WH -> $\ell\nu bb$ Analysis

Nils Kristian Hüske
LPNHE Paris

on behalf of the WH Team

**Gregorio Bernardi, Jonathan Brown, Duncan Brown,
Yuji Enari, Ken Herner, Sebastien Greder, Jeremie Lellouch,
Michiel Sanders, Isabelle Ripp-Baudot,
Jianming Qian, Chun Xu, Hatim Hegab**

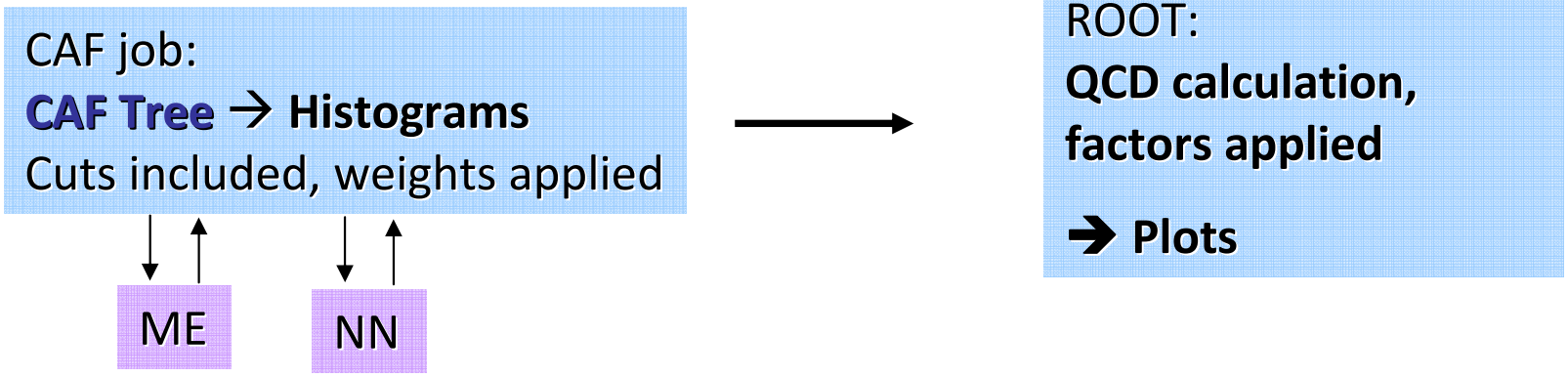
D0 France Meeting – Grenoble – April 01 2009

Overview

- New WH Framework
- WH Electron Channel
  - Efficiency Study
- WH Muon Channel
- Future Plan

WH Framework Flowchart

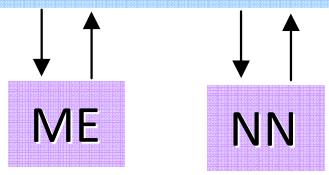
Old Framework:



WH Framework Flowchart

Old Framework:

CAF job:
CAF Tree → Histograms
Cuts included, weights applied



→

ROOT:
QCD calculation, factors applied

→ Plots

New Framework:

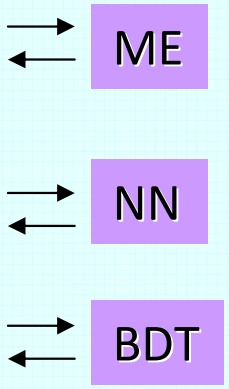
CAF job:
CAF Tree → WH Tree
No Cuts, weights *stored*

Can be run directly on SAM data

→

ROOT:
QCD calculation, apply Cuts (incl. b-tagging), rem.dupl.events, apply weights

→ Plots



WH Electron Channel – 2 jet exclusive

WH Electron Channel - Using Vjets 2.3.2

$L=2.58\ fb^{-1}_{(p20)}$

Default Vjets_cafe factors
K-Factor Wjj 1.3
HF Factor 1.47

Selection criteria:

Exactly 2 Vertex Confirmed Jets

Jet1 pT > 20 GeV
Jet2 pT > 15 GeV

MET > 15 GeV
no HT cut
Triangle cut applied
CC region only

Normalization: 1.34

Before:

No Vertex Confirmation

Jet1 pT > 25 GeV
Jet2 pT > 20 GeV

MET > 20 GeV
HT > 60 GeV

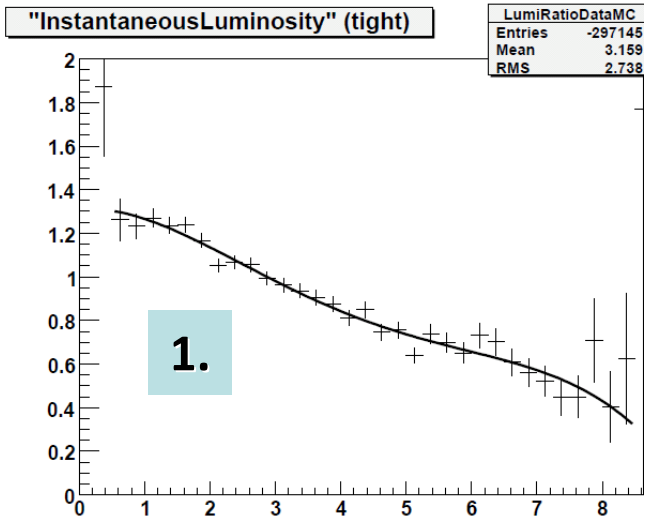
+ Additional Luminosity Reweighting

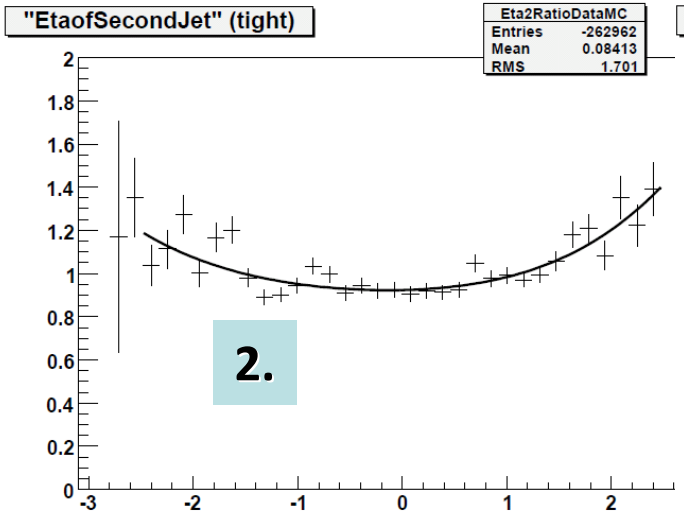
+ VCJ Scale Factors applied

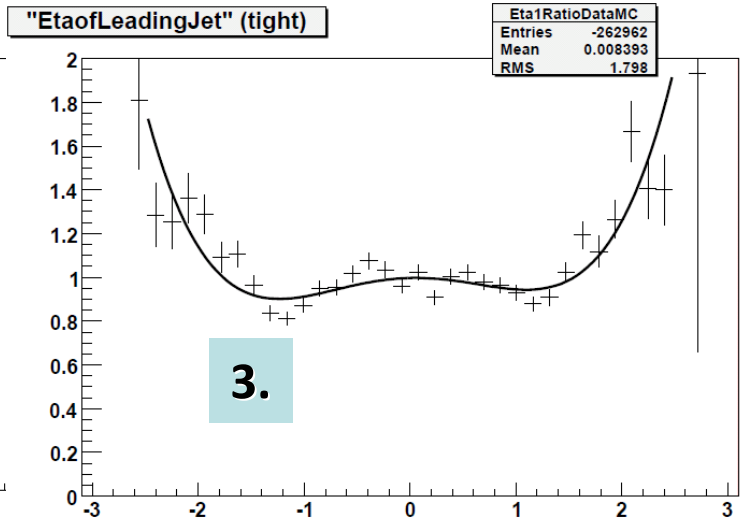
+ Alpgen MC Reweighting (rederived)

1. Eta Second Jet
2. Eta Leading Jet
3. Delta Eta
4. Delta Phi

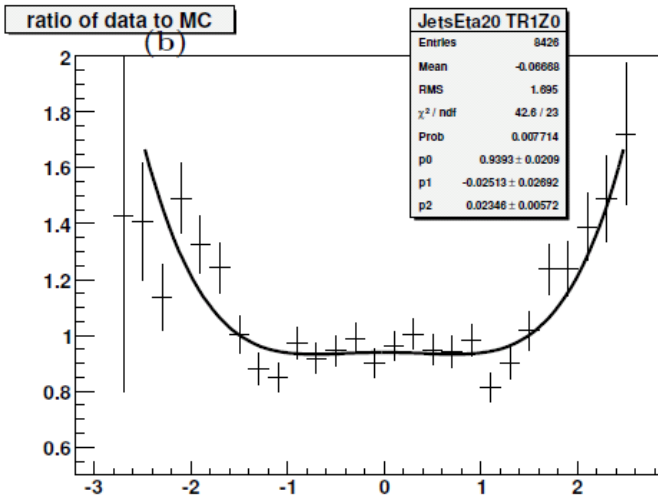
Reweighting functions

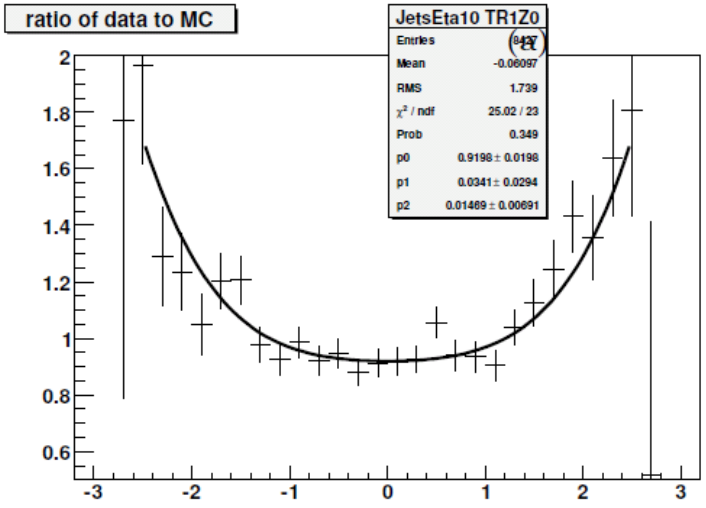




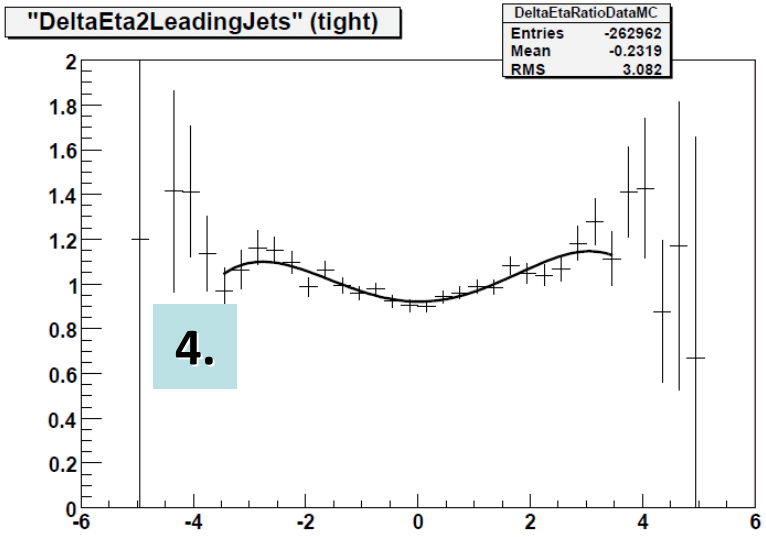


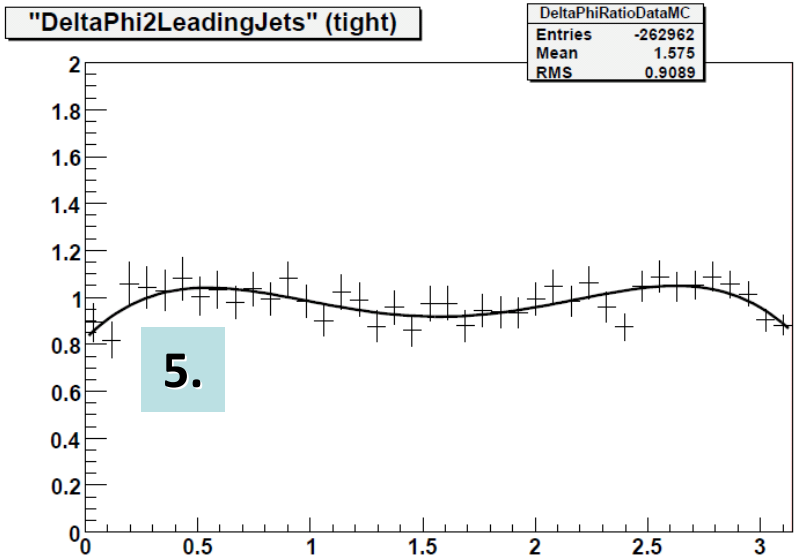
Old reweighting functions:



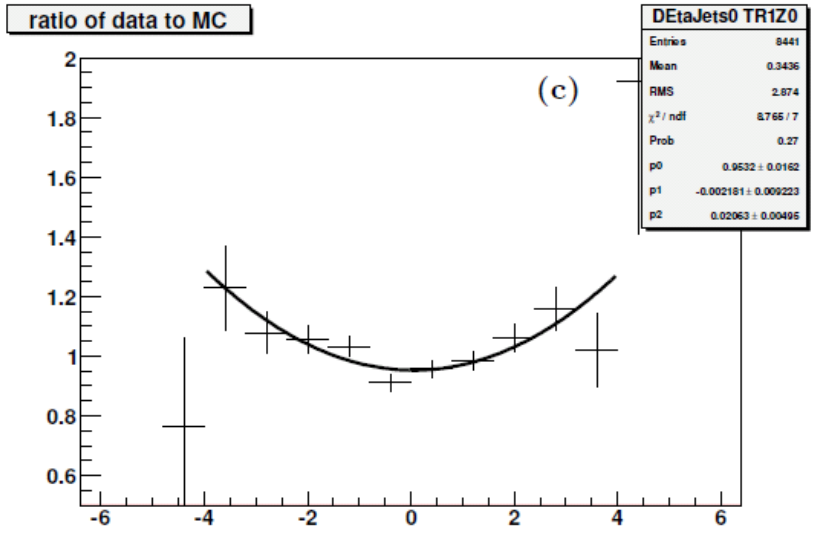


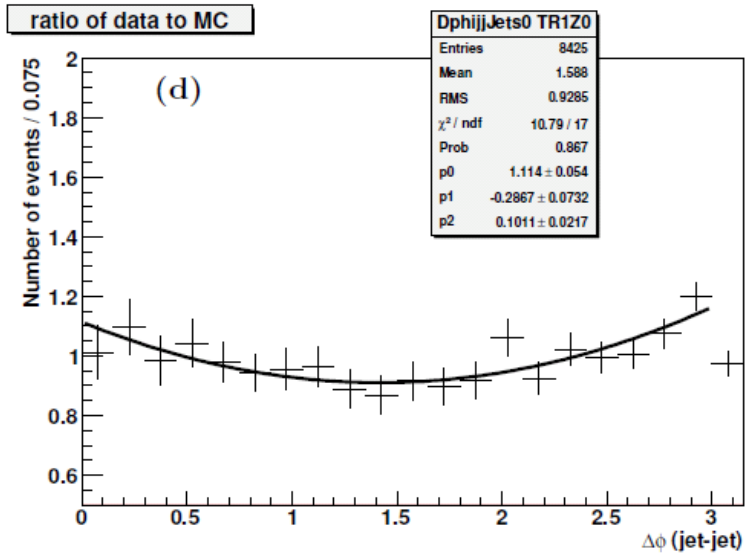
Reweighting functions





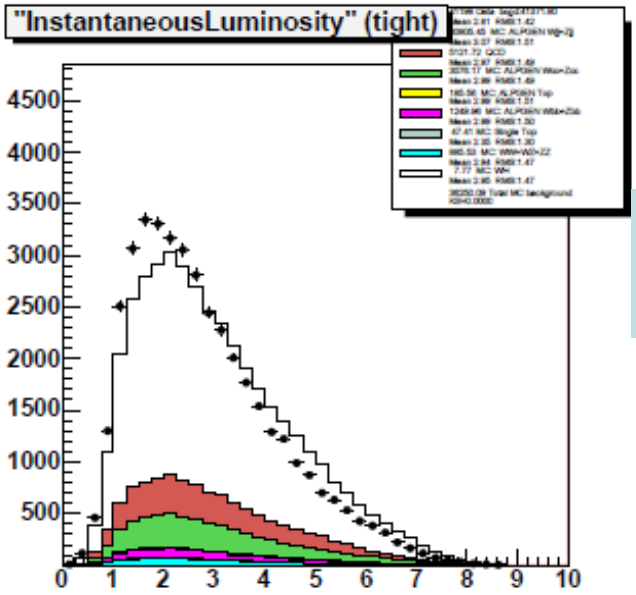
Old reweighting functions:



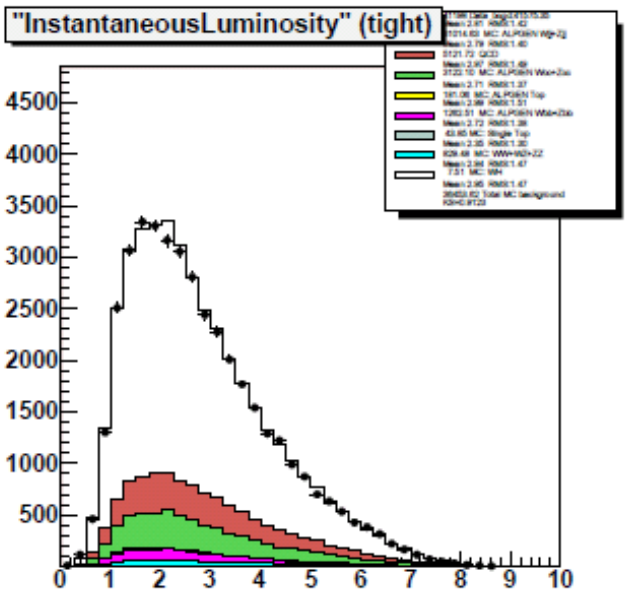


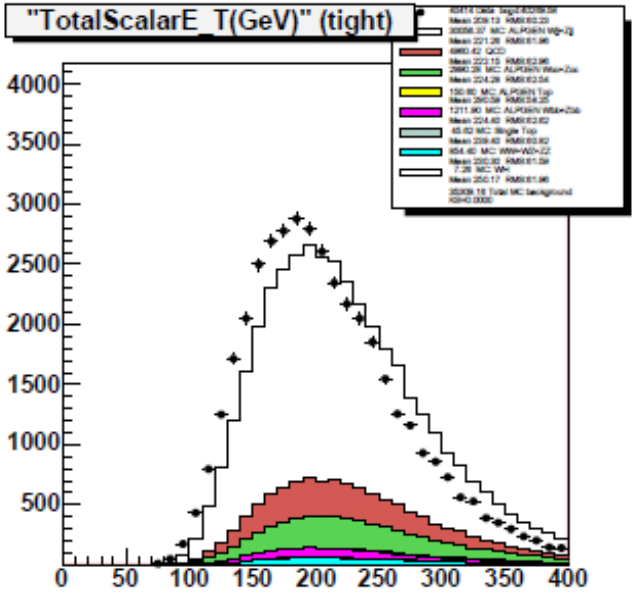
Inst. Luminosity/Total Scalar E_T

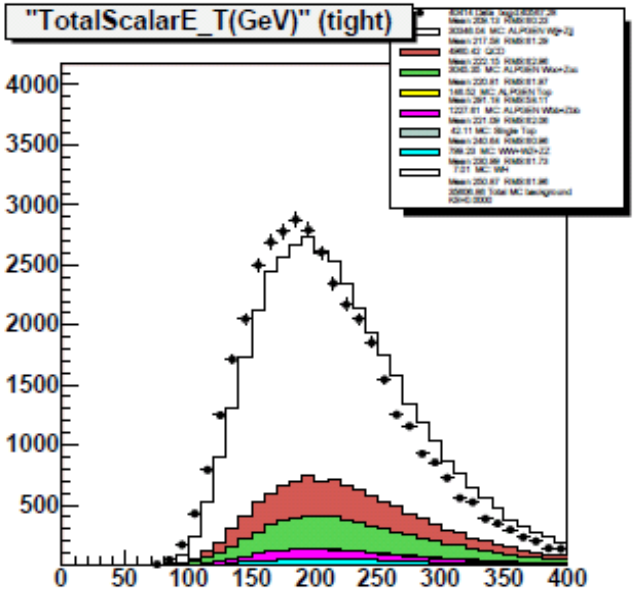
BEFORE
Lumi rew.



AFTER
Lumi rew.

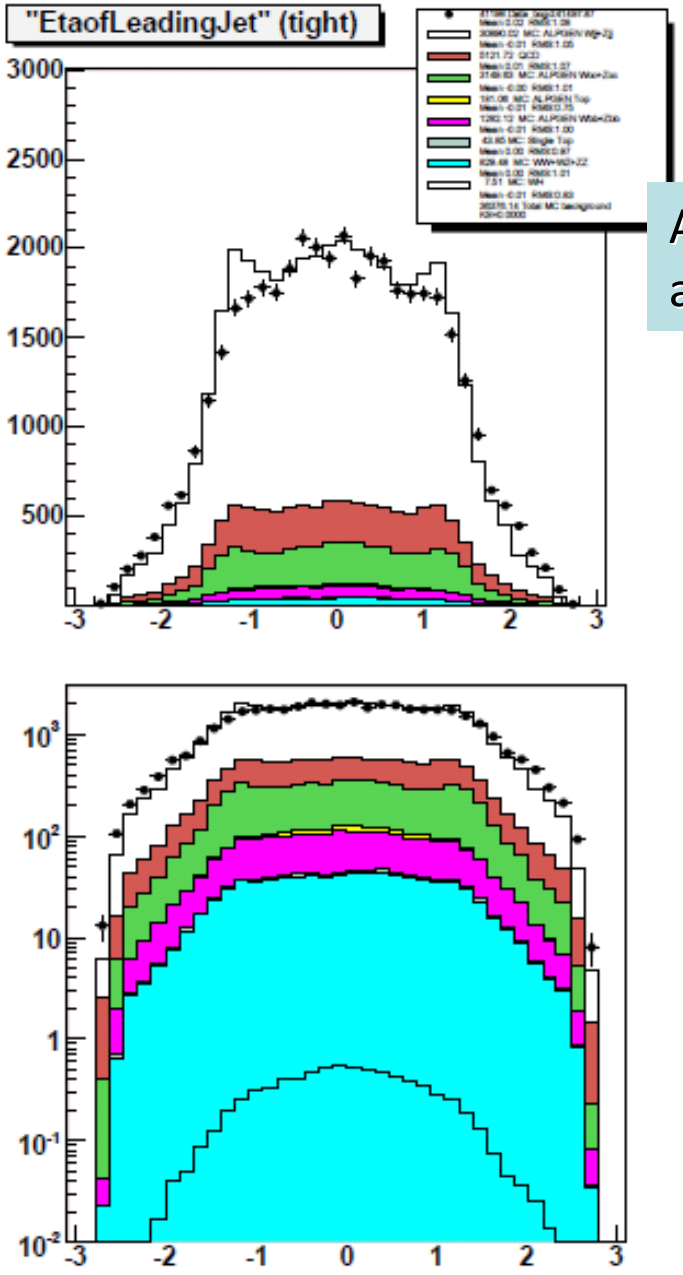




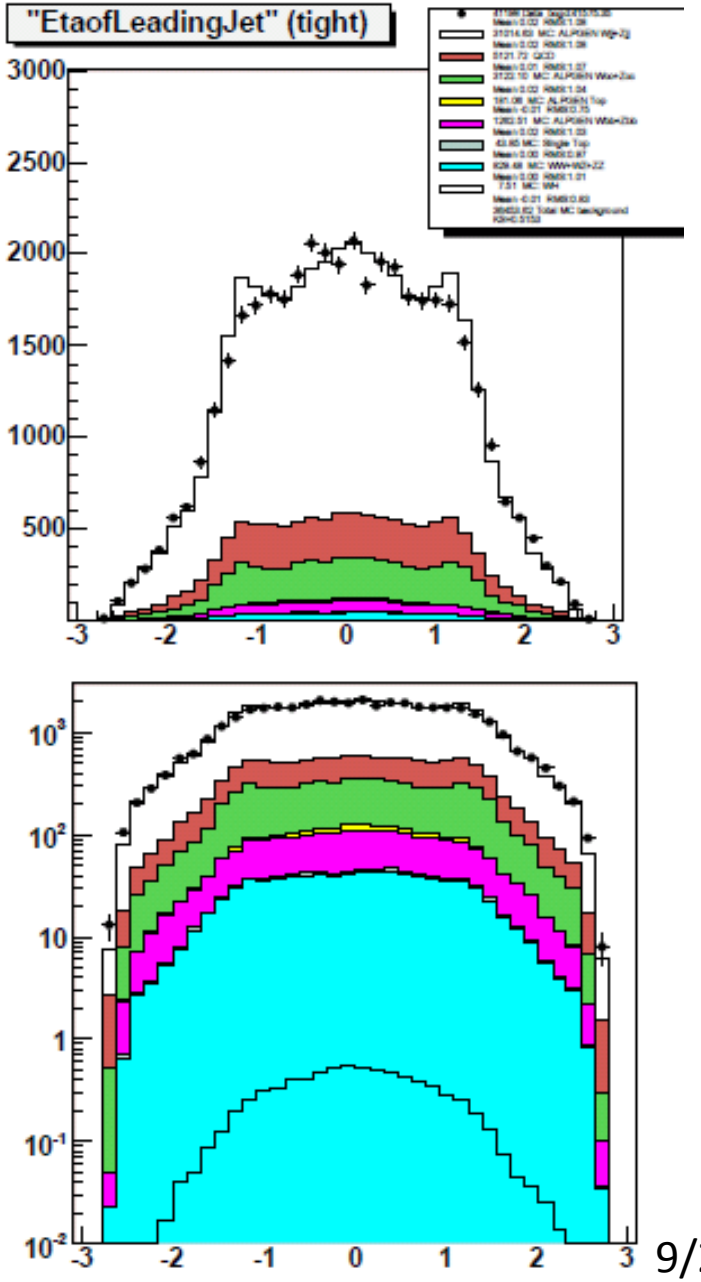


Eta of Leading Jet

BEFORE alpgen rew.

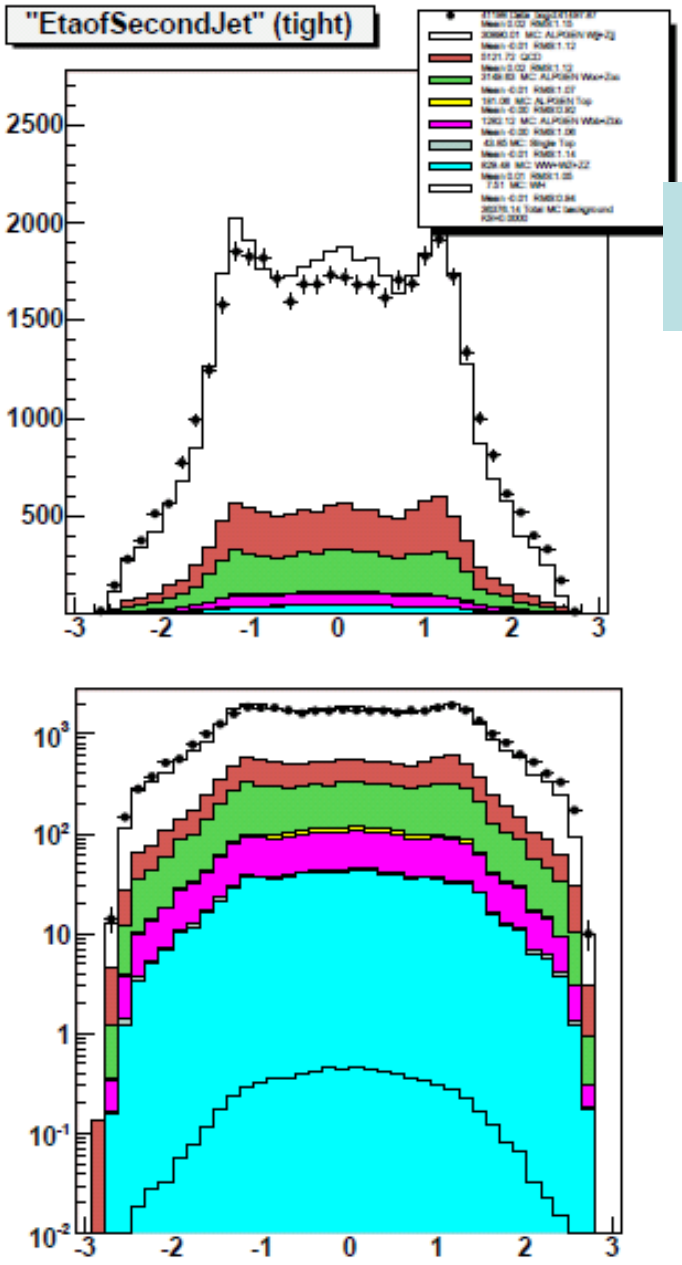


AFTER alpgen rew.

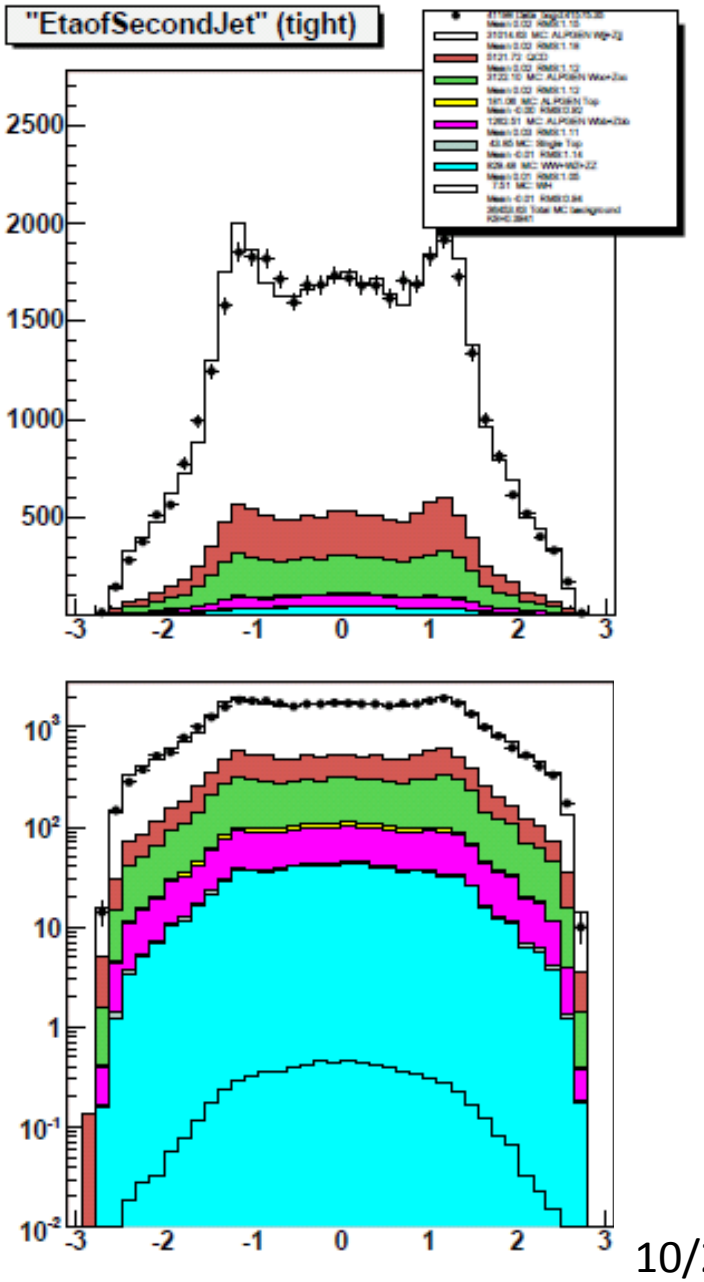


Eta of Second Jet

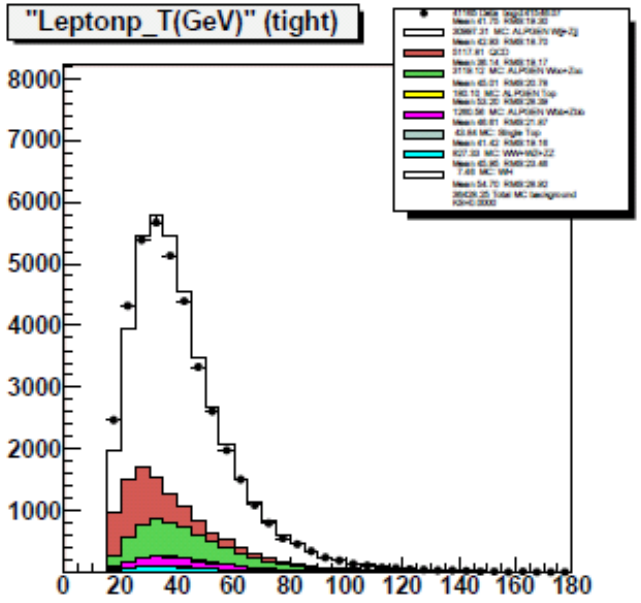
BEFORE alpgen rew.

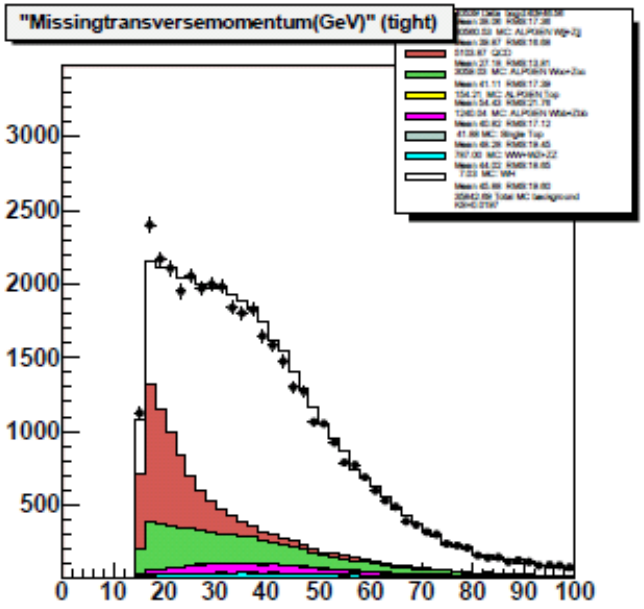


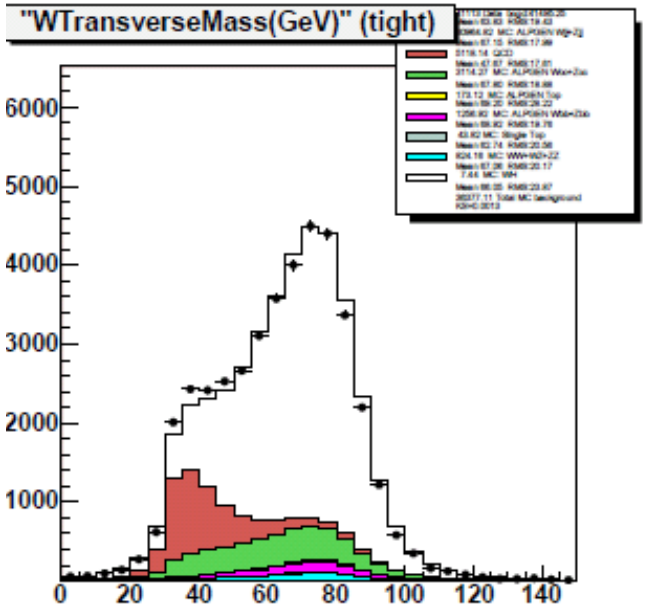
AFTER alpgen rew.

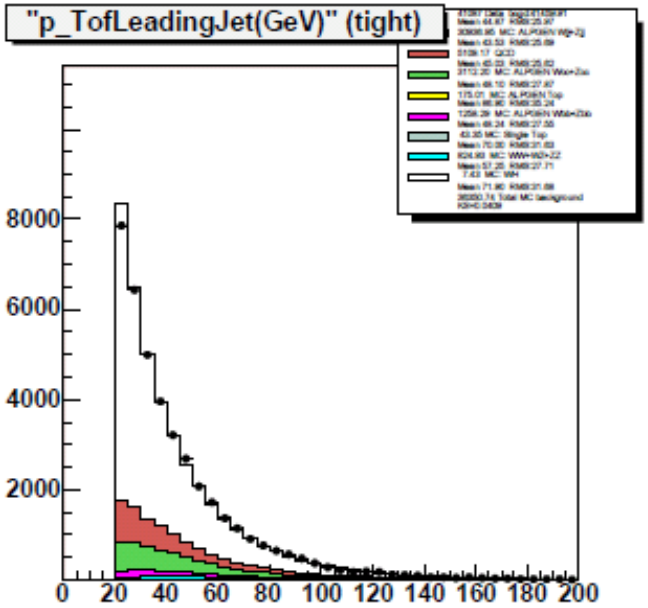


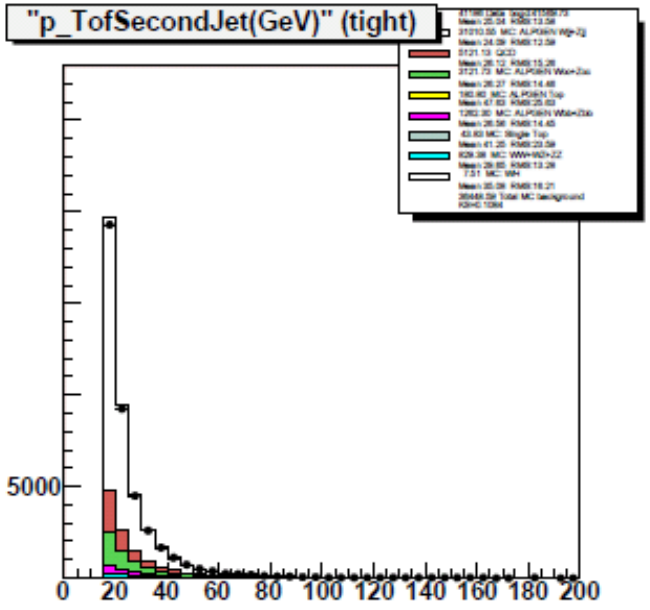
2-jet exclusive – Pretag Plots

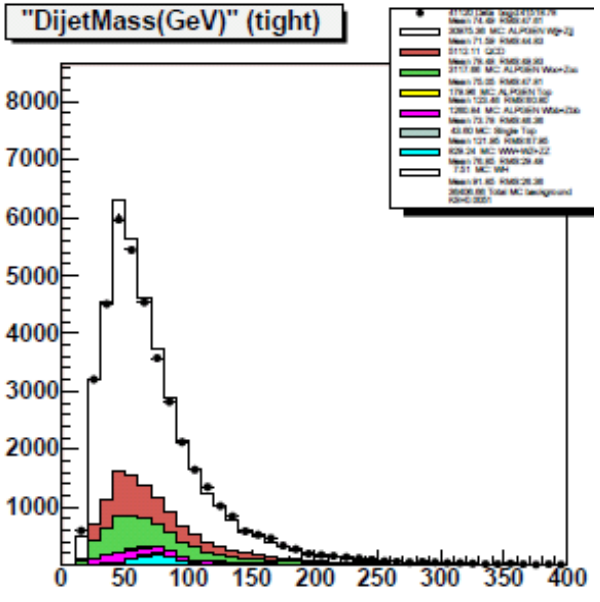




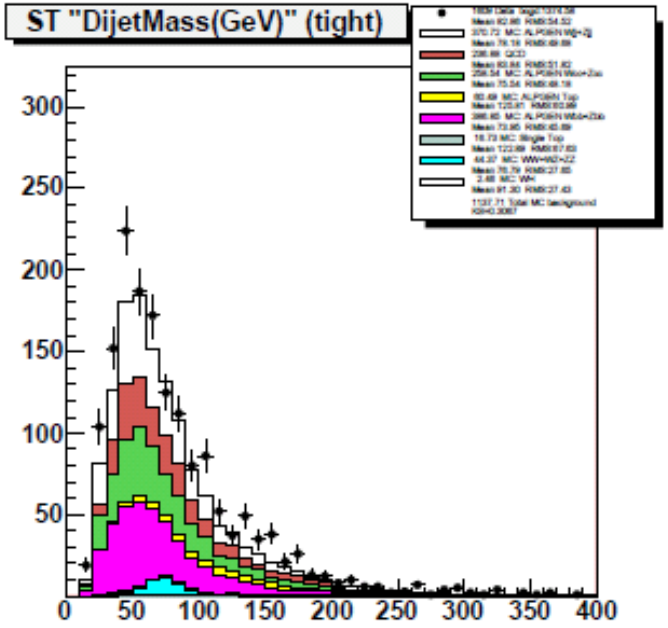


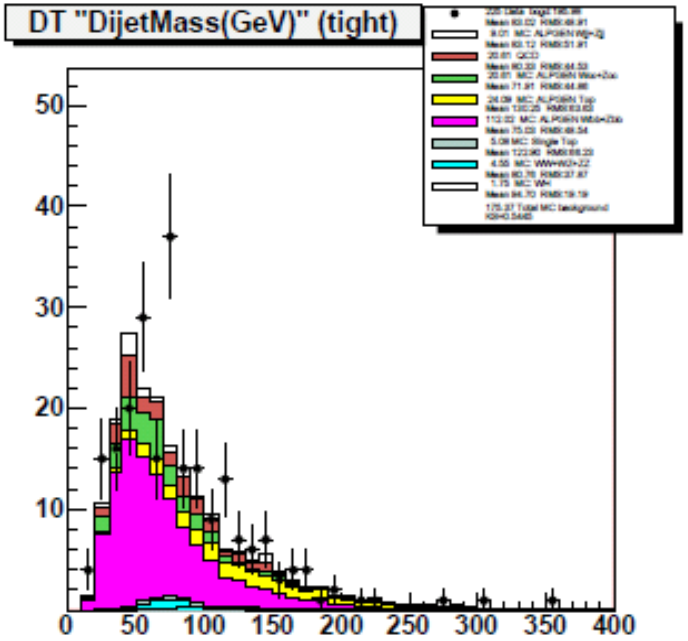


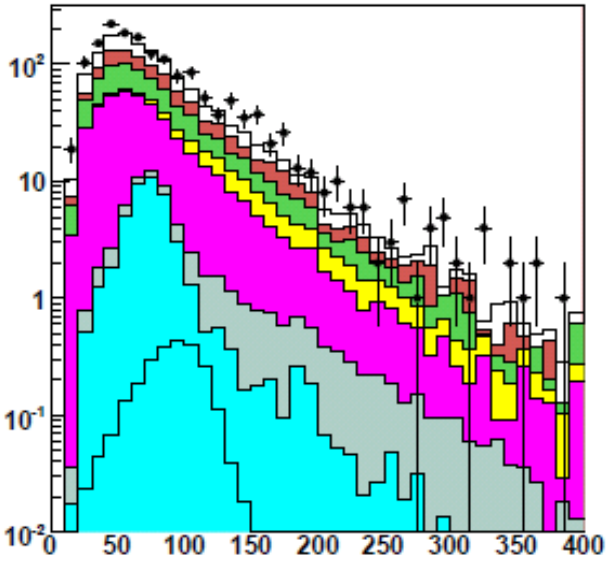


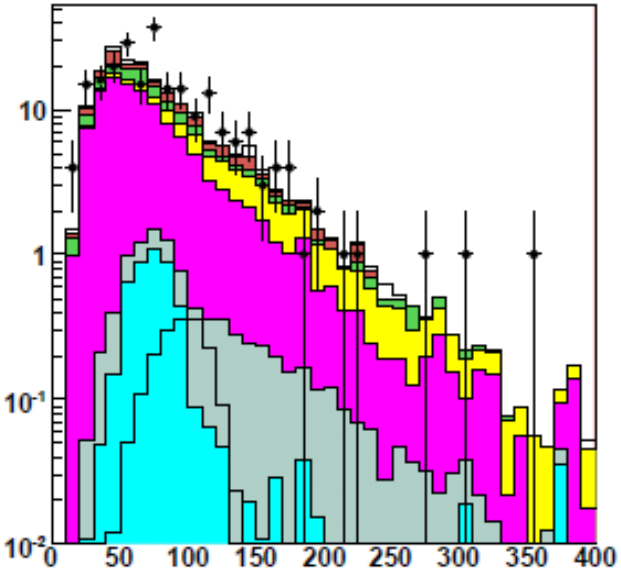


2-jet exclusive – Tagged Plots









WH Electron Channel - 3-jet exclusive

WH Electron Channel - Using Vjets 2.3.2

$L=2.58\ fb^{-1}_{(p20)}$

Default Vjets_cafe factors
K-Factor Wjj 1.3
HF Factor 1.47

Selection criteria:

Exactly 3 Vertex Confirmed Jets

Jet1 pT > 20 GeV
Jet2 pT > 15 GeV
Jet3 pT > 15 GeV

MET > 15 GeV
no HT cut
Triangle cut applied
CC region only

Normalization: 1.54

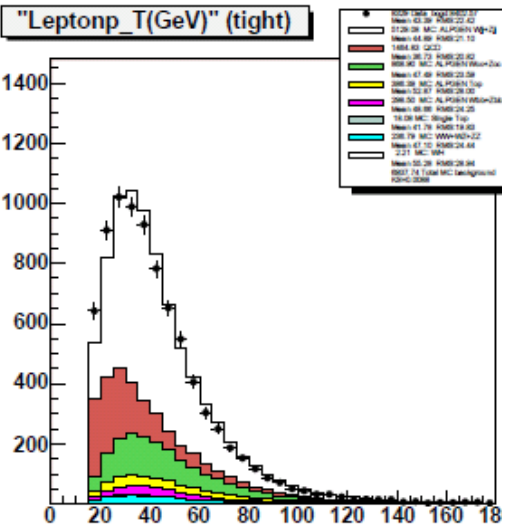
+ Additional
Luminosity Reweighting

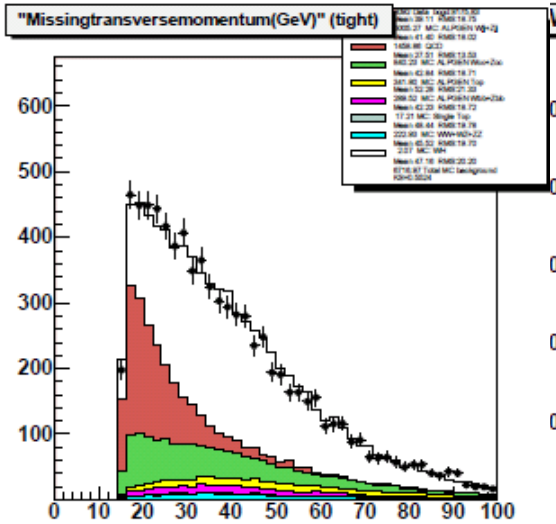
+ VCJ Scale Factors applied

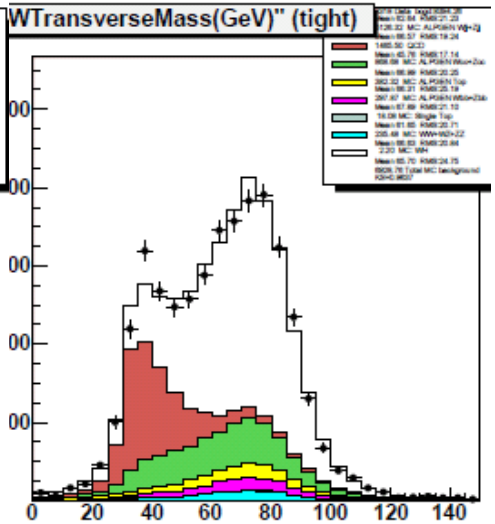
+ Alpgen MC Reweighting

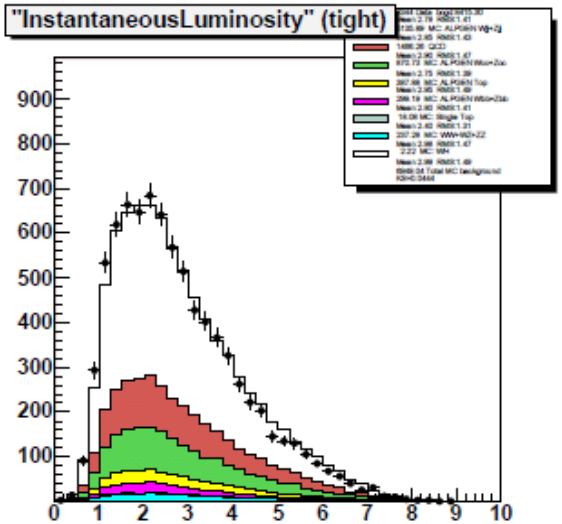
- Eta Second Jet
- Eta Leading Jet
- Delta Eta
- Delta Phi
- Eta Third Jet

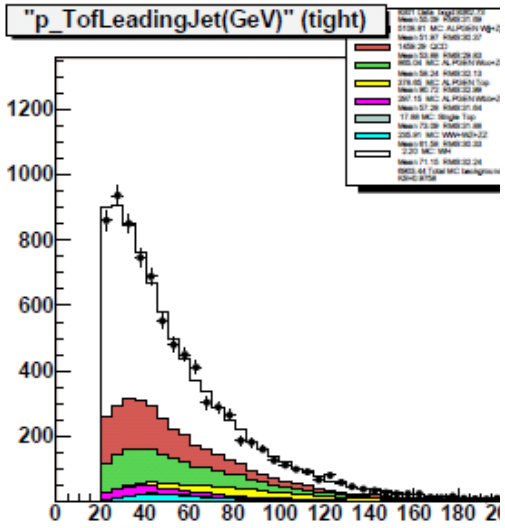
3-jet exclusive – Pretag Plots

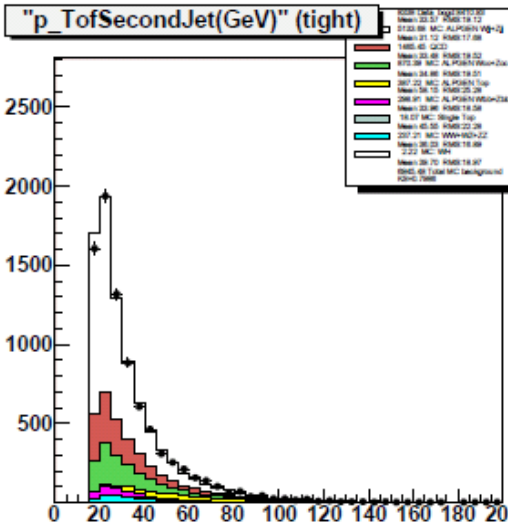


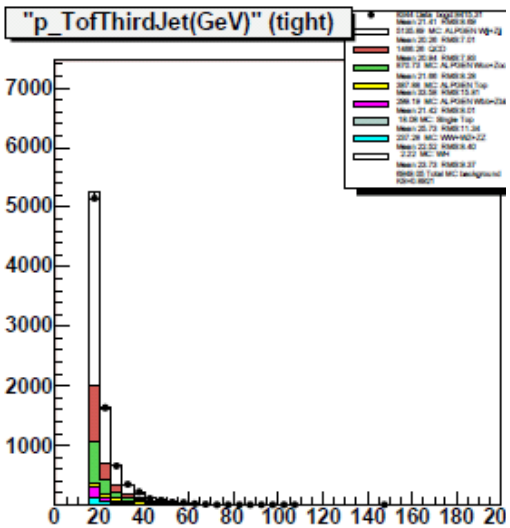


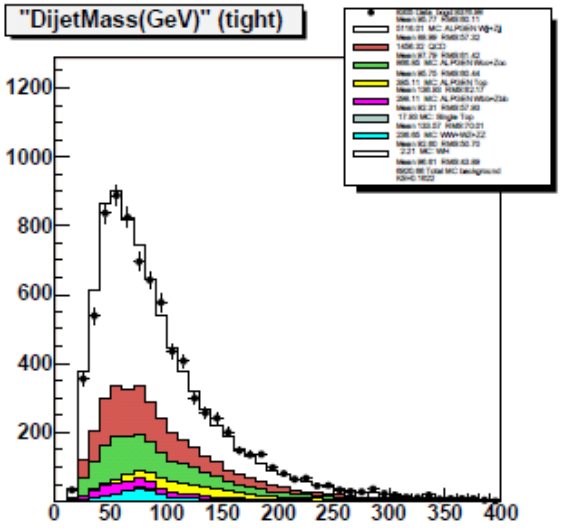




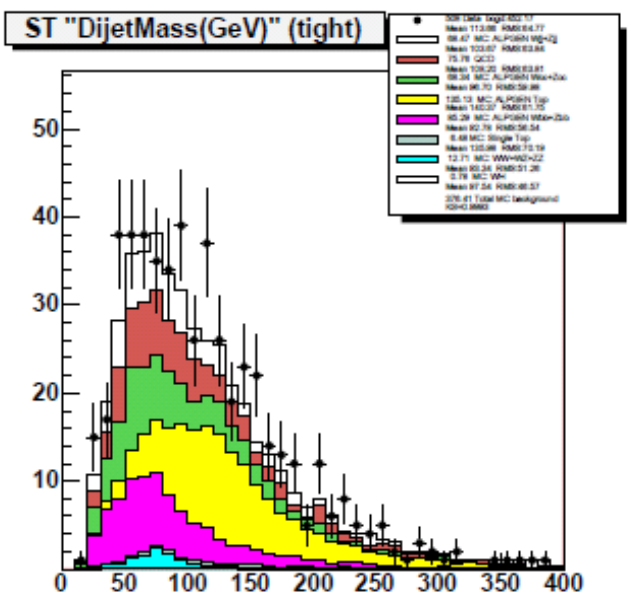


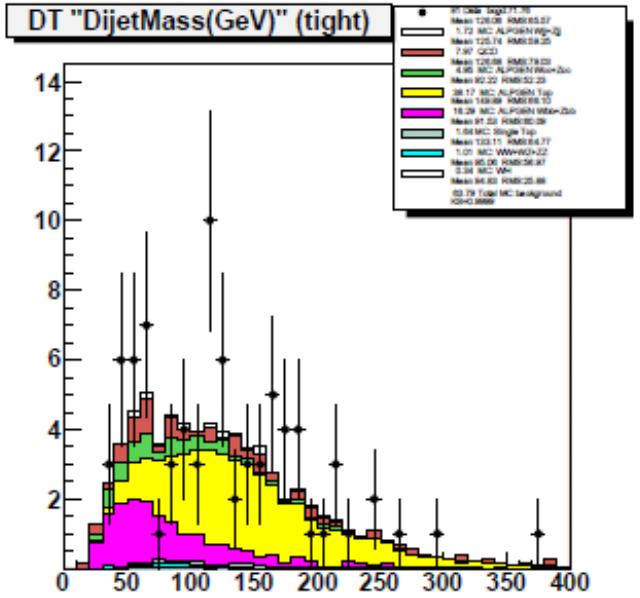


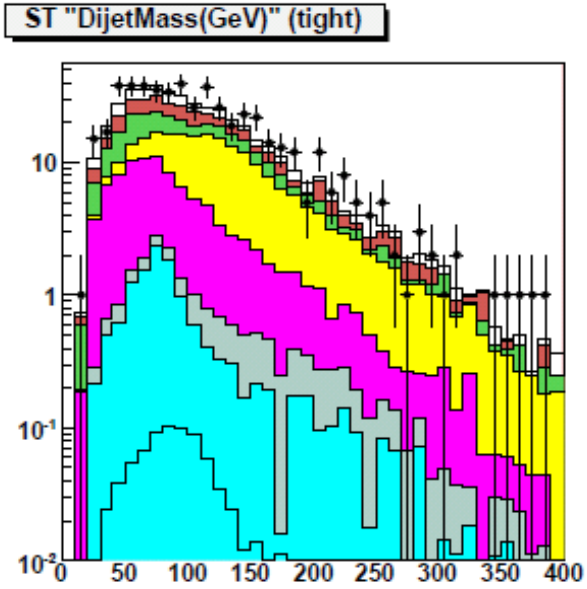


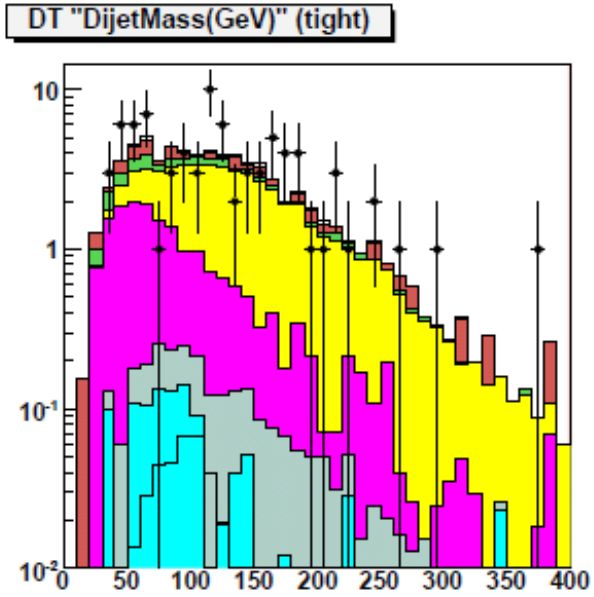


3-jet exclusive – Tagged Plots









Electron Efficiency Study with Z → ee

Check run dependence

Run IIa ←→ Run IIb (pre/postshutdown)

Plots today: Run IIb only

"Preselect" electrons.

Loose electron selection efficiency

Tag: *CC* or *EC*, *top_tight*

One of the electrons passed *top_tight* criteria

Preselect:

Quality: Preselect

Isolation: 0.2

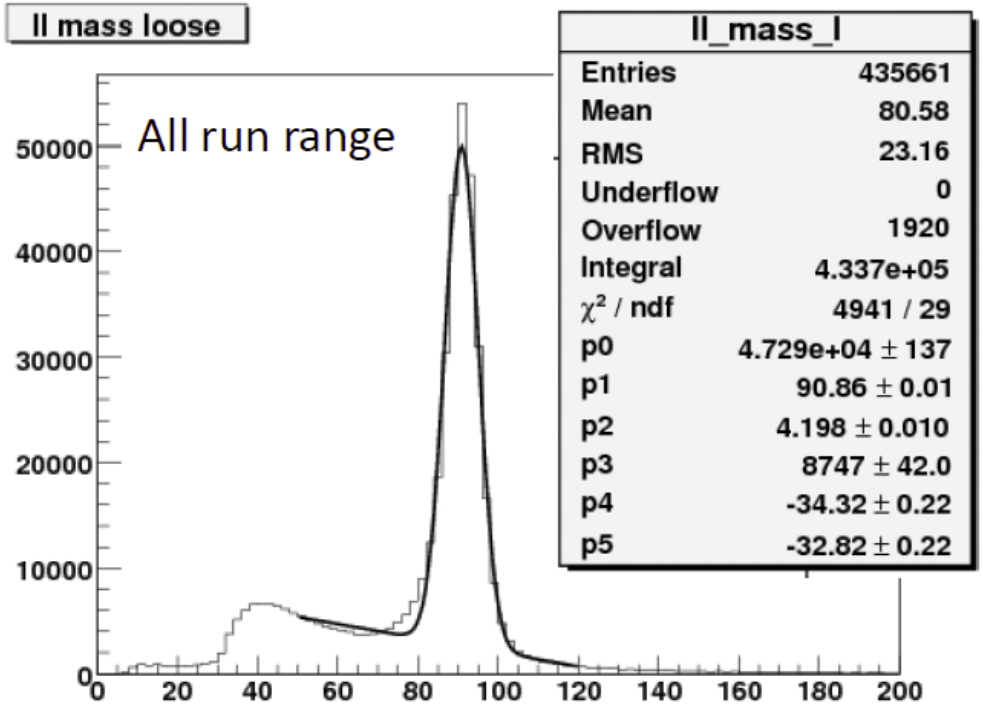
EMFraction: 0.9

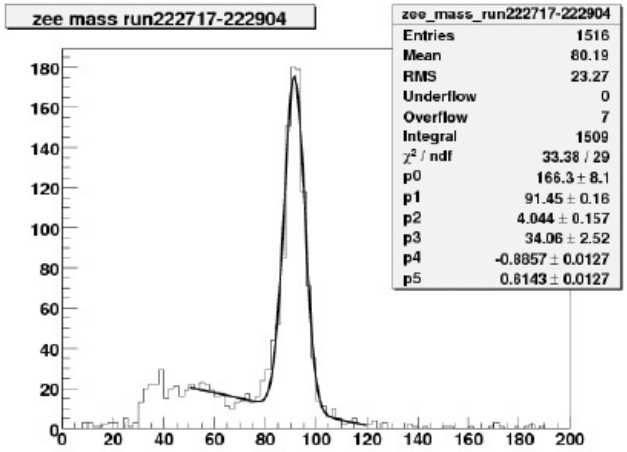
pT: 3

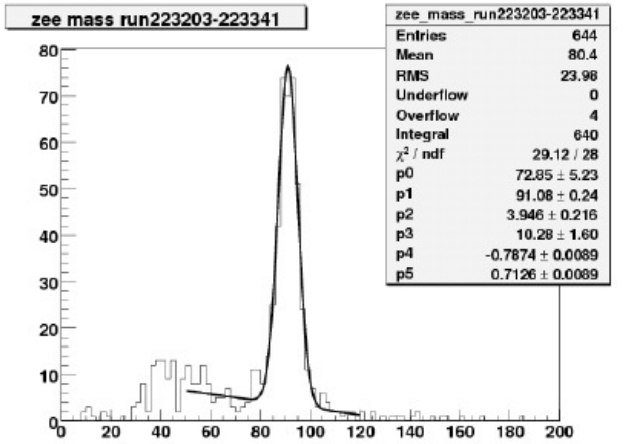
Obtaining the Z yield

- Fit di-electron plot with Gaussian + 2nd order polynomial to get yield
  Range : 50 GeV < m_{ee} < 120 GeV to subtract background

- Evaluate mean and width
- Here is a fit example:

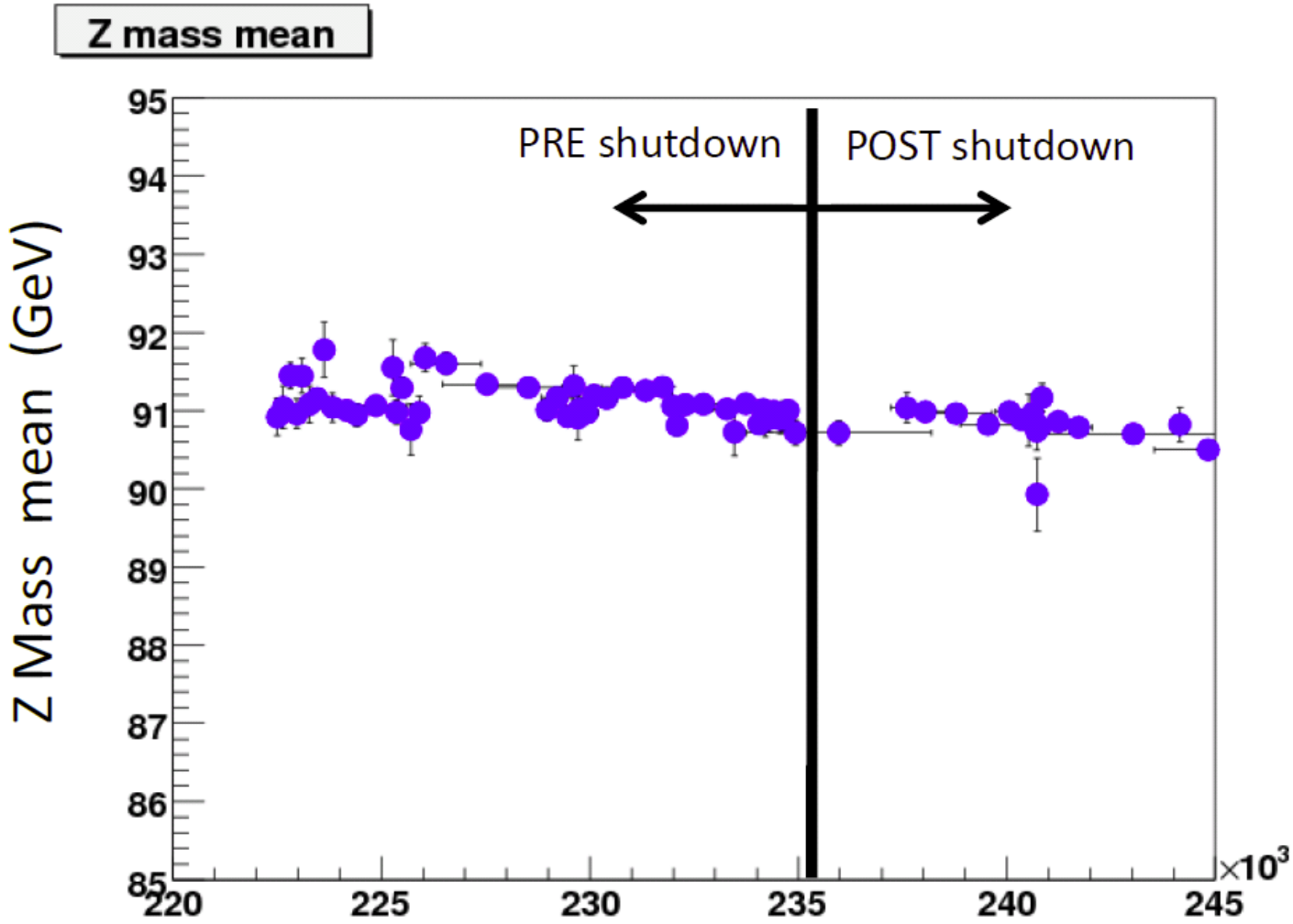






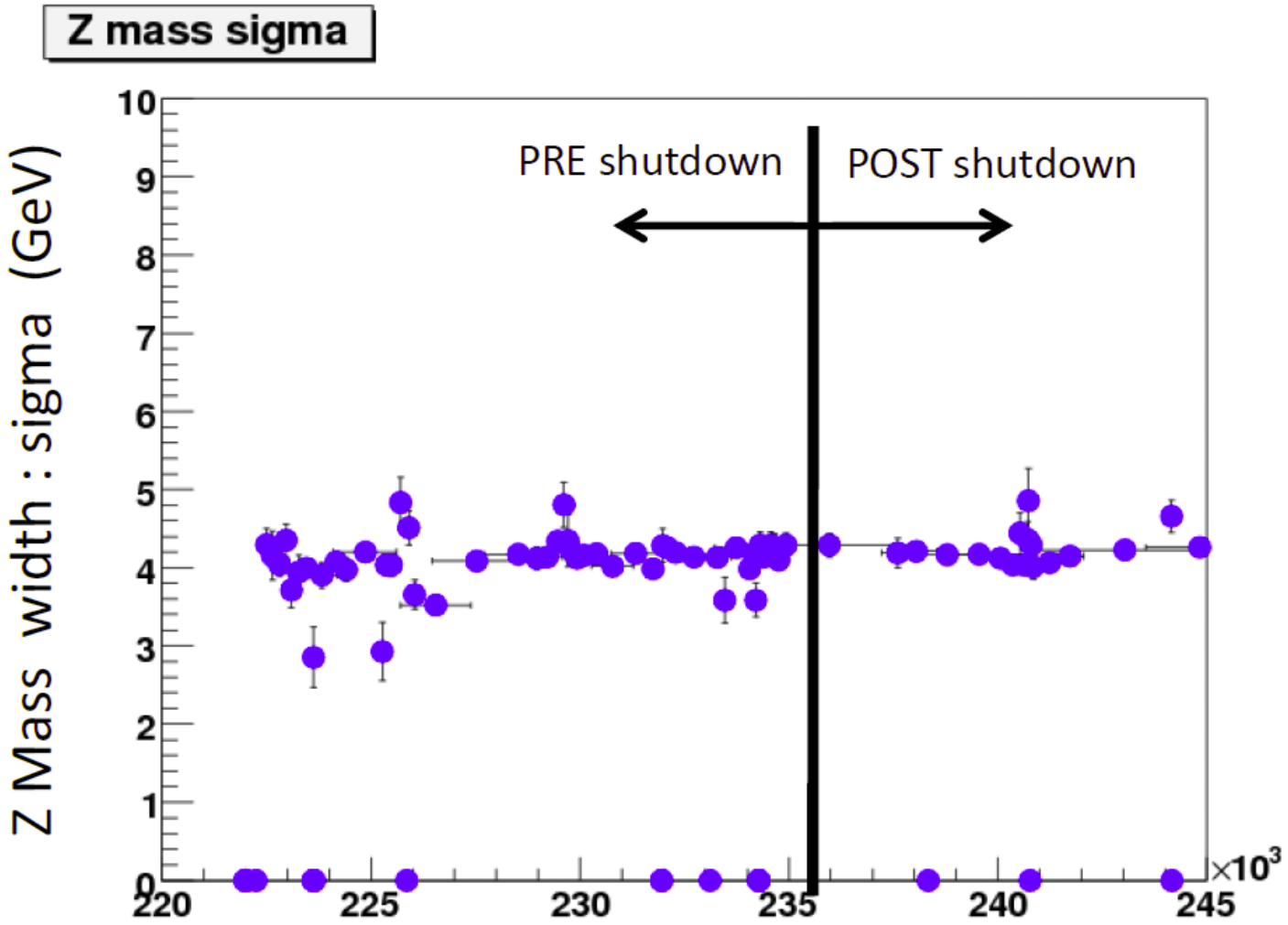
Efficiency Study – Z Peak

Run dependence of the Z mass *mean*



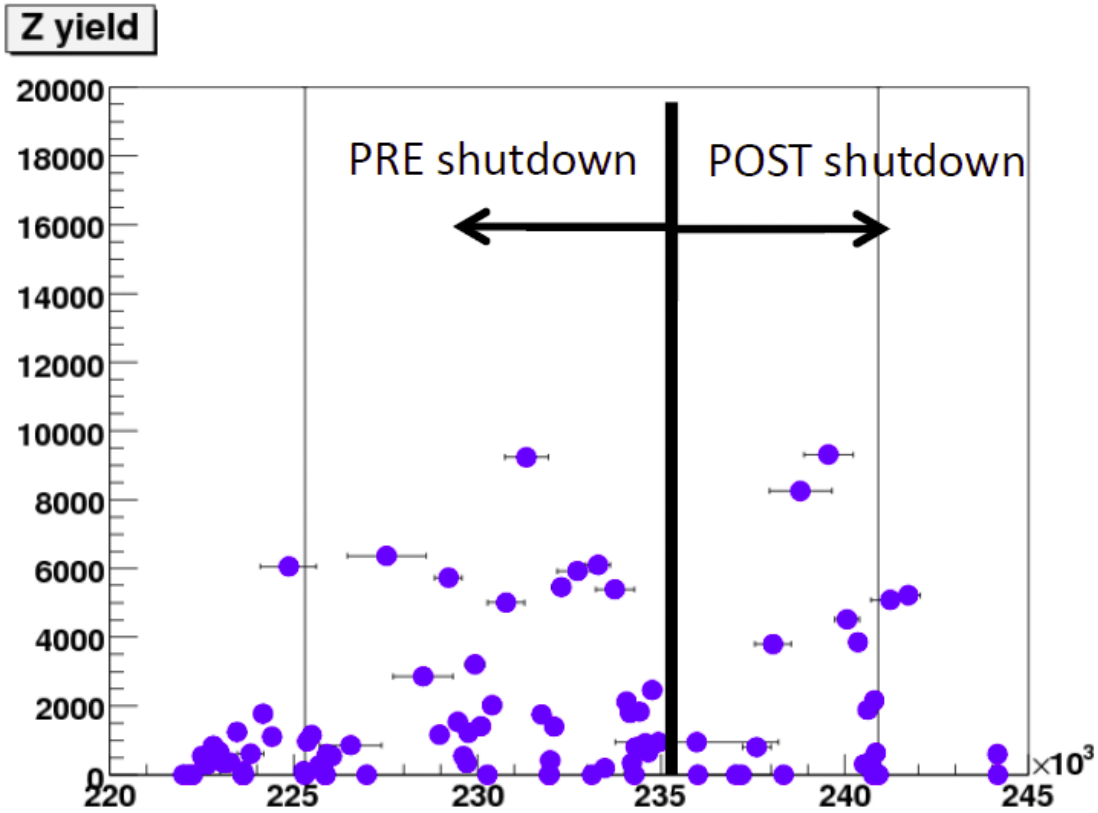
Efficiency Study – Z Peak

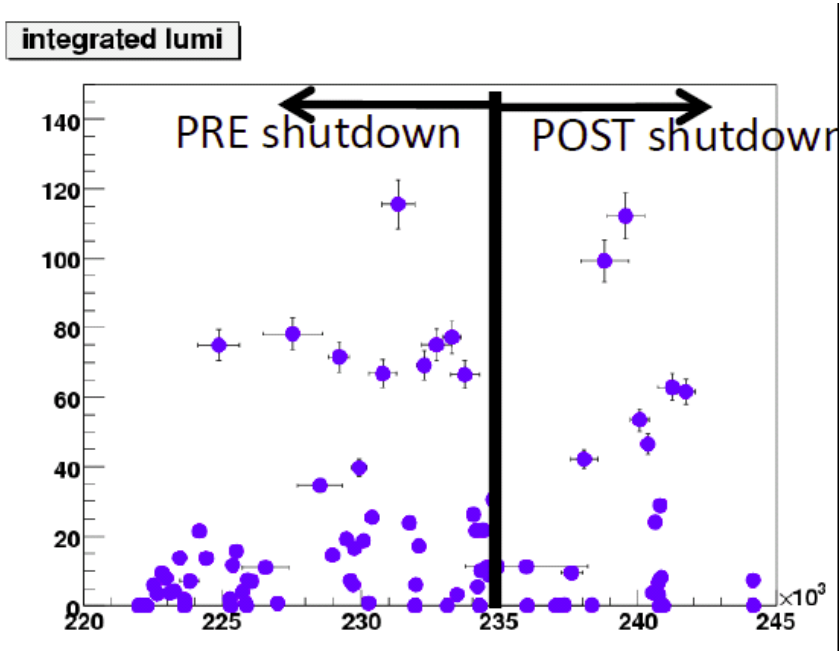
Run dependence of the Z mass *width*



Efficiency Study – Z Peak

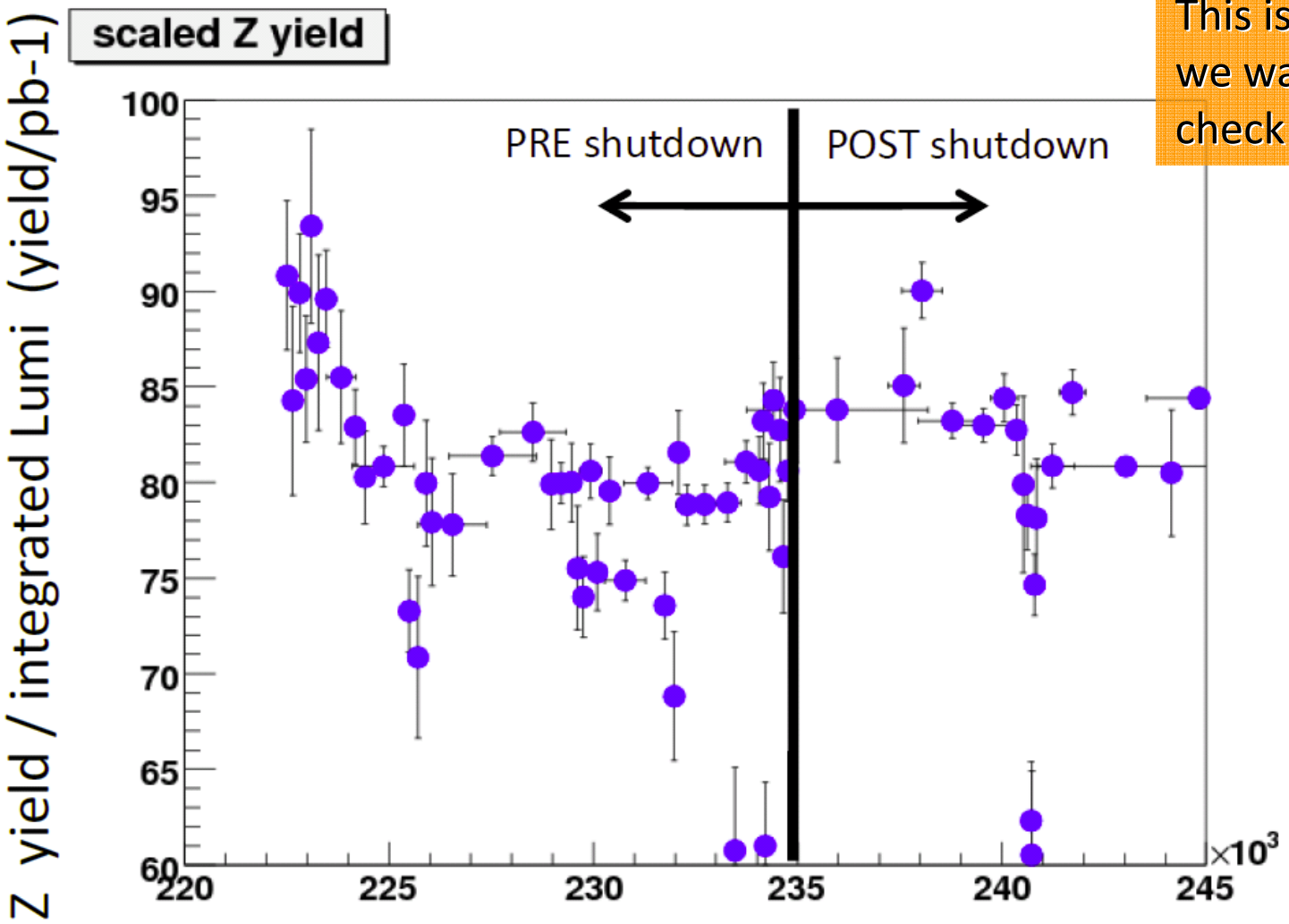
Run dependence of the Z yield and integrated luminosity





Efficiency Study – Z Peak

Run dependence of the normalized Z yield



This is what we want to check

WH Muon Channel – 2 jet exclusive

WH Muon Channel - Using Vjets 2.3.2

Default Vjets_cafe factors
K-Factor Wjj 1.3
HF Factor 1.47

$L=1.6\ fb^{-1}_{(p20,\ prelim)}$

Selection criteria:

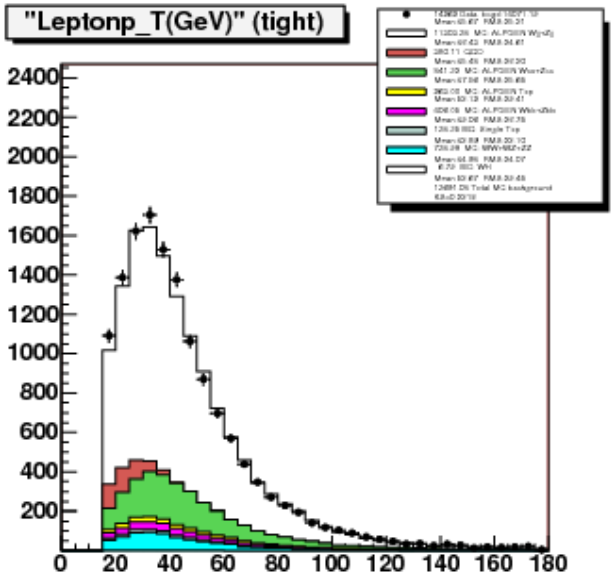
Exactly 2 Standard Jets

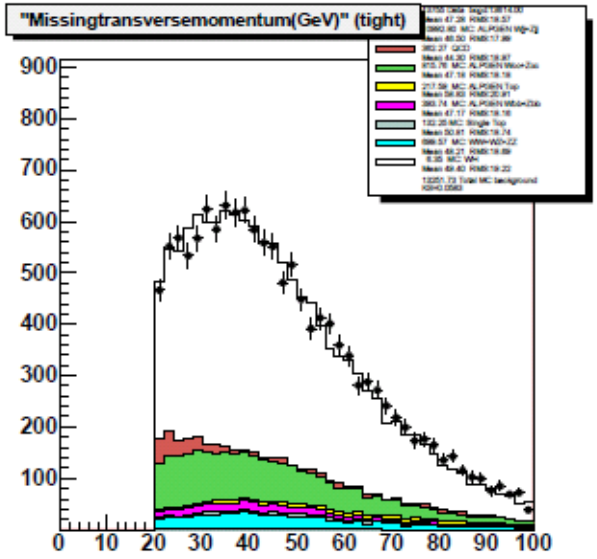
Jet1 pT > 20 GeV
Jet2 pT > 15 GeV

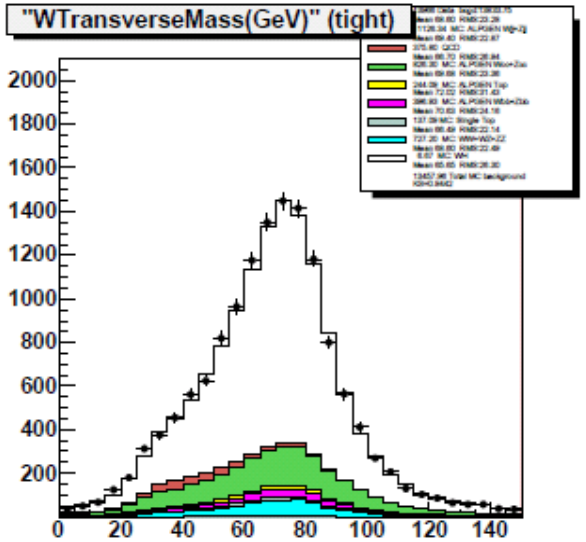
Lepton pT > 15 GeV
MET > 20 GeV
HT > 60 GeV
Triangle cut applied

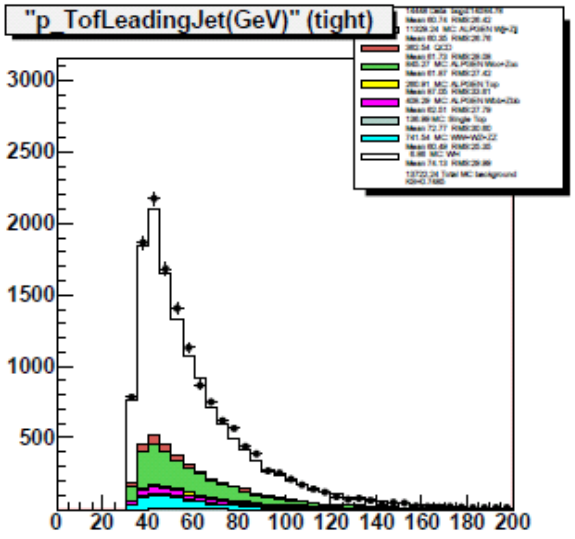
Normalization: 0.88918

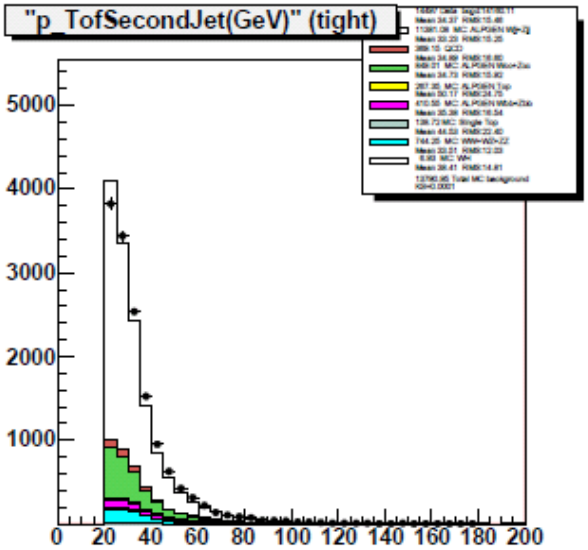
2-jet exclusive – Pretag Plots

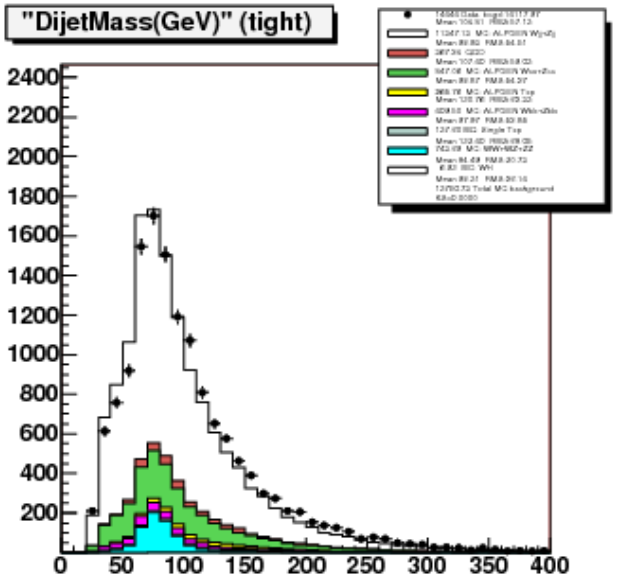












Plan

- Finish studies on taggability, Z peak, b-ID improvement
- Improve new multivariate techniques: optimize Super NN and RF/BDT.
  Finish including them into the new framework

→See next talk!

- Loosen tight selection, freeze criteria by mid April
- Finalize loose selection very soon to start the ME integration

→ **Get a stable and very competitive result for the summer conferences**

BACKUP SLIDES