Trilepton Analysis: The $WH \rightarrow WWW \rightarrow l\nu l\nu l\nu$ Signal

Failed Events

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Summary

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Cuts	Number (out of 100,000)	%(from previous step)
Pass $HW \longrightarrow WWW \longrightarrow l\nu l\nu l\nu$ filter	2358	2.36
P_T , η cuts at generator-level	1902	80.6
Lead, 2nd, 3rd Reconstructed leptons found	1539	80.9
Same P_T , η cuts at reconstruction-level	1497	97.3
Pass Matching Criterion	1201	80.2
Pass Quality/Isolation Cuts	964	80.3

Table: The number of events passing each level of cuts is presented here. The sample began with 100,000 events and has 2358 left after passing the trilepton filter described in the abstract.

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- Difficult to plot values that don't exist (i.e. the lepton NOT reconstructed)
- To estimate, I take each of the three generator-level W-leptons for each event and attempt to find a match with the reconstructed electron and muon objects.
- If no match is found, assume the gen.-lepton was not reconstructed (or at least poorly reconstructed)

Lead Lepton Eta (elecs)

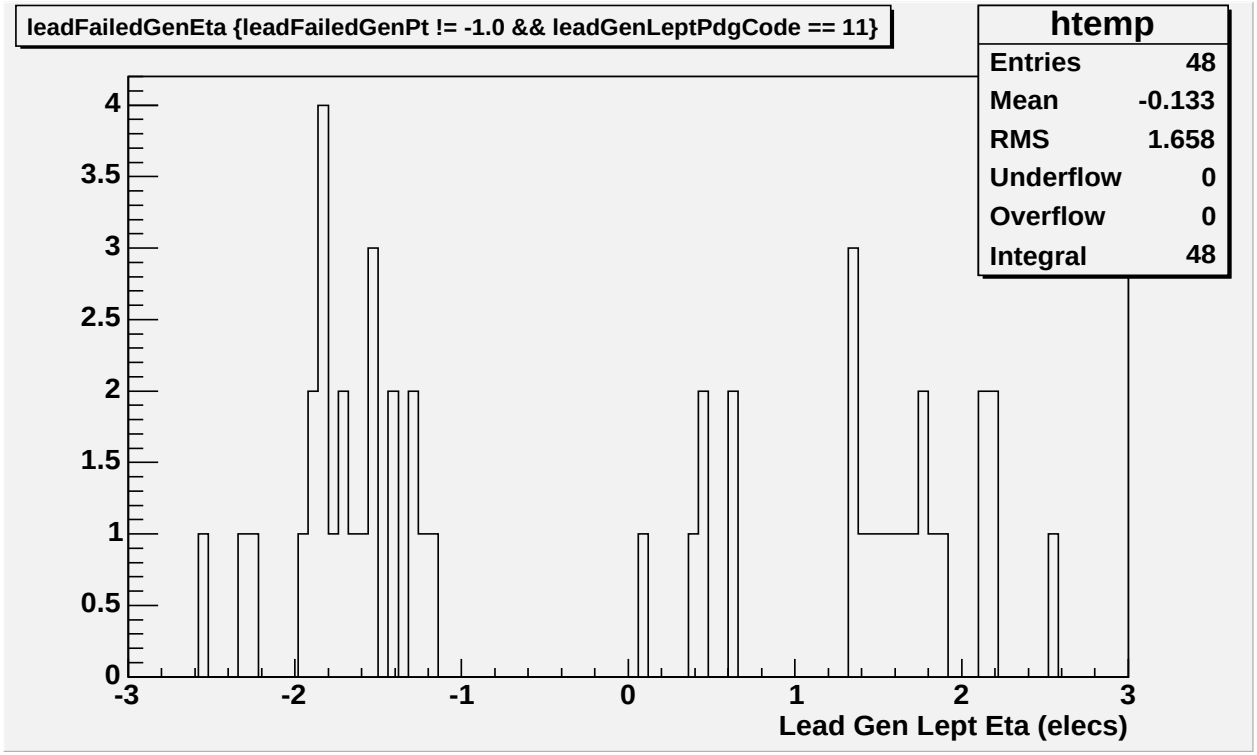

Figure: η of lead generated lepton (electrons only) not matched to a reconstructed lepton.

Lead Lepton Eta (muons)

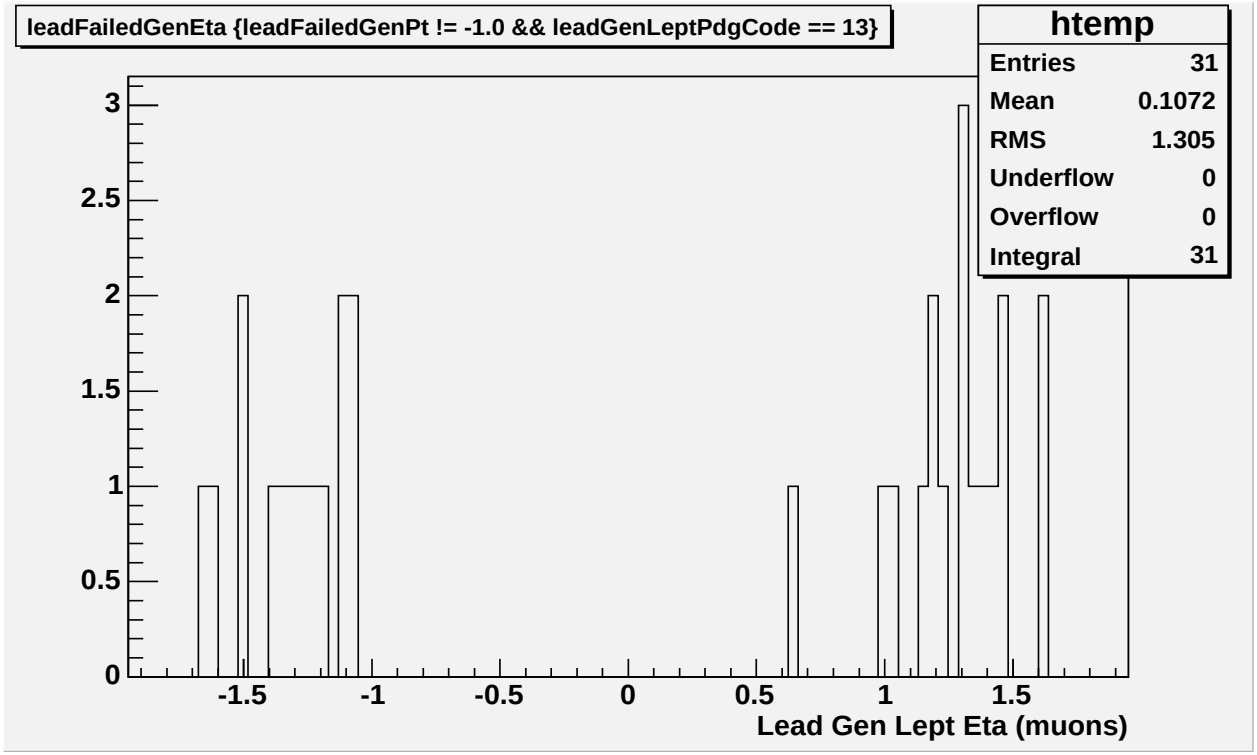

Figure: η of lead generated lepton (muons only) not matched to a reconstructed lepton.

2nd Lepton Eta (elecs)

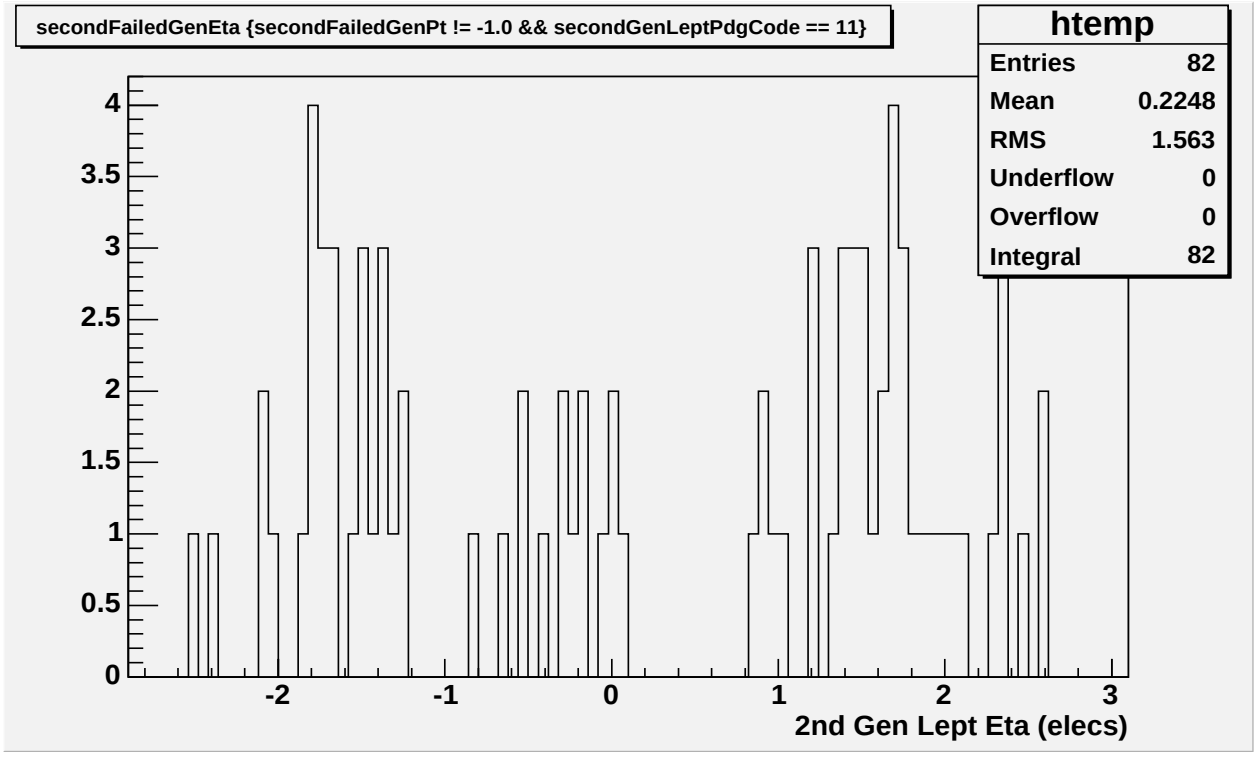

Figure: η of 2nd generated lepton (electrons only) not matched to a reconstructed lepton.

2nd Lepton Eta (muons)

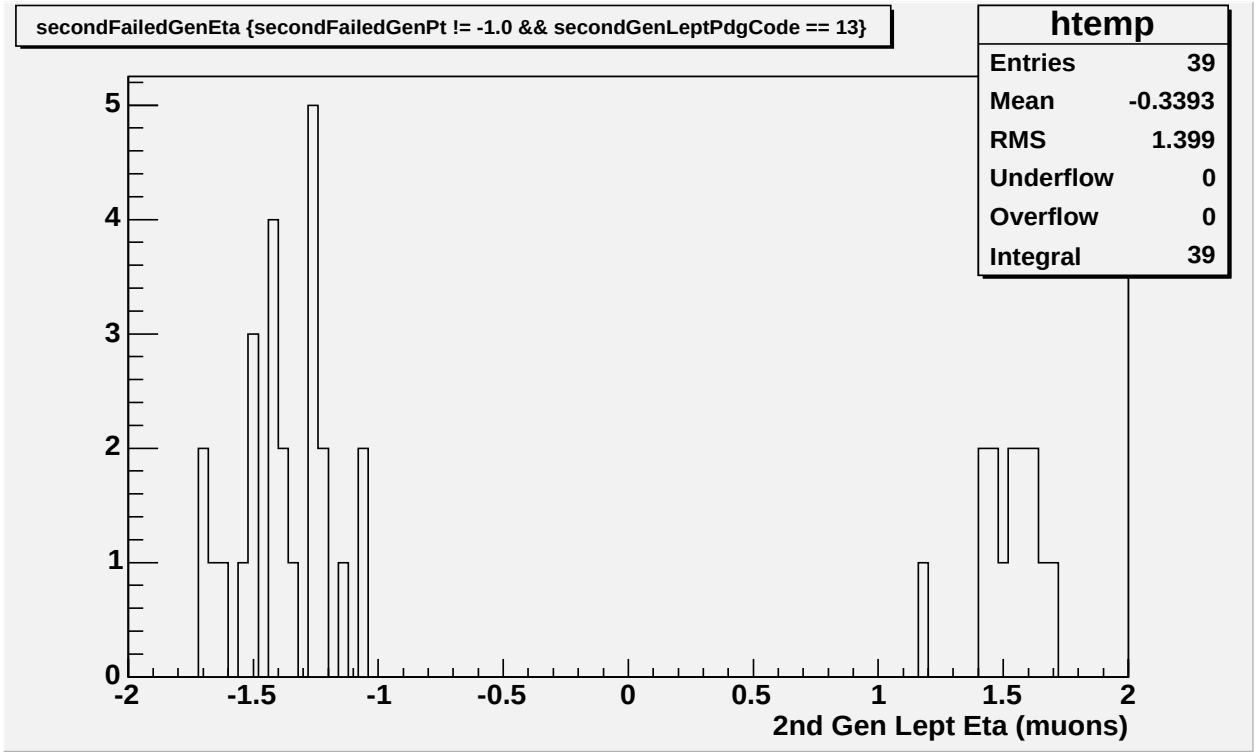

Figure: η of 2nd generated lepton (muons only) not matched to a reconstructed lepton.

3rd Lepton Eta (elecs)

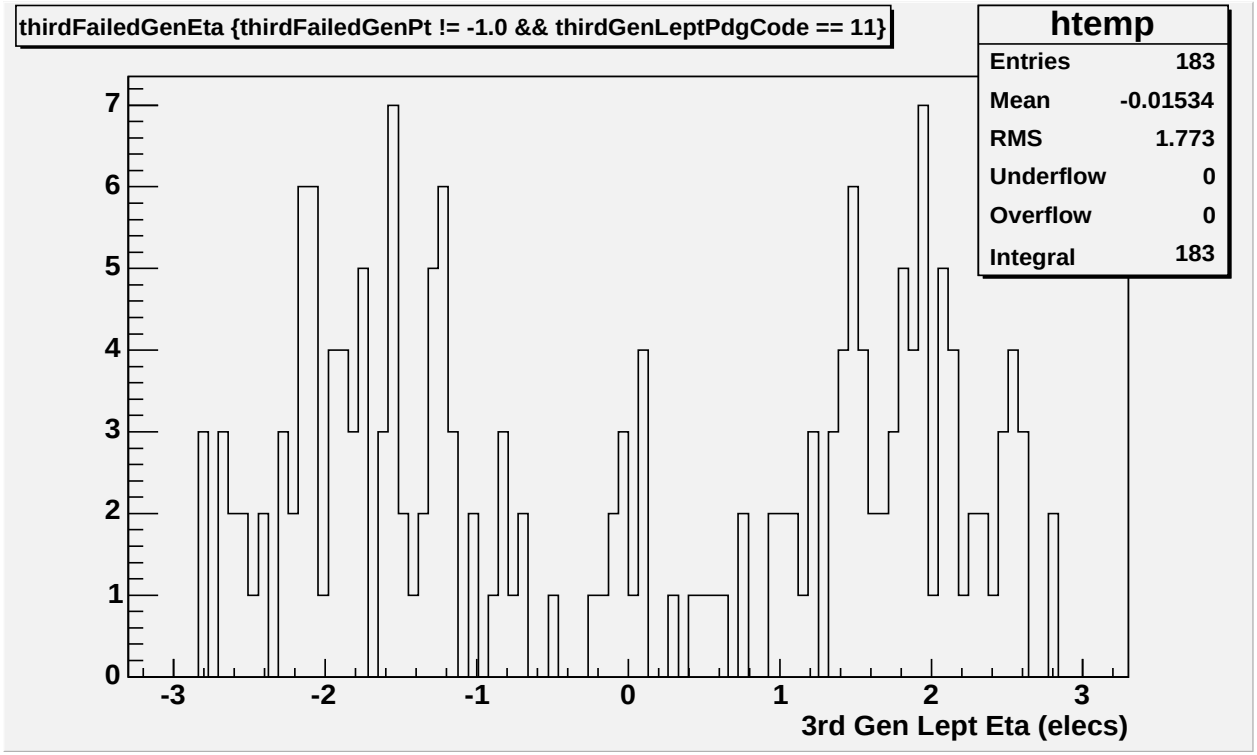

Figure: η of 3rd generated lepton (electrons only) not matched to a reconstructed lepton.

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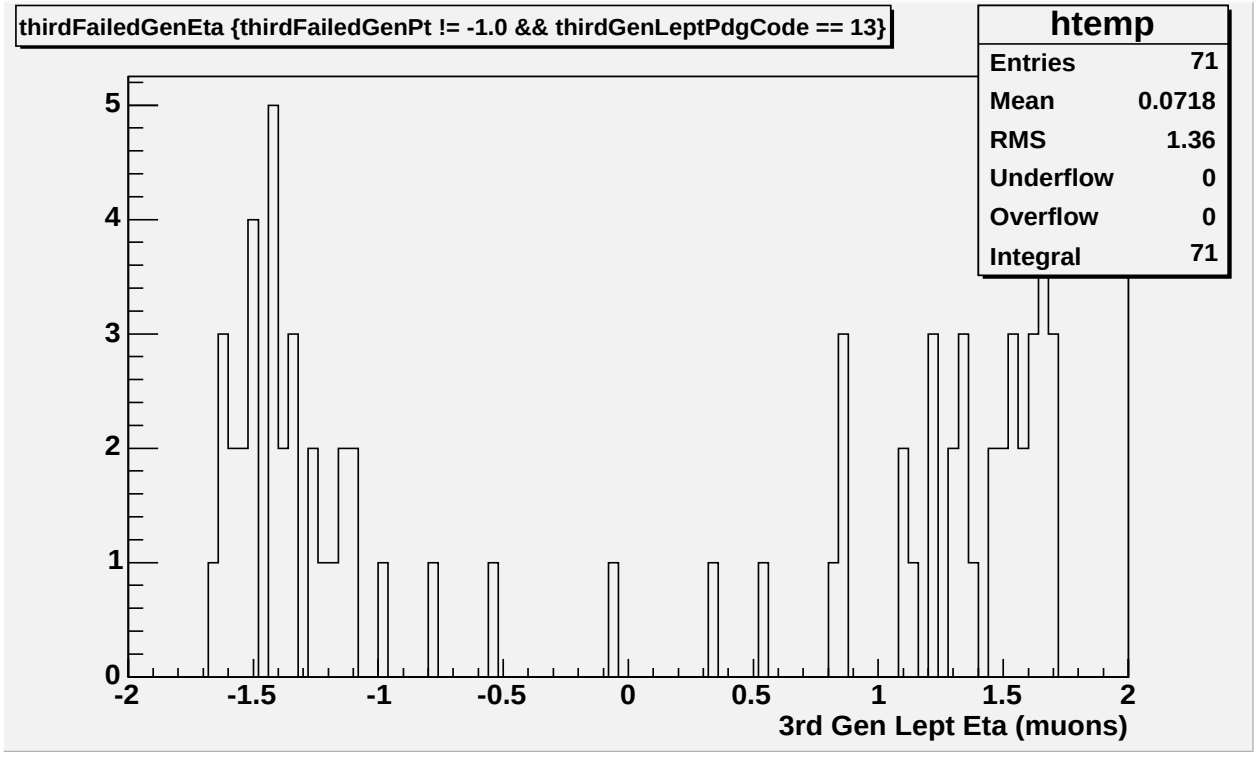

Figure: η of 3rd generated lepton (muons only) not matched to a reconstructed lepton.

Matching Summary

Lept.	Fail Matching	Pass Matching
Lead Lept.	41	347
2nd Lept.	81	308
3rd Lept.	301	88

Table: These are the 389 events that fail the matching step because at least one of the three leading reconstructed leptons does not match successfully to a generator-level lepton. It is overwhelming the 3rd leptons that fail fails to match, among these.

Loose Matching: Electrons

Loose Match	Electrons	Muons	Pions	Rho	Kaons	Protons
Lead Lept. (elecs,24)	11(0)	3(3)	10(7)	0	0	0
2nd Lept. (elecs,53)	21(0)	10(8)	17(5)	0	4(4)	1(1)
3rd Lept. (elecs,217)	97(0)	5(1)	85(22)	6(1)	9(4)	15(1)

Table: The matching criterion allows reconstructed electrons to search for matches only among generator-electrons, and reconstructed muons to search for matches only among generator-level electrons and muons. When that matching criterion has failed, I run the fail events through a looser matching function that will search for matches among several different possible charged particles to see if a generator-level charged particle was reconstructed with the wrong particle type. The number given is the quantity of leptons (that are electrons) that match best to particles of the given type. The number in parentheses that follows is the quantity of ”best matches” that are ”successful matches” (matchingFactor < 40.0).

Loose Matching: Muons

Loose Match	Muons	Electrons	Pions	Rho	Kaons	Protons
Lead Lept. (muons,18)	6(0)	1(0)	7(2)	1(0)	2(0)	1(1)
2nd Lept. (muons,28)	3(0)	6(0)	16(7)	0	1(0)	2(1)
3rd Lept. (muons,84)	9(0)	13(1)	43(21)	1(0)	15(10)	3(2)

Table: The matching criterion allows reconstructed electrons to search for matches only among generator-electrons, and reconstructed muons to search for matches only among generator-level electrons and muons. When that matching criterion has failed, I run the fail events through a looser matching function that will search for matches among several different possible charged particles to see if a generator-level charged particle was reconstructed with the wrong particle type. The number given is the quantity of leptons (that are muons) that match best to particles of the given type. The number in parentheses that follows is the quantity of "best matches" that are "successful matches" (matchingFactor < 40.0).

Quality Cuts Event Summary

Lept.	Fail Quality Cuts	Pass Quality Cuts
Lead Lept.	80	157
2nd Lept.	80	157
3rd Lept.	99	138

Table: These are the 237 events that fail the quality cuts step because at least one of the three leading reconstructed leptons does not pass one of several quality cuts.

Leading Lepton Cuts

Lead Lept.	Fail Cut	Pass Cut
Elec iso/et	35	202
Elec HadE/EmE	14	223
Elec EOverP	32	205
Muon iso/pt	40	197
Muon EmE	35	202
Muon HadE	16	221

Table: These are the particular quality cuts of the leading lepton.

2nd Lepton Cuts

Lead Lept.	Fail Cut	Pass Cut
Elec iso/et	25	212
Elec HadE/EmE	9	228
Elec EOverP	6	231
Muon iso/pt	38	199
Muon EmE	19	218
Muon HadE	6	231

Table: These are the particular quality cuts of the 2nd lepton.

3rd Lepton Cuts

Lead Lept.	Fail Cut	Pass Cut
Elec iso/et	26	211
Elec HadE/EmE	5	232
Elec EOverP	11	226
Muon iso/pt	37	200
Muon EmE	21	216
Muon HadE	3	234

Table: These are the particular quality cuts of the 3rd lepton.