Study of Single-W process

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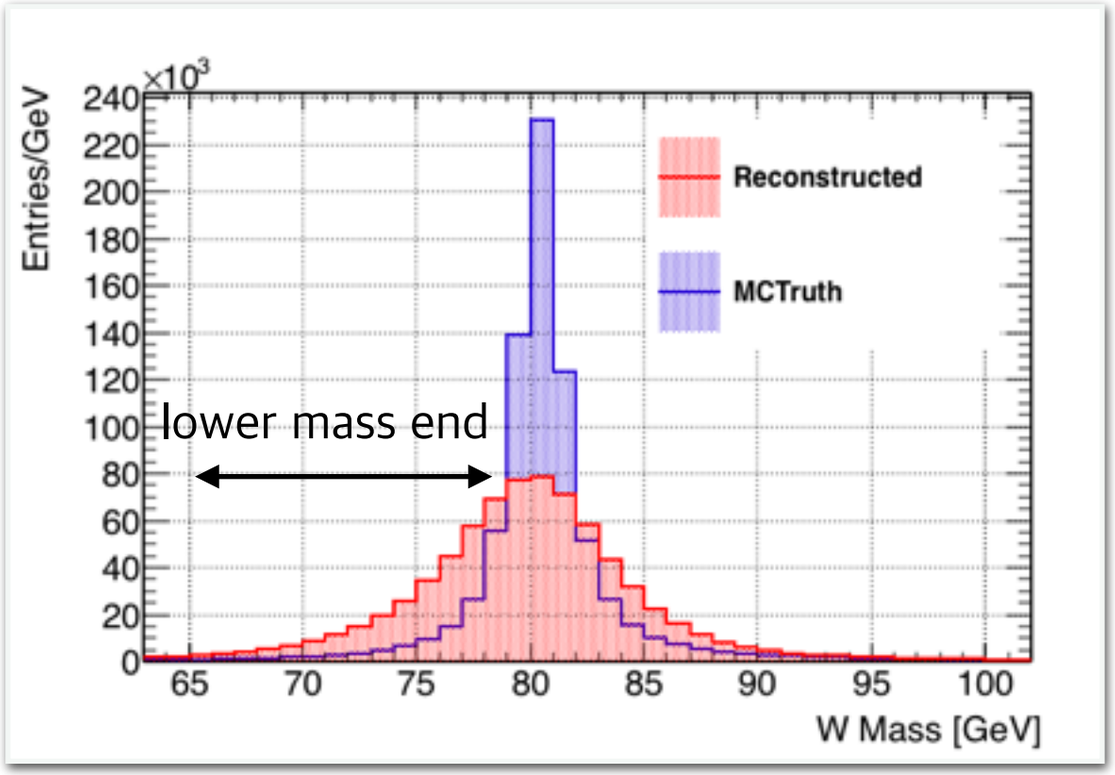
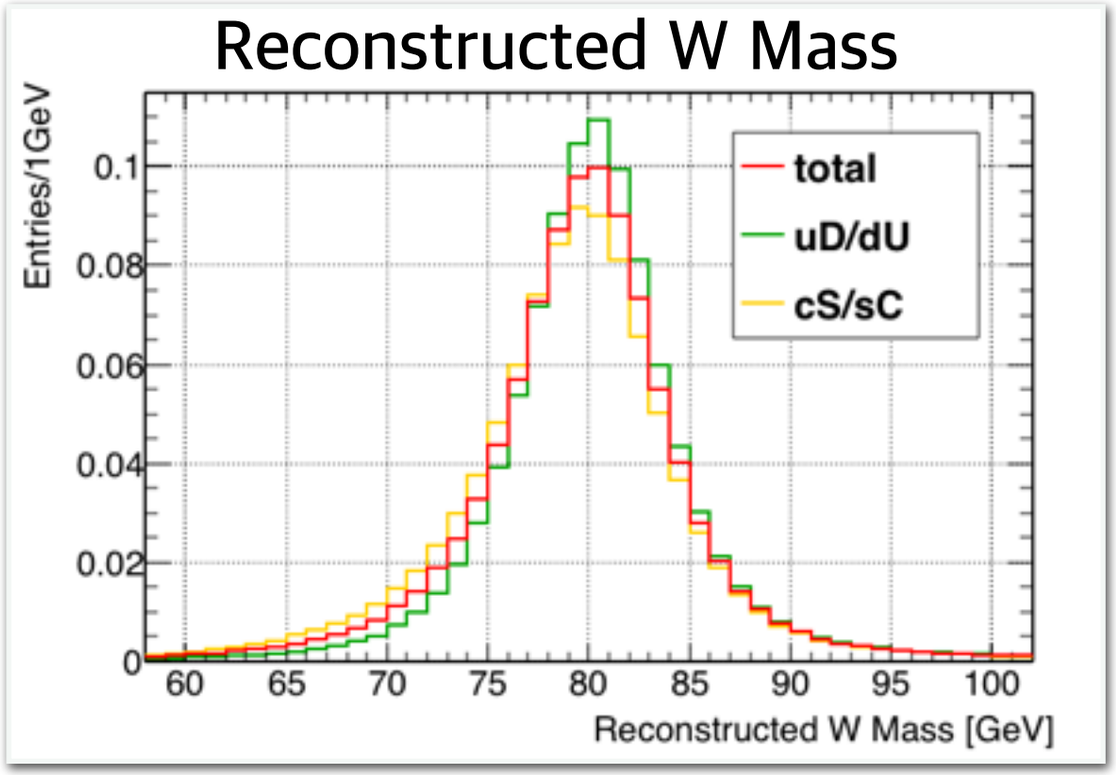
9th, January 2015 :
—> Current status & progress of my study

Status

- I checked the influences of missing neutrinos in jets on W mass reconstruction

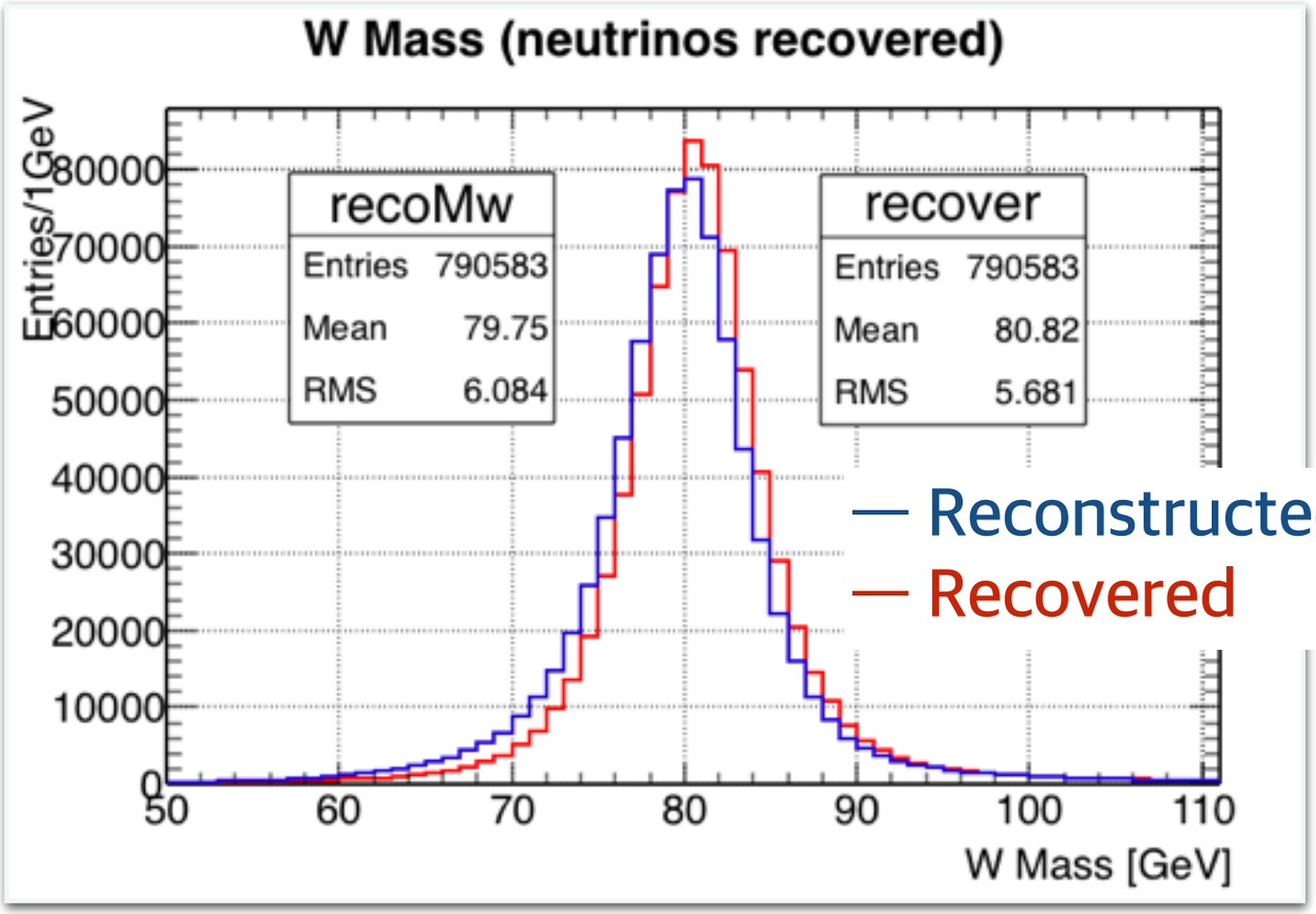
Missing neutrinos





- There can be missing neutrinos in jets.
  - like; c—>sW—>slν
- And this can be main reason that causes asymmetry in lower mass end.

Missing ν effects on m_W



"recovered" means that reconstructed jets include the MC neutrino energies and momenta

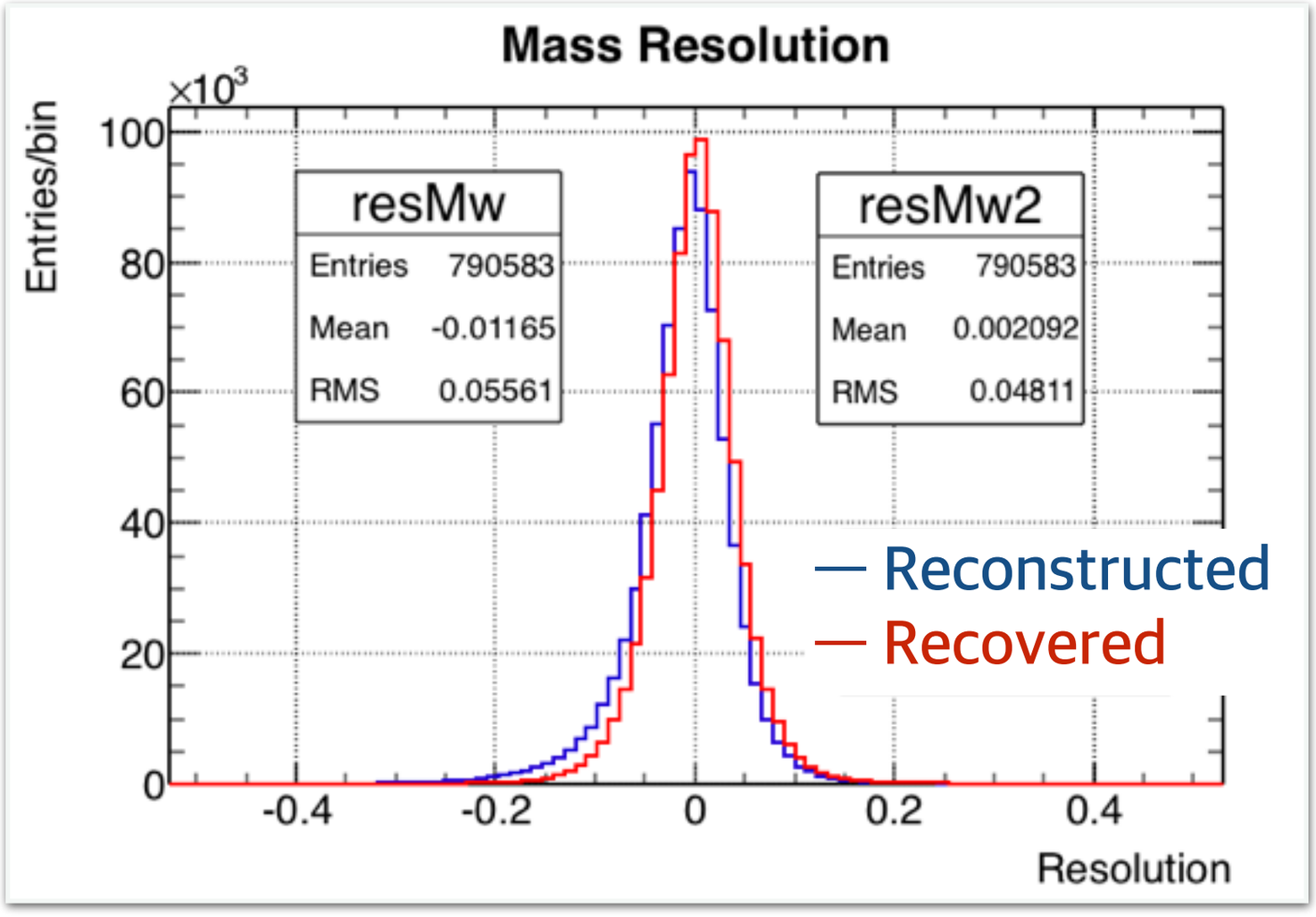
the asymmetry of lower mass side has been suppressed by recovering neutrinos

mean value; 79.75 —> 80.82 (where generator input is 80.5)

Missing ν effects on resolution

$$Mass\ Resolution$$

$$\frac{(Reco) - (MCtrue)}{MCtrue}$$

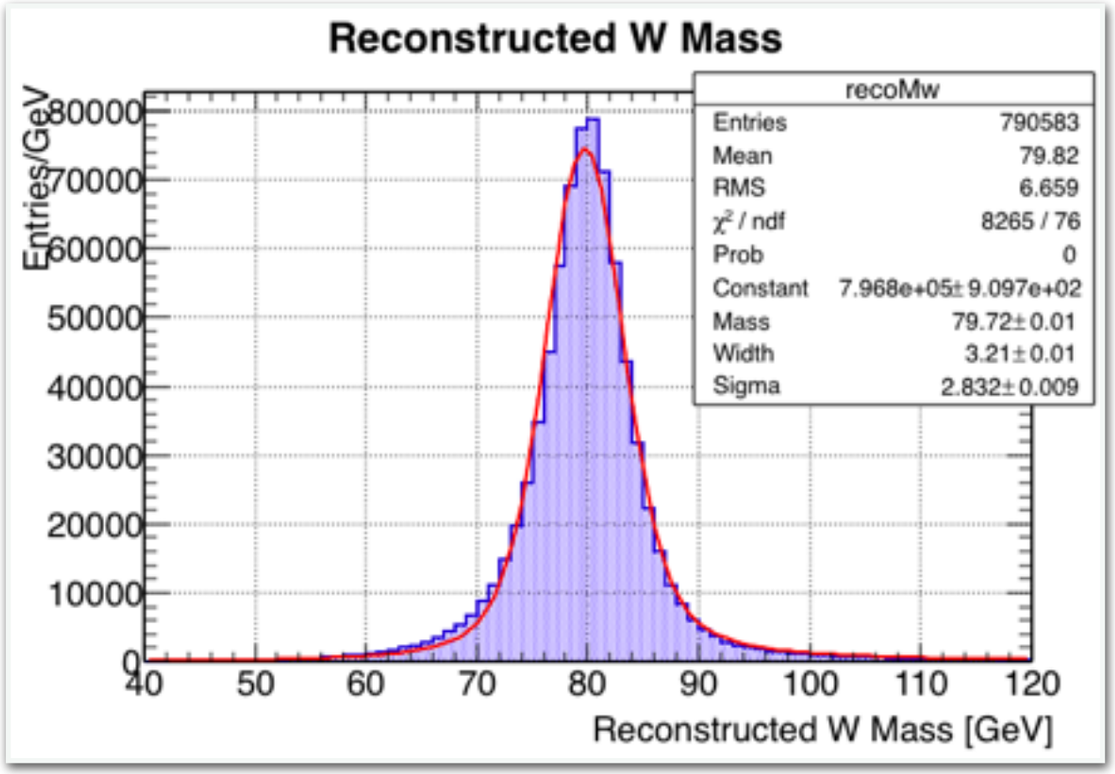


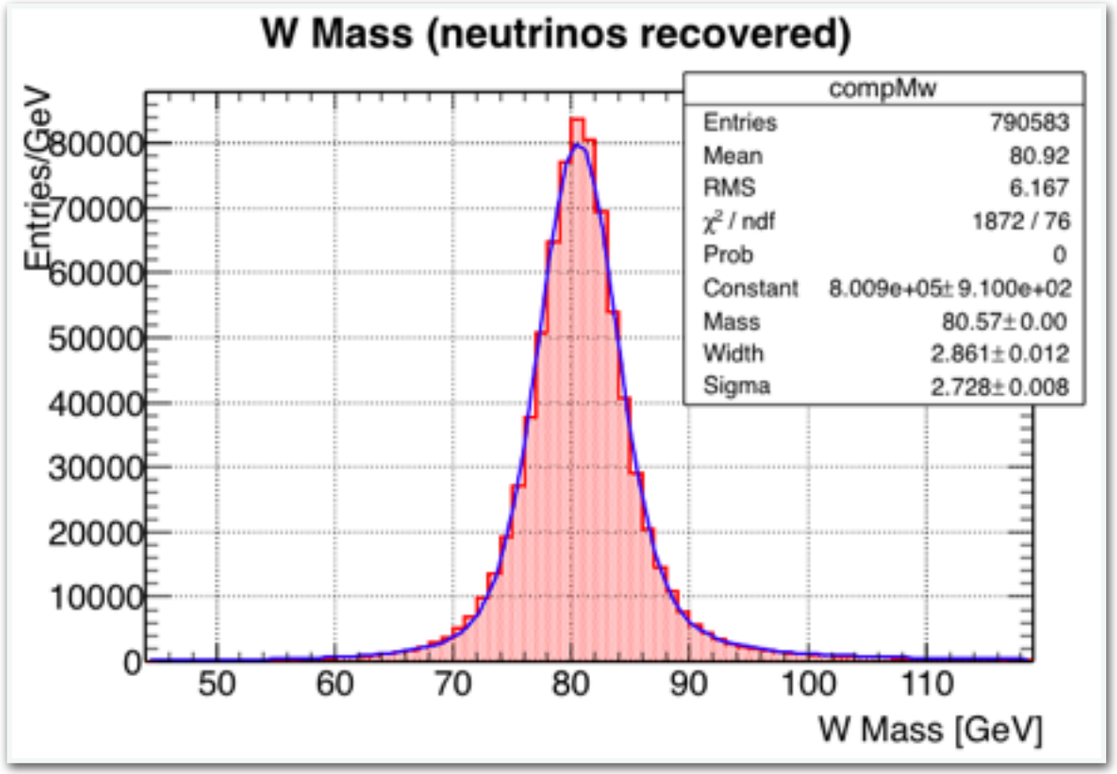
a systematic shift due to the missing neutrino effects is compensated

mean value; -0.012 —> 0.002

RMS value; 0.056 —> 0.048

Fitting



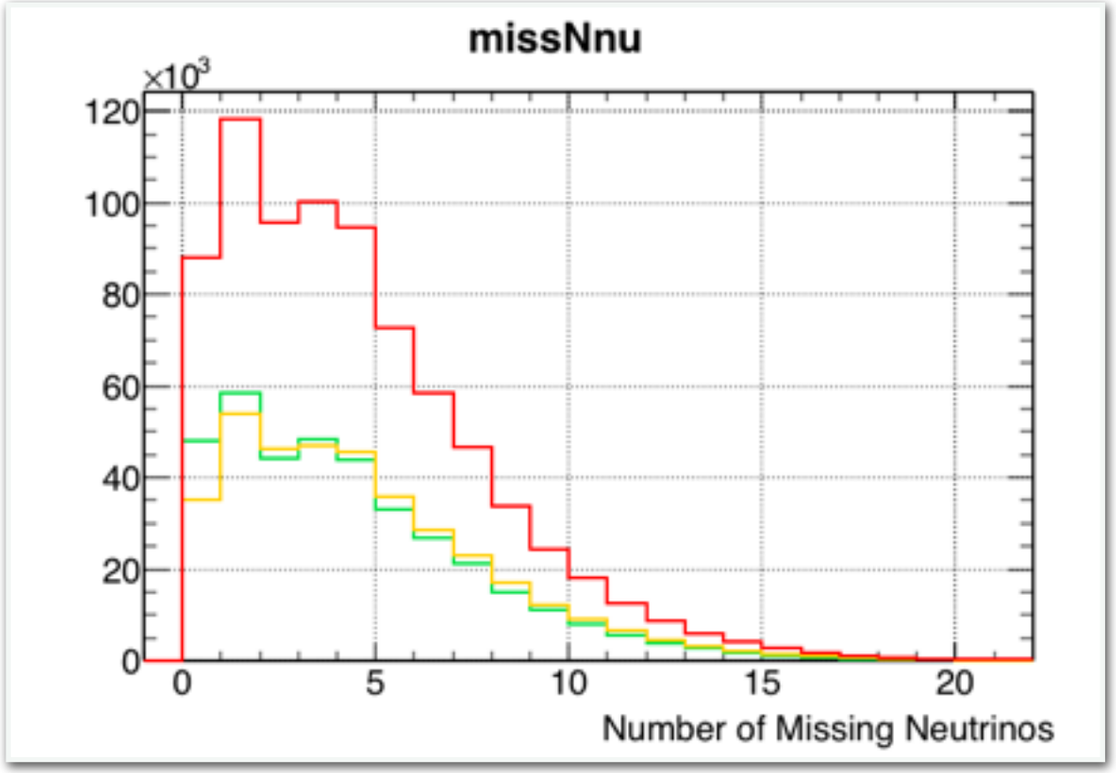


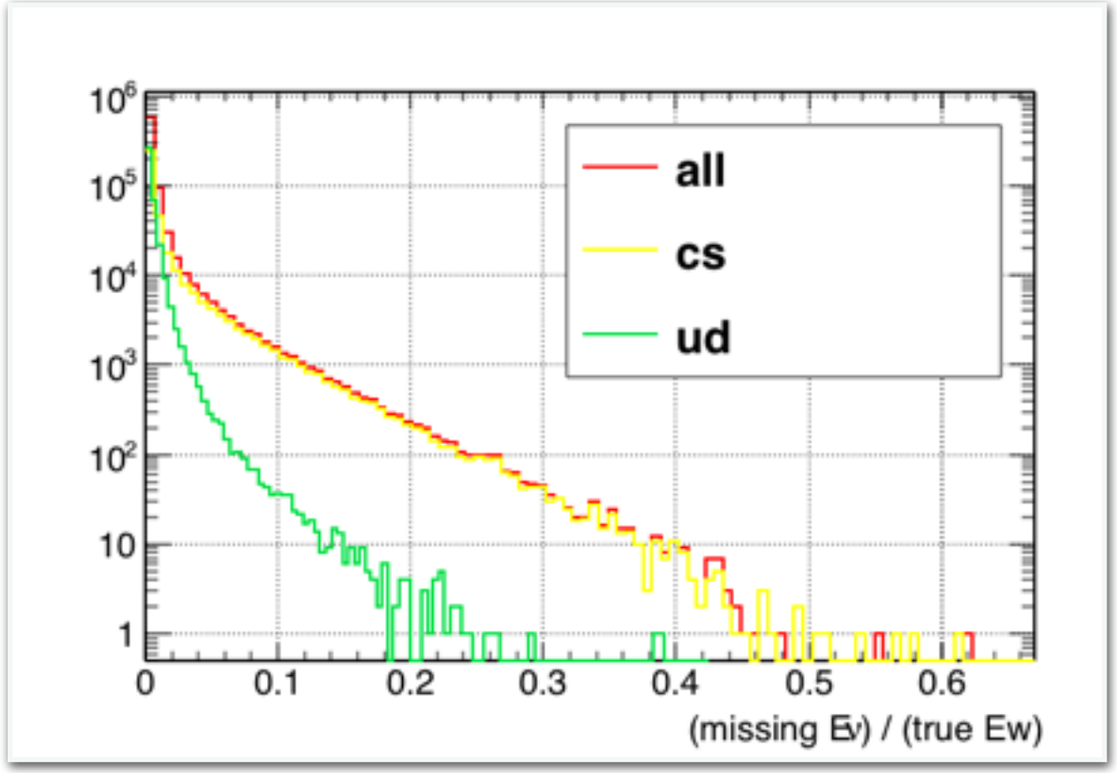
- relativistic Breit-Wigner convoluted with Gaussian
- χ^2/ndf : ~110 —> ~25
  - still large χ^2/ndf

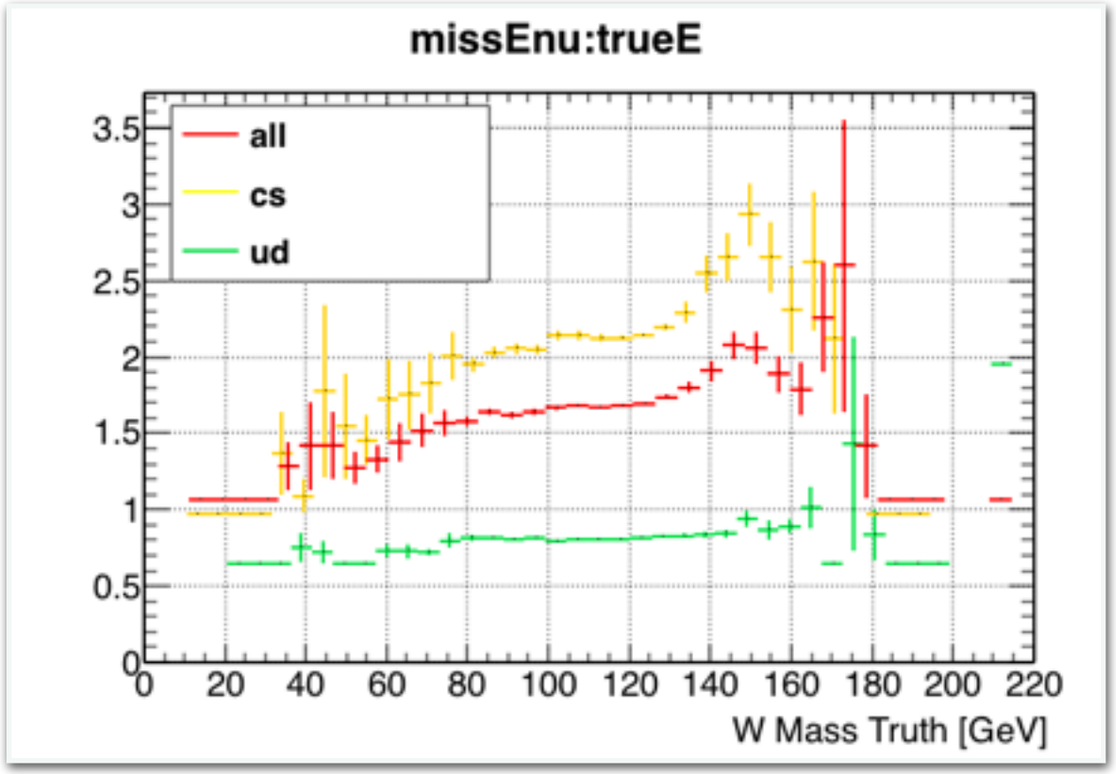
Summary & Next

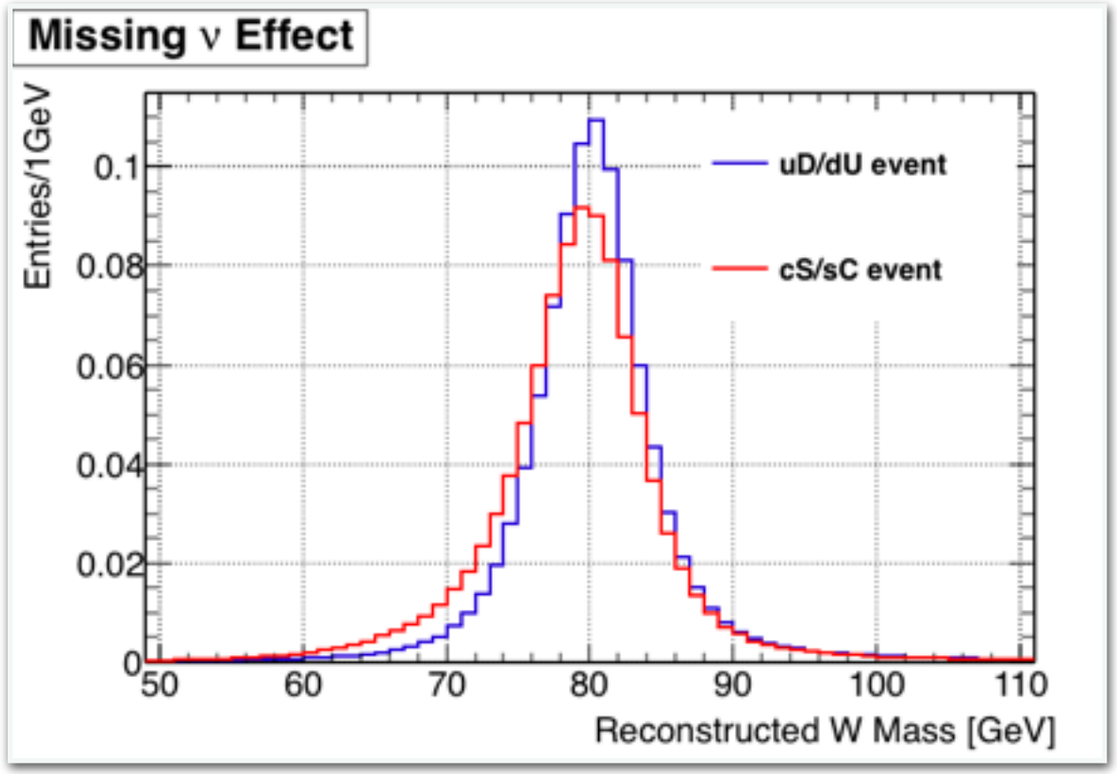
- There is a systematic which came from the influence of missing neutrinos in jets.
- I confirmed that this systematic can be compensated by recovering neutrinos to quark jets (by cheating, not realistic way).

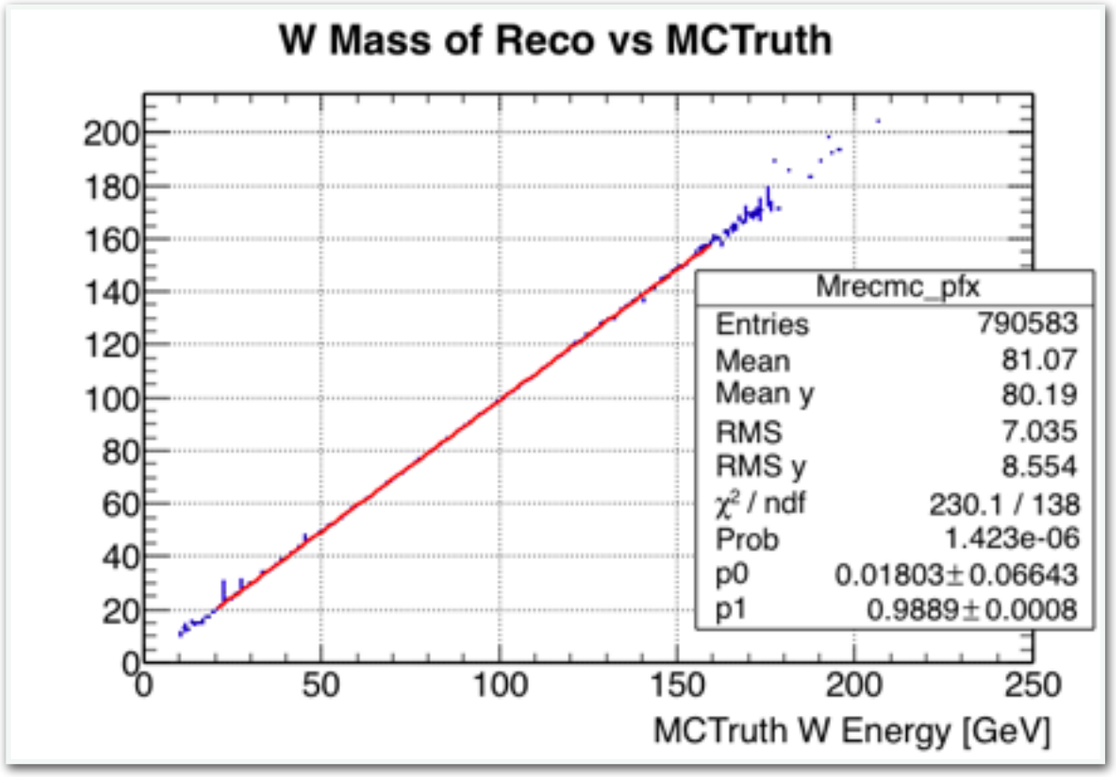
Back up

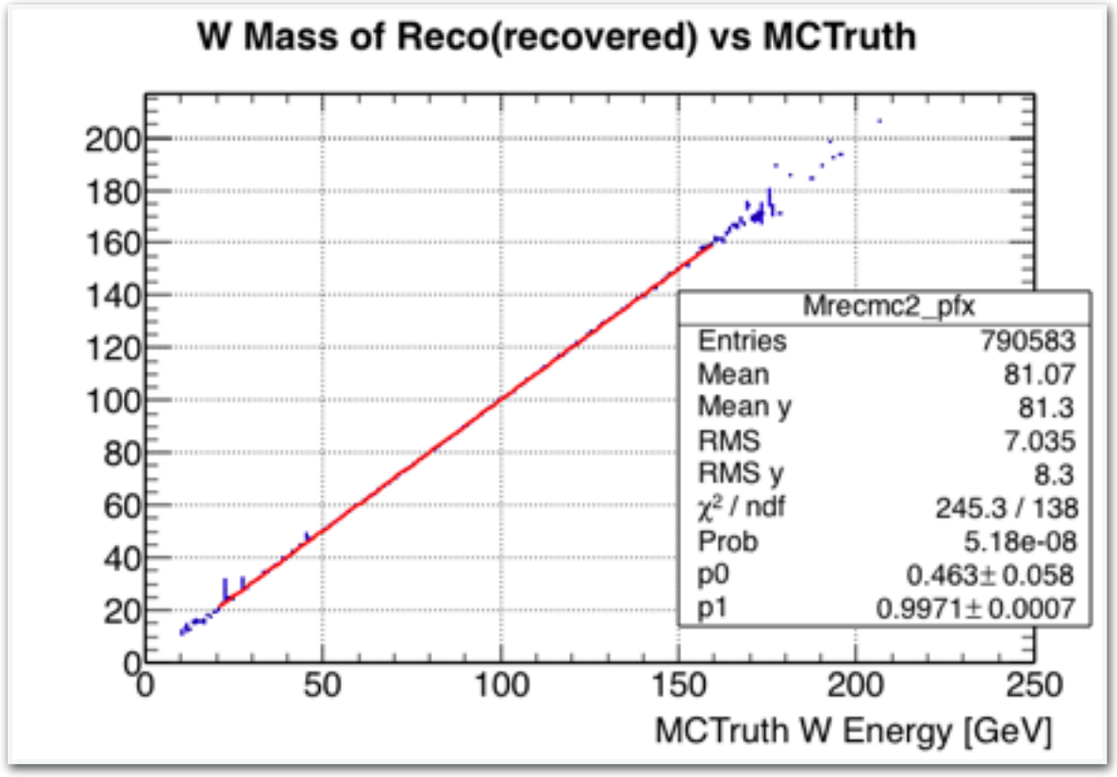

missNnu
×10^3
120
100
80
60
40
20
0
0
5
10
15
20
Number of Missing Neutrinos

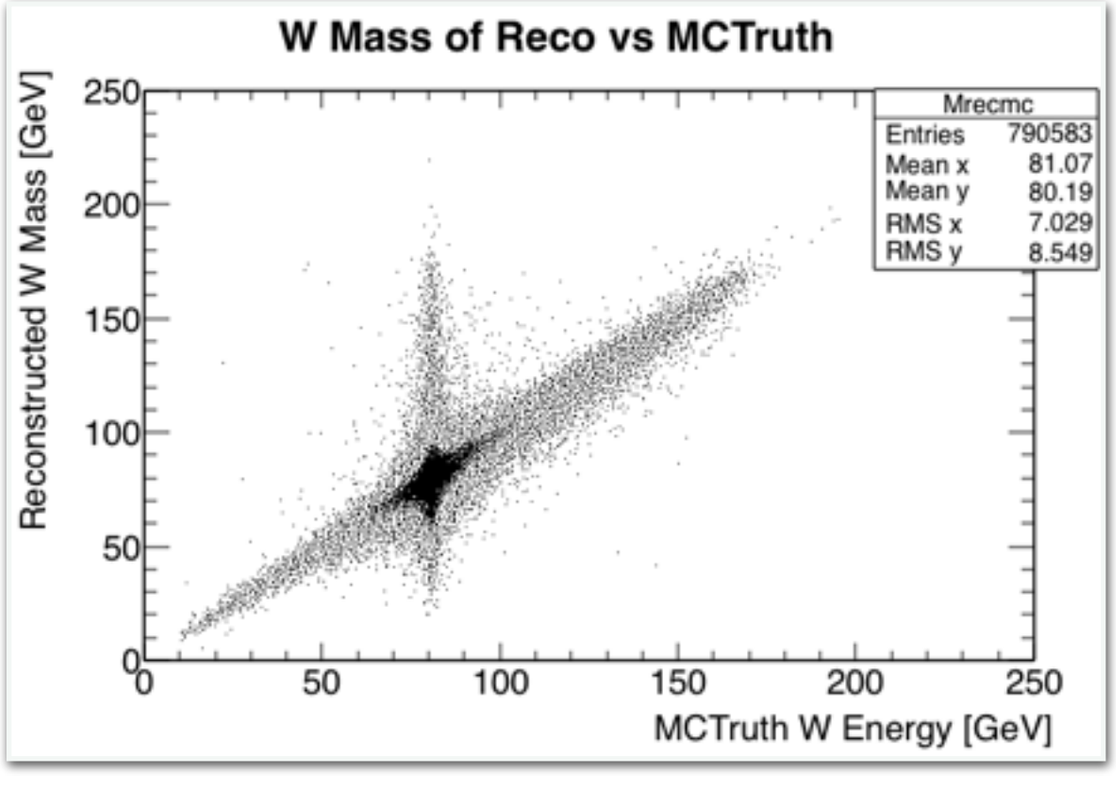

10^6
10^5
10^4
10^3
10^2
10
1
0
0.1
0.2
0.3
0.4
0.5
0.6
all
cs
ud
(missing Eν) / (true Eν)

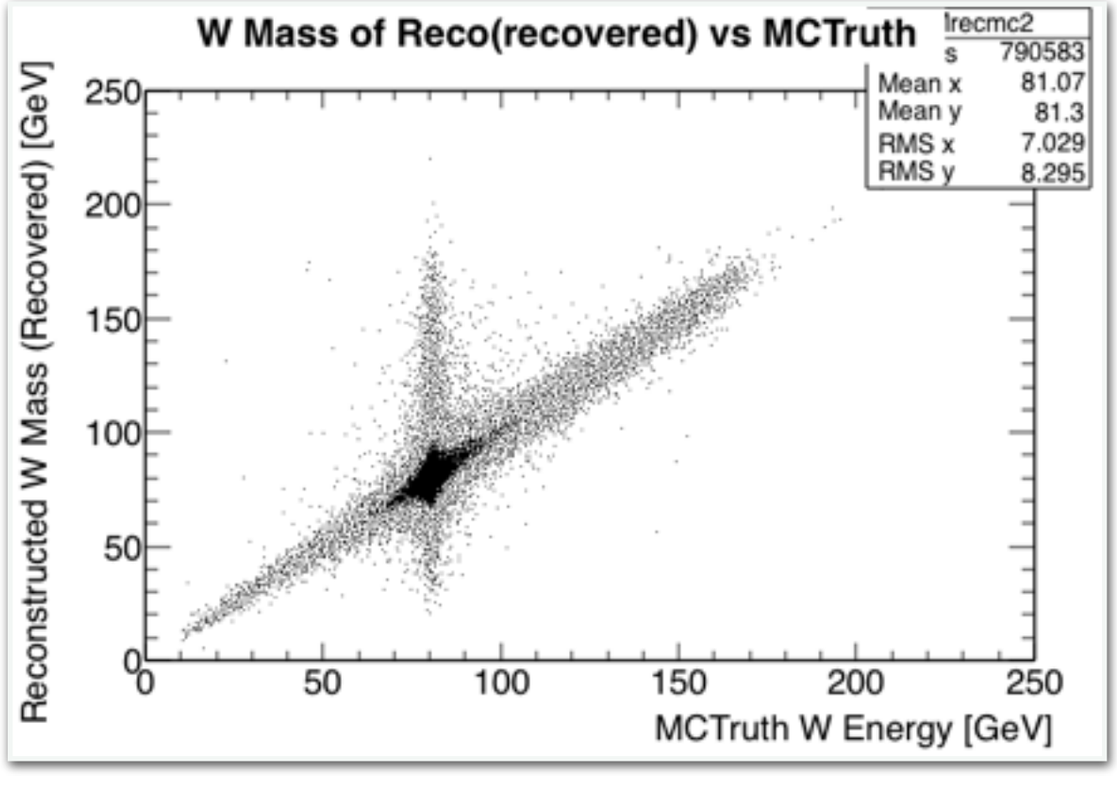

missEnu:trueE
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
200
220
all
cs
ud
W Mass Truth [GeV]


Missing ν Effect
Entries/1GeV
0.1
0.08
0.06
0.04
0.02
0
50
60
70
80
90
100
110
uD/dU event
cS/sC event
Reconstructed W Mass [GeV]


W Mass of Reco vs MCTruth
Mrecmc_pfx
Entries 790583
Mean 81.07
Mean y 80.19
RMS 7.035
RMS y 8.554
χ² / ndf 230.1 / 138
Prob 1.423e-06
p0 0.01803± 0.06643
p1 0.9889± 0.0008
MCTruth W Energy [GeV]


W Mass of Reco(recovered) vs MCTruth
Mrecmc2_pfx
Entries 790583
Mean 81.07
Mean y 81.3
RMS 7.035
RMS y 8.3
χ² / ndf 245.3 / 138
Prob 5.18e-08
p0 0.463± 0.058
p1 0.9971± 0.0007
MCTruth W Energy [GeV]


W Mass of Reco vs MCTruth
Mrecmc
Entries 790583
Mean x 81.07
Mean y 80.19
RMS x 7.029
RMS y 8.549
Reconstructed W Mass [GeV]
MCTruth W Energy [GeV]


W Mass of Reco(recovered) vs MCTruth
Mrecmc2
s 790583
Mean x 81.07
Mean y 81.3
RMS x 7.029
RMS y 8.295
Reconstructed W Mass (Recovered) [GeV]
MCTruth W Energy [GeV]