Compressed EWK study(ISRC1N2)

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Tasklist

- Bkg estimation for C1N2ISR

- BSc thesis: https://www.overleaf.com/project/674e7119837a2580151a0868

SR definition

Pre-Selection

- lep-had channel:nTaus$\geq$1;nLeps$\geq$1
- had-had channel:nTaus$\geq$2;nLeps=0
- MET$\geq$ 200; pass MET trigger
- $1 \leq nBaseJet$ → Nbjets > 0
  For Top estimation
- b-veto
- OS

SR for HH channel

hyper parameter: NTrees=500, learning rate=0.05, max depth=12, MinNodeSize=1%(default)

Pre-Selection + BDT score $\geq$ 0.91

SR for LH channel

hyper parameter: NTrees=400, learning rate=0.01, max depth=10, MinNodeSize=1%(default)

Pre-Selection + BDT score $\geq$ 0.87

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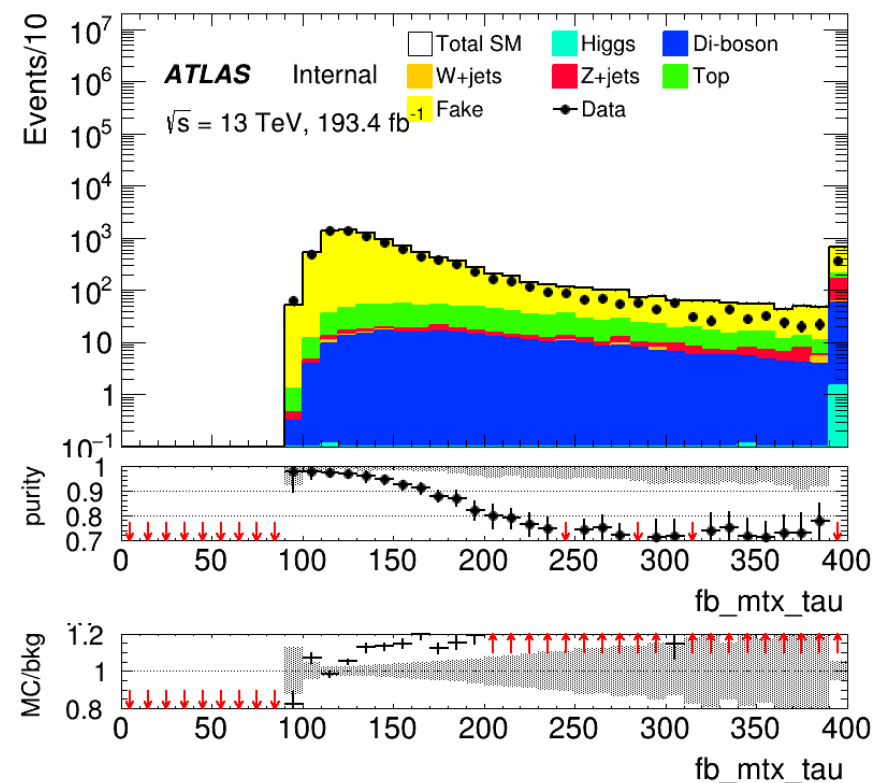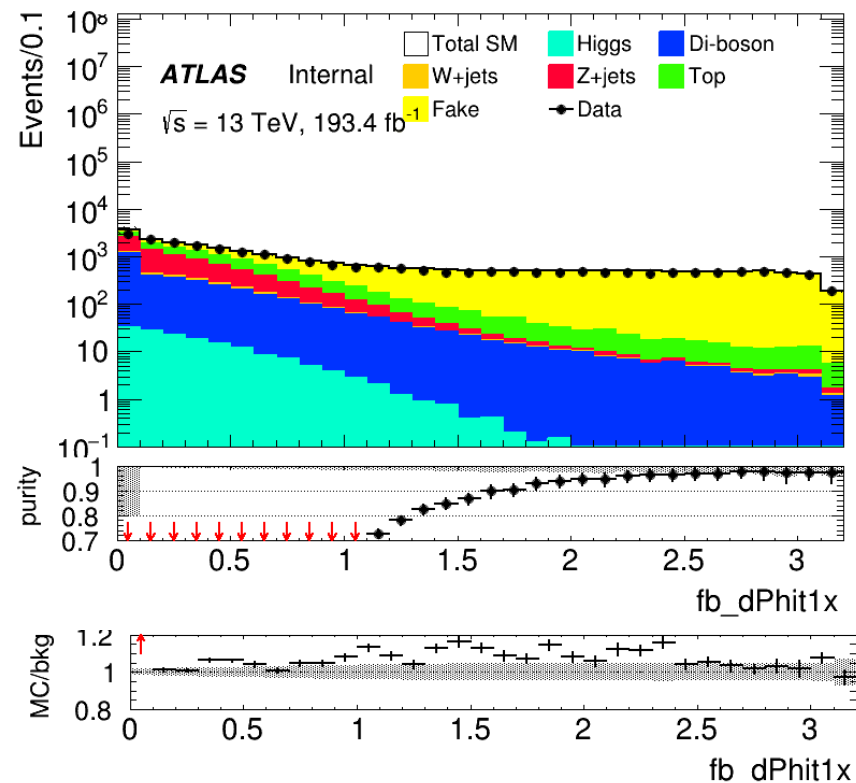
>= 1 medium tau

>= 1 lepton

METtrig && MET >= 200

OS

bVeto

$$\Delta\Phi(tau, MET) > 2$$
$$M_T(tau, MET) < 150$$

CRID:

Fake : 5332.71+-12.118, MC: 5530.2+-12.1666 purity: 0.964289

Top(HH)

>= 1 medium tau

>= 1 lepton

METtrig && MET >= 200

OS

>= 1 bTag
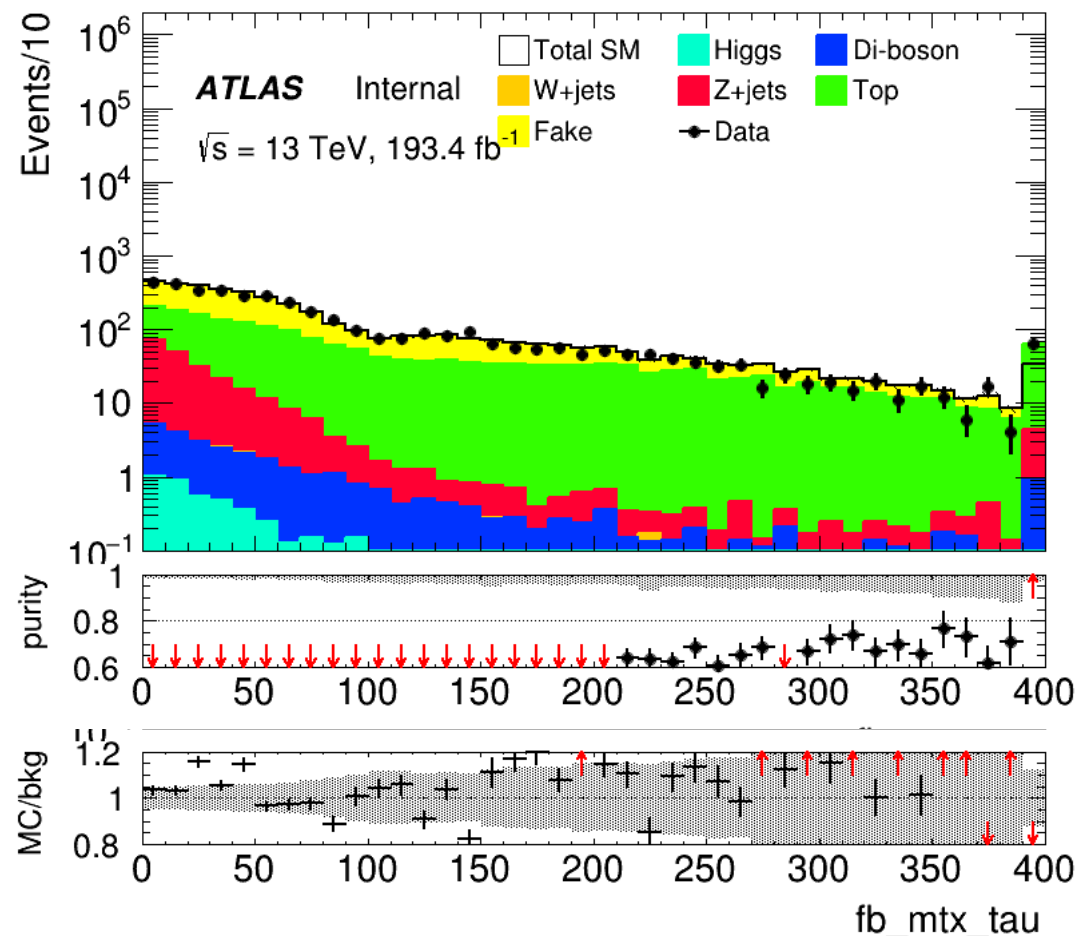
CR: $M_T(l, MET) > 300$

VR: $200 < M_T(l, MET) < 200$
$P_1(tau1) + P_T(tau2) > 130$

CR: TOP 160.201+-3.13218, MC: 179.424+-4.37706, purity: 0.892863
VR: TOP 60.8234+-2.09314, MC: 81.6181+-2.40428, purity: 0.74522

>= 1 medium tau

>= 1 lepton

METtrig && MET >= 200

OS

b Veto
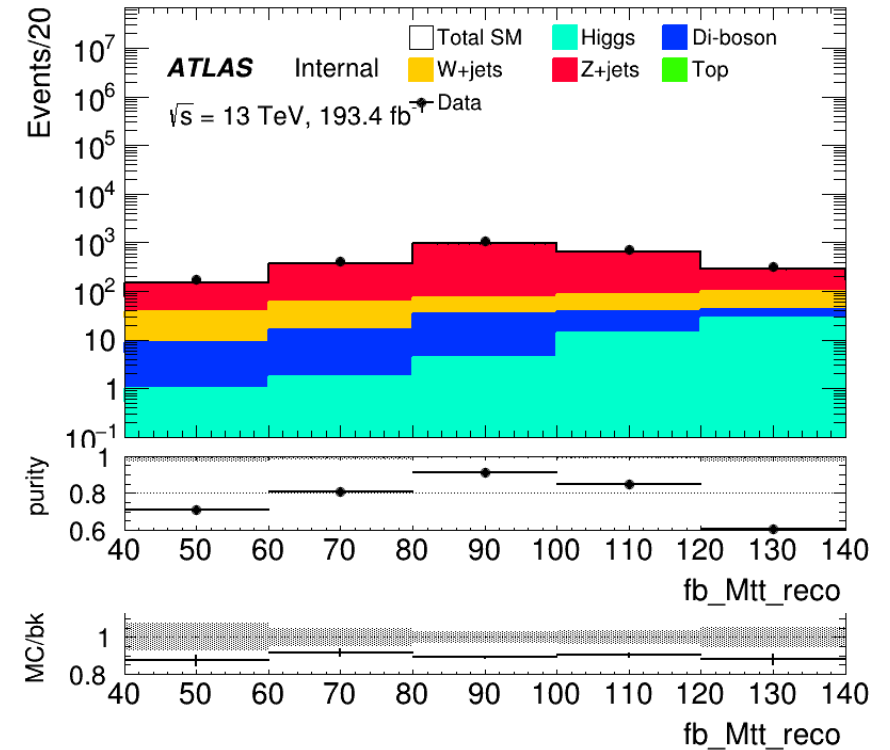
$M_T(MET, \tau) + M_T(MET, l) < 80$

CR: $80 < M_{tt}reco < 110$

VR: $40 < M_{tt}reco < 80 \,||\, 110 < M_{tt}reco < 130$

CR: Zjets: 1222.78 +- 5.51281, MC: 1353.18 +- 8.55008, purity: 0.903629

VR: Zjets: 716.519 +- 4.33741, MC: 941.069+-12.0672, purity: 0.761388

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ML for Bkg estimation

All ML code is ready, something happened in file perpared

Hadd Zjets.root Zjets*   **Error happened when I try to merge file and estimate fake**

```
hadd Target file: Zjets.root
hadd compression setting for all output: 1
hadd Source file 1: Zjets_1516.root
hadd Source file 2: Zjets_17.root
hadd Source file 3: Zjets_18.root
hadd Source file 4: Zjets_22.root
hadd Source file 5: Zjets_23.root
hadd Target path: Zjets.root:/
Warning in <TTree::CopyEntries>: One of the export top level branches (HLT_mu20_iloose_L1MU15_match_Nominal) is not present in the import TTree.
Warning in <TTree::CopyEntries>: One of the export top level branches (HLT_mu20_iloose_L1MU15_match_Nominal) is not present in the import TTree.
Warning in <TTree::CopyEntries>: One of the export top level branches (HLT_mu50_match_Nominal) is not present in the import TTree.
Warning in <TTree::CopyEntries>: One of the export top level branches (HLT_mu50_match_Nominal) is not present in the import TTree.
```

In Zjets_1516.root

```
*Br  269 :fb_Proj_ttx : fb_Proj_ttx/D                                     *
*Entries :    143498 : Total  Size=    1153121 bytes  File Size  =    1088342 *
*Baskets :       48 : Basket Size=       53760 bytes  Compression=    1.06     *
*..........................................................................*
```

In Zjets.root

```
*Br  269 :fb_Proj_ttx : fb_Proj_ttx/D                                     *
*Entries :    143498 : Total  Size=    1153121 bytes  File Size  =    1088342 *
*Baskets :       48 : Basket Size=       53760 bytes  Compression=    1.06     *
*..........................................................................*
```

Still try to find the reason for that

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TODO

- **Solve merge problem and Start to ML for background estimation**

- **Generate new sample for FF method**

- **Calculate FF by using jiarong's sample(familiar with steps of FF method)**

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Backup

Bkg decay mode

Wjets: W->e/muon + nu
             W->tau+nu(can contribute true tau_had)
             jet misidentified to a fake tau

Zjets: Z->ll/tautau
             jet misindentified to fake tau

Top: top->W+b, W can contribute a true tau_had
             b-quark is a source of fake

VV: W/Z

LH channel: $\geq 1tau, \geq 1lep$
Wjets: W contribute lep, jets misidentified to fake
Zjets:
SingleTop: W contribute lep, b-quark misidentified to fake
VV:

HH channel: $\geq 2tau, == 0lep$
Wjets: W contribute tau_had, plus a fake tau
Zjets: Z->tautau(had) or 2 fake tau
SingleTop: W contribute a tau_had, plus a fake tau
VV: