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

(CDF Collaboration)

Jason Nett

(Dated: 24 May 2009)

Abstract

Contents

ΔR BETWEEN GENERATOR-LEVEL LEPTONS

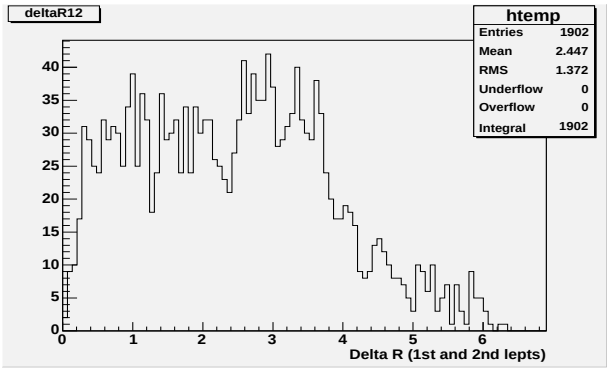

FIG. 1: ΔR between the leading and 2nd generator-level leptons.

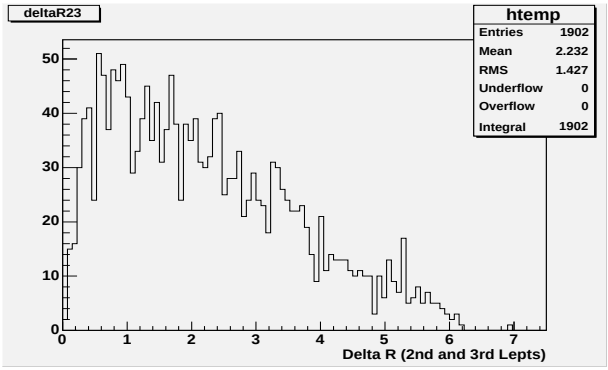

FIG. 2: ΔR between the 2nd and 3rd generator-level leptons.

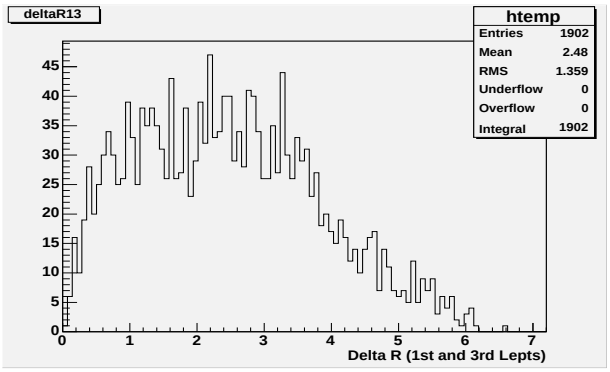

FIG. 3: ΔR between the leading and 3rd generator-level leptons.

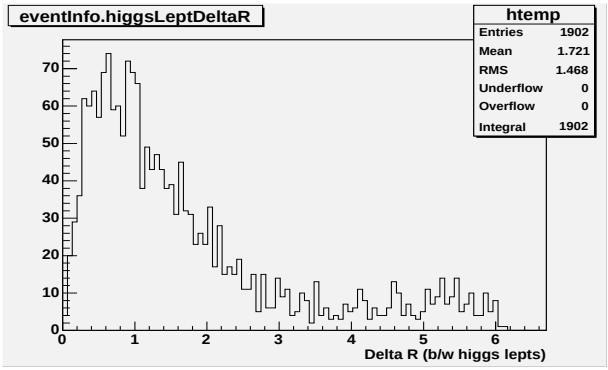

FIG. 4: ΔR between the two leptons that directly decay from the Higgs. Notice that the distribution indicates these two leptons generally tend to be closer together.

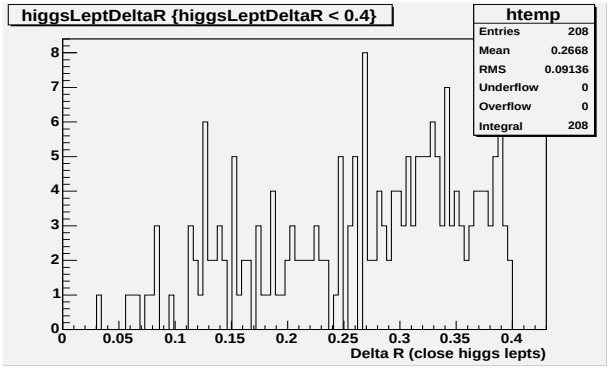

FIG. 5: ΔR between the two leptons that directly decay from the Higgs. These are specifically the 208 instances that are within $\Delta R < 0.4$.

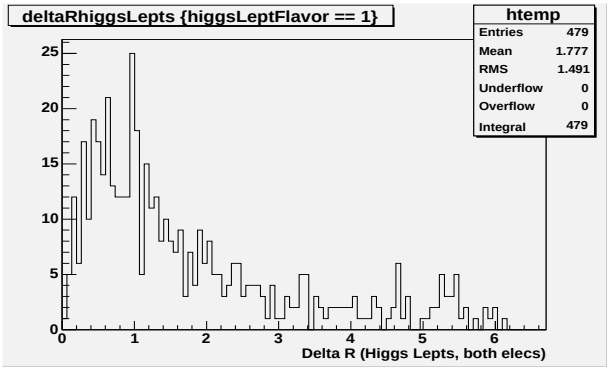

FIG. 6: ΔR between the two leptons that directly decay from the Higgs. These are specifically the events where the two Higgs leptons are electrons.

HIGGSLEPTONS AND BREM-W LEPTONS

Now lets distinguish between the leptons that decay directly from the Higgs boson and the lepton that decays from the W boson that radiated the Higgs.

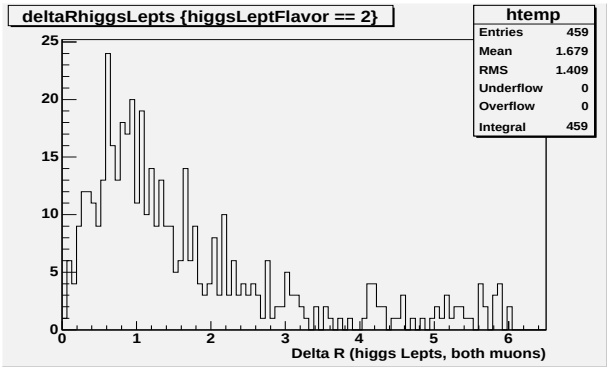

FIG. 7: ΔR between the two leptons that directly decay from the Higgs. These are specifically the events where the two Higgs leptons are muons.

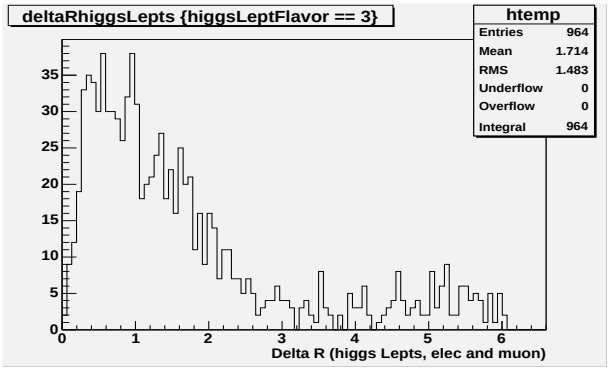

FIG. 8: ΔR between the two leptons that directly decay from the Higgs. These are specifically the events where the two Higgs leptons are one electron and one muon.

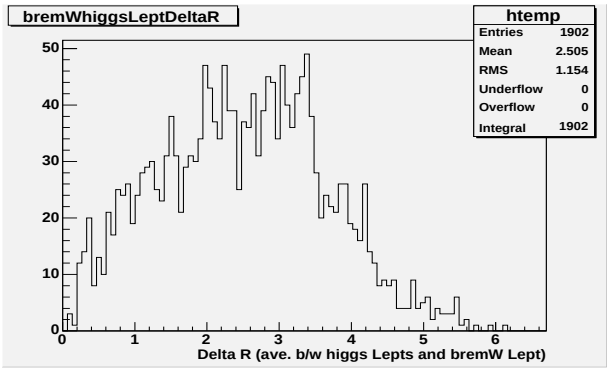

FIG. 9: ΔR between the average angular position of the two Higgs leptons and the lepton from the Brem W.

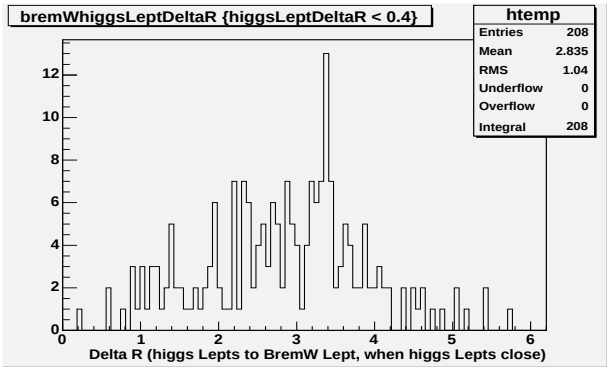

FIG. 10: ΔR between the average angular position of the two Higgs leptons and the lepton from the Brem W for the 208 events where the two Higgs leptons are close ($\Delta R < 0.4$).

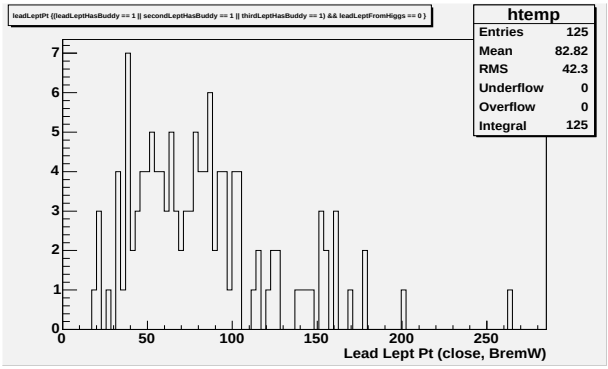

FIG. 11:

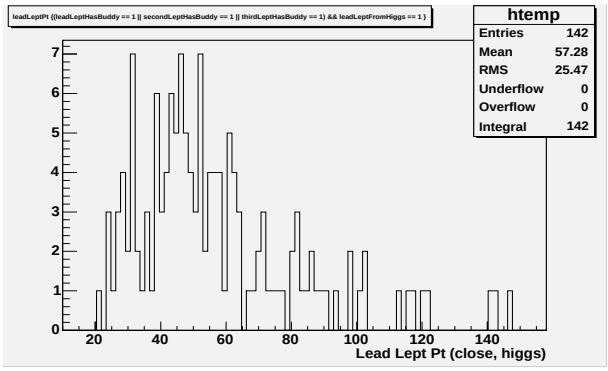

FIG. 12:

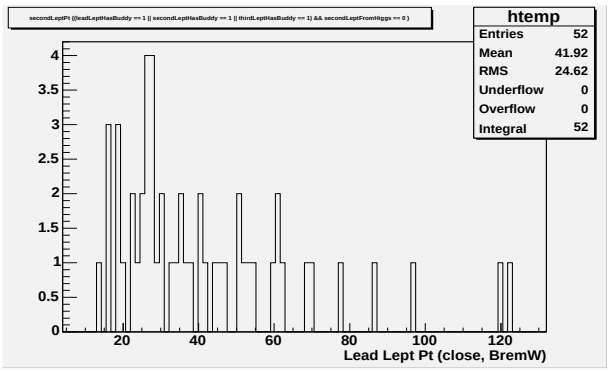

FIG. 13:

P_T AND η DISTRIBUTIONS FOR EVENTS WITH CLOSE LEPTONS

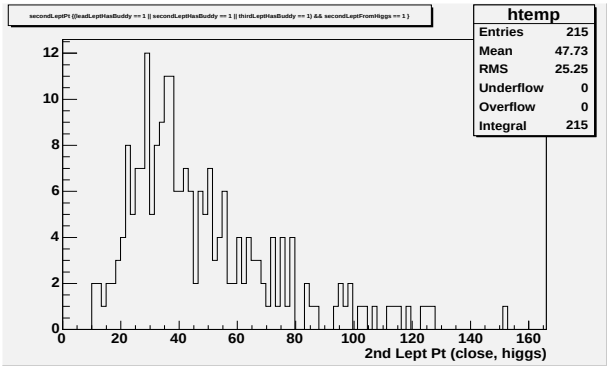

FIG. 14:

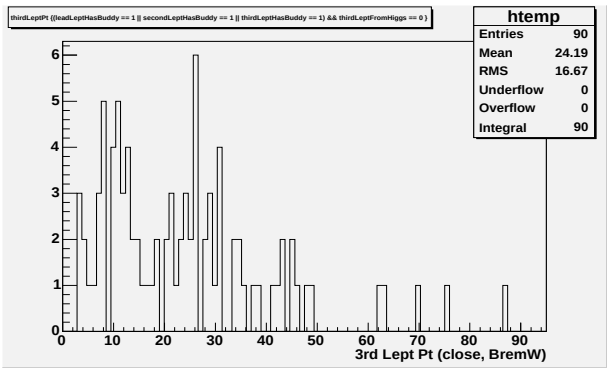

FIG. 15:

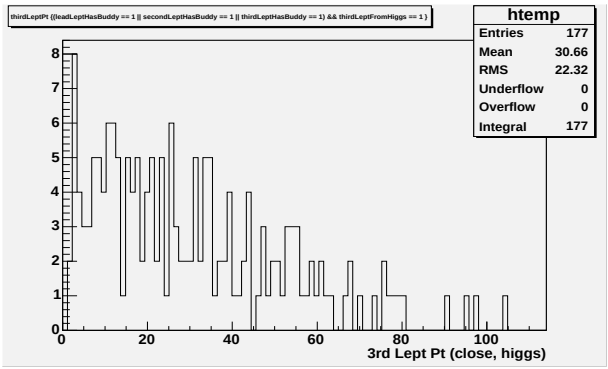

FIG. 16:

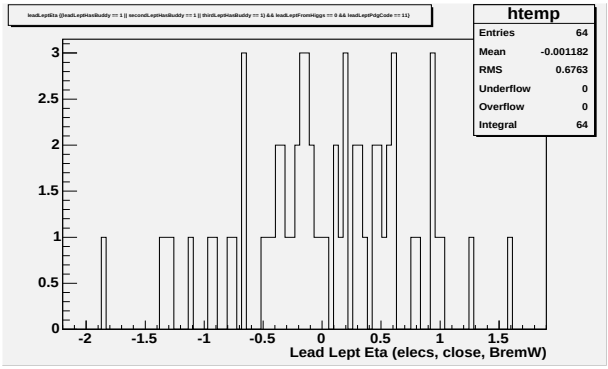

FIG. 17:

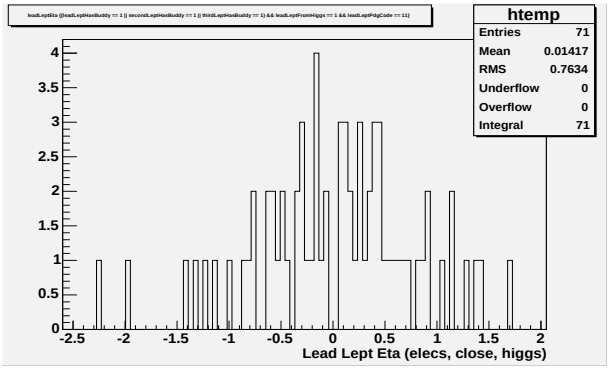

FIG. 18:

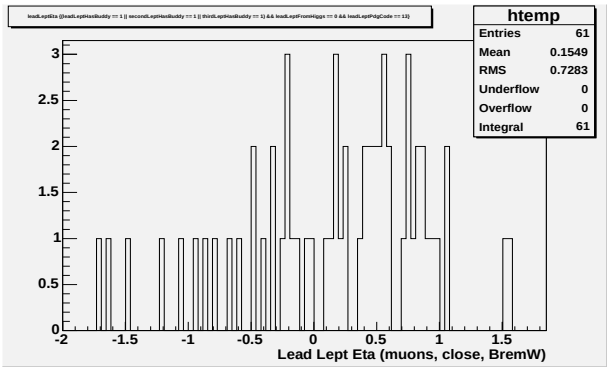

FIG. 19:

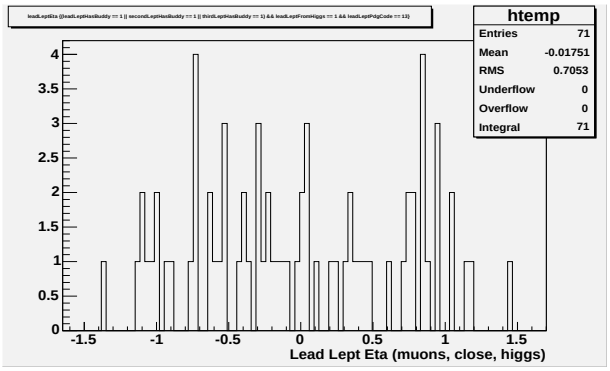

FIG. 20:

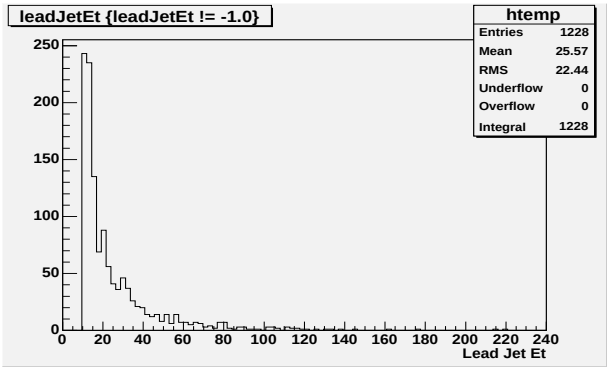

FIG. 21:

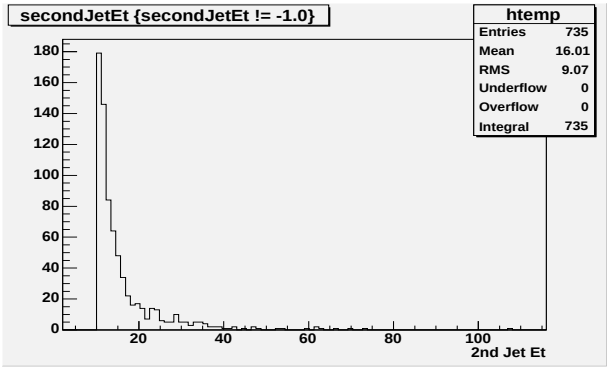

FIG. 22:

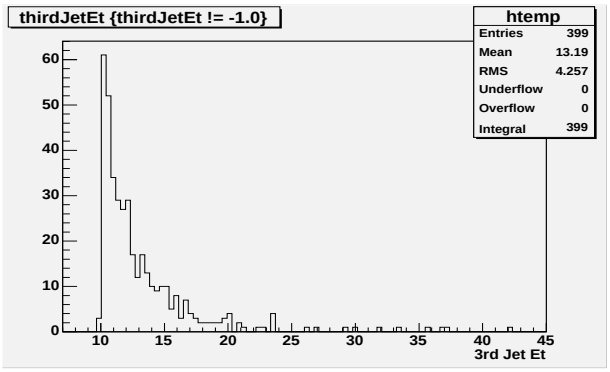

FIG. 23:

LEADING THREE JETS IN EVENTS W/ GEN. CUTS ONLY

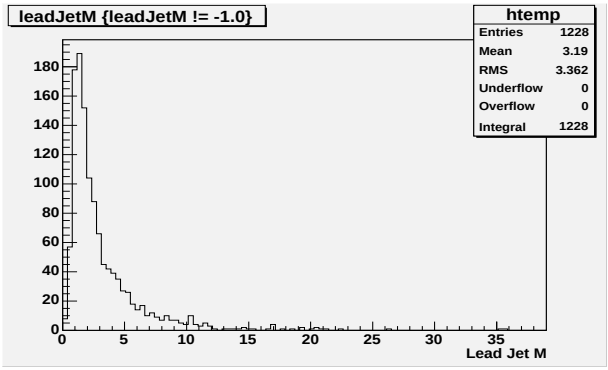

FIG. 24:

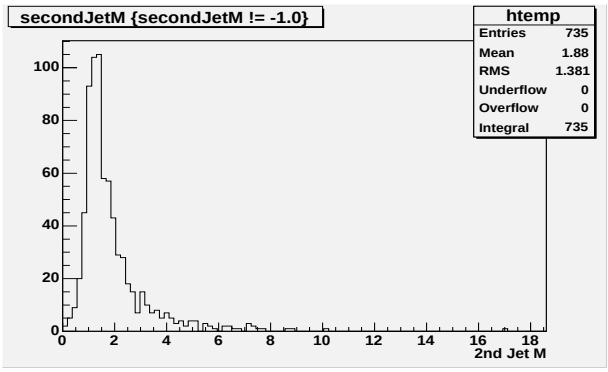

FIG. 25:

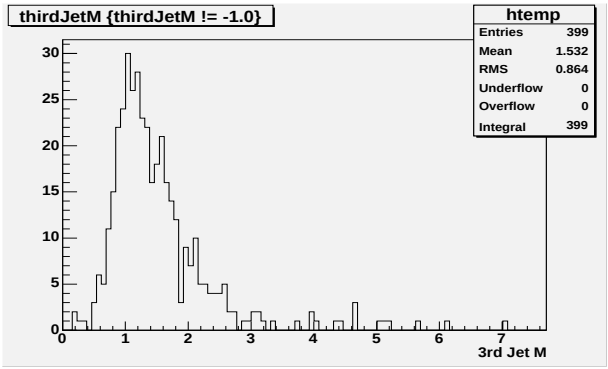

FIG. 26:

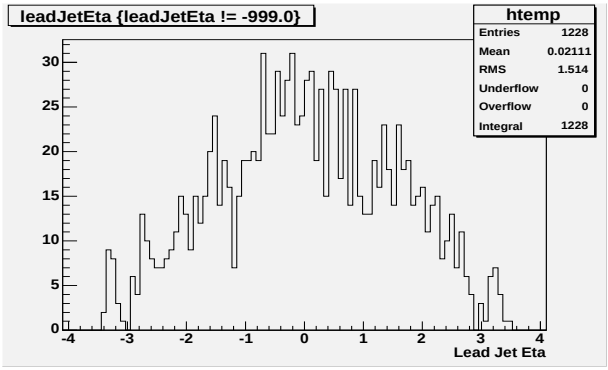

FIG. 27:

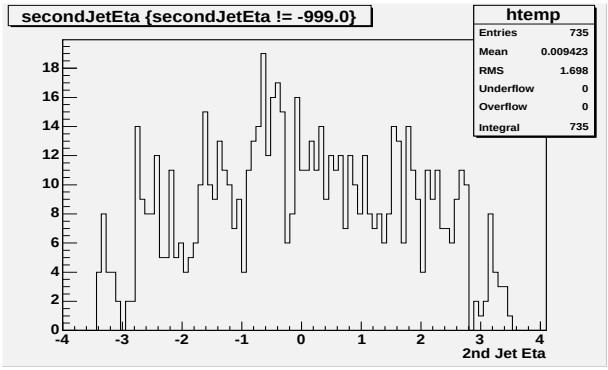

FIG. 28:

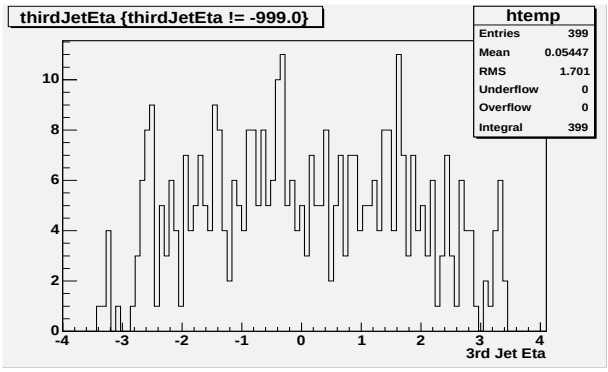

FIG. 29:

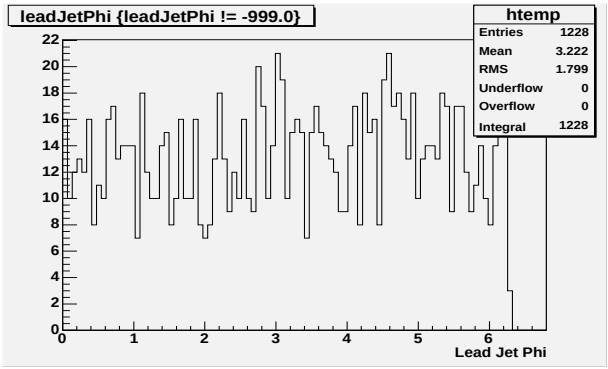

FIG. 30:

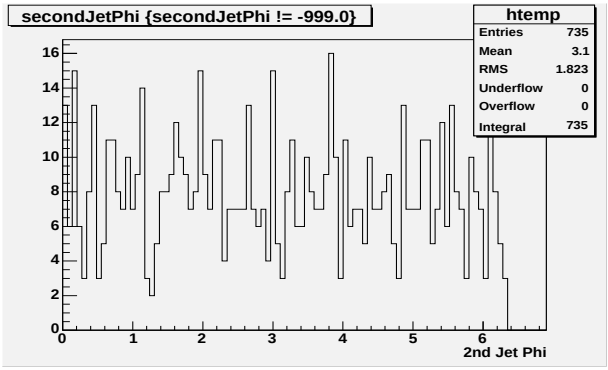

FIG. 31:

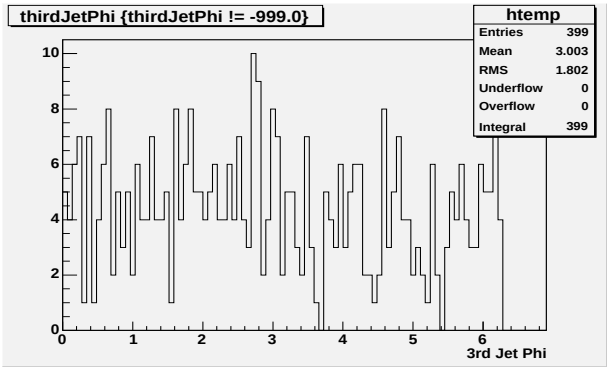
thirdJetPhi {thirdJetPhi != -999.0}
htemp
Entries 399
Mean 3.003
RMS 1.802
Underflow 0
Overflow 0
Integral 399
10
8
6
4
2
0
0
1
2
3
4
5
6
3rd Jet Phi

FIG. 32:

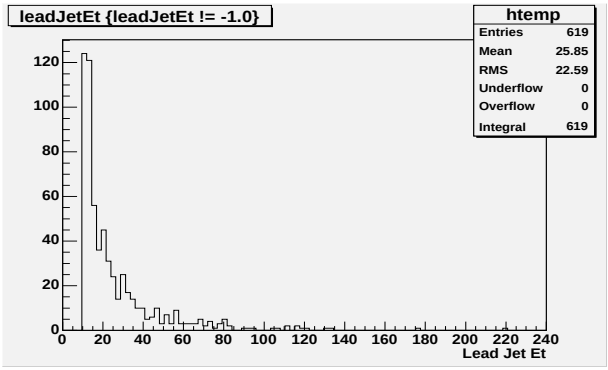

FIG. 33:

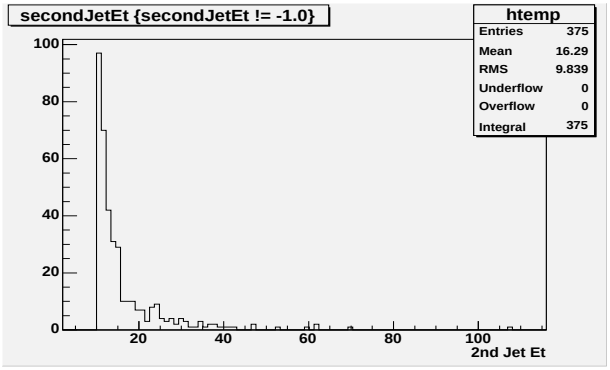

FIG. 34:

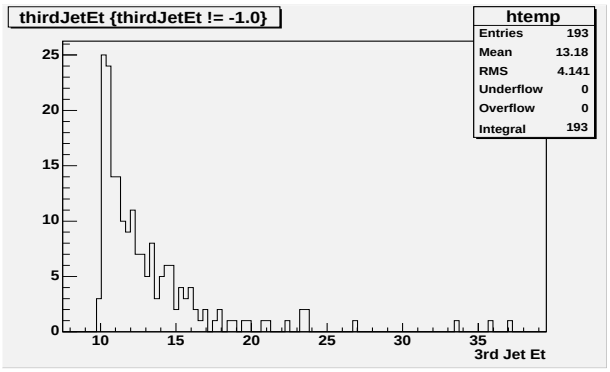

FIG. 35:

LEADING THREE JETS IN EVENTS W/ THREE LEPTONS PASSING QUALITY CUTS AND MATCHING

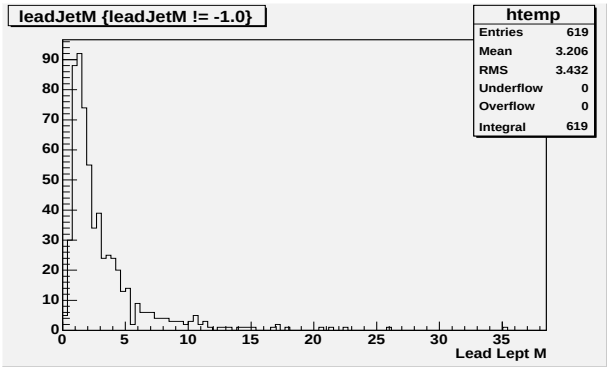

FIG. 36:

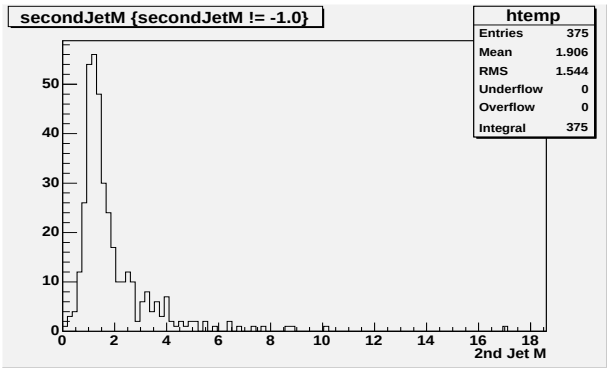

FIG. 37:

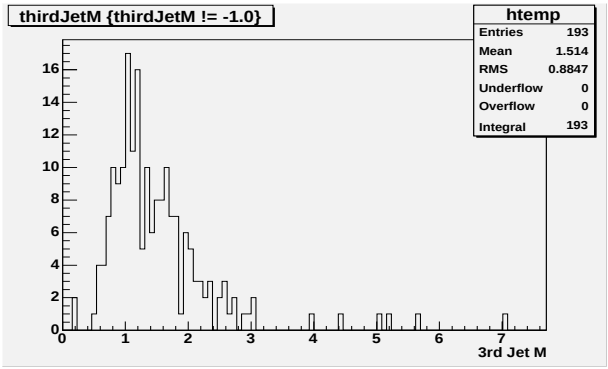

FIG. 38:

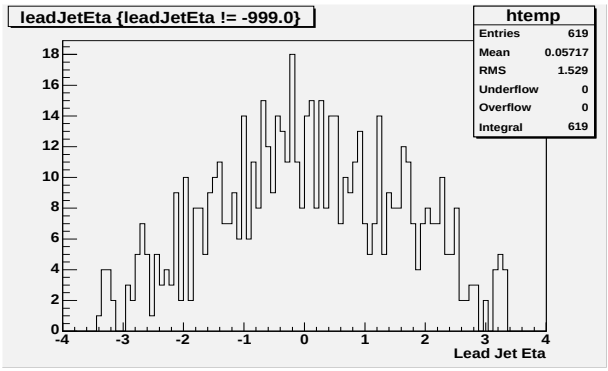

FIG. 39:

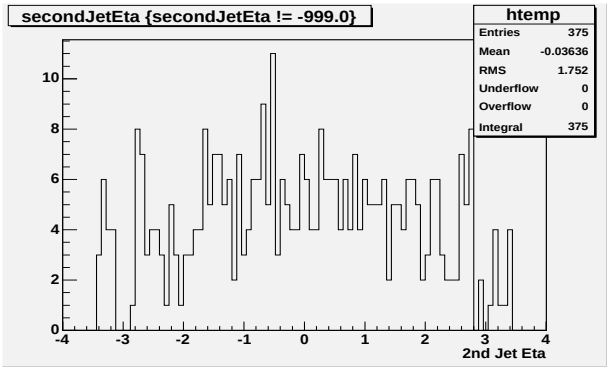

FIG. 40:

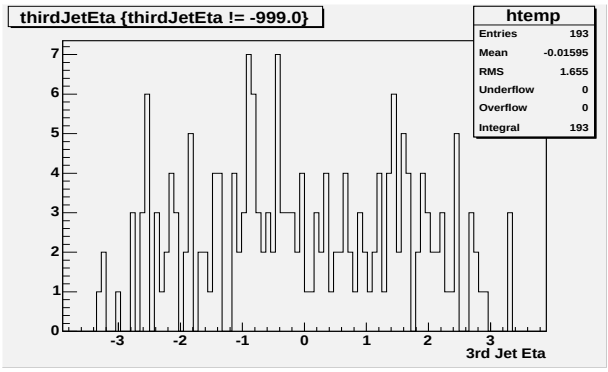

FIG. 41:

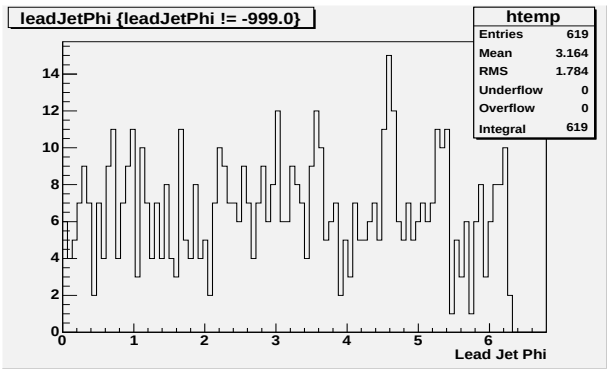

FIG. 42:

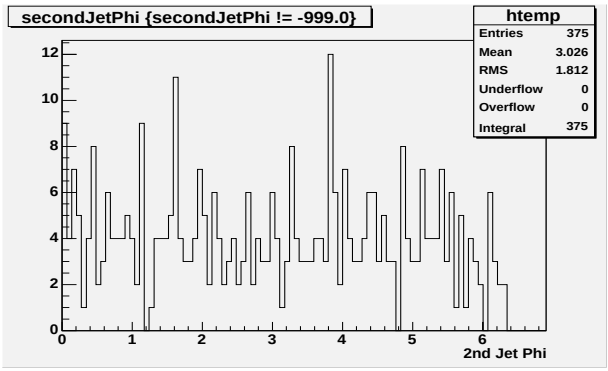

FIG. 43:

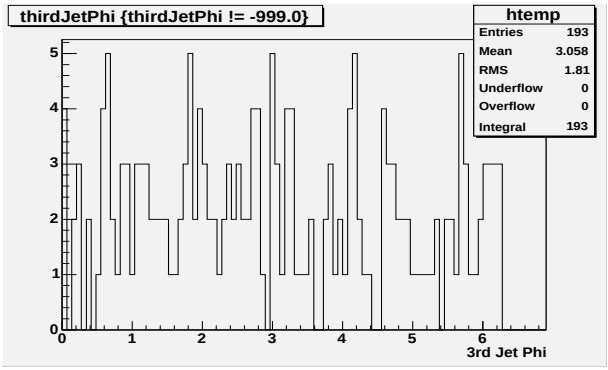
thirdJetPhi {thirdJetPhi != -999.0}
htemp
Entries 193
Mean 3.058
RMS 1.81
Underflow 0
Overflow 0
Integral 193
0
1
2
3
4
5
0
1
2
3
4
5
6
3rd Jet Phi

FIG. 44:

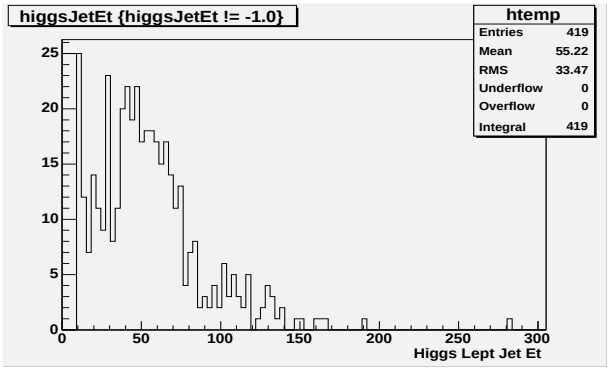

FIG. 45:

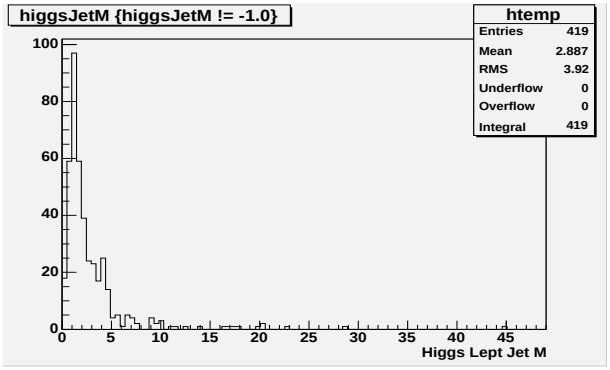

FIG. 46:

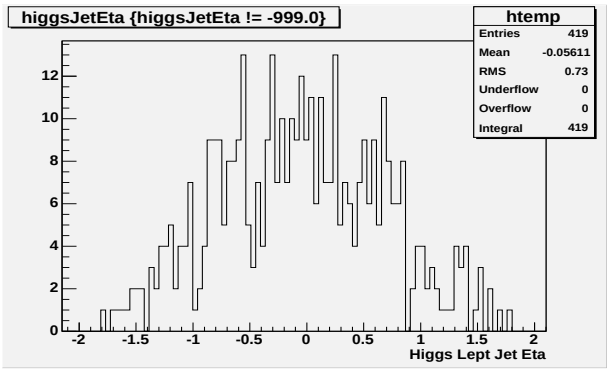

FIG. 47:

PROPERTIES OF JETS MATCHING SMALL-ANGLE HIGGS LEPTONS

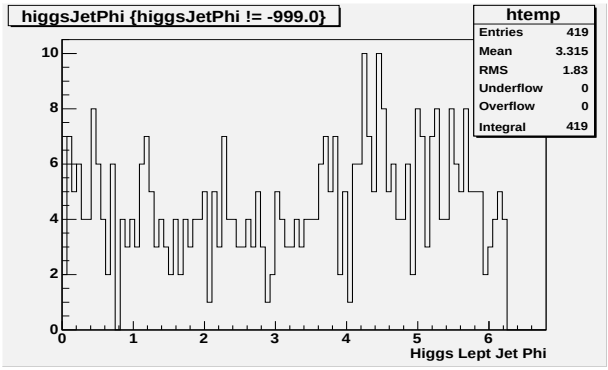
higgsJetPhi {higgsJetPhi != -999.0}
htemp
Entries 419
Mean 3.315
RMS 1.83
Underflow 0
Overflow 0
Integral 419
10
8
6
4
2
0
0
1
2
3
4
5
6
Higgs Lept Jet Phi

FIG. 48:

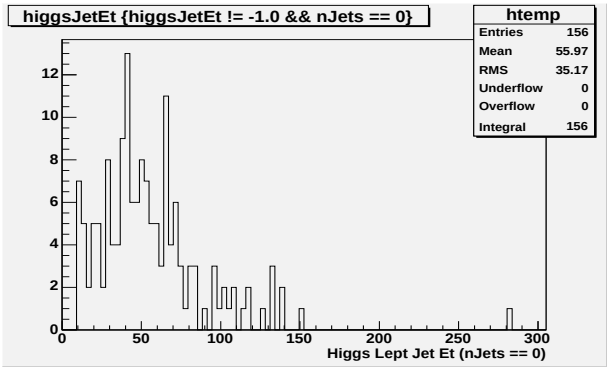

FIG. 49:

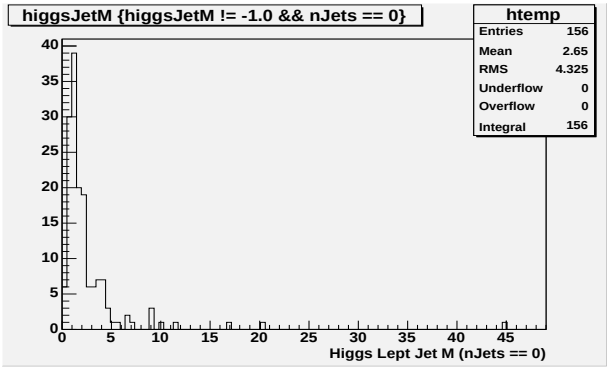

FIG. 50:

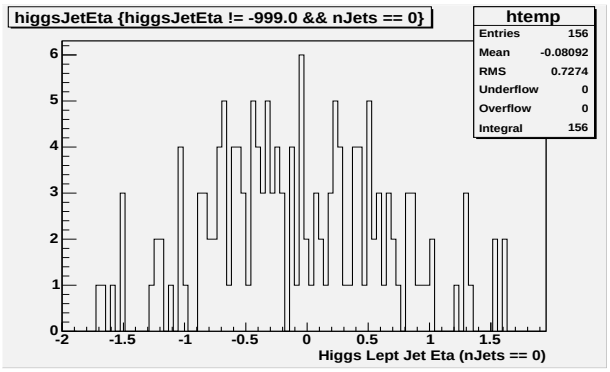

FIG. 51:

PROPERTIES OF JETS MATCHING SMALL-ANGLE HIGGS LEPTONS IN THE ZERO-JET BIN

I define Zero-Jet bin here as the number of jets for the event excluding those jets containing any of the three generator-level W leptons within $\Delta R < 0.4$ and any jet with $E_T < 10.0$ GeV. The jet whose properties are shown here is the one containing two higgs leptons.

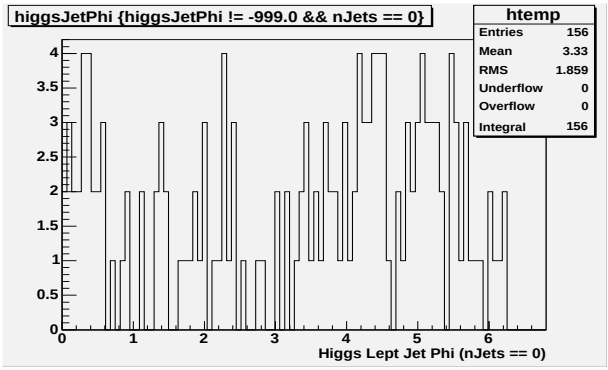
higgsJetPhi {higgsJetPhi != -999.0 && nJets == 0}
htemp
Entries 156
Mean 3.33
RMS 1.859
Underflow 0
Overflow 0
Integral 156
Higgs Lept Jet Phi (nJets == 0)

FIG. 52: