Double Parton Scattering W->ev+ ≥ 2 Jets

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Talk Outline

- Description of samples used and those that Still need to be run on
- Summary of W/Electron/Jet Selection Cuts
- Selection cuts for the Tracks used in the Jet Z calculation
- Electron/Jet Variable Plots after Selecting the Tracks using ΔR(Trk-Jet Centroid)<0.8 and $|\Delta Z$(JetZ-TrkZ)|<0.04
- Electron/Jet Variable Plots after selecting events with $|\Delta Z$(Leading JetZ-Electron Z)|<0.04 and $|\Delta Z$(Next-to-Leading JetZ-Electron Z)|<0.04
- Dividing the $\Delta\phi$(Leading,Second) in to segments of radians i.e [0-0.5],[1-2],[2.5-PI] and look at various $\Delta\phi$

Data/MC samples used

- Data:
  1. Have already run on BHELBD[Period 0-8] till BHELBK[Period 20-21]
  2. Need to run of BHELAP and BHELBM
- MC with MPI
  1. Run on all available sample from P0-P17 including ad Run-Independent Sample
- MC-without MPI
  1. Run on my old sample ~ 5 millions
  2. Added more new Sample ~ 5 million events
  3. Scales the same Run range as above

Electron/W Section Cuts

- Standard Tight Electron Cuts Applied ,Approved by Joint Physics
- Missing Et corrected for Muons as well as Jet
- MET>30 GeV applied
- Transverse Mass >50 GeV

Jet Selection Cuts

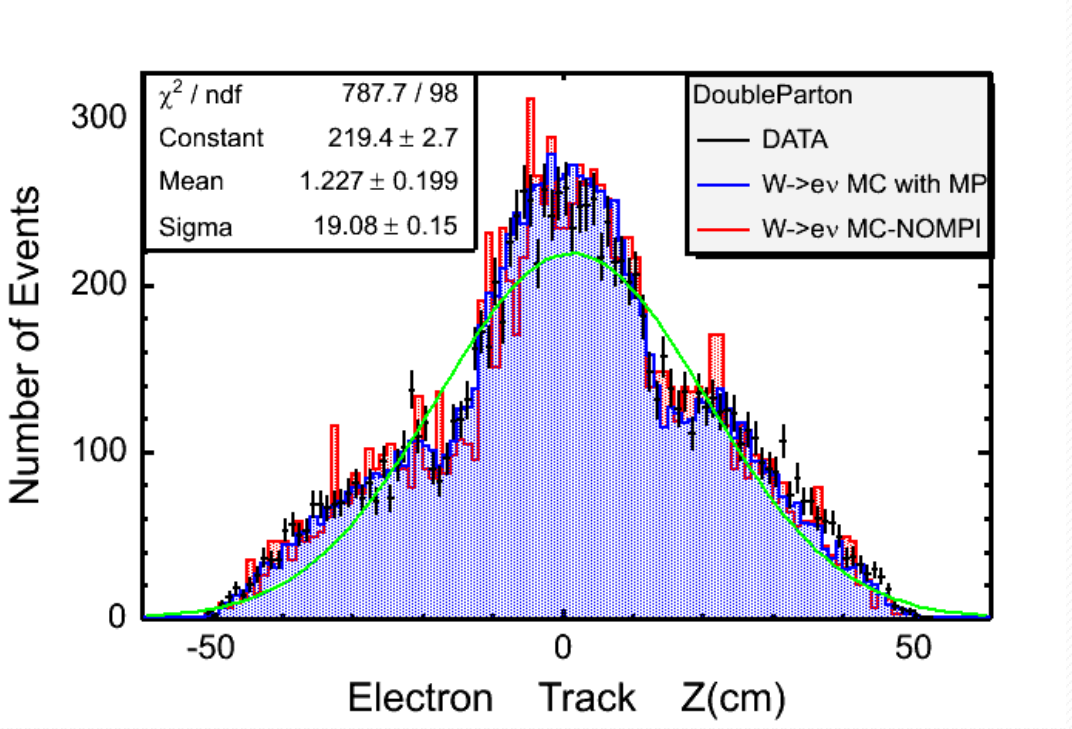
- “Electron Jet “ Removed
- Jet Corrected for L% Jet Energy scale Correction
- Jet ET>10 GeV and Detector $|\eta|<2$ selected

Weighted Jet Average Z

- Only Tracks with Algorithm 11 selected
- Track Z error weighted average of Track calculated – Jet Average Z
- The above calculation if done again – One iteration
- Jet Centroid (η,ϕ) recalculated with respect to the above Jet Average Z
- "Re-associate Tracks" with respect to the recalculated Jet Centroid in the (η,ϕ) Plane
- Select Only Those tracks that satisfy $|\Delta Z(\text{JetZ-TrkZ})|<0.04$
- Recalculate the Jet Average Z again with the Remaining Tracks

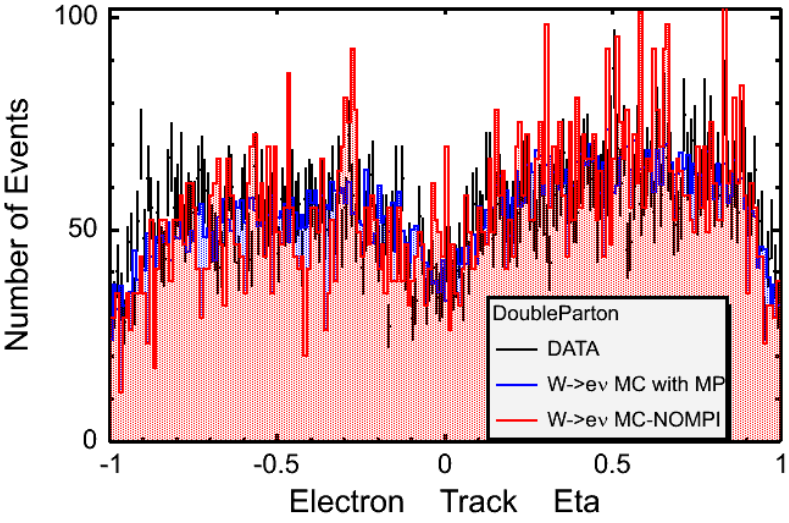
Electron Track Z

- Only the SVX Beam Correction Applied to the Eletroan Track Z
- Track Algorithm has to be 11

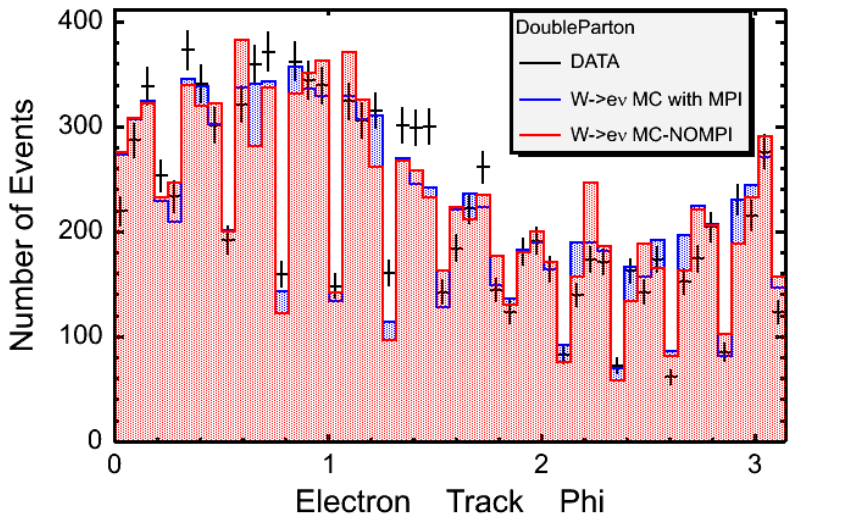


Electron Track

Electron Track Eta

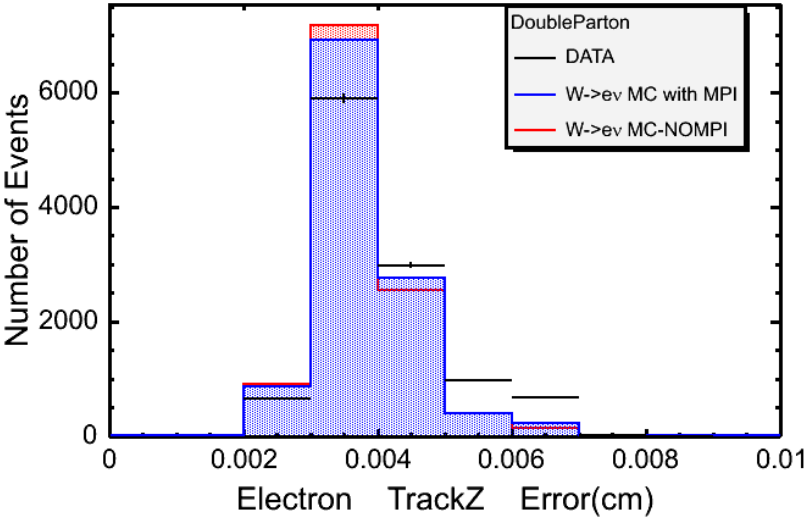


Electron Track Phi

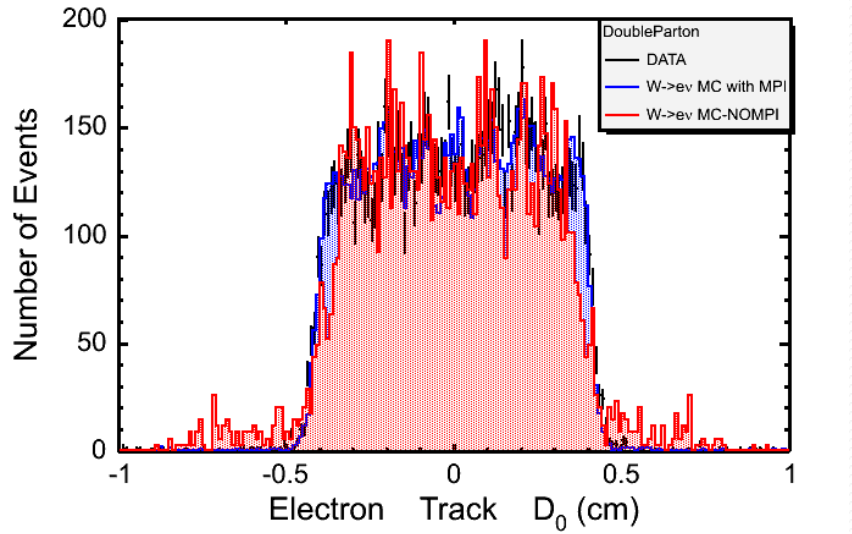


Electron Track (contd)

Electron Track Z Error

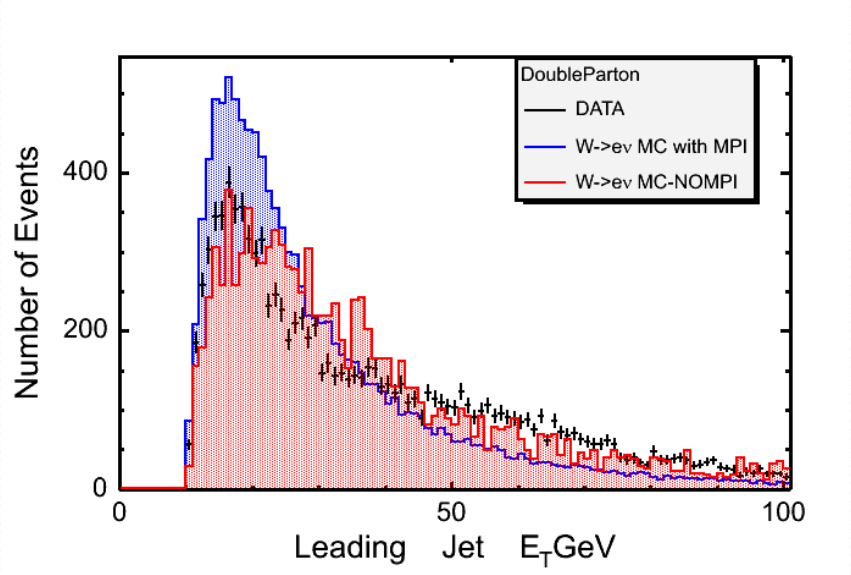


Electron Impact Parameter

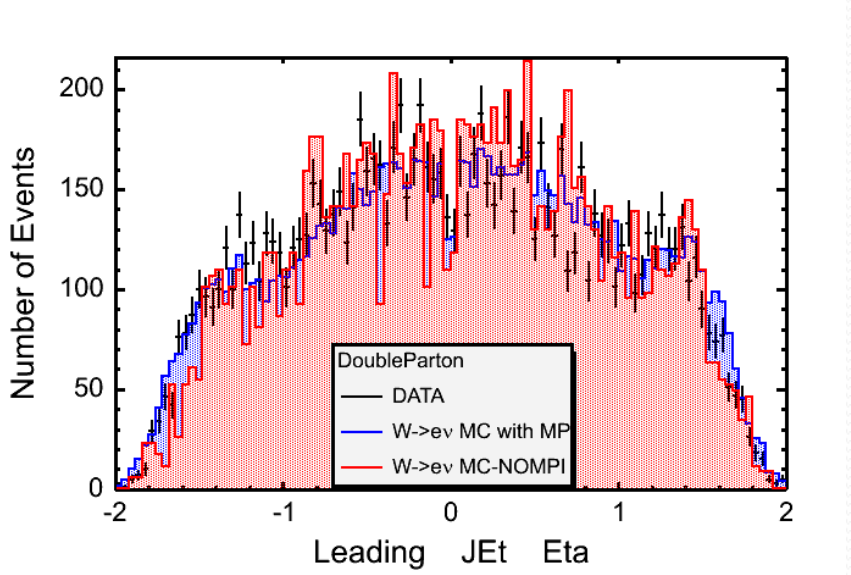


Leading Jet Variables

Leading Jet E_T

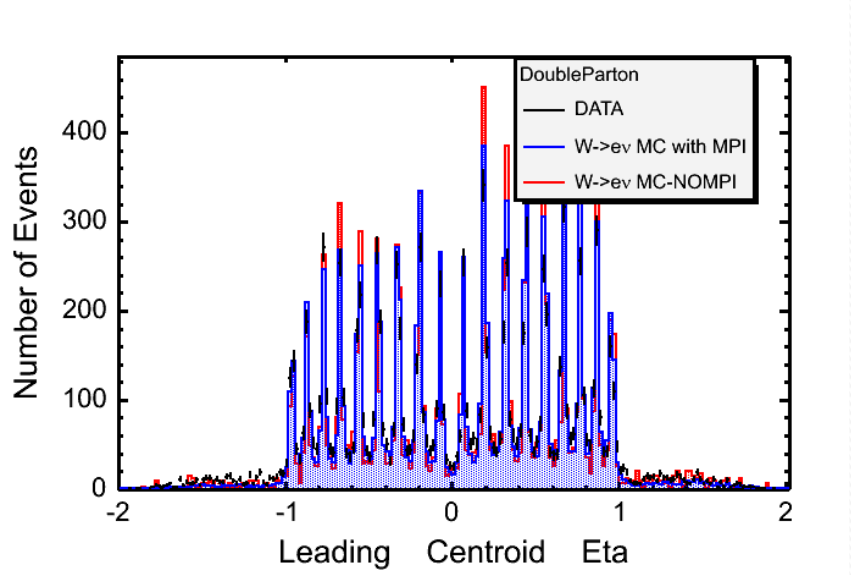


Leading Jet Detector η

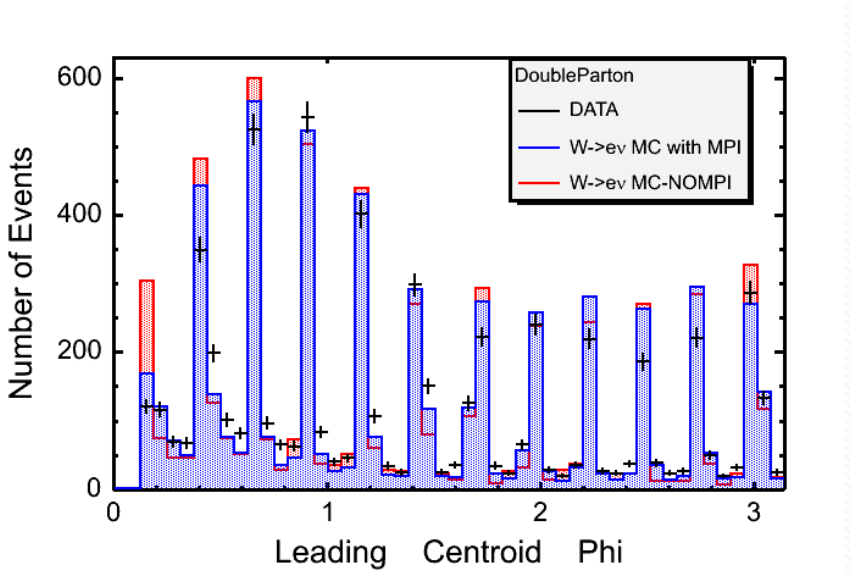


Leading Jet Variables

Leading Jet Centroid Phi

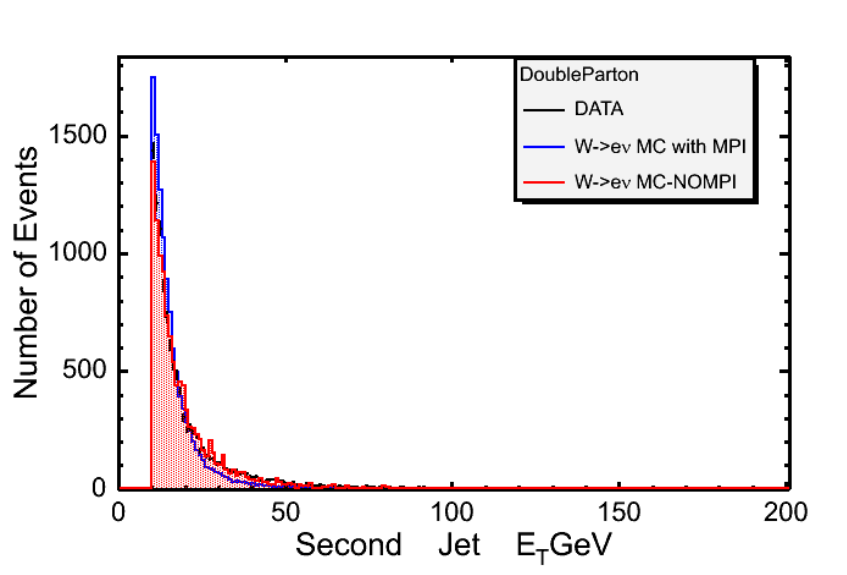


Leading Jet Centroid Eta

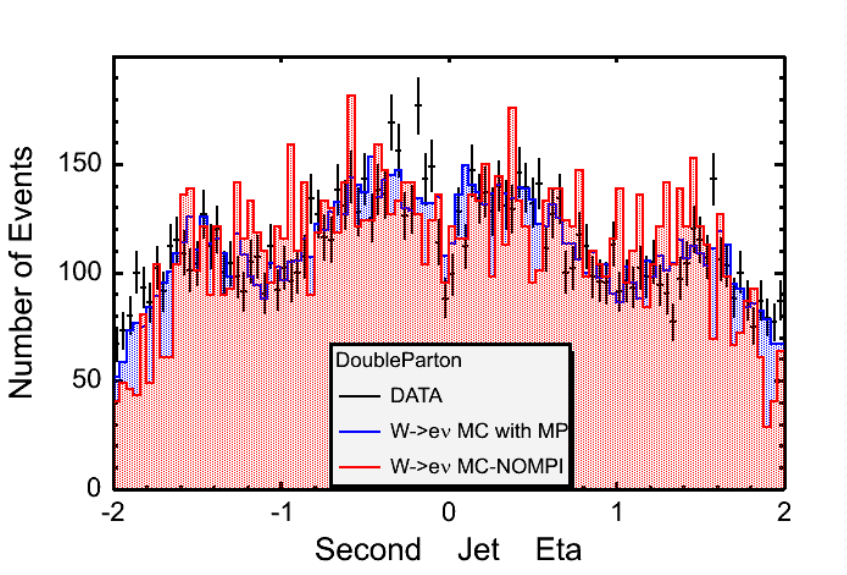


Next-to-Leading Jet

Next-to-Leading Jet E_T

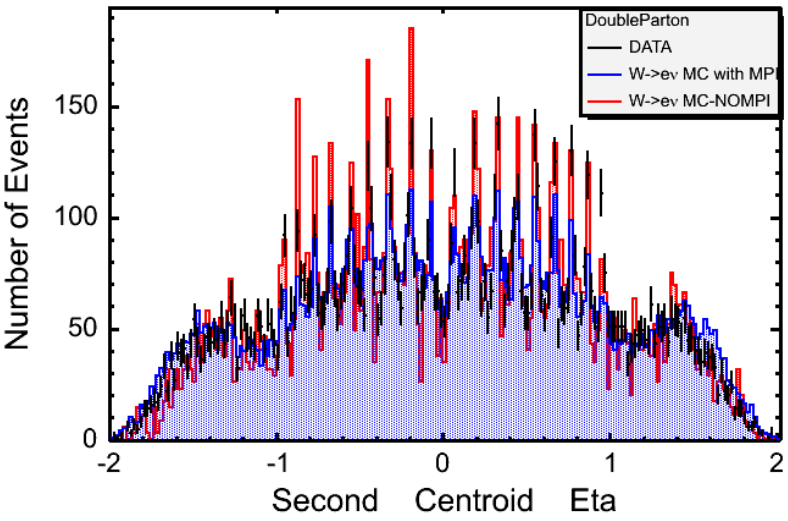


Next-to-Leading Jet Detector η

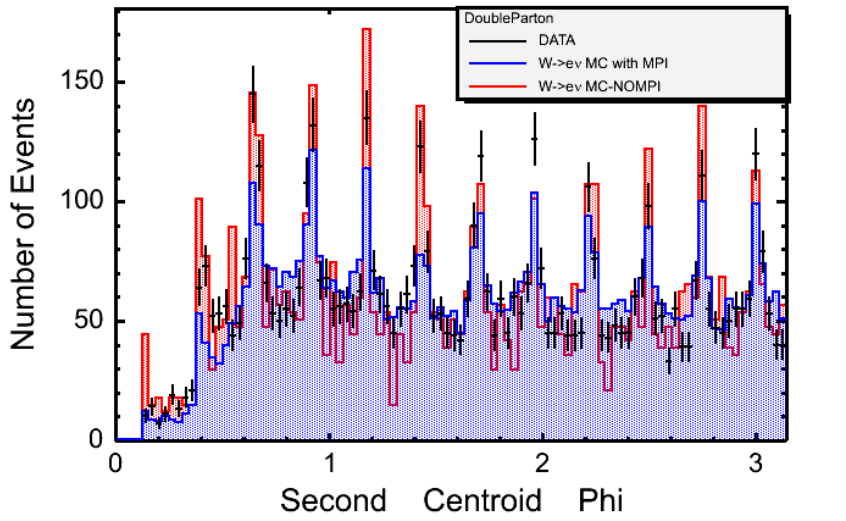


Next-to-Leading Jet

Next-to-Leading Jet Centroid η

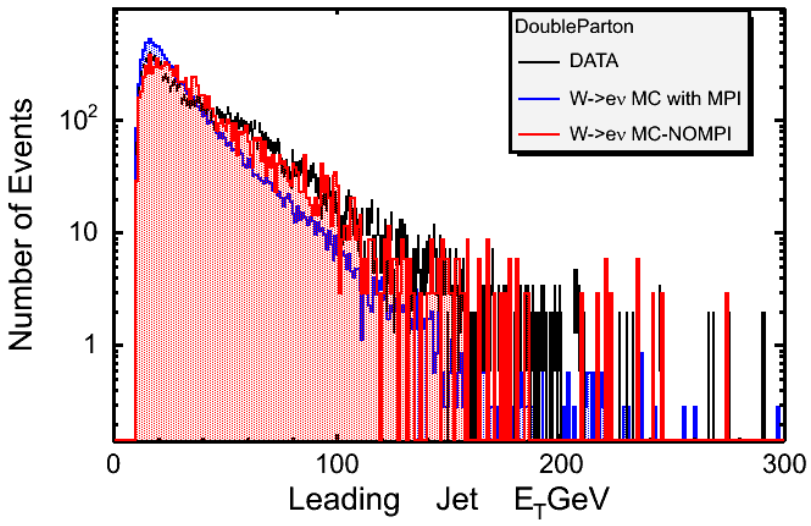


Next-to-Leading Jet Centroid ϕ

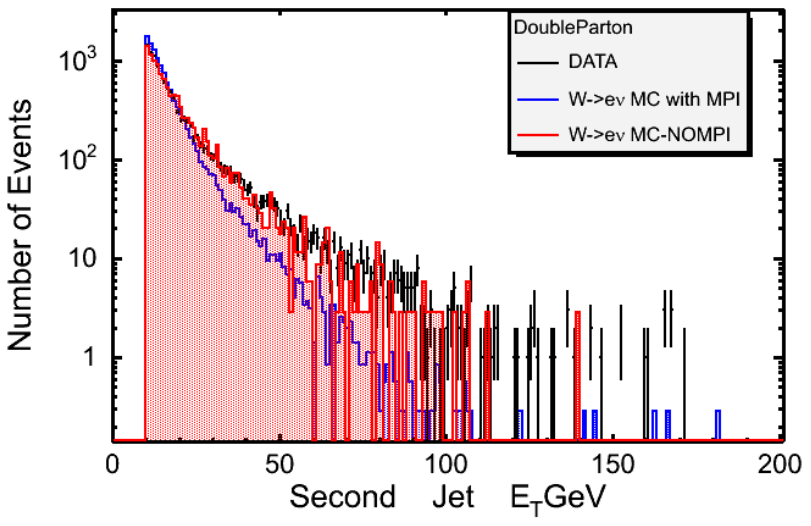


Leading/Next-to-Leading Jets

Leading Jet E_T

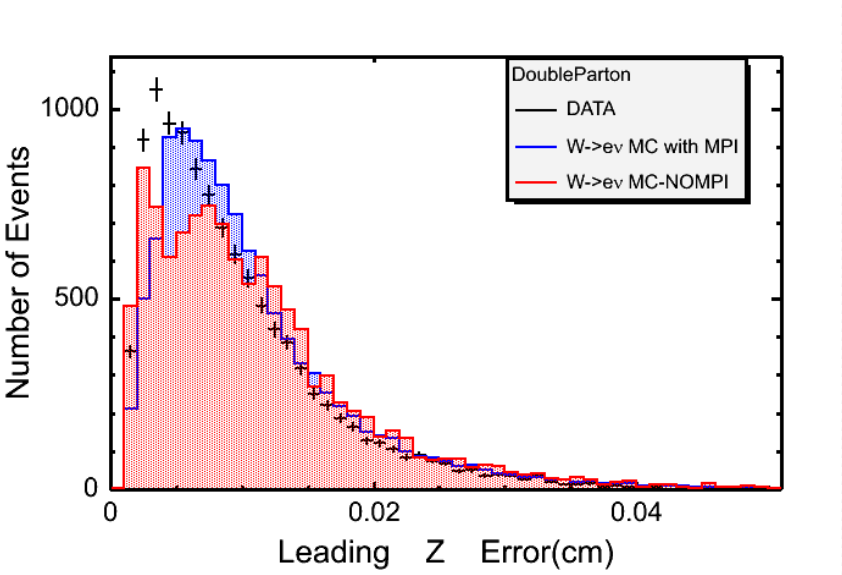


Next-to-Leading Jet E_T

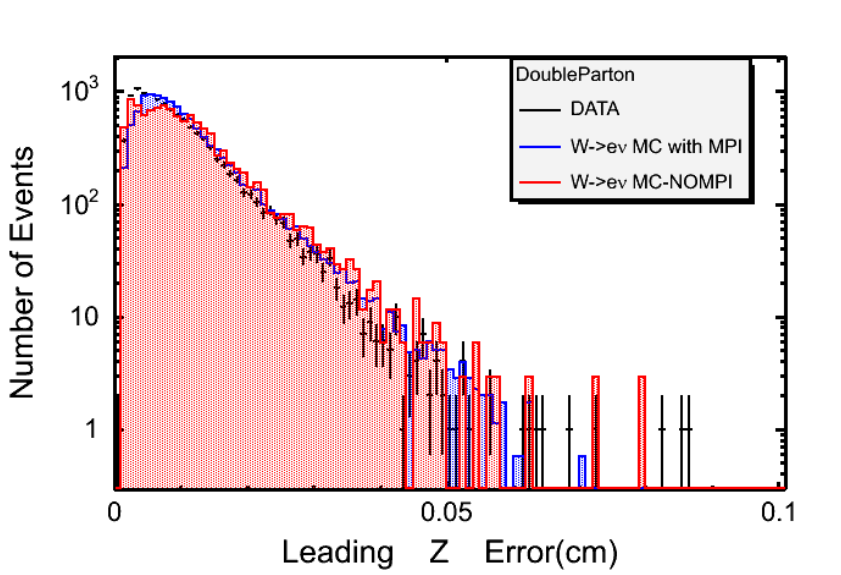


Leading Jet Z Error

Leading Jet Z Error

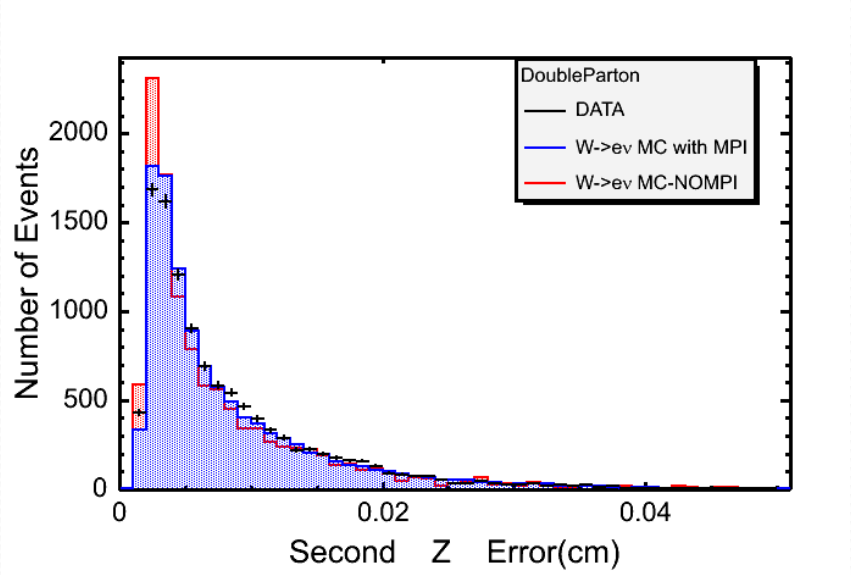


Leading Jet Z error –Log Scale

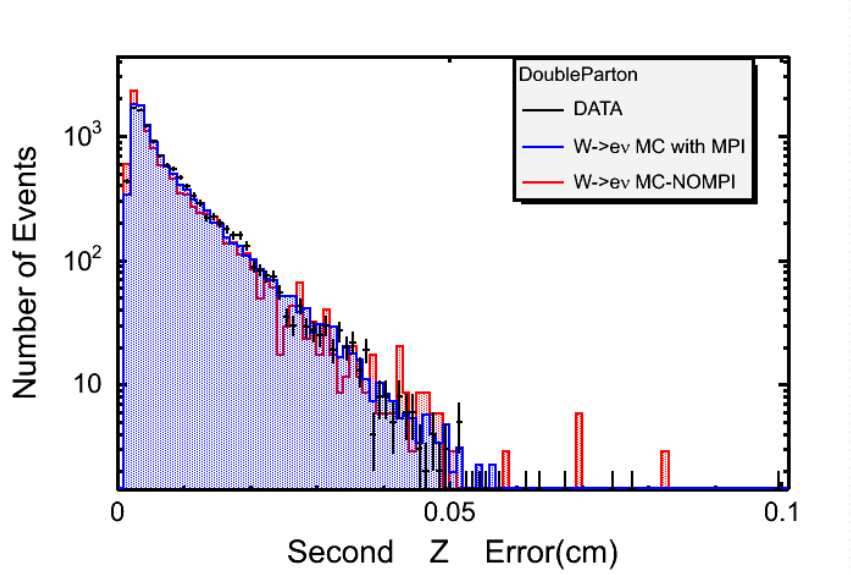


Next-to-Leading Jet Z Error

Next-to-Leading Jet Z Error

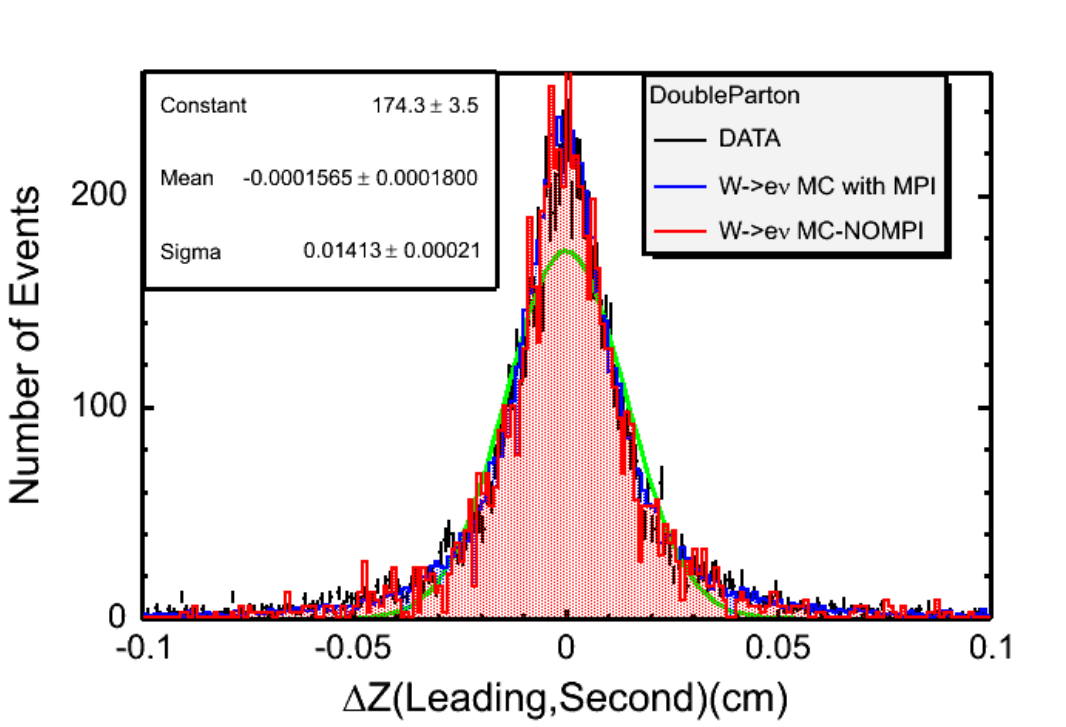


Next-to-Leading Jet Z Error-Log Scale



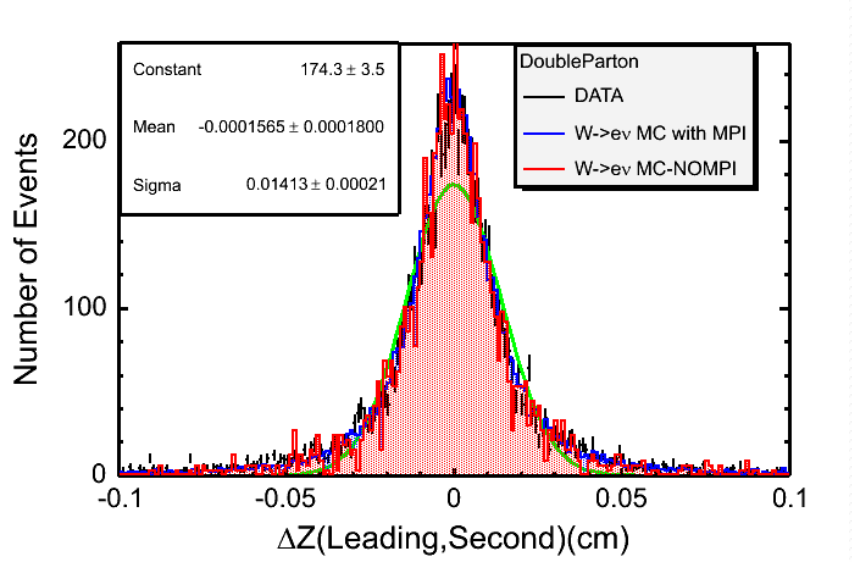
ΔZ(Leading,Second) – [-0.1,0.1] (cm)

- Above variable is Fit to a Gaussian in the Range Plotted

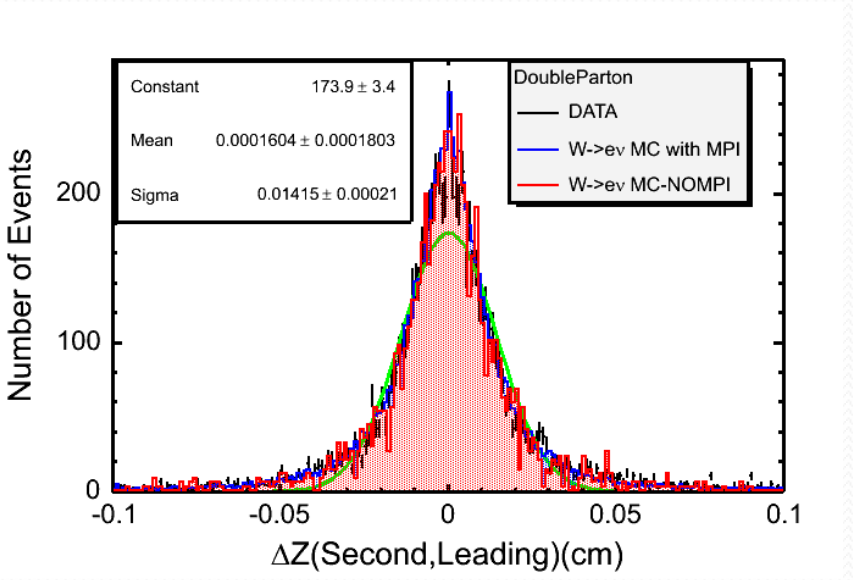


ΔZ(Leading,Second)

ΔZ(Leading,Second) [-0.1,0.1]



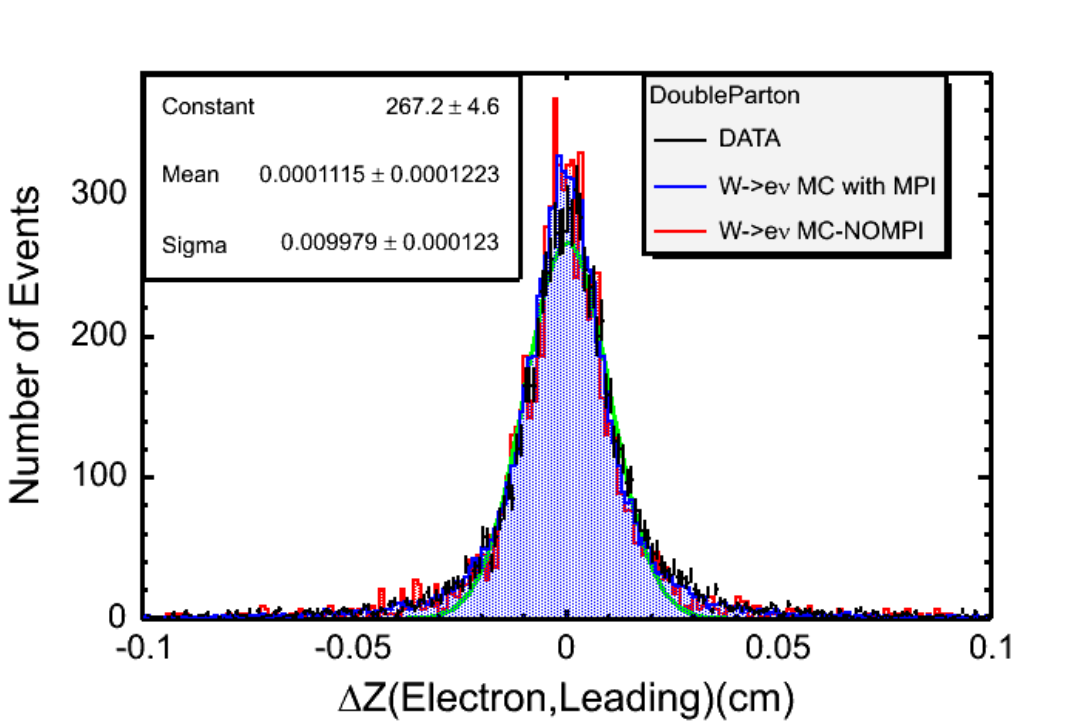
ΔZ(Second,Leading) [-0.1,0.1]



Checking to make sure that it does not matter how I subtract !!

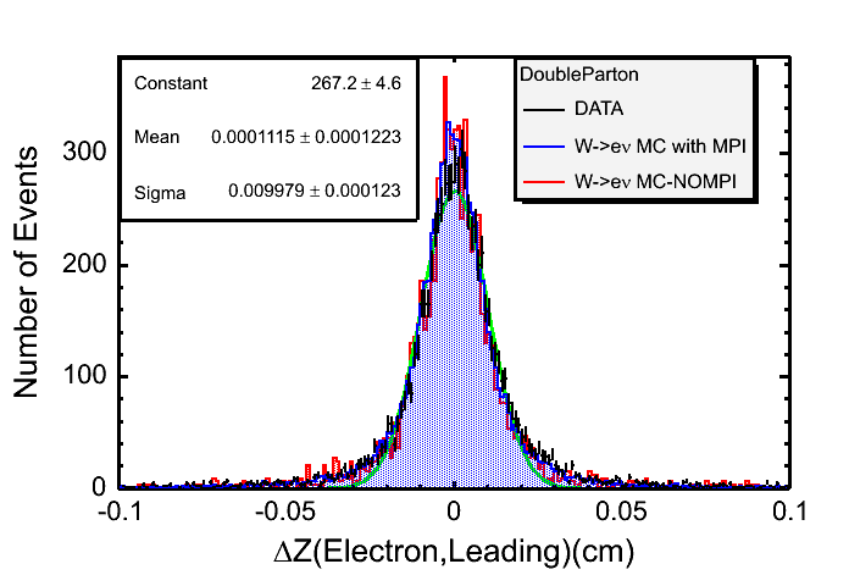
ΔZ(Electron Track,Leading) [-0.1,0.1] (cm)

- Before I cut on the ΔZ(Electron Track,Leading)

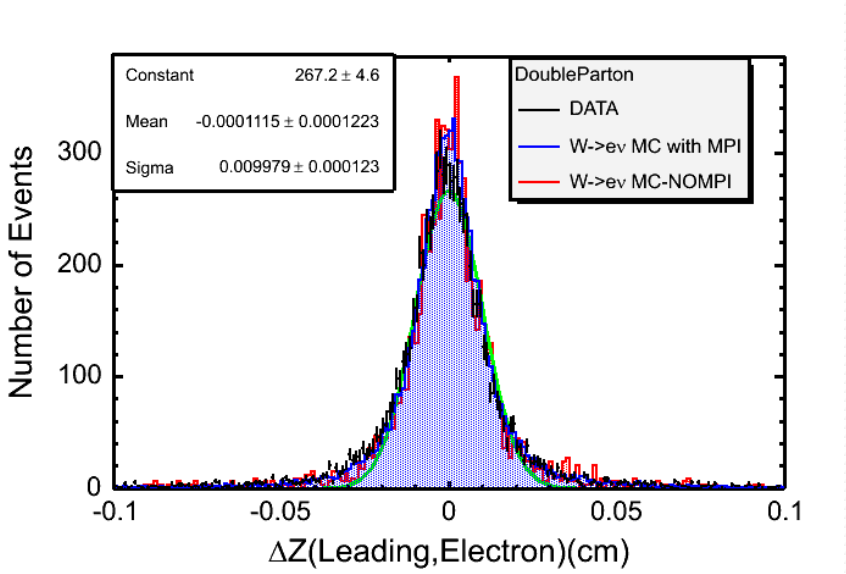


ΔZ(Electron,Leading)

ΔZ(Electron,Leading)[-0.1,0.1]

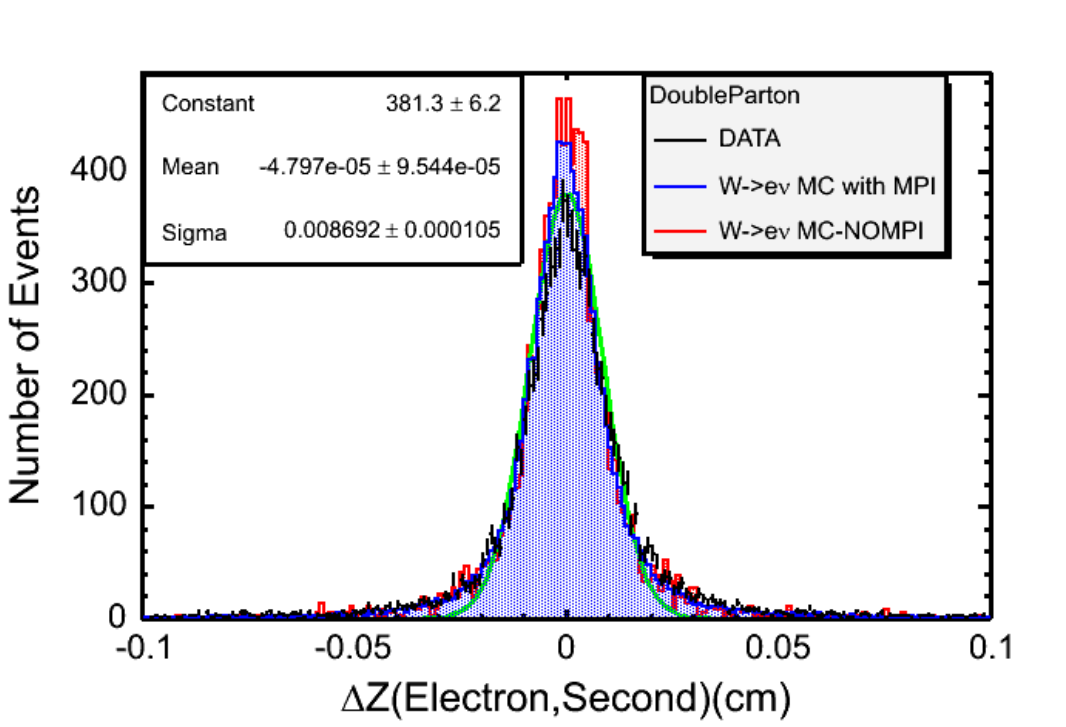


ΔZ(Leading,Electron)[-0.1,0.1]



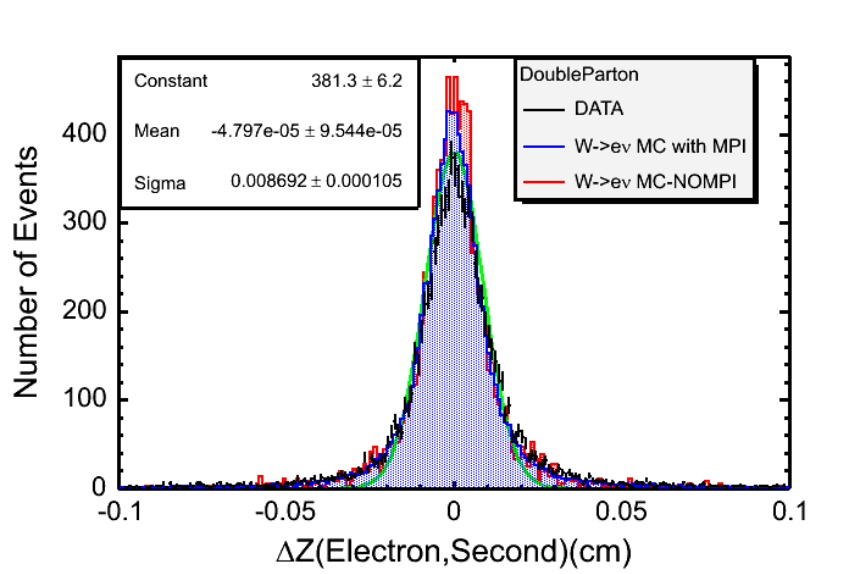
ΔZ(Electron Track,Next-to-Leading) [-0.1,0.1] (cm)

- Before I cut on the ΔZ(Electron Track,Second)

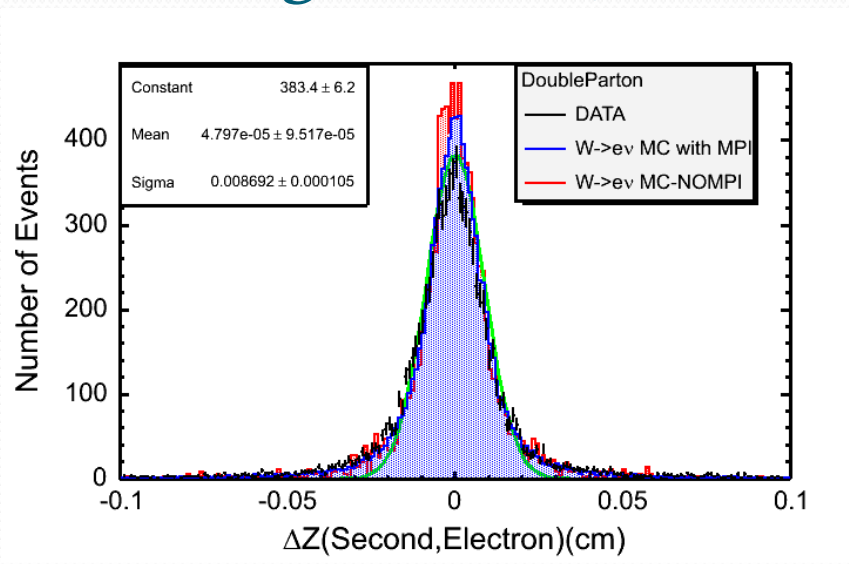


ΔZ(Electron Track,Next-to-Leading)

ΔZ(Electron,Next-to-Leading)[-0.1,0.1]

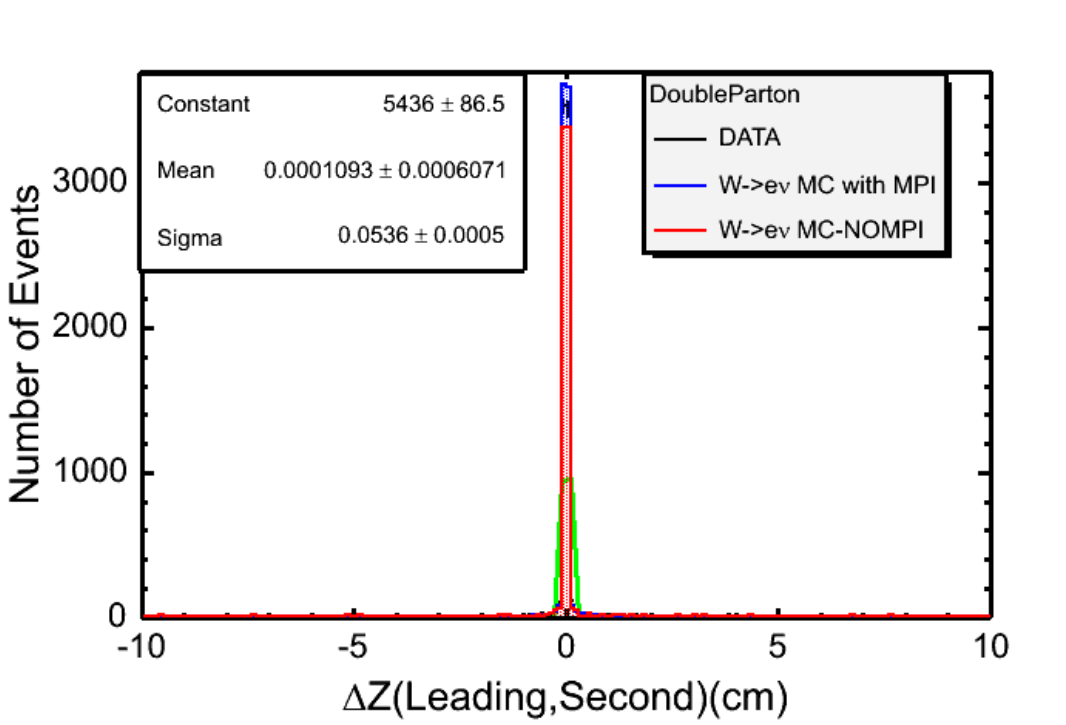


ΔZ(Next-to-Leading,Electron)[-0.1,0.1]



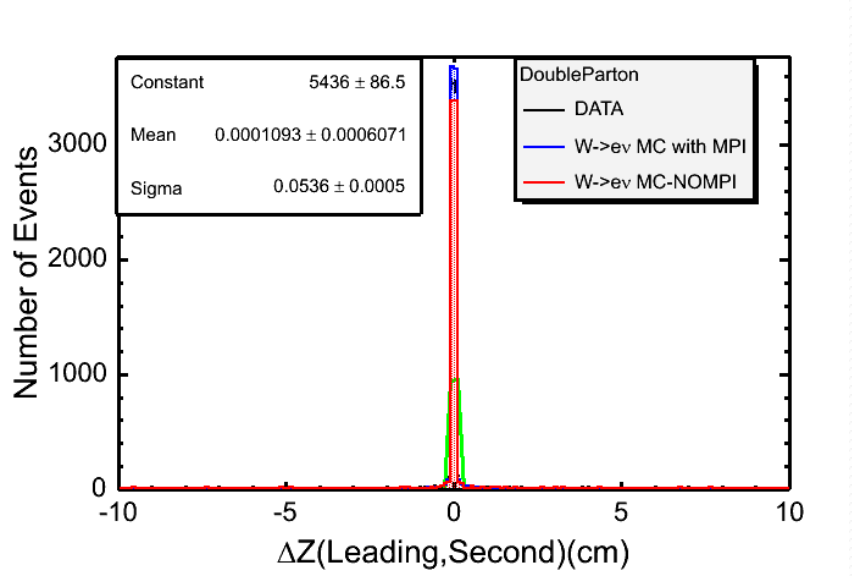
ΔZ(Leading,Next-to-Leading) [-10,10] (cm)

- Before I cut on the ΔZ(Electron Track,Leading)

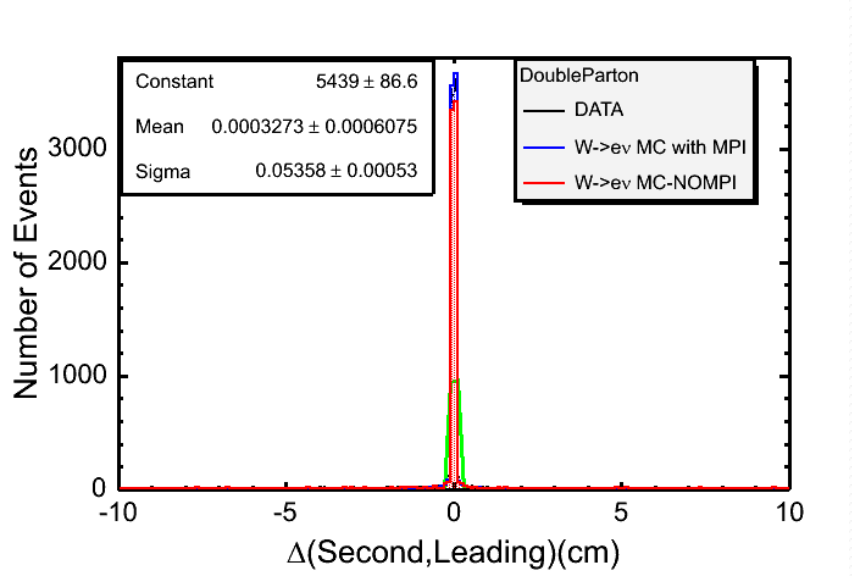


ΔZ(Leading,Next-to-Leading) [-10,10] (cm)

ΔZ(Leading,Next-to-Leading)[-10,10]

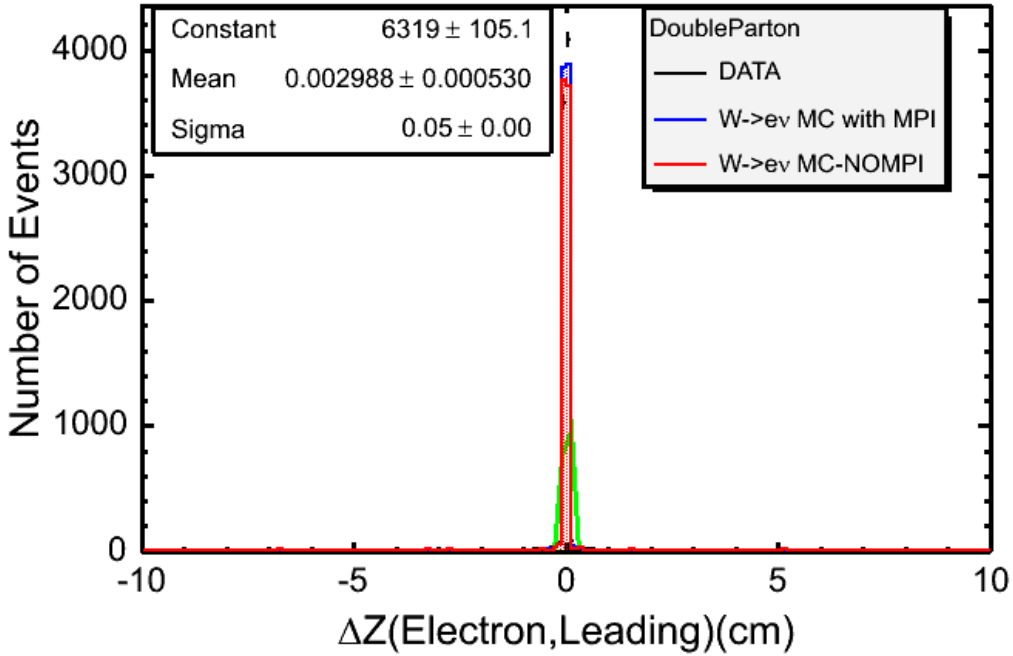


ΔZ(Next-to-Leading,Leading)[-10,10]



ΔZ(Electron Track,Leading) [-10,10] (cm)

- Before I cut on the ΔZ(Electron Track,Leading)



ΔZ(Electron Track,Leading) [-10,10] (cm)

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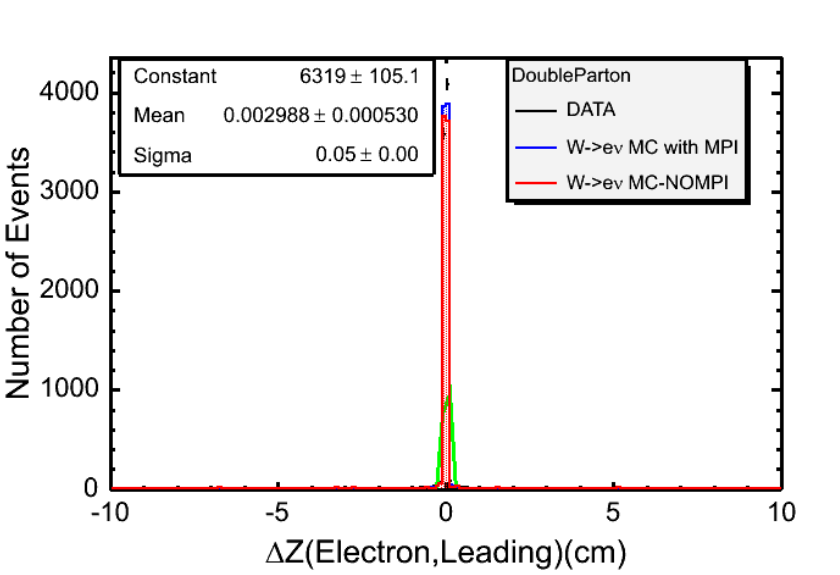
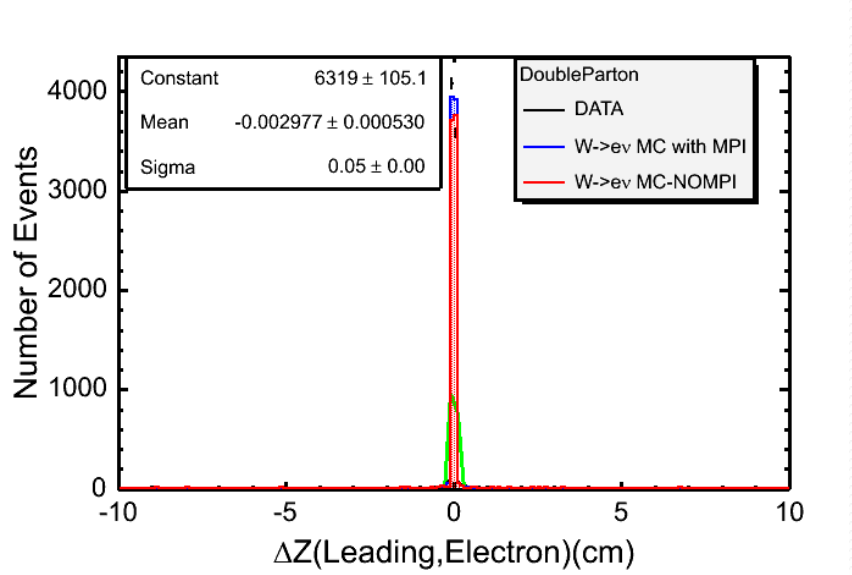
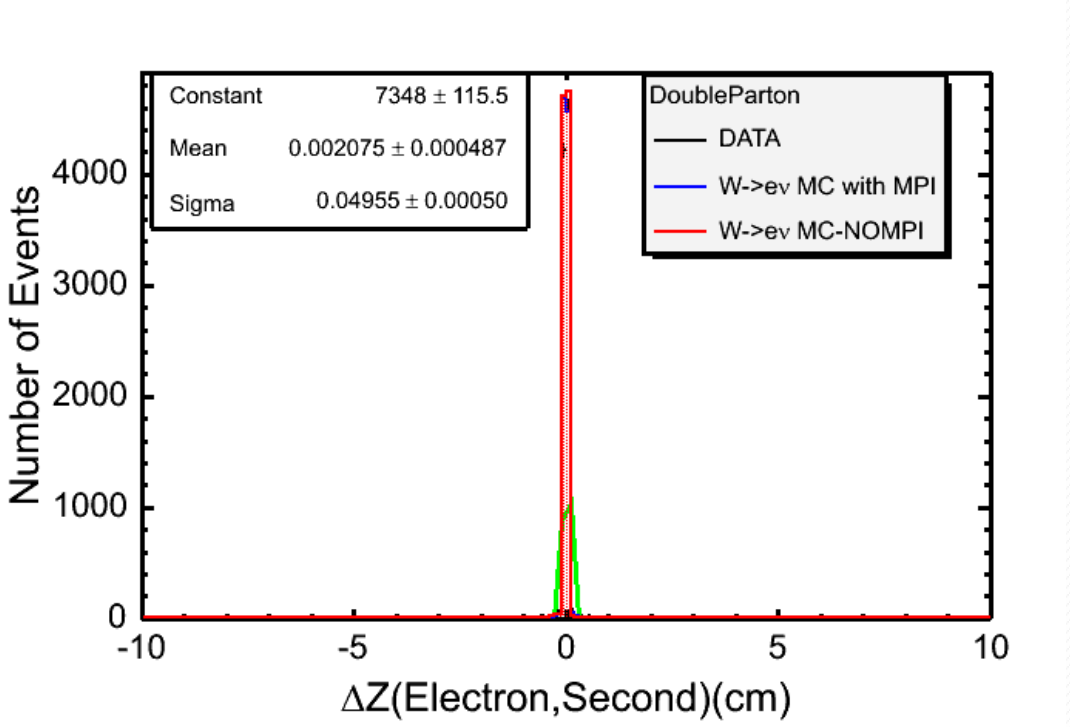


ΔZ(Leading,Electron Track) [-10,10] (cm)



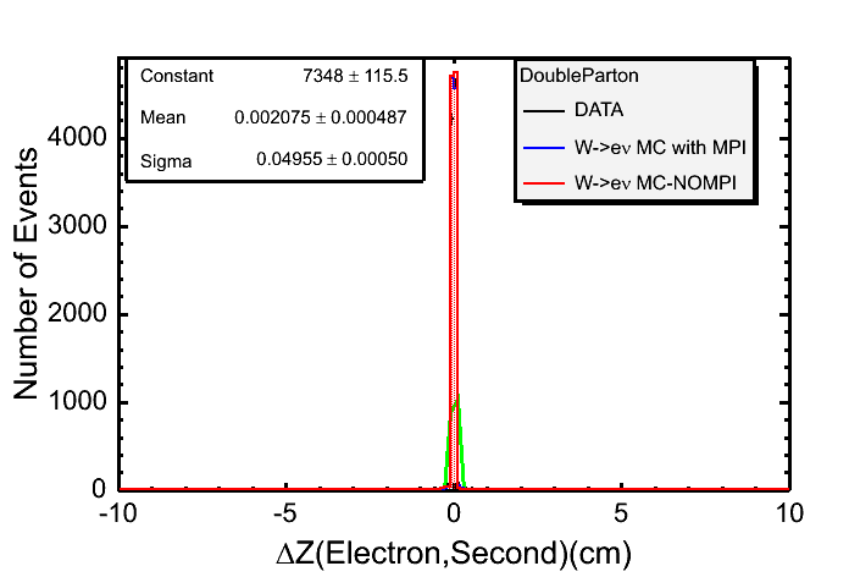
ΔZ(Electron Track,Next-to-Leading) [-10,10] (cm)

- Before I cut on the ΔZ(Electron Track,Leading)

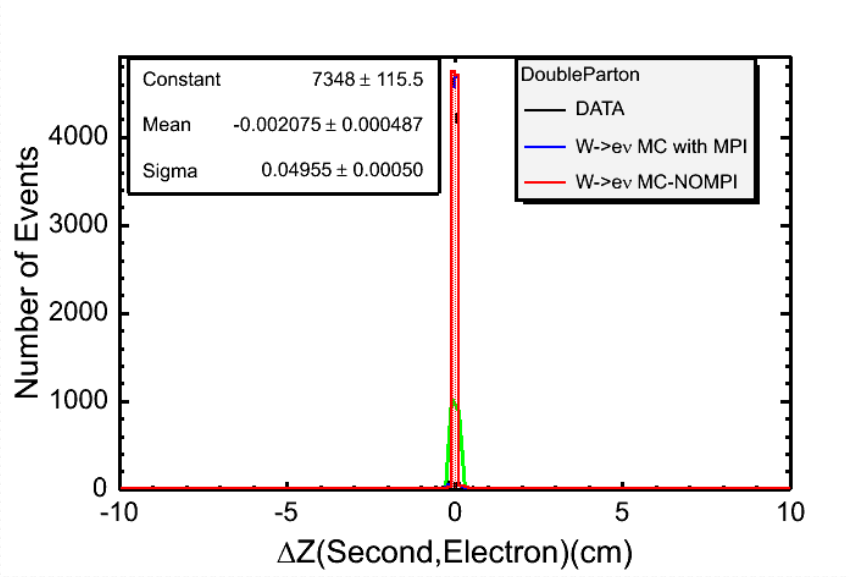


ΔZ(Electron Track,Next-to-Leading) [-10,10] (cm)

ΔZ(Electron Track,Next-to-Leading) [-10,10] (cm)

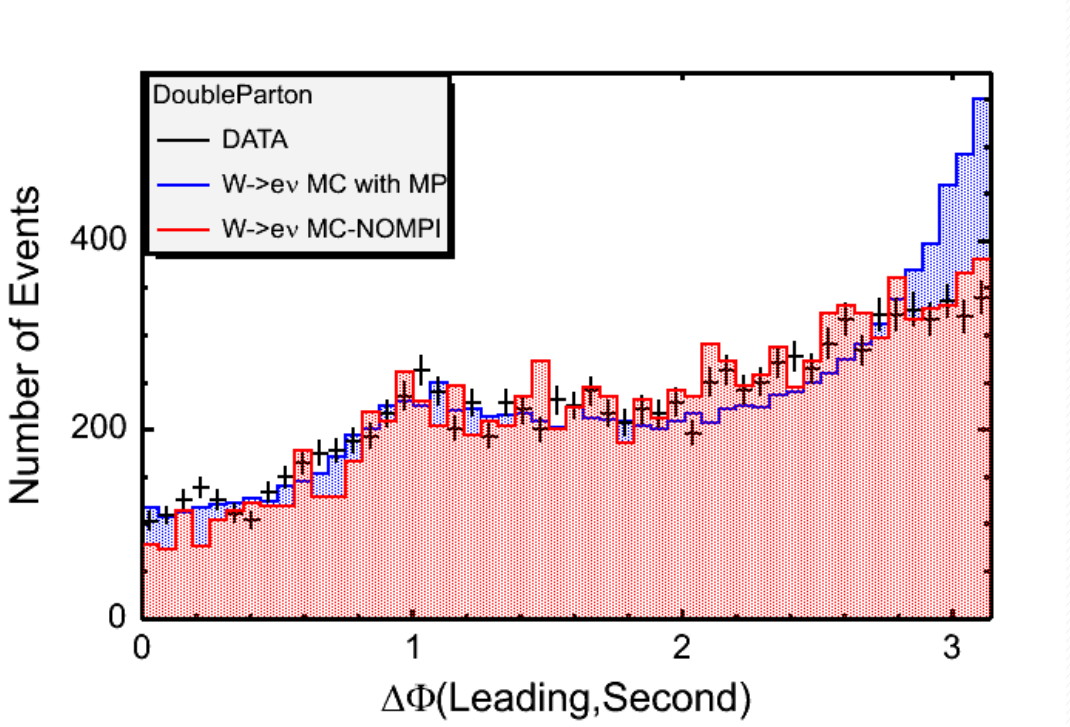


ΔZ(Next-to-Leading,Electron Track) [-10,10] (cm)



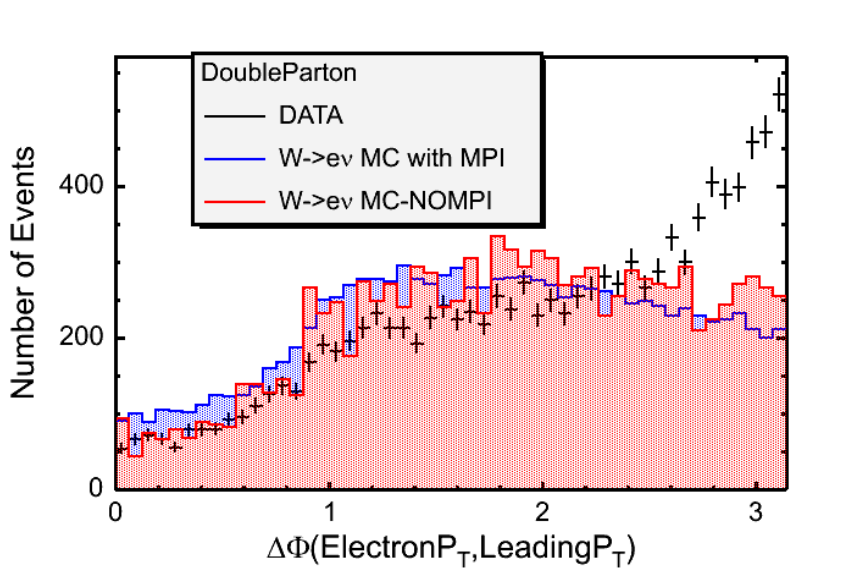
Δϕ(Leading,Next-to-Leading)

- Will be dividing this plot into [0-0.5],[1-2] and [2.5-PI] radians ,to understand the events

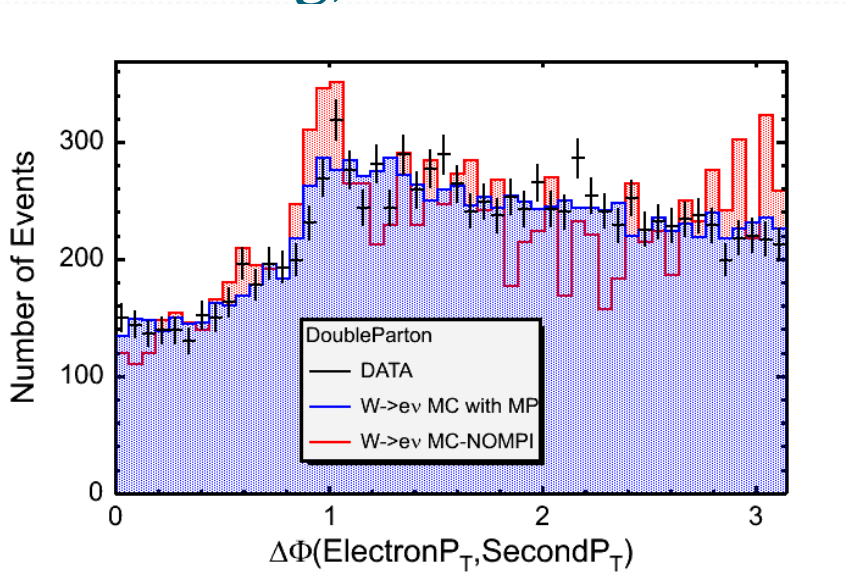


Δϕ(Electron/Leading,Next-to-Leading)

Δϕ(Electron,Leading)

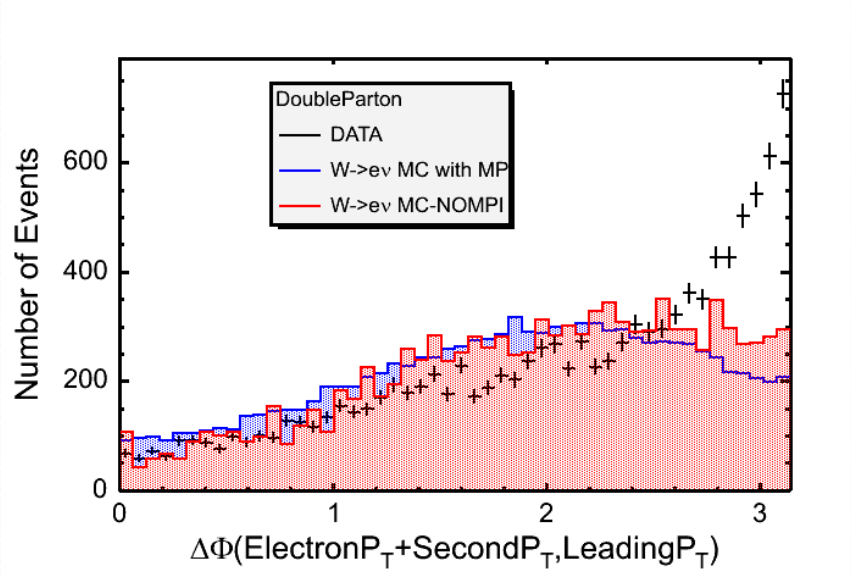


Δϕ(Electron,Next-to-Leading)

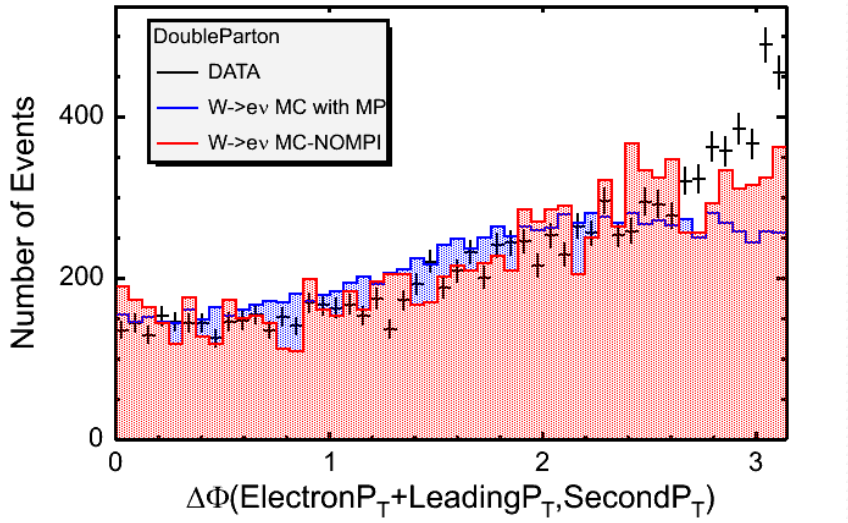


Δφ(Electron/Leading,Next-to-Leading)

Δφ(Electron+Second,Leading)

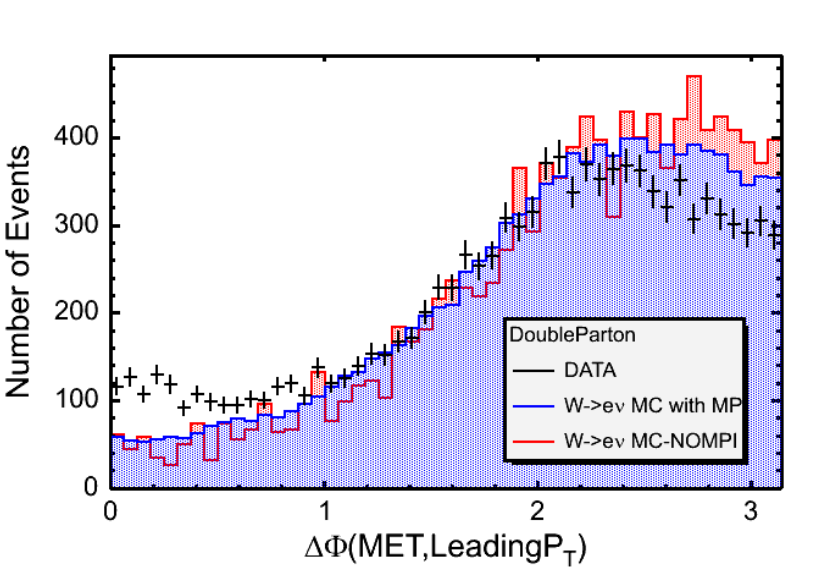


Δφ(Electron+Leading,Second)

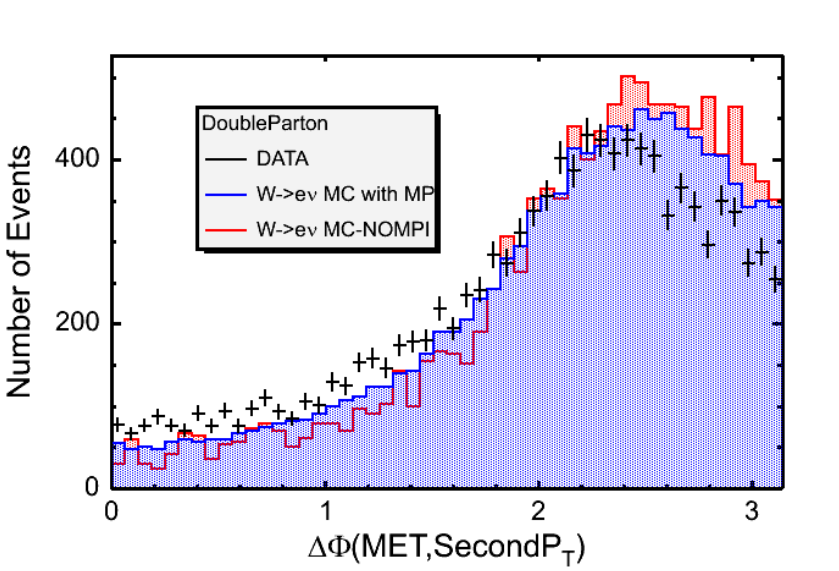


Δφ(MET/Leading,Next-to-Leading)

Δφ(MET,Leading)

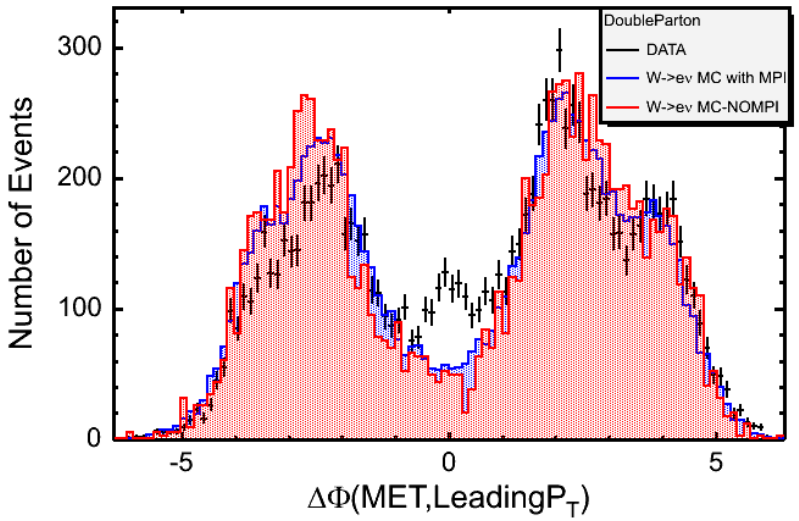


Δφ(MET,Second)

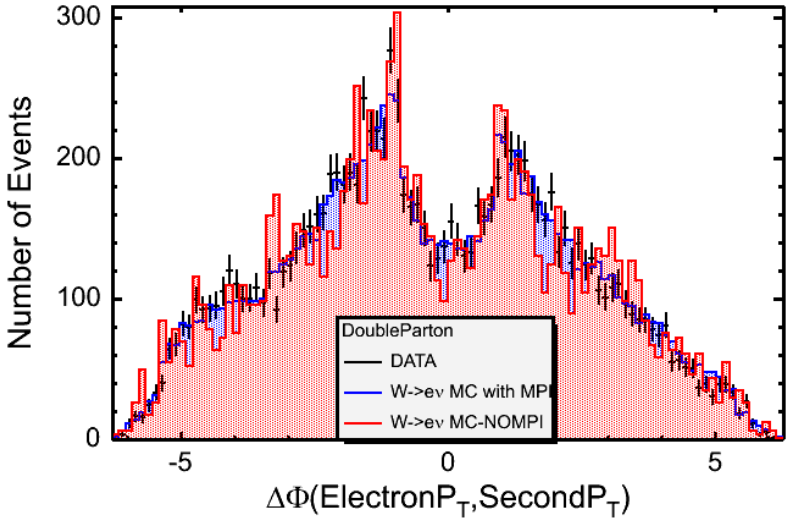


Δφ(MET/Leading,Next-to-Leading)

No Folding Done

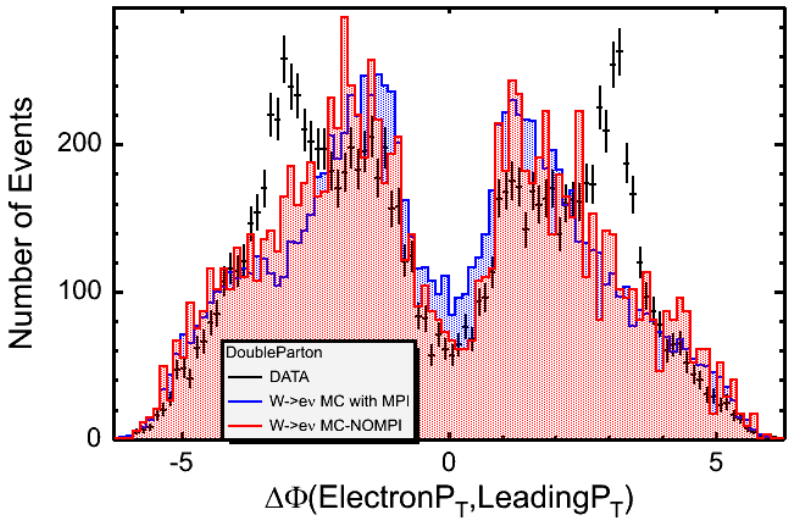


No Folding Done

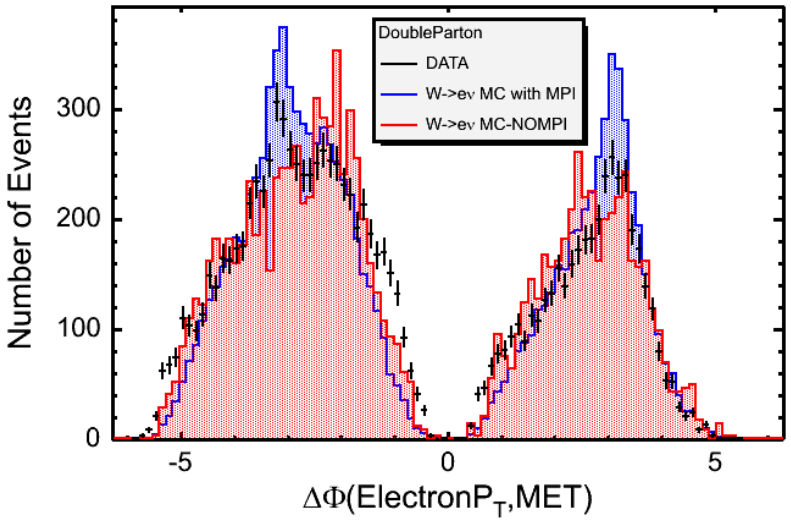


Δφ(Electron/Leading,Next-to-Leading)

No FOLDING Done

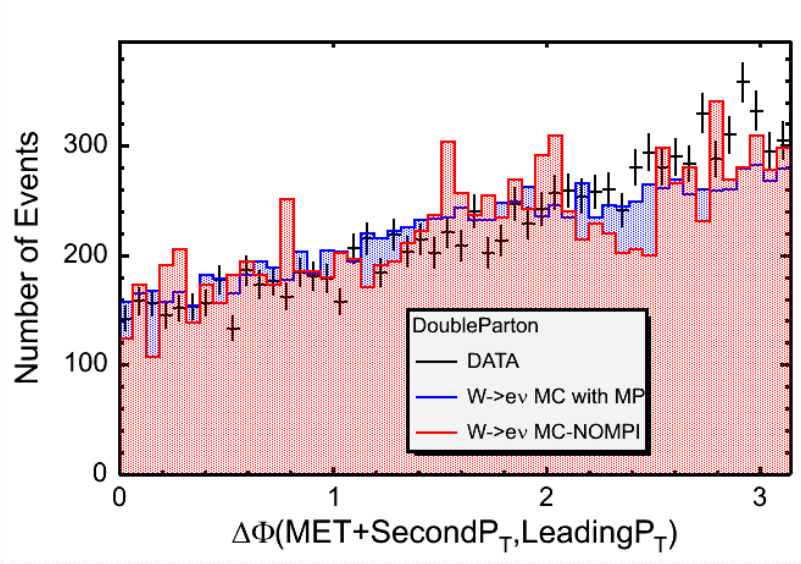


No FOLDING Done

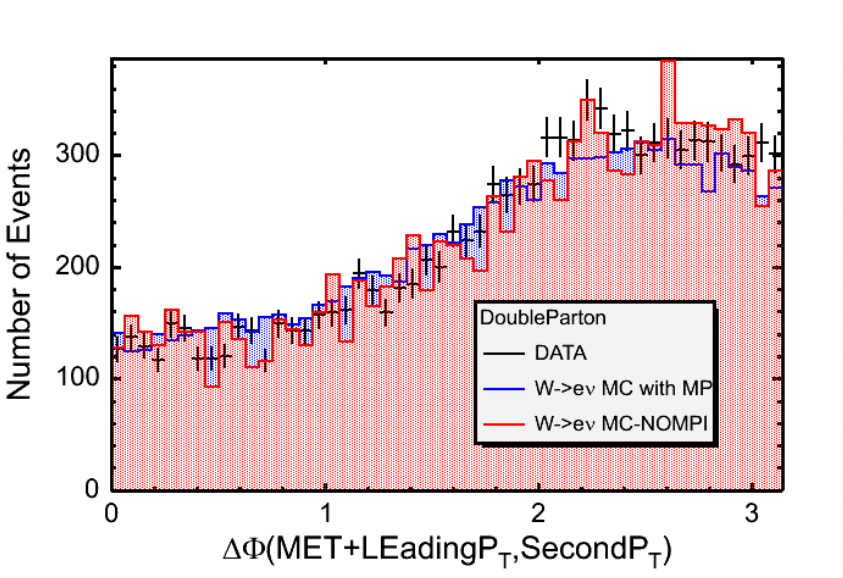


Δφ(MET/Leading,Next-to-Leading)

Δφ(MET+Second,Leading)

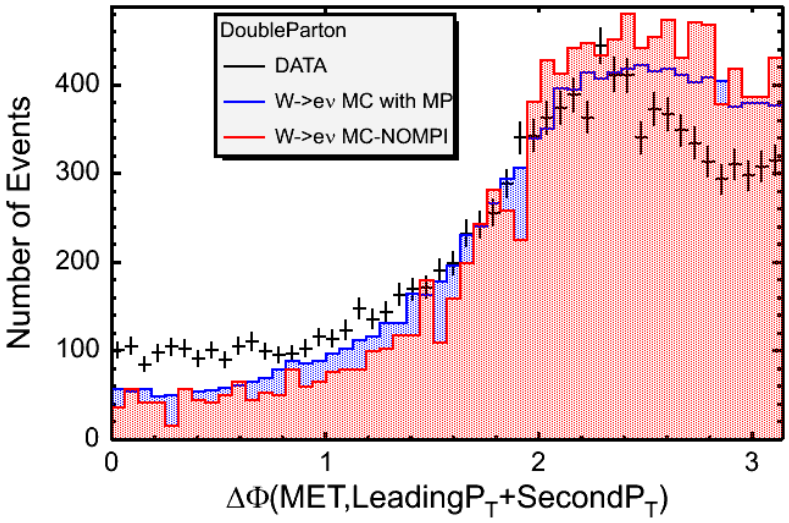


Δφ(MET+Leading,Second)

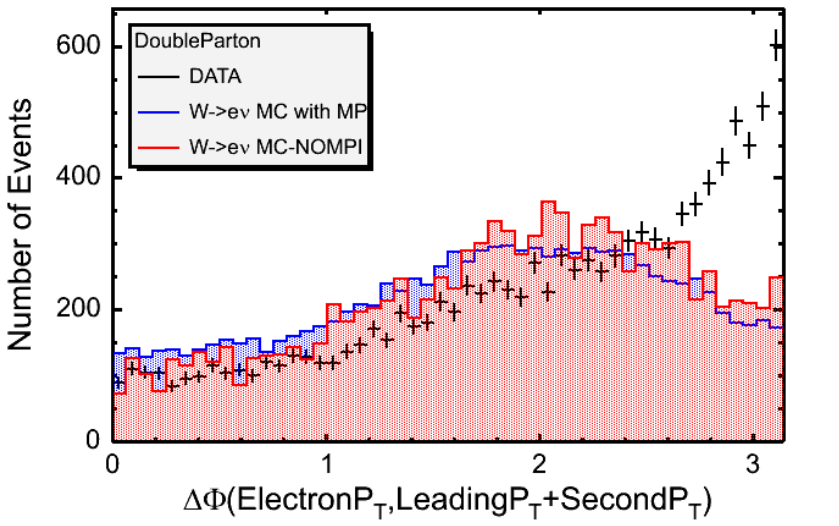


Δϕ(MET/Electron,Leading,Second)

Δϕ(MET,Second+Leading)

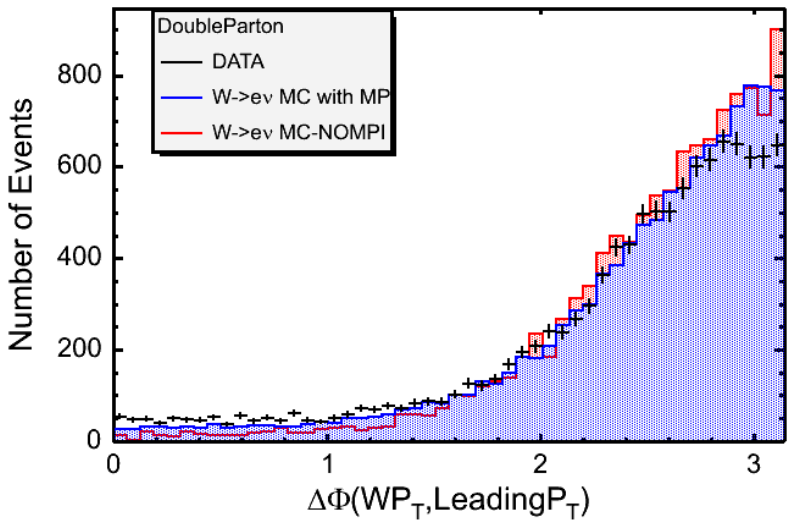


Δϕ(ElectronP*T*,Second+Leading)

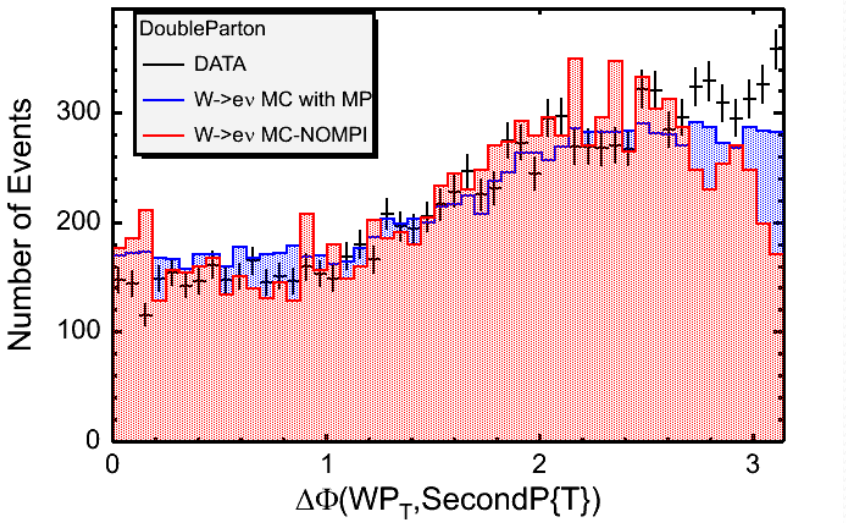


Δϕ(W/Leading,Next-to-Leading)

Δϕ(W,Leading)

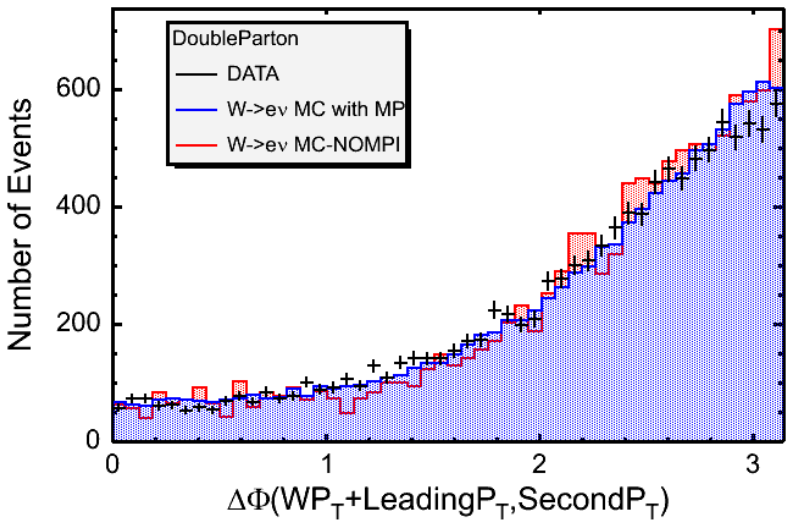


Δϕ(W,Second)

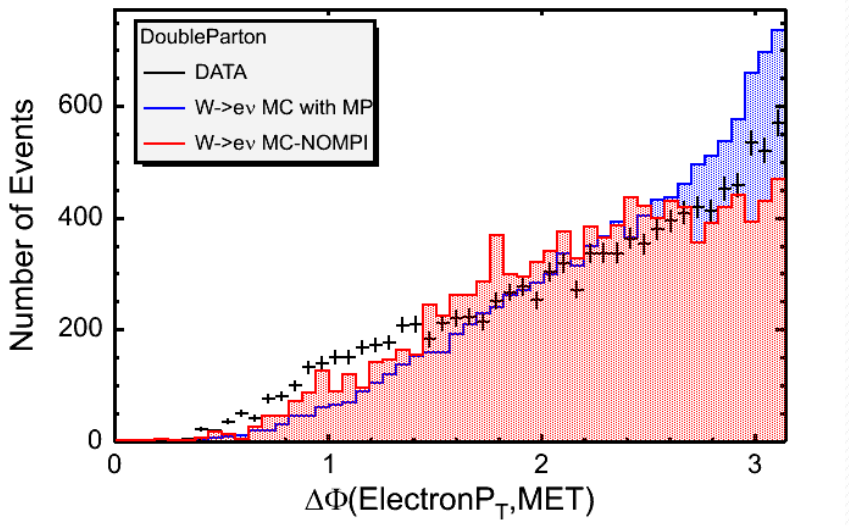


Δϕ(W/Leading,Next-to-Leading)

Δϕ(W+Leading,Second)

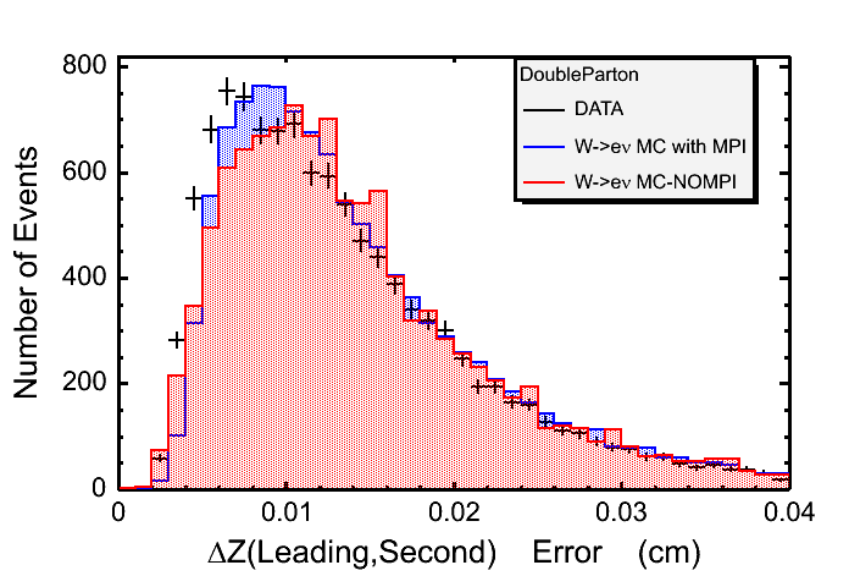


Δϕ(Electron,MET)

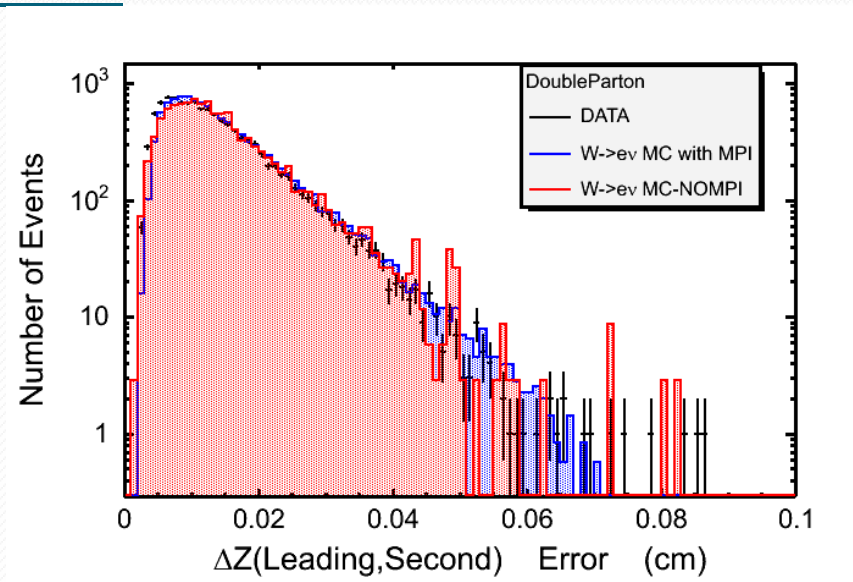


Error- ΔZ(Leading,Second)

ΔZ(Leading,Second) -Error

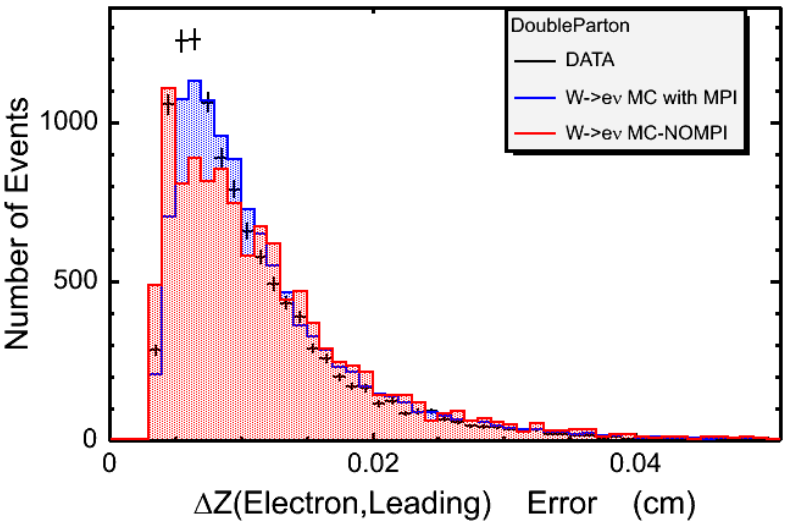


ΔZ(Leading,Second) –Error -Log Scale

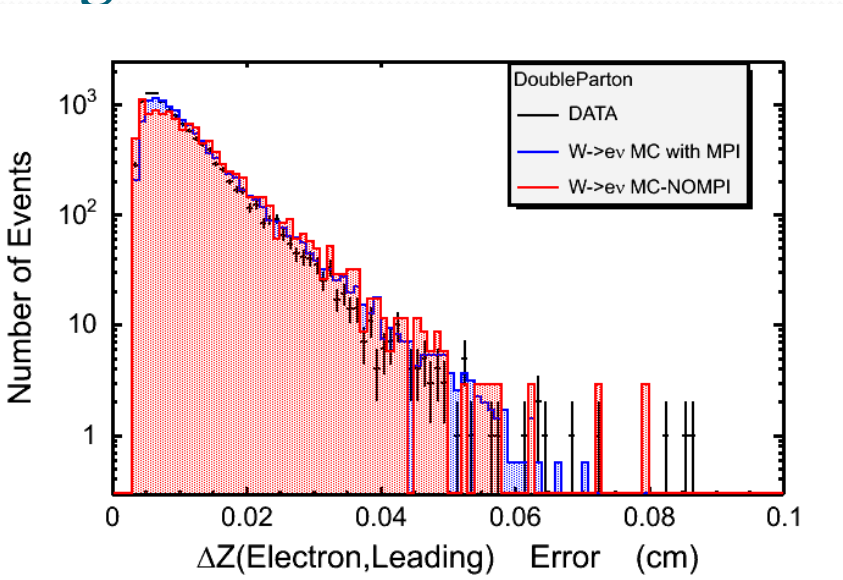


Error- ΔZ(Electron,Leading)

ΔZ(Electron,Leading) -Error

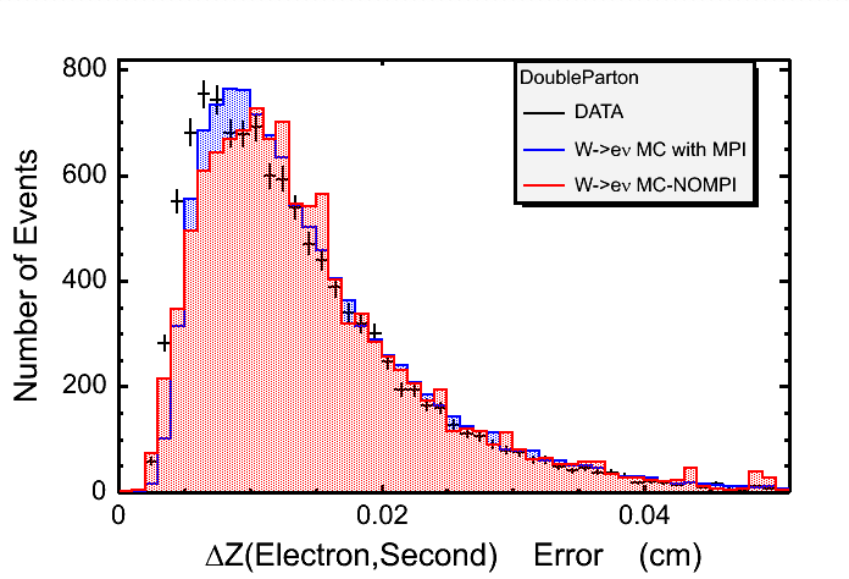


ΔZ(Electron,Leading) –Error- Log Scale

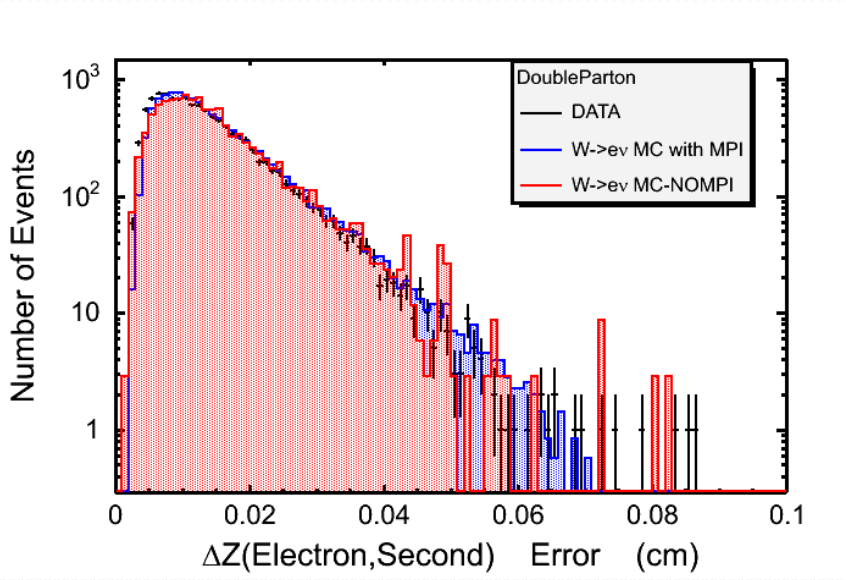


Error- ΔZ(Electron,Next-to-Leading)

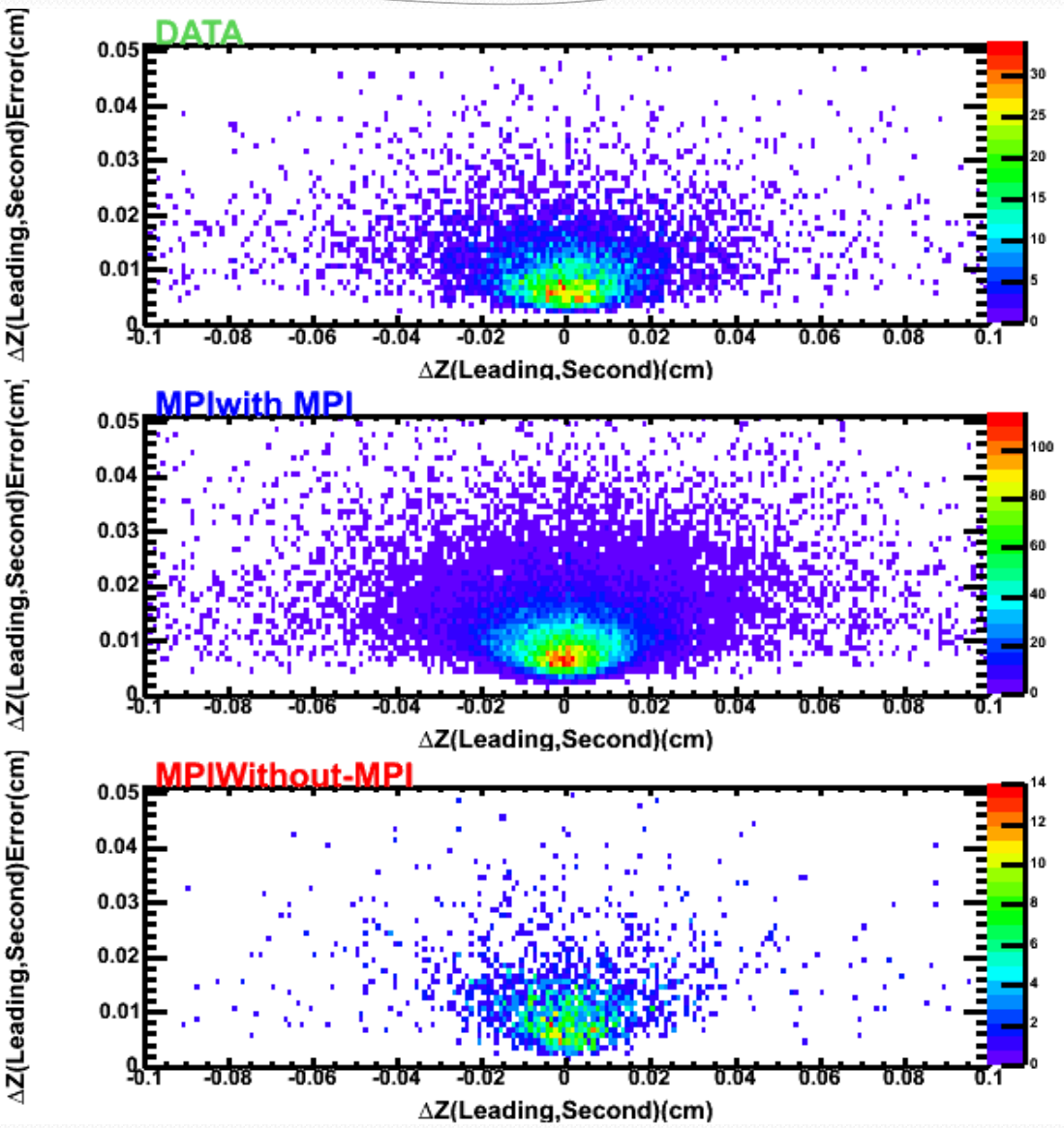
ΔZ(Electron,Next-to-Leading) - Error



ΔZ(Electron,Next-to-Leading) –Error- Log Scale

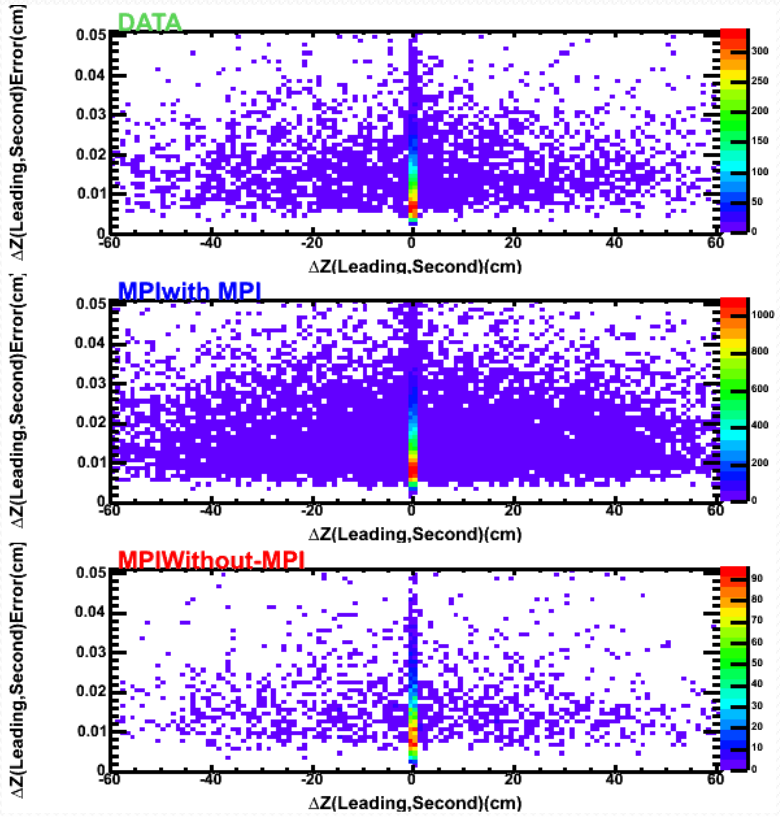


ΔZ(Leading,Second) /Error

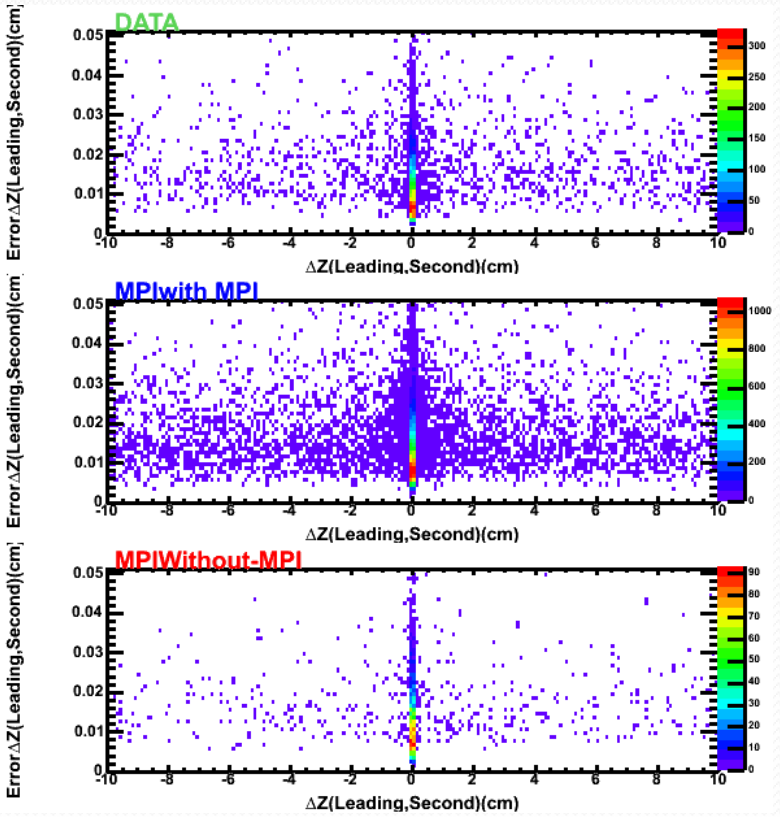


ΔZ(Leading,Second)/Error

ΔZ(Leading,Second)/Error [-60,60](cm)

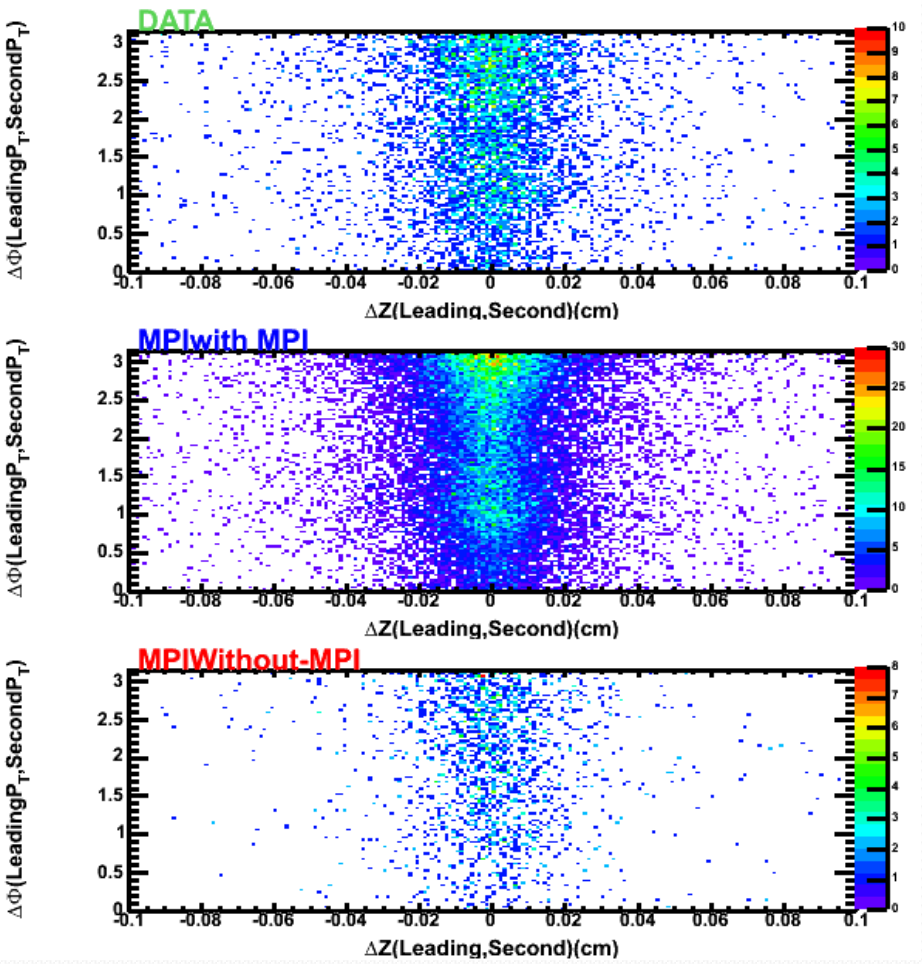


ΔZ(Leading,Second)/Error [-10,10](cm)



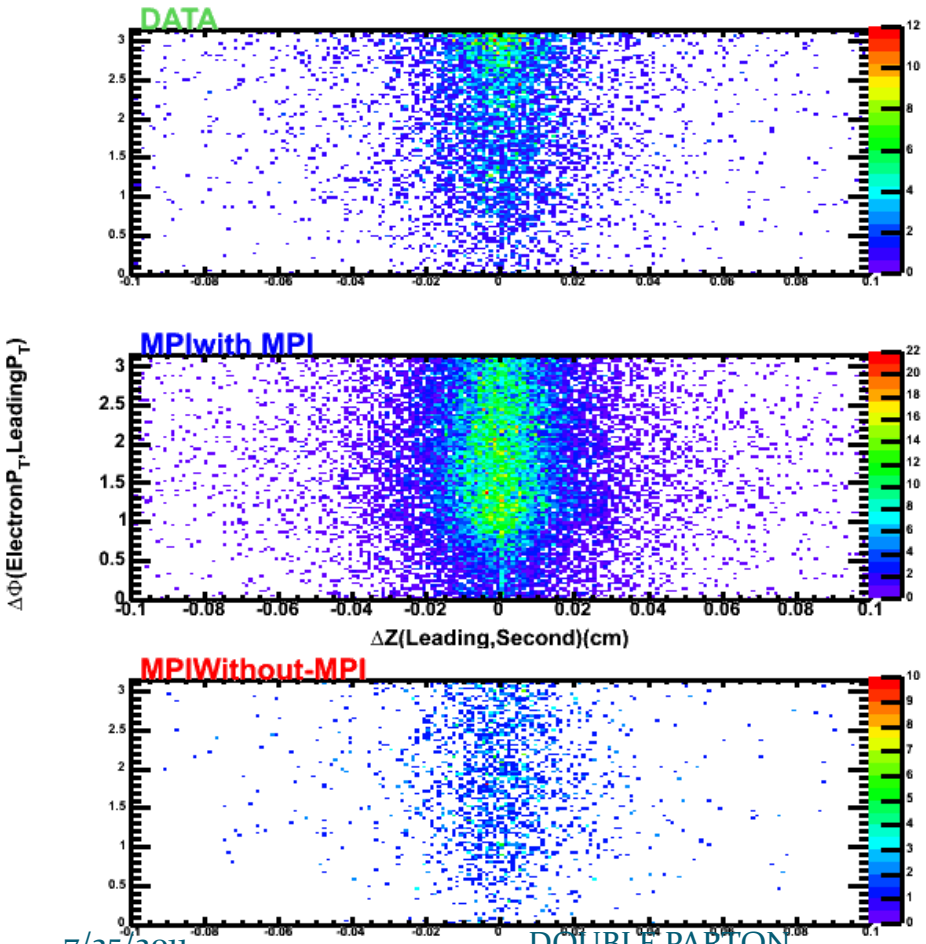
ΔZ(Leading,Second)/Δϕ(Leading,Second)

- Before I cut on the ΔZ(Electron Track,Leading)

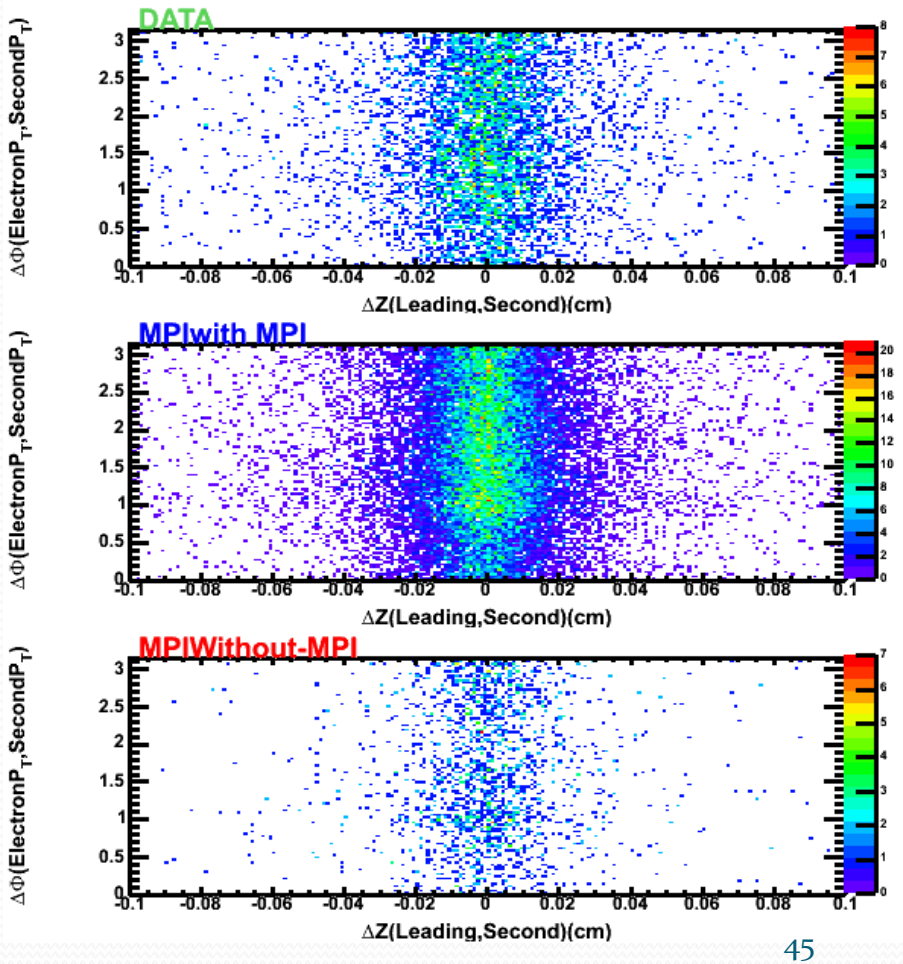


ΔZ(Leading,Second)/Δϕ(Electron/Leading,Second)

ΔZ(Leading,Second)/Δϕ(Electron,Leading)



ΔZ(Leading,Second)/Δϕ(Electron,Leading)



Applying

- ΔZ(Electron Track,Leading) <0.04
- ΔZ(Electron Track,Second)<0.04
- Consists of the Signal-Double Parton and Background- QCD

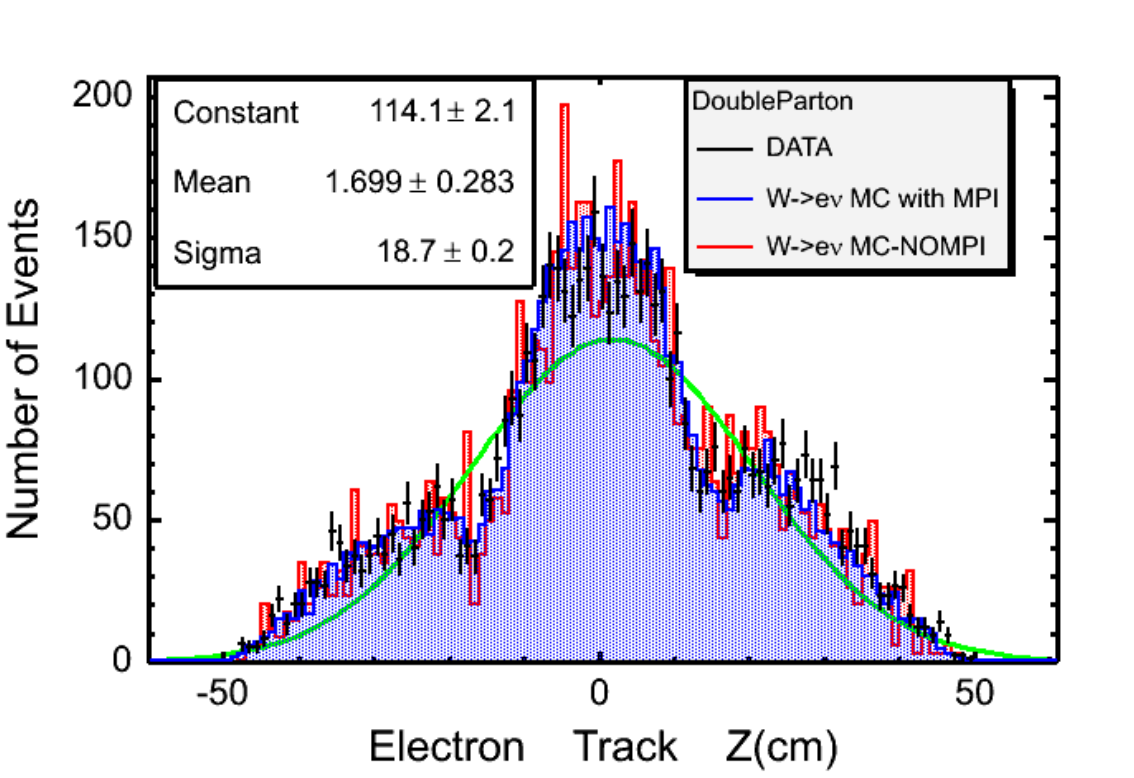
Electron Track Z

- AFTER I cut on the

ΔZ(Electron Track,Leading)

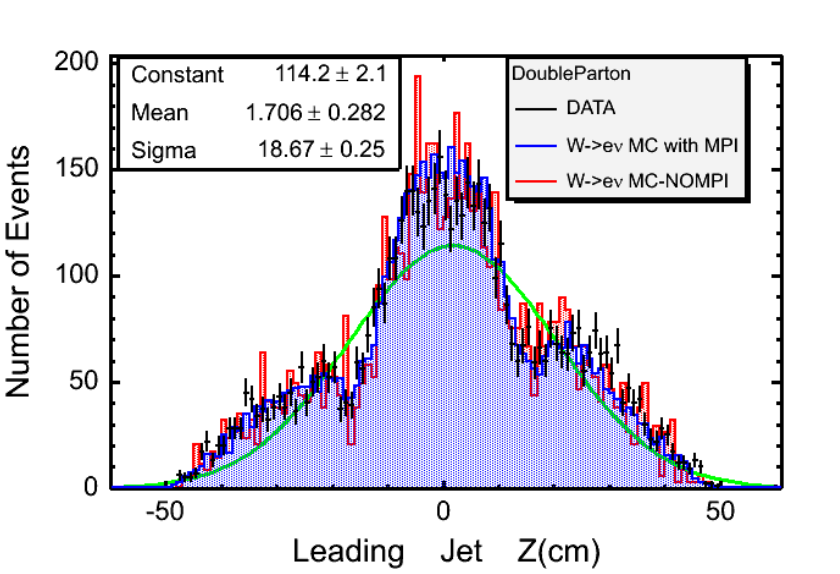
And

ΔZ(Electron Track,Second)

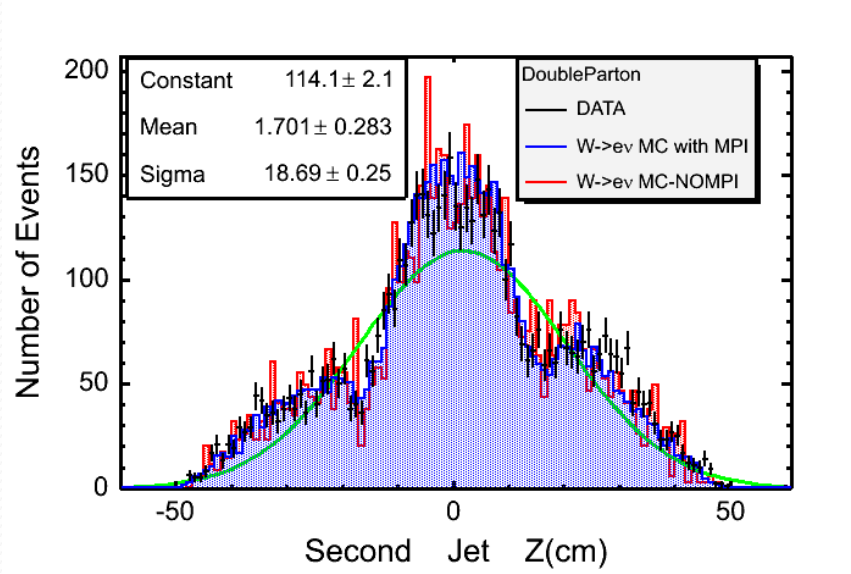


Leading/Next-to-Leading Z

Leading Z

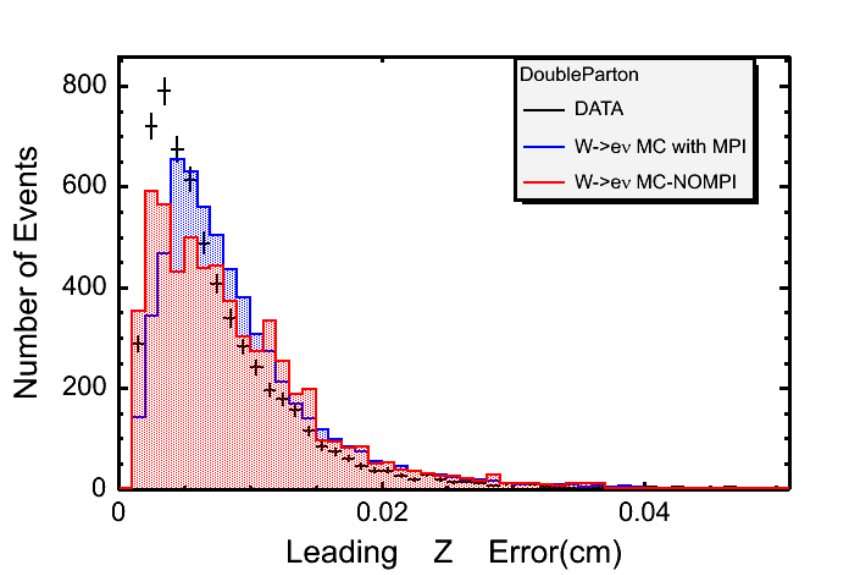


Next-to-Leading Z

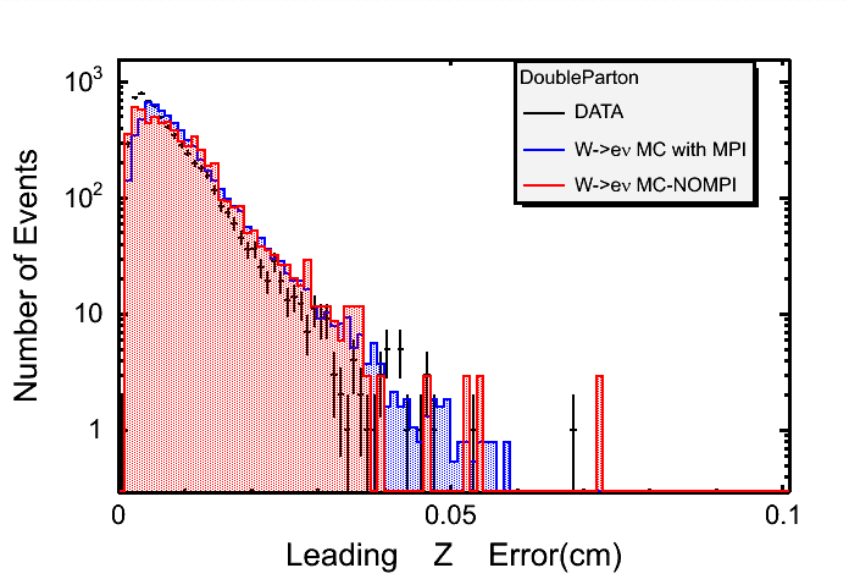


Leading Jet Z Error

Leading Jet Z Error

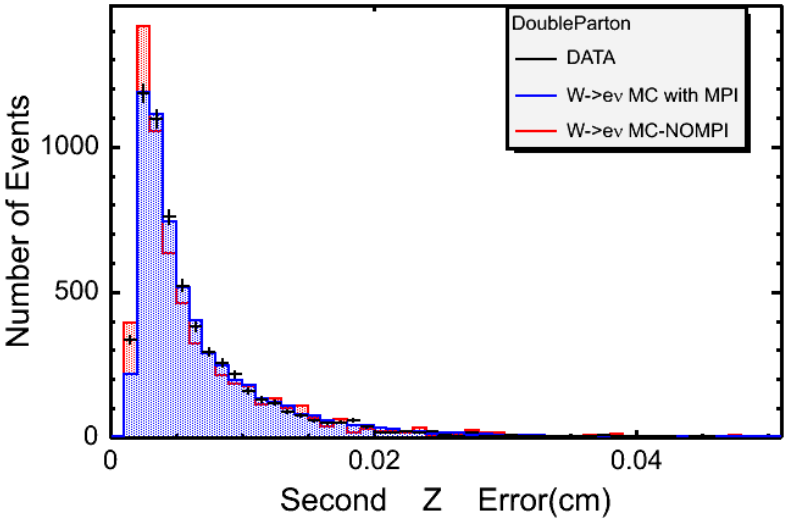


Leading Jet Z Error – Log Scale

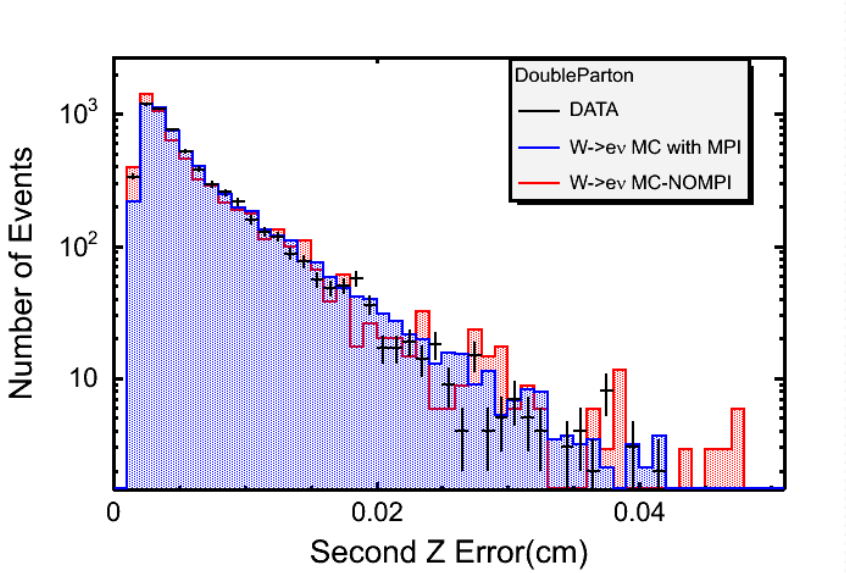


Next-to-Leading Jet Z Error

Next-to-Leading Jet Z Error

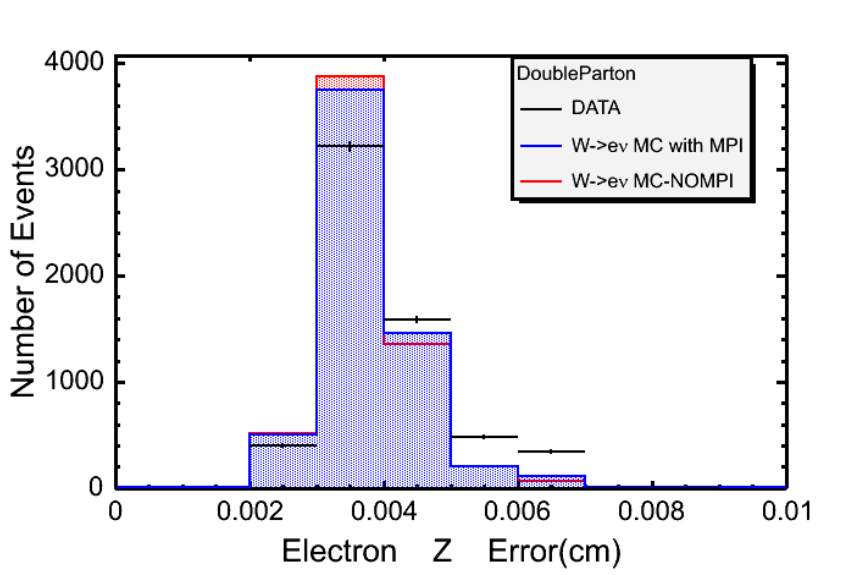


Next-to-Leading Jet Z Error Log Scale

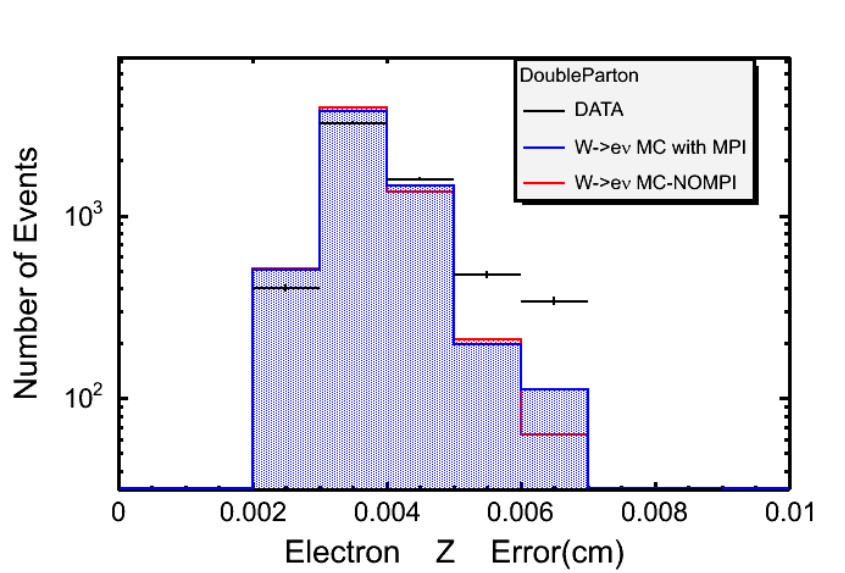


Electron Track Z -Error

Electron Z Error



Electron Z Error – Log Scale



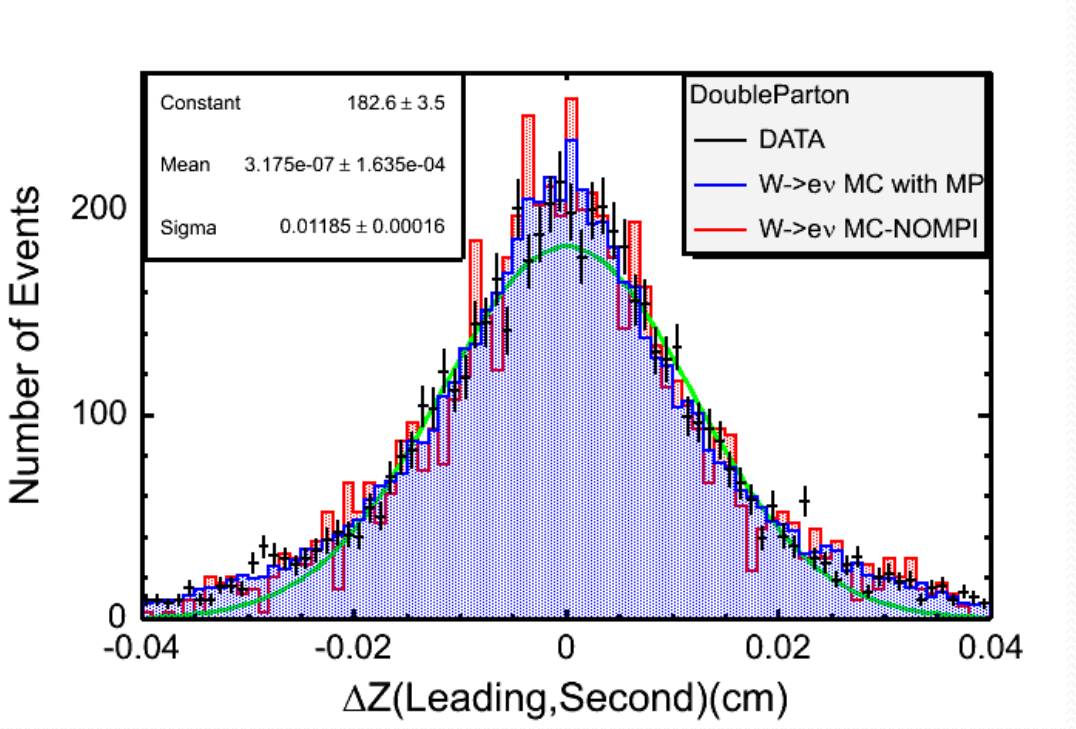
ΔZ(Leading,Second)

- AFTER I cut on the

ΔZ(Electron Track,Leading)

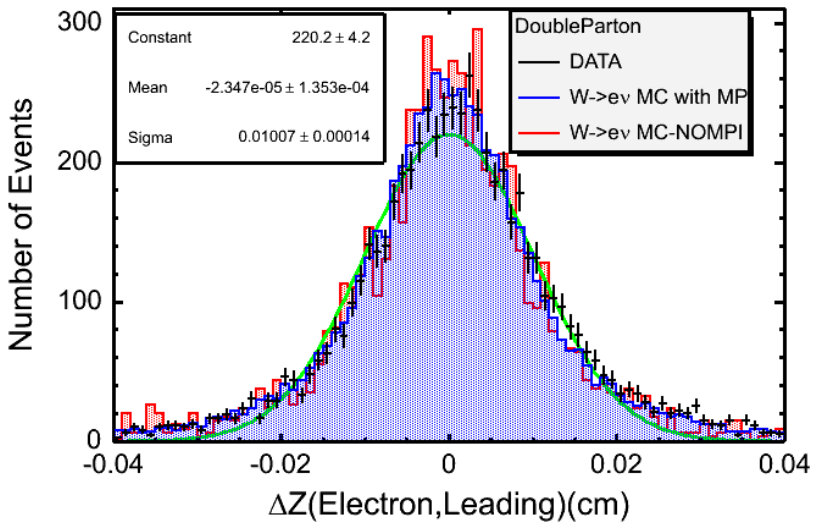
And

ΔZ(Electron Track,Second)

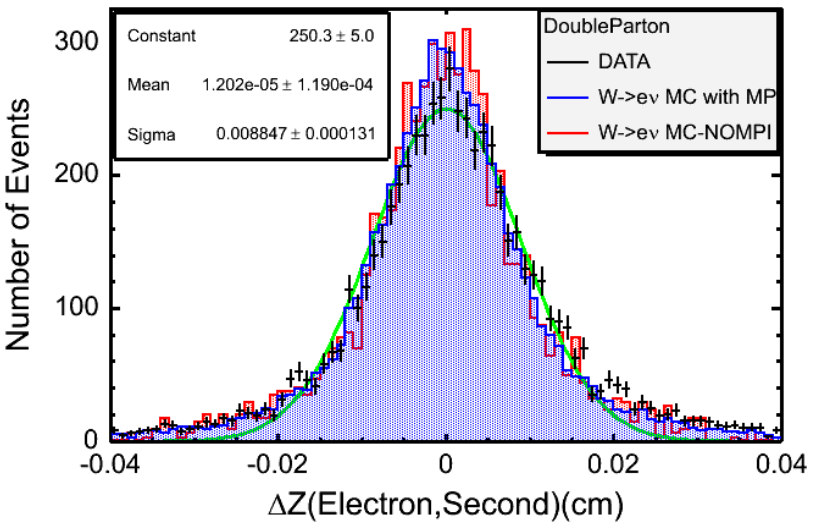


ΔZ(Electron/Leading,Second)

ΔZ(Electron,Leading)



ΔZ(Electron,Second)



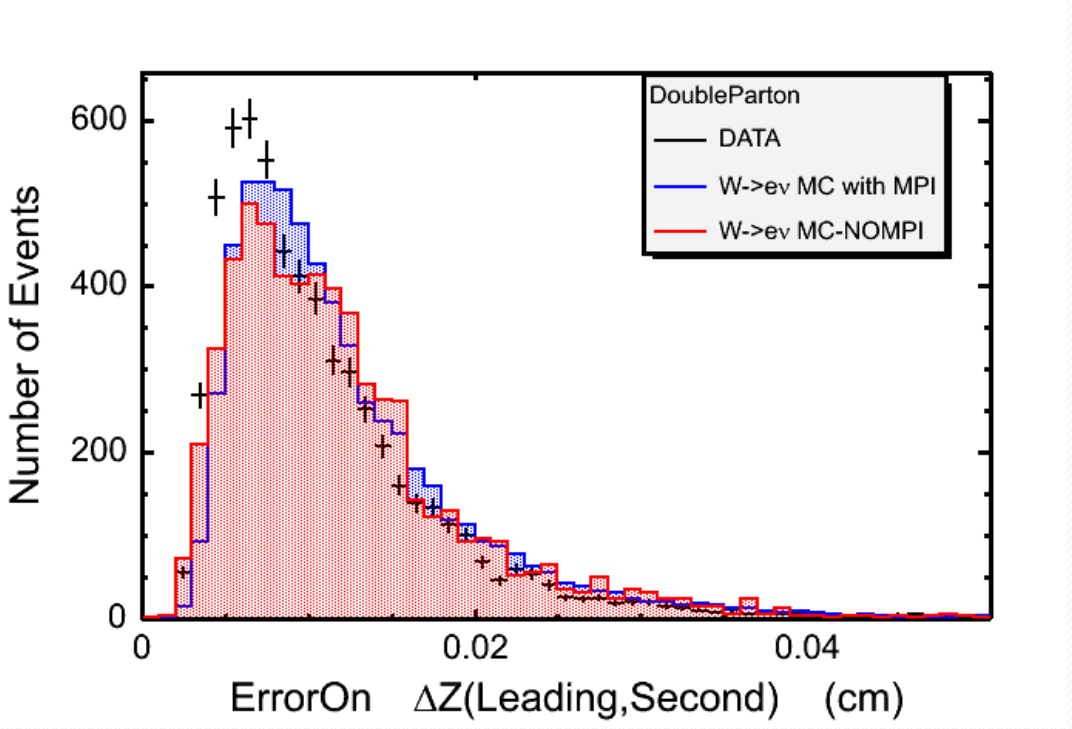
ΔZ(Leading,Second)-Error

- AFTER I cut on the

ΔZ(Electron Track,Leading)

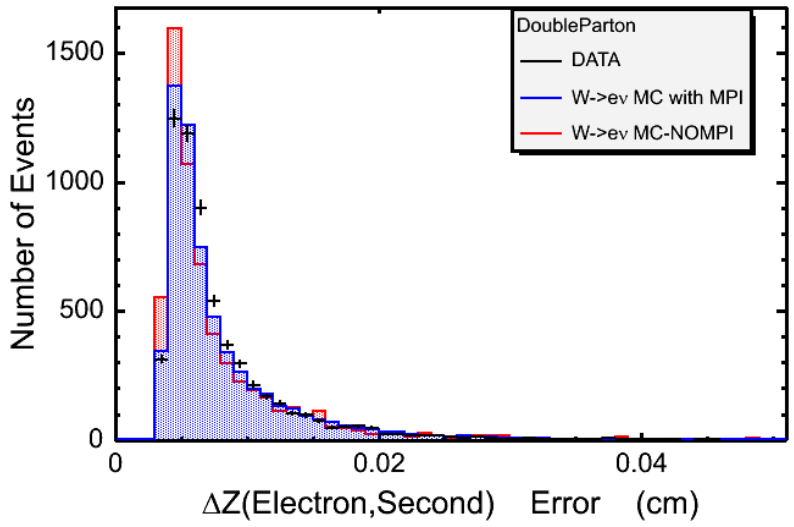
And

ΔZ(Electron Track,Second)

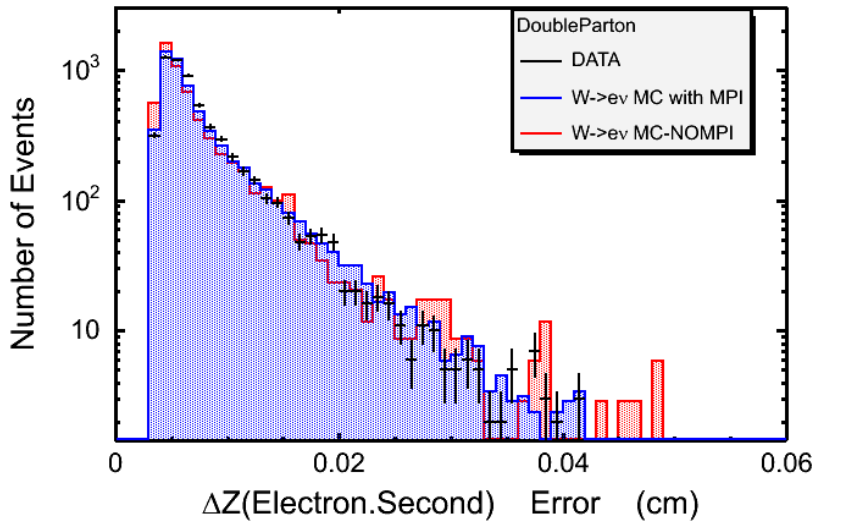


ΔZ(Electron,Second)-Error

ΔZ(Electron,Second)-Error

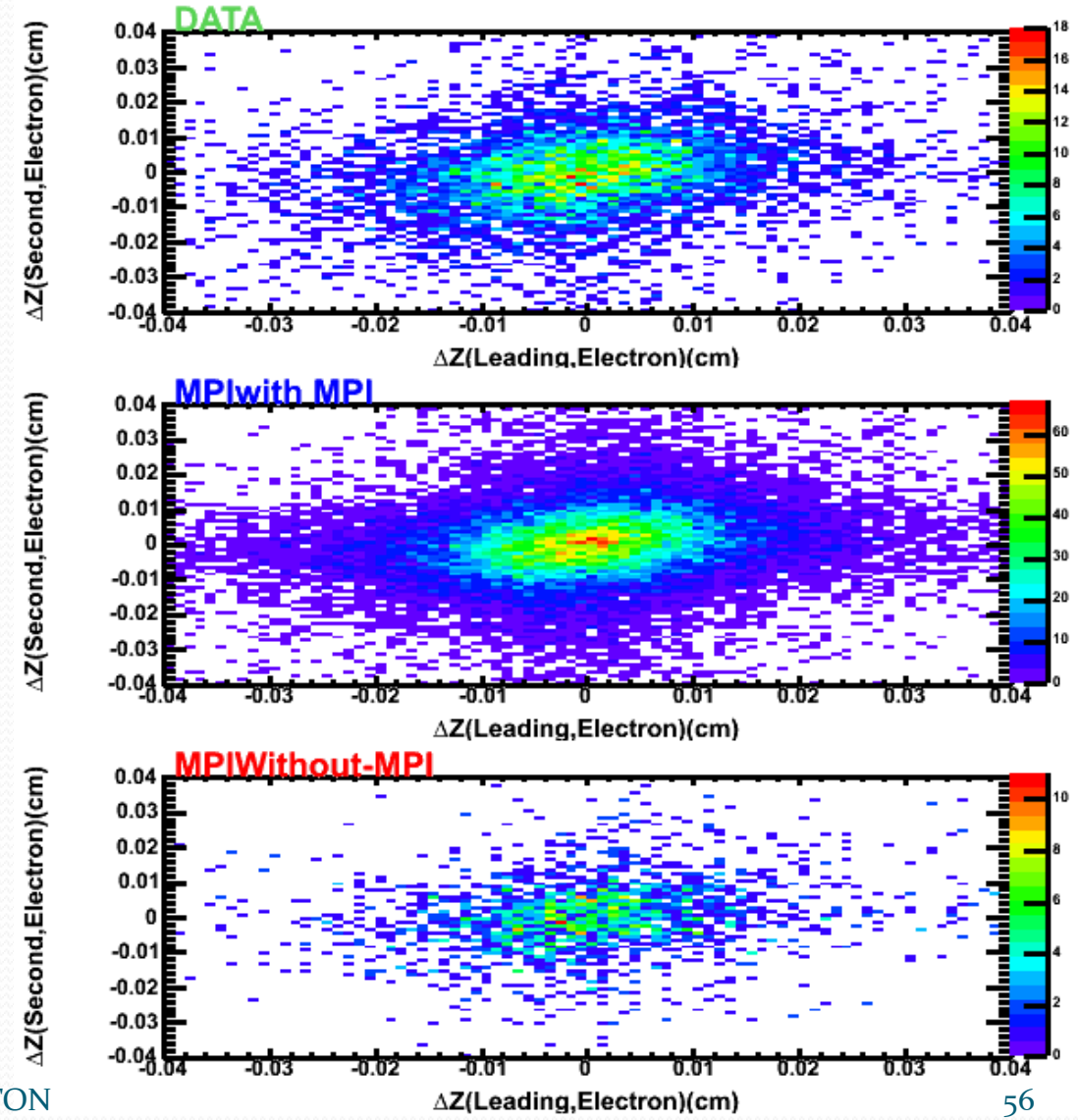


ΔZ(Electron,Second)-Error Log Scale



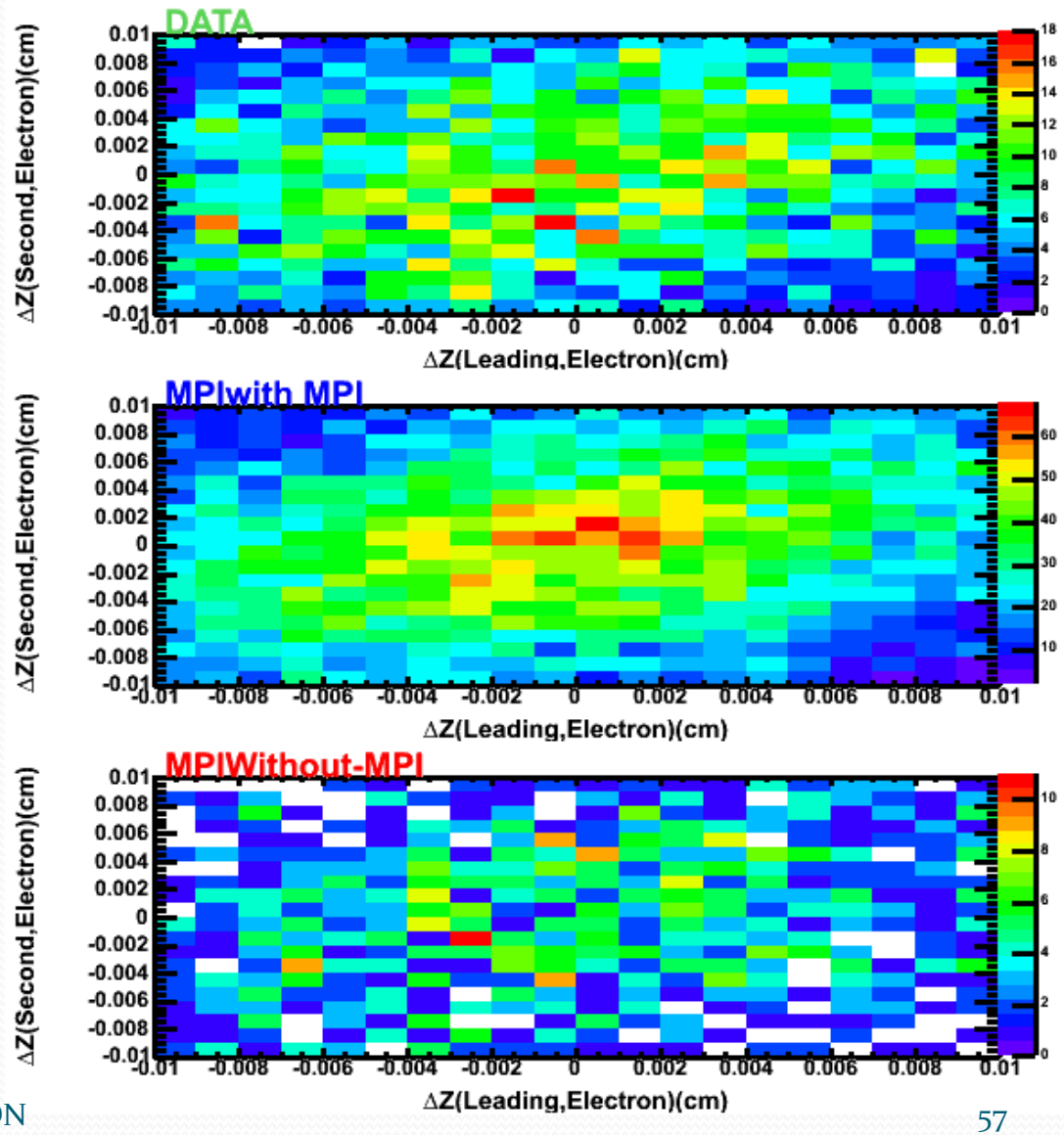
ΔZ(Electron,Second)Vs ΔZ(Electron,Leading)

- AFTER I cut on the ΔZ(Electron Track,Leading) And ΔZ(Electron Track,Second)



ΔZ(Electron,Second)Vs ΔZ(Electron,Leading)

- AFTER I cut on the ΔZ(Electron Track,Leading) And ΔZ(Electron Track,Second)

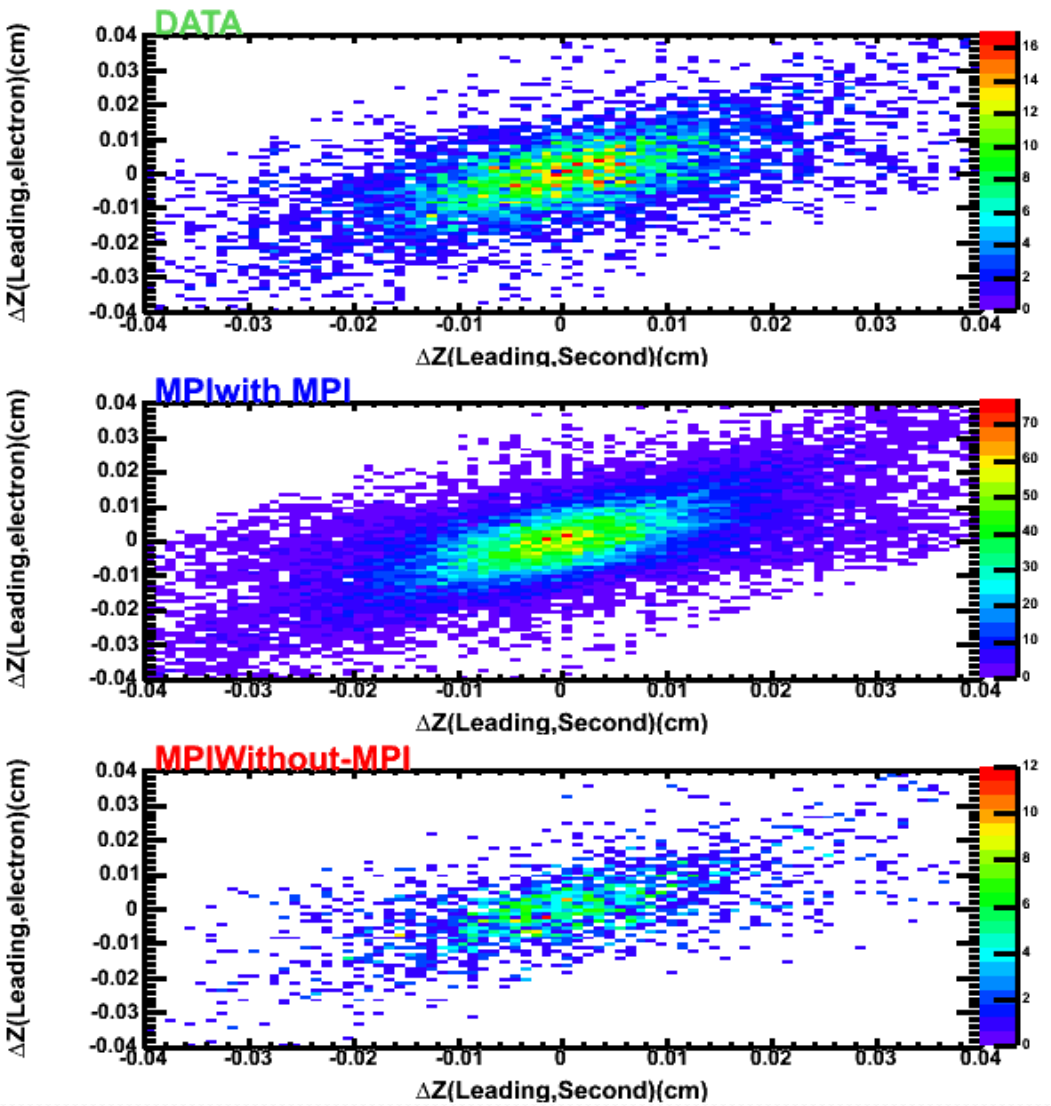


ΔZ(Leading,Second)Vs ΔZ(Electron,Leading)

- AFTER I cut on the ΔZ(Electron Track,Leading)

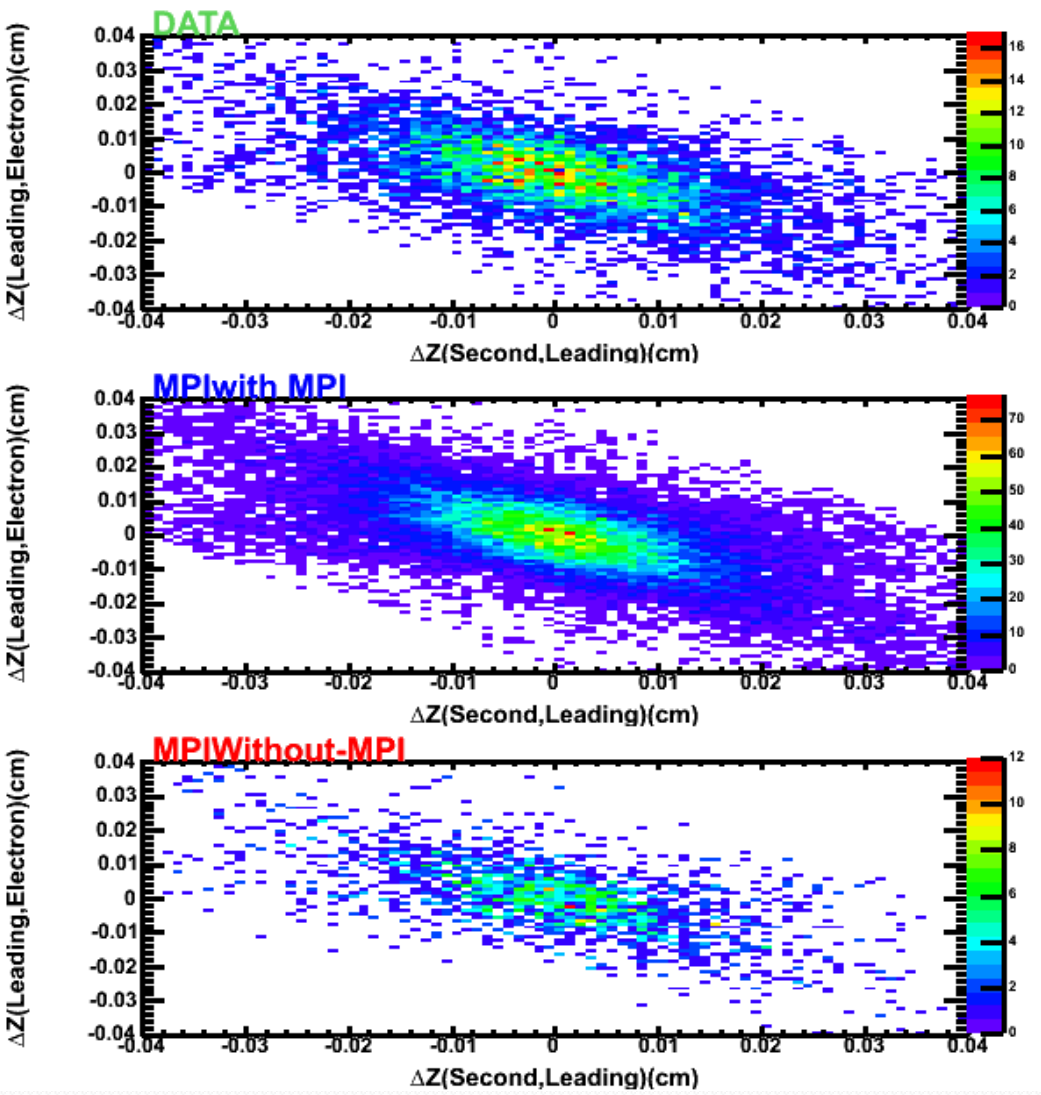
And

ΔZ(Electron Track,Second)



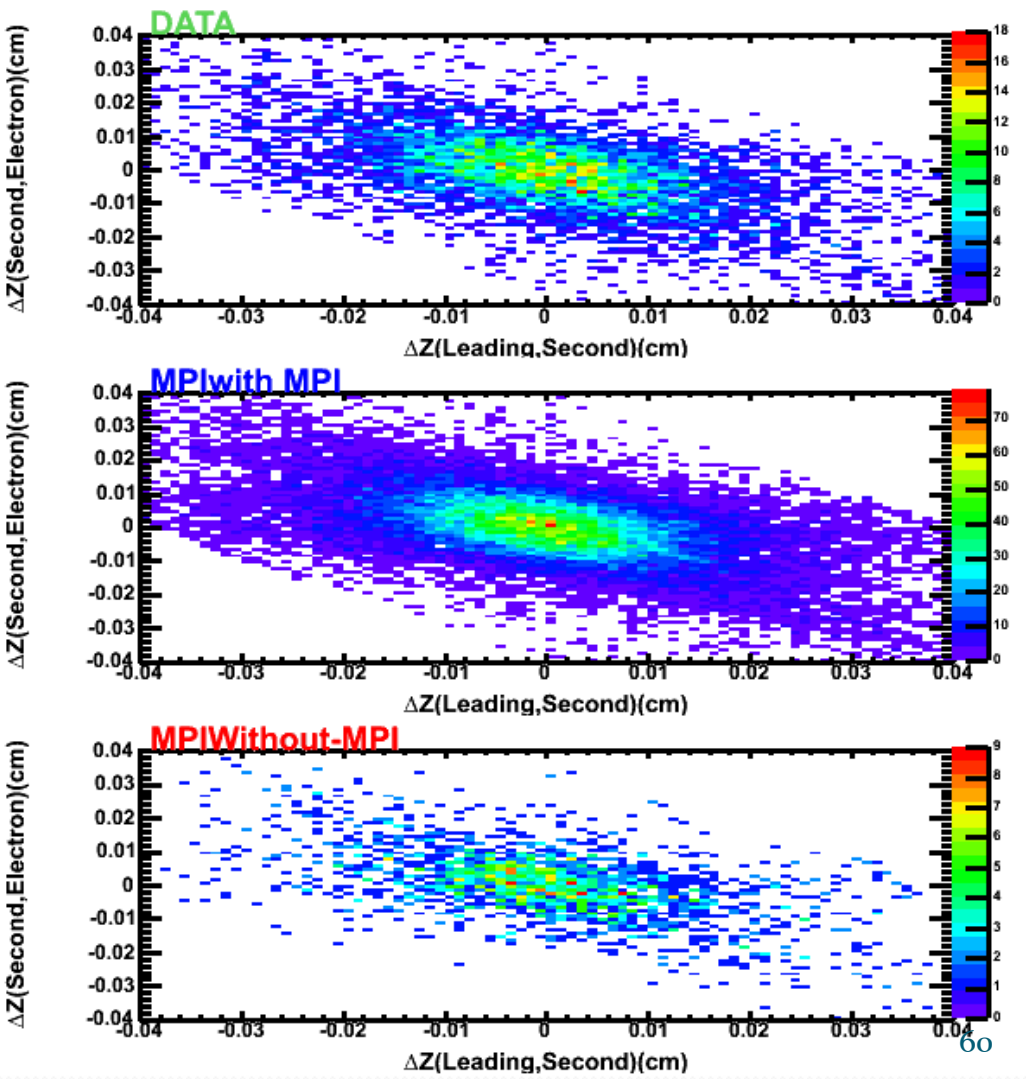
ΔZ(Second,Leading)Vs ΔZ(Electron,Leading)

- AFTER I cut on the ΔZ(Electron Track,Leading) And ΔZ(Electron Track,Second)



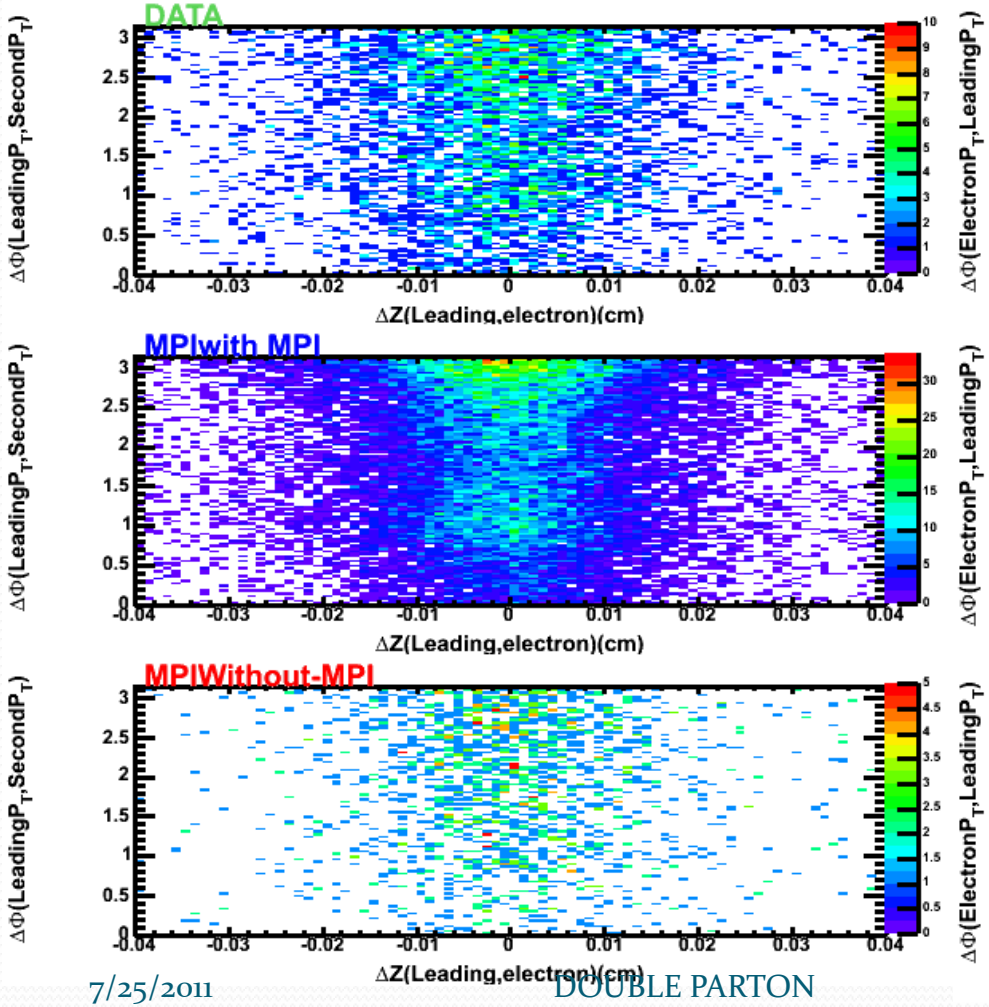
ΔZ(Leading,Second)Vs ΔZ(Second,Electron)

- AFTER I cut on the ΔZ(Electron Track,Leading) And ΔZ(Electron Track,Second)

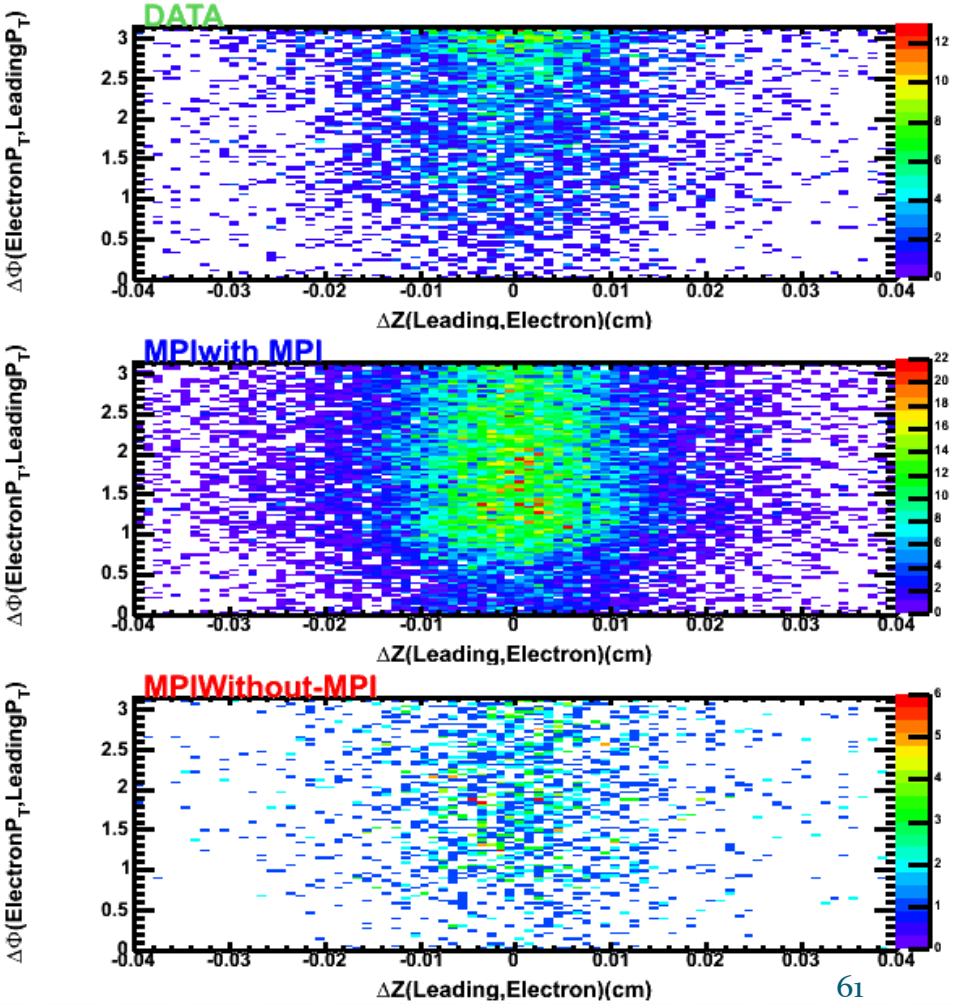


ΔZ(Leading,Second)Vs Δϕ(Second,Electron)

ΔZ(Leading,Electron)VsΔϕ(Leading,Second)



ΔZ(Leading,Electron)VsΔϕ(Leading,Second)

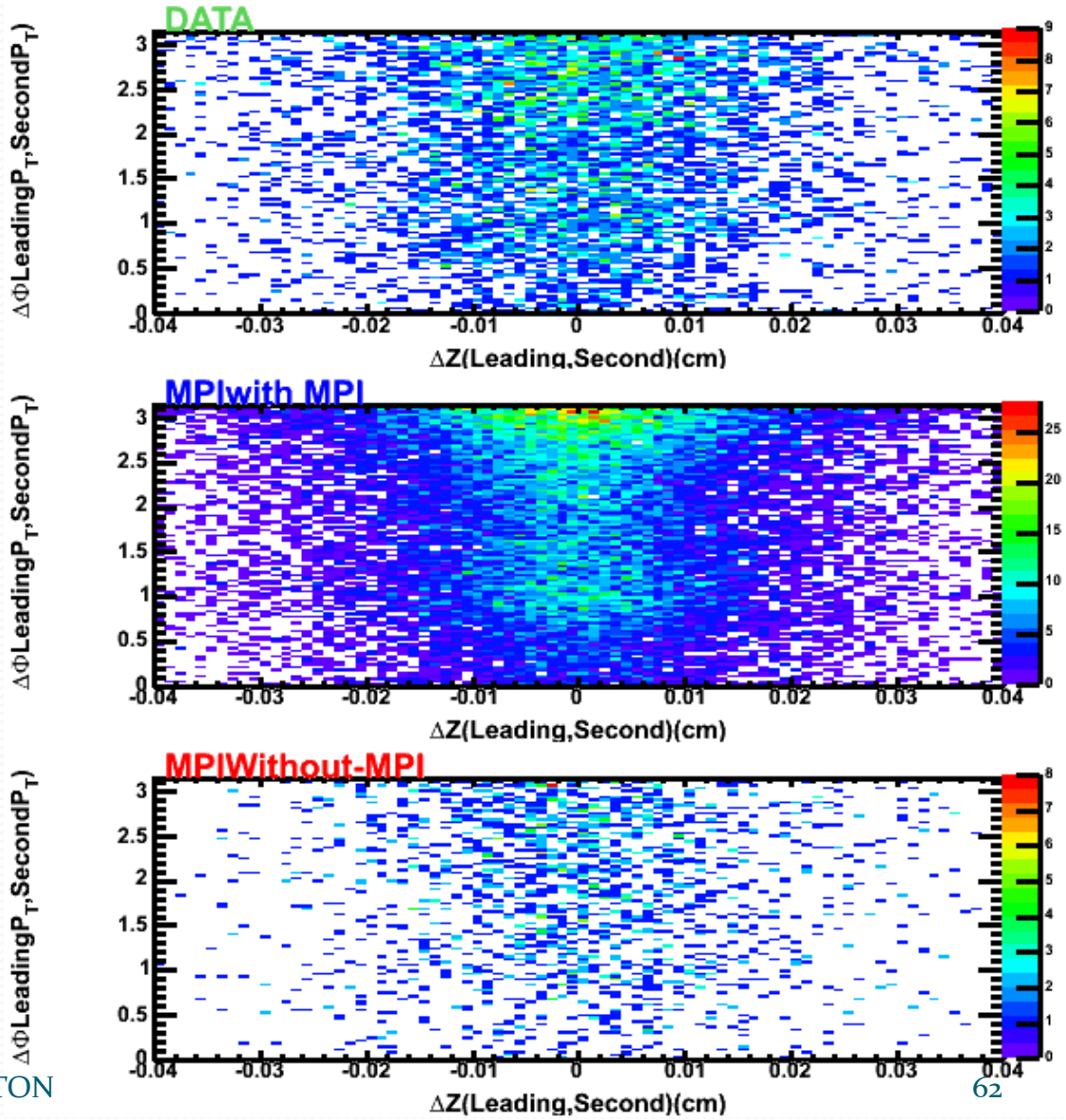


ΔZ(Leading,Second)Vs Δϕ(Leading,Second)

- AFTER I cut on the ΔZ(Electron Track,Leading)

And

ΔZ(Electron Track,Second)

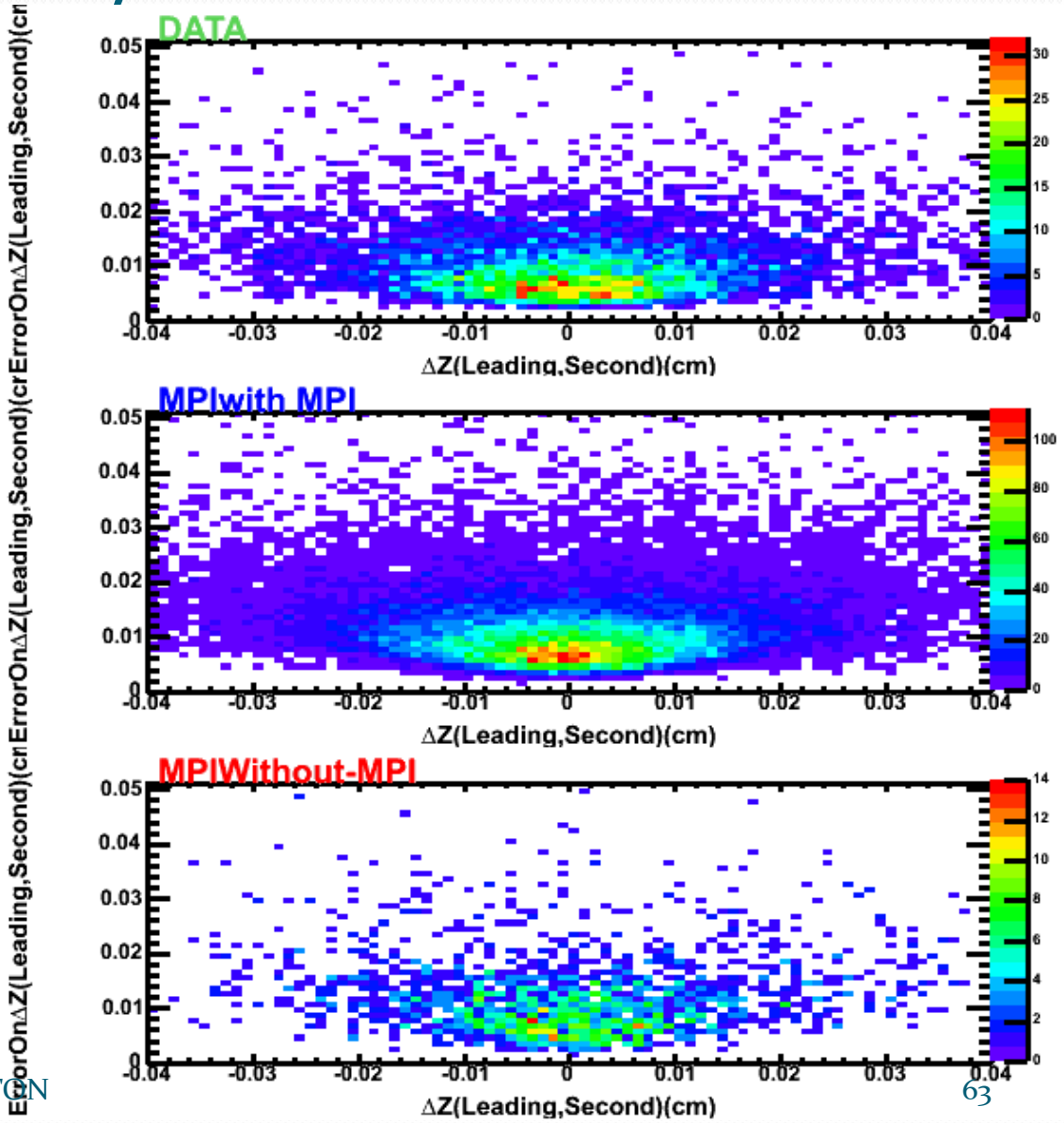


ΔZ(Leading,Second)Vs Error On ΔZ(Leading,Second)

- AFTER I cut on the ΔZ(Electron Track,Leading)

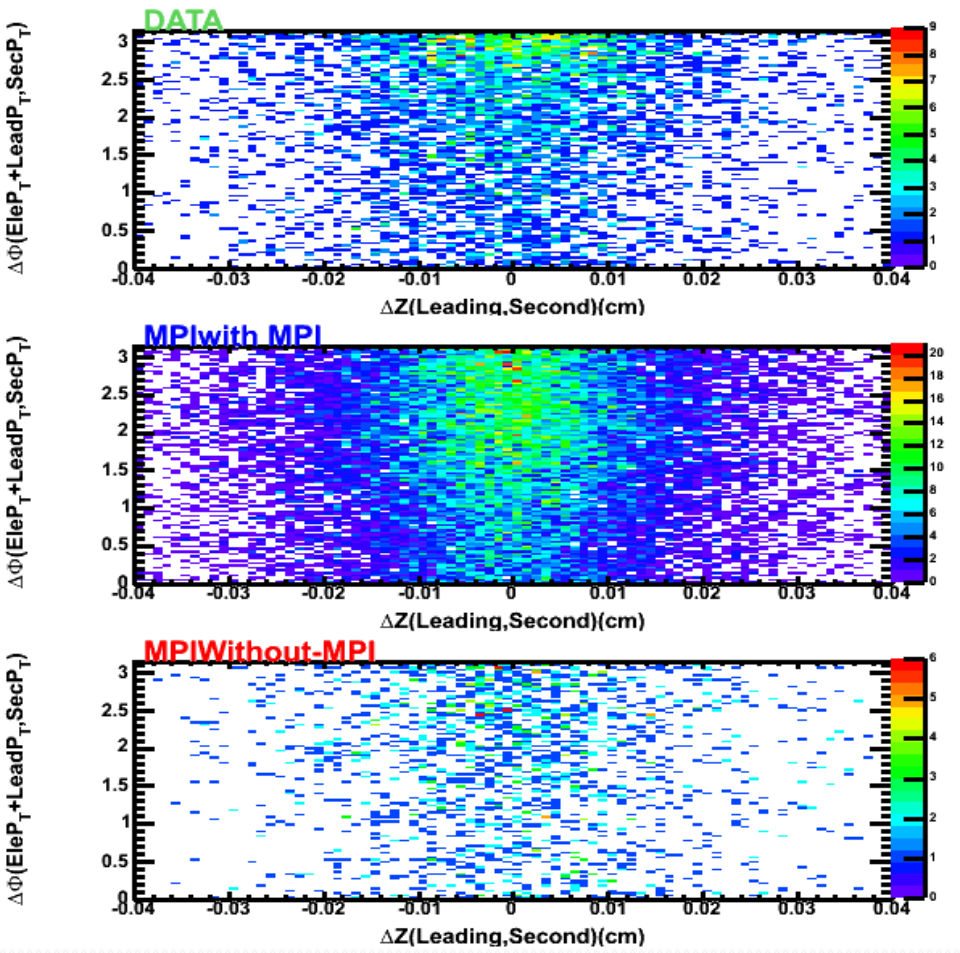
And

ΔZ(Electron Track,Second)

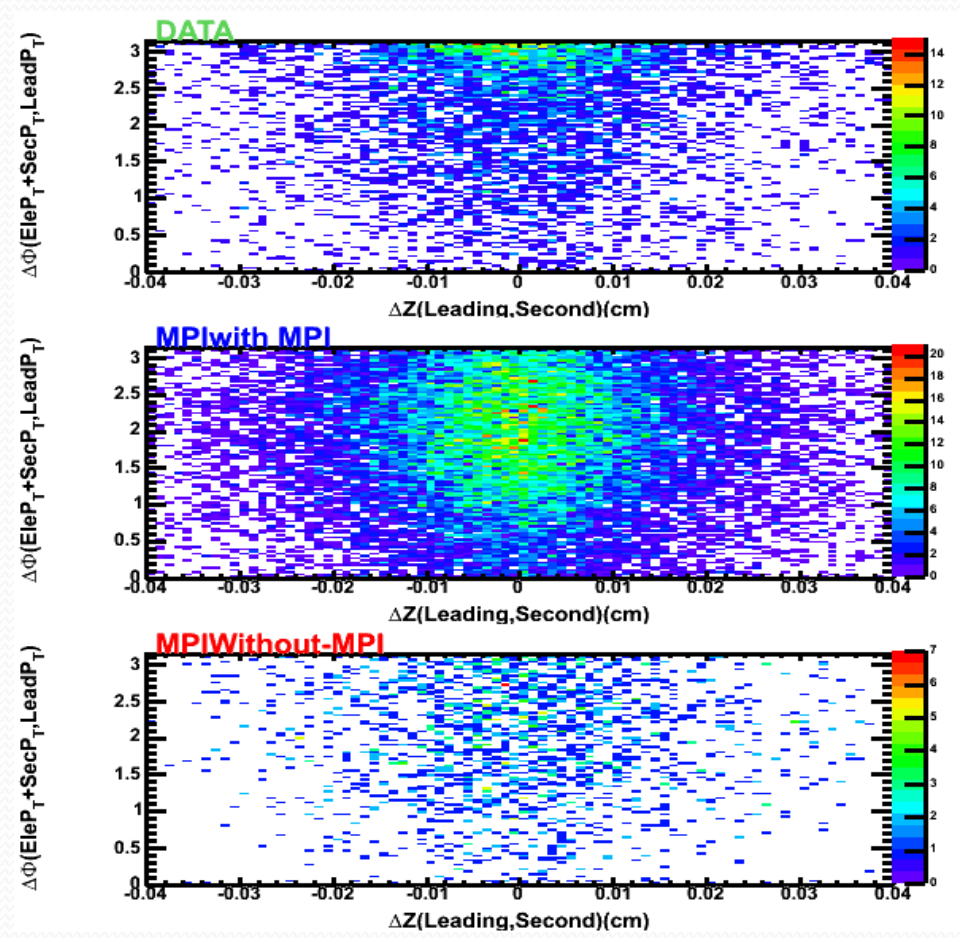


ΔZ(Leading,Second)Vs Δϕ(Electron/Leading,Second)

ΔZ(Leading,Second)Vs Δϕ(Electron+Leading,Second)



ΔZ(Leading,Second)Vs Δϕ(Electron+Second,Leading)

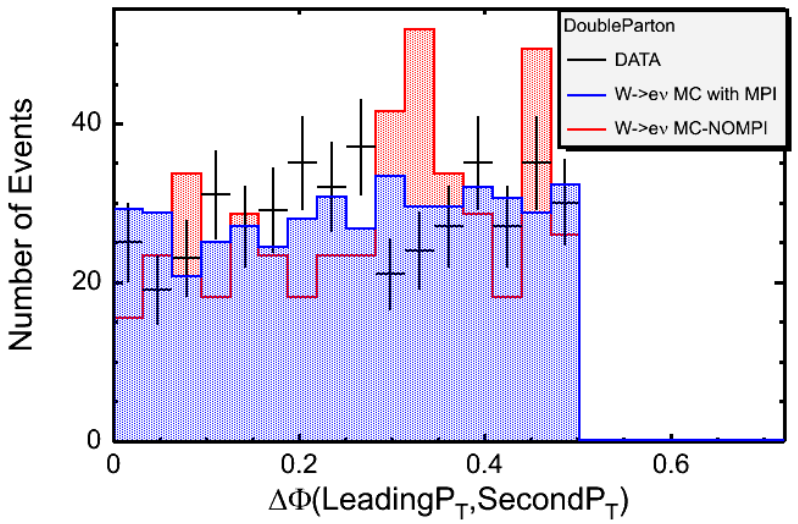


Δϕ(Leading,Second) – Only for the Core events

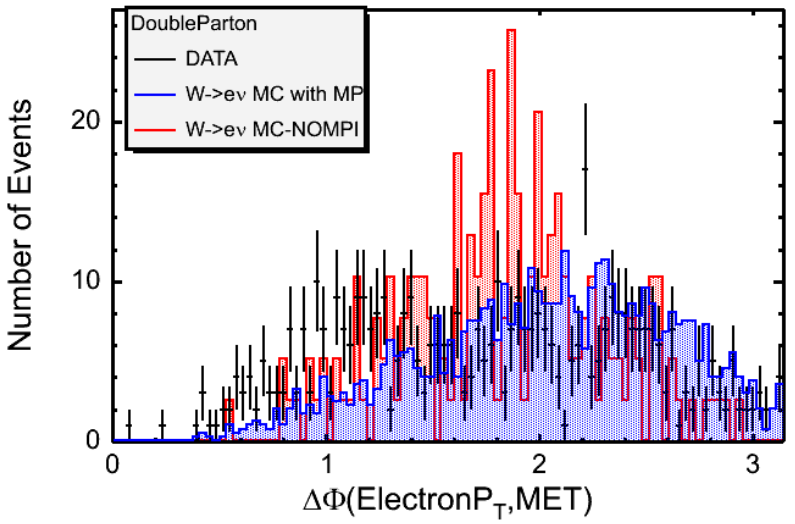
- Define Core Events: Events that satisfy the selection cuts ΔZ(Electron Track,Leading) <0.04 cm AND ΔZ(Electron Track,Second) <0.04 cm
- Looking at the Δϕ(Leading,Second) before, one can see that we need to divide the plot into different regions and Look at the Δϕ wrt Electron/MET to understand the type of Event
- I have divided into Ranges [0-0.5],[1-2],2.5-PI]
- They so suffer from lack of statistics

Δϕ(Leading,Second) [0-0.5] radians

Δϕ(Leading,Second)



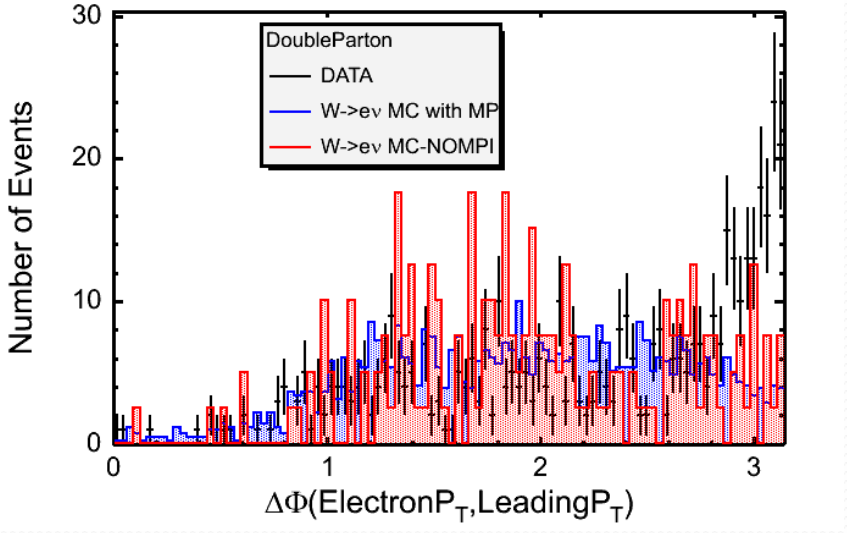
Δϕ(Electron,MET)



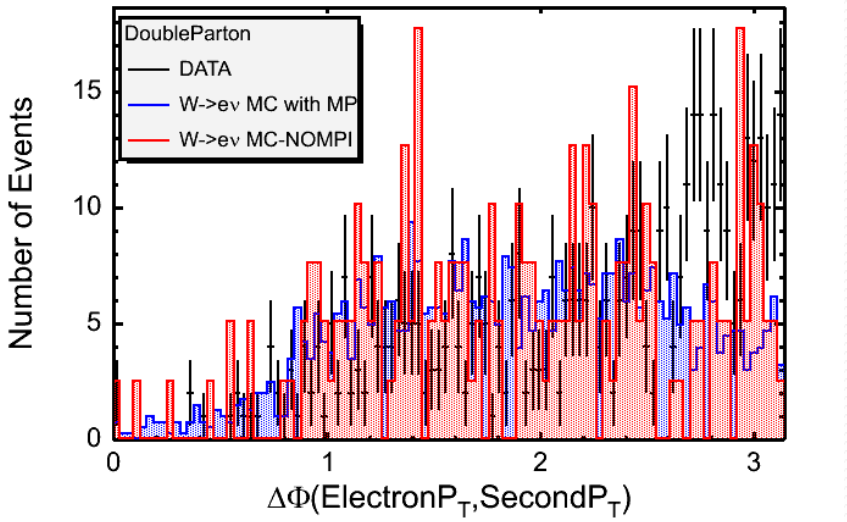
- REGION I -Δφ(Leading,Second) [0-0.5] radians
- Considred preodomnantly QCD background events

Δϕ(Leading,Second) [0-0.5] radians

Δϕ(Electron,Leading



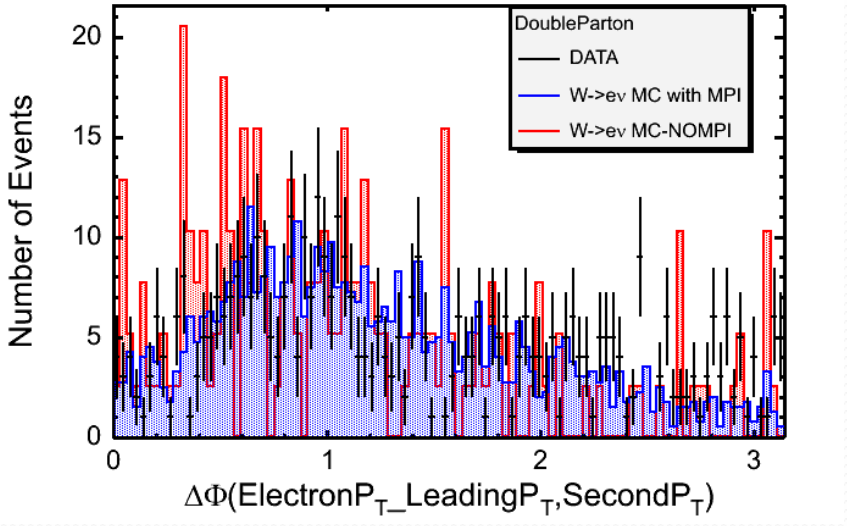
Δϕ(Electron,Second)



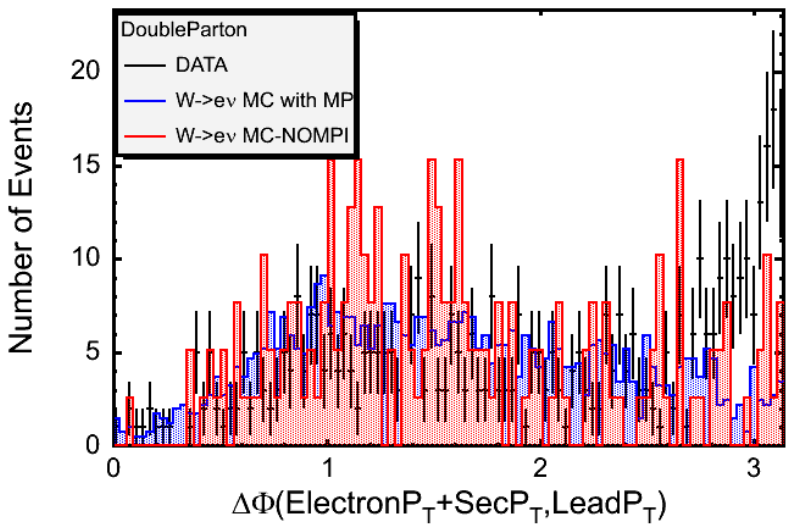
- REGION I -Δφ(Leading,Second) [0-0.5] radians
- Considred preodomnantly QCD background events

Δϕ(Leading,Second) [0-0.5] radians

Δϕ(Electron+Leading,Second)



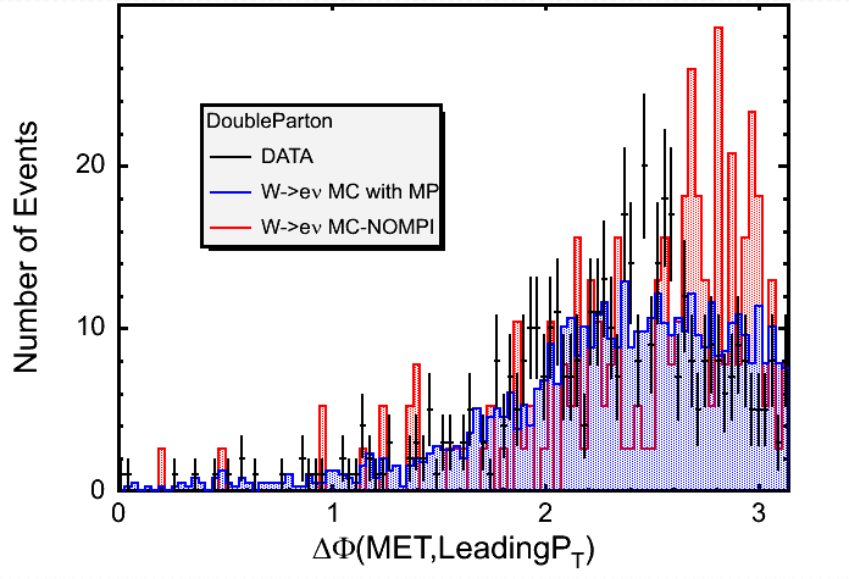
Δϕ(Electron,+secondLeading



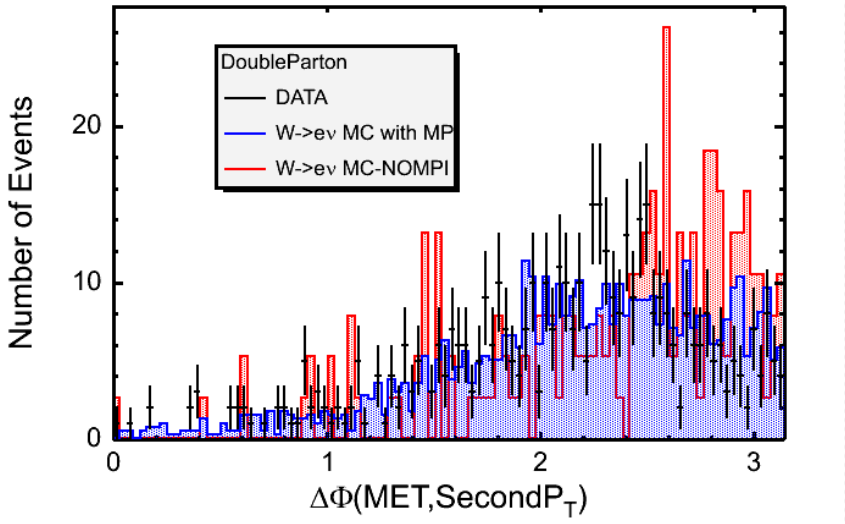
- REGION I -Δφ(Leading,Second) [0-0.5] radians
- Considered predominantly QCD background events

Δϕ(Leading,Second) [0-0.5] radians

Δϕ(MET,Leading)

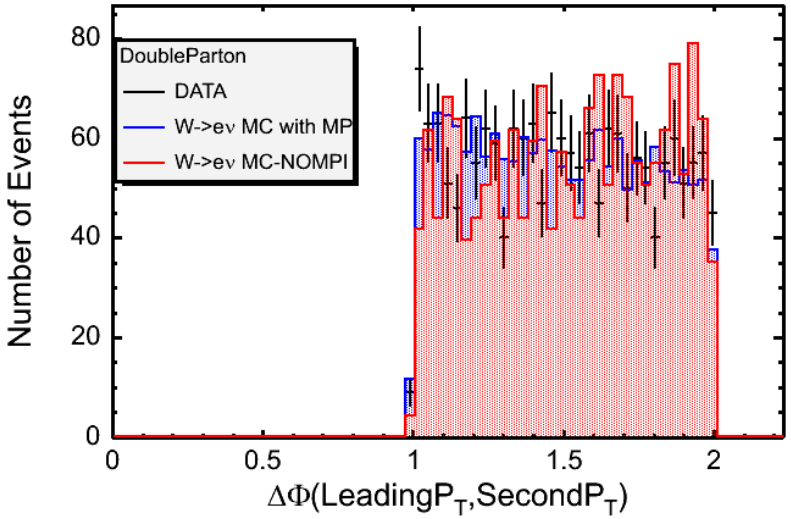


Δϕ(MET,Second)

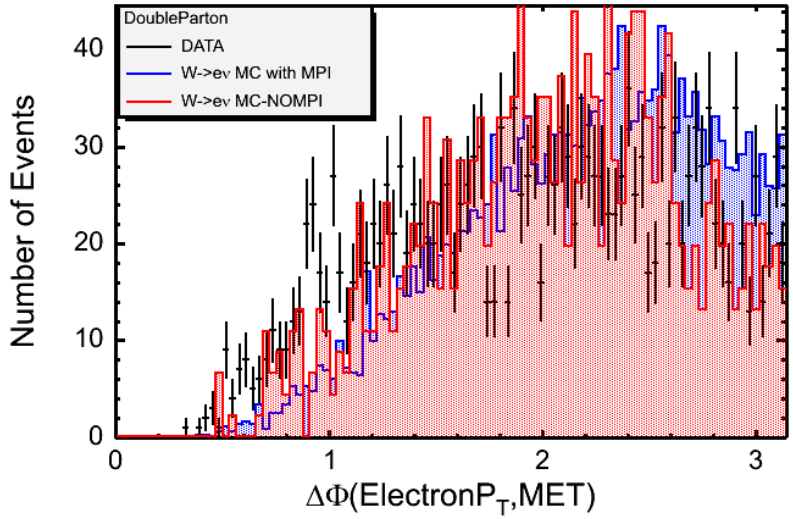


Δϕ(Leading,Second) [1-2] radians

Δϕ(Leading,Second)



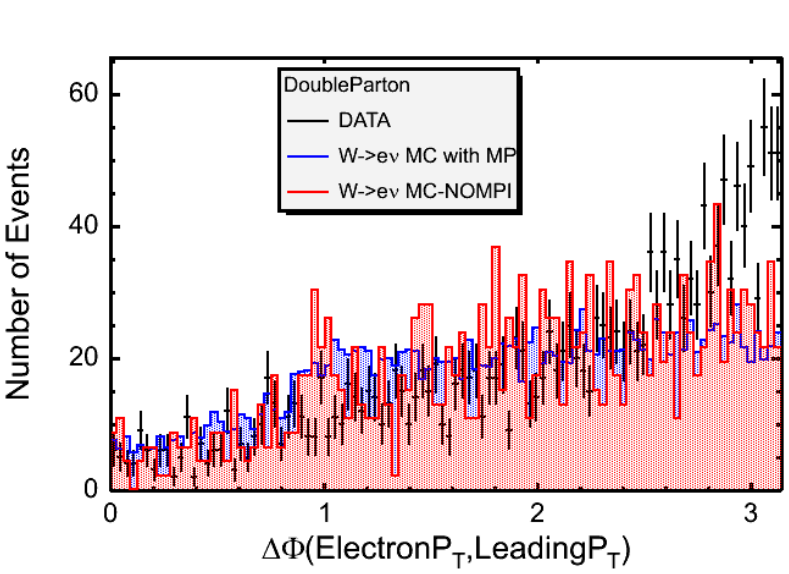
Δϕ(Electron,MET)



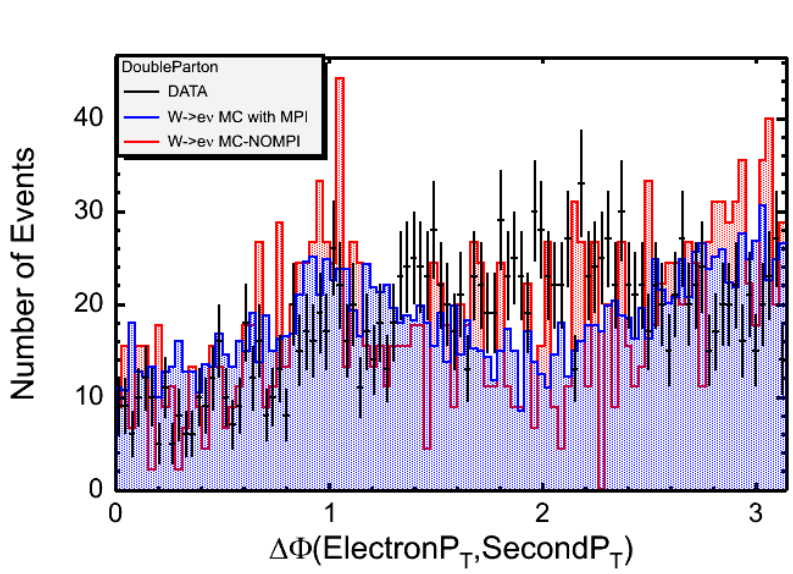
- REGION II -Δφ(Leading,Second) [1-2] radians
- Possible Candidates for Signal-Double Parton

Δφ(Leading,Second) [1-2] radians

Δφ(Electron,Leading)



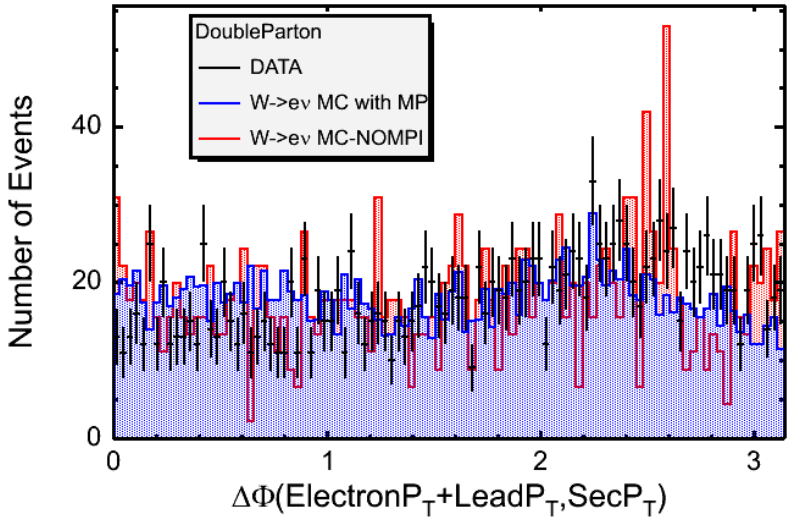
Δφ(Electron,Second)



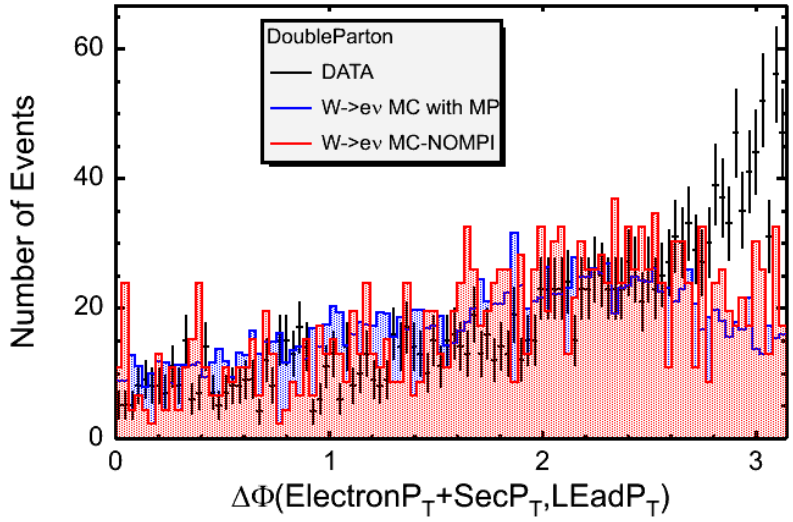
- REGION II -Δφ(Leading,Second) [1-2] radians
- Possible Candidates for Signal-Double Parton

Δϕ(Leading,Second) [1-2] radians

Δϕ(Electron+Leading,Second)



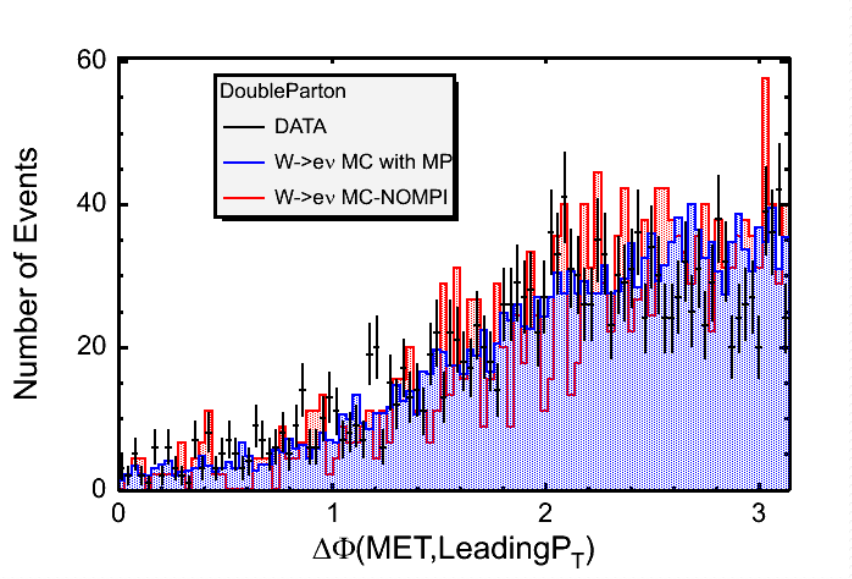
Δϕ(Electron+Second,Leading)



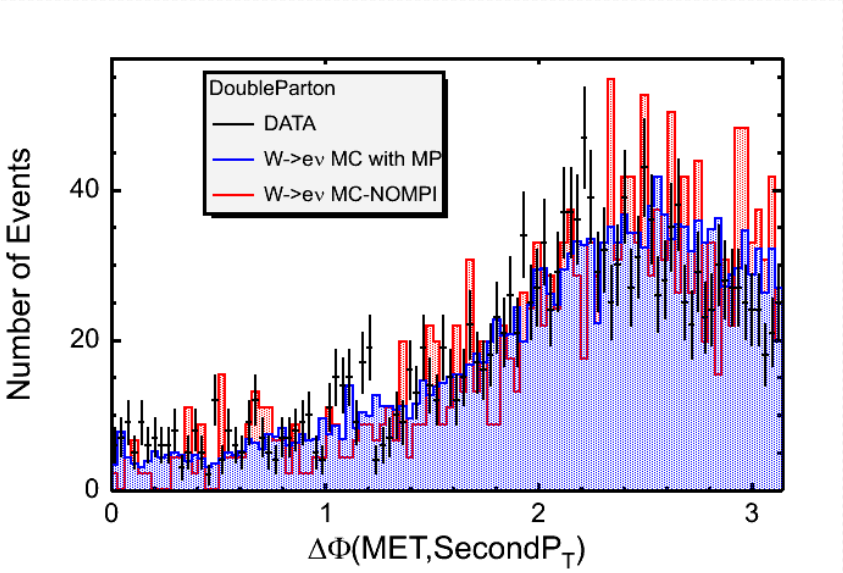
- REGION II -Δφ(Leading,Second) [1-2] radians
- Possible Candidates for Signal-Double Parton

Δφ(Leading,Second) [1-2] radians

Δφ(MET,Leading)



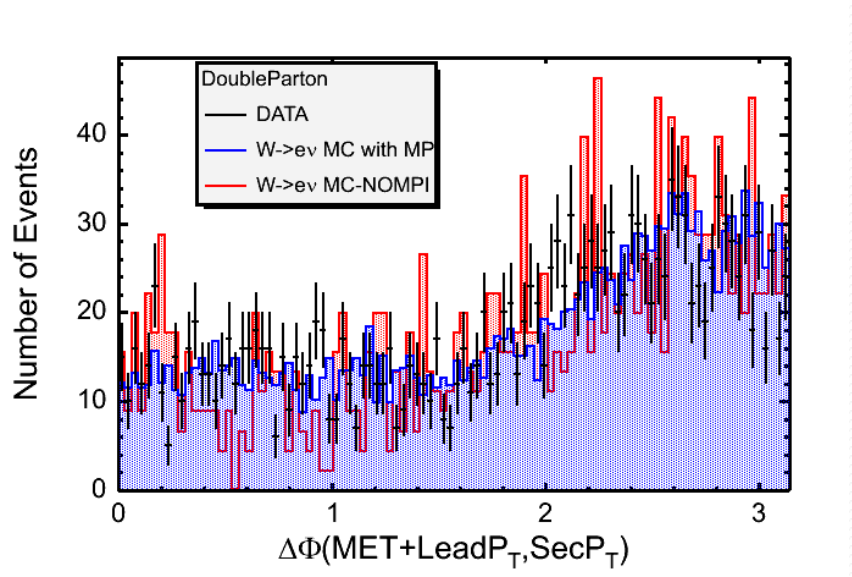
Δφ(MET,Second)



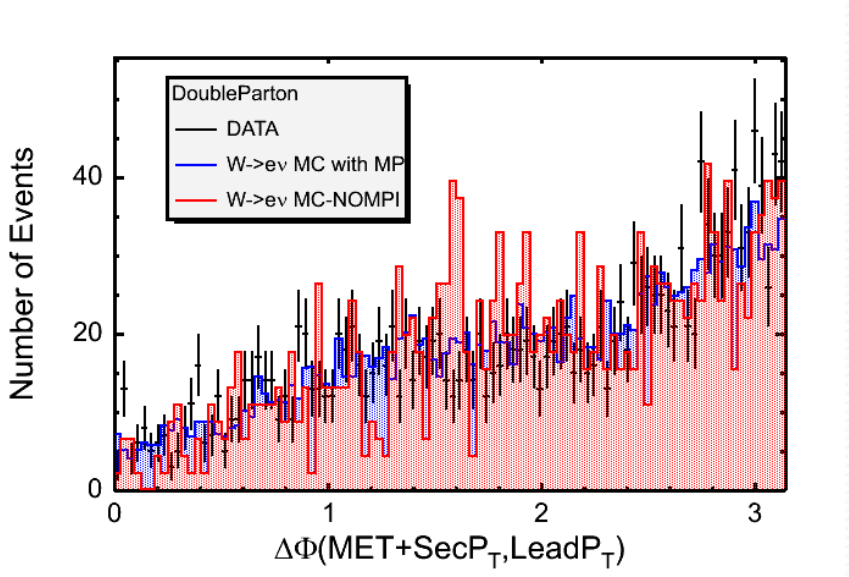
- REGION II -Δφ(Leading,Second) [1-2] radians
- Possible Candidates for Signal-Double Parton

Δϕ(Leading,Second) [1-2] radians

Δϕ(MET+Leading,Second)

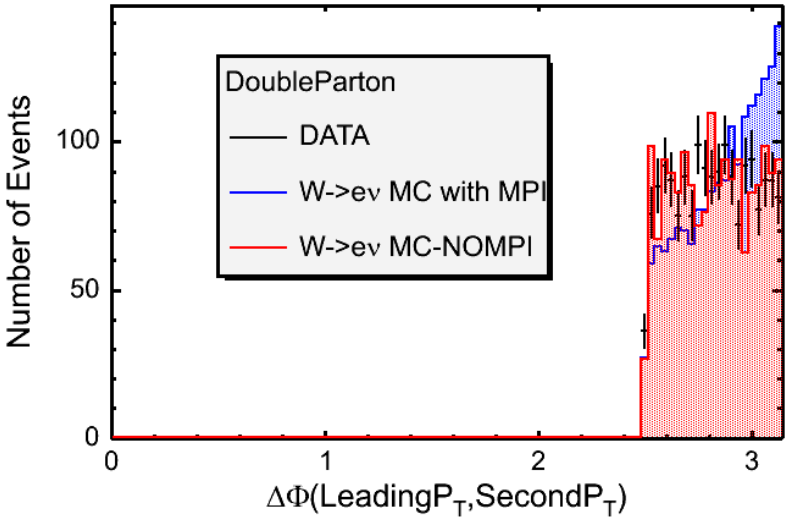


Δϕ(MET+second,Leading)

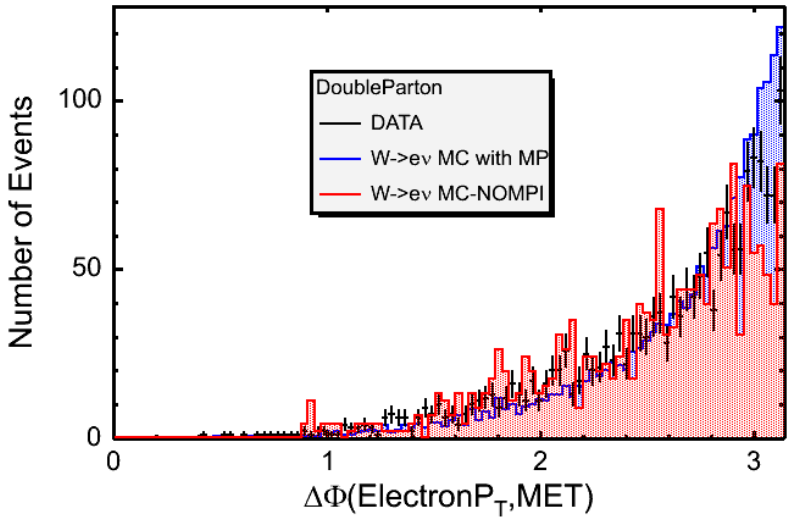


Δφ(Leading,Second) [2.5-PI] radians

Δφ(Leading,Second)



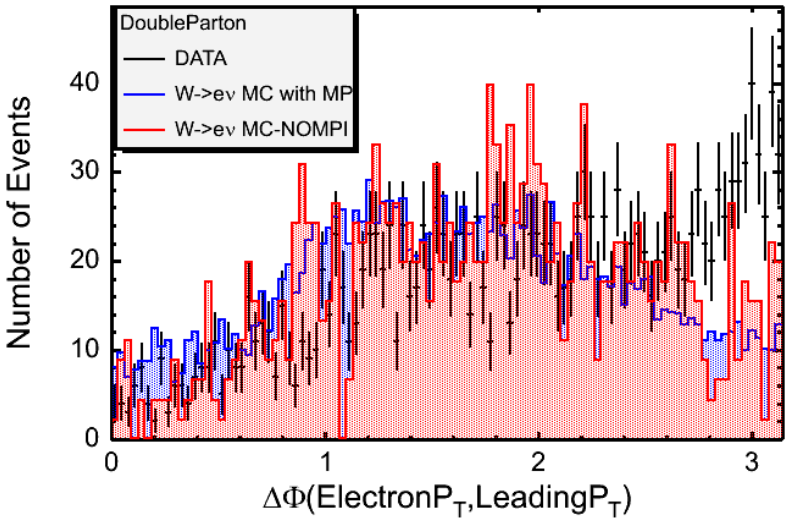
Δφ(Electron,MET)



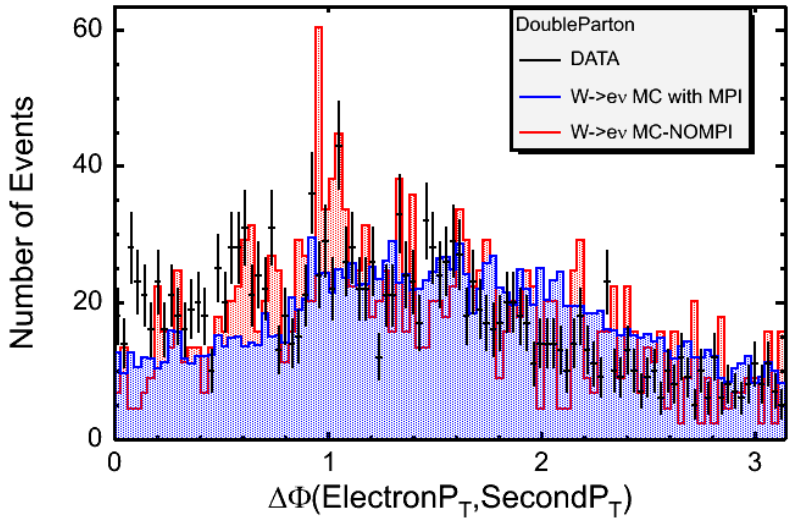
- REGION III -Δφ(Leading,Second) [2.5-PI] radians

Δφ(Leading,Second) [2.5-PI] radians

Δφ(Electron,Leading)



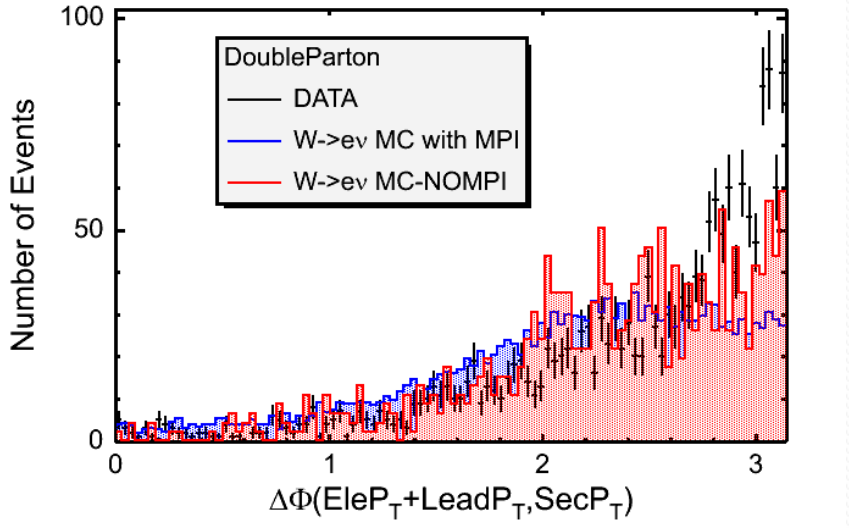
Δφ(Electron,Second)



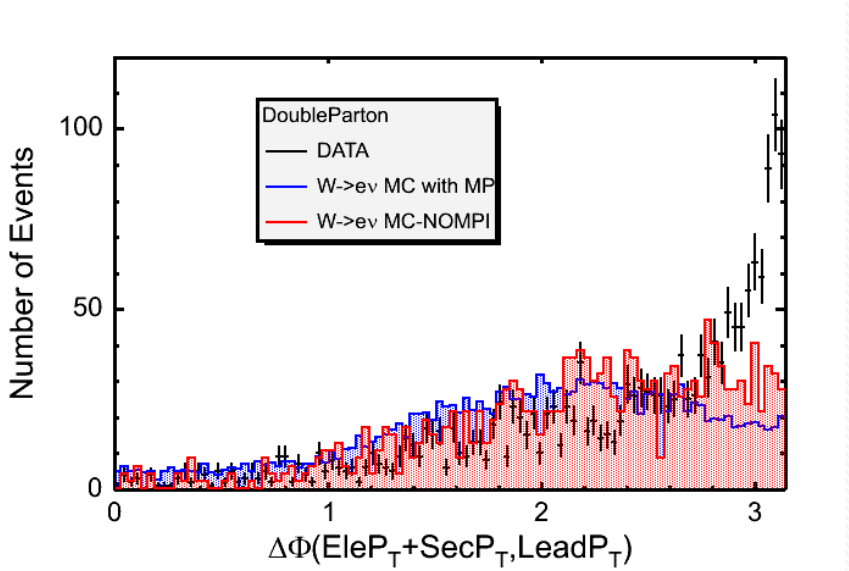
- REGION III -Δφ(Leading,Second) [2.5-PI] radians

Δϕ(Leading,Second) [2.5-PI] radians

Δϕ(Electron+Leading,Second)



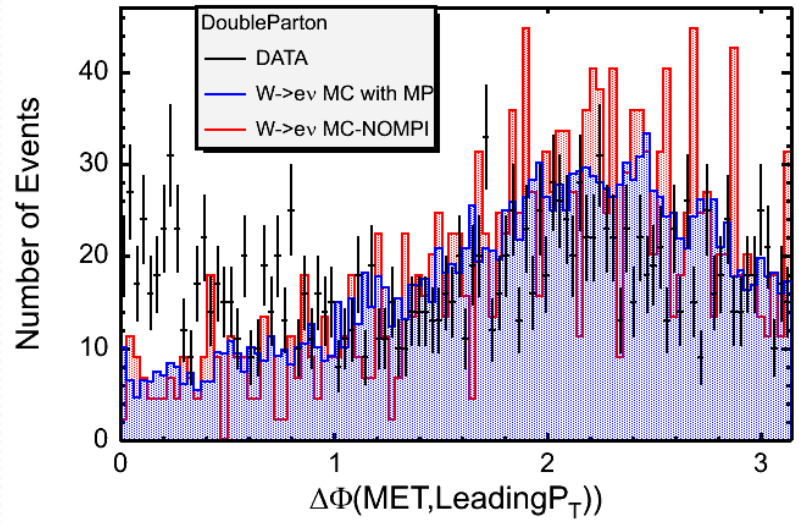
Δϕ(Electron+Second,Leading)



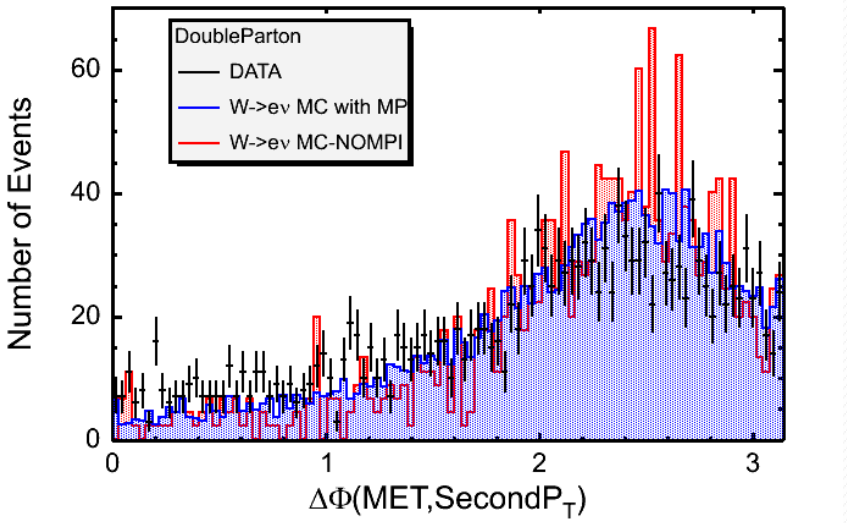
- REGION III -Δφ(Leading,Second) [2.5-PI] radians

Δϕ(Leading,Second) [2.5-PI] radians

Δϕ(Leading,Second)



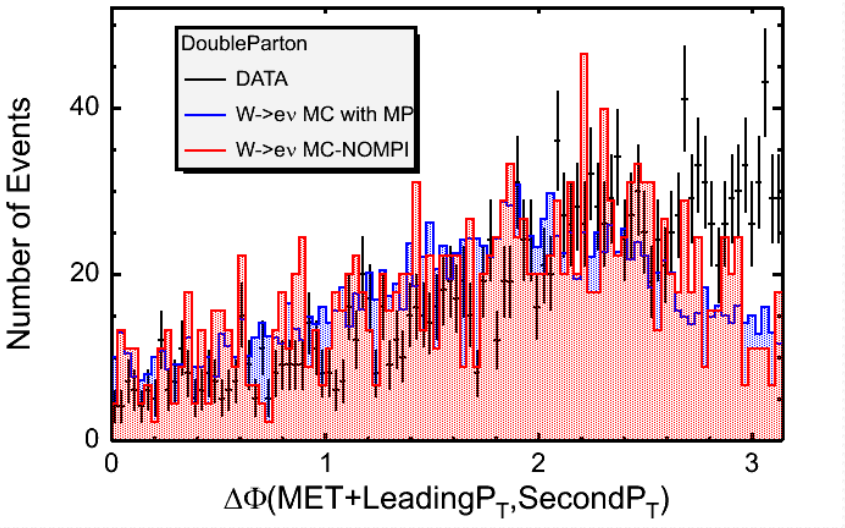
Δϕ(Electron,MET)



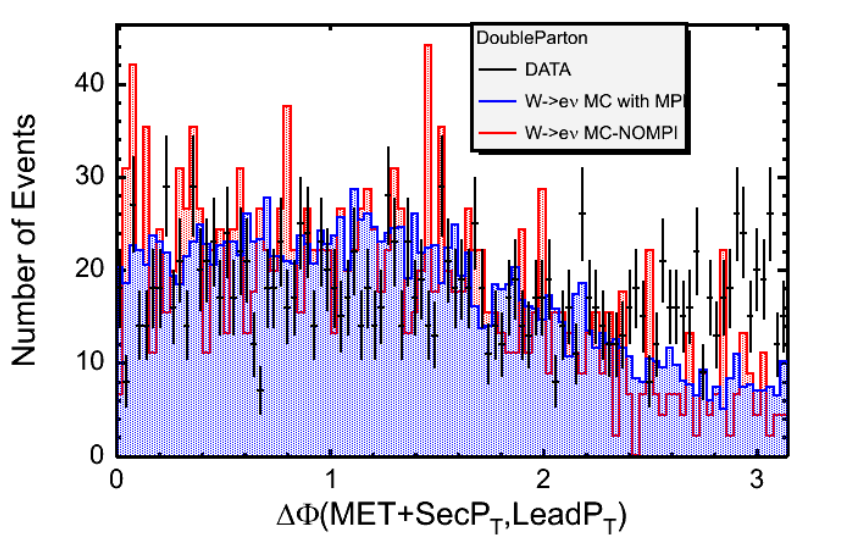
- REGION III -Δφ(Leading,Second) [2.5-PI] radians

Δϕ(Leading,Second) [2.5-PI] radians

Δϕ(MET+Leading,Second)



Δϕ(MET+Second,Leading)



- REGION III -Δφ(Leading,Second) [2.5-PI] radians

Still To Come…..

- Plots Leading upto this Talk
  1. Electron Track Variable Plots
  2. Electron Track Z Error VS Electron Track Variable Plots
  3. Jet Track Variable Plots
  4. Jet Track Z Error VS Electron Track Variable Plots
- Plots Leading upto this Talk
  1. ΔZ(Jet-Track)
  2. Reason for 0.04 cm cut
  3. Extrapolating to the Calorimeter Plots

Still To Come……

- SAME SET OF ABOVE PLOTS but ASK for ONLY TWO Jets instead of ≥ 2
- SAME SET OF ABOVE PLOTS for Number of JETS ≥ 3
- SAME SET OF ABOVE PLOTS BUT Look at the Region OUTSIDE the CORE ie ΔZ(Electron Track,Leading) >0.04 cm AND ΔZ(Electron Track,Second) >0.04 cm
- Do the Above for Both ONLY Two Jets AND ≥ 2 Jets