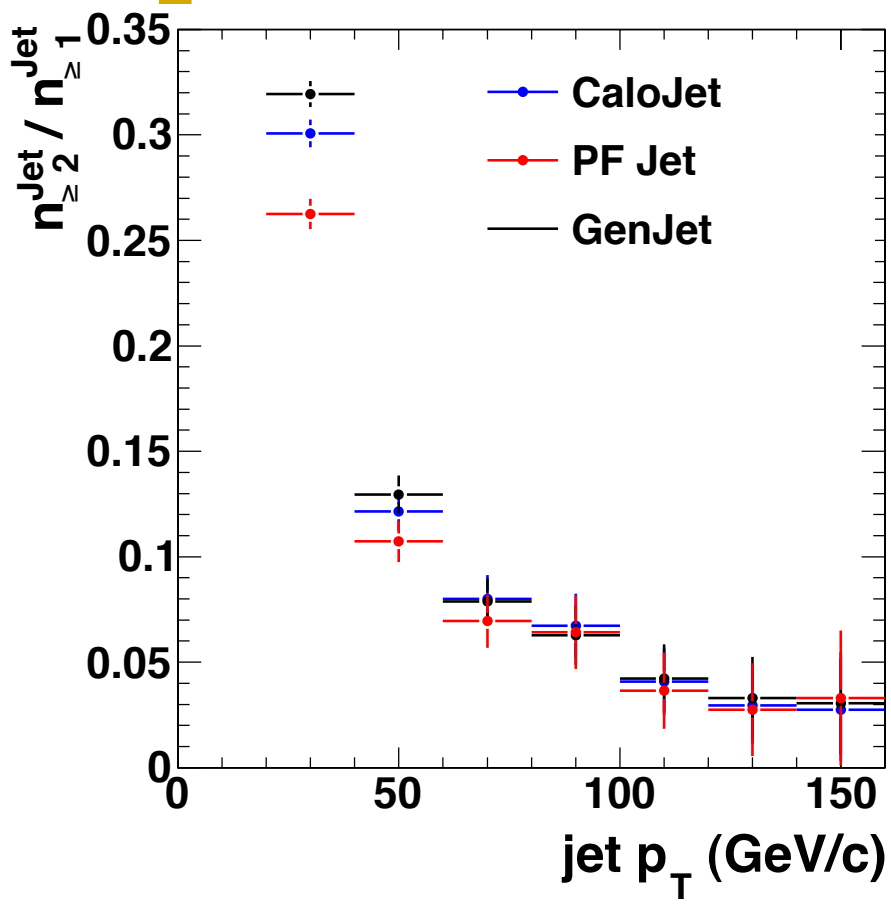
10 TeV: Jet p_T distribution

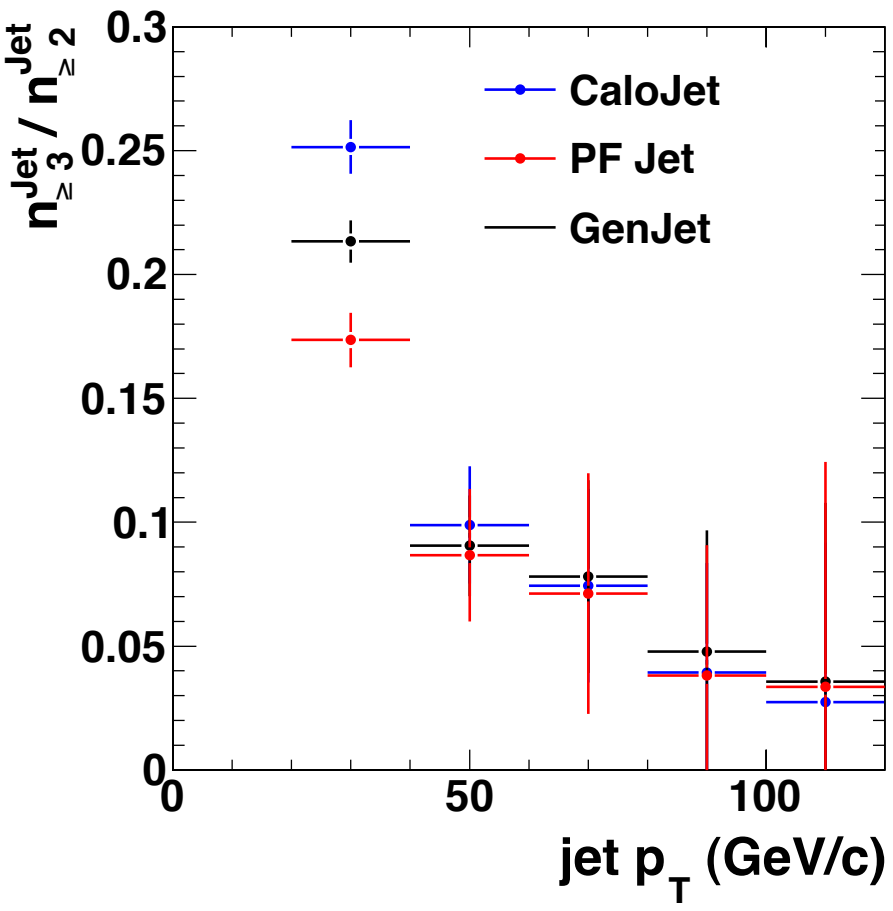






10 TeV: N+1 / N jet ratio





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