Update on BSM Higgs searches

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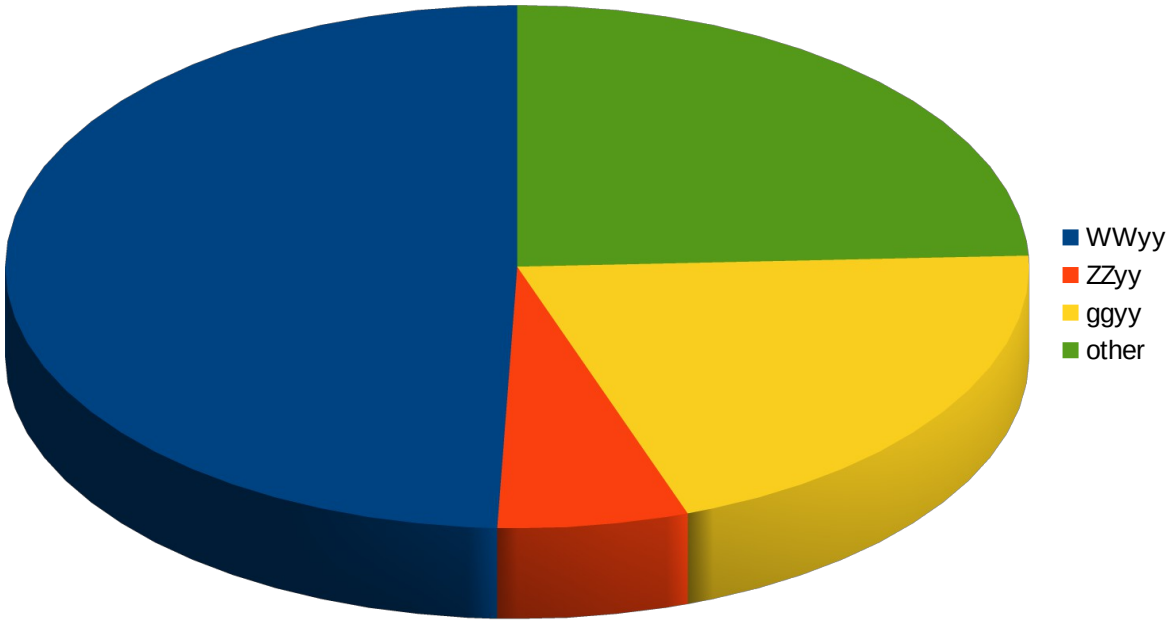
MC sample production

- Prepared generator files for XXyy signal samples excluding bbyy
- MG5(HeavyScalar)+Pythia8
  - MG5 for gg → X → hh
  - Pythia8 for h decays, parton shower and hadronization
- Files are all ready as well as the JOs, sent to Liron and MC production responsibles, waiting for theire confirmation and submittion to the production queues
- The samples are produced in an inclusive way
  - The decay table of SM h is rewritten

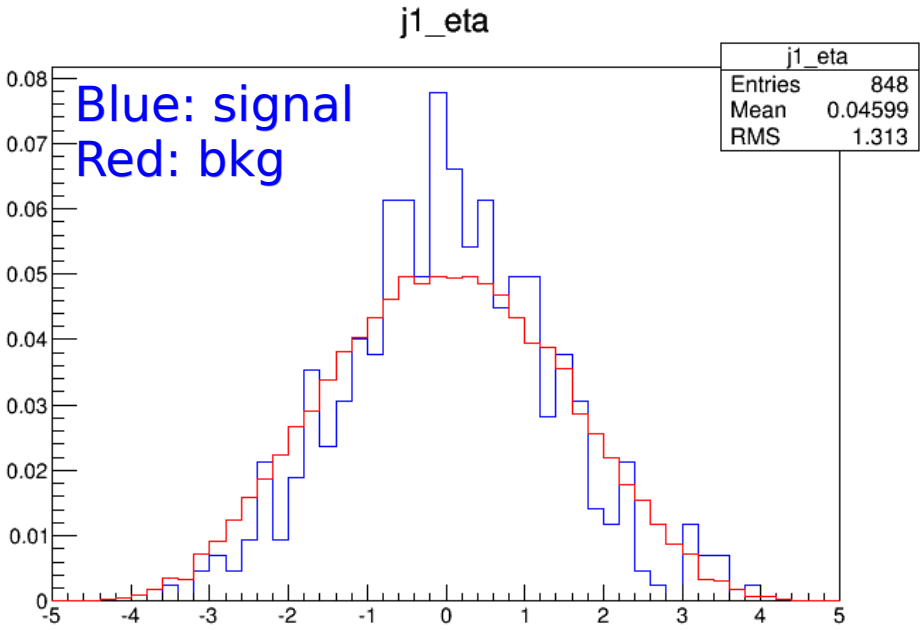
```
#Pythia8 Commands
topAlg.Pythia8.Commands += [ "25:onMode = off",
                             "25:oneChannel = on 0.5 100 22 22 ", # setting yy with 50% br, all ot
                             "25:addChannel = on 0.0750 100 15 -15", # tau tau
                             "25:addChannel = on 0.0003 100 13 -13", # mu mu
                             "25:addChannel = on 0.0345 100 4 -4", # c c
                             "25:addChannel = on 0.0003 100 3 -3", # s s
                             "25:addChannel = on 0.1017 100 21 21", # g g
                             "25:addChannel = on 0.0018 100 23 22", # Z y
                             "25:addChannel = on 0.2551 100 24 -24", # W W
                             "25:addChannel = on 0.0313 100 23 23" # Z Z
                             ]
```

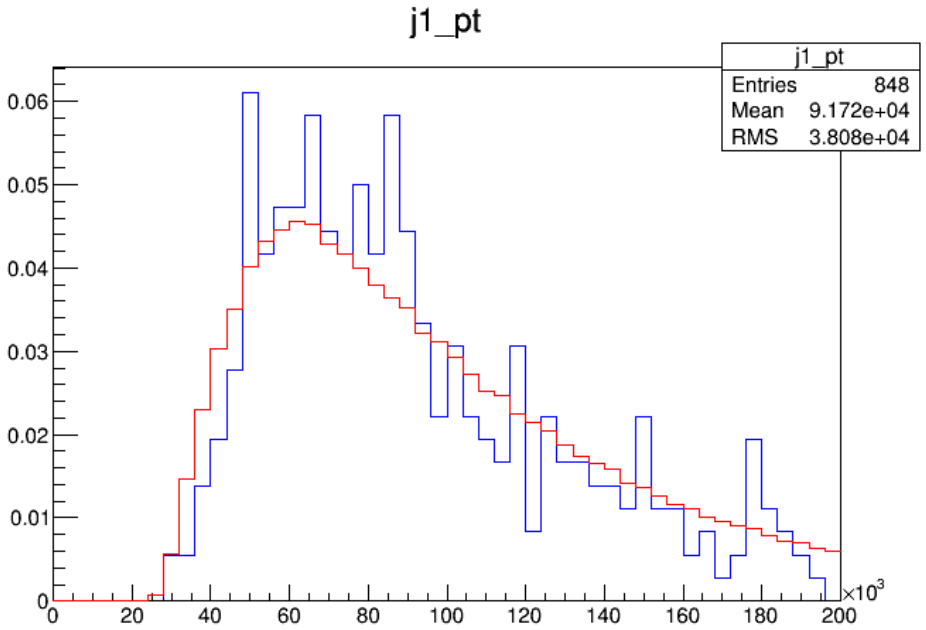
Inclusive production



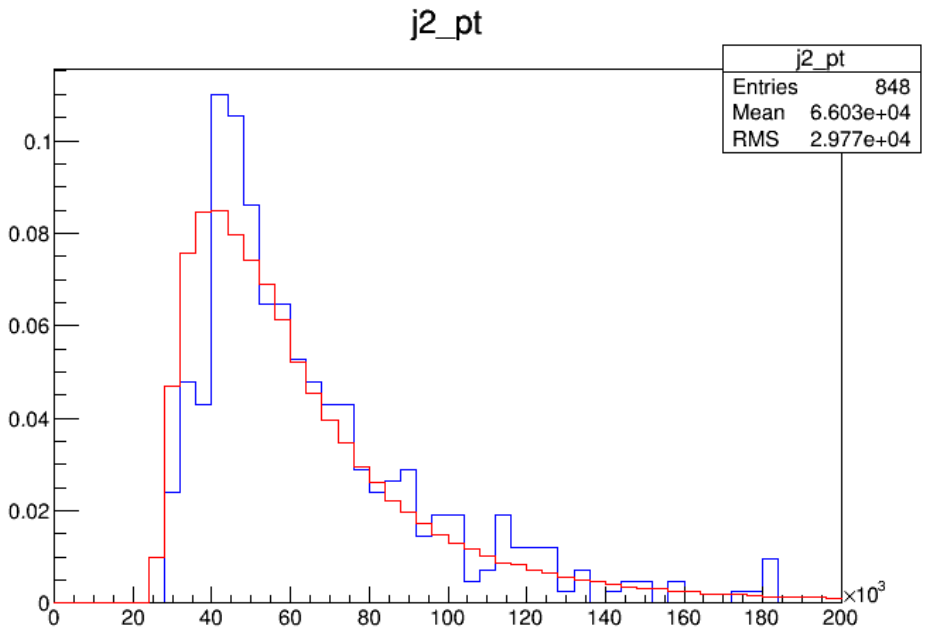
WhadWhadyy

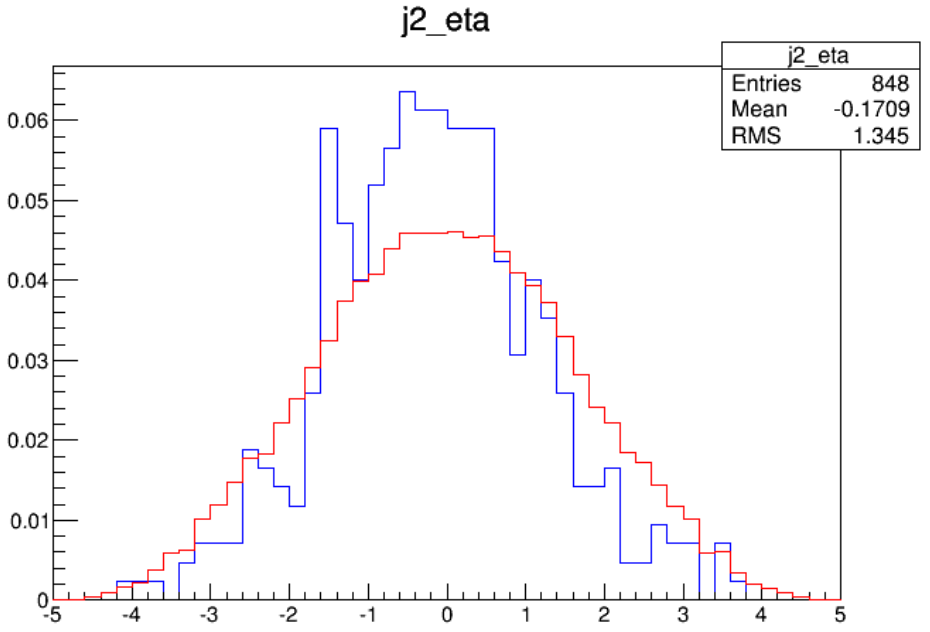
- Compare some distributions between signal (~1k) and backgrounds (data)
  - Data is from /publicfs/atlas/atlasnew/higgs/hgg/huijun/sample/Data/data.root
  - I assume in data, bkg is dominant → the kine will minic bkg

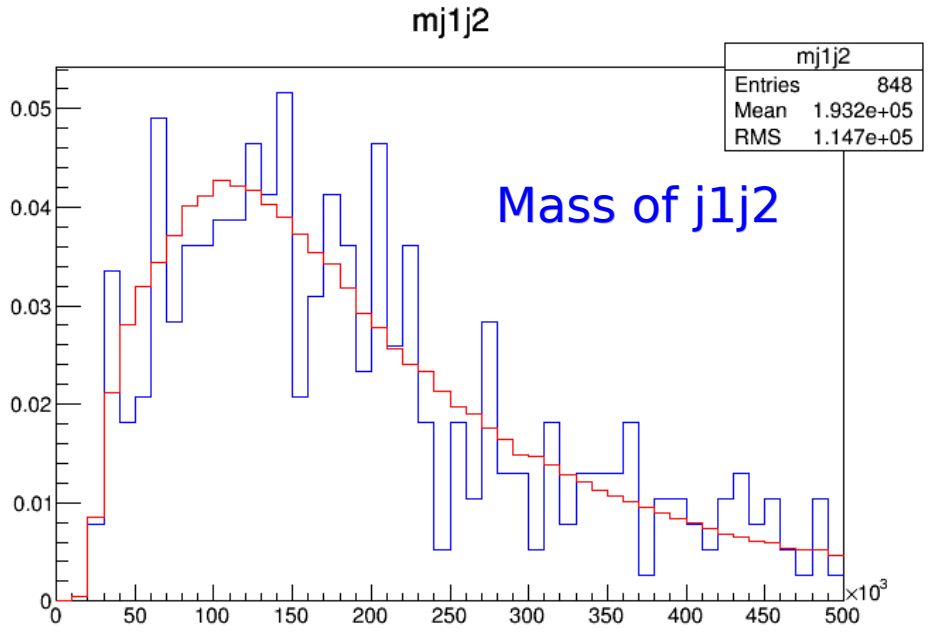


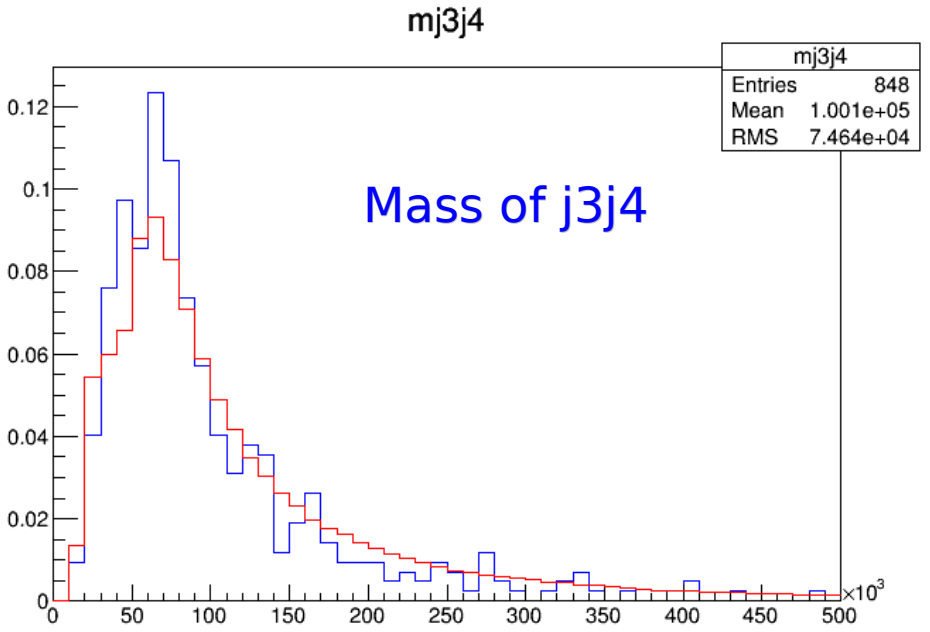


Kine

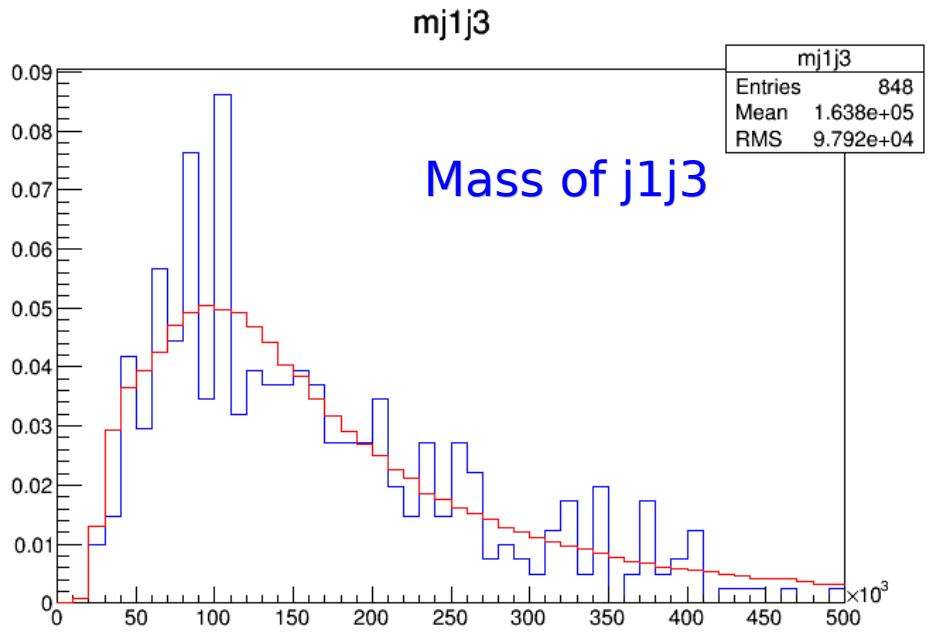

j2_pt
j2_pt
Entries 848
Mean 6.603e+04
RMS 2.977e+04
×10^3

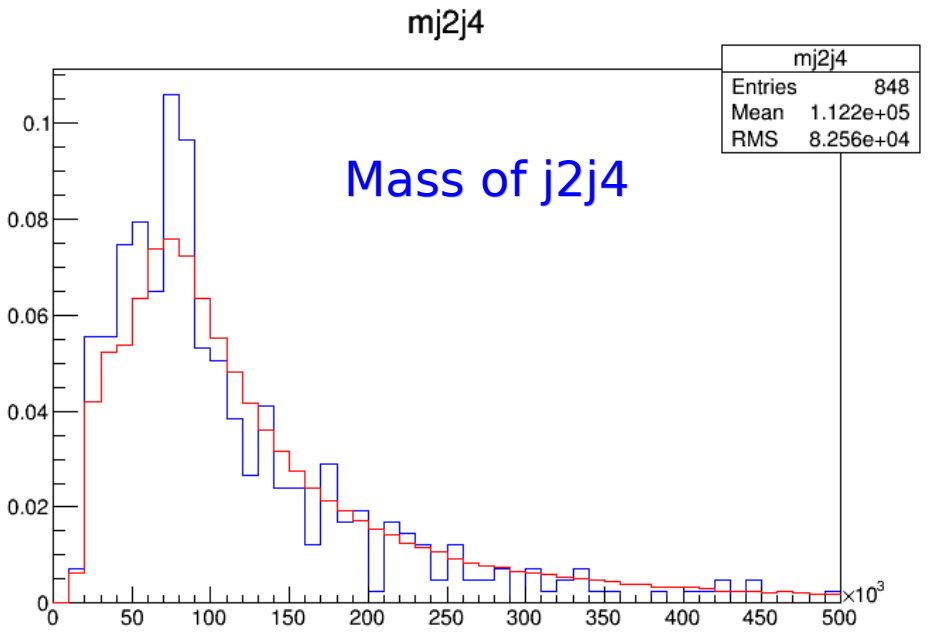

j2_eta
j2_eta
Entries 848
Mean -0.1709
RMS 1.345

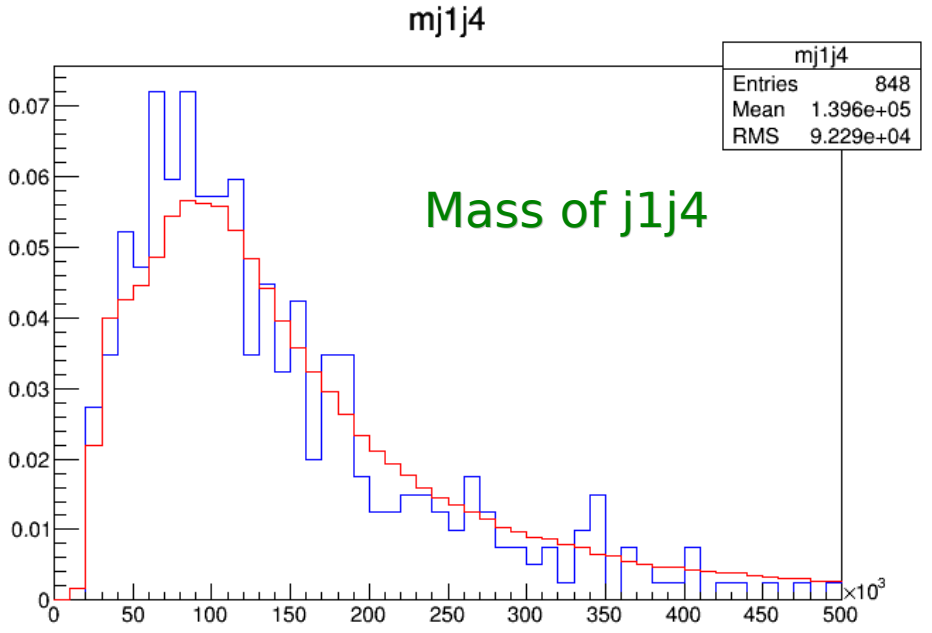

mj1j2
mj1j2
Entries 848
Mean 1.932e+05
RMS 1.147e+05
Mass of j1j2
×10^3

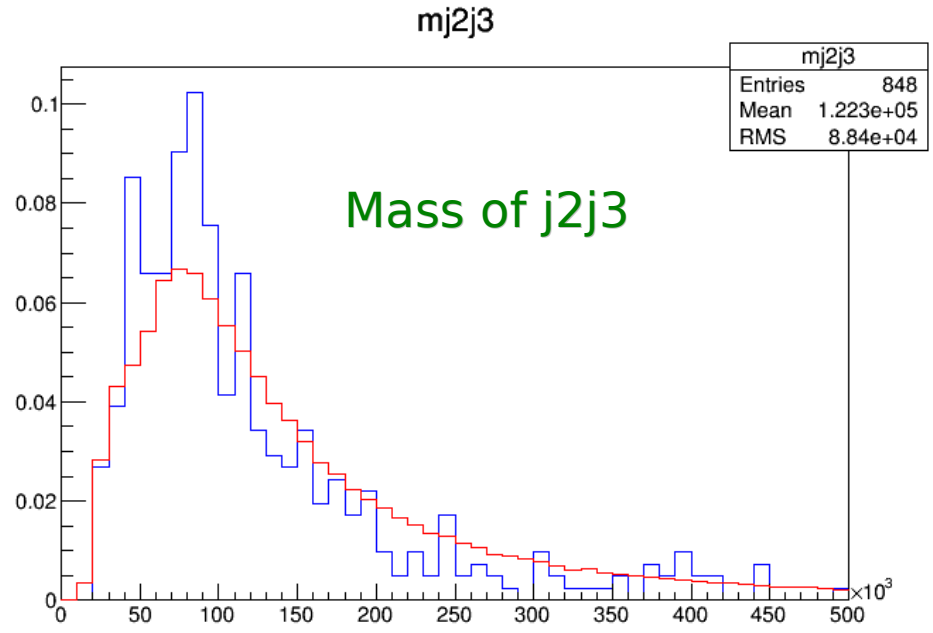

mj3j4
mj3j4
Entries 848
Mean 1.001e+05
RMS 7.464e+04
Mass of j3j4
×10^3

Kine

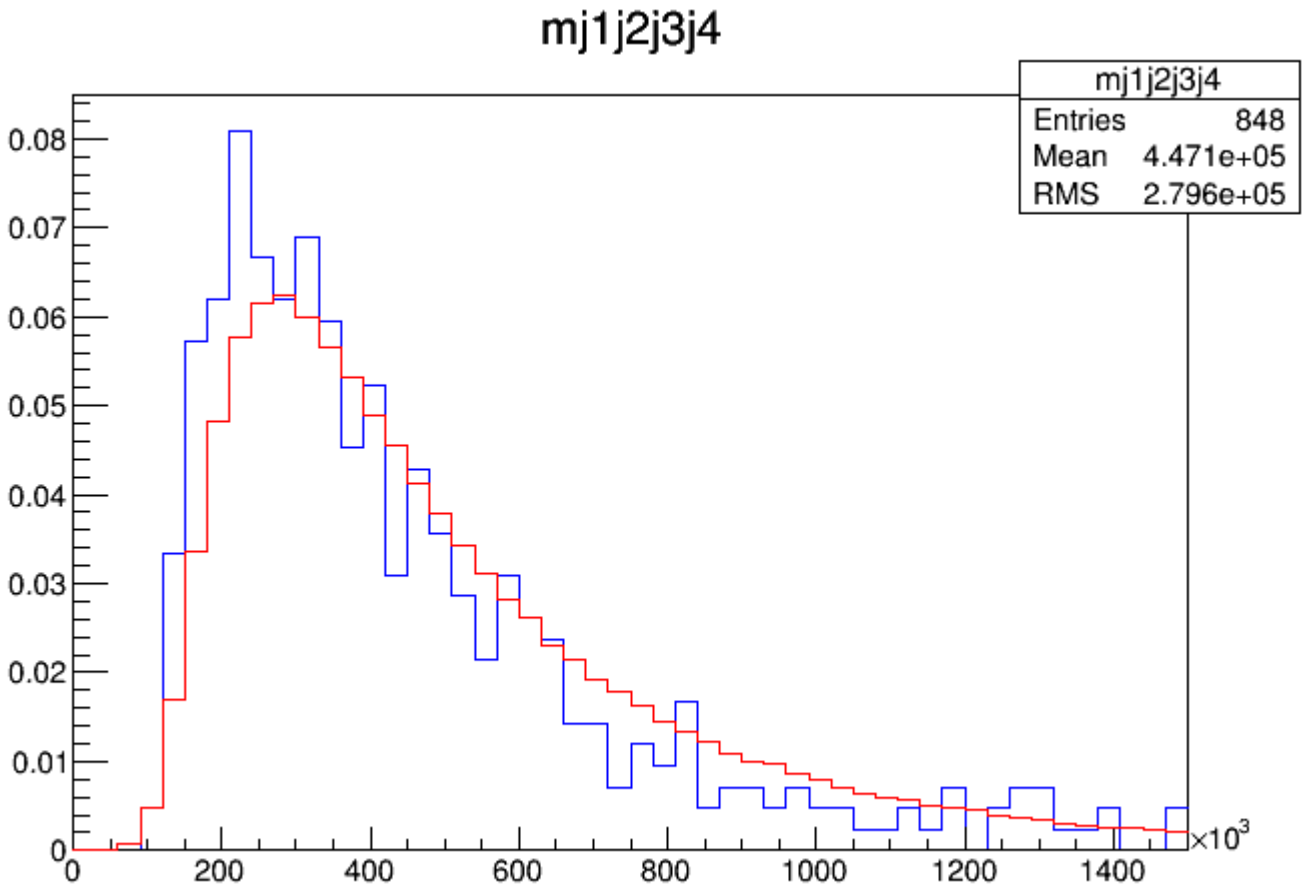

mj1j3
mj1j3
Entries 848
Mean 1.638e+05
RMS 9.792e+04
Mass of j1j3
×10^3


mj2j4
mj2j4
Entries 848
Mean 1.122e+05
RMS 8.256e+04
Mass of j2j4
×10^3


mj1j4
mj1j4
Entries 848
Mean 1.396e+05
RMS 9.229e+04
Mass of j1j4
×10^3


mj2j3
mj2j3
Entries 848
Mean 1.223e+05
RMS 8.84e+04
Mass of j2j3
×10^3

Kine


mj1j2j3j4
mj1j2j3j4
Entries 848
Mean 4.471e+05
RMS 2.796e+05
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
200
400
600
800
1000
1200
1400
×10^3

WhadWhadyy

- It seems that signal and bkg are quite similar if I did not misused the datasets
- ? Or, we should not use the leading 4 jets, instead, look for other jets to reconstruct WW*?
- ? Or, photon trigger killed too many the signal?
  - 3500 events are generated, only ~1000 events have >=4 jets in photon_ntuple