

# Progress Report on Tau Final States of TTTT

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# Outline

# EventSelection

- MET fillters
- HLT requirements
  - `HLT_PFHT450_SixJet40_BTagCSV_p056==1,`  
`HLT_PFHT400_SixJet30_DoubleBTagCSV_p056==1`
- loose preselection
  - `tausL.size()>0, jets.size()>3, bjetsL.size()>1`
- Subchannel requirements

# MC reweighting

- genWeight
- prefireWeight

# Event Yield

```
Plotting jetsL_number1Tau0L.  
TTTT = 9.36221  
TTTTo2L2Nu = 508.248  
TTTToHadronic = 2121.81  
TTTToSemiLeptonic= 695.047  
TTX = 83.6046  
VV = 0.19055  
VVV = 0.863185  
DY = 0  
ST = 99.4086  
TX = 12.8674  
QCD = 7.68782  
Total BKG = 3529.72
```

```
Plotting jetsL_number2Tau0L.p  
TTTT = 0.506521  
TTTTo2L2Nu = 374.833  
TTTToHadronic = 59.6552  
TTTToSemiLeptonic= 36.986  
TTX = 14.3918  
VV = 0.0450174  
VVV = 0.0995102  
DY = 0  
ST = 15.5453  
TX = 4.42826  
QCD = 0.0424961  
Total BKG = 506.027
```

# Event Yield

```
Plotting jetsL_number1Tau1E.p
TTTT          = 3.32279
TTTo2L2Nu    = 1597.72
TTToHadronic  = 6.37647
TTToSemiLeptonic= 95.9063
TTX          = 22.6899
VV          = 0.0588446
VVV        = 0.19016
DY         = 0
ST         = 21.6513
TX         = 1.44137
QCD        = 0.00104707
Total BKG  = 1746.03
```

```
Plotting jetsL_number1Tau1Mu
TTTT          = 3.76192
TTTo2L2Nu    = 1593.71
TTToHadronic  = 1.15845
TTToSemiLeptonic= 90.1023
TTX          = 21.9617
VV          = 0.0639575
VVV        = 0.0570129
DY         = 0
ST         = 15.086
TX         = 2.24998
QCD        = 0
Total BKG  = 1724.39
```

# Event Yield

```
Plotting jetsL_number1Tau20S.pr
TTTT          = 1.04276
TTTo2L2Nu    = 160.775
TTToHadronic  = 0
TTToSemiLeptonic= 0.223172
TTX          = 8.13481
VV          = 0.0450476
VVV        = 0.00915125
DY         = 0
ST         = 0.290944
TX         = 0.590368
QCD        = 0
Total BKG  = 170.069
```

```
Plotting jetsL_number1Tau2SS.p
TTTT          = 0.547448
TTTo2L2Nu    = 3.59189
TTToHadronic  = 0
TTToSemiLeptonic= 0.204265
TTX          = 2.51271
VV          = 0
VVV        = 0.00923359
DY         = 0
ST         = 0.0227258
TX         = 0.246583
QCD        = 0
Total BKG  = 6.58741
```

# Event Yield

```
Plotting jetsL_number2Tau1Mu.
TTTT          = 0.115827
TTTo2L2Nu    = 18.0671
TTToHadronic  = 0
TTToSemiLeptonic= 0.865173
TTX          = 2.20134
VV          = 0
VVV         = 0
DY          = 0
ST          = 0.0404202
TX          = 0.328719
QCD         = 0
Total BKG   = 21.5027
```

```
Plotting jetsL_number2Tau1E.p
TTTT          = 0.108454
TTTo2L2Nu    = 22.2676
TTToHadronic  = 0.188376
TTToSemiLeptonic= 0.9091
TTX          = 2.73753
VV          = 0
VVV         = 0
DY          = 0
ST          = 0.0664521
TX          = 0.476292
QCD         = 0
Total BKG   = 26.6453
```



# Event Yield

```
Plotting jetsL_number2Tau2SS.p
TTTT          = 0.00853442
TTTo2L2Nu    = 0
TTToHadronic  = 0
TTToSemiLeptonic= 0
TTX          = 0.0423281
VV           = 0
VVV          = 0
DY           = 0
ST           = 0.00070743
TX           = 0.00525338
QCD          = 0
Total BKG    = 0.0482889
```

```
Plotting jetsL_number2Tau20S.p
TTTT          = 0.0162024
TTTo2L2Nu    = 0.903687
TTToHadronic  = 0
TTToSemiLeptonic= 0
TTX          = 0.324906
VV           = 0
VVV          = 0
DY           = 0
ST           = 0.00482086
TX           = 0.0303921
QCD          = 0
Total BKG    = 1.26381
```

# TTTT Cutflow

| selection | raw entries | weighted | crossSection |
|-----------|-------------|----------|--------------|
| tau       | 585067      | 4577.69  | 25.0792      |
| lepton    | 332507      | 2611.21  | 14.3057      |
| jet       | 250108      | 1845.49  | 10.1106      |
| bjet      | 231157      | 1708.88  | 9.36221      |

Table: TTTT

# Cross Section

```
TTTT{ baseDir+"TTTT_TuneCP5_PSweights_13TeV-amcatnlo-pythia8_correctnPartonsInBorn.root", 0.01197};
TTTo2L2Nu{ baseDir+"TTTo2L2Nu_TuneCP5_PSweights_13TeV-powheg-pythia8.root", 373. };
TTToHadronic{baseDir+"TTToHadronic_TuneCP5_PSweights_13TeV-powheg-pythia8.root", 367. };
TTToSemiLeptonic{baseDir+"TTToSemiLeptonic_TuneCP5_PSweights_13TeV-powheg-pythia8.root", 90.6};
ss TTGJets(baseDir+"TTGJets_TuneCUETP8M1_13TeV-amcatnloFFFX-madspin-pythia8.root", 3.773 );//TTGJets
ttZJets(baseDir+"ttZJets_13TeV_madgraphMLM-pythia8.root", 0.6559);////something with the files
ttWJets(baseDir+"ttWJets_13TeV_madgraphMLM.root", 0.2014 );
ttH{baseDir+"ttH_4f_ctcvcp_TuneCP5_13TeV_madgraph_pythia8.root", 0.3372 };//ttH

WZ(baseDir+"WZ_TuneCUETP8M1_13TeV-pythia8.root", 2.343 );
WW(baseDir+"WW_TuneCUETP8M1_13TeV-pythia8.root", 6.430 );
ssWWTo2L2Nu+"WWTo2L2Nu_DoubleScattering_13TeV-pythia8.root", 0.1697 );
ss (baseDir+"WpWpJJ_EWK-QCD_TuneCUETP8M1_13TeV-madgraph-pythia8.root", 0.05390 );//?missing this in other places
ZZ(baseDir+"ZZ_TuneCUETP8M1_13TeV-pythia8.root", 1.016 );//ZZ
WGJets(baseDir+"WGJets_MonoPhoton_PtG-40to130_TuneCUETP8M1_13TeV-madgraph.root", 1.269 );//
ZGJetsToLLG(baseDir+"ZGJetsToLLG_EW_L0_13TeV-sherpa.root", 0.1319 );//

WWW(baseDir+"WWW_4F_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 0.2086 );//
WWZ(baseDir+"WWZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 0.1651 );//
ss WWG(baseDir+"WWG_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root");//
ZZZ(baseDir+"ZZZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 0.01398 );//
WZZ(baseDir+"WZZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 0.05565 );//
WZG(baseDir+"WZG_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 0.04123 );//
WGG(baseDir+"WGG_5f_TuneCUETP8M1_13TeV-amcatnlo-pythia8.root", 1.819 );
ZGGJets(baseDir+"ZGGJets_ZToHad0rNu_5f_L0_madgraph_pythia8.root", 0.3717 );
```

# Cross Section

```
ss WJetsToNu(baseDir+"WJetsToNu_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 50300 );//WJets
DYJetsToTauTau(baseDir+"DYJetsToTauTau_ForcedMuEleDecay_M-50_TuneCUETP8M1_13TeV-amcatnloFXFX-pythia8_ext1.root", 1983 );
e_Top
tZq_ll(baseDir+"tZq_ll_4f_ckm_NLO_TuneCP5_PWeights_13TeV-amcatnlo-pythia8.root", 0.07358 );
ss tZq_nunu(baseDir+"tZq_nunu_4f_13TeV-amcatnlo-pythia8_TuneCUETP8M1.root", );//???
ST_tw_antitop(baseDir+"ST_tw_antitop_5f_inclusiveDecays_13TeV-powheg-pythia8_TuneCUETP8M2T4.root", 38.06 );
ST_tw_top(baseDir+"ST_tw_top_5f_inclusiveDecays_13TeV-powheg-pythia8_TuneCUETP8M2T4.root", 38.09 );

TGJets(baseDir+"TGJets_TuneCUETP8M1_13TeV_amcatnlo_madspin_pythia8.root", 2.967 );
THW(baseDir+"THW_ctcvcp_HIncl_M125_TuneCP5_13TeV-madgraph-pythia8.root", 0.1467 );
THQ(baseDir+"THQ_ctcvcp_HIncl_13TeV-madgraph-pythia8_TuneCUETP8M1.root", 0.8816 );

0 //2.466e+08 +- 2.190e+05 pb
200 //2.801e+07 +- 2.608e+04 pb
QCD_HT200to300(baseDir+"QCD_HT200to300_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 1.710e+3 ); // 1.710e+06 +- 1.626e+0
QCD_HT300to500(baseDir+"QCD_HT300to500_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 3.473e+02); // 3.473e+05 +- 3.327e+
QCD_HT500to700(baseDir+"QCD_HT500to700_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 3.220e+01); // 3.220e+04 +- 3.100e+
QCD_HT700to1000(baseDir+"QCD_HT700to1000_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 6.839e+0); // 6.839e+03 +- 6.602
QCD_HT1000to1500(baseDir+"QCD_HT1000to1500_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 1.207e+0); // 1.207e+03 +- 1.16
QCD_HT1500to2000(baseDir+"QCD_HT1500to2000_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 0.1201); // 1.201e+02 +- 1.160e
QCD_HT2000toInf(baseDir+"QCD_HT2000toInf_TuneCUETP8M1_13TeV-madgraphMLM-pythia8.root", 0.02524); // 2.524e+01 +- 2.436e-
```