A look at W(→eν) + 2 jet sample: Reconstructable W Pairs

Kalanand Mishra

Fermilab

Trying to follow closely the steps as done for muon sample in Dan's slides:

http://indico.cern.ch/getFile.py/access?contribId=1&resId=1&materialId=slides&confId=121892

Candidate events

✦W→ev reconstruction
- -GsfElectron passing tight WP80 criteria
  - •E_T>25 GeV
  - •PF MET
- -To further improve signal purity, require
  - •MET > 25 GeV
  - • Transverse mass in range 40−200 GeV

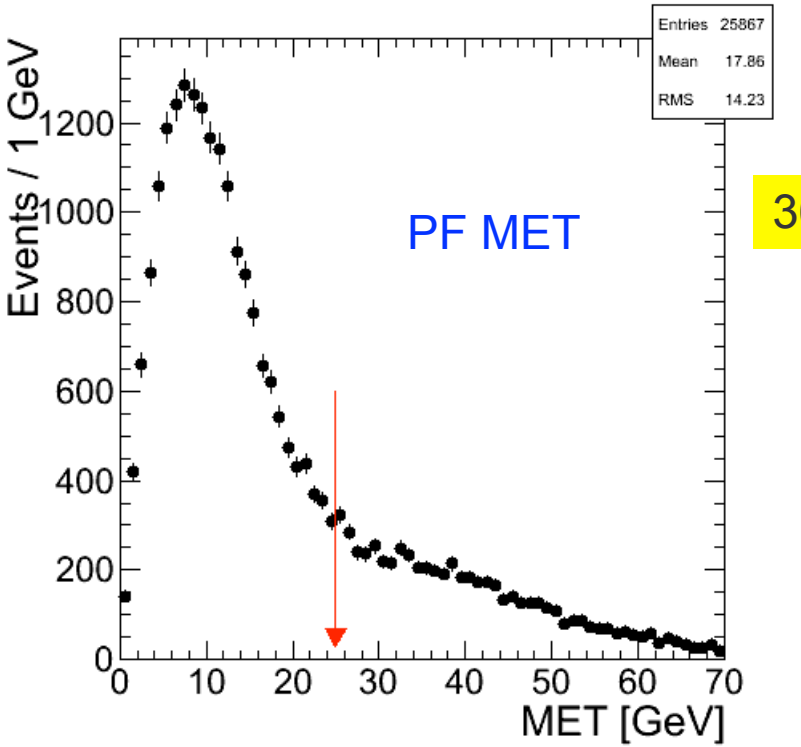
✦Require <u>exactly two</u> PF jets in the event
- -each jet with corrected p_T >20 GeV and $|\eta|$ <2.6
- -the third jet p_T should be less than 10 GeV

✦To suppress QCD background cut on $\Delta\eta = \eta_1 - \eta_2$ between two jets

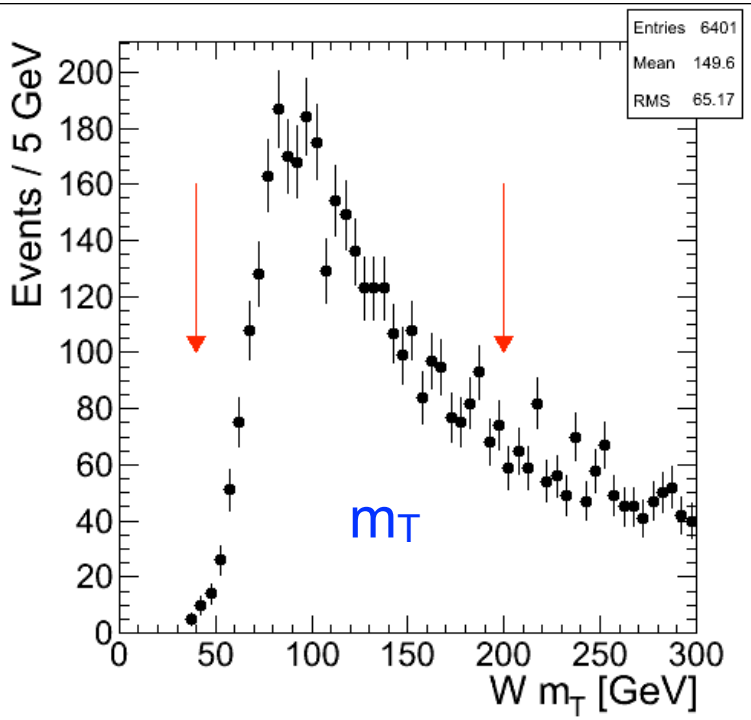
✦To suppress top background require exactly 0 b-tags

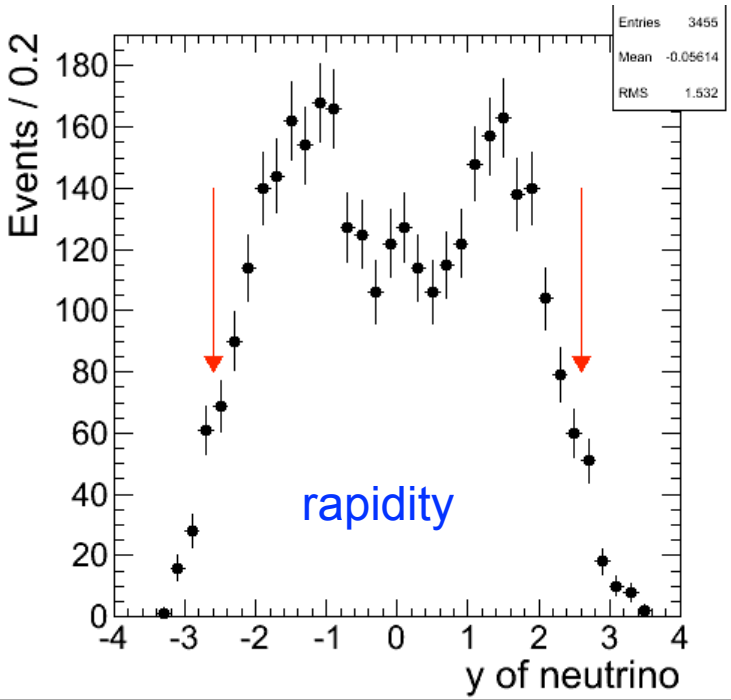
Cut flow in data

Start with 224619 events which have an electron of E_T>25 GeV passing WP80 and doesn't have second electron with 70 < m_{ee} < 110 GeV.



36 pb^{-1}

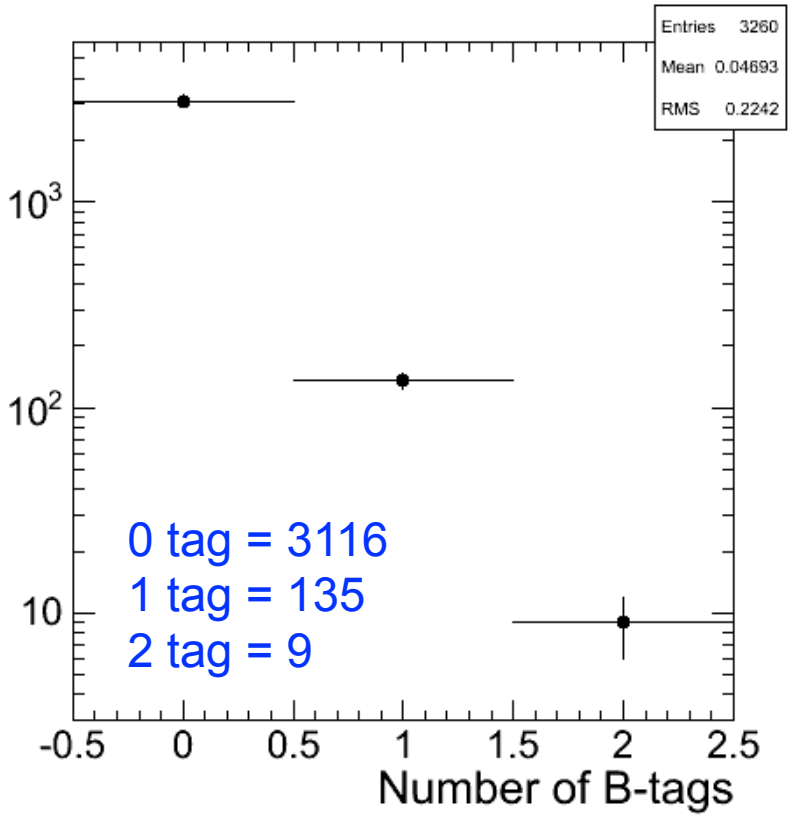




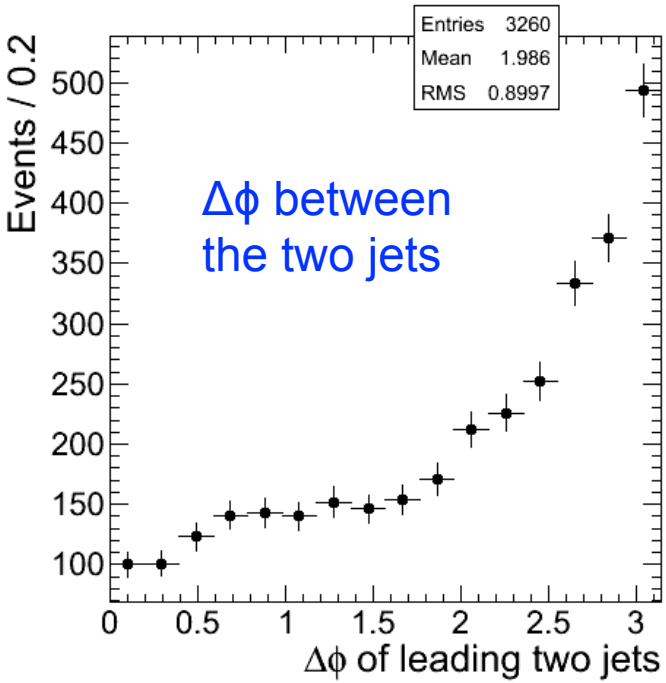
After these selections we are left with 65873 leptonic W events.

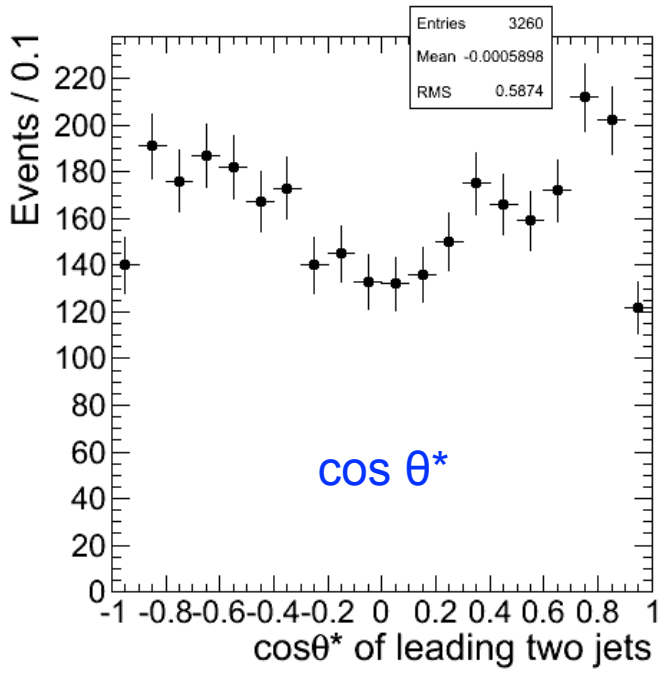
Cut flow in data – 2

Out of 65873 leptonic W events from previous slide, 3260 are W+jj events.



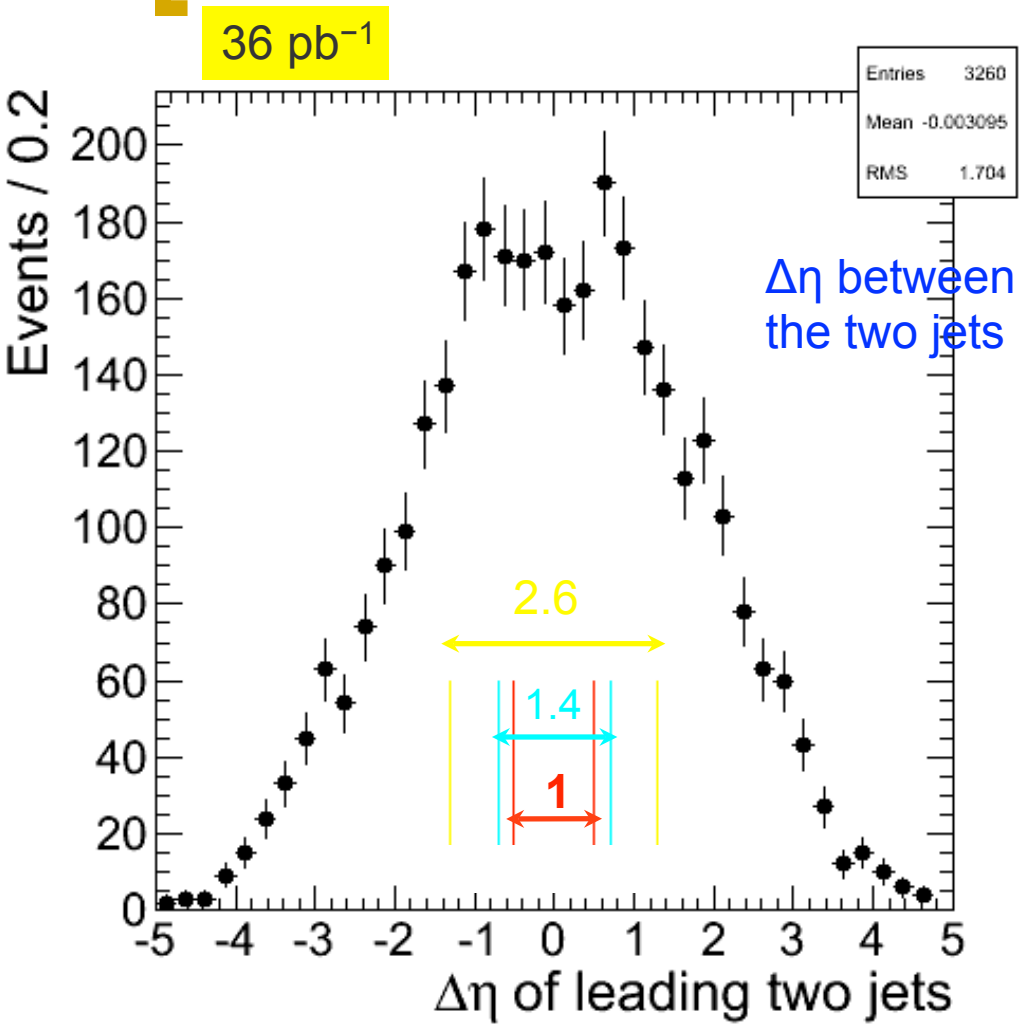
36 pb^{-1}

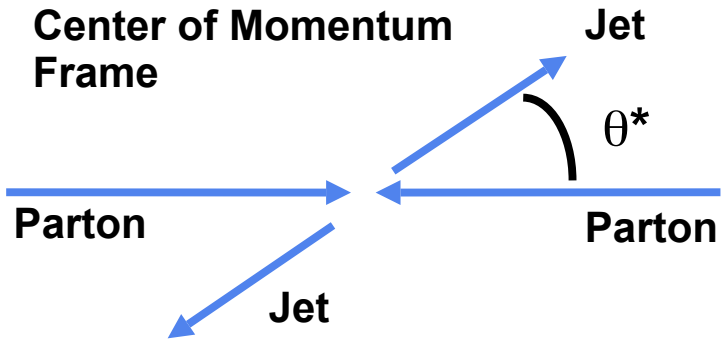




After top veto we are left with 3116 W+jj events.

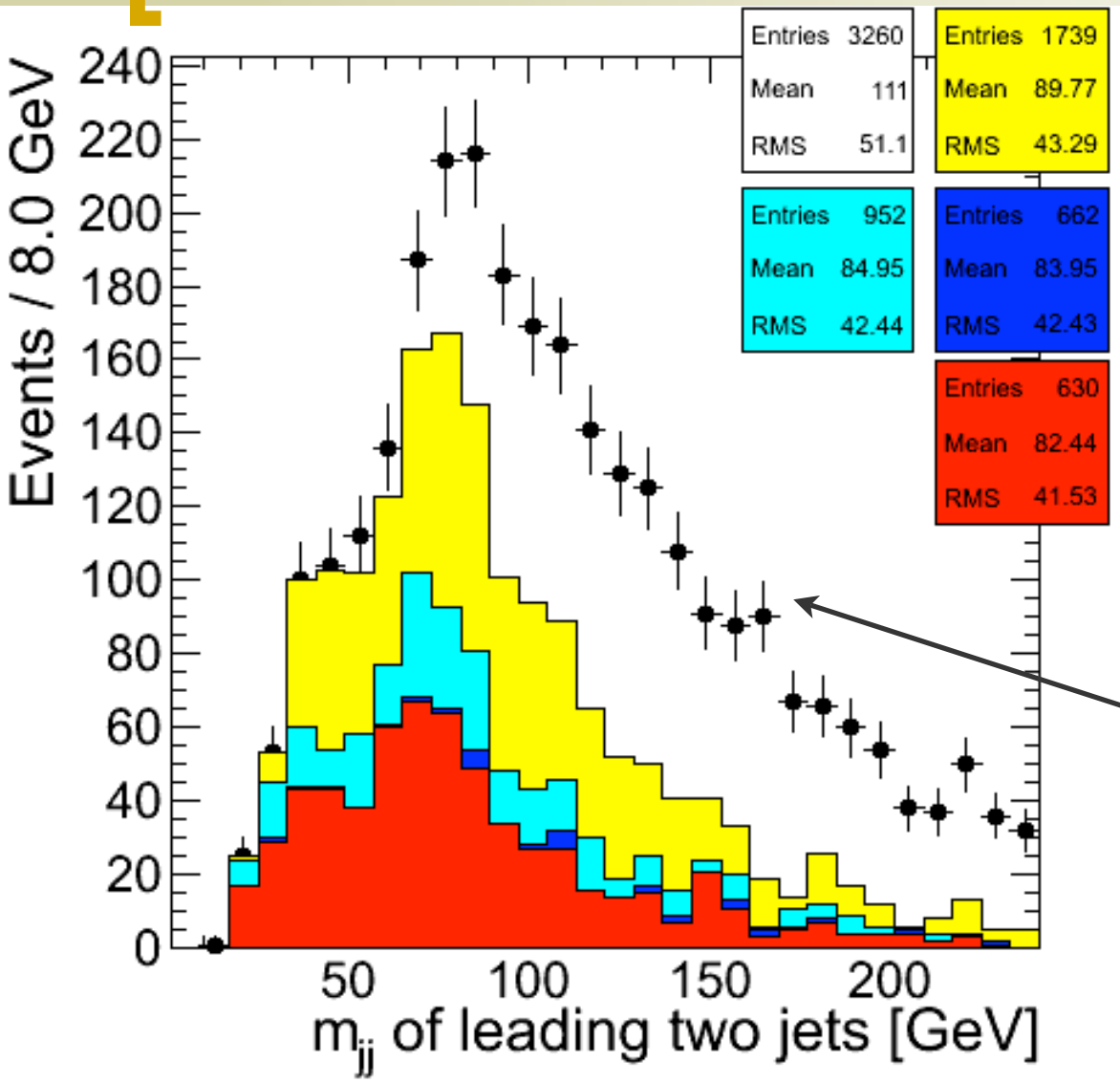
Cut flow in data – 3





- Resonance signal is s-channel
  - Practically flat in cos θ*
- QCD is mainly t-channel
  - Peaks at cos θ* = 1, large Δη
- Cos θ* ≈ tanh (Δη / 2)
  - cut at | Δη | = 1.3 corresponds to cos θ* = 0.57

m_{jj} distribution for W+jj events



Out of 630 events surviving $|\Delta\eta| < 0.5$ cut and b-tag veto 214 events are in the W mass window 70−90 GeV

Expect much fewer WW events. However number of W+jj events is in expected ball park. Need to understand better.

all W+jj events

after $|\Delta\eta| < 1.3$ cut

after $|\Delta\eta| < 0.7$ cut

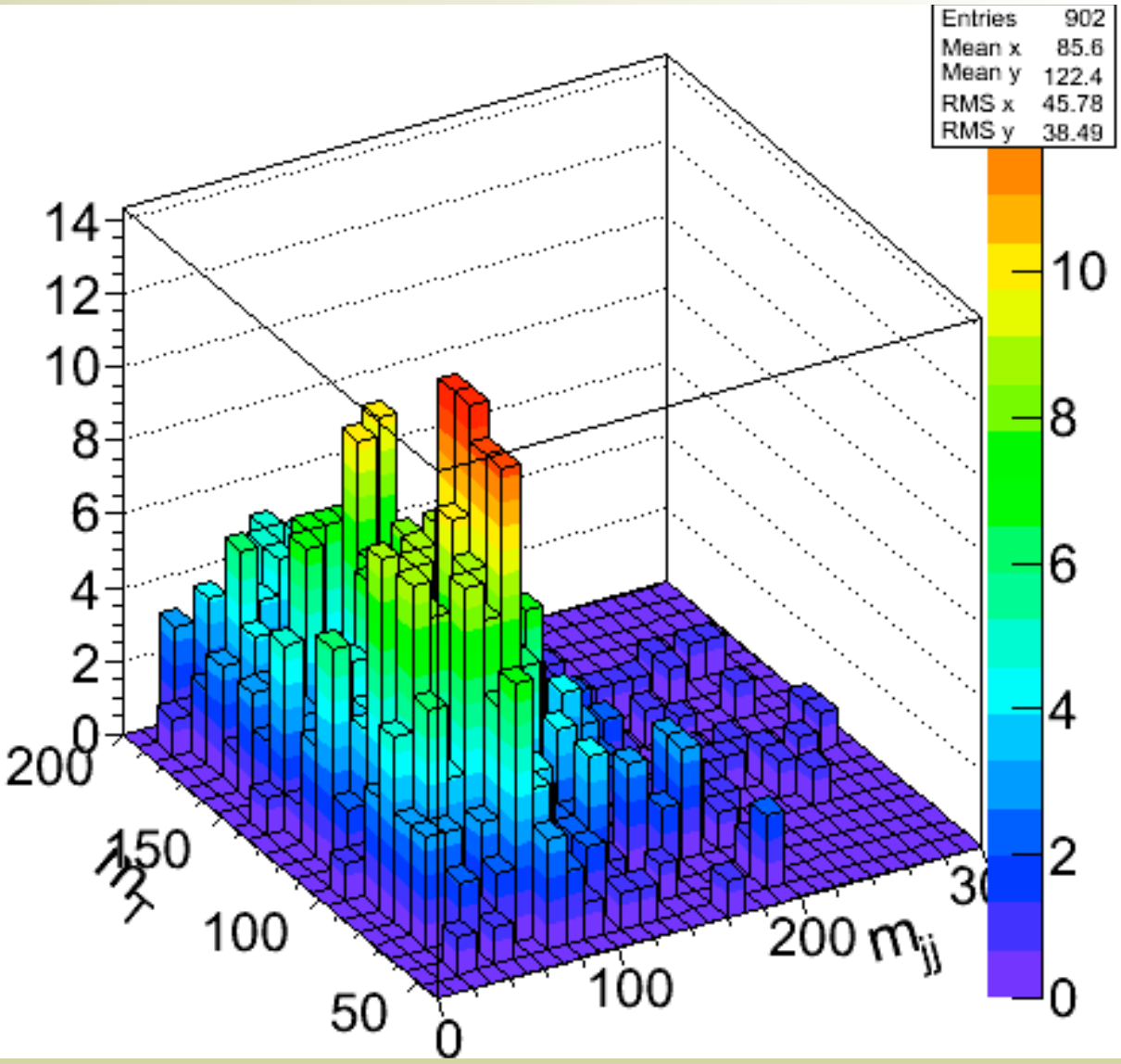
after $|\Delta\eta| < 0.5$ cut

$|\Delta\eta| < 0.5$, no b-tag

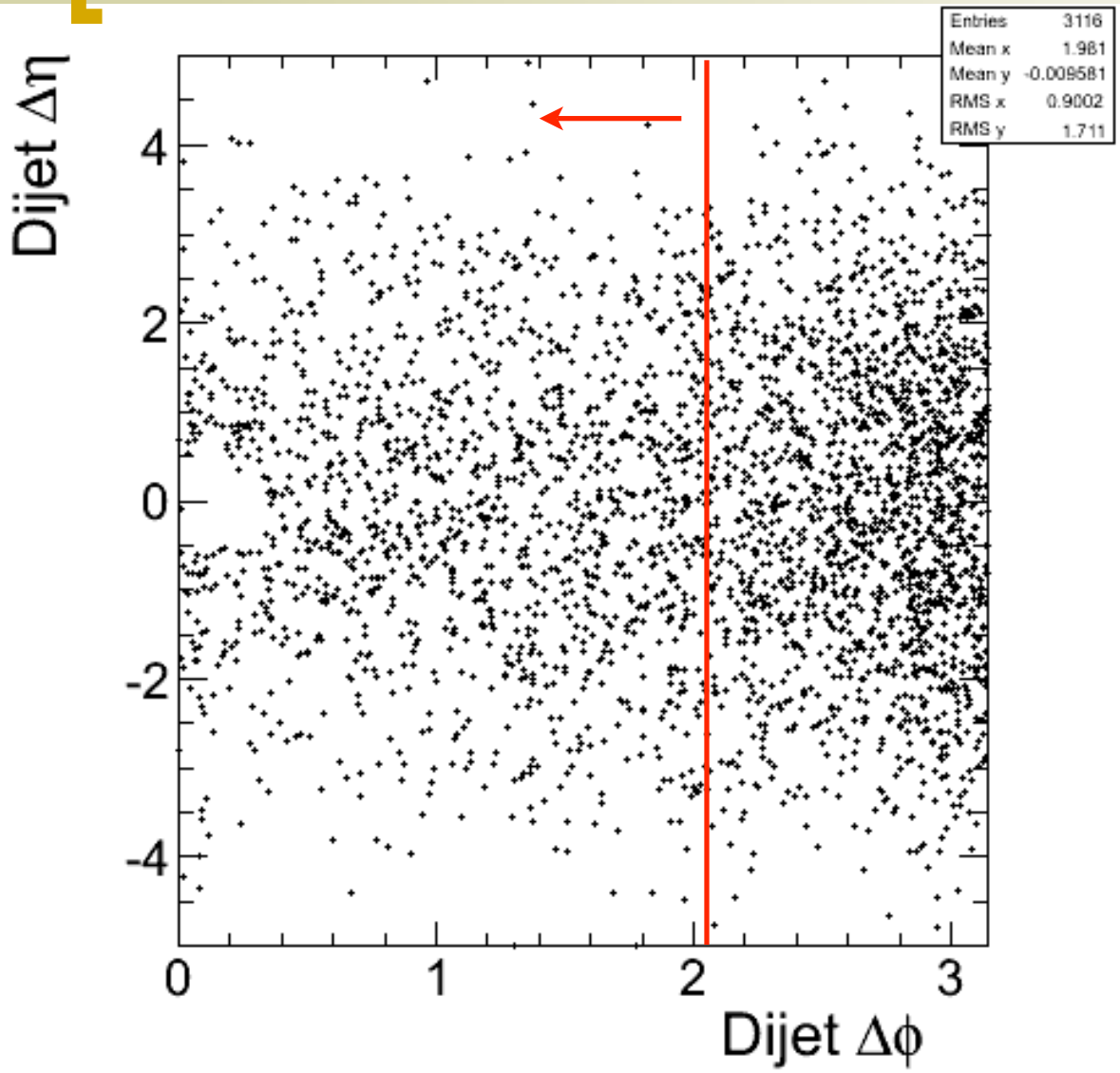
W m_T vs m_{jj} lego plot in W+jj events

$\Delta\eta$ (j1, j2) < 1.3
both jet p_T > 20 GeV

W:
electron E_T >25 GeV
MET >25 GeV

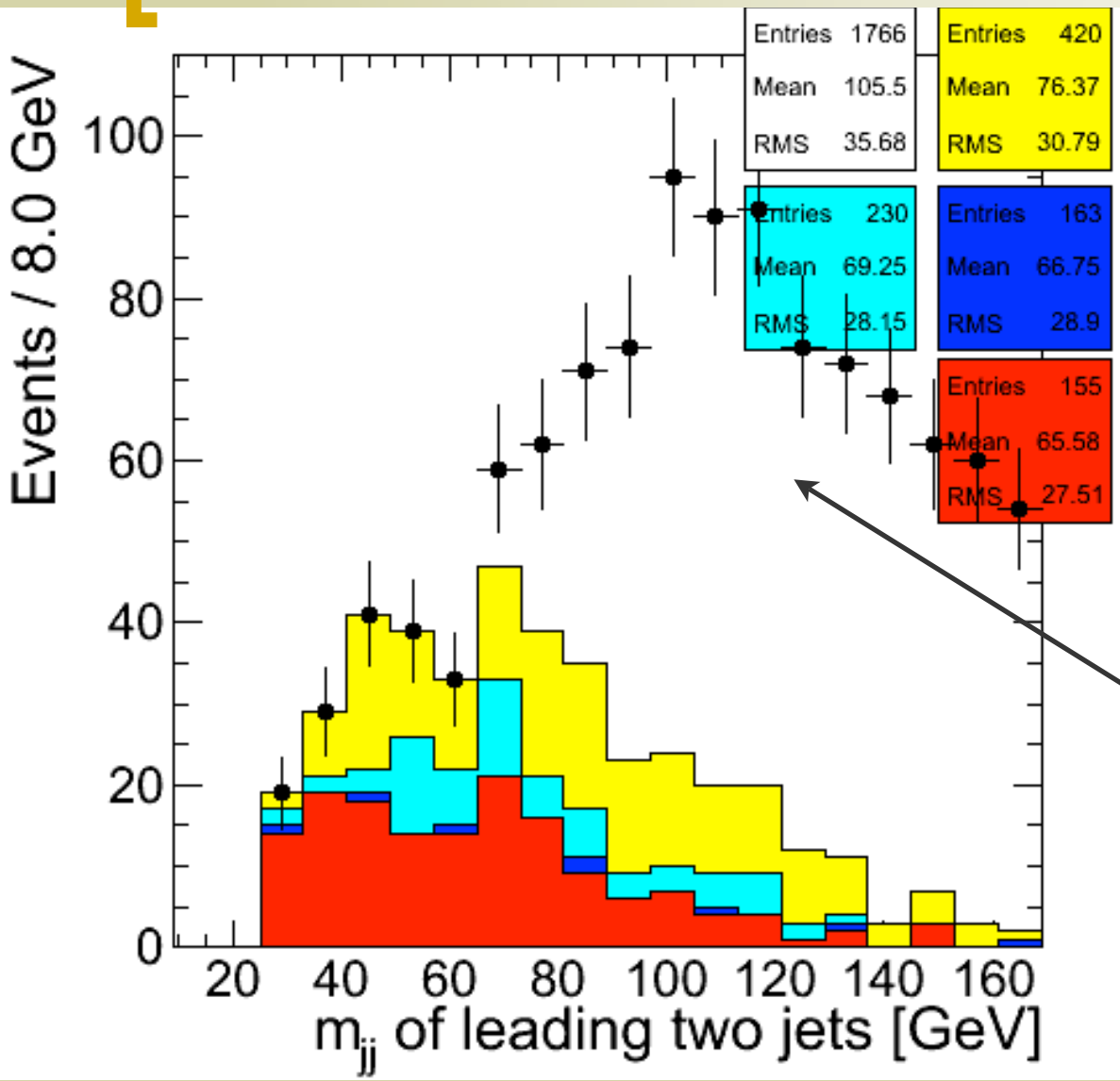


$\Delta\eta(j_1,j_2)$ versus $\Delta\phi(j_1,j_2)$ in W+jj events



- The QCD events have $\Delta\phi$ peaking close to π.
- $W \rightarrow jj$ events should have more uniform $\Delta\phi$ distribution
  - (need to verify this from MC)
- Meanwhile, lets plot the m_{jj} distribution for events with $\Delta\phi < 2\pi/3$
  - to improve the signal purity

m_{jj} after $\Delta\phi$ <2π/3, each jet p_T >25 GeV cuts



Out of 155 events surviving |Δη| < 0.5 cut and b-tag veto 52 events are in the W mass window 70−90 GeV

all W+jj events

after |Δη| < 1.3 cut

after |Δη| < 0.7 cut

after |Δη| < 0.5 cut

|Δη| < 0.5, no b-tag