

SiD

Total Higgs Width from

$e^+e^- \rightarrow ZH, H \rightarrow ZZ^$*

@ $E_{cm} = 250 \text{ GeV}$

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Inputs

ftp://ftp-lcd.slac.stanford.edu/ilc4/DBD/ILC250/higgs_ffh_zz/

But no description on

[https://confluence.slac.stanford.edu/display/ilc/Standard+M](https://confluence.slac.stanford.edu/display/ilc/Standard+Model+Data+Samples)

[odel+Data+Samples](https://confluence.slac.stanford.edu/display/ilc/Standard+Model+Data+Samples)

/nfs/slac/g/lcd/ilc_data4/snowmass/ILC250/higgs/sidloi3/slci/reco/higgs_ffh_zz_-80e-_+30e+_000_SLIC-v3r0p3_geant4-v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.slci

directory inv ab	250	2000	all_SM_background	250	-80/+30	2,822,661
directory inv ab				250	+80/-30	2,058,374
directory inv ab	250	2000	evW_eeZ_vvZ_semileptonic	250	-80/+30	2,030,078
directory inv ab				250	+80/-30	1,485,507

/nfs/slac/g/lcd/ilc_data4/snowmass/ILC250/backgrounds/sidloi3/slci/reco/all_SM_

[background](#) [-80e-_+30e+_000_SLIC-](#)

[v3r0p3_geant4v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.slci">v3r0p3_geant4v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.slci](#)

Topologies

higgs_ffh_zz_-80e-_+30e+_018_SLIC-v3r0p3_geant4-v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.slcio-flav.slcio

6 Jet

- ▷ gamma(E=1.3421 status=Intermediate)
- ▷ gamma(E=.081287 status=Intermediate)
- ▷ e-(E=46.709 status=Intermediate)
- ▷ e+(E=64.186 status=Intermediate)
- ▽ h0/H01(E=136.92 status=Intermediate)
 - ▽ h0/H01(E=136.92 status=Intermediate)
 - ▷ Zo(E=86.447 status=Intermediate)
 - ▷ Zo(E=50.470 status=Intermediate)

- ▷ gamma(E=.018825 status=Intermediate)
- ▷ gamma(E=1.4878 status=Intermediate)
- ▷ mu-(E=48.367 status=Intermediate)
- ▷ mu+(E=60.933 status=Intermediate)
- ▽ h0/H01(E=138.96 status=Intermediate)
 - ▽ h0/H01(E=138.96 status=Intermediate)
 - ▷ Zo(E=45.666 status=Intermediate)
 - ▷ Zo(E=93.293 status=Intermediate)

4 Jet

- ▷ gamma(E=2.7756E-14 status=Intermediate)
- ▷ gamma(E=1.4775E-5 status=Intermediate)
- ▷ nu_e(E=47.906 status=Intermediate)
- ▷ nu_e_bar(E=51.523 status=Intermediate)
- ▽ h0/H01(E=150.99 status=Intermediate)
 - ▽ h0/H01(E=150.99 status=Intermediate)
 - ▷ Zo(E=128.37 status=Intermediate)
 - ▷ Zo(E=22.613 status=Intermediate)

- ▷ gamma(E=1.4452E-5 status=Intermediate)
- ▷ gamma(E=5.8498E-8 status=Intermediate)
- ▷ u(E=80.005 status=Intermediate)
- ▷ u_bar(E=30.779 status=Intermediate)
- ▽ h0/H01(E=137.89 status=Intermediate)
 - ▽ h0/H01(E=137.89 status=Intermediate)
 - ▷ Zo(E=108.89 status=Intermediate)
 - ▷ Zo(E=28.993 status=Intermediate)

Data Preparation

- Steps of the job that prepares the data for analyzing:

Fill hit counting values:

source /u/ey/homer/sidhome/sid/lcsim-homer/testrunsubDetHitNum \$1 input_prejet.slcio

Clustering to 6 jets: (JetOut6Jets)

Marlin /u/ey/homer/sidhome/lcfi/mfast-all-batch-6jet-step1.xml

Clustering to 4 jets: (JetOut)

Marlin /u/ey/homer/sidhome/lcfi/mfast-all-batch-4jet-step2.xml

Vertexing:

Marlin /u/ey/homer/sidhome/lcfi/steering/revertex-all-batch.xml

Flavor tagging:

Marlin /u/ey/homer/sidhome/lcfi/steering/flavortag-all-batch-revtx-350-4jets.xml

Post-processing of reco files

```
bash-3.2$ ls -lrt ~/tagged_files/higgs_ffh_zz_-80e-_+30e+_001_SLIC-  
v3r0p3_geant4  
-v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.slcio-dir/  
  
-rw-r--r--+ 1 homer lcddata 206374020 Jul 17 16:17 input_prejet.slcio  
-rw-r--r--+ 1 homer lcddata 204005832 Jul 17 16:18 output_postjet-6jet.slcio  
-rw-r--r--+ 1 homer lcddata    6726 Jul 17 16:18 jet-6jet-step1.log  
-rw-r--r--+ 1 homer lcddata 204434924 Jul 17 16:20 output_postjet.slcio  
-rw-r--r--+ 1 homer lcddata    7371 Jul 17 16:20 jet-4jet-step2.log  
-rw-r--r--+ 1 homer lcddata    691 Jul 17 16:20 vtx.log  
-rw-r--r--+ 1 homer lcddata 91850240 Jul 17 16:27 output_postjet_vtx.slcio
```

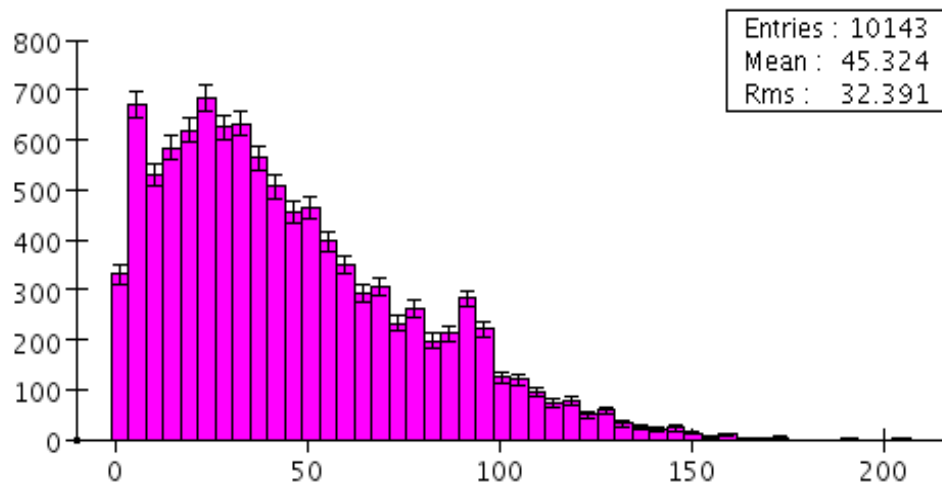
```
bash-3.2$ ls -lrt ~/tagged_files/higgs_ffh_zz_-80e-_+30e+_001_SLIC-v3r0p3_geant4-  
v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_lcsim-2.9_pandora.s  
lcio-dir/  
  
-rw-r--r--+ 1 homer lcddata    6726 Jul 17 16:18 jet-6jet-step1.log  
-rw-r--r--+ 1 homer lcddata    7371 Jul 17 16:20 jet-4jet-step2.log  
-rw-r--r--+ 1 homer lcddata    5984 Jul 17 16:34 vtx.log  
-rw-r--r--+ 1 homer lcddata 205640380 Jul 17 16:36 output_postjet_flavtag.slcio  
-rw-r--r--+ 1 homer lcddata  929495 Jul 17 16:36 flav.log  
lrwxrwxrwx 1 homer lcddata    28 Jul 17 16:36 higgs_ffh_zz_-80e-_+30e+_001_SLIC-  
v3r0p3_geant4-v9r5p1_QGSP_BERT_sidloi3_lcsimTracking_l  
csim-2.9_pandora.slcio-flav.slcio -> output_postjet_flavtag.slcio
```

Steps

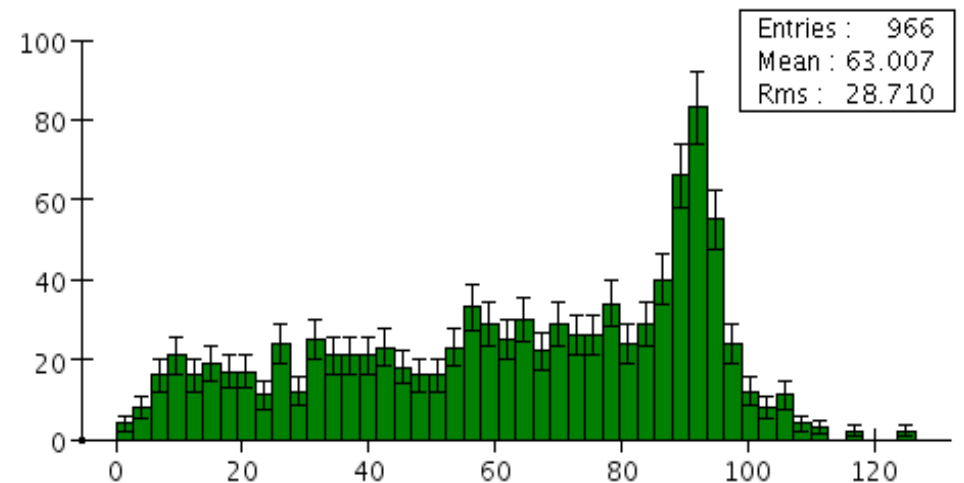
- 6 jet topology:
 - Find 2 exclusive jet pairs giving mass most consistent with $m(Z)$
 - Find pair that gives mass most consistent with $m(H)$ when combined with the rest of the event
- 4 jet topology:
 - Find jet pair giving mass most consistent with $m(Z)$
 - Form candidate $m(H)$ from this and the rest of the event
- Select topology giving best $m(H)$
 - Will add missing energy cuts and vertexing quality cuts

$e^+e^- \rightarrow ZH, H \rightarrow ZZ^*$ 6 jet topology

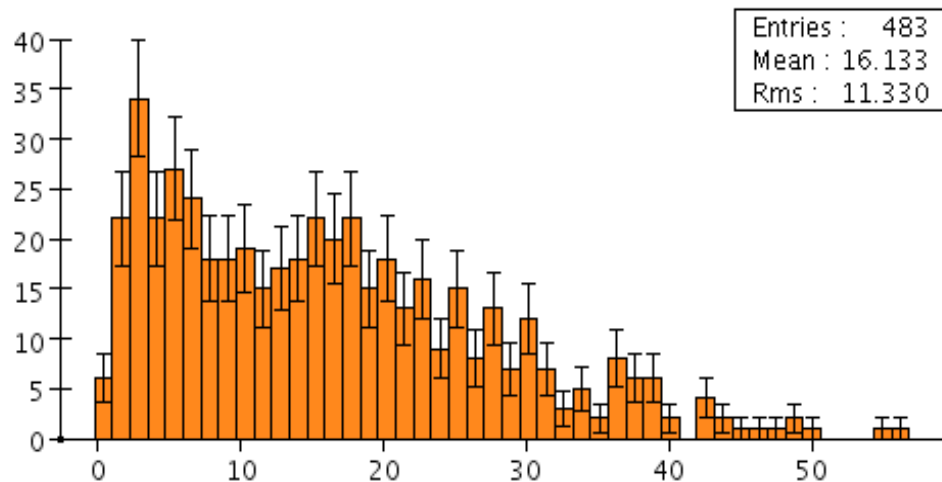
PAIR: /all 6 jet non-trivial pair masses



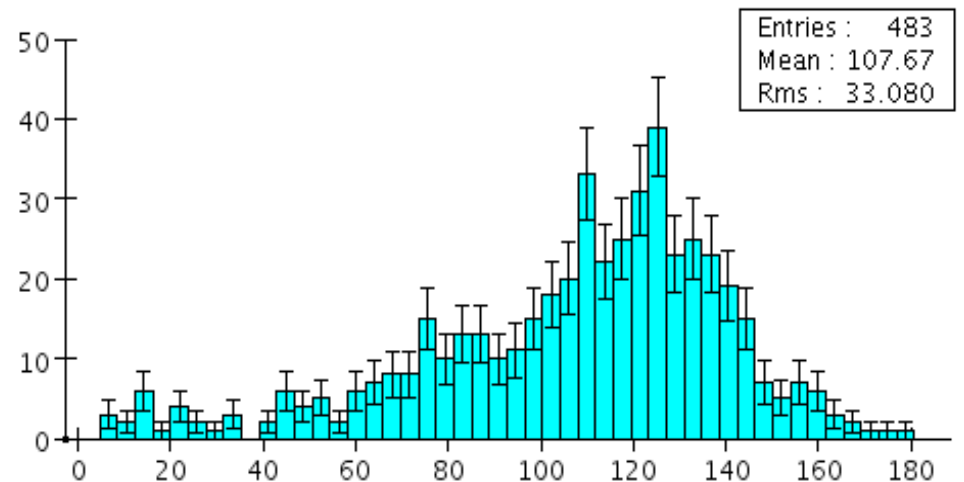
PAIR: /mass of best two Z pairs from 6 jets



PAIR: /mass of other pair from 6 jets



PAIR: /H mass from best pair from 6 jets

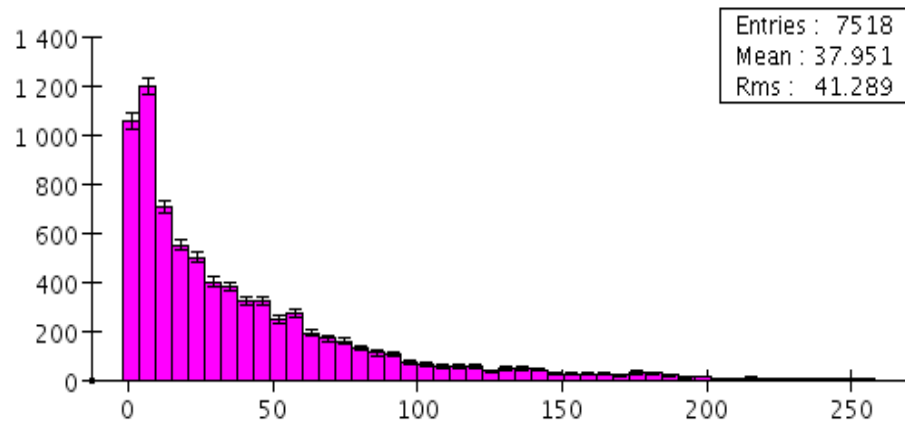


all_SM_background

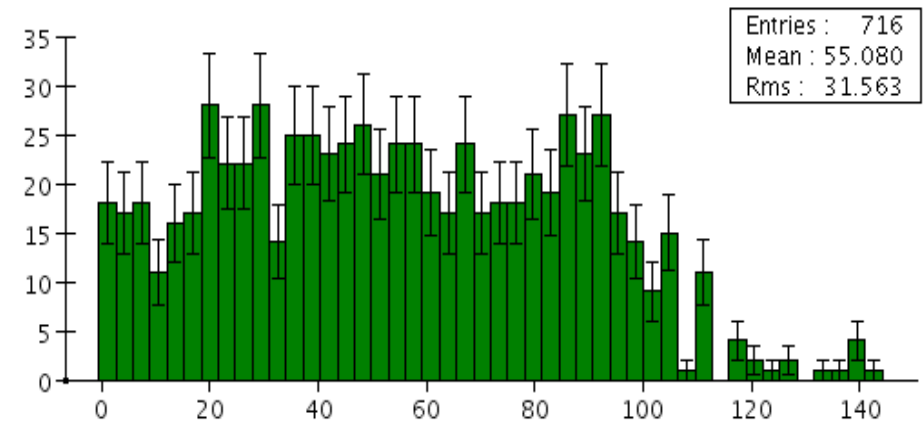
6 jet topology

(NOT weighted yet)

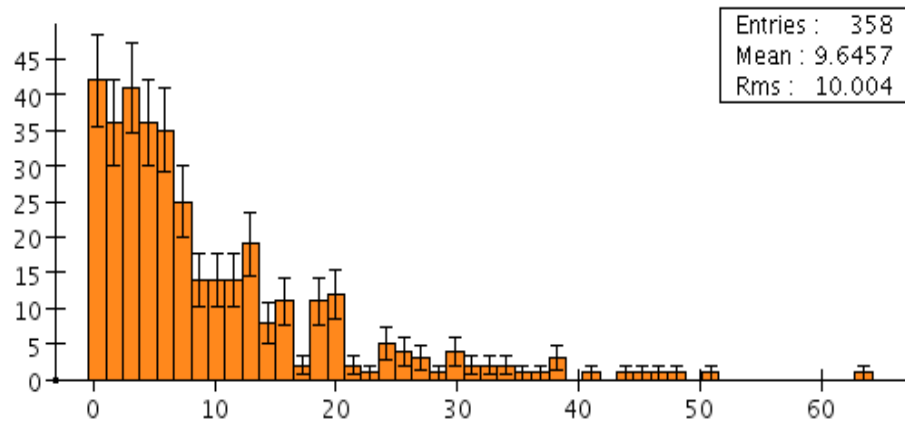
PAIR:/all 6 jet non-trivial pair masses



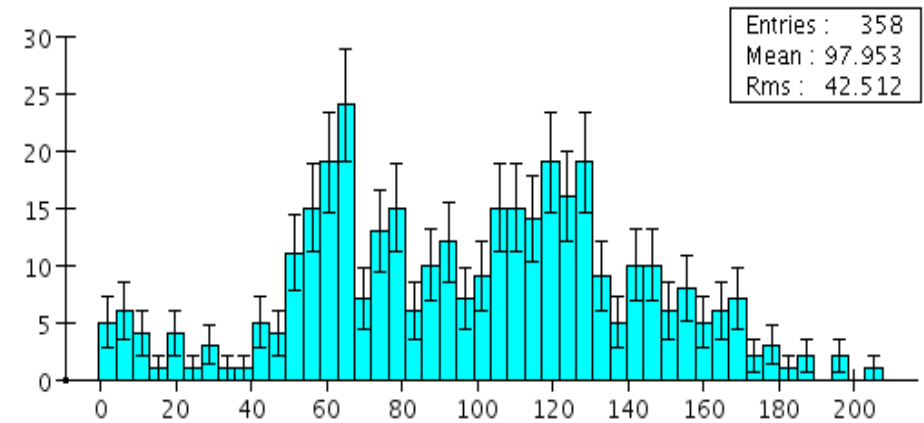
PAIR:/mass of best two Z pairs from 6 jets



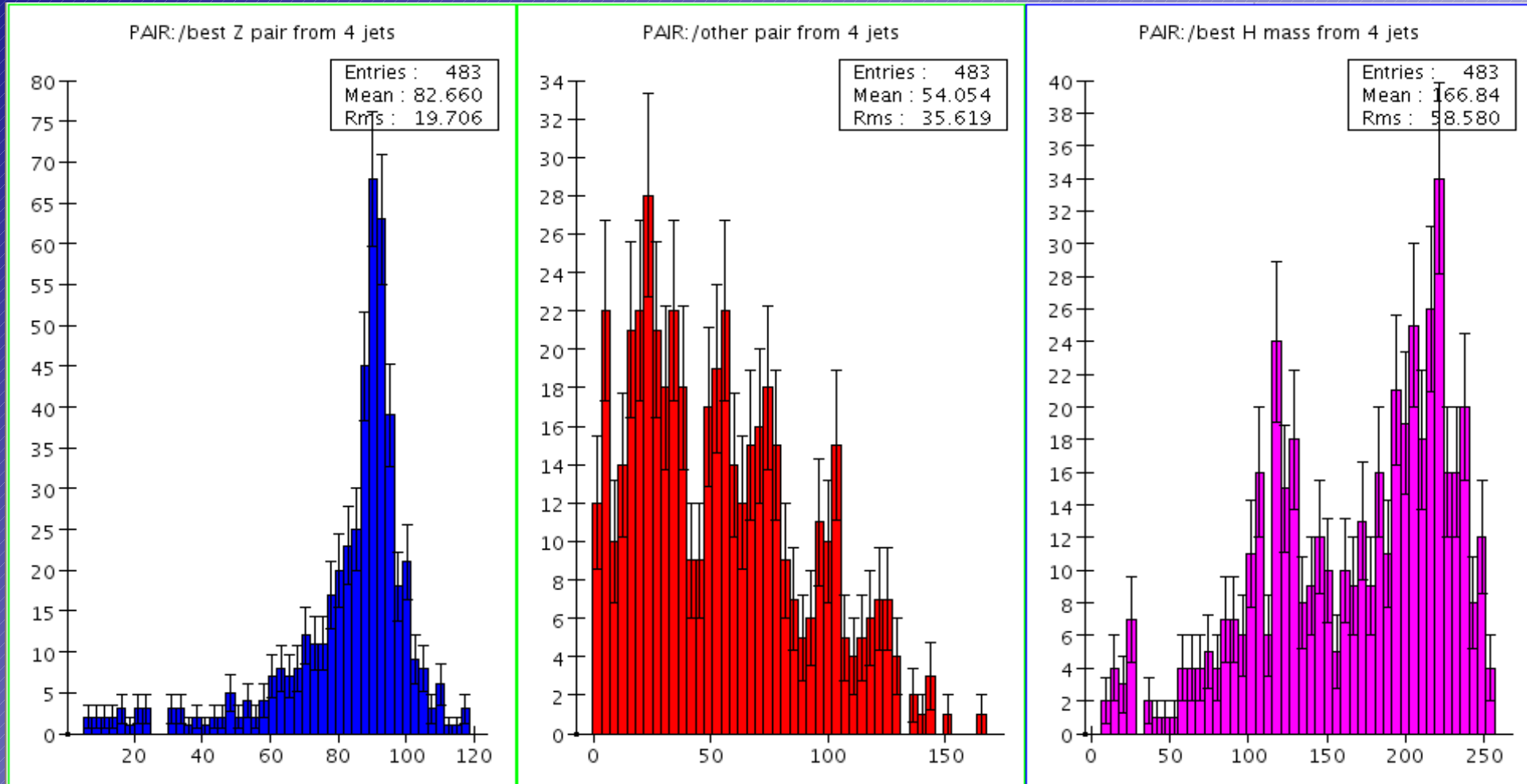
PAIR:/mass of other pair from 6 jets



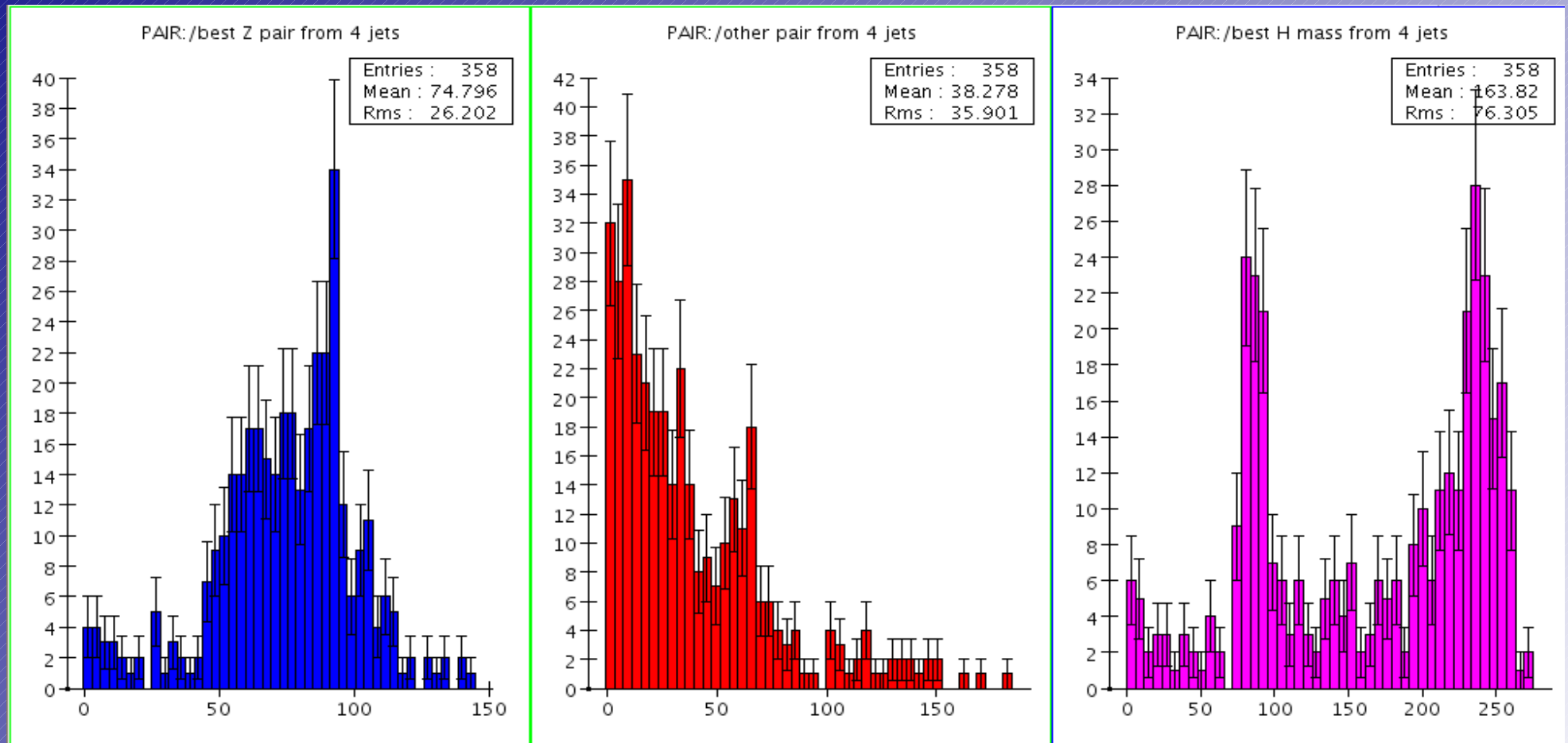
PAIR:/H mass from best pair from 6 jets



$e^+e^- \rightarrow ZH, H \rightarrow ZZ^*$ 4 jet topology

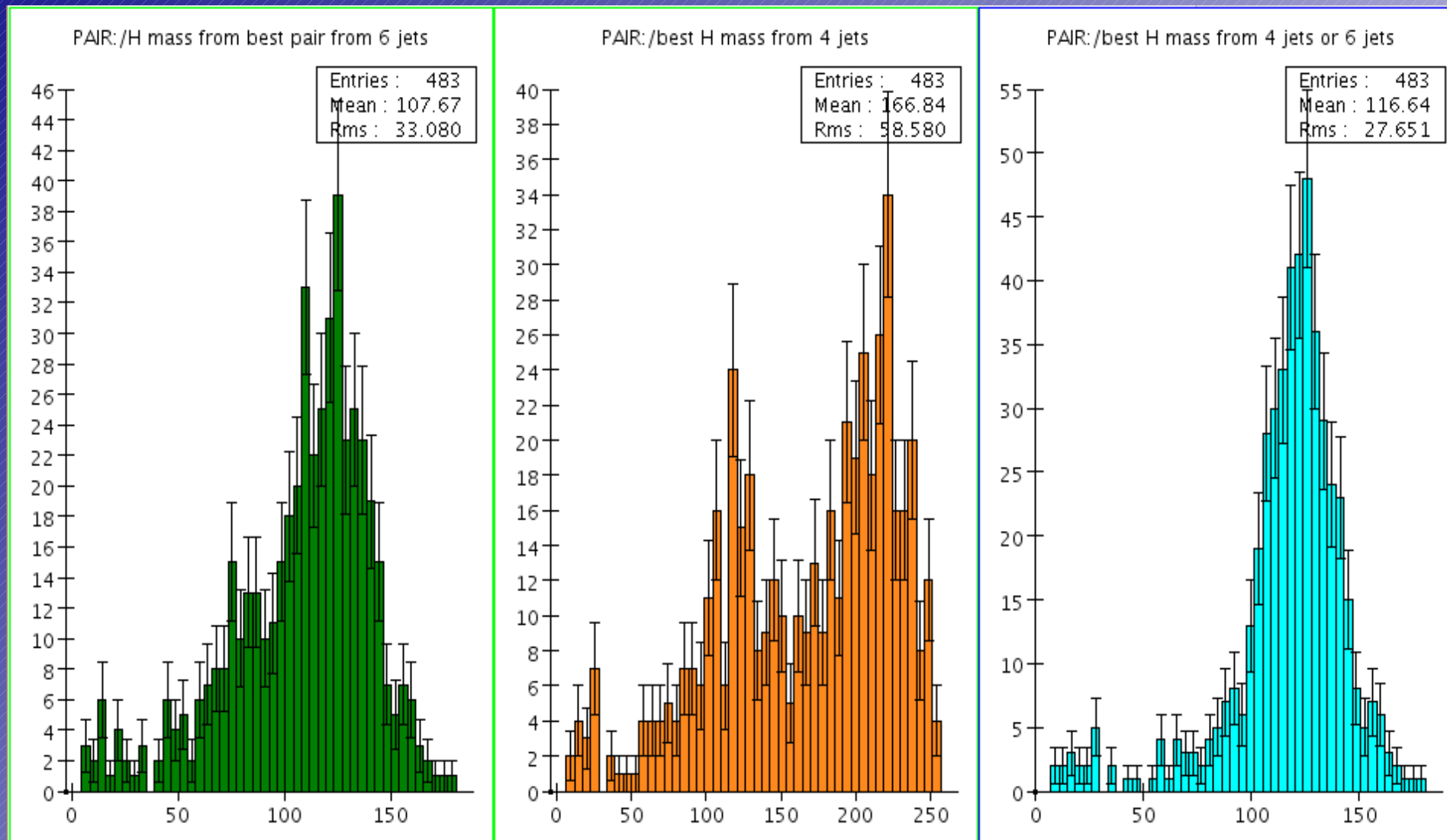


all_SM_background 4 jet topology (NOT weighted yet)

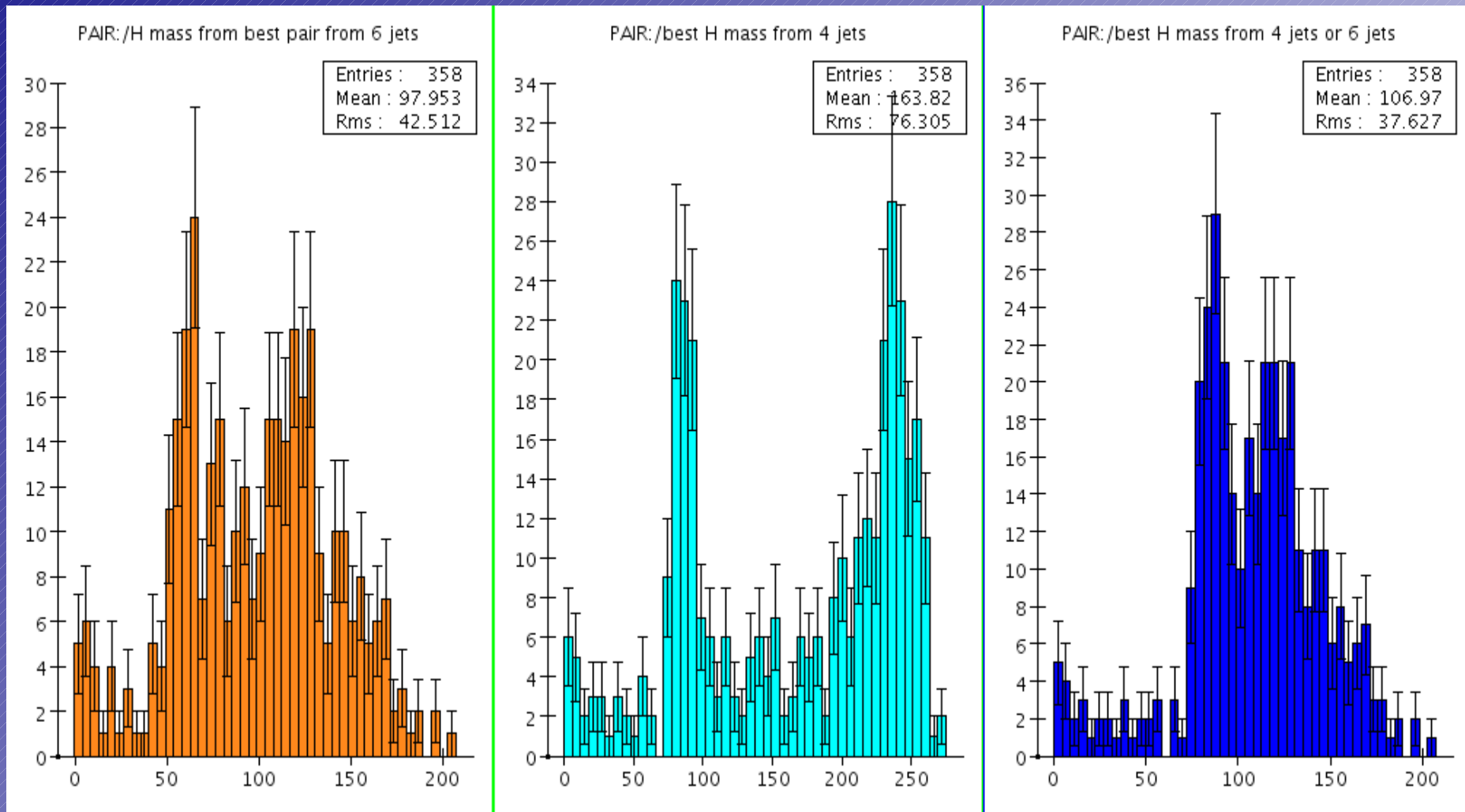


$e^+e^- \rightarrow ZH, H \rightarrow ZZ^*$

best of 4/6 jet topology



all_SM_background best of 4/6 *jet topology* (NOT weighted yet)



Target

- Must have a very clear outline of what measurements are needed and the methods to be used.
- Is the desired result just:

$$\frac{\Delta(\sigma \cdot BR)}{\sigma \cdot BR} = \frac{\sqrt{S+B}}{S}$$

for $H \rightarrow ZZ^*$ at $E_{\text{CM}} = 250\text{GeV}$ for $-80/+30$ and $+80/-30$
with no results by channel and only using flavor tagging
for improving overall significance

?

- Are there any previous studies I should get suggestions from?