

Status report

Feb 23, 2021

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HYU / IP2I

Building analysis

Sample

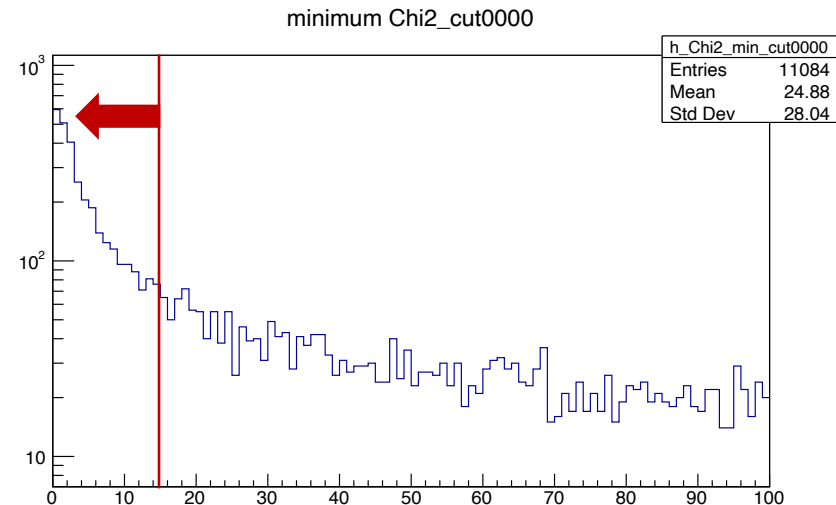
- TprimeBToTH_M-700_LH_TuneCP5_PSWeights_13TeV-madgraph_pythia8 (RunII Summer19 UL18)

HLT path

- Even though using haddnano.py some HLT paths are still missing
 - HLT_PFHHT380_SixJet32_DoubleBTagCSV_p075
 - HLT_PFHHT380_SixPFJet32_DoublePFBTagCSV_2p2
 - HLT_PFHHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
 - HLT_PFHHT400_SixPFJet32_DoublePFBTagDeepCSV_2p94
 - HLT_PFHHT430_SixPFJet40_PFBTagCSV_1p5
 - HLT_PFHHT430_SixJet40_BTagCSV_p080
 - HLT_PFHHT430_SixPFJet40_PFBTagDeepCSV_1p5
 - HLT_PFHHT450_SixPFJet36_PFBTagDeepCSV_1p59
 - HLT_PFHHT1050
 - HLT_PFJet500
 - HLT_PFHHT300PT30_QuadPFJet_75_60_45_40_TriplePFBTagCSV_3p0
 - HLT_PFHHT330PT30_QuadPFJet_75_60_45_40_TriplePFBTagDeepCSV_4p5
 - HLT_PFJet550
 - HLT_PFHHT400_FivePFJet_100_100_60_30_30_DoublePFBTagDeepCSV_4p5
 - HLT_PFHHT400_FivePFJet_120_120_60_30_30_DoublePFBTagDeepCSV

Building analysis flow

- 1) HLT
- 2) $n_{\text{Jets}} \geq 6$ & $n_{\text{b(DeepCSV)Jets}} \geq 3$
 - **TightID**, $p_T > 40 \text{ GeV}$, $|\eta| < 4.5$
- 3) $\text{jet1}_{pT} > 170$ & $\text{jet2}_{pT} > 130$ & $\text{jet3}_{pT} > 80$
- 4) $HT > 500$
- 5) $\text{minimum Chi2} < 15$
- 6) $2^{\text{nd}} \text{ Top mass} > 250$
- 7) $\text{Higgs mass} > 100$



Building analysis

Error on HLT path

- Even though using haddnano.py some HLT paths are still missing

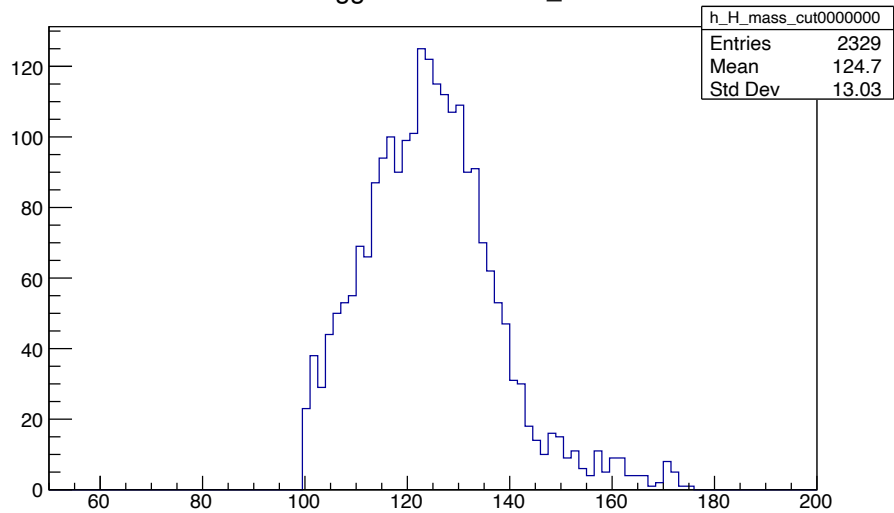
- HLT_PFH380_SixJet32_DoubleBTagCSV_p075
- HLT_PFH380_SixPFJet32_DoublePFBTagCSV_2p2
- HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2
- HLT_PFH400_SixPFJet32_DoublePFBTagDeepCSV_2p94
- HLT_PFH430_SixPFJet40_PFBTagCSV_1p5
- HLT_PFH430_SixJet40_BTagCSV_p080
- HLT_PFH430_SixPFJet40_PFBTagDeepCSV_1p5
- HLT_PFH450_SixPFJet36_PFBTagDeepCSV_1p59
- HLT_PFH1050
- HLT_PFJet500
- HLT_PFH300PT30_QuadPFJet_75_60_45_40_TriplePFBTagCSV_3p0
- HLT_PFH330PT30_QuadPFJet_75_60_45_40_TriplePFBTagDeepCSV_4p5
- HLT_PFJet550
- HLT_PFH400_FivePFJet_100_100_60_30_30_DoublePFBTagDeepCSV_4p5
- HLT_PFH400_FivePFJet_120_120_60_30_30_DoublePFBTagDeepCSV_4p5

The framework cannot interpret the information
if there is no such branch

```
input_line_157:7:8: error: use of undeclared identifier 'HLT_PFH380_SixJet32_DoubleBTagCSV_p075'
return HLT_PFH380_SixJet32_DoubleBTagCSV_p075 || HLT_PFH380_SixPFJet32_DoublePFBTagCSV_2p2 || HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2 |...
input_line_157:7:51: error: use of undeclared identifier 'HLT_PFH380_SixPFJet32_DoublePFBTagCSV_2p2'
return HLT_PFH380_SixJet32_DoubleBTagCSV_p075 || HLT_PFH380_SixPFJet32_DoublePFBTagCSV_2p2 || HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2 |...
input_line_157:7:97: error: use of undeclared identifier 'HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2'
return HLT_PFH380_SixJet32_DoubleBTagCSV_p075 || HLT_PFH380_SixPFJet32_DoublePFBTagCSV_2p2 || HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2 |...
input_line_157:7:198: error: use of undeclared identifier 'HLT_PFH430_SixPFJet40_PFBTagCSV_1p5'
...|| HLT_PFH380_SixPFJet32_DoublePFBTagDeepCSV_2p2 || HLT_PFH400_SixPFJet32_DoublePFBTagDeepCSV_2p94 || HLT_PFH430_SixPFJet40_PFBTagCSV_1p5 || H...
input_line_157:7:238: error: use of undeclared identifier 'HLT_PFH430_SixJet40_BTagCSV_p080'
...|| HLT_PFH400_SixPFJet32_DoublePFBTagDeepCSV_2p94 || HLT_PFH430_SixPFJet40_PFBTagCSV_1p5 || HLT_PFH430_SixJet40_BTagCSV_p080 || HLT_PFH430_Si...
input_line_157:7:275: error: use of undeclared identifier 'HLT_PFH430_SixPFJet40_PFBTagDeepCSV_1p5'
...|| HLT_PFH400_SixPFJet32_DoublePFBTagDeepCSV_2p94 || HLT_PFH430_SixPFJet40_PFBTagCSV_1p5 || HLT_PFH430_SixJet40_BTagCSV_p080 || HLT_PFH430_Si...
input_line_157:7:396: error: use of undeclared identifier 'HLT_PFH300PT30_QuadPFJet_75_60_45_40_TriplePFBTagCSV_3p0'
...|| HLT_PFH430_SixPFJet40_PFBTagDeepCSV_1p5 || HLT_PFH450_SixPFJet36_PFBTagDeepCSV_1p59 || HLT_PFH1050 || HLT_PFJet500 || HLT_PFH300PT30_QuadP...
input_line_157:7:538: error: use of undeclared identifier 'HLT_PFH400_FivePFJet_100_100_60_30_30_DoublePFBTagDeepCSV_4p5'
...|| HLT_PFH330PT30_QuadPFJet_75_60_45_40_TriplePFBTagDeepCSV_4p5 || HLT_PFJet550 || HLT_PFH400_FivePFJet_100_100_60_30_30_DoublePFBTagDeepCSV_4p...
input_line_157:7:604: error: use of undeclared identifier 'HLT_PFH400_FivePFJet_120_120_60_30_30_DoublePFBTagDeepCSV_4p5'
...|| HLT_PFJet550 || HLT_PFH400_FivePFJet_100_100_60_30_30_DoublePFBTagDeepCSV_4p5 || HLT_PFH400_FivePFJet_120_120_60_30_30_DoublePFBTagDeepCSV_4p5
```

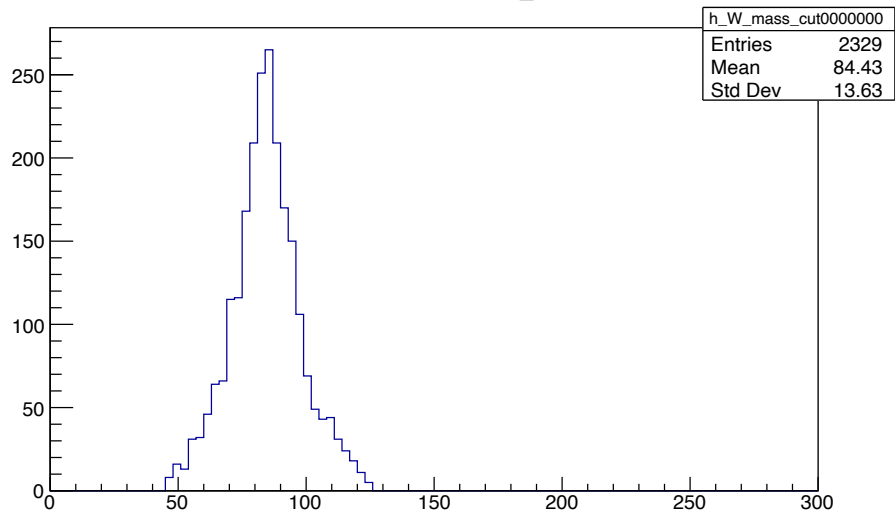
Mass distribution from Chi2 reconstruction

mass of the Higgs from minChi2_cut0000000

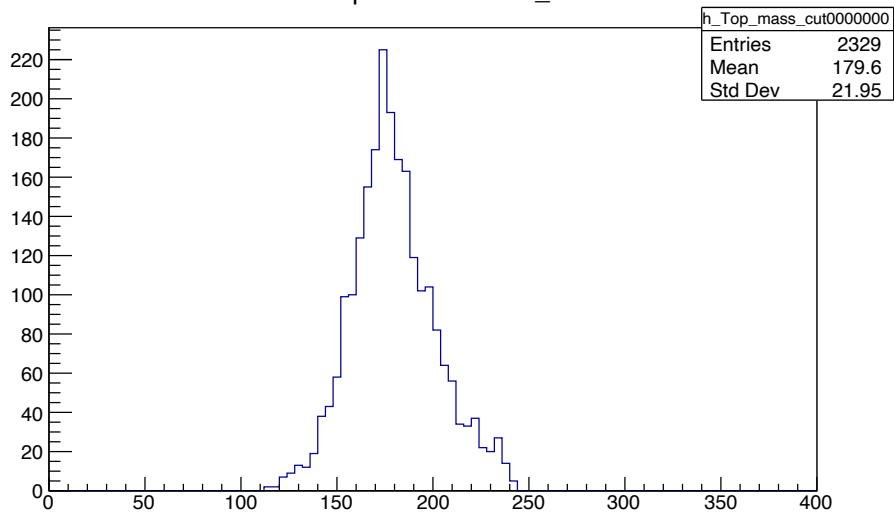


Particles	Reconstructed Masses		Reconstructed σ	
	2018 UL		2018 UL	
M_Z	90.9 ± 0.3	GeV/c^2	11.3 ± 0.2	GeV/c^2
M_H	120.2 ± 0.3	GeV/c^2	14.3 ± 0.2	GeV/c^2
M_W	83.9 ± 0.2	GeV/c^2	10.8 ± 0.2	GeV/c^2
M_t	175.9 ± 0.4	GeV/c^2	17.2 ± 0.3	GeV/c^2

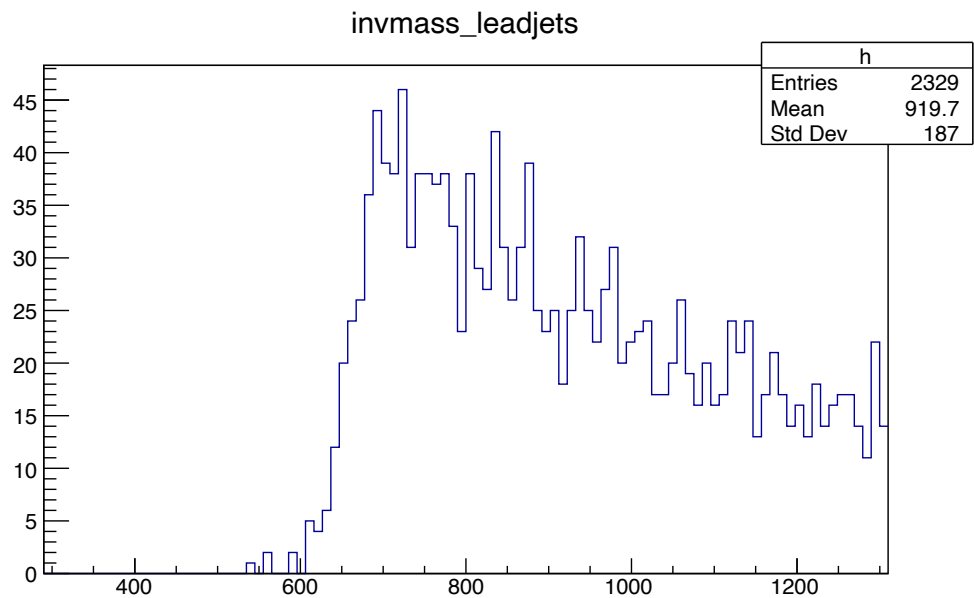
mass of the W from minChi2_cut0000000



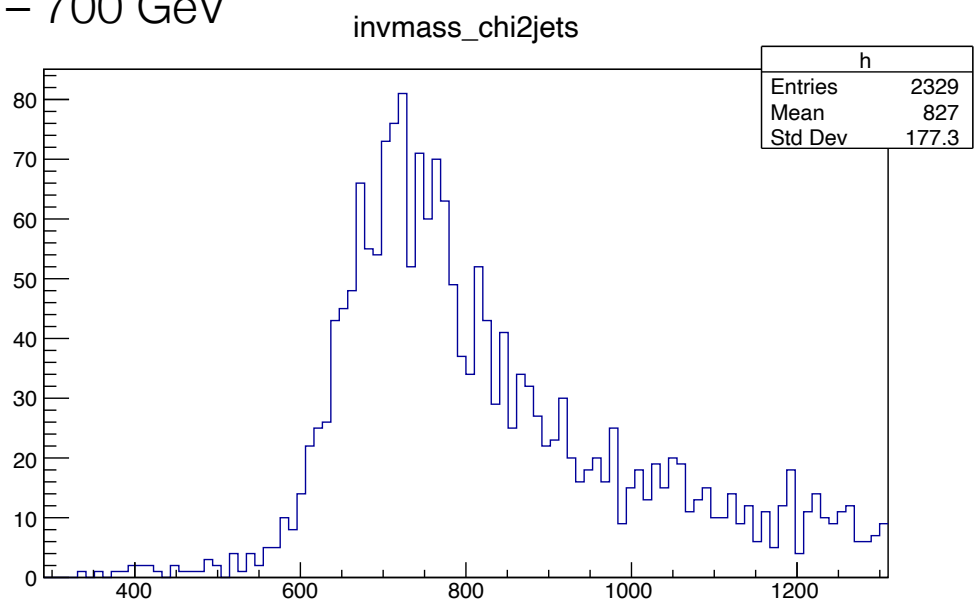
mass of the Top from minChi2_cut0000000



Mass distribution from Chi2 reconstruction



T' mass is modeled – 700 GeV



True Tprime

Tracking true Tprime from nanoAOD

- Find particle which is not lepton, and has top/Higgs in its mothers
- If it has top/Higgs, look up the Tprime in its mothers
- Matching the genParticle with genJet, if minDR < 0.4
- Matching the Jet with genJet, (Jet_genJetIdx)

```
root [6] Events->Scan("Jet_pt:Jet_genJetIdx:GenJet_pt")
*****
*      Row      * Instance *      Jet_pt * Jet_genJe * GenJet_pt *
*****
*      0      *      0      * 120.4375 *      0      * 116.71450 *
*      0      *      1      *   84.25  *      1      *  90.457222 *
*      0      *      2      *   76.0625 *      2      *  65.974769 *
*      0      *      3      *   72.6875 *      3      *  60.032177 *
*      0      *      4      *   54.03125 *      4      *  52.556812 *
*      0      *      5      *   31.015625 *      6      *  29.301639 *
*      0      *      6      *   25.859375 *      7      *  28.415885 *
*      0      *      7      *   16.125  *      8      *  25.966417 *
*      0      *      8      *           *           *  14.779829 *
*      1      *      0      *   81.6875 *      0      * 105.7864  *
*      1      *      1      *   49.34375 *      1      *  49.604560 *
*      1      *      2      *   39.28125 *      3      *  38.700149 *
*      1      *      3      *   29.4375  *      4      *  31.123186 *
*      1      *      4      *   28.4375  *      2      *  25.862447 *
*      1      *      5      *   22.234375 *      6      *  22.249050 *
*      1      *      6      *   21.453125 *      5      *  20.936103 *
*      1      *      7      *   20.3125  *      7      *  19.073207 *
*      1      *      8      *   20.265625 *      9      *  15.719570 *
*      1      *      9      *   16.015625 *      8      *  15.316276 *
*      1      *     10      *           *           *  10.435597 *
```

- Inserting in framework in progress
- Next: Check the portion of jets from true Tprime from Chi2 method

Tested with one file(27300 events) of
TprimeBToTH_M-700_LH_2018

