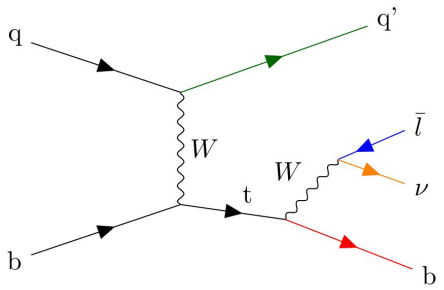
# Analysis review single top t-channel

Christopher Greenberg
22/07/22



# RunIISummer20UL17NanoAODv9 dataset for single top t-channel analysis:

| Data set name | Events | Xsec [pb] |
|---|---|---|
| **List of simulated samples for 2017** | | |
| /ST_t-channel_top_4f_InclusiveDecays_TuneCP5_13TeV-powheg-madspin-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 129903000 | 136.02 |
| /ST_t-channel_antitop_4f_InclusiveDecays_TuneCP5_13TeV-powheg-madspin-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 69793000 | 80.95 |
| /ST_s-channel_4f_leptonDecays_TuneCP5_13TeV-amcatnlo-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 13620000 | 3.68 |
| /ST_tW_top_5f_inclusiveDecays_TuneCP5_13TeV-powheg-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v2/NANOAODSIM | 5649000 | 35.85 |
| /ST_tW_antitop_5f_inclusiveDecays_TuneCP5_13TeV-powheg-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v2/NANOAODSIM | 5674000 | 35.85 |
| /TTToSemiLeptonic_TuneCP5_13TeV-powheg-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 346052000 | 364.351 |
| /TTTo2L2Nu_TuneCP5_13TeV-powheg-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 106724000 | 87.31 |
| /TTWJetsToLNu_TuneCP5_13TeV-amcatnloFXFX-madspin-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 7140411 | |
| /TTWJetsToQQ_TuneCP5_13TeV-amcatnloFXFX-madspin-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 655018 | |
| /TTZToLLNuNu_M-10_TuneCP5_13TeV-amcatnlo-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 14036000 | |
| /TTZToQQ_TuneCP5_13TeV-amcatnlo-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 13822000 | |
| /WJetsToLNu_TuneCP5_13TeV-madgraphMLM-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 78307186 | 61526.7 |
| /DYJetsToLL_M-10to50_TuneCP5_13TeV-madgraphMLM-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 68480179 | 18610.0 |
| /DYJetsToLL_M-50_TuneCP5_13TeV-madgraphMLM-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 102863931 | 6025.2 |
| /WW_TuneCP5_13TeV-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 15634000 | |
| /ZZ_TuneCP5_13TeV-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 2706000 | |
| /WZ_TuneCP5_13TeV-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v1/NANOAODSIM | 7889000 | |
| /tZq_Zhad_Wlept_4f_ckm_NLO_TuneCP5_PSweights_13TeV-amcatnlo-pythia8/RunIIAutumn18NanoAODv7-Nano02Apr2020_102X_upgrade2018_realistic_v21-v1/NANOAODSIM | | |
| /QCD_Pt-15To20_MuEnrichedPt5_TuneCP5_13TeV-pythia8/RunIISummer20UL17NanoAODv9-106X_mc2017_realistic_v9-v2/NANOAODSIM | | |
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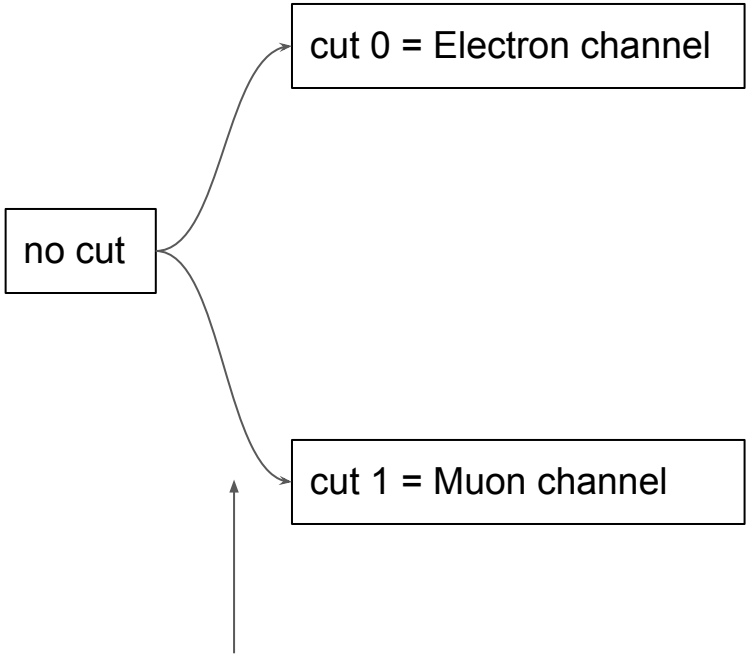



Possibility of parallelization?

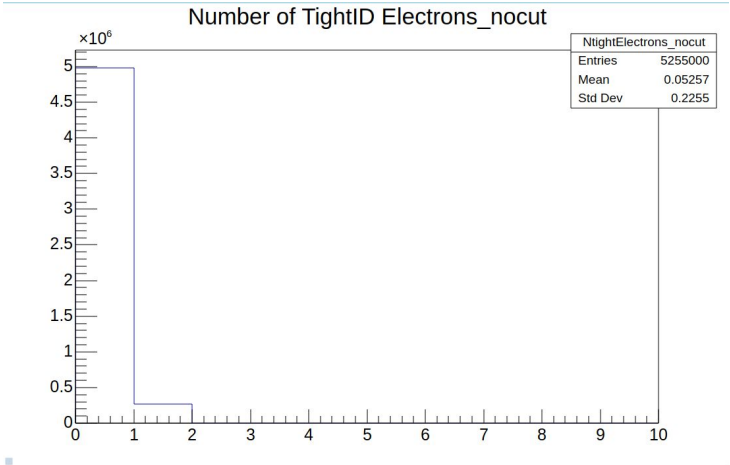
Running the framework on parallel through all the datasets using SLURM:

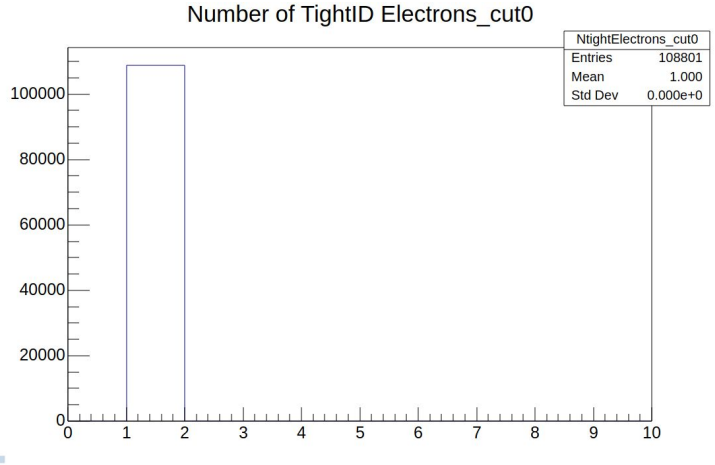
```
  JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
 662001    normal QCD_Pt-5 greenber  R       0:14      1 lyowork049
 662002    normal QCD_Pt-5 greenber  R       0:14      1 lyowork048
 662003    normal QCD_Pt-3 greenber  R       0:14      1 lyowork047
 662004    normal QCD_Pt-6 greenber  R       0:14      1 lyowork046
 662005    normal QCD_Pt-7 greenber  R       0:14      1 lyowork045
 662006    normal QCD_Pt-1 greenber  R       0:14      1 lyowork044
 662007    normal QCD_Pt-2 greenber  R       0:14      1 lyowork043
 662008    normal QCD_Pt-3 greenber  R       0:14      1 lyowork042
 662009    normal QCD_Pt-3 greenber  R       0:14      1 lyowork041
 662010    normal QCD_Pt-1 greenber  R       0:14      1 lyowork068
 662011    normal QCD_Pt-1 greenber  R       0:14      1 lyowork067
 662012    normal QCD_Pt-4 greenber  R       0:14      1 lyowork066
 662013    normal QCD_Pt-3 greenber  R       0:14      1 lyowork065
 662014    normal QCD_Pt-8 greenber  R       0:14      1 lyowork028
 662015    normal QCD_Pt-8 greenber  R       0:14      1 lyowork027
 662016    normal QCD_Pt-1 greenber  R       0:14      1 lyowork026
 662017    normal QCD_Pt-1 greenber  R       0:14      1 lyowork025
 662018    normal QCD_Pt-2 greenber  R       0:14      1 lyowork024
 662019    normal QCD_Pt-8 greenber  R       0:14      1 lyowork023
 661982    normal ST_t-cha greenber  R       0:16      1 lyowork035
 661983    normal ST_t-cha greenber  R       0:16      1 lyowork034
 661984    normal ST_tW-ch greenber  R       0:16      1 lyowork033
 661985    normal ST_s-cha greenber  R       0:16      1 lyowork040
 661986    normal DYJetsTo greenber  R       0:16      1 lyowork039
 661987    normal ST_tW-ch greenber  R       0:16      1 lyowork064
 661988    normal TTTo2L2N greenber  R       0:16      1 lyowork063
 661989    normal TTWJetsT greenber  R       0:16      1 lyowork062
 661990    normal TTZToLLN greenber  R       0:16      1 lyowork060
 661991    normal TTZToQQ_ greenber  R       0:16      1 lyowork059
 661992    normal DYJetsTo greenber  R       0:16      1 lyowork058
 661993    normal WJetsToL greenber  R       0:16      1 lyowork057
 661994    normal TTWJetsT greenber  R       0:16      1 lyowork056
 661995    normal WW_UL17- greenber  R       0:16      1 lyowork055
 661996    normal TTToSemi greenber  R       0:16      1 lyowork054
 661997    normal WZ_UL17- greenber  R       0:16      1 lyowork053
 661998    normal ZZ_UL17- greenber  R       0:16      1 lyowork052
 661999    normal tZq_UL17 greenber  R       0:16      1 lyowork051
 662000    normal QCD_Pt-1 greenber  R       0:16      1 lyowork050
```

Last test: ~2h for 170M events

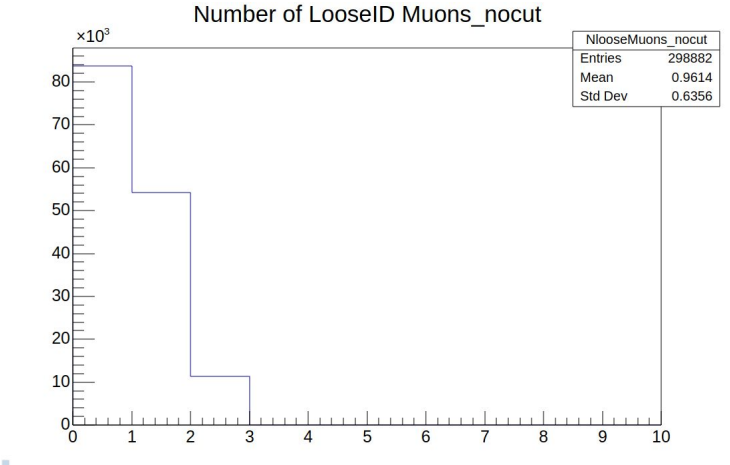
cut 0 = exactly one tight electron && remove events with extra veto electrons

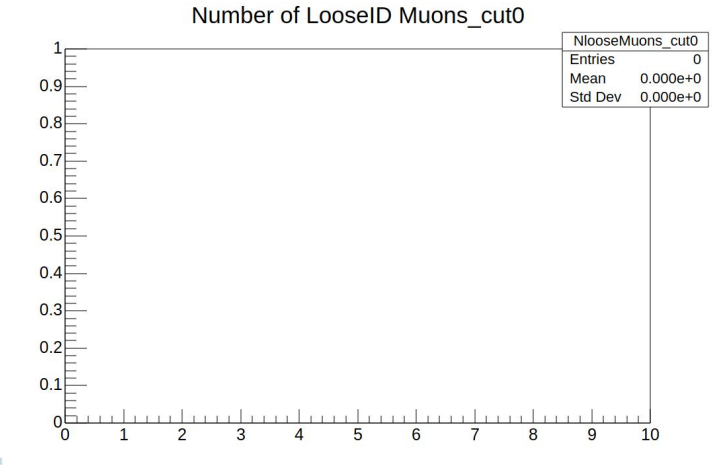
electrons:



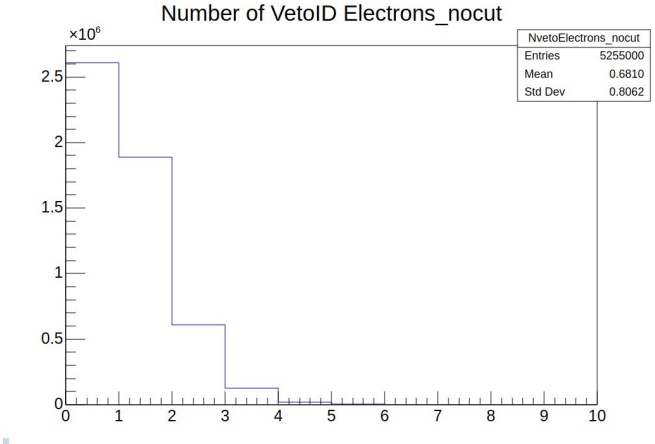

muons:

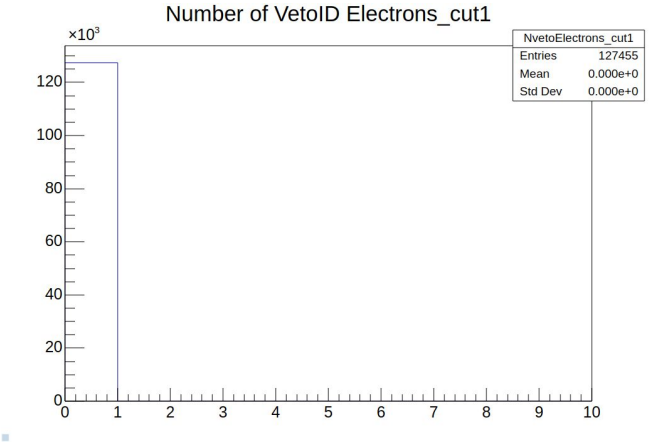


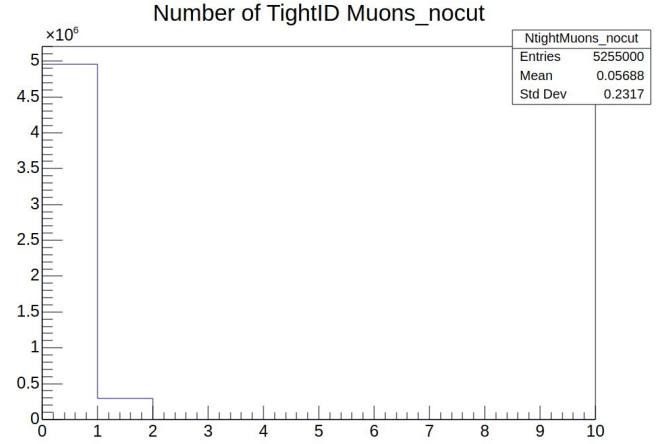
cut 1 = exactly one tight muon && remove events with extra loose muons

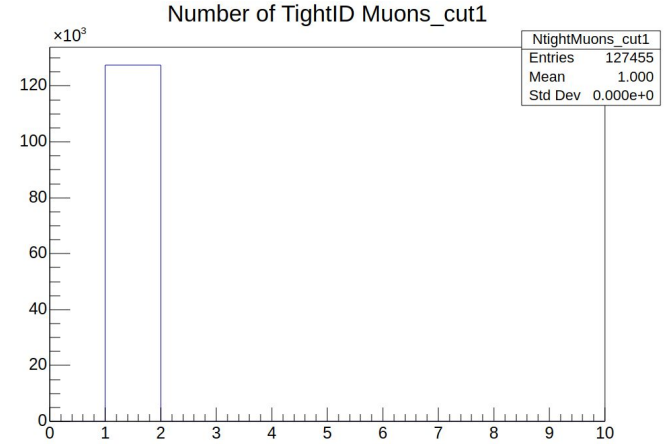
electrons:

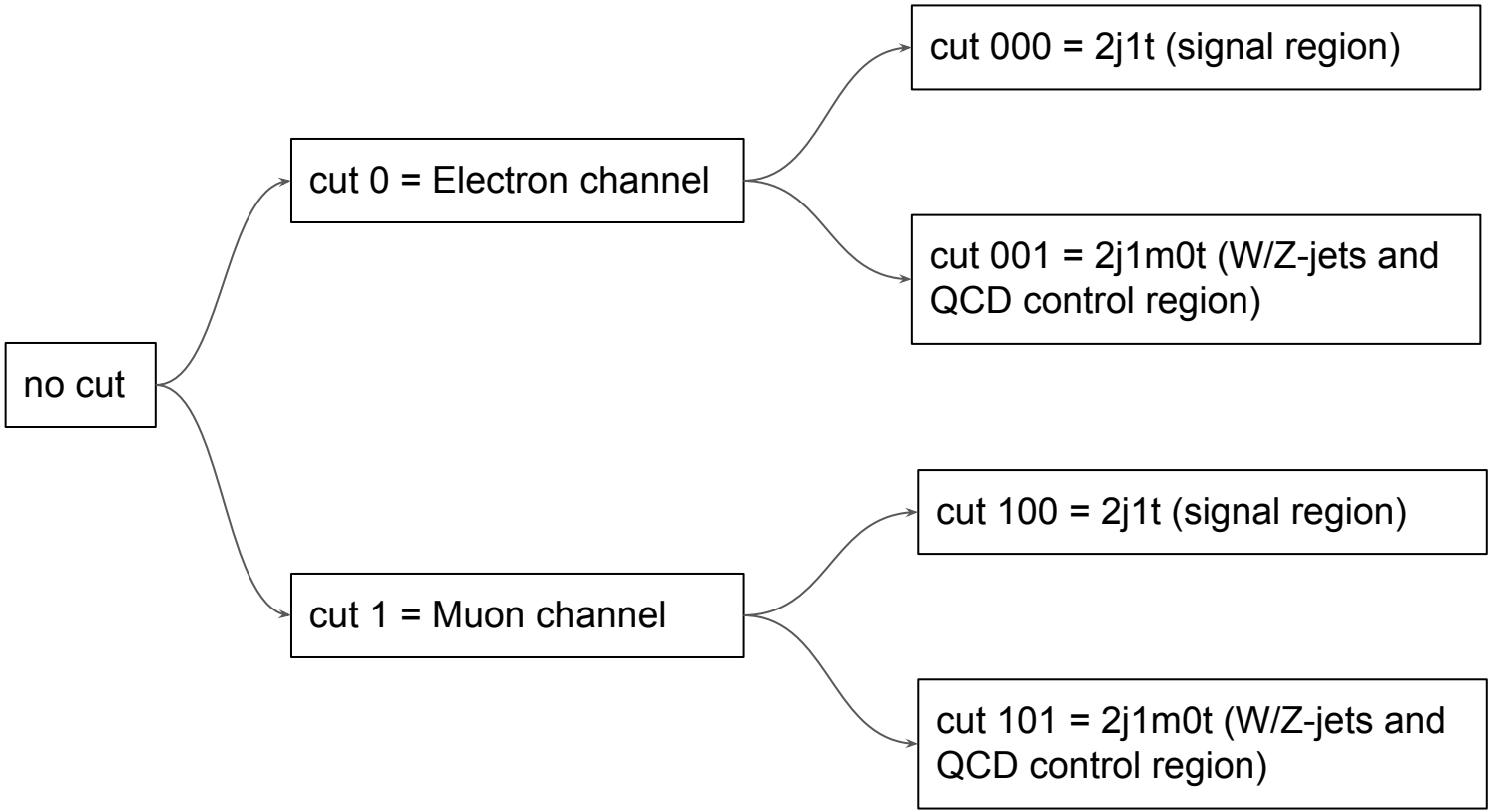



muons:



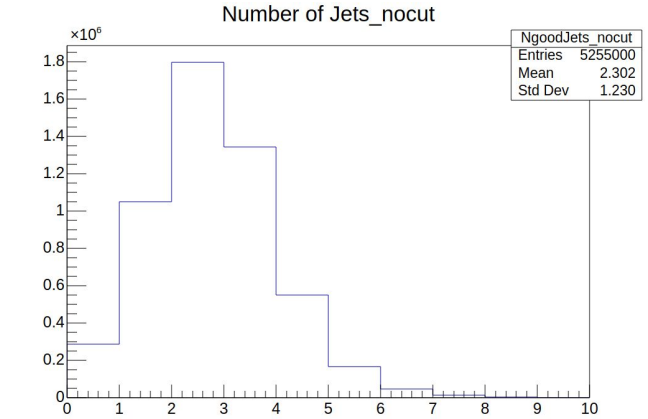



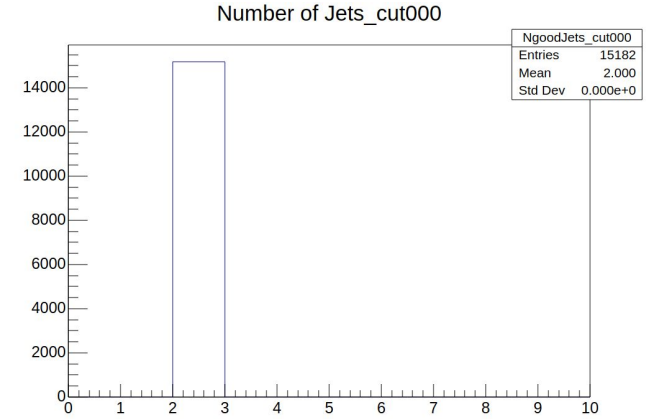

no cut
cut 0 = Electron channel
cut 1 = Muon channel
cut 000 = 2j1t (signal region)
cut 001 = 2j1m0t (W/Z-jets and QCD control region)
cut 100 = 2j1t (signal region)
cut 101 = 2j1m0t (W/Z-jets and QCD control region)

cut x0x = HLT

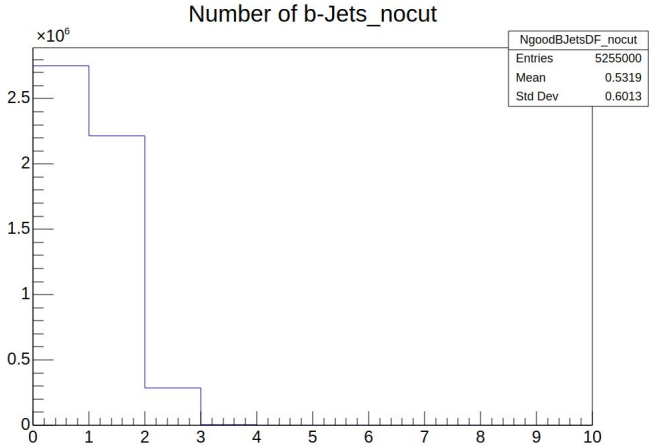
cut 000 = Events need to contain exactly two jets, of which one is b tagged

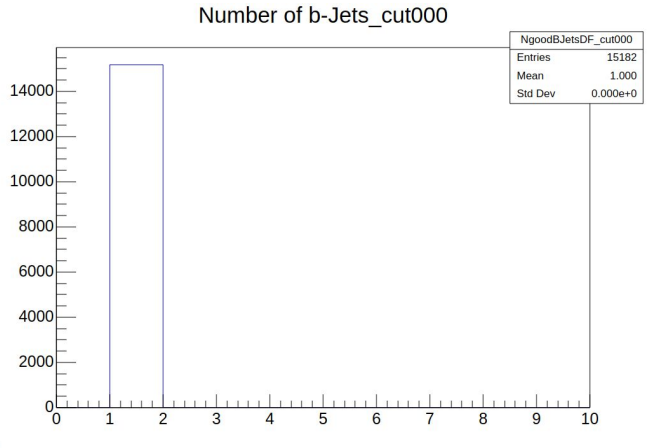
all Jets:

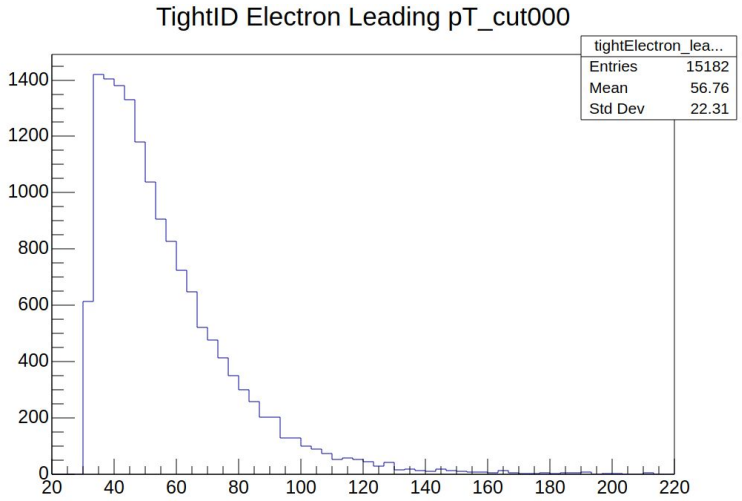



b Jets:




TightID Electron Leading pT_cut000
tightElectron_lea...
Entries 15182
Mean 56.76
Std Dev 22.31
1400
1200
1000
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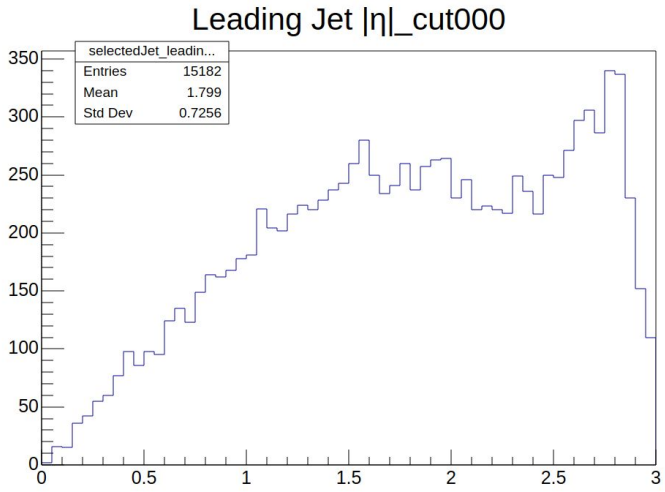
600
400
200
0
20 40 60 80 100 120 140 160 180 200 220


Leading Jet |η|_cut000
selectedJet_leadin...
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Mean 1.799
Std Dev 0.7256
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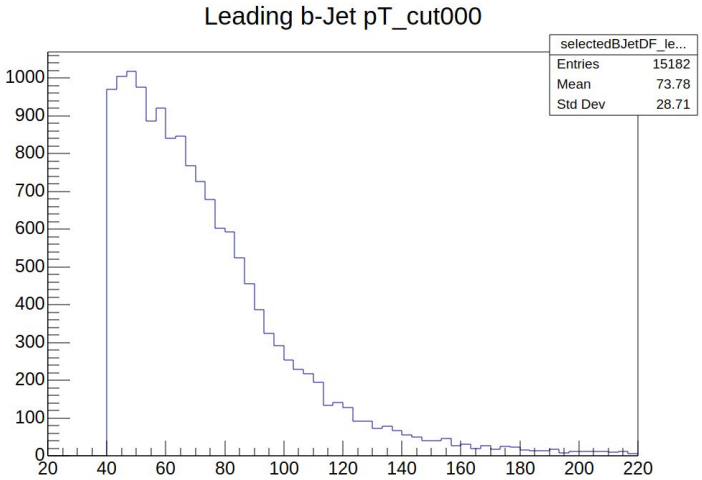
300
250
200
150
100
50
0
0 0.5 1 1.5 2 2.5 3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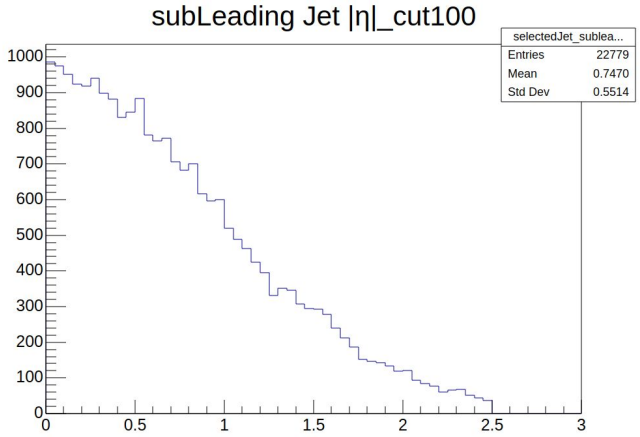
20 40 60 80 100 120 140 160 180 200 220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Std Dev 0.5514
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900
800
700
600
500
400
300
200
100
0
0 0.5 1 1.5 2 2.5 3

So far:

- Already have all datasets (Data + MC) for: 2016 (pre and post APV), 2017 and 2018 (Thanks to Denis for the help implementing Rucio and EOS space)
- Using latest version of framework
- Implemented Framework + Slurm

What's next?

- Make some Stack plots! -> Try the stack plots code from the framework
- Implement new control regions (3j2t = ttbar control region)
- How to access the MET value in a single event?
- PuppiMET, DeepMET or PFMET?
- What SF to start working on? Which ones are already implemented in NanoAOD?
- (Maybe can implement Dask to framework?)
- Present my Pheno work in front of CMS group in IP2I