Generator Level Electrons/Neutrinos

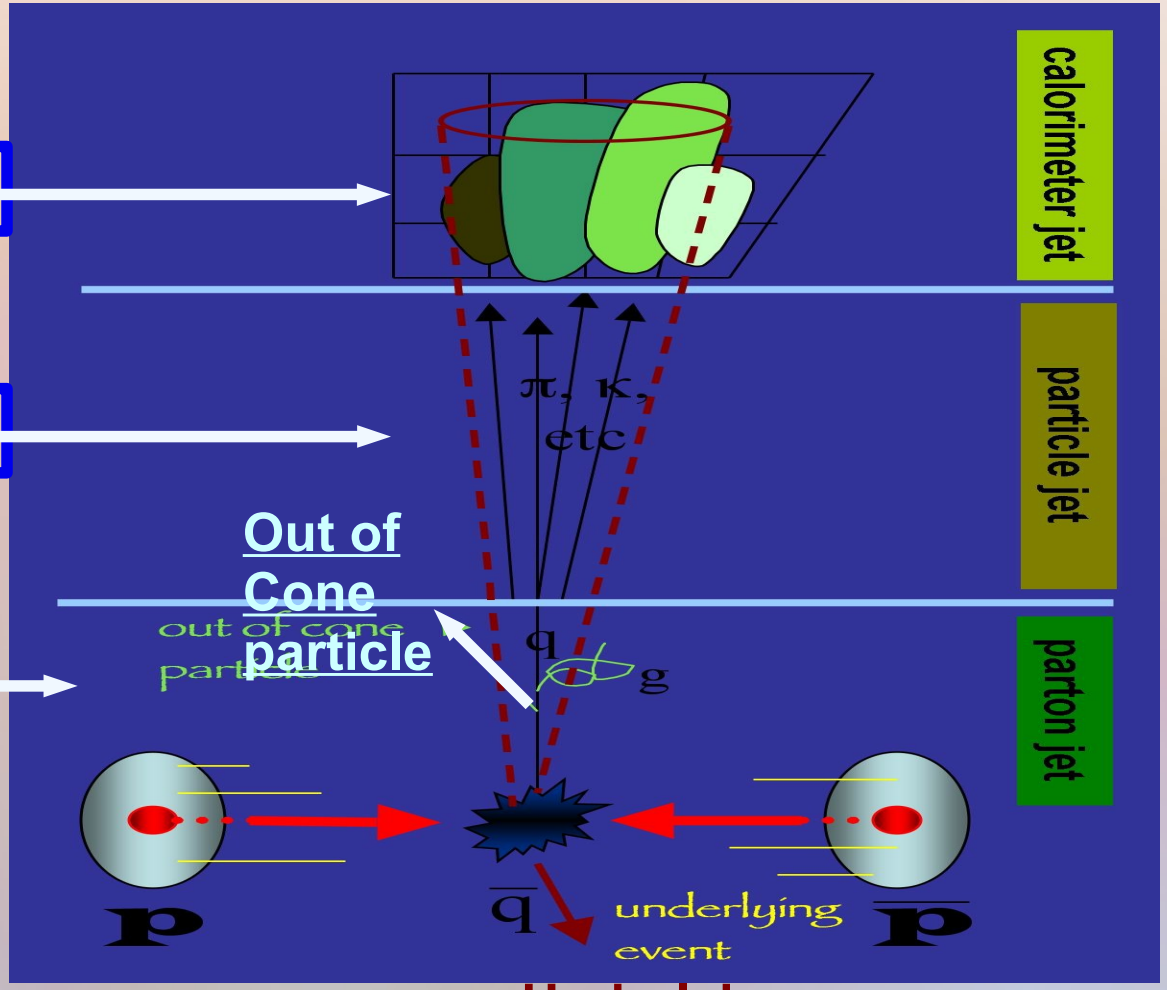
Generated Particles	Selection Cut
Electron or Neutrino ?	PdgCode for Electron=11 PdgCode for Neutrino=12
Are these particles in Final State ?	Status Code =1(implies Electron/Neutrino are in final state)
Are these final state Electrons from a Parent W?	Get the Mother of the Generated Electron and check PdgCode=24 for W
Transverse Energy and η of the Electron ? What about the Neutrino ?	E_T> 20 GeV,|η|<1.0 Collect the Variables Data and apply the cut later on

What are Hadron and Parton Jets ?

CALORIMETER JETS

HADRON JETS

PARTON JETS



Underlying event

Hadron/Parton Jets

Hadron/Parton Jets	Selection Cut
Are they treated similarly at the Ntuple level?	Hadron and Parton Jets are stored as separate Jet Blocks .Need to Loop over both jets jets separatlely
What about Electron Jets ?	Inside the two separate loop for Haron/Parton ,Only allow jets that have ΔR(generated_electron,hadron/parton Jet)>0.7
What about E_T and η cuts ?	E_T> 7 GeV |η|<2.0

Neutrino/W

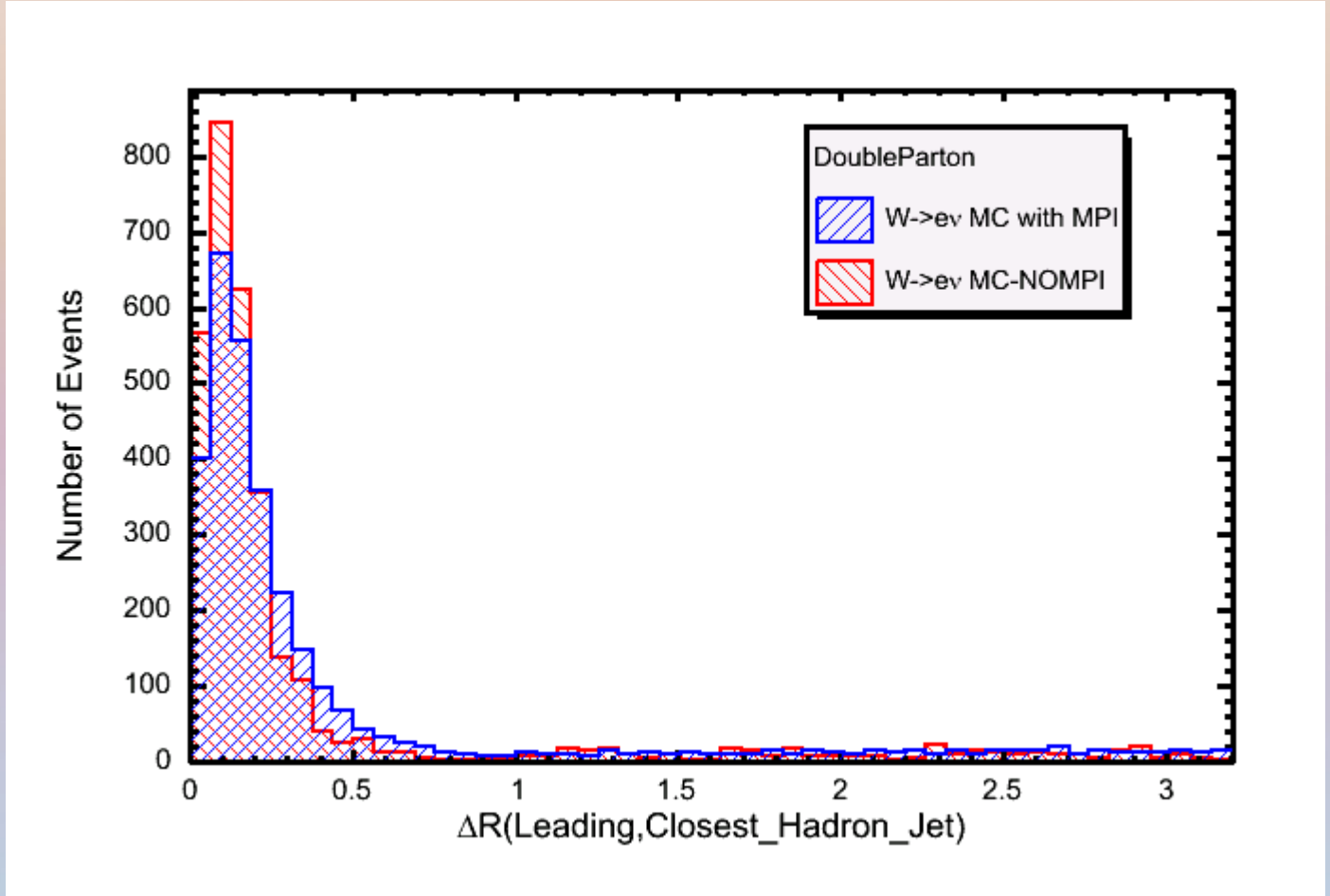
Neutrino/W	Selection Cut
How many generated Electrons can the event have ?	Ask for ONLY ONE generated electron with selection cuts from before
Neutrino E_T	> 30 GeV
W Transverse Mass	>50 GeV
Number of Hadron/Parton Jets	≥2
Number of Tracks in Hadron/Parton Jets	≥2

Hadron-Paron Jet Matching

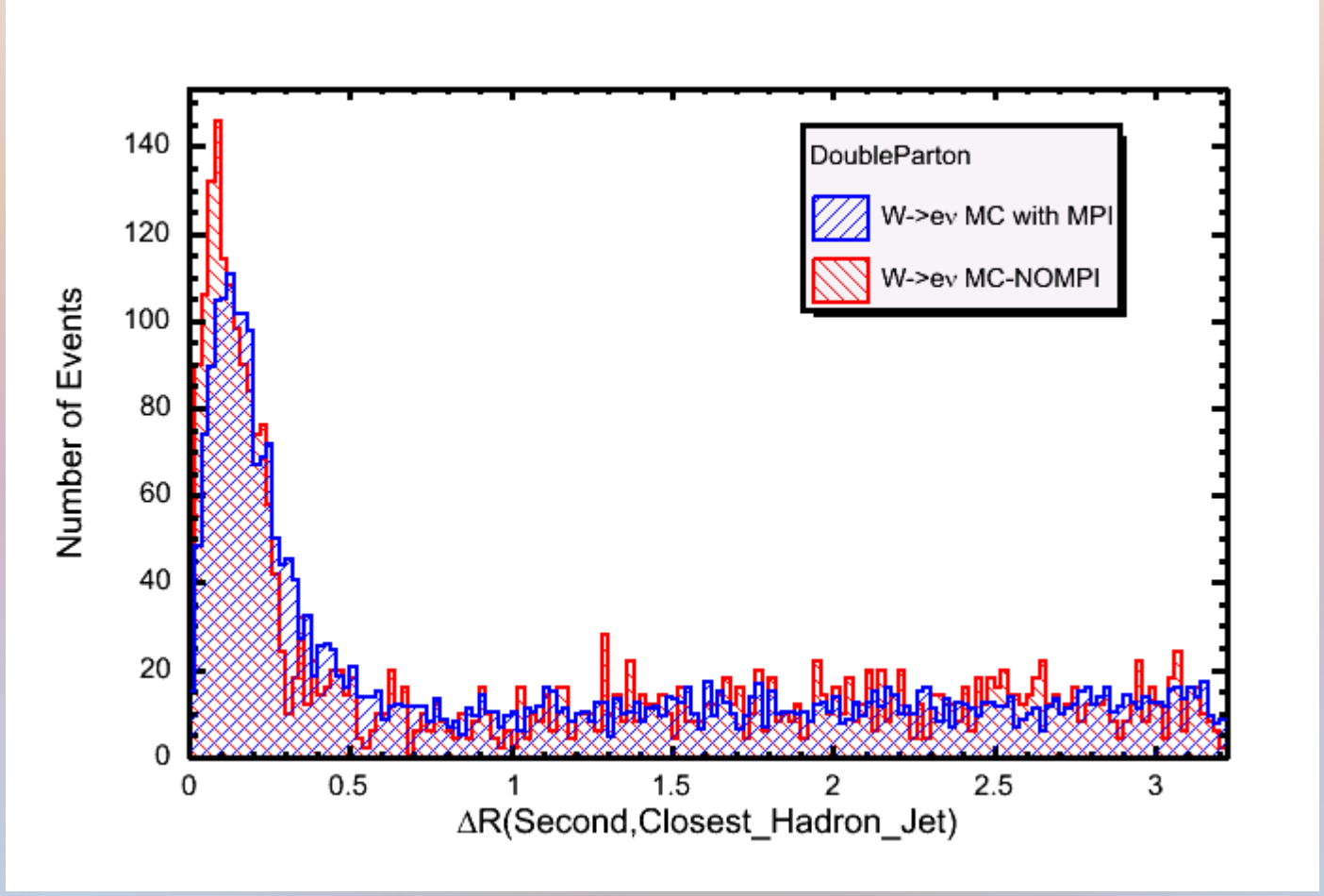
- Loop over the Selected Hadron jets in the outside and Parton jets in a nested loop inside.
- For every Hadron Jet in the Loop calculate the $\Delta\varphi$(Neutrino,Hadron Jet) ,ΔR(Parton,Hadron Jet)
- Select only those which pass
  1. $\Delta\varphi$(Neutrino,Hadron Jet)>0.92
  2. $\Delta\varphi$(Neutrino,Electron)>0.92
  3. ΔR(Parton,Hadron Jet)<0.7

All Jets Plots from so on are Matched Hadron Jets

|ΔZ(Electron,Leading)|<0.04 cm,|ΔZ(Electron,Leading)|<0.04 cm|ΔZ(Electron,Leading)|<0.04 cm, Δφ(MET,Electron)>2.5 AND Number of Matched Hadron Jets ≥1



|ΔZ(Electron,Leading)|<0.04 cm,|ΔZ(Electron,Leading)|<0.04 cm|ΔZ(Electron,Leading)|<0.04 cm, Δφ(MET,Electron)>2.5 AND Number of Matched Hadron Jets ≥1



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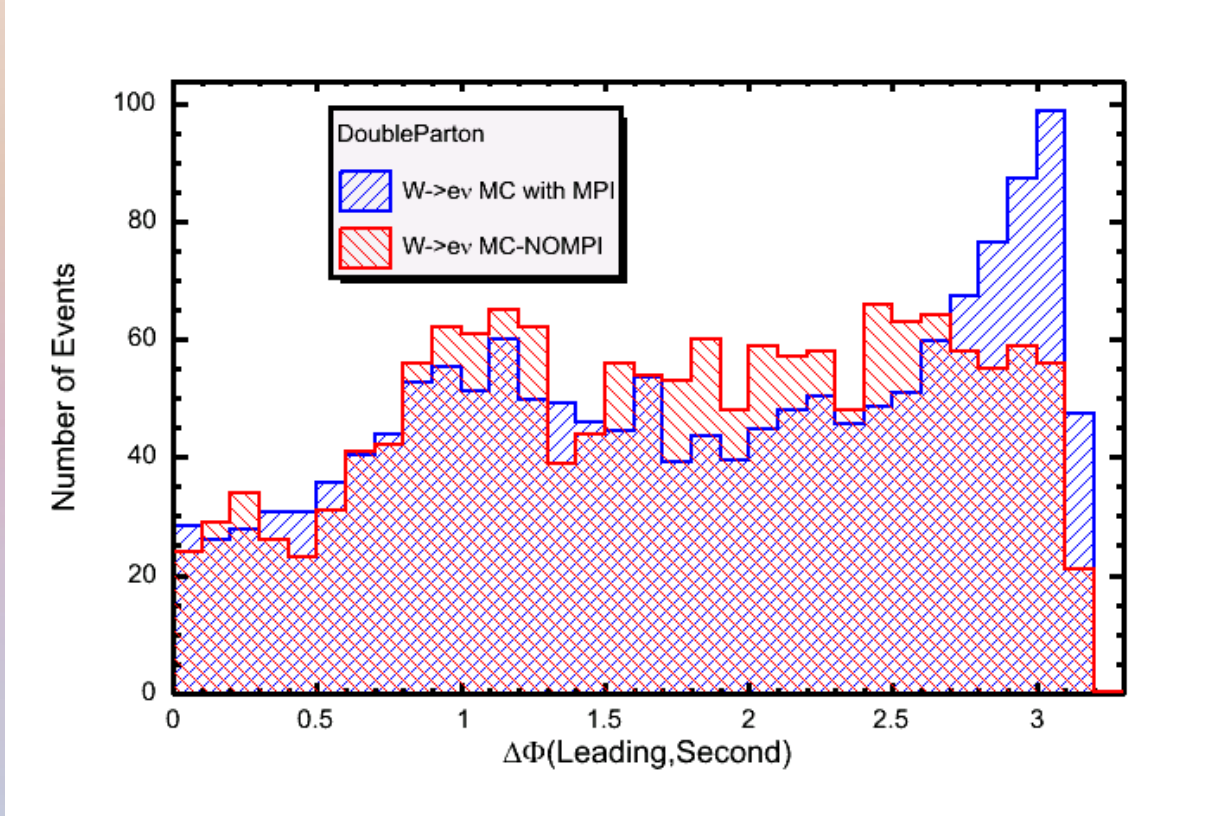

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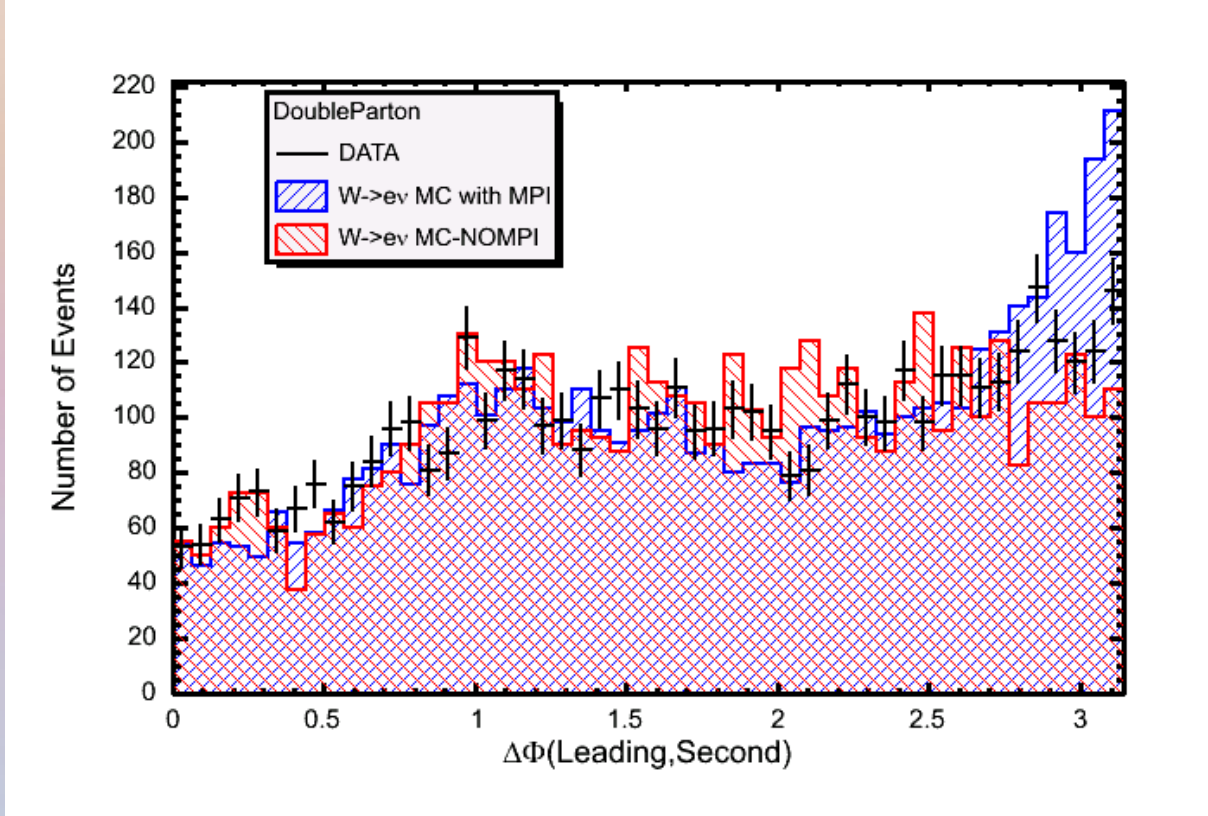

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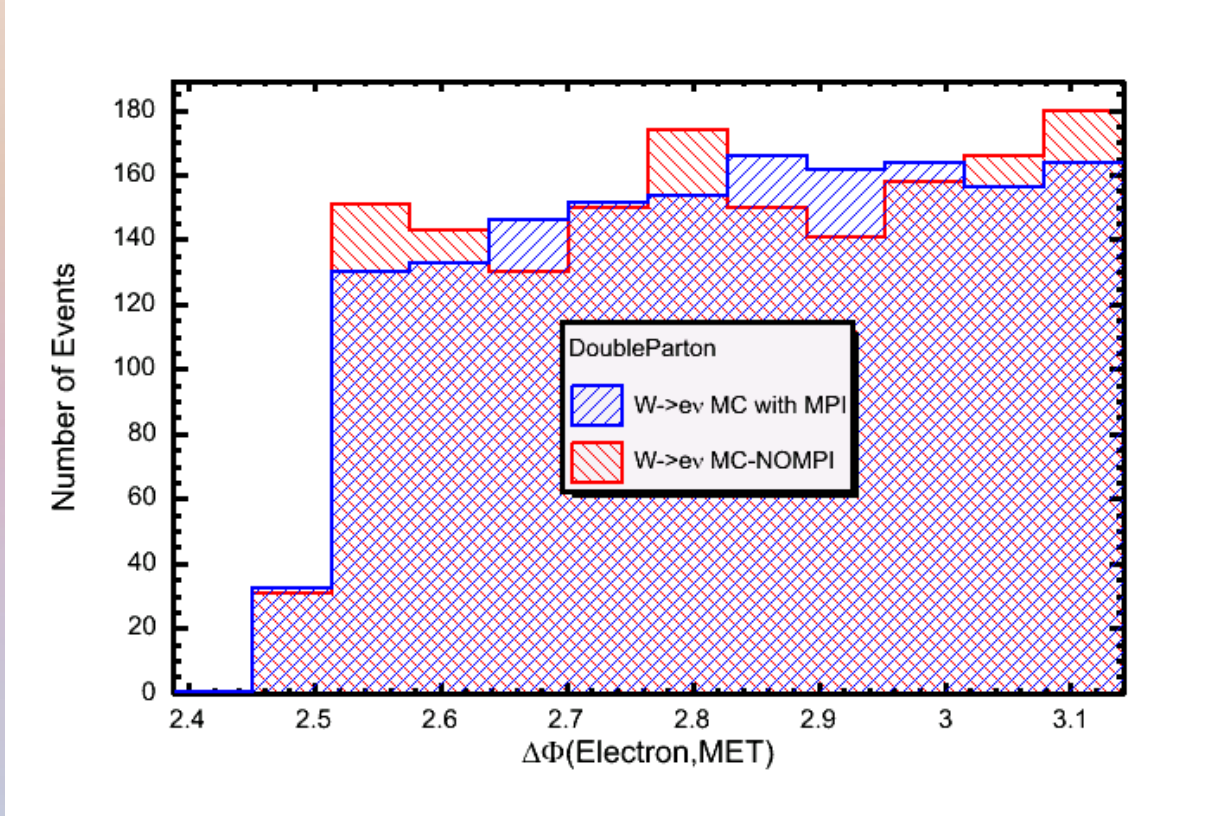
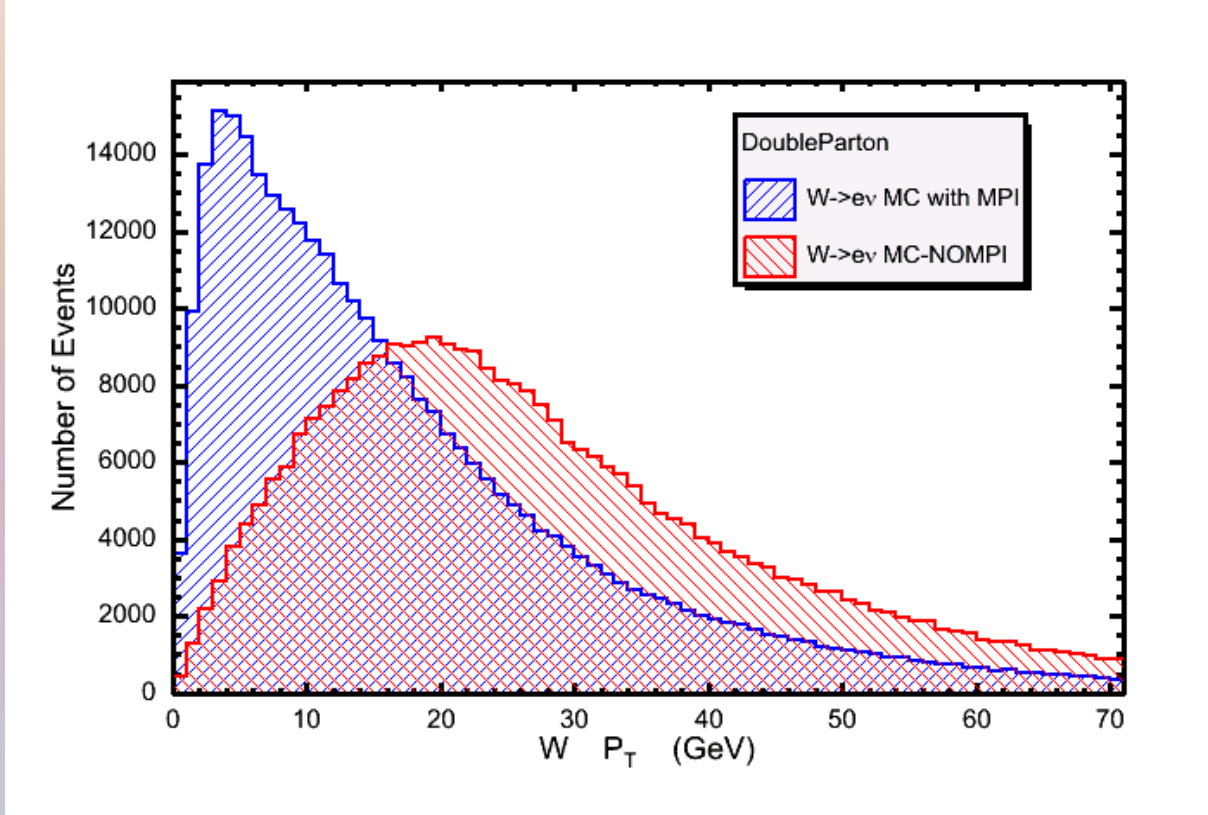
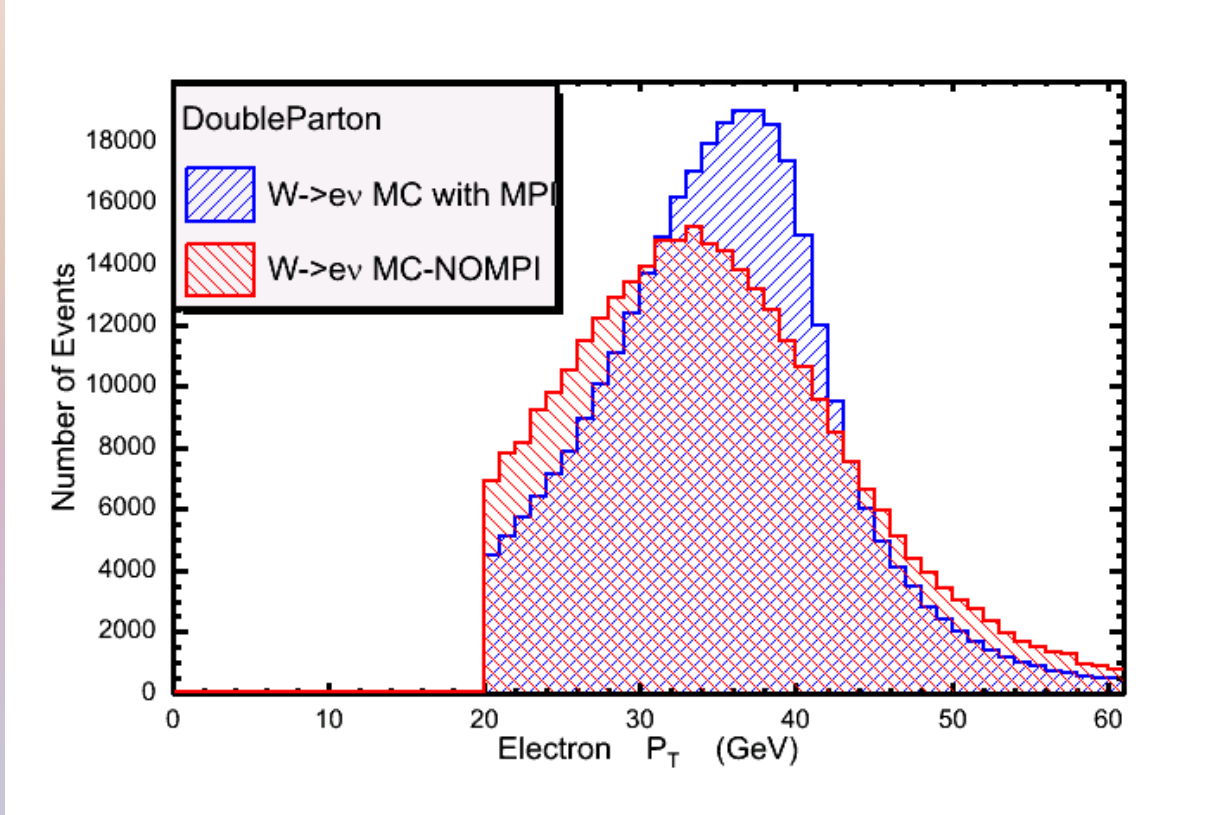


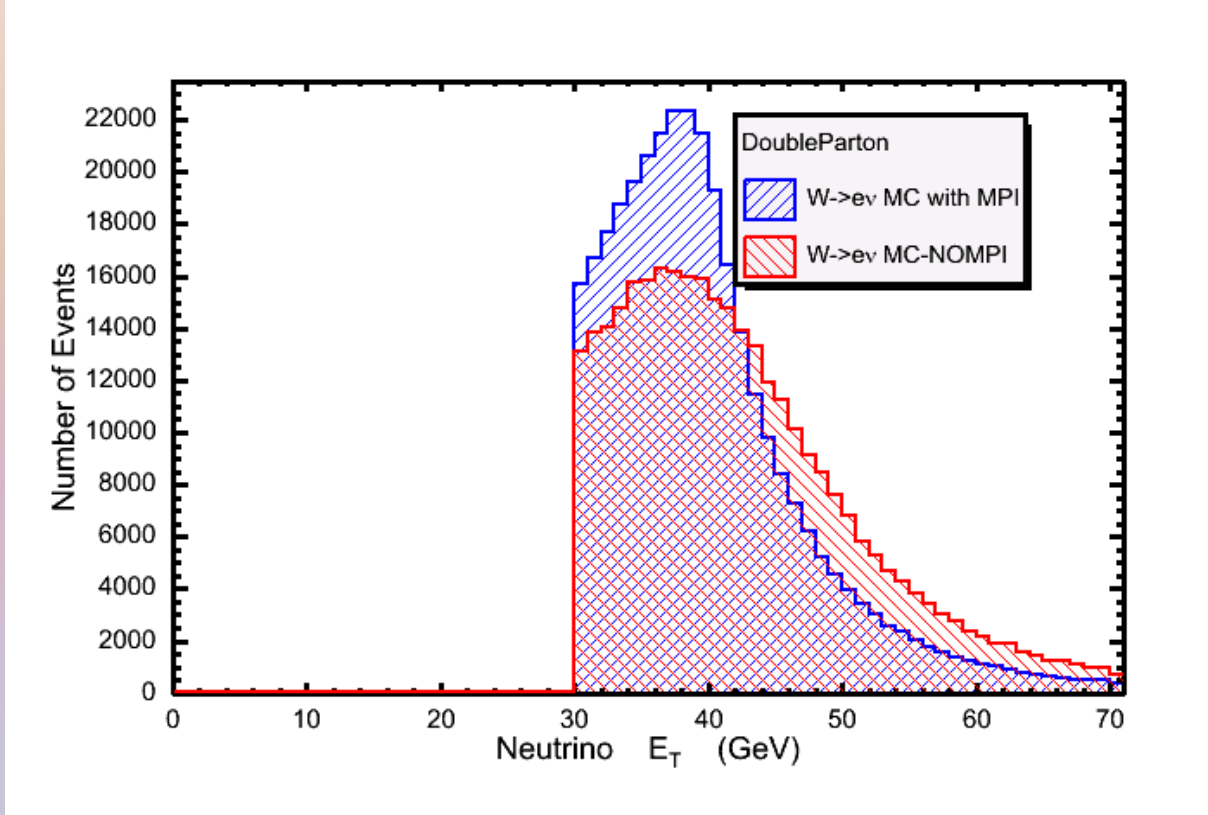
W P_T


DoubleParton
W->ev MC with MPI
W->ev MC-NOMPI
Number of Events
0
2000
4000
6000
8000
10000
12000
14000
0
10
20
30
40
50
60
70
W P_T (GeV)

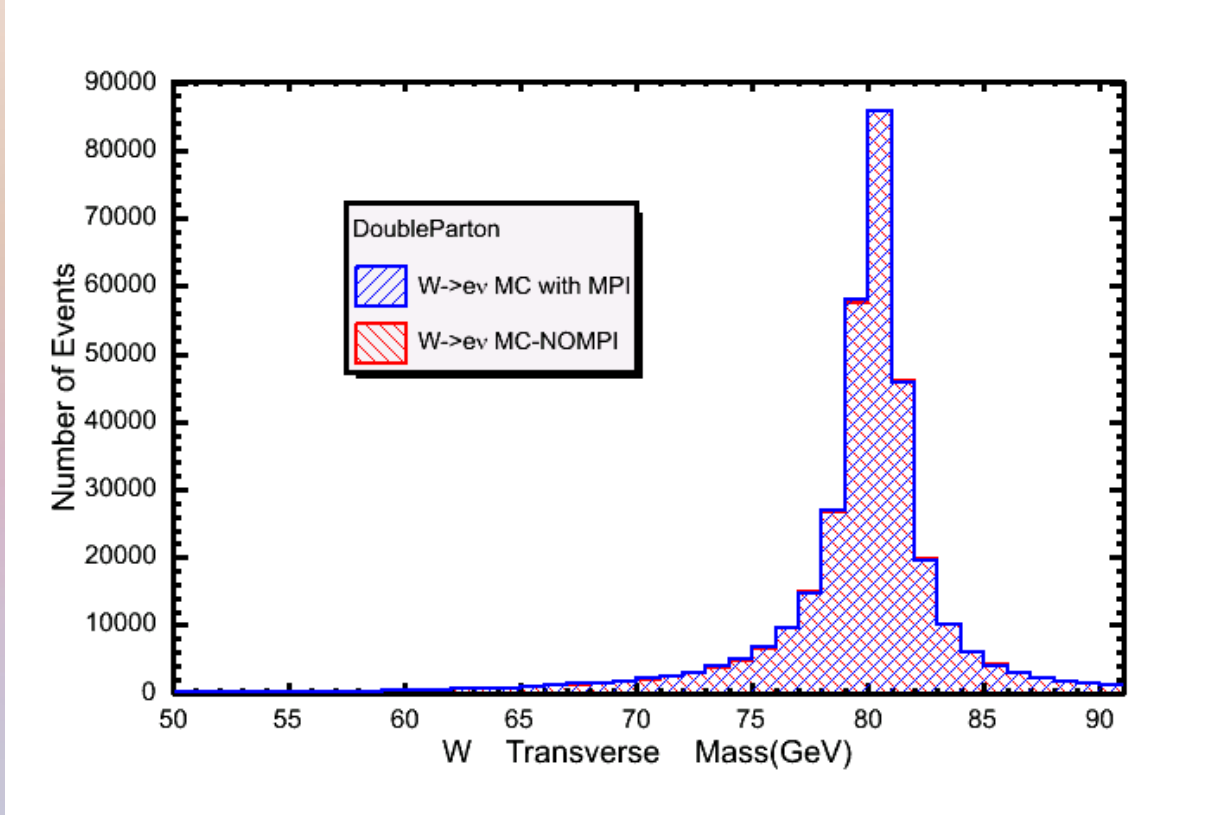
Electron P_T


DoubleParton
W->eν MC with MPI
W->eν MC-NOMPI
Number of Events
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
10
20
30
40
50
60
Electron P_T (GeV)

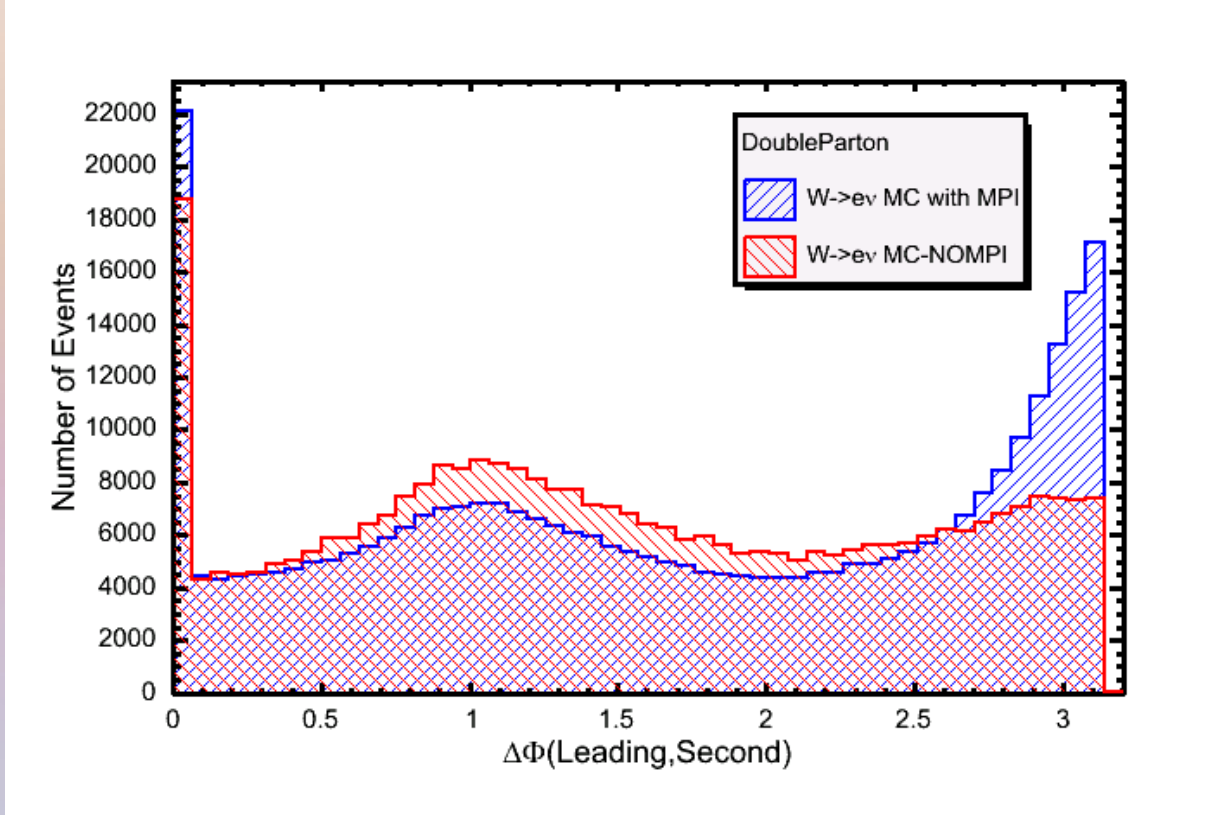
Neutrino E_T


DoubleParton
W->ev MC with MPI
W->ev MC-NOMPI
Number of Events
Neutrino E_T (GeV)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
0
10
20
30
40
50
60
70

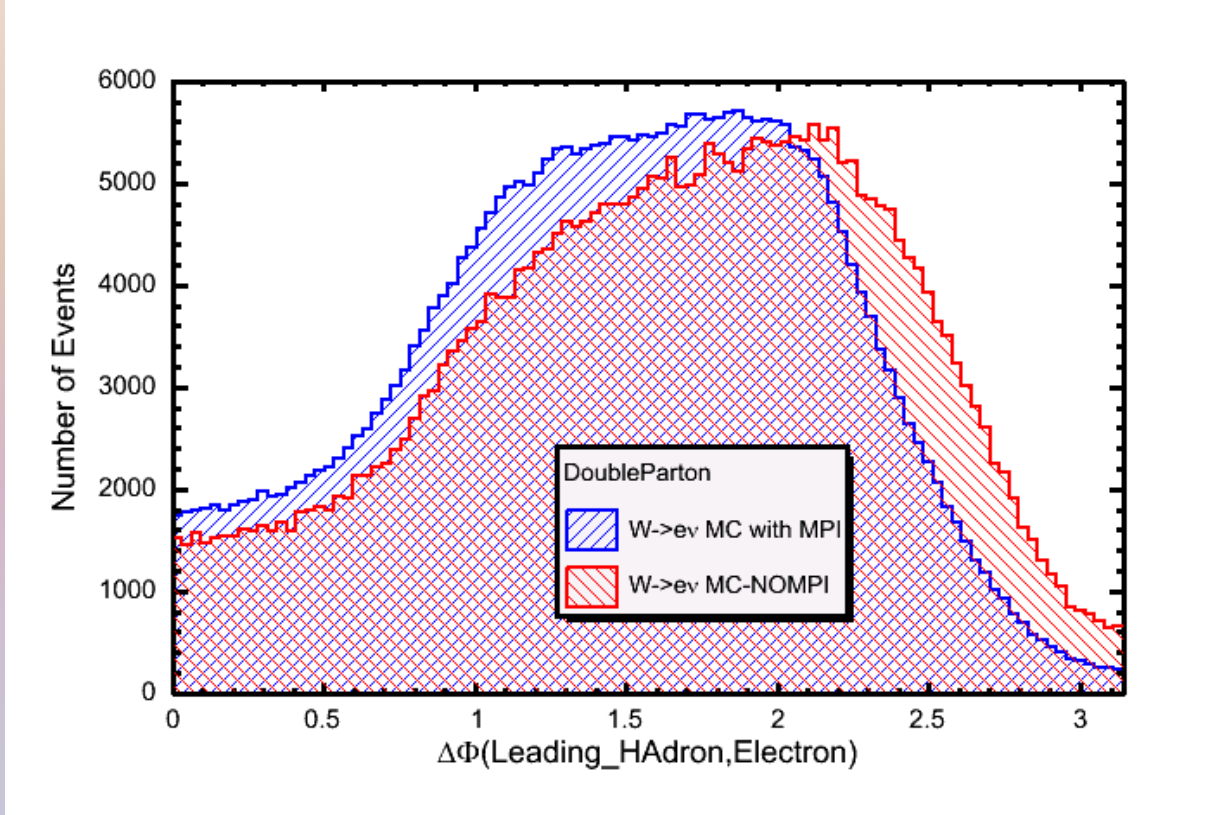
W Transverse Mass



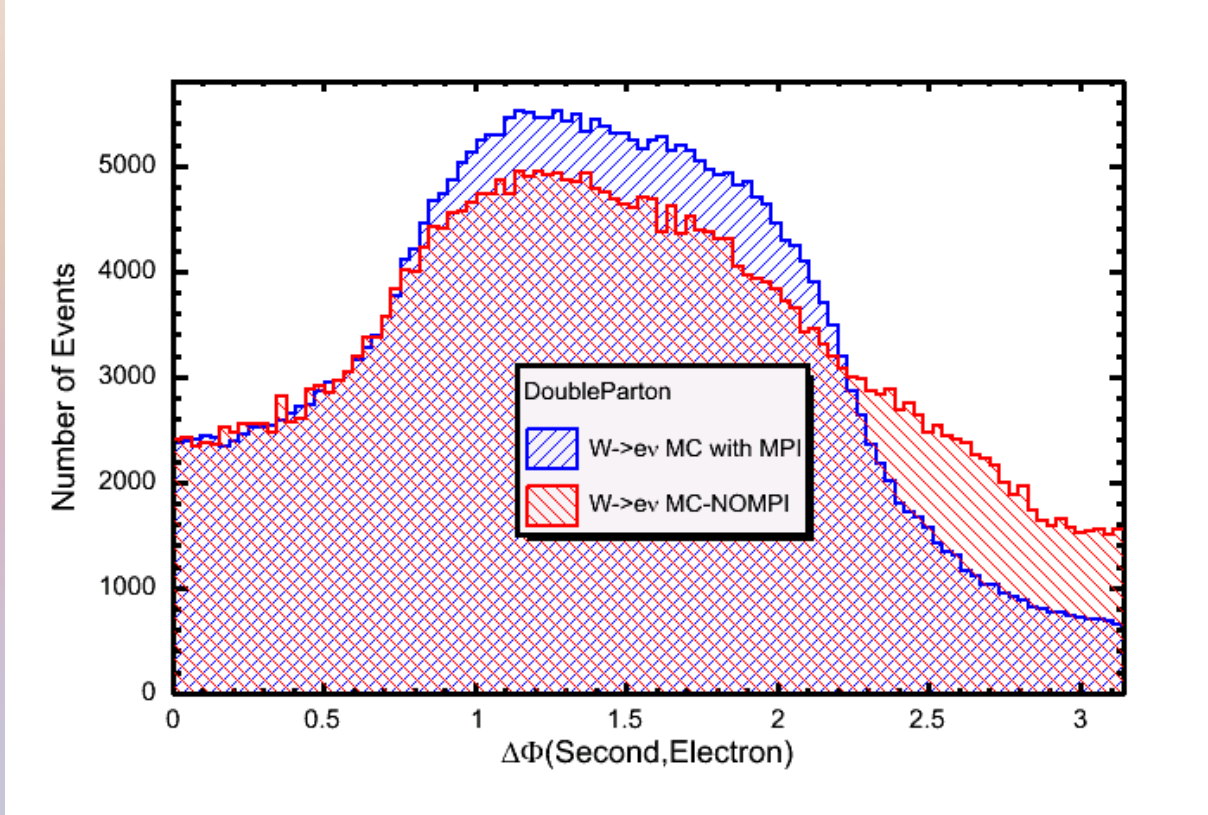
Δφ(Leading_Hadron,Second_Hadron)



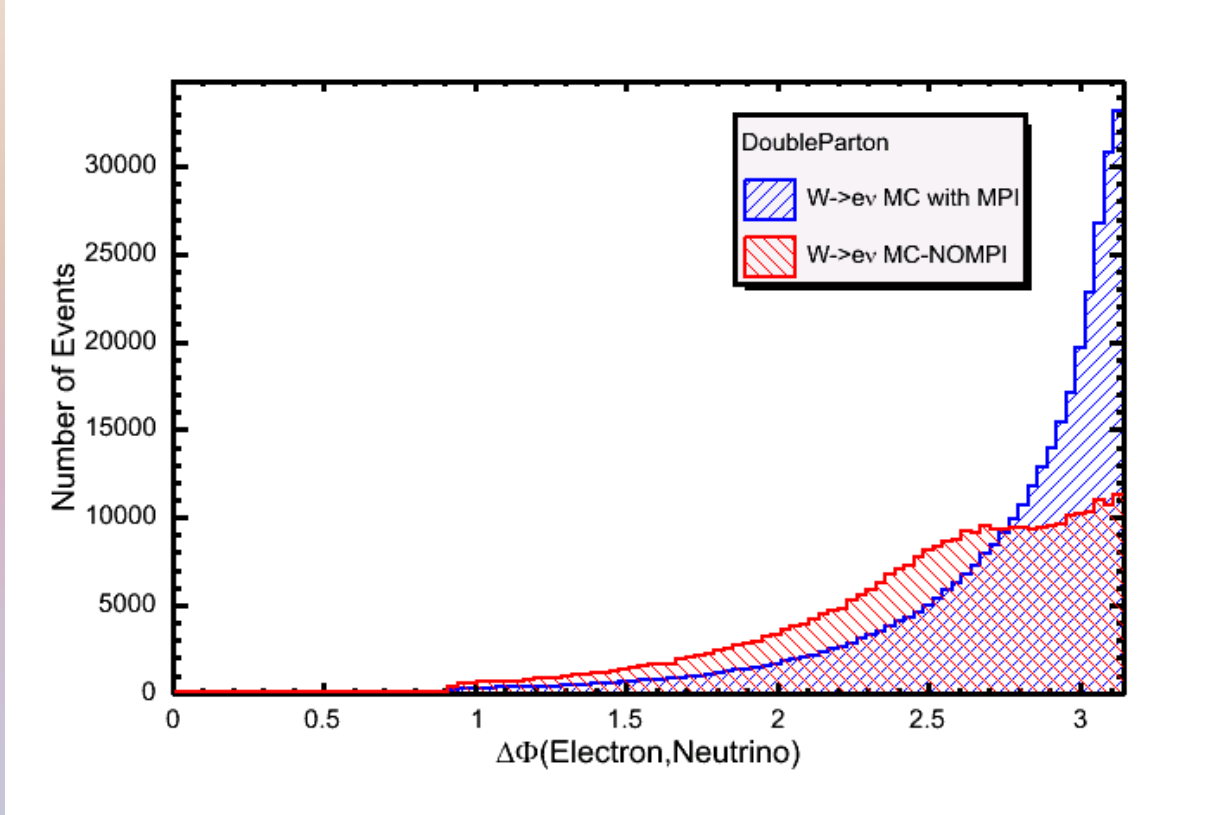
Δφ(Leading_Hadron,Electron)



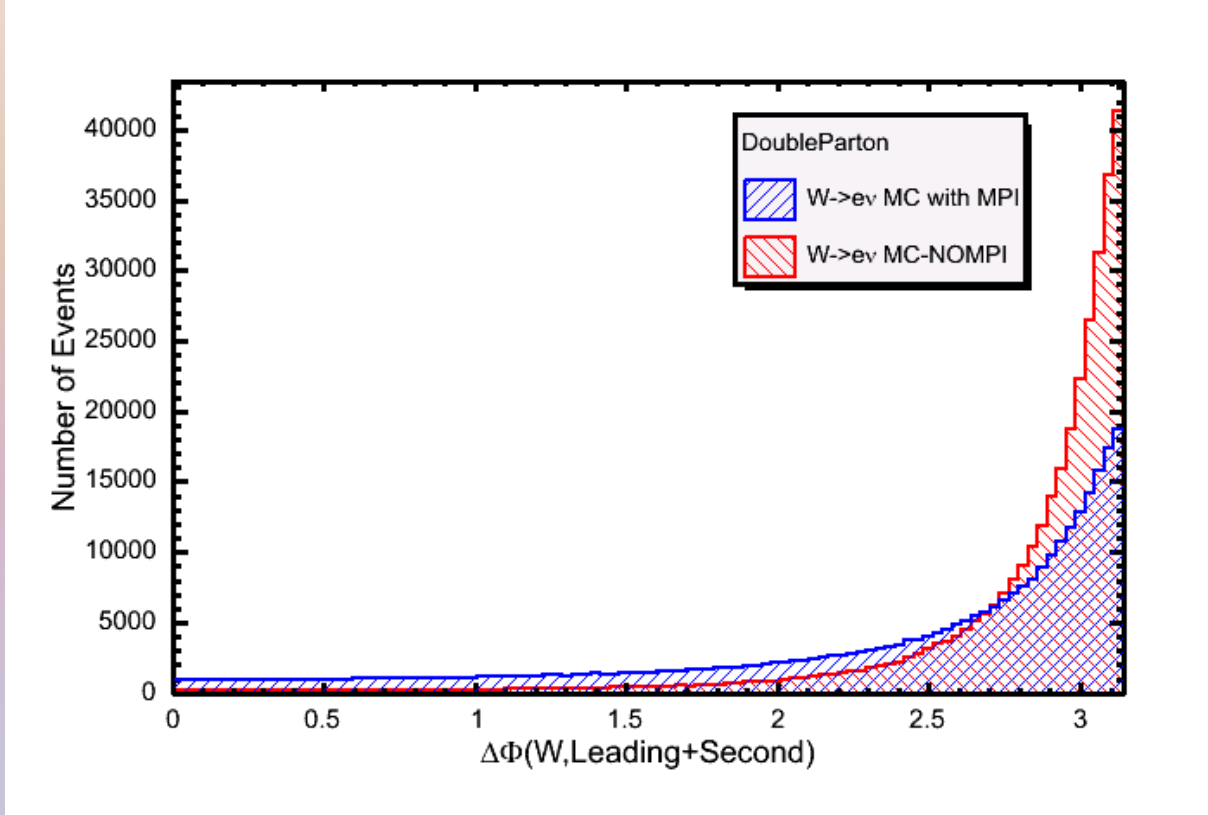
Δφ(Second_Hadron,Electron)



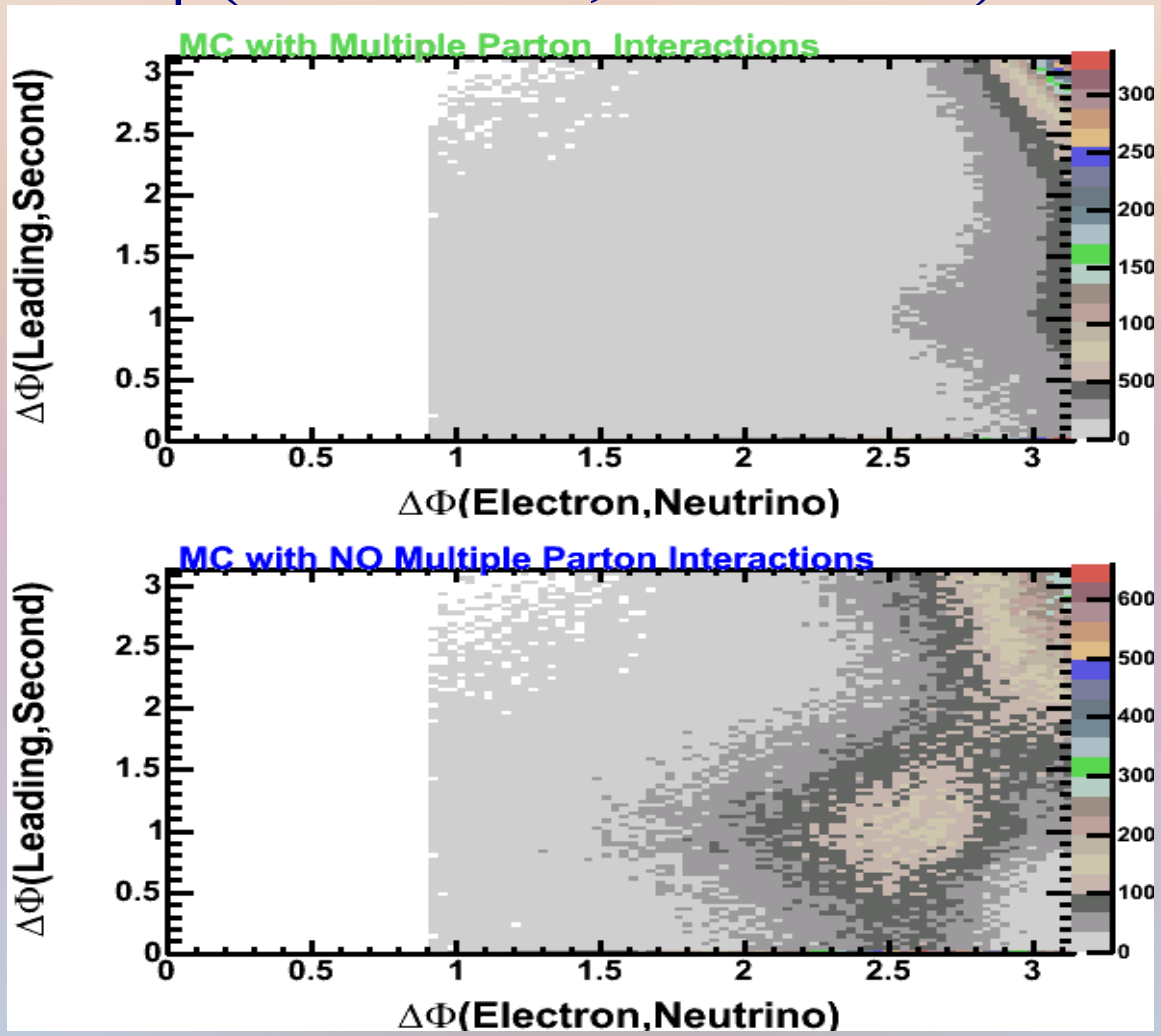
Δφ(Neutrino,Electron)



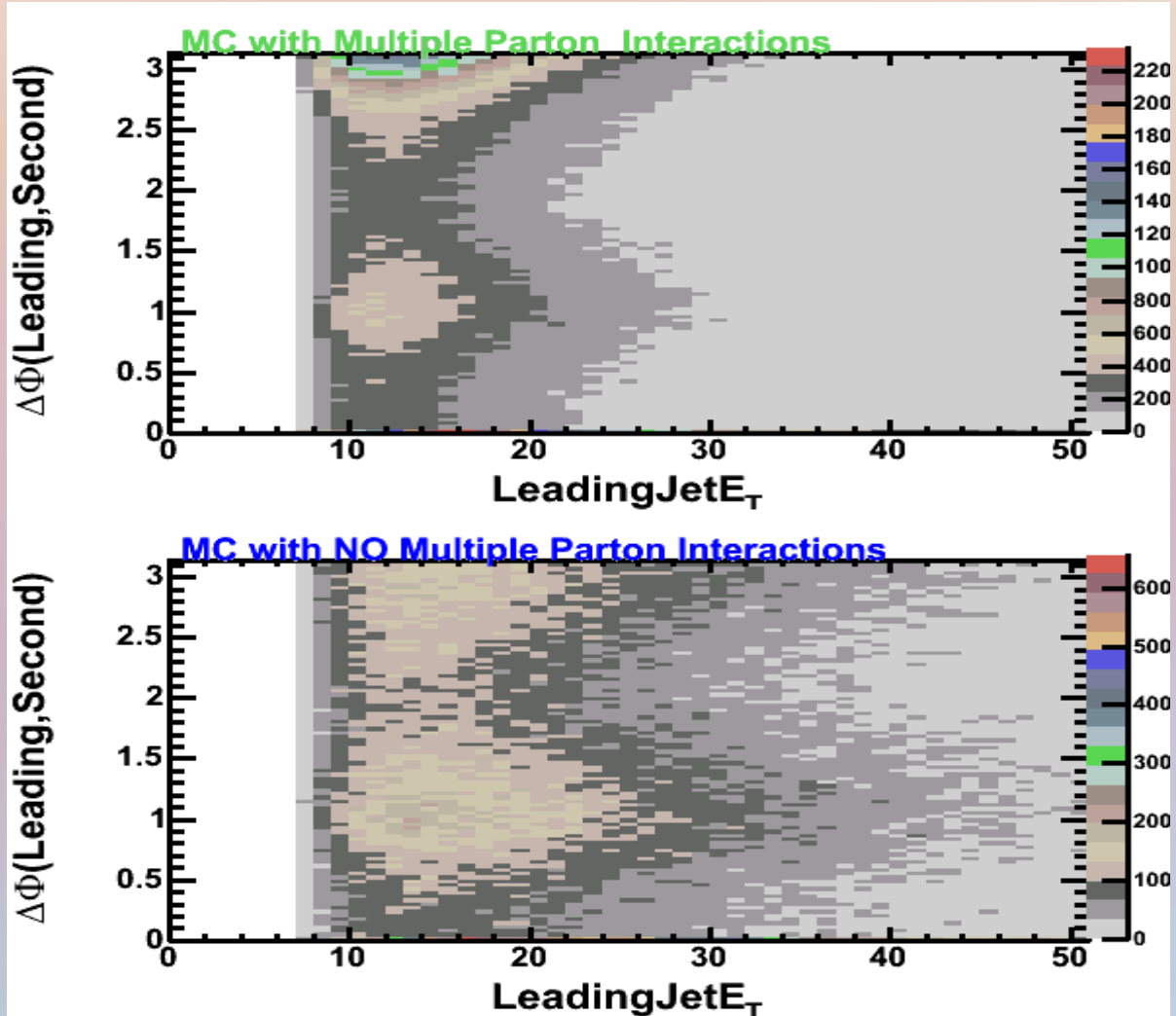
Δφ(Leading_Hadron+Second_Hadron,W)



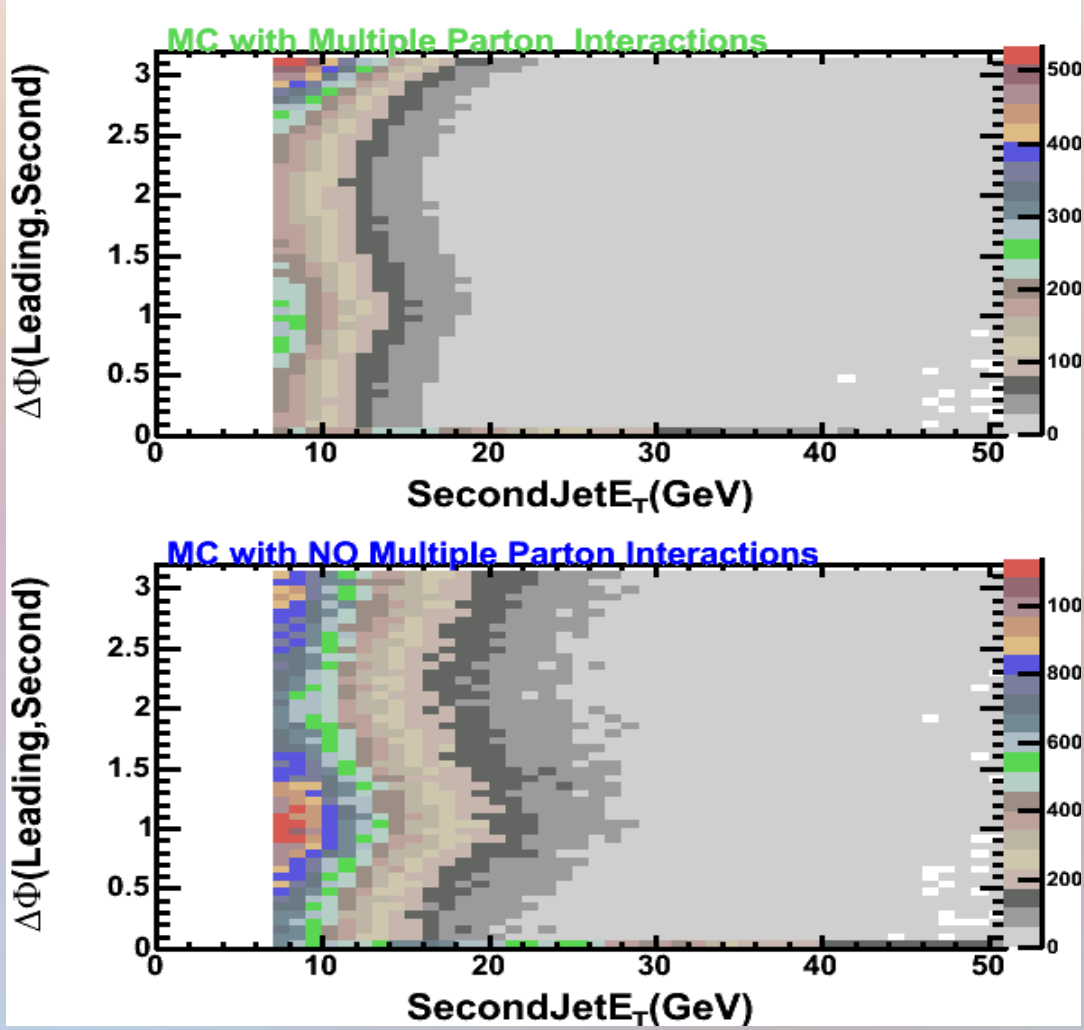
Δφ(Leading_Hadron+Second_Hadron) Vs Δφ(Electron,Neutrino)



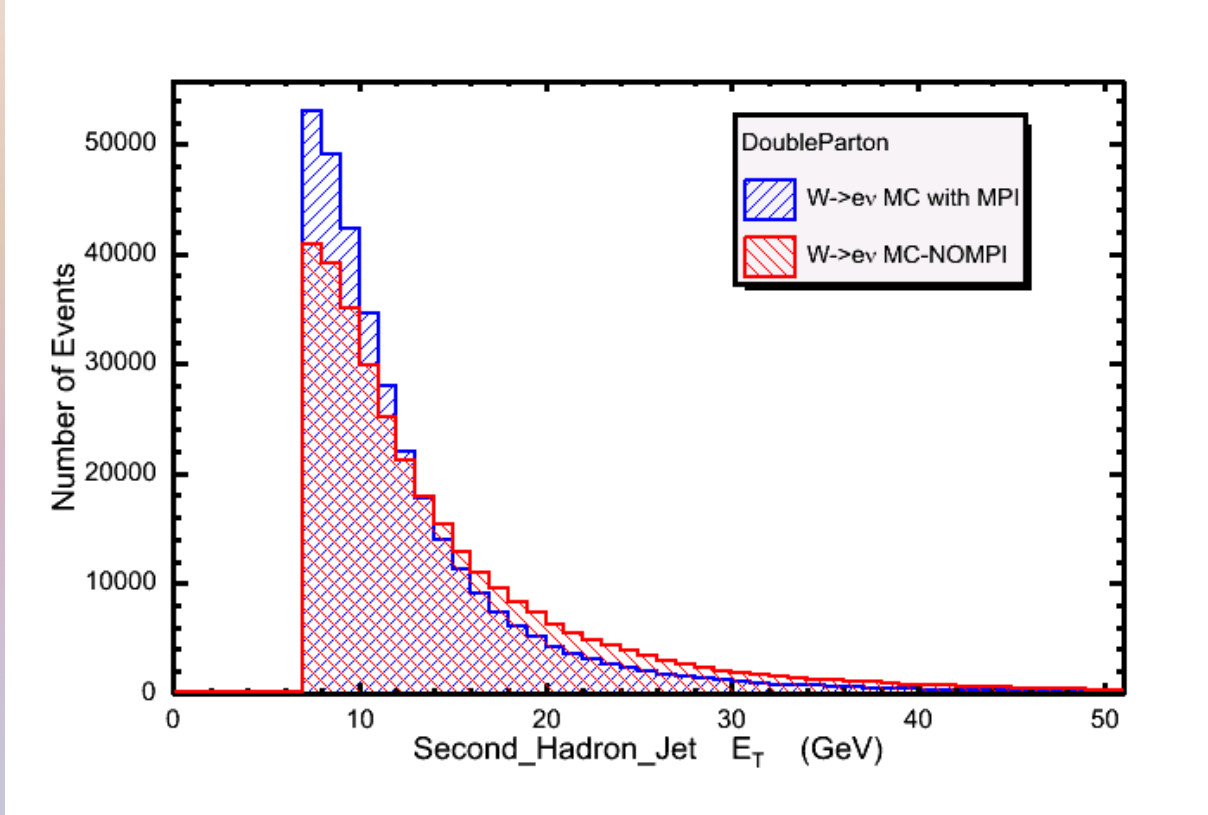
Δφ(Leading_Hadron+Second_Hadron) Vs Leading ET



Δφ(Leading_Hadron+Second_Hadron) Vs Second ET



Second Hadron ET



Leading Hadron ET