



HZZ 250 GeV Analysis

Added by [Homer Neal](#), last edited by [Homer Neal](#) on Aug 29, 2013

Update on the HZZ 250 GeV +80/-30 250/fb Analysis for the 29 August 2013 SiD Meeting:

Archive of the preparation and analysis code:

[subproclst-data8-delay-e250-350Gflav-4jets](#)

[flavortag-all-batch-revtx-350-4jets.xml](#) [revertex-all-batch.xml](#)

[runitallbatch2](#) [suballbatch2](#) [allSME250p80m30.lst](#) [ffhzzE250p80m30.lst](#)

[FastJetProcessor.cpp](#)

All difference in the LCFIPlus routines were commented out; not including these should make no difference in the output.

[algoEtc.cc](#) [FlavorTag.cc](#) [flavtag.cc](#)

Analysis code:

[MyDBDvvh.java](#)

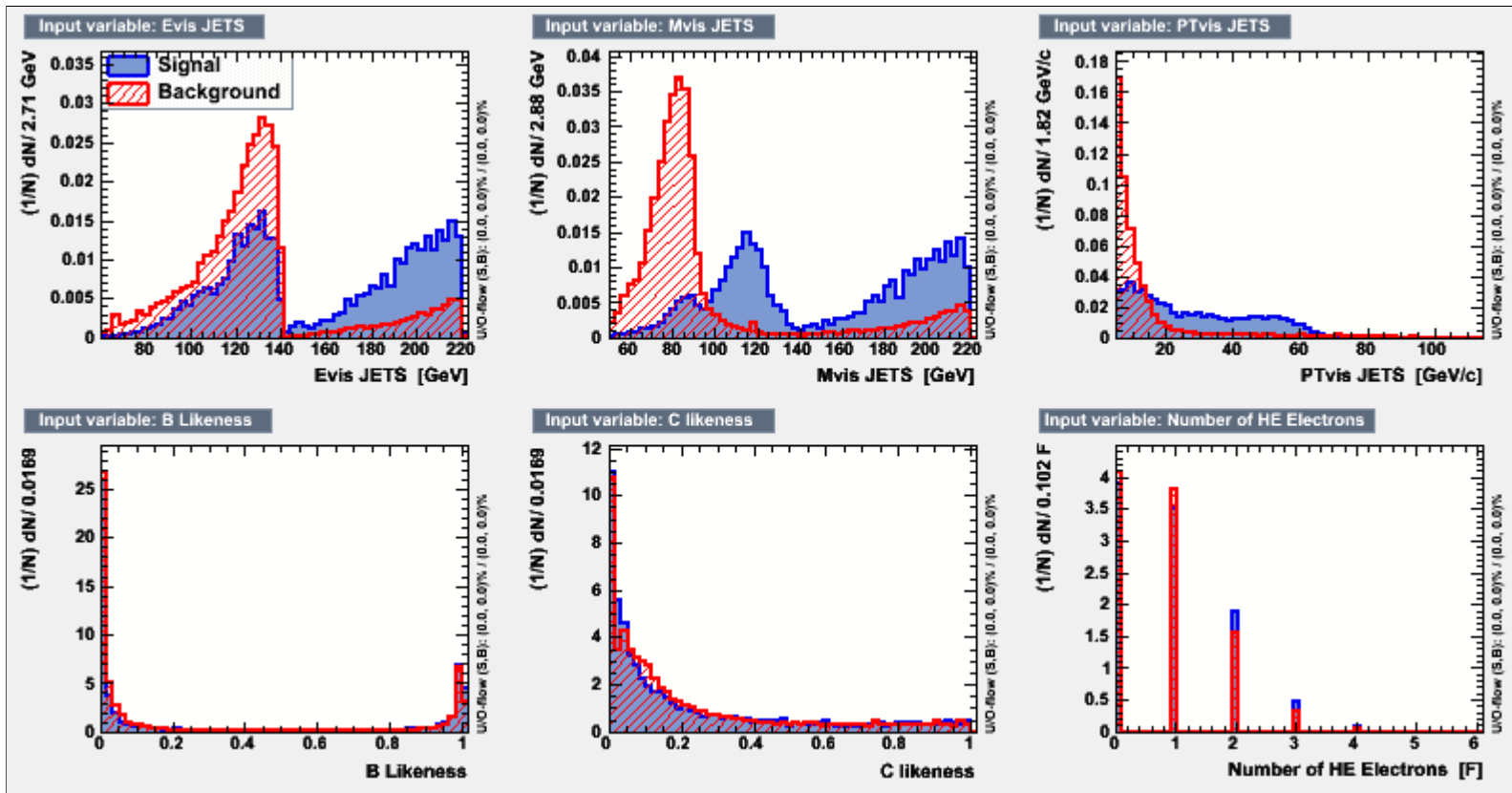
[MyDBDzHzzAnalysis.java](#)

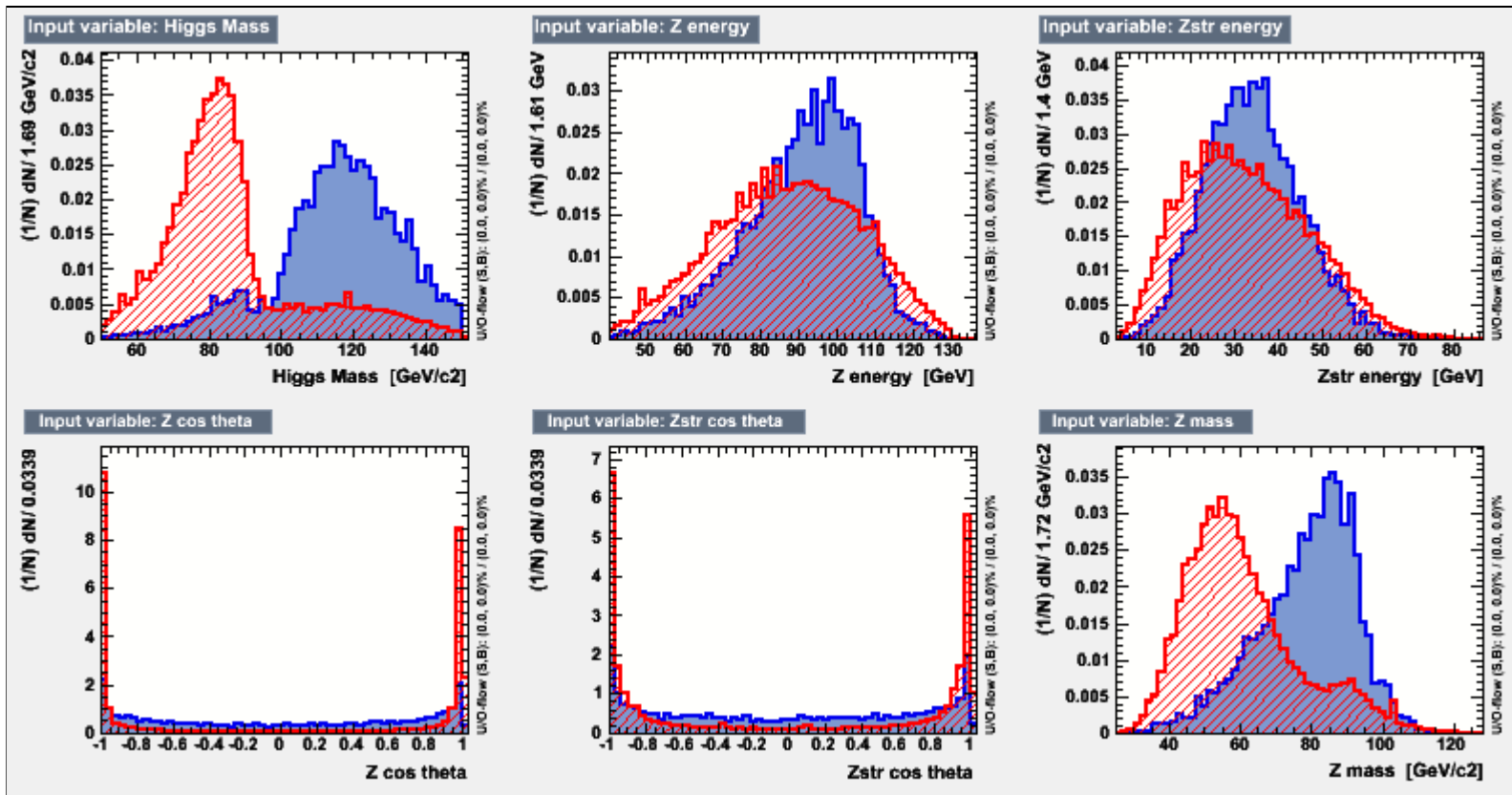
[IsolatedHighPElectronIdentifier.java](#)

Analysis:

- divide into 4 jet / 6 jet topologies
- apply preselection depending on topology
- train/apply TMVA's
- validate with cut table
- check remaining backgrounds

[variables_id_c1.png](#) [variables_id_c2.png](#) [variables_id_c3.png](#)

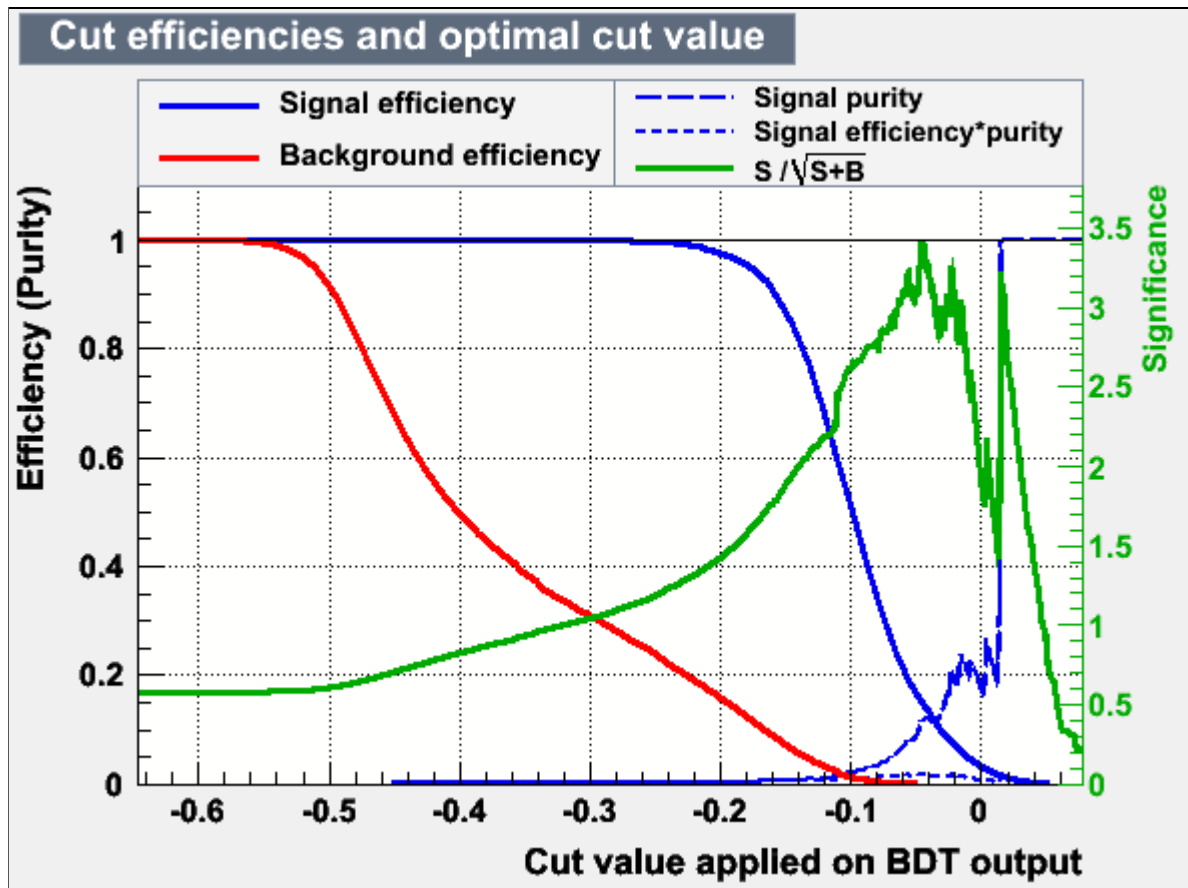


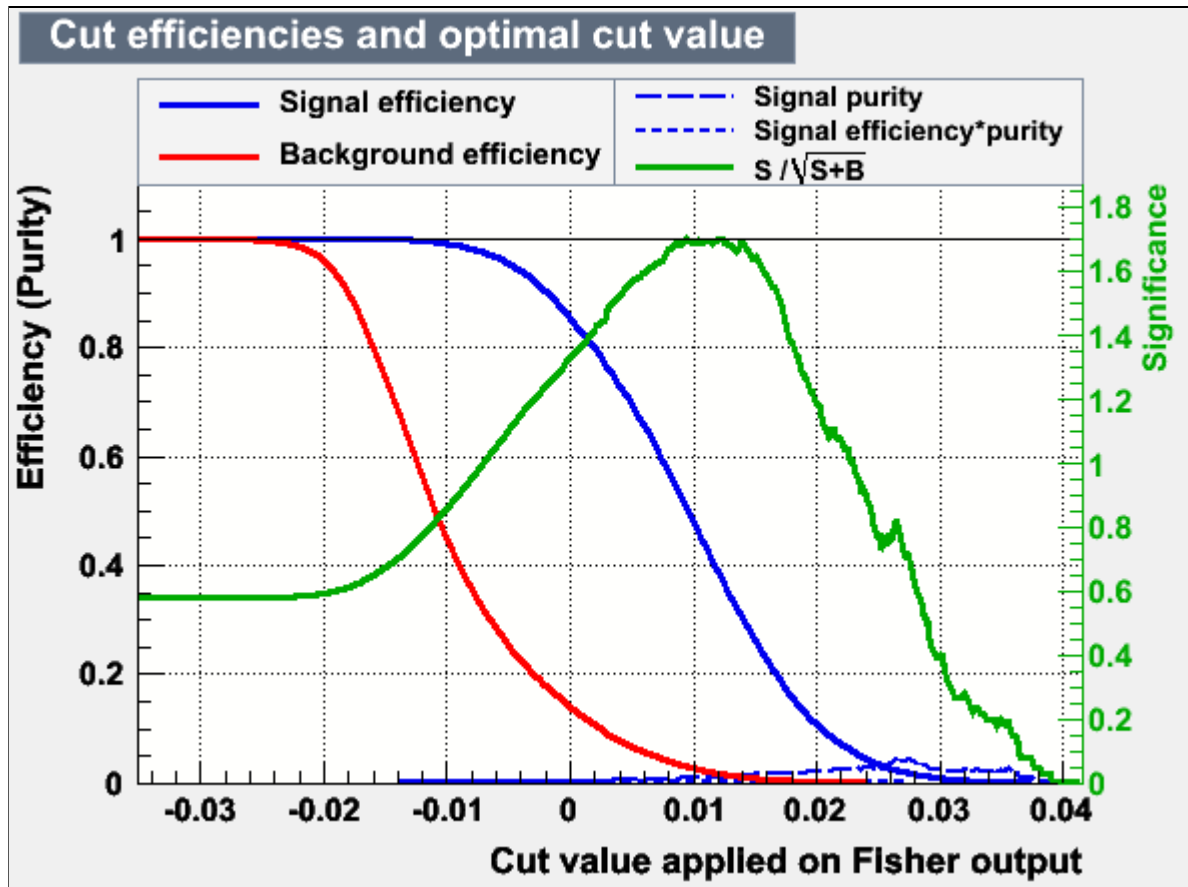


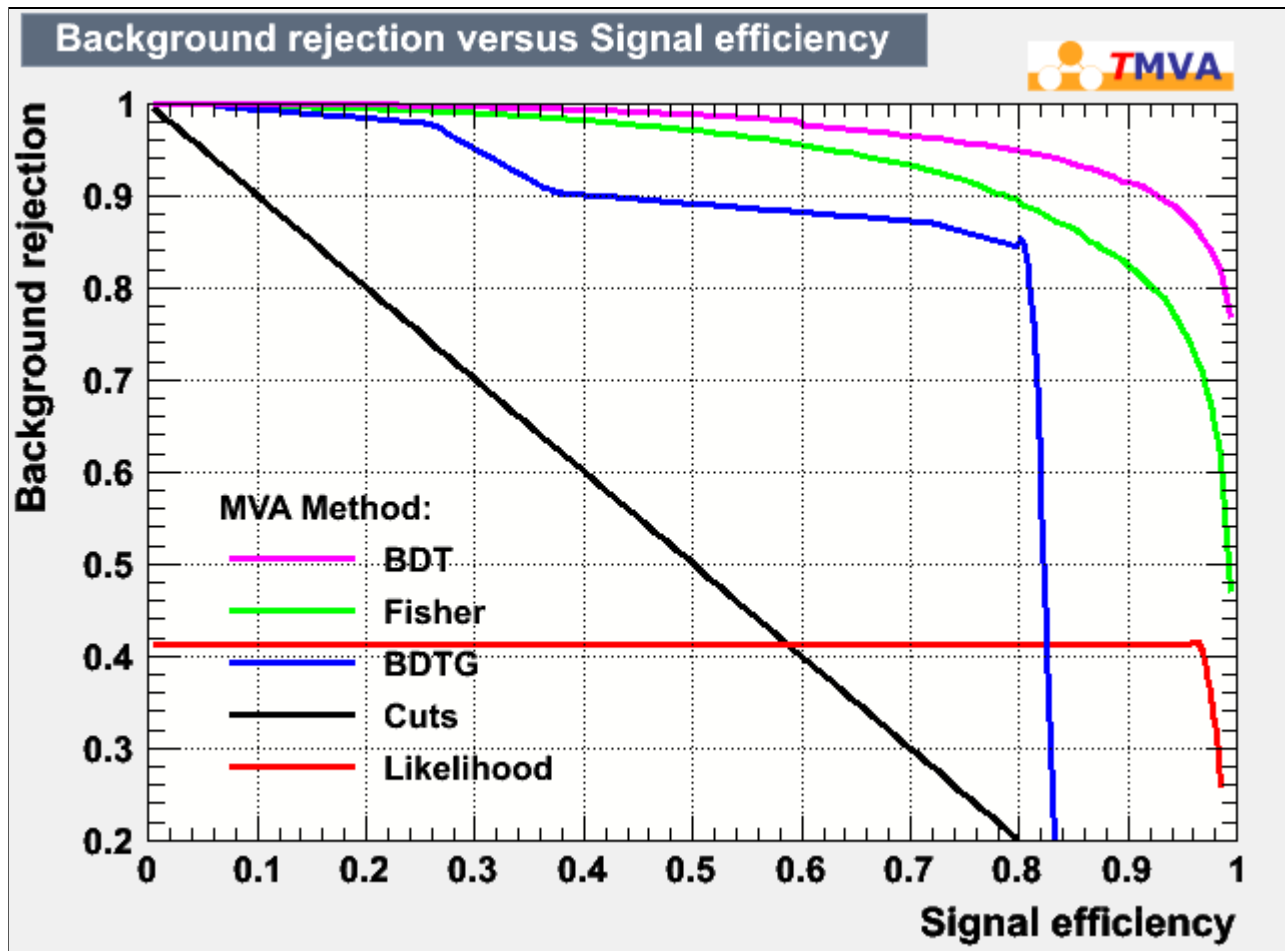
Performance of different MVA options:

```
[neal@localhost weights]$ grep -A 8 -i optimal- ../hzzv14-presel-v4-new-common0410results.txt
--- Classifier      ( #signal, #backgr.)  Optimal-cut  S/sqrt(S+B)      NSig      NBkg      EffSig      EffBkg
-----
---      Cuts:      ( 664.0744,1312202.5)    -0.0050      0              0          0          0          0
--- Likelihood:    ( 664.0744,1312202.5)     1.0000      0.728991    644.0848    779980.1    0.9699    0.5944
---      Fisher:    ( 664.0744,1312202.5)     0.0120      1.70335     258.2099    22721.13    0.3888    0.01732
---      BDTG:      ( 664.0744,1312202.5)    -0.9823      1.17754     538.5353    208621.3    0.811     0.159
---      BDT:       ( 664.0744,1312202.5)    -0.0462      3.42709     100.6751    762.2891    0.1516    0.0005809
-----
```

Combined 4-jet 6-jet performance using a cut at EvisJETS of 140 GeV to determine the preselection cuts to be used:







Cut table for BDT:

```

isigall= 1345.984602 isigpresel= 1460.101057 igood= 114.116455 ibad= 762.500000
intot= 77692005.984714 ipre= 876.616455
cuts__ (Cut Name          ):      all  others    2f      4f      6f      aa      1f      3f      5f
cut #0 (all                ): 7.769e+07  625000  14507062  1019938  0  54073784  0  7464875  0
cut #1 (20.<PTvisJETS      ): 1.283e+07  37500  5525512  746188  0  2968250  0  3546875  0
cut #2 (EvisJETS<220.    ): 4.637e+06  25000  3287550  514400  0  130196  0  678875  0
cut #3 (50.<hmass<140.   ): 3.306e+06  0  2542562  378675  0  60426  0  323875  0
cut #4 (||dph|-3.14159|>0.15 ): 2.772e+06  0  2083912  364150  0  57097  0  266000  0
cut #5 (nTrks>10        ): 1.426e+06  0  1136375  169088  0  30283  0  89875  0

```

```

cut #6 (jetthrust<0.99      ): 1.325e+06      0 1044700 165588      0 30033      0 84125      0
cut #7 (ej1>40.            ): 1.313e+06      0 1035112 164625      0 29215      0 83250      0
cut #8 (MVA                 ): 8.766e+02      0 138      625      0 0      0 0      0

```

Remaining backgrounds:

```

$ awk '{print $3,$7,$15}' zzhpassing.dat | sort -n | uniq -c | awk '{if (NF==4) print $1*$2*$4,$0}' | sort -k 1,1 -n
1278744      1 106562 4f_sz 12.500000
1278792      1 106566 4f_sw 12.500000
1278864      1 106572 4f_sz 12.500000
1278900      1 106575 4f_zz 12.500000
1279284      1 106607 2f_z_ 12.500000
2557224      2 106551 4f_ww 12.500000
2557272      2 106553 4f_zz 12.500000
2557704      2 106571 4f_sz 12.500000
2557752      2 106573 4f_zz 12.500000
3836664      3 106574 4f_zz 12.500000
3836808      3 106578 4f_ww 12.500000
12792960     10 106608 2f_z_ 12.500000
16625856     13 106576 4f_zz 12.500000
24299556     19 106577 4f_ww 12.500000

```

Variable distributions without any preselection:

[variables_id_c1-nopresel.png](#) [variables_id_c2-nopresel.png](#) [variables_id_c3-nopresel.png](#)

nu nu H only:

[variables_id_c1-4jonly.png](#)

qqH,IIH only:

[variables id c1-no4j.png](#)

[TrackSubdetectorHitNumbersDriver.java](#)

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