

$WH \rightarrow WWW \rightarrow l\nu l\nu l\nu$

Matching Details

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Summary

- 1 The Matching Problem
- 2 Three Reconstructed Leptons w/ Matching Criterion
- 3 Matching Factor Distributions
- 4 PDG Code: Muons Are Matching to Electrons
- 5 Summary

Last Week's Summary

Cuts	Number (out of 100,000)	%(from previous step)
Pass $HW \rightarrow WWW \rightarrow l\nu l\nu l\nu$ filter	2358	2.36
P_T, η cuts at generator-level	1902	80.6
Lead, 2nd, 3rd Reconstructed leptons found	1845	97.0
Same P_T, η cuts at reconstruction-level	1702	92.2
Pass Matching Criterion	1129	66.3
Pass Quality/Isolation Cuts	771	68.3

Table: Event Summary

Matching Definition

The matching criterion is:

$$\text{Matching Factor} \equiv \frac{|P_{T,\text{recon}} - P_{T,\text{gen}}|}{\delta_{P_T}} + \frac{|\eta_{\text{recon}} - \eta_{\text{gen}}|}{\sigma_\eta} + \frac{|\phi_{\text{recon}} - \phi_{\text{gen}}|}{\sigma_\phi} < 40.0$$

$P_{T,\text{recon}}$ = Reconstructed particle P_T

$P_{T,\text{gen}}$ = Generator-level particle P_T

$\delta_{P_T} = 0.0015 \cdot P_{T,\text{recon}}$

η_{recon} = Pseudorapidity of reconstructed particle

η_{gen} = Pseudorapidity of generator-level particle

ϕ_{recon} = Azimuthal Angle of reconstructed particle

ϕ_{gen} = Azimuthal Angle of generator-level particle

σ_η = Standard Deviation of a Gaussian fit to $\eta_{\text{recon}} - \eta_{\text{gen}}$

σ_ϕ = Standard Deviation of a Gaussian fit to $\phi_{\text{recon}} - \phi_{\text{gen}}$

Original Strategy

- Calculate the matching factor between the lepton (elec or muon) and other common charged particles.
 - Electrons and Muons
 - Charged Pions, Kaons
 - Protons
- Best-matched particle is chosen, must have 'matchingFactor < 40.0' and best-matched particle must have been of the same type (by PDG Code).

Lead Lepton Matching Factor

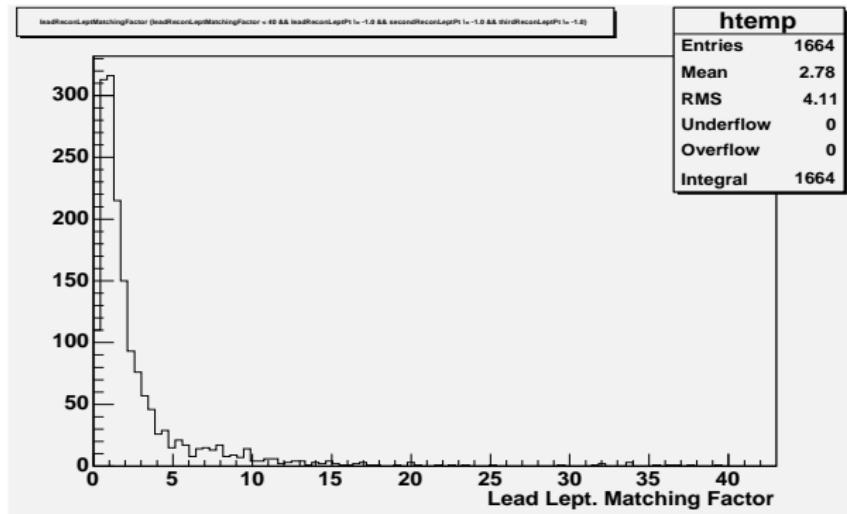


Figure: Lead Leptons Passing Matching Factor, PDG Code match not required. 1664/1702 pass.

2nd Lepton Matching Factor

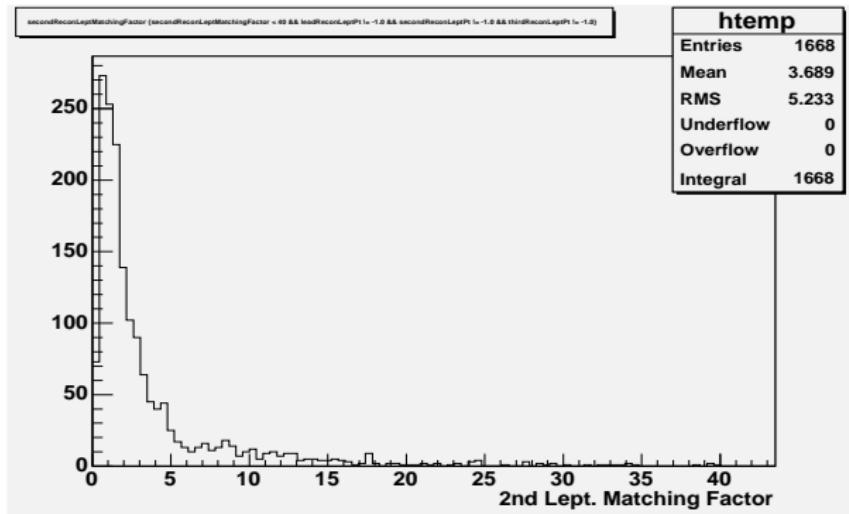


Figure: 2nd Leptons Passing Matching Factor, PDG Code match not required. 1668/1702 pass.

3rd Lepton Matching Factor

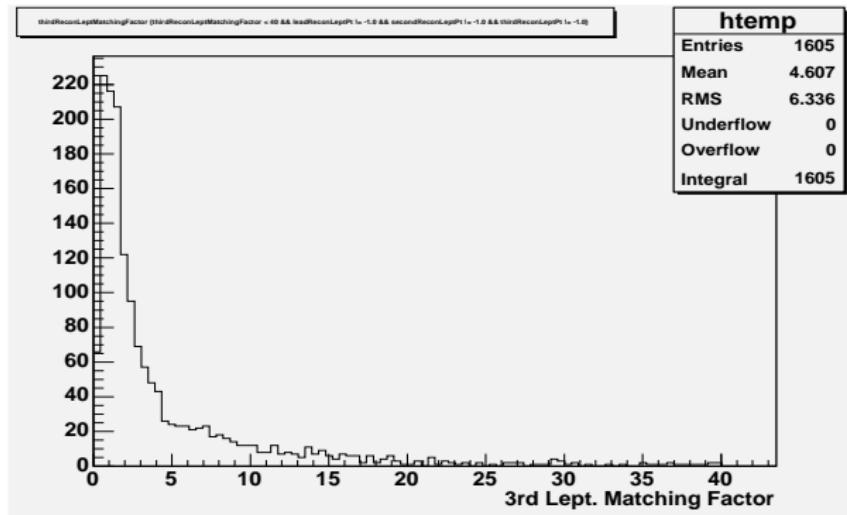


Figure: 3rd Leptons Passing Matching Factor, PDG Code match not required. 1605/1702 pass.

PDG Code of Lead Muon Match

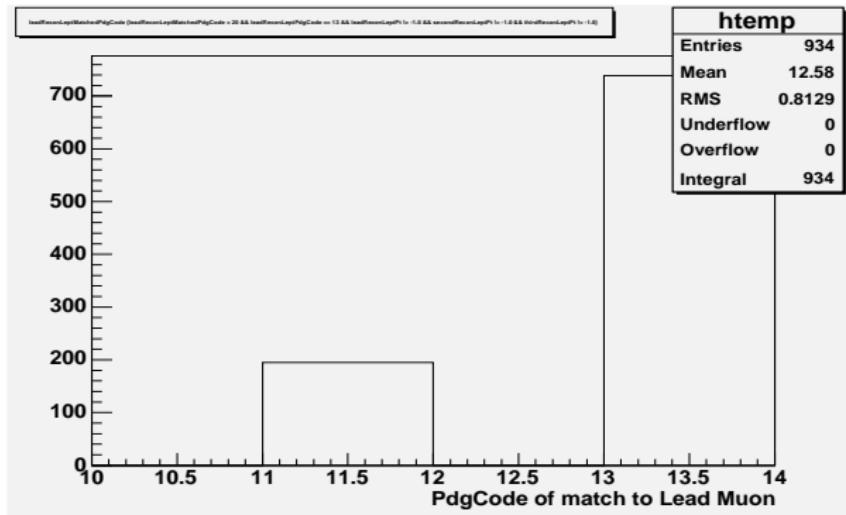


Figure: PDG Code of gen. particles matched to leading leptons that are muons. 3 other events matched non-leptons, not included.

PDG Code of 2nd Muon Match

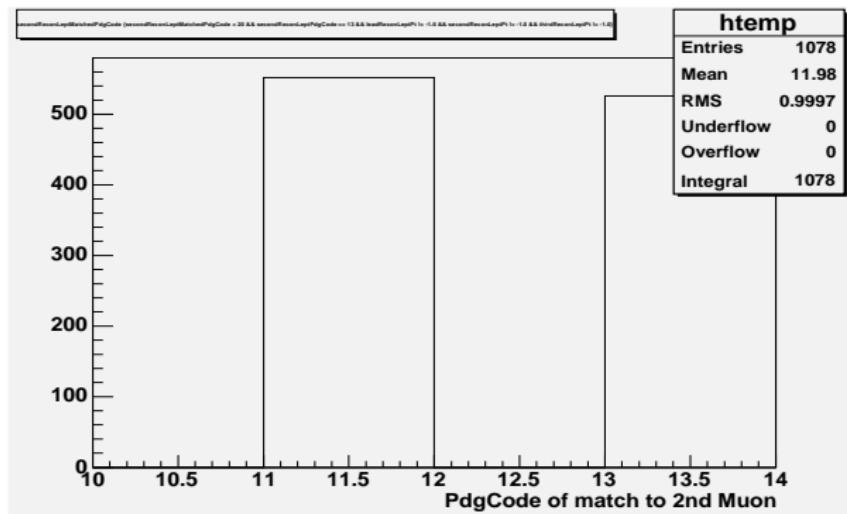


Figure: PDG Code of gen. particles matched to 2nd leptons that are muons. 5 other events matched non-leptons, not included.

PDG Code of 3rd Muon Match

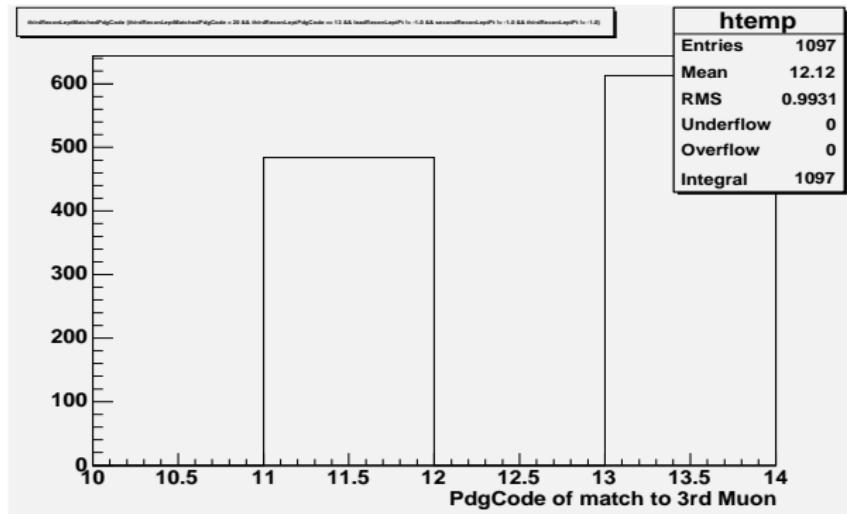


Figure: PDG Code of gen. particles matched to 3rd leptons that are muons. 31 other events matched non-leptons, not included.

Summary

- Working on Alternate Matching methods:
- Delete PDG Code match requirement ($1702 \rightarrow 1622$ events)
- Attempt matches only like-sign, like-flavor leptons, instead of all charged particles.