W + N Jets Study

Varsha Ramakrishnan
UW Madison CDF Hep Meeting
04/30/09

Talk Outline

- Study Opening angle Plots between W-Leading Jet for W+ (N Jets ≥ 1)
- Study Opening angle Plots between W-Next-To-Leading Jet for W+ (N Jets ≥ 2) as well as Jet-Jet Opening angles
- Study Opening angle Plots between W-Third Jet for W+ (N Jets ≥ 3) as well as Jet-Jet Opening angles
- Look at properties of Tracks Alogrithm 11 and 23

Data and Montecarlo

DATA

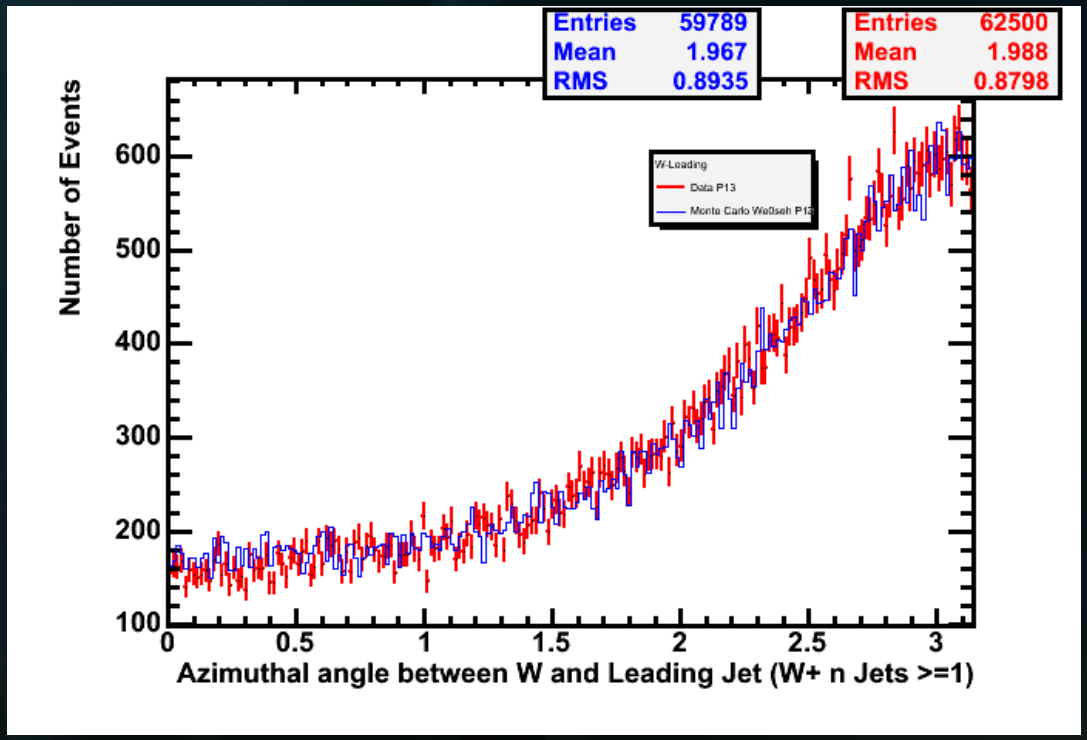
- Period 11-13 Data Run No (233133 - 246231)
- Luminosity – 200 pb^{-1}
- CEM Good run list with Silicon bit set is applied

MC

- Period 11-13 Monte Carlo sample

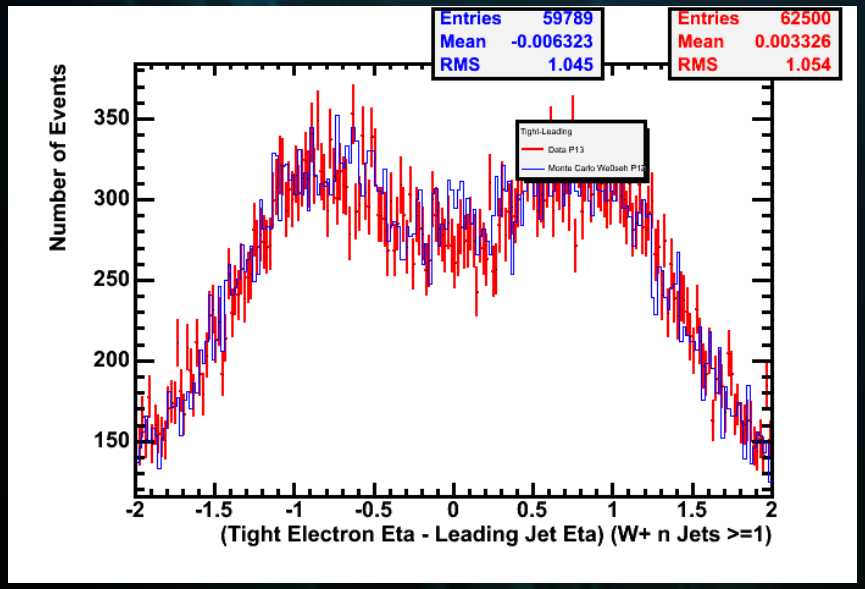
W + (N Jets ≥ 1)

- $\Delta\varphi(\vec{W}\ \vec{P}_T$ and Leading Jet $\vec{P}_T)$
- Leading Jet Et L5 Corrected >5 Gev and <10 GeV
- Leading Jet $|\eta| < 2$
- No Muon Correction Applied to MET
- MET Corrected for Selected Jets

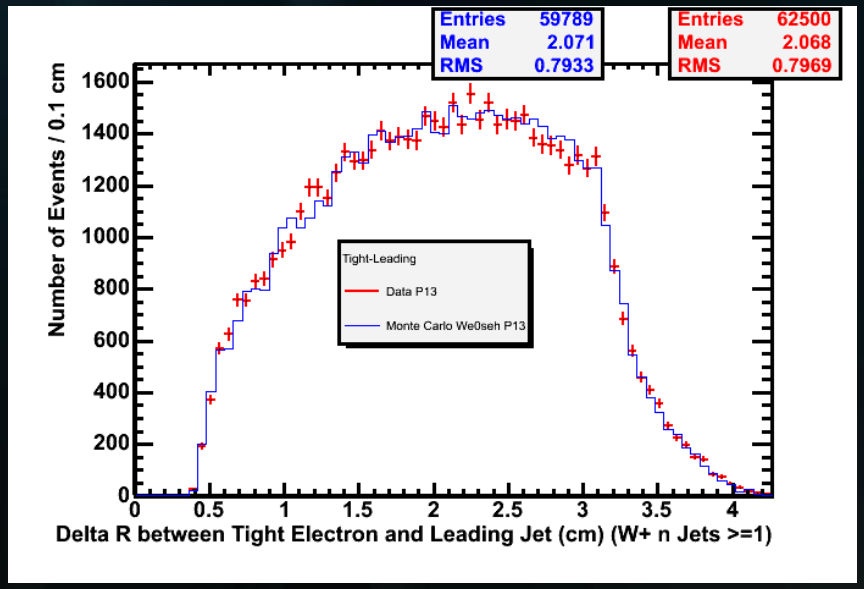


W + (N Jets ≥ 1)

Δη(Tight electron – Leading Jet Eta)



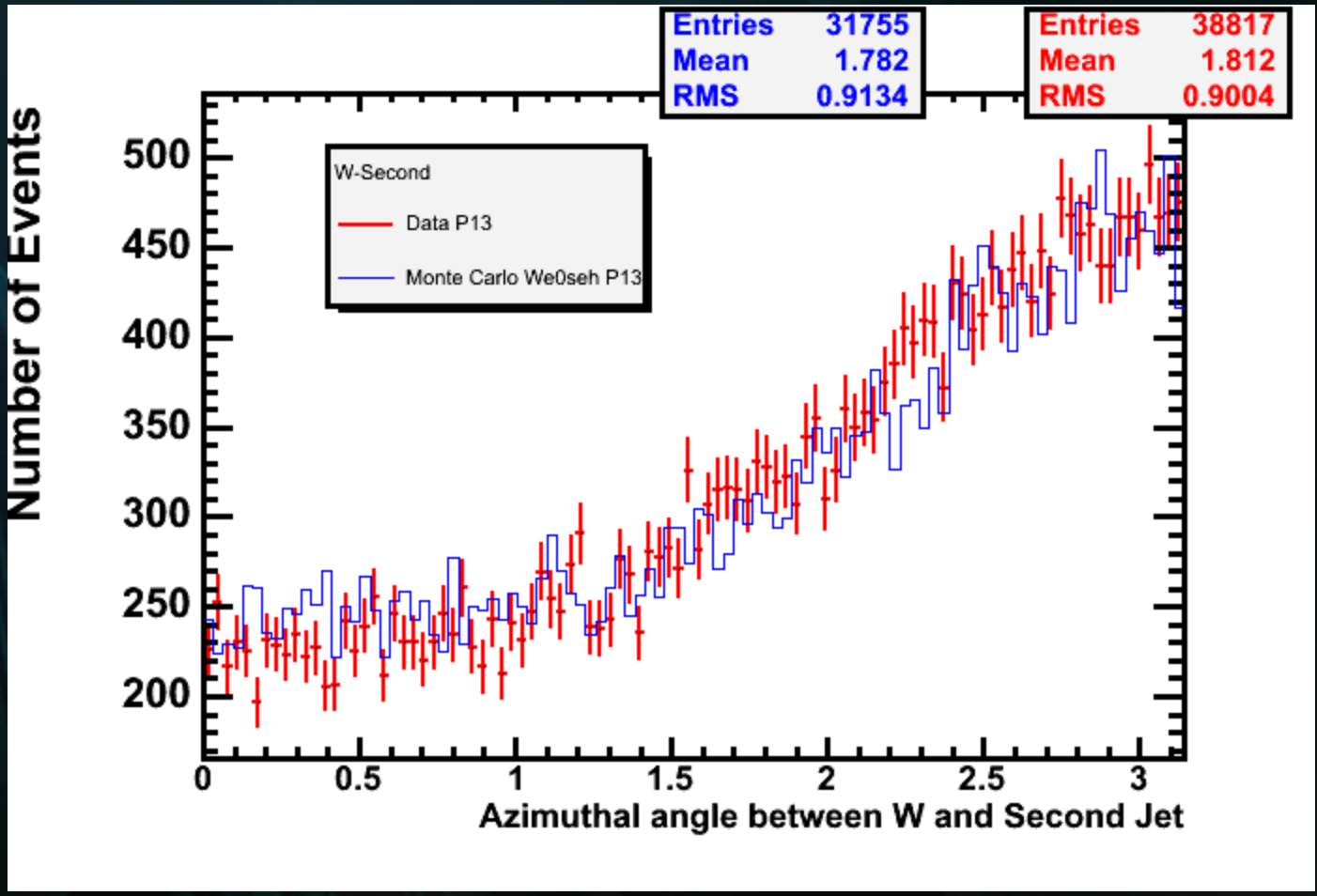
ΔR(Tight electron – Leading Jet)



- Symmetrical about Forward-Central Region
- Peak at $\Delta\eta$ ~1 (Electron is Centrally Triggered)

- W- Leading Jet are back-to-back, hence the Drop-off after ~3.14

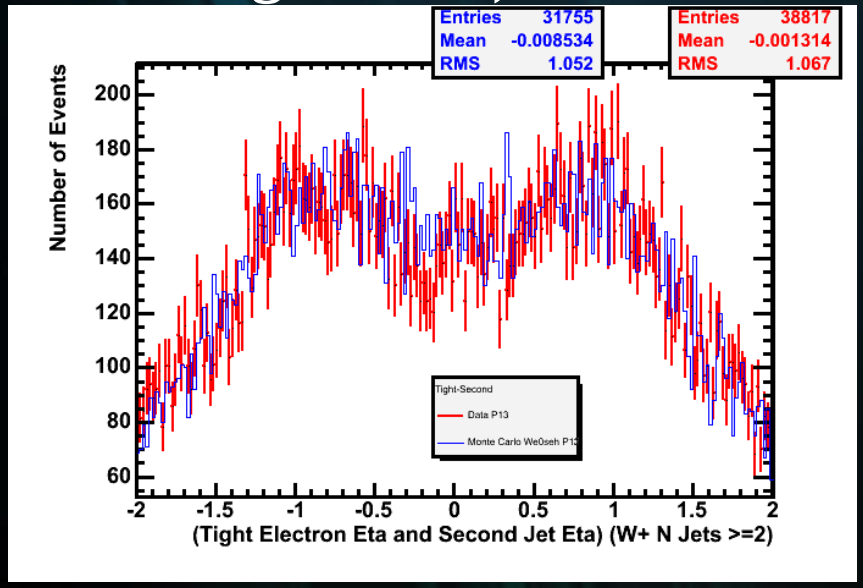
W + (N Jets ≥ 2)



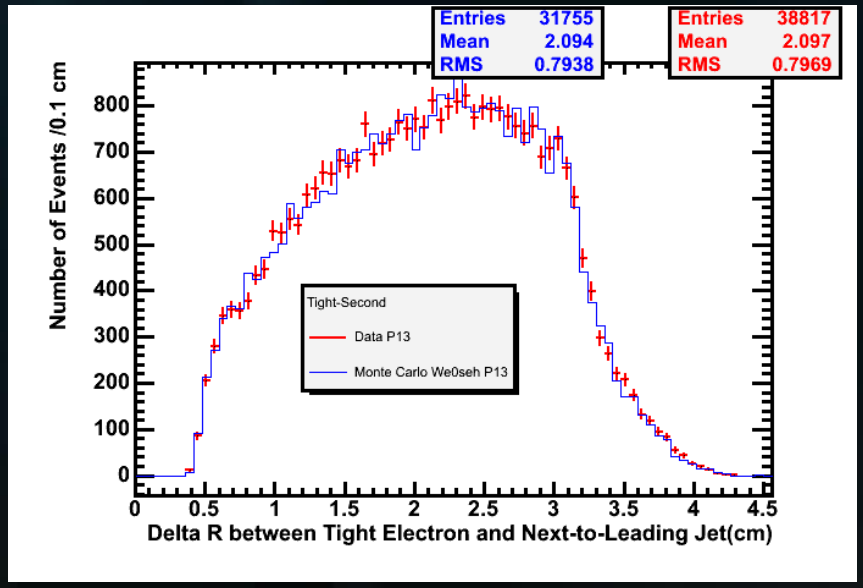
- $\Delta\varphi(W\ \vec{P}_T$ and Next-To-Leading Jet $\vec{P}_T)$
- W P_T ~ Jet P_T

W + (N Jets ≥ 2)

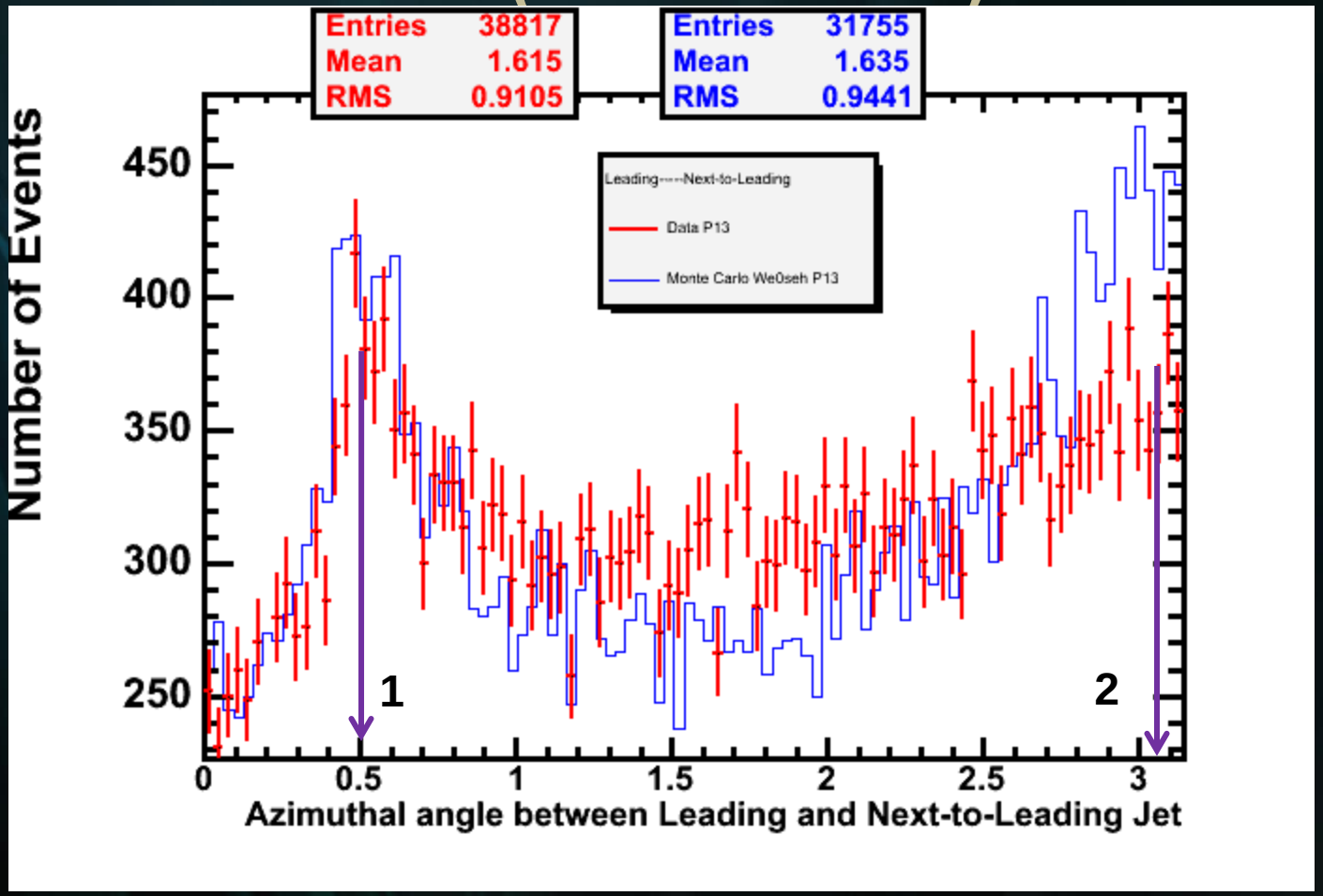
Δη(Tight electron – Next-To-Leading Jet Eta)



ΔR(Tight electron – Next-To-Leading Jet)



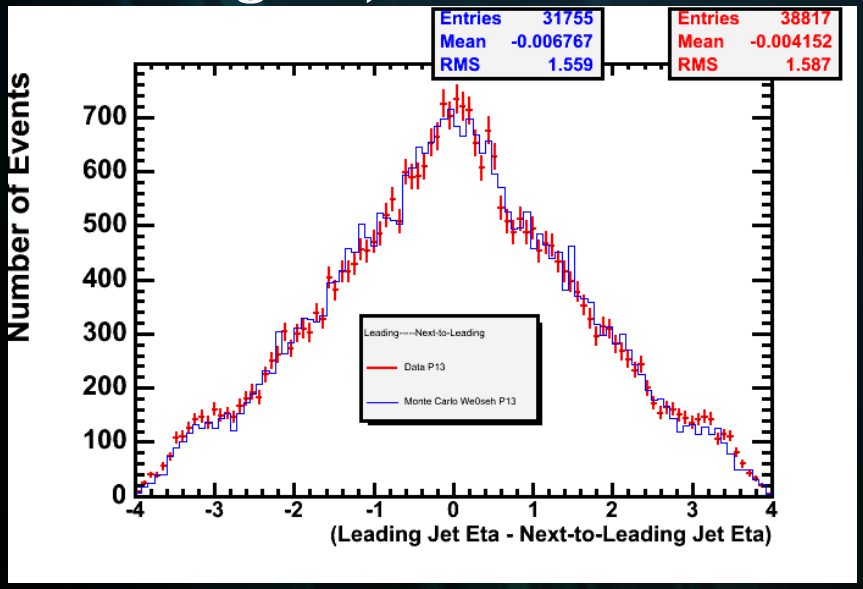
W + (N Jets ≥ 2)



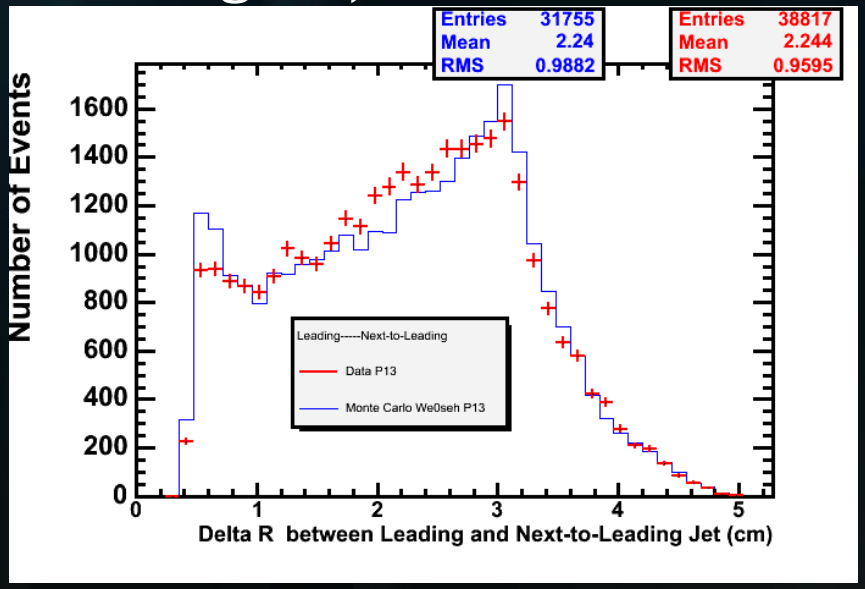
- $\Delta\varphi$(Leading Jet P_T and Next-To-Leading Jet P_T)
- Peak 1 can correspond Single-Vertex W+2 Jet event
- Peak 2 can correspond Double Parton W+2 Jet OR a Dijet event

W + (N Jets ≥ 2)

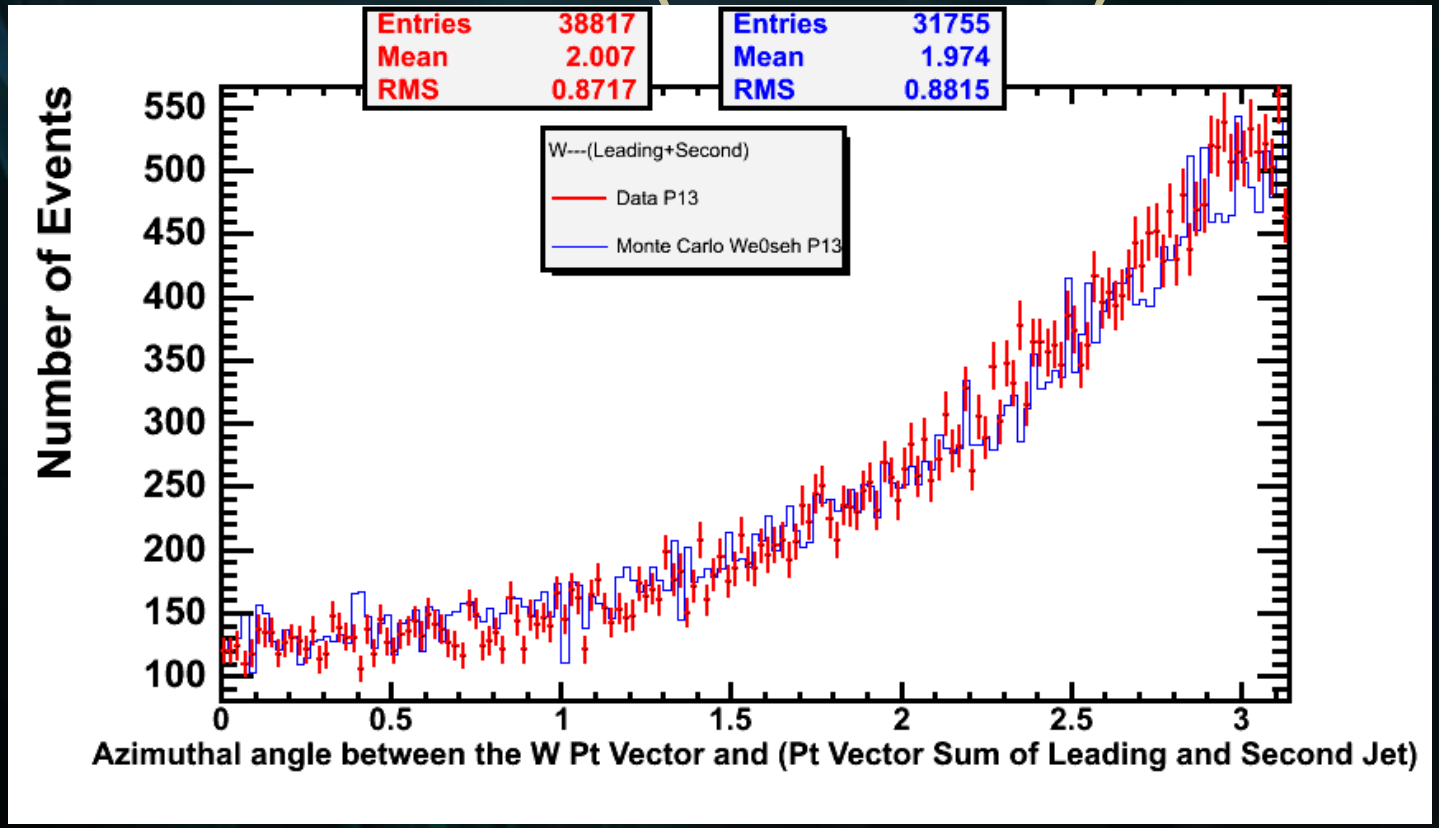
Δη(Leading Jet-Next-To-Leading Jet)



ΔR(Leading Jet-Next-To-Leading Jet)



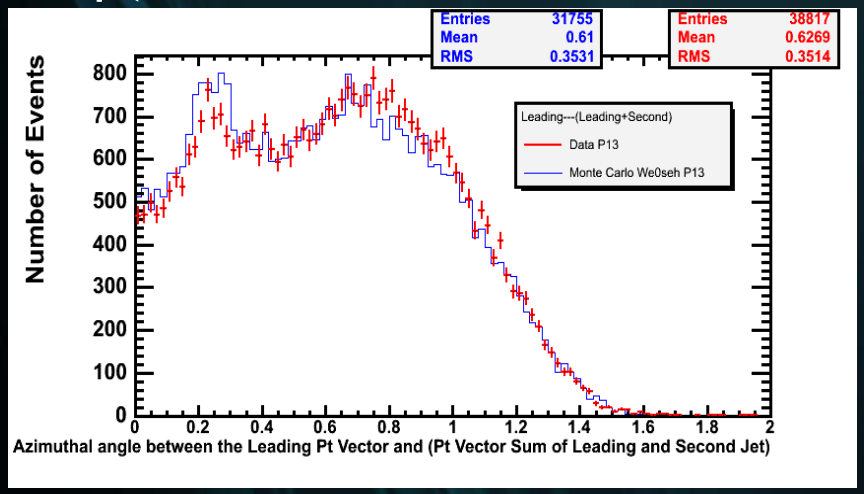
W + (N Jets ≥ 2)



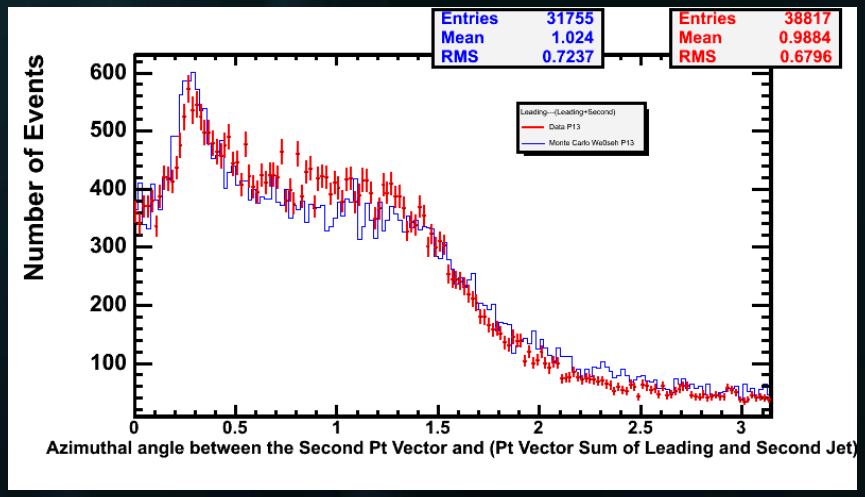
- Resultant P_T Vector = Leading Jet P_T + Next-To-Leading Jet P_T
- Plot above is $\Delta\varphi$(W P_T and Resultant P_T vector)
- If $\Delta\varphi$(Leading Jet P_T and Next-To-Leading Jet P_T) ~ Peak 1

W + (N Jets ≥ 2)

Δφ(Leading ,Resultant Vector)

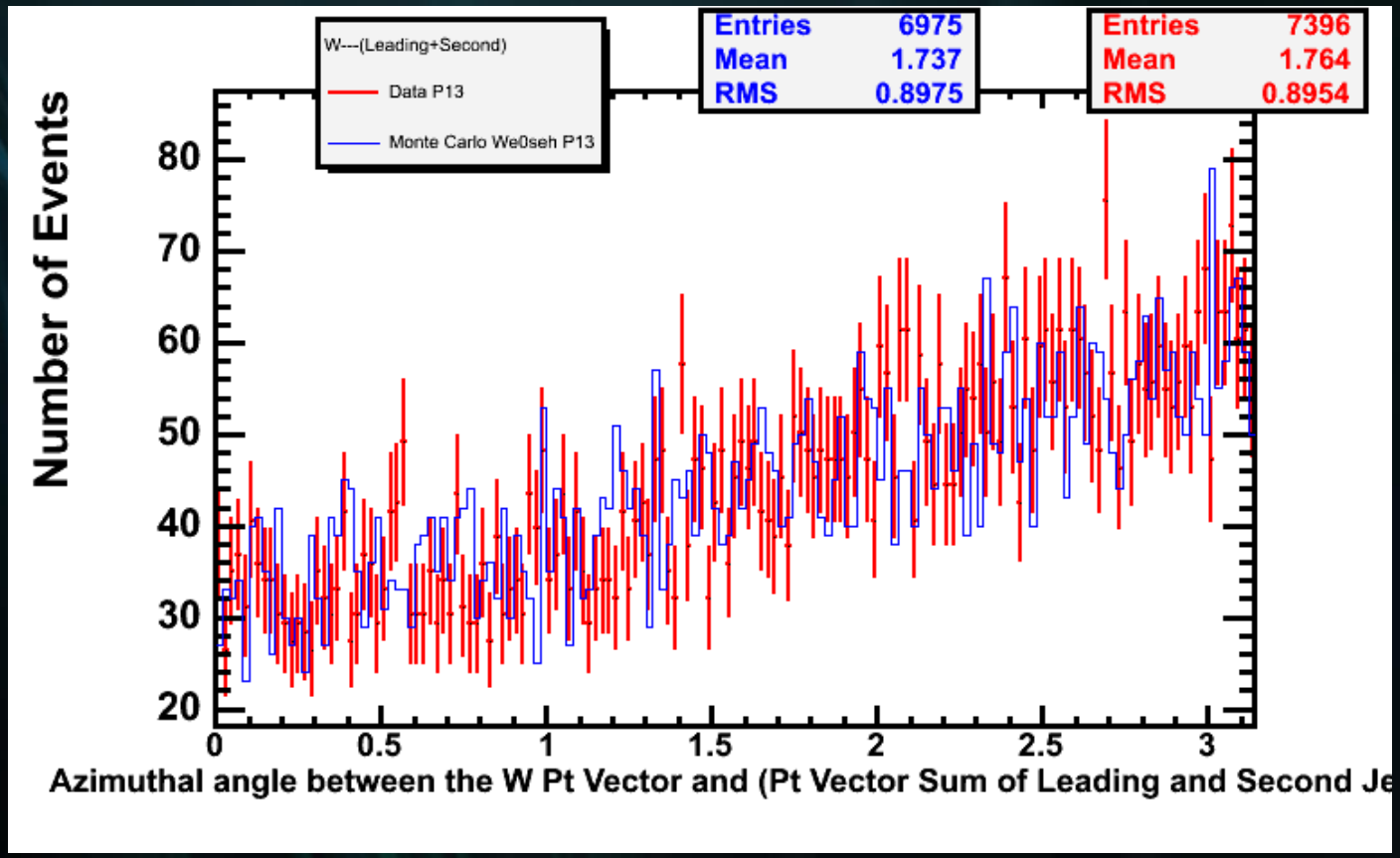


Δφ(Next-To-Leading ,Resultant)



- Resultant Vector = Leading Jet P_T + Next-To-Leading Jet P_T
- Δφ(Leading Jet P_T and Resultant P_T vector)
- If Δφ(Leading Jet P_T and Next-To-Leading Jet P_T) ~ Peak 1

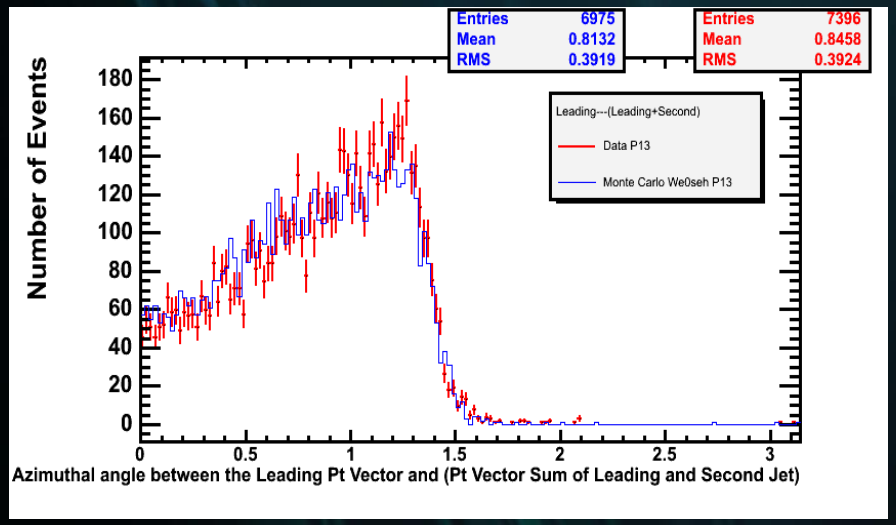
W + (N Jets ≥ 2)



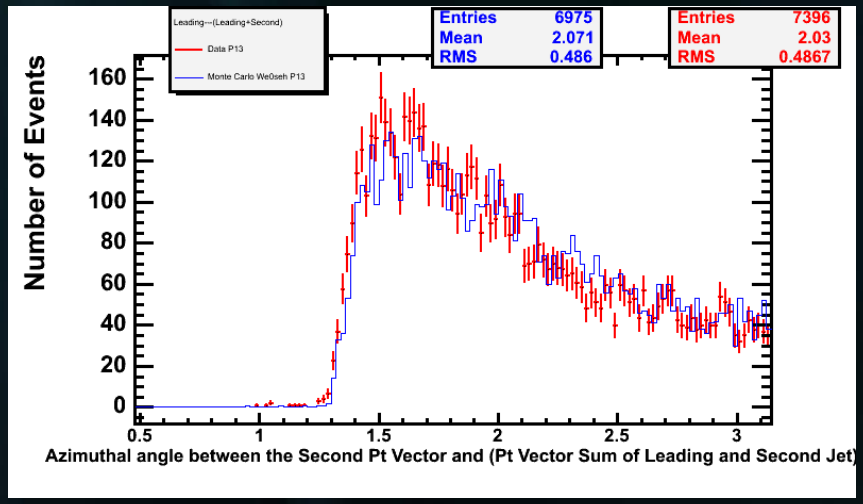
- $\Delta\varphi$(Leading Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector = Leading Jet P_T + Next-To-Leading Jet P_T
- Plot above is $\Delta\varphi$(W P_T – Resultant Jet P_T)

W + (N Jets ≥ 2)

- Δφ(Leading ,Resultant)



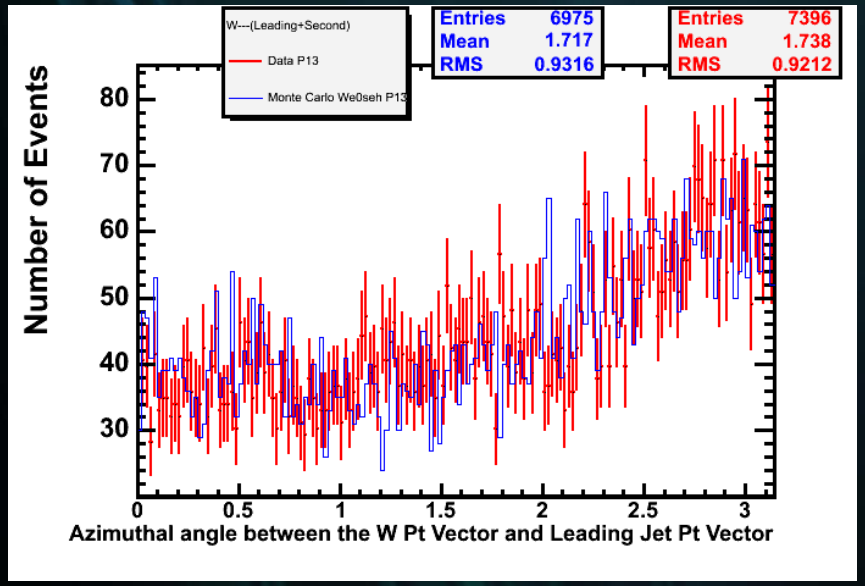
- Δφ(Leading ,Resultant)



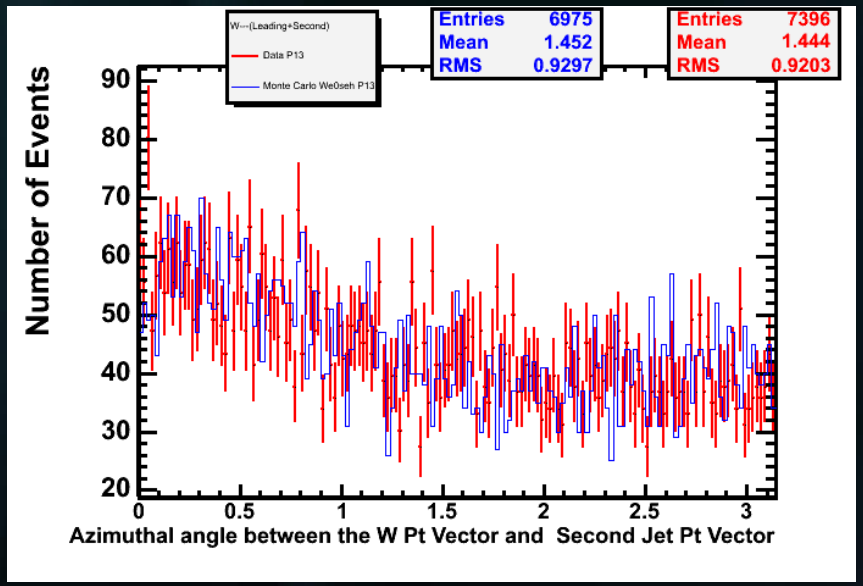
- Δφ(Leading Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector = Leading Jet P_T + Next-To-Leading Jet P_T
- Δφ(Leading Jet P_T – Resultant Jet P_T) and Δφ(Next-To-Leading Jet P_T – Resultant Jet P_T) complement each other

W + (N Jets ≥ 2)

Δφ(W $\mathbf{P_T}$ – Leading Jet P_T)

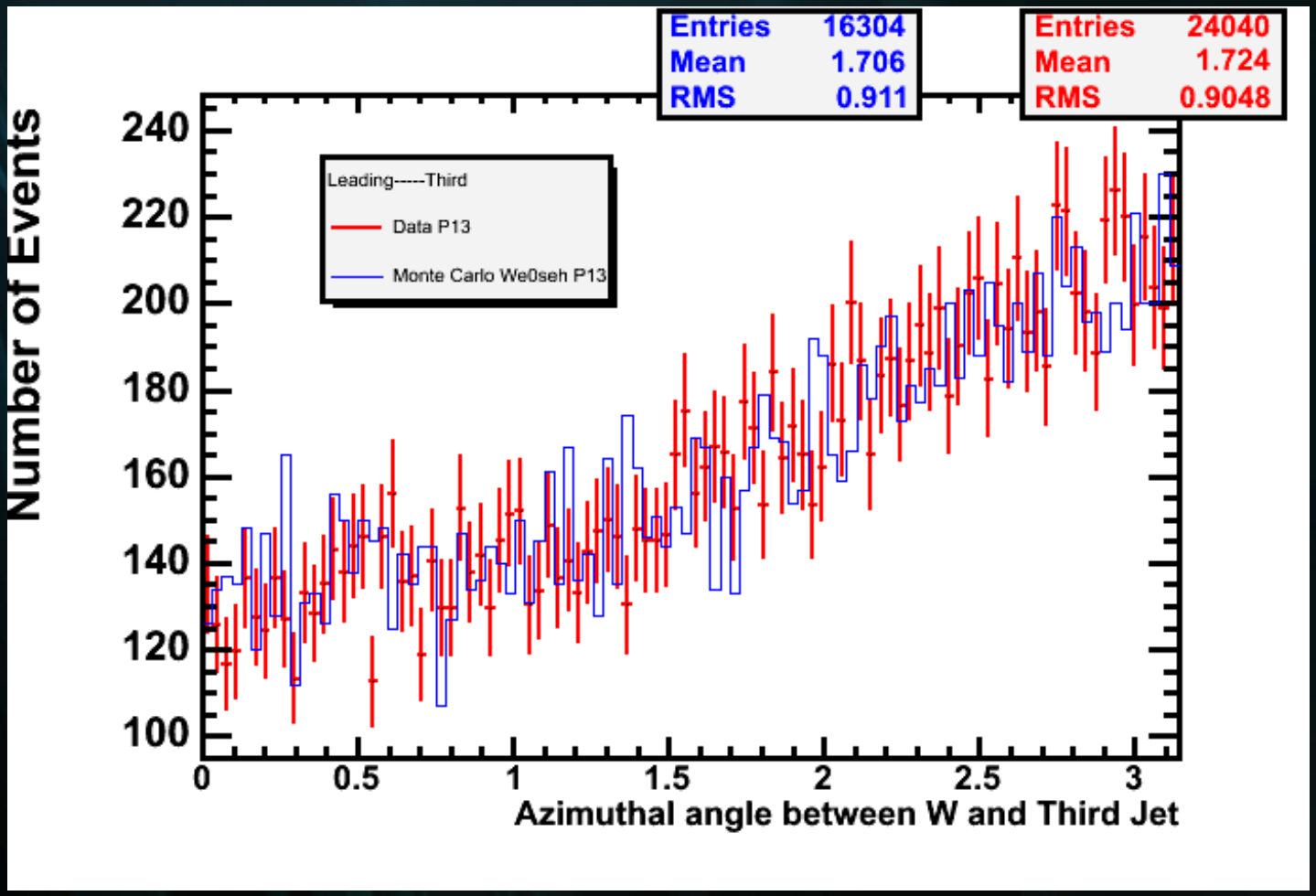


Δφ (W $\mathbf{P_T}$– Next-To-Leading Jet)



- Δφ(Leading Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector = Leading Jet P_T + Next-To-Leading Jet P_T
- Δφ(W P_T – Leading Jet P_T) and Δφ(W P_T – Next-To-Leading Jet P_T) supplement each other

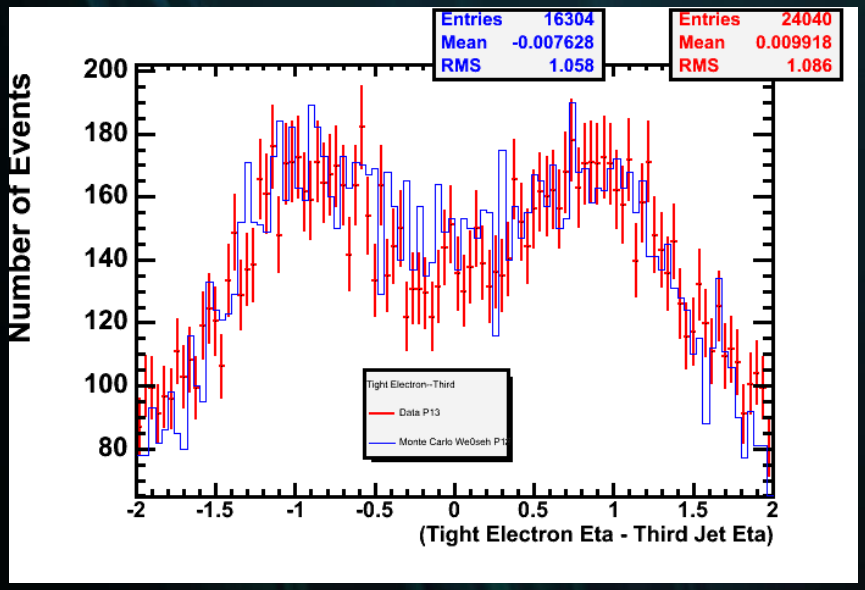
W + (N Jets ≥ 3)



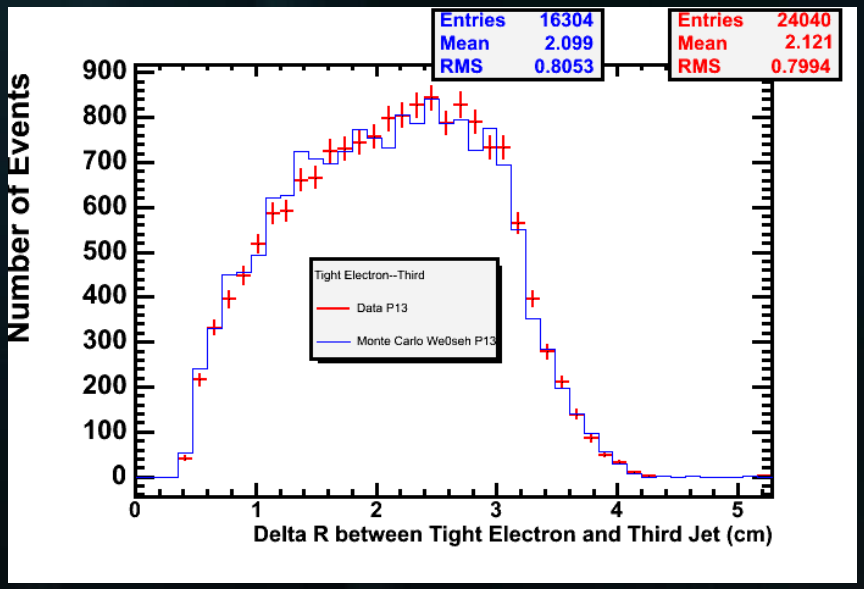
- Plot above is $\Delta\varphi$(W P_T and Third Jet P_T)
- W P_T ~ Third Jet P_T

W + (N Jets ≥ 3)

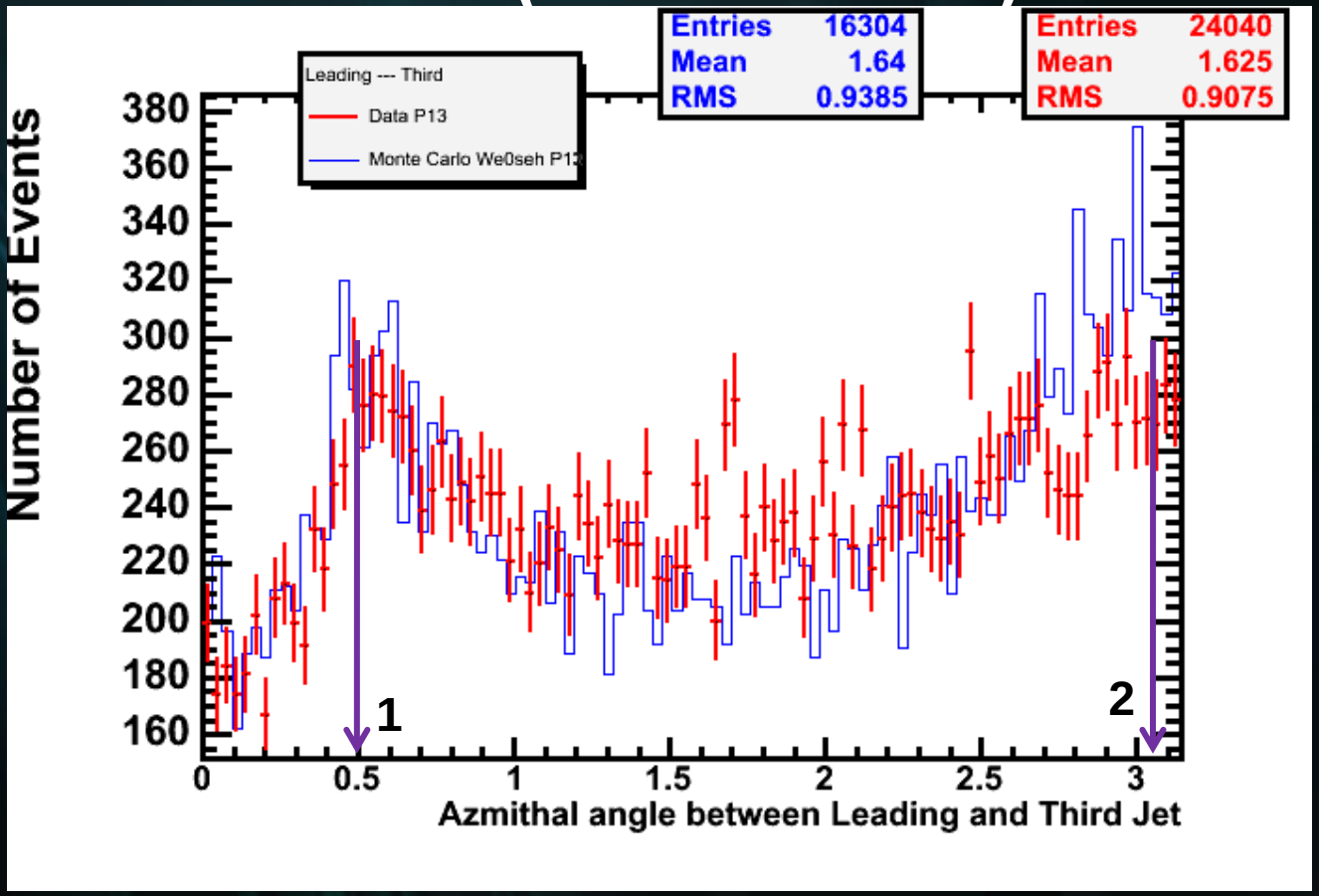
Δη(Leading Jet- Third Jet)



ΔR(Leading Jet-Third Jet)



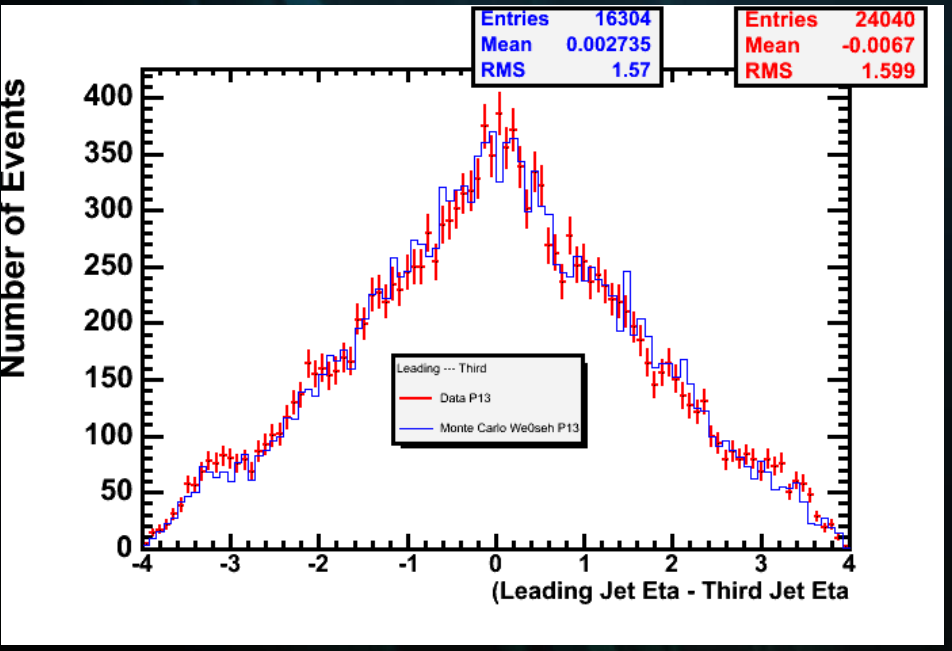
W + (N Jets ≥ 3)



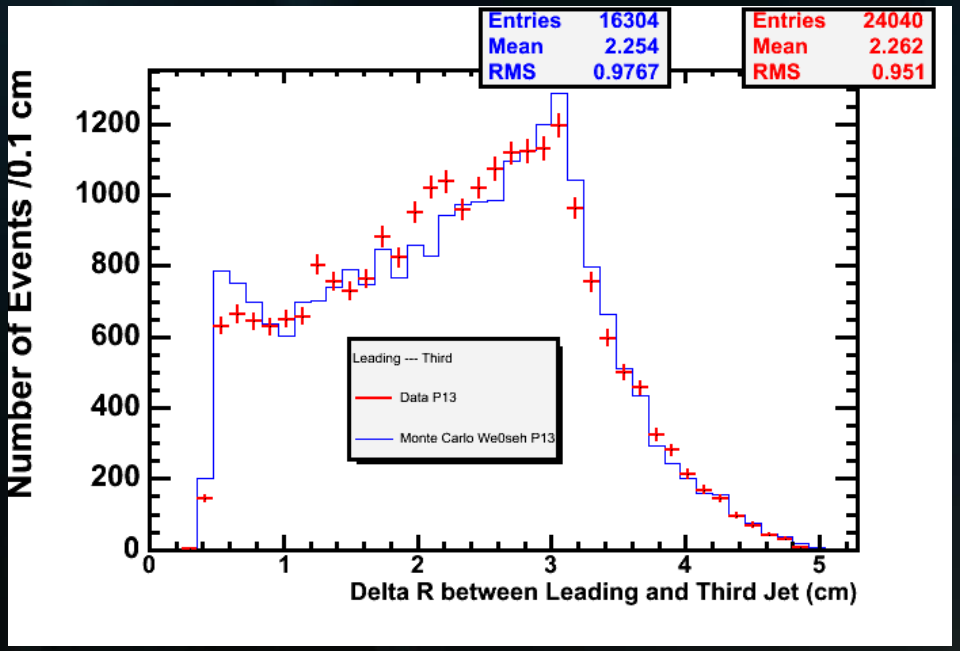
- Plot above is $\Delta\varphi$(Leading Jet P_T and Third Jet P_T)
- Peak 1 can correspond Single-Vertex W+2 Jet event
- Peak 2 can correspond Double Parton W+2 Jet OR a Dijet event

W + (N Jets ≥ 3)

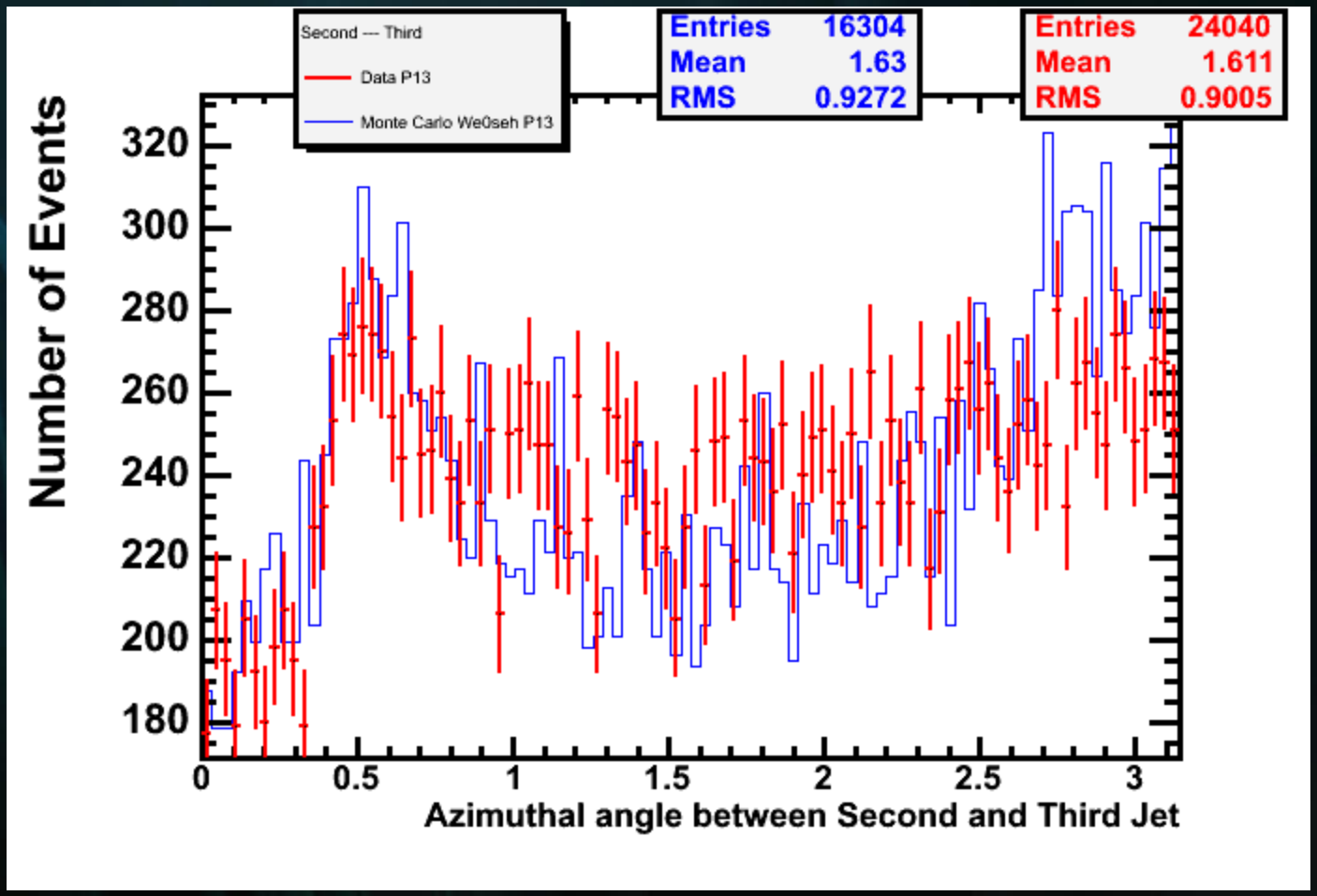
Δη(Leading Jet- Third Jet)



ΔR(Leading Jet- Third Jet)



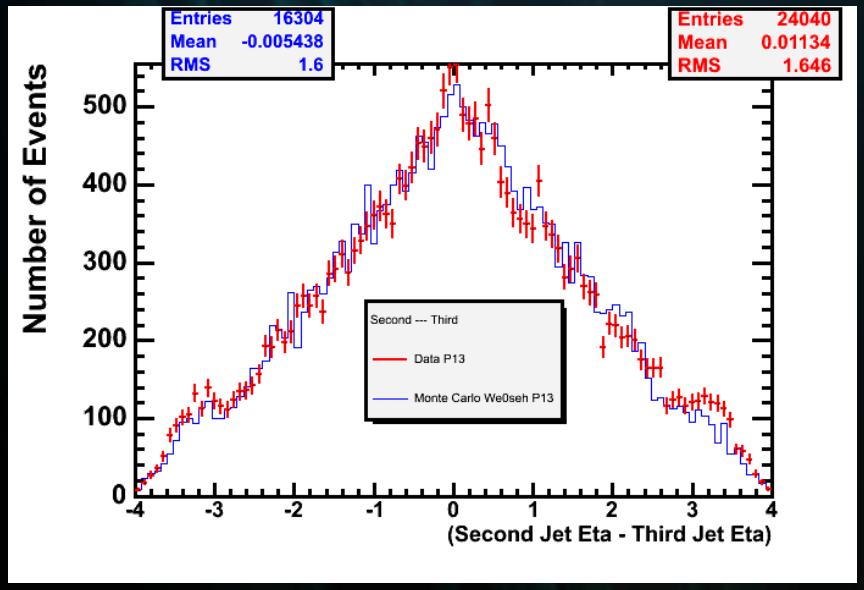
W + (N Jets ≥ 3)



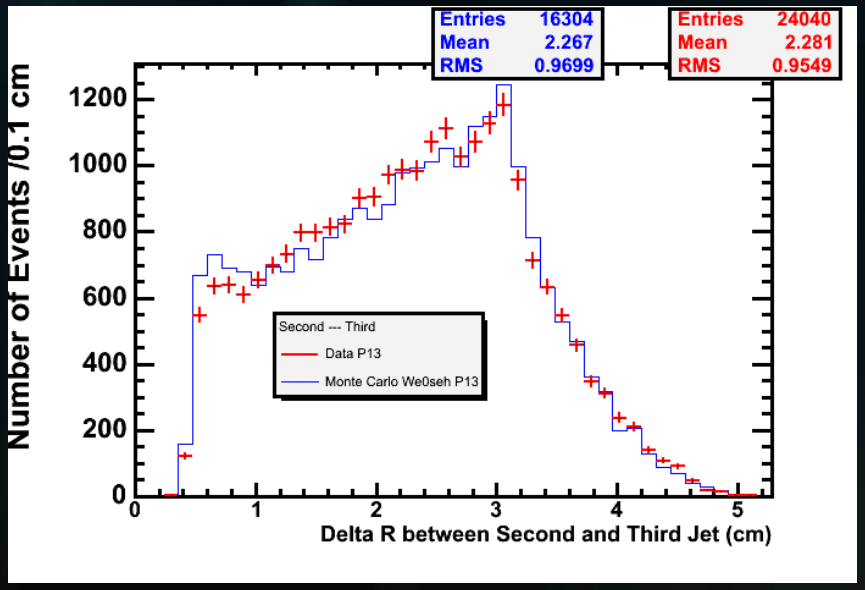
- Plot above is $\Delta\varphi$(Leading Jet P_T and Third Jet P_T)

W + (N Jets ≥ 3)

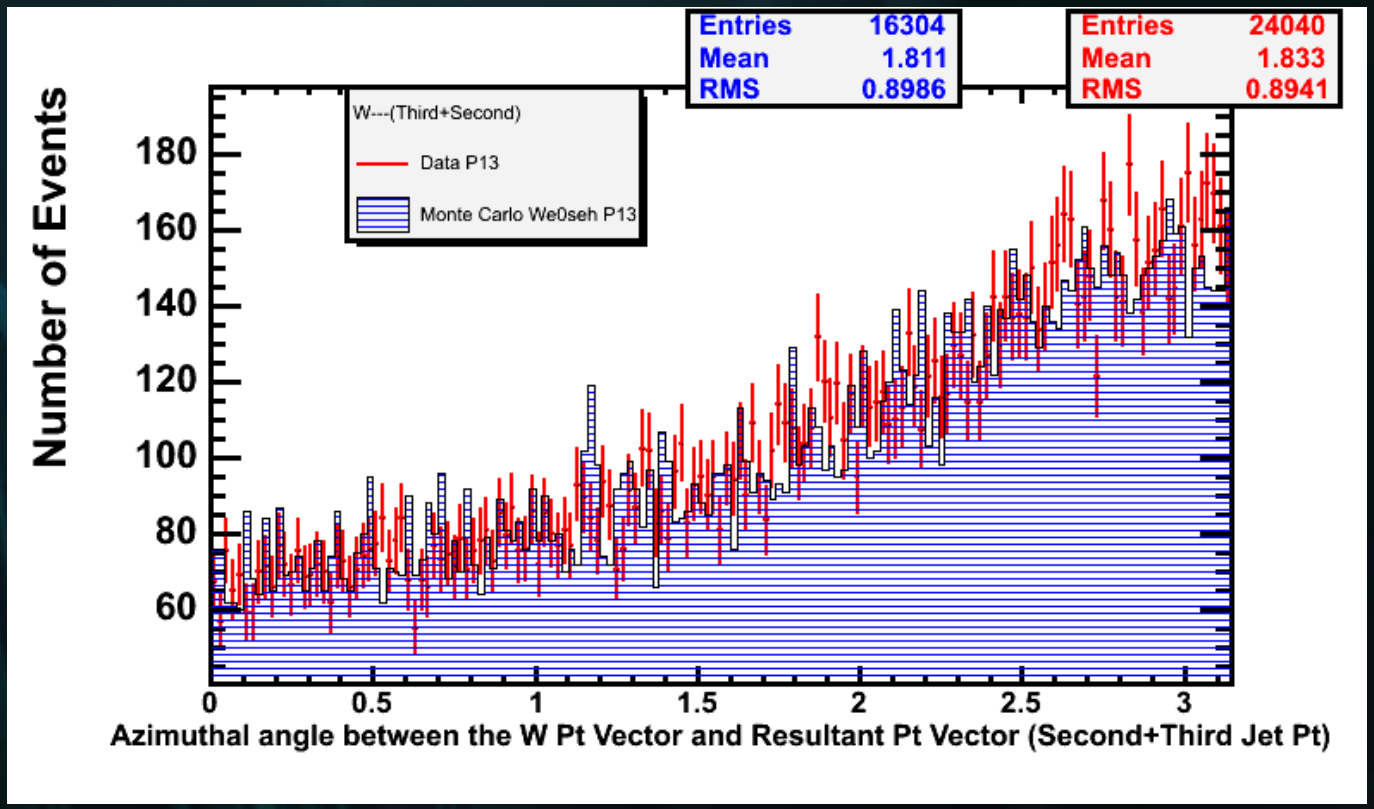
Δη(Next-To-Leading Jet-Third Jet)



ΔR(Next-To-Leading Jet-Third Jet)



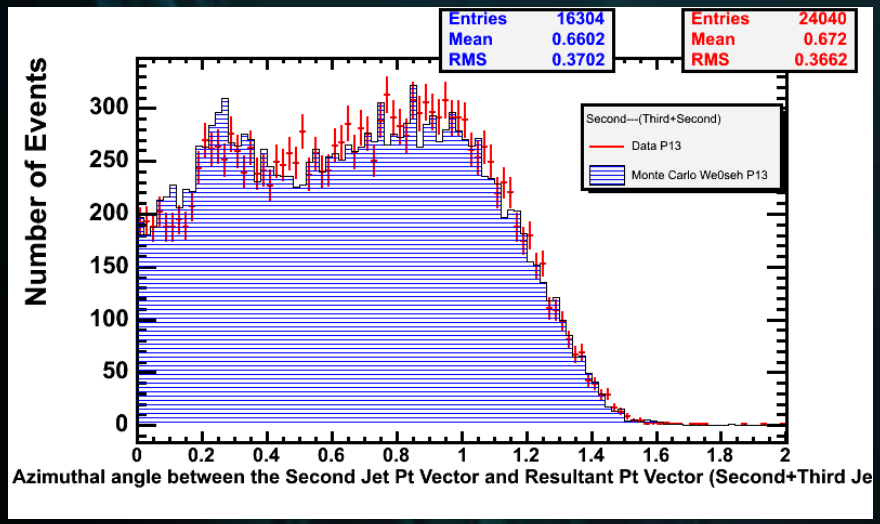
W + (N Jets ≥ 3)



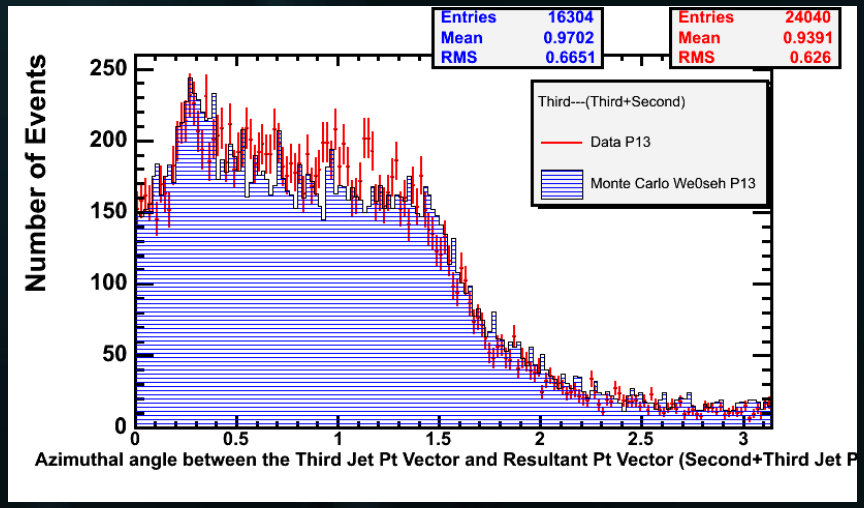
- Resultant P_T Vector = Third Jet P_T + Next-To-Leading Jet P_T
- Plot above is $\Delta\varphi$(W P_T and Resultant P_T vector)
- $\Delta\varphi$(Leading Jet P_T and Next-To-Leading Jet P_T) ~ Peak 1

W + (N Jets ≥ 3)

Δφ(Second,Resultant)

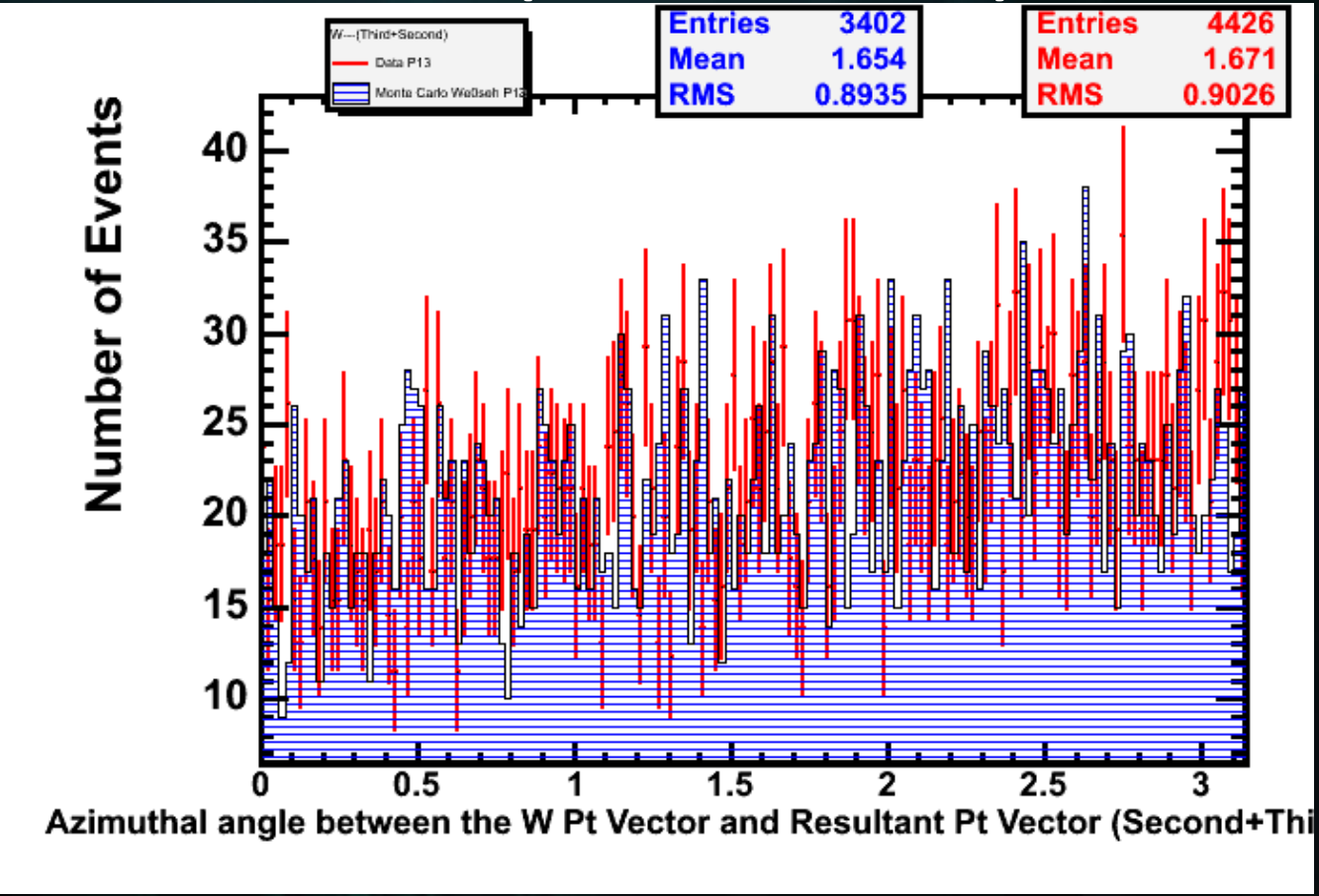


Δφ(Third,Resultant)



- Resultant P_T Vector = Third Jet P_T + Next-To-Leading Jet P_T

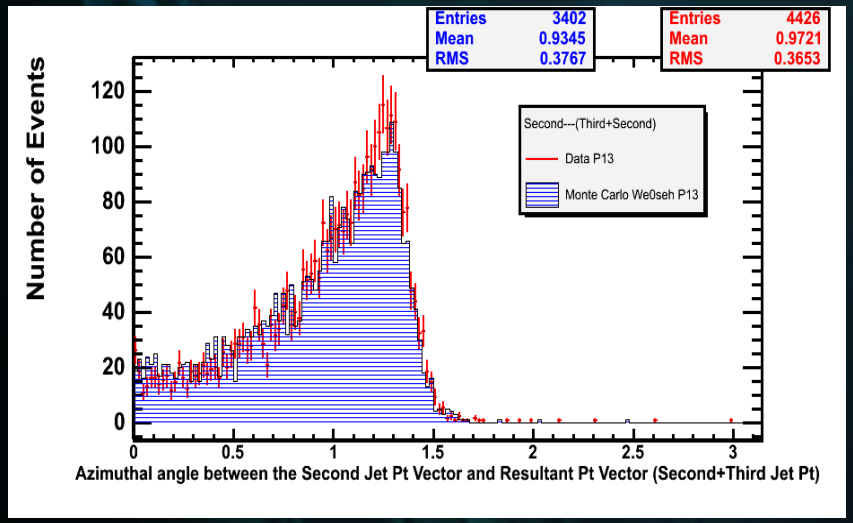
W + (N Jets ≥ 3)



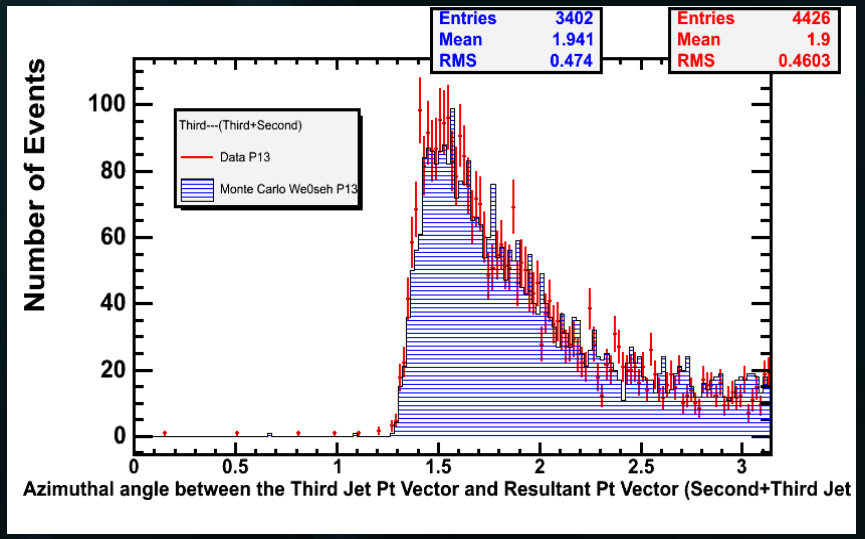
- $\Delta\varphi$(Third Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector = Third Jet P_T + Next-To-Leading Jet P_T
- Plot above is $\Delta\varphi$(W P_T – Resultant Jet P_T)

W + (N Jets ≥ 3)

- Δφ(Second ,Resultant)



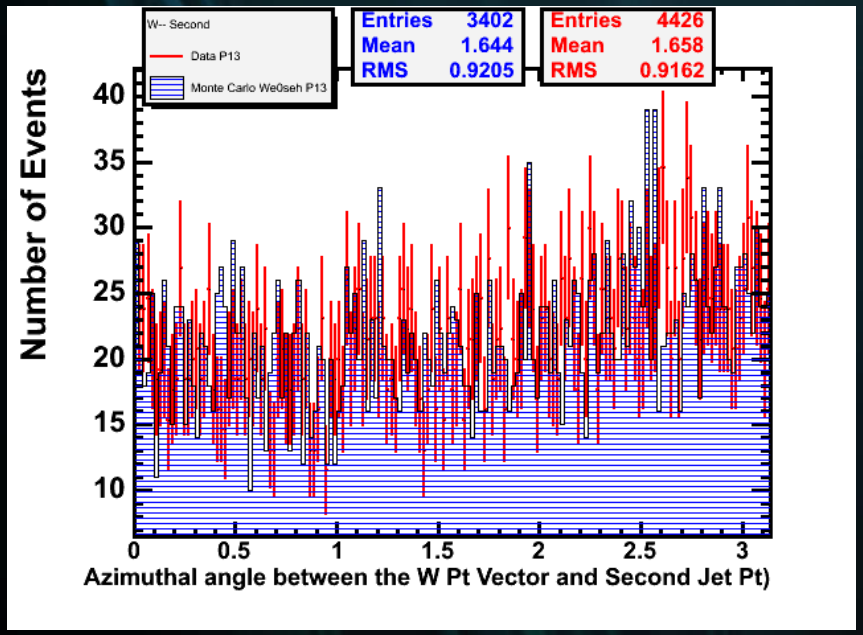
- Δφ(Third ,Resultant)



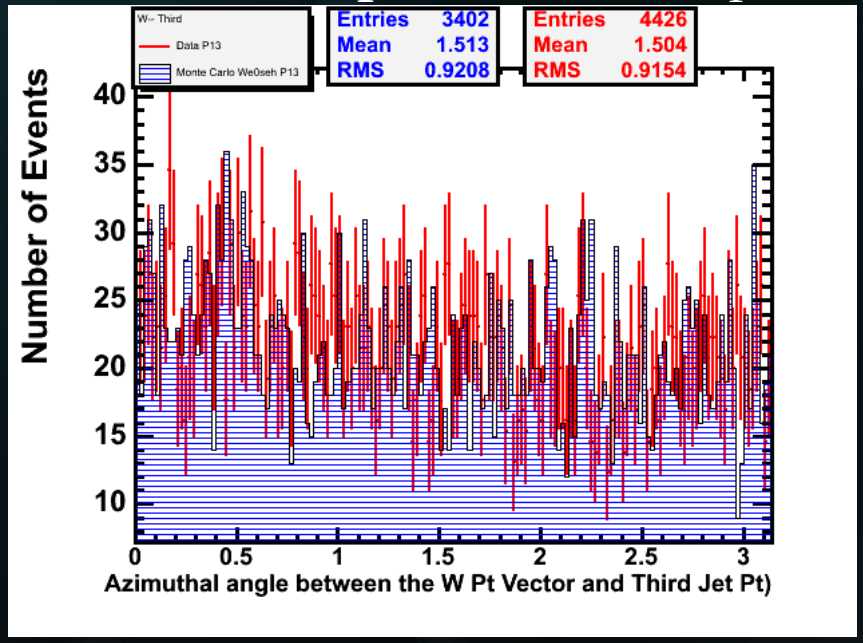
- Δφ(Third Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector =ThirdJet P_T + Next-To-Leading Jet P_T
- Δφ(Third Jet P_T – Resultant Jet P_T) and Δφ(Next-To-Leading Jet P_T – Resultant Jet P_T) complement each other

W + (N Jets ≥ 3)

$\Delta\varphi$(W $\mathbf{P_T}$ – Second Jet P_T)



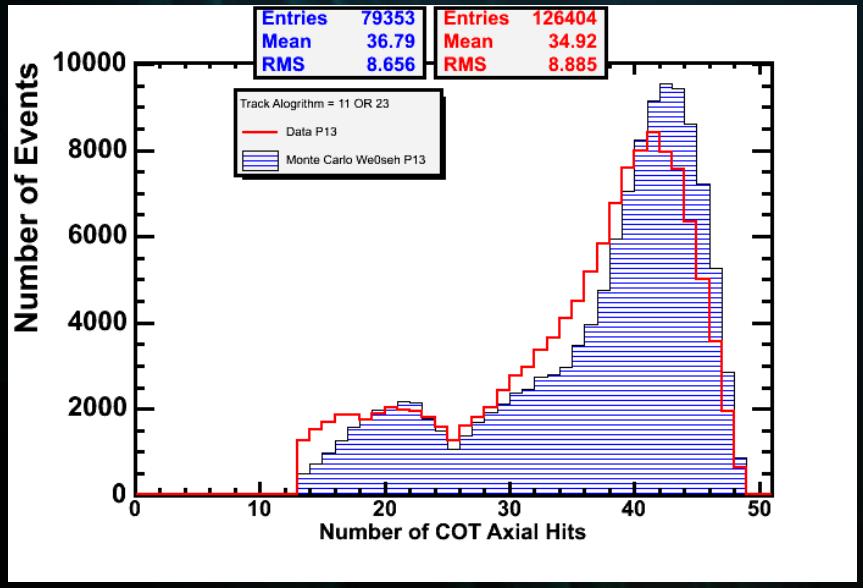
$\Delta\varphi$(W $\mathbf{P_T}$ – Third Jet P_T)



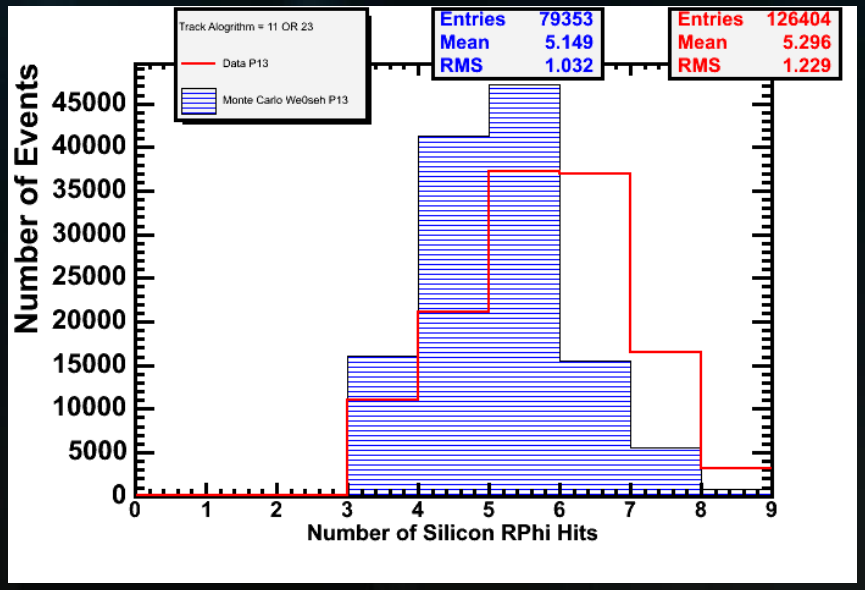
- $\Delta\varphi$(Third Jet P_T – Next-To-Leading Jet P_T) > 2.6 rad is applied
- Resultant Jet P_T Vector = Third Jet P_T + Next-To-Leading Jet P_T
- $\Delta\varphi$(W P_T – Third Jet P_T) and $\Delta\varphi$(W P_T – Next-To-Leading Jet P_T) supplement each other

Tracks Algorithm 11 OR 23

Number of COT Axial Hits

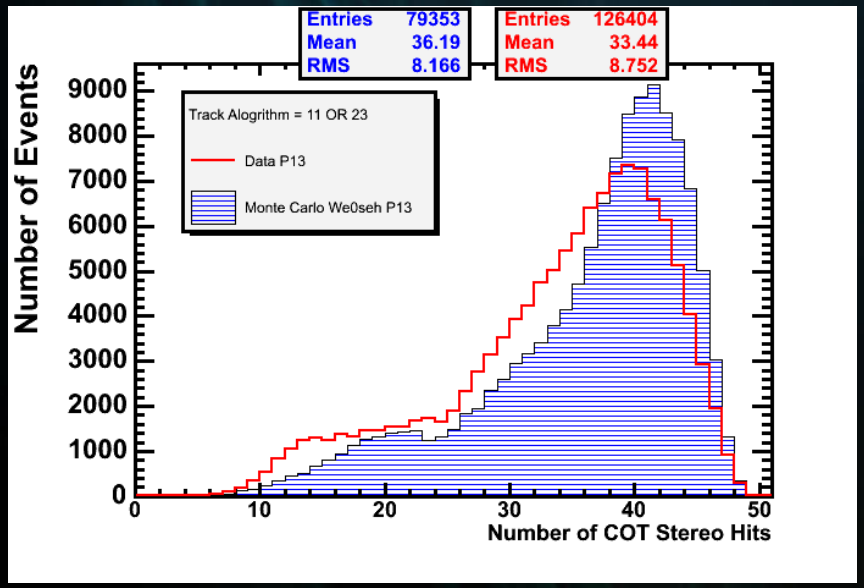


Number of SVX RPhi Hits

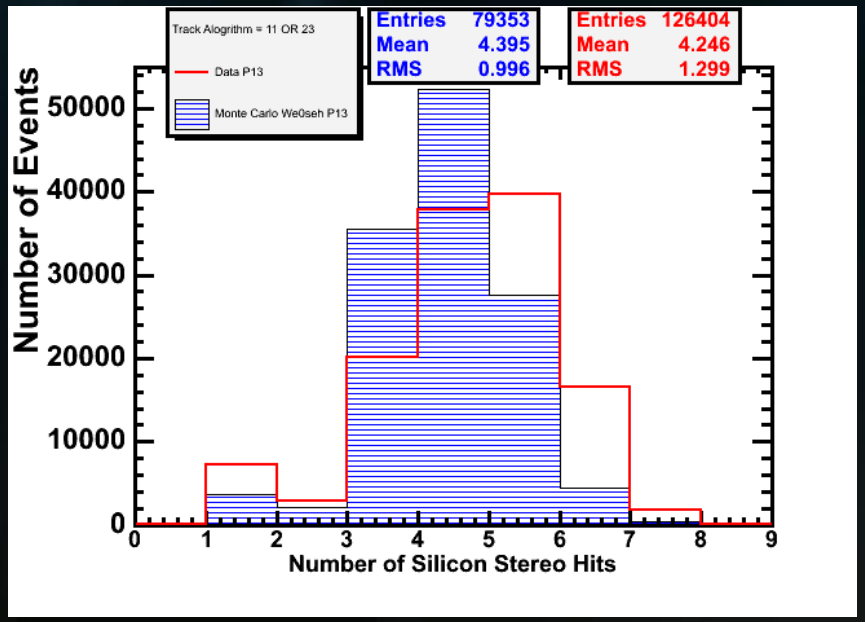


Tracks Algorithm 11 OR 23

Number of COT Stereo Hits

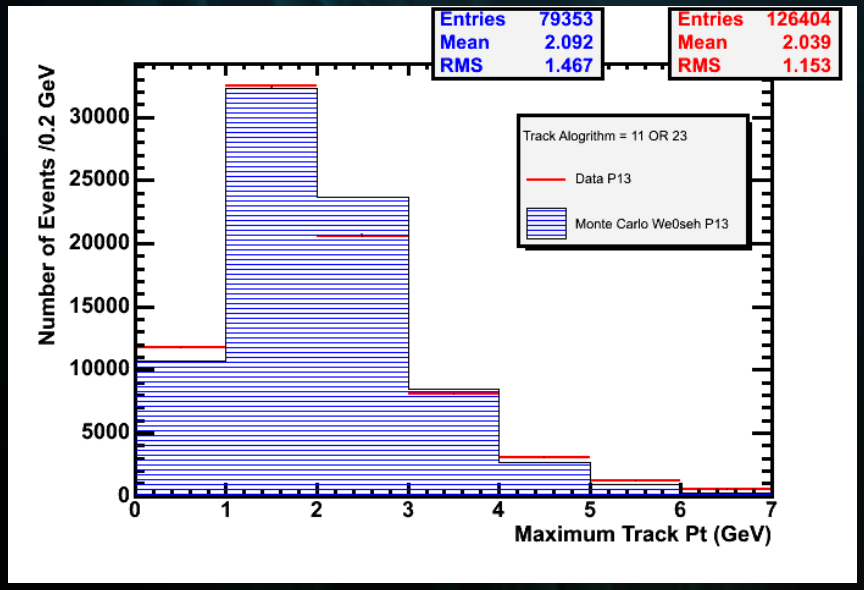


Number of SVX Stereo Hits

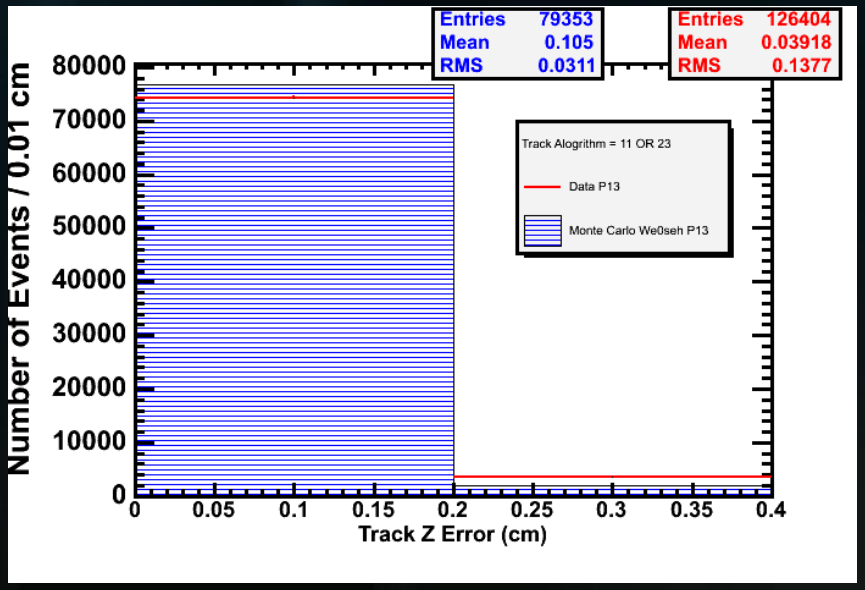


Tracks Algorithm 11 OR 23

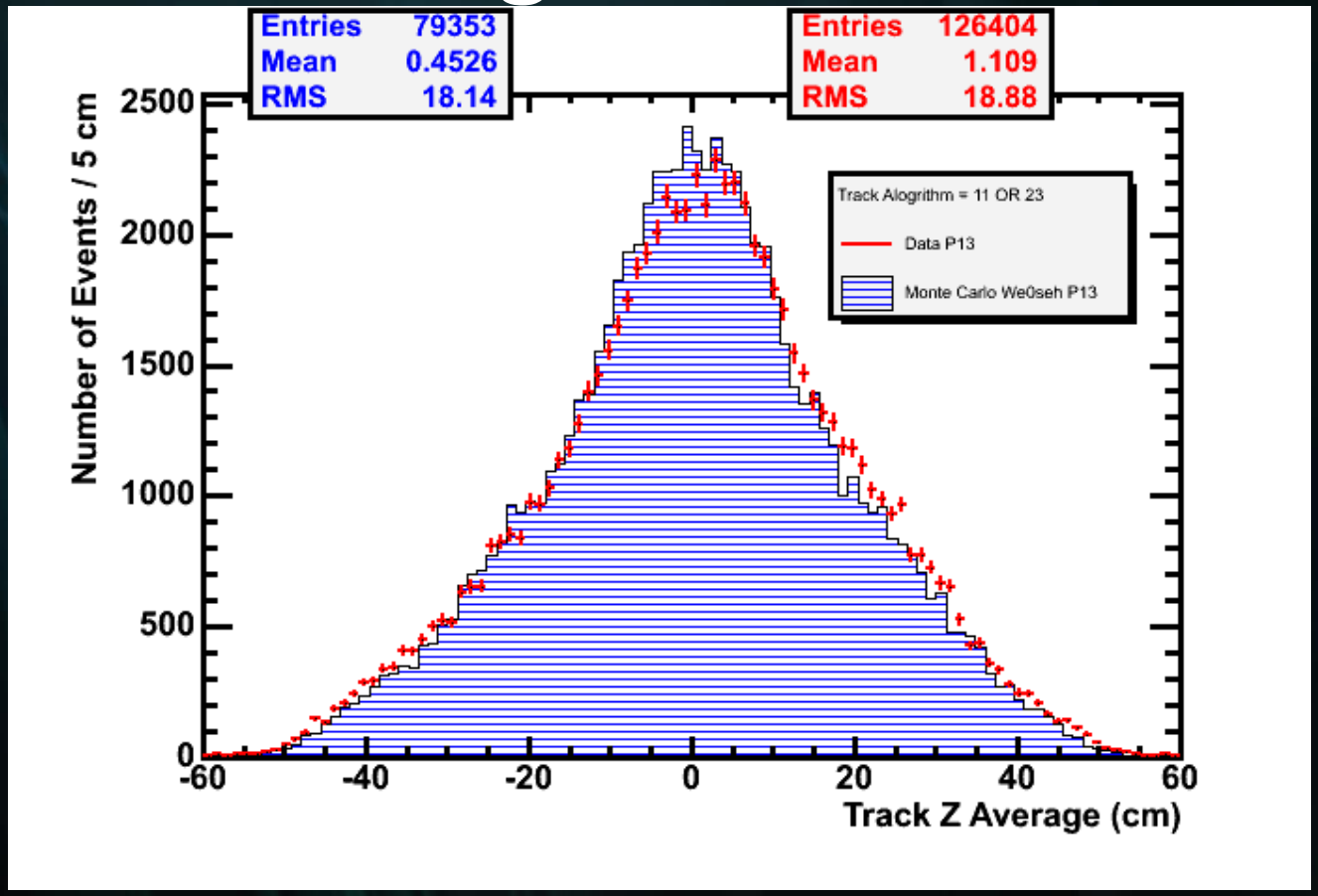
Highest Track PT



Track Z Error



Tracks Algorithm 11 OR 23



- Tracks selected with Algorithm either 11 OR 23
- Average of Track Z of above selected Tracks is plotted
- Average above is NOT weighted by the Tracks Z error

Conclusions

- Need to Look at the effect of Jet-Corrected-MET on the above plots
- Next Talk will be with both Muon and Jet Corrected MET and same plots as above
- Look at Jets with L5 Corrected Et >10 GeV and <15 GeV with Muon-Jet Corrected MET