

Update on the fake estimation by fake factor method

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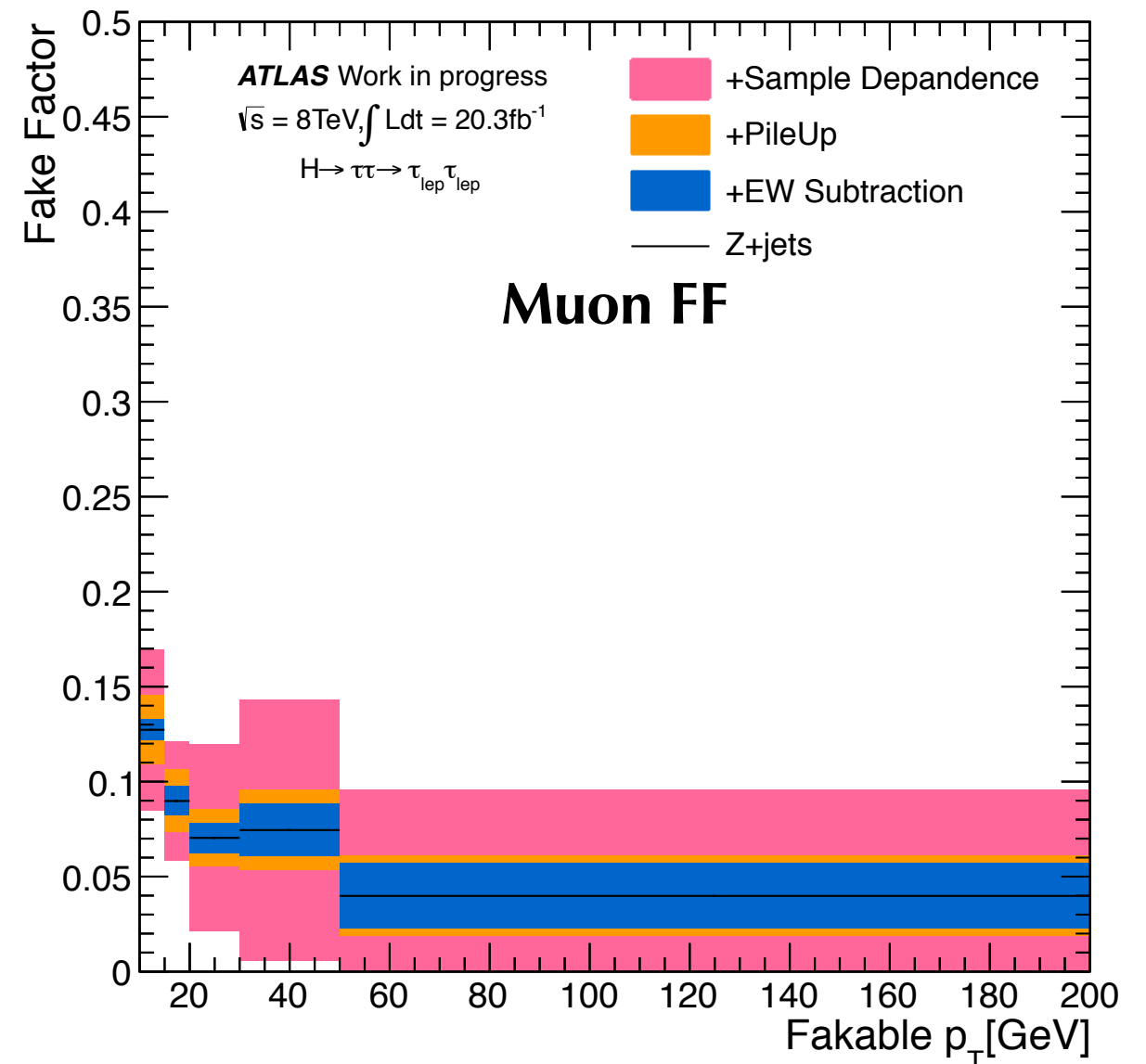
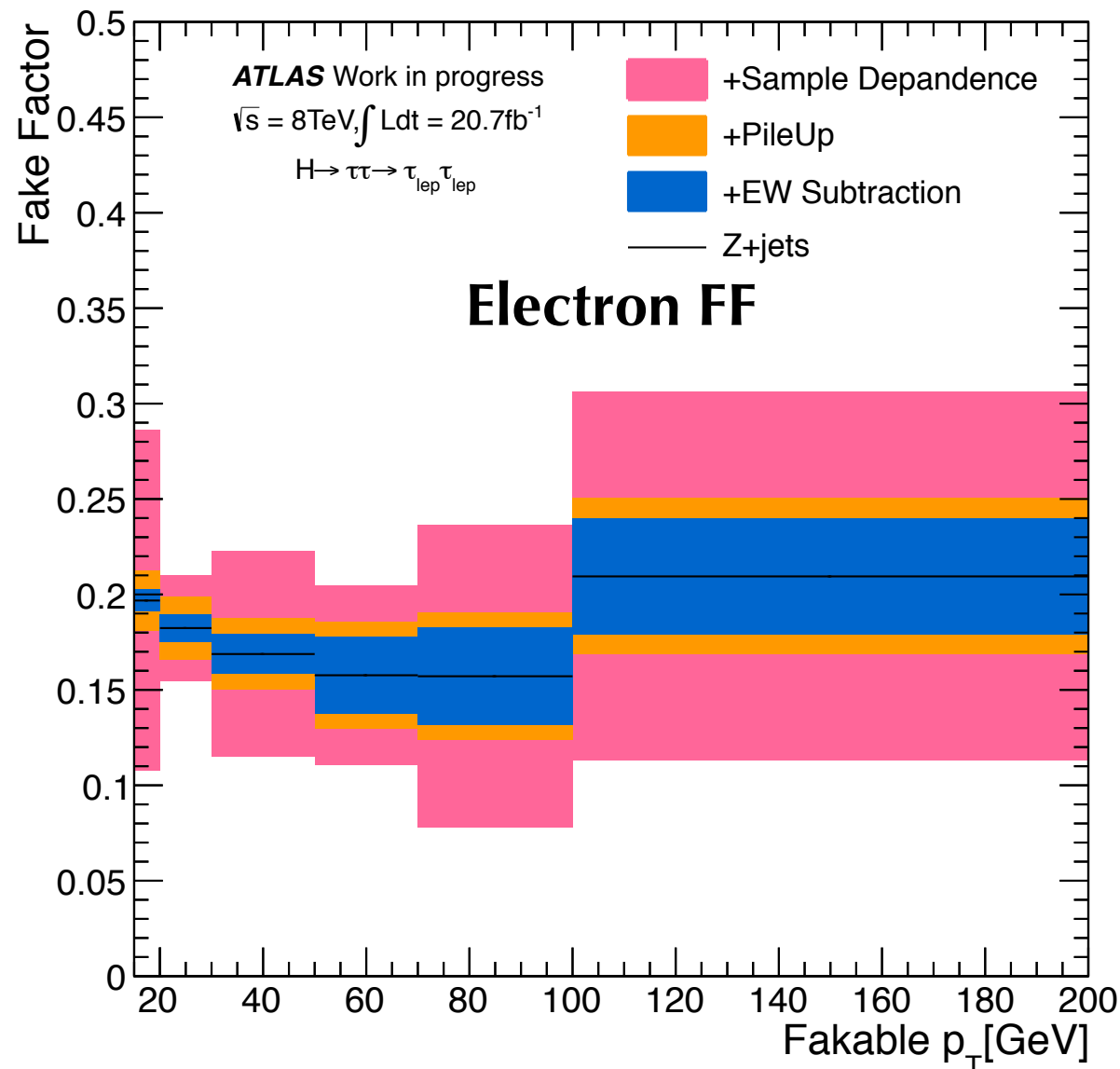
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Fake estimation

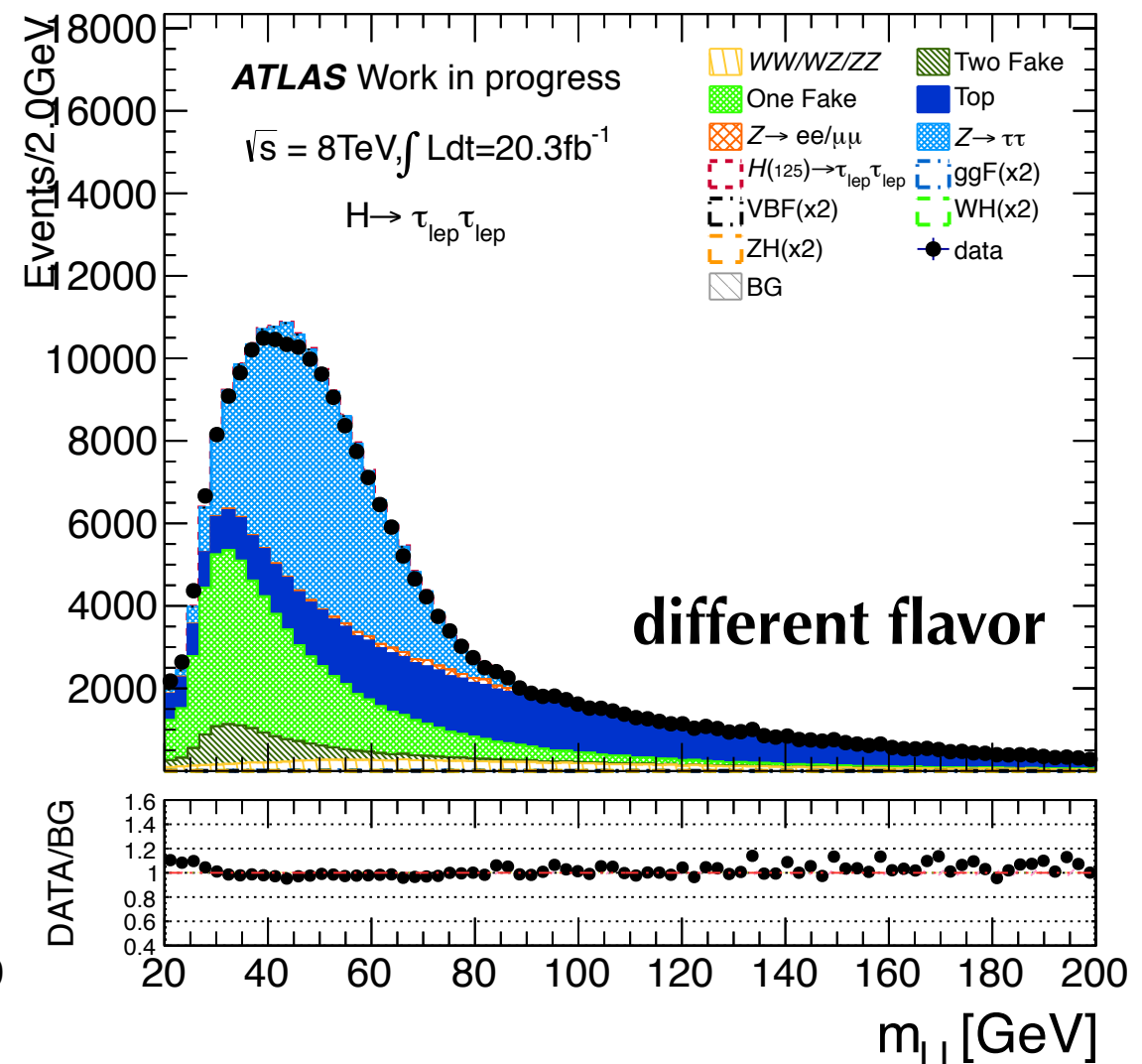
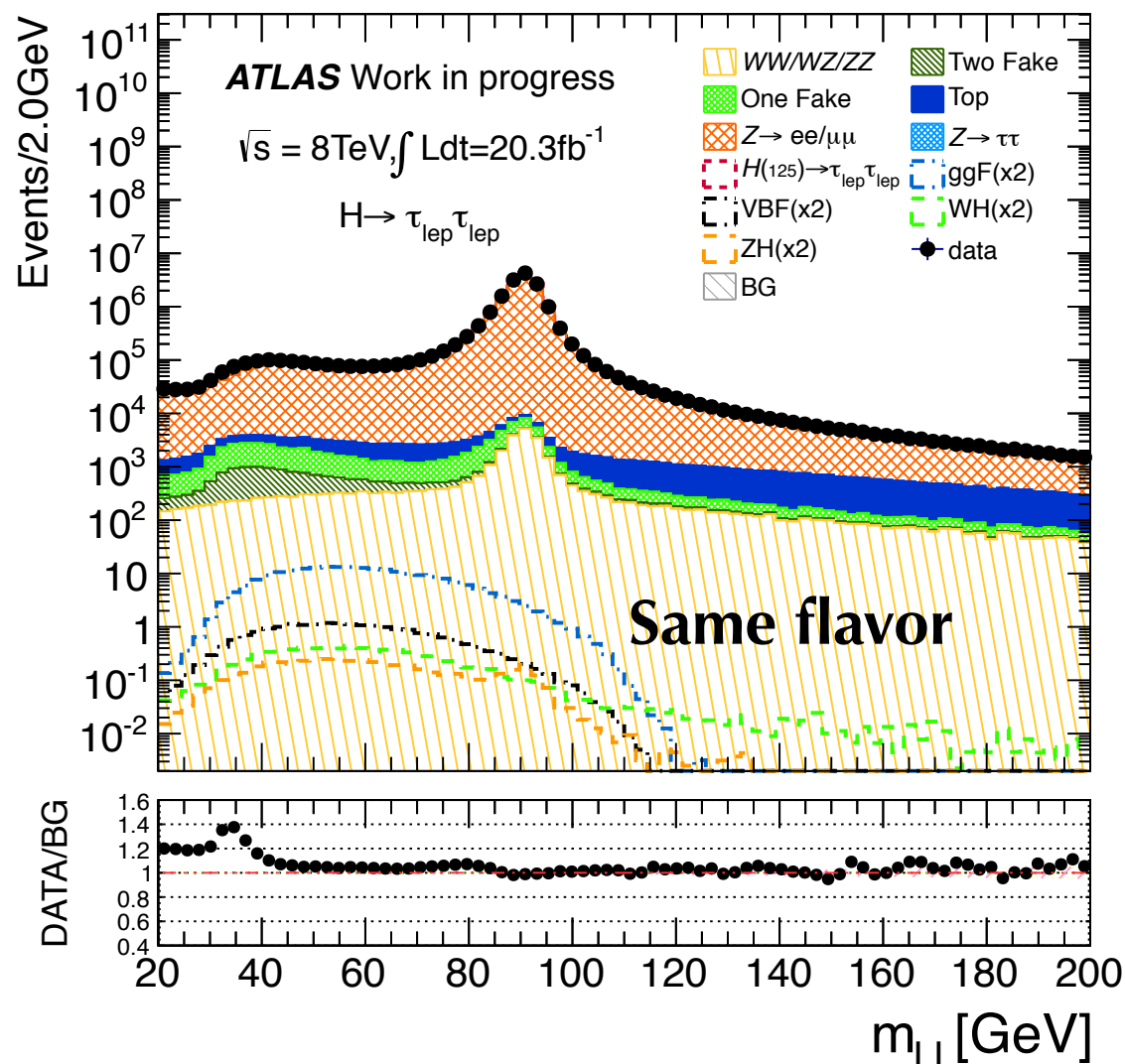
- I updated the denominator definition, because of this the fake factor were changed.
- New fake factor are here.



- Mainly, muon denominator changed by removing track hit recommendation cut.
 - Increase fake control sample stats!

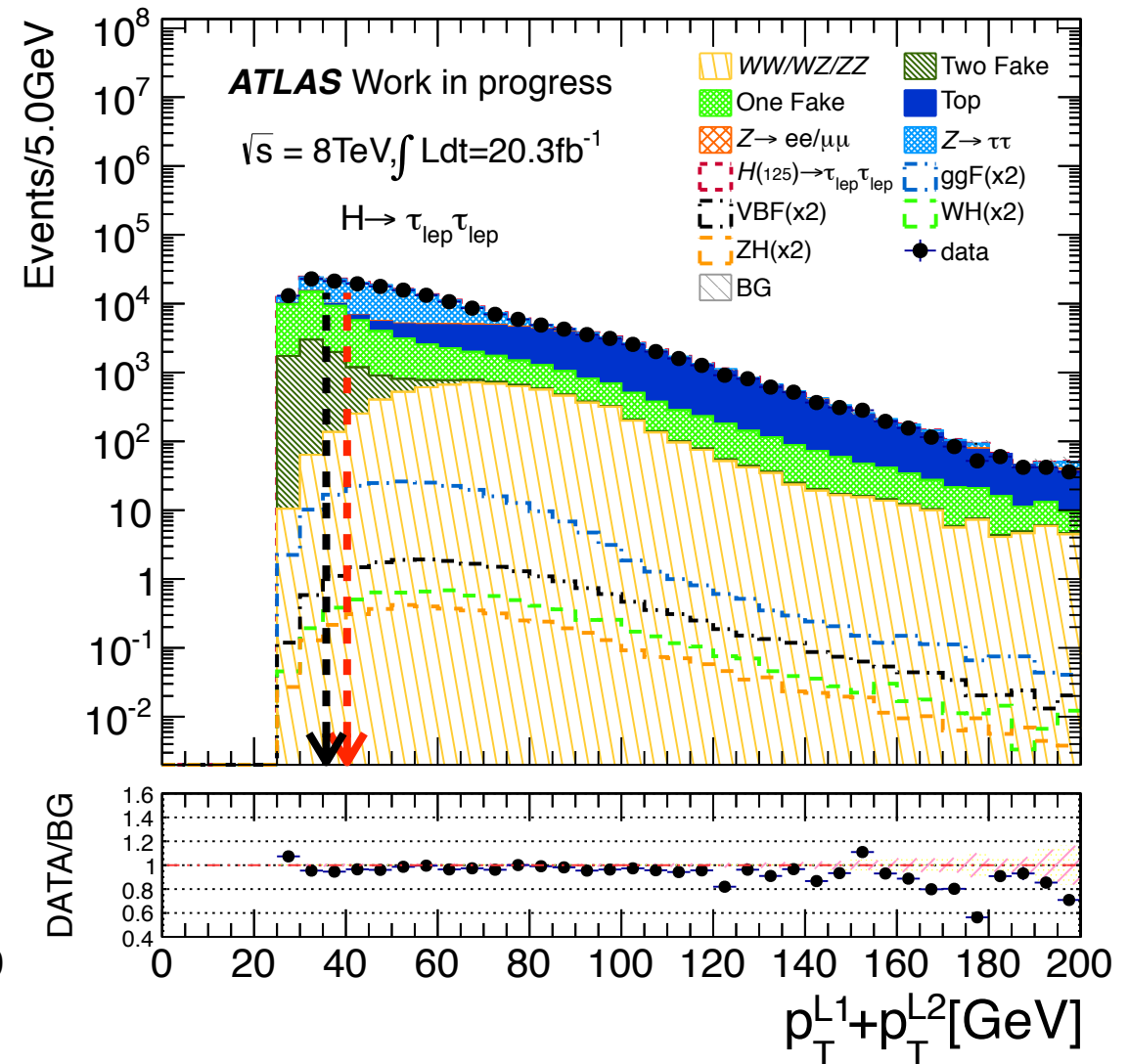
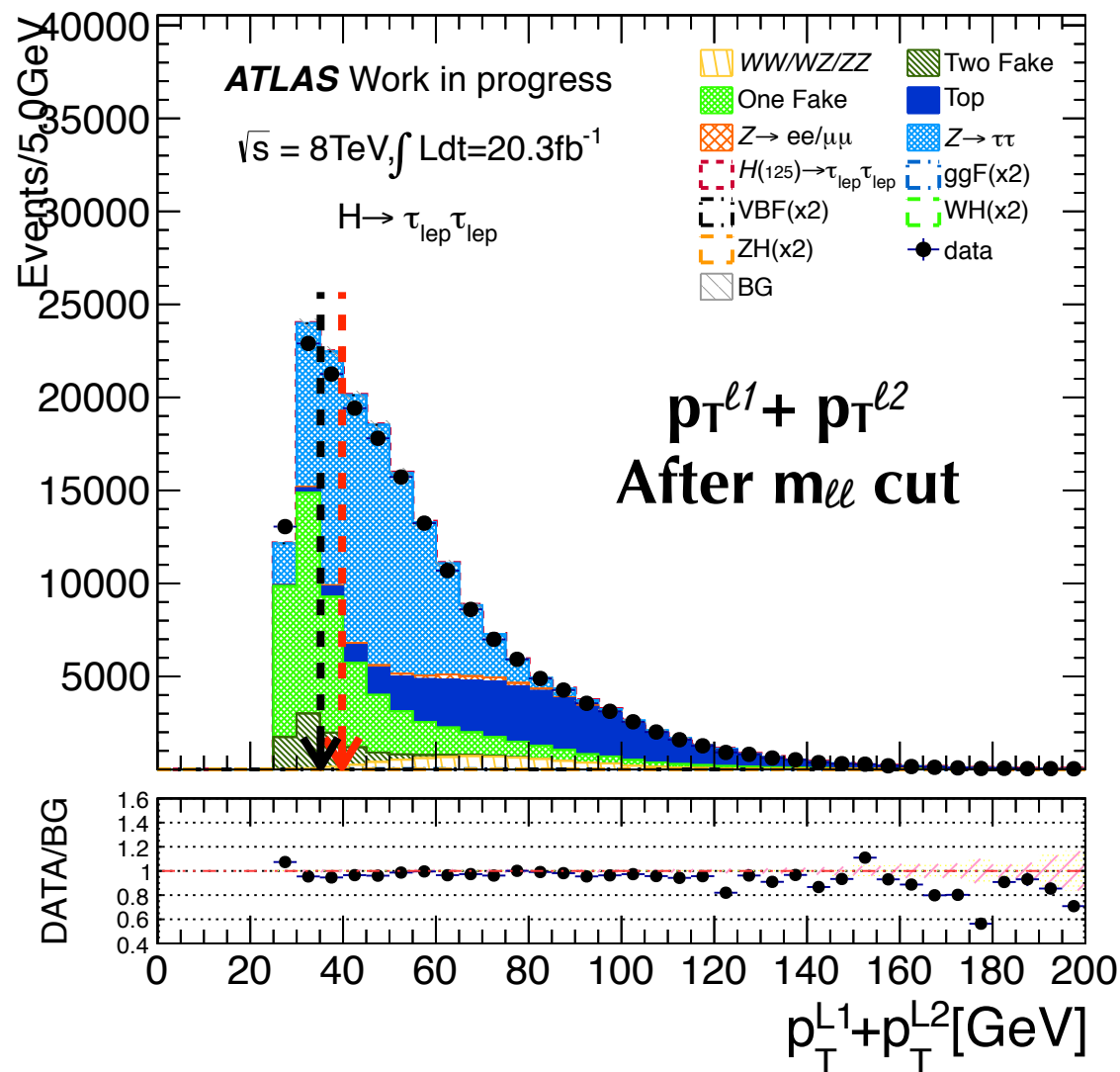
QCD contamination

- Fake lepton events might be affected by QCD multi-jet events.
- QCD multi-jet events has two fake leptons.
 - I estimated QCD events by using two fakable lepton events. (Applied FF1 x FF2)
 - And I subtracted (FF1+FF2) weight from one fakable events (W+jets).
- Di-lepton invariant mass plots after O.S. cut for each flavors.



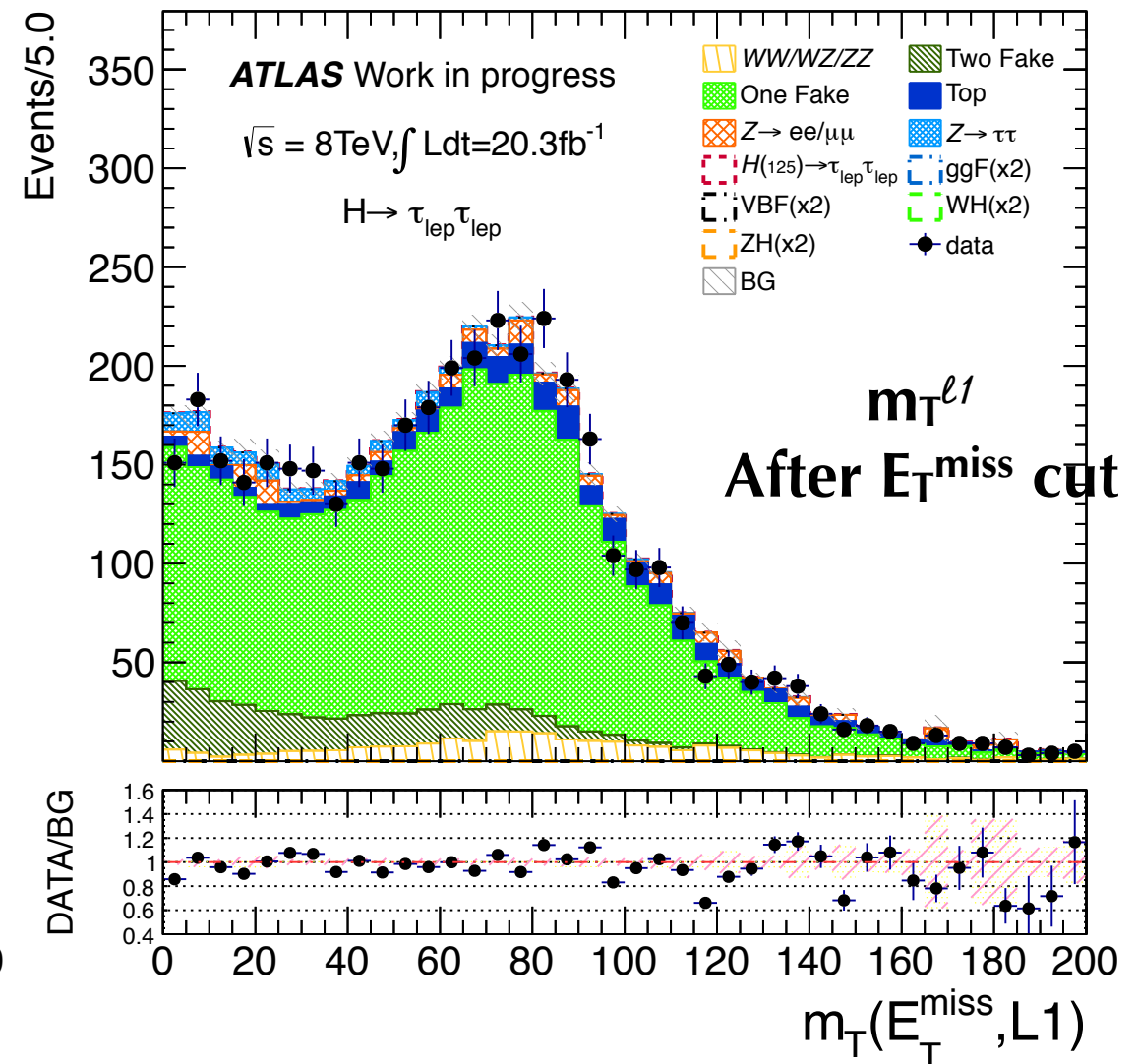
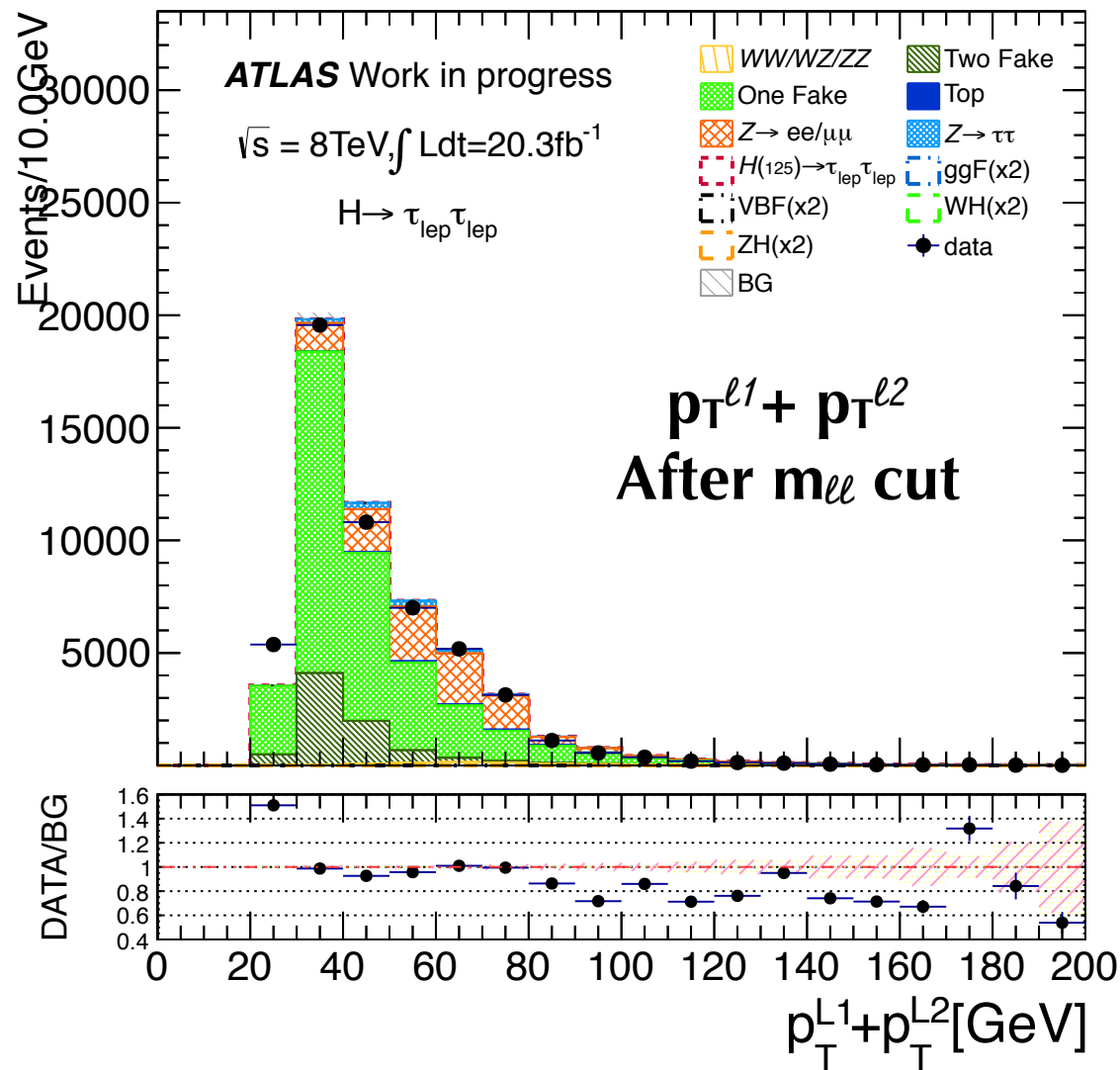
O.S. events

- Low sum p_T region has large fake lepton bkg, at the moment we cut events less than 35GeV.
- If we increase this threshold, we can decrease 30~40% fake leptons.
 - The effect of this for signal is very low.



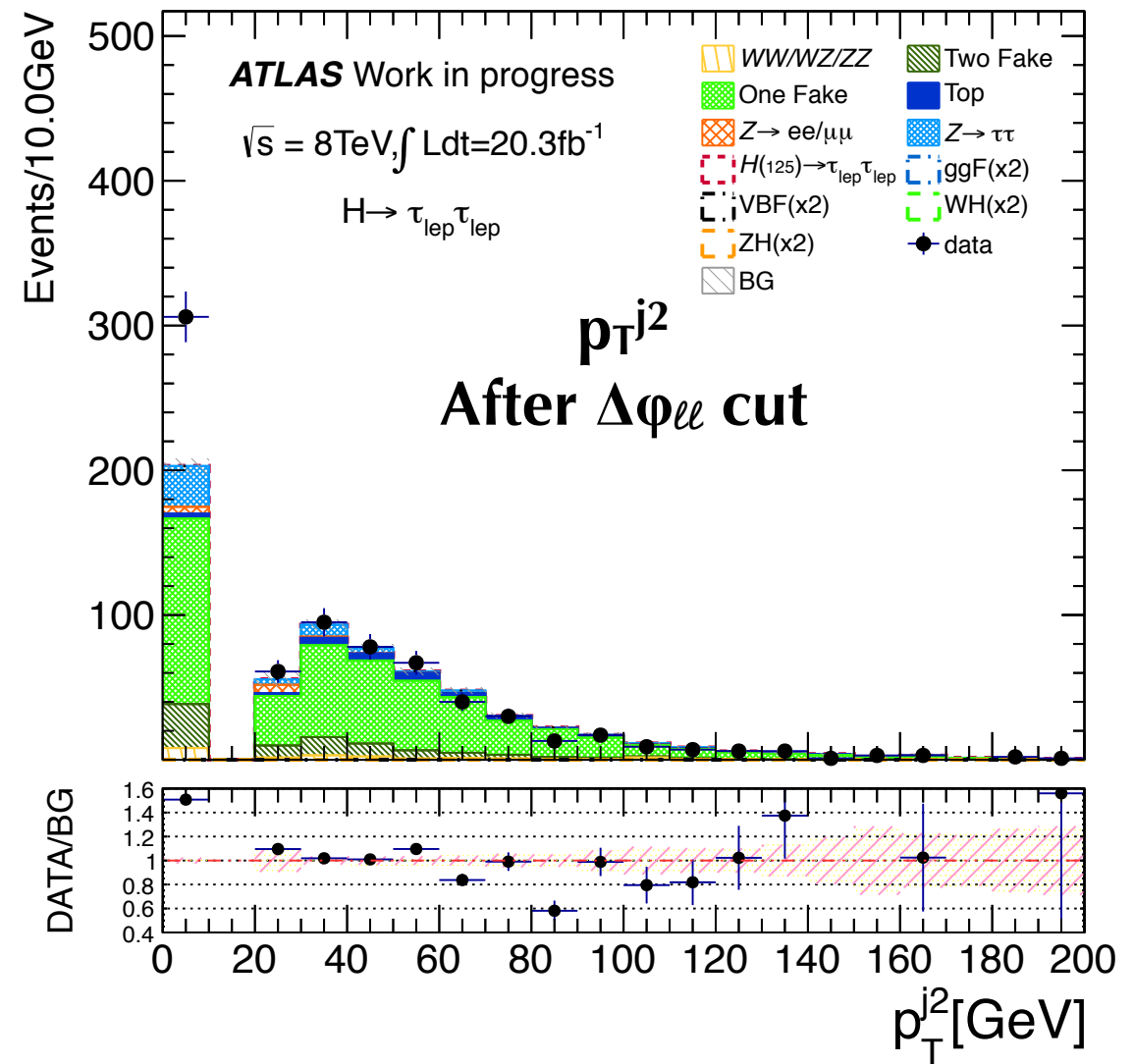
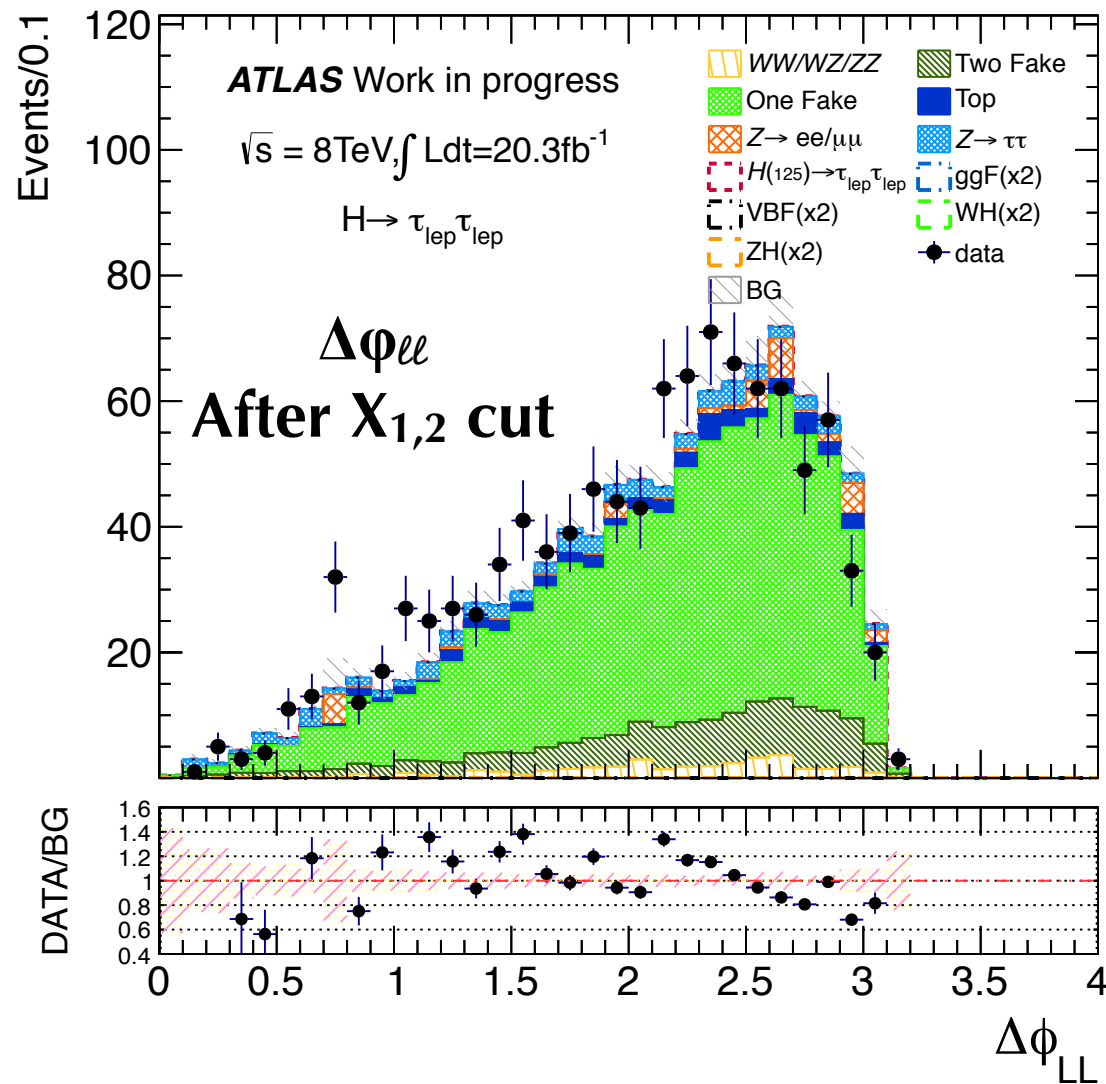
Same Sign validation

- Same sign events has large fake lepton contamination from QCD and W+jets.
- Fake factor method works very well!!



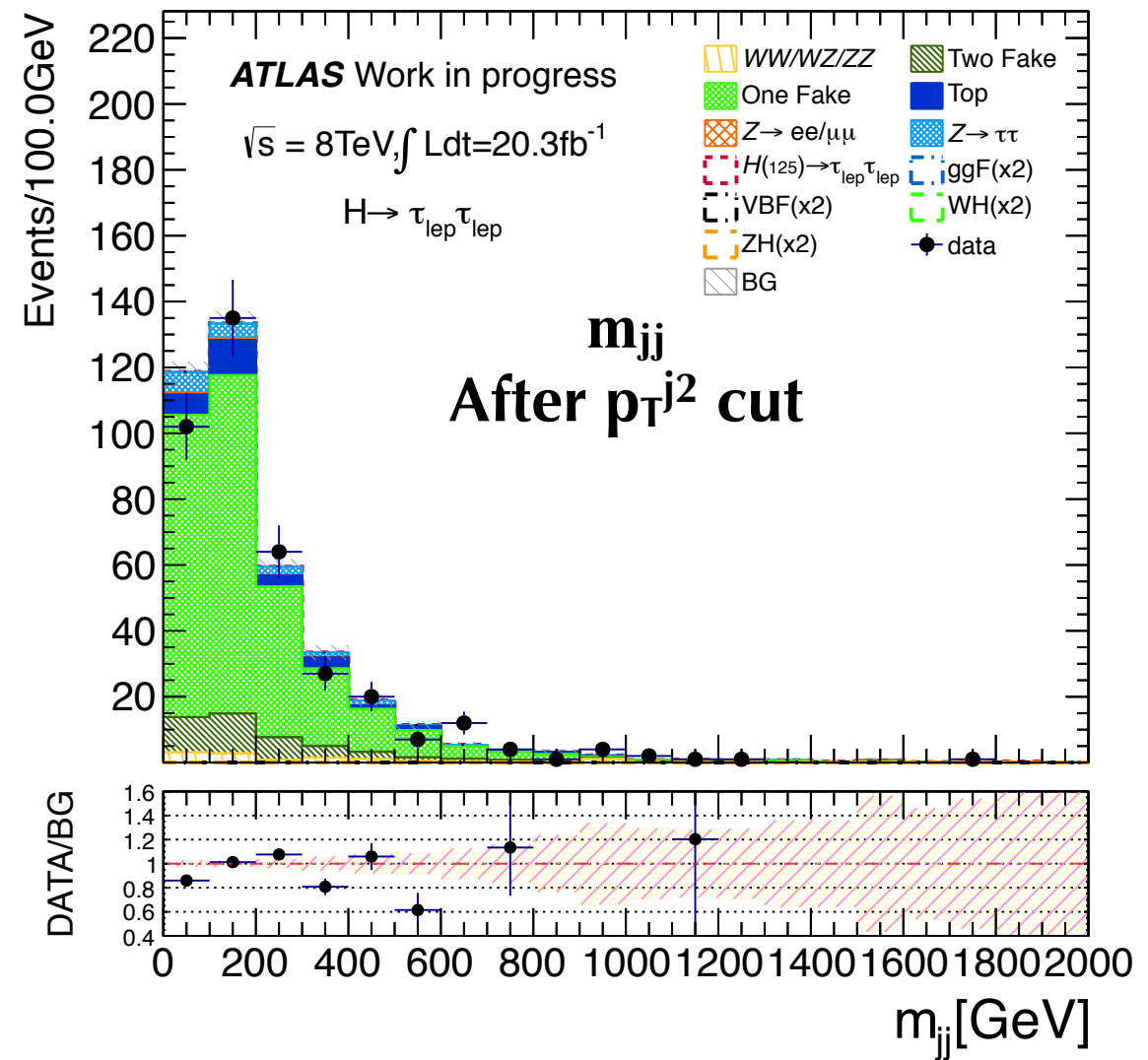
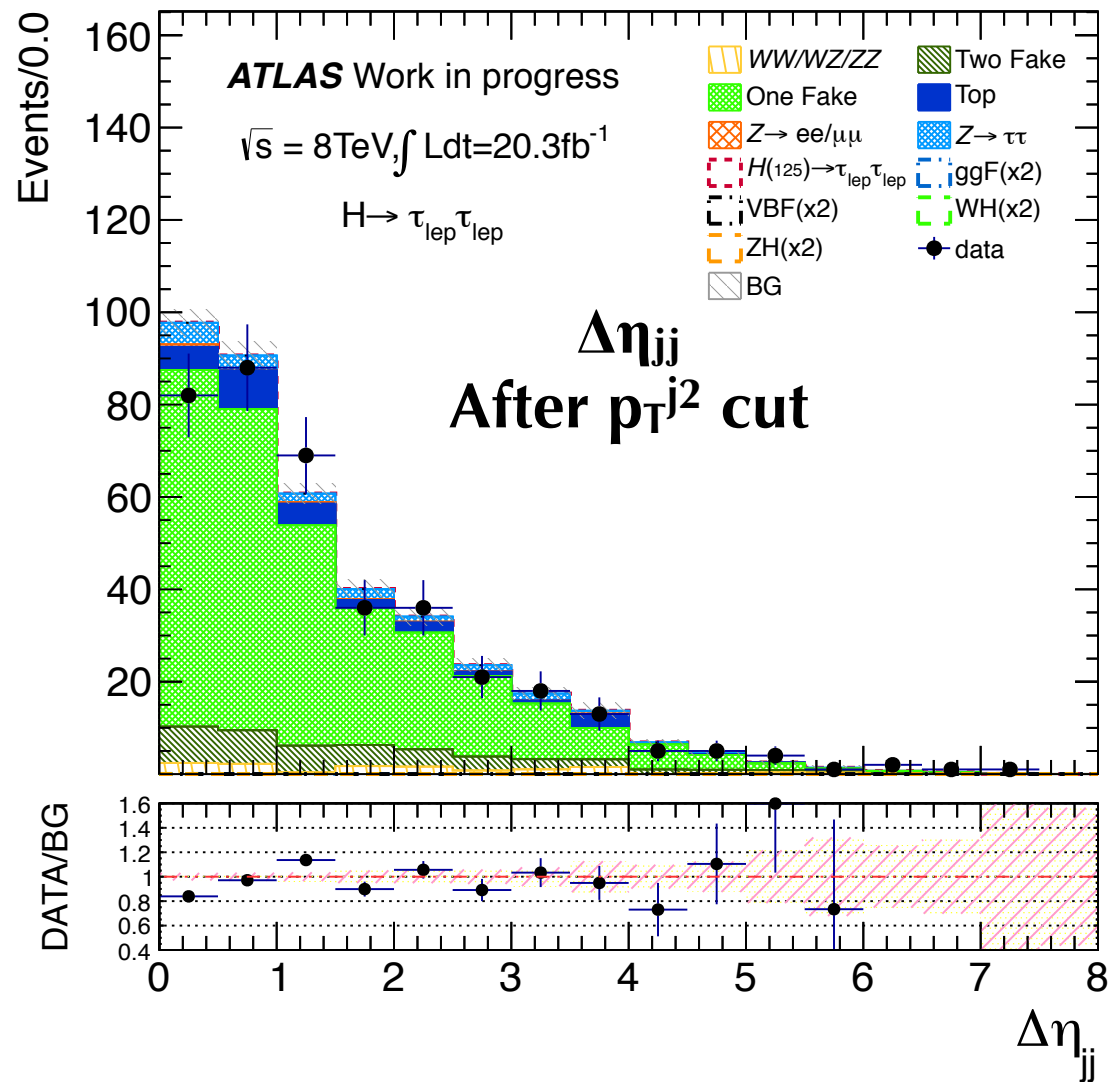
Same Sign validation

- More validations...



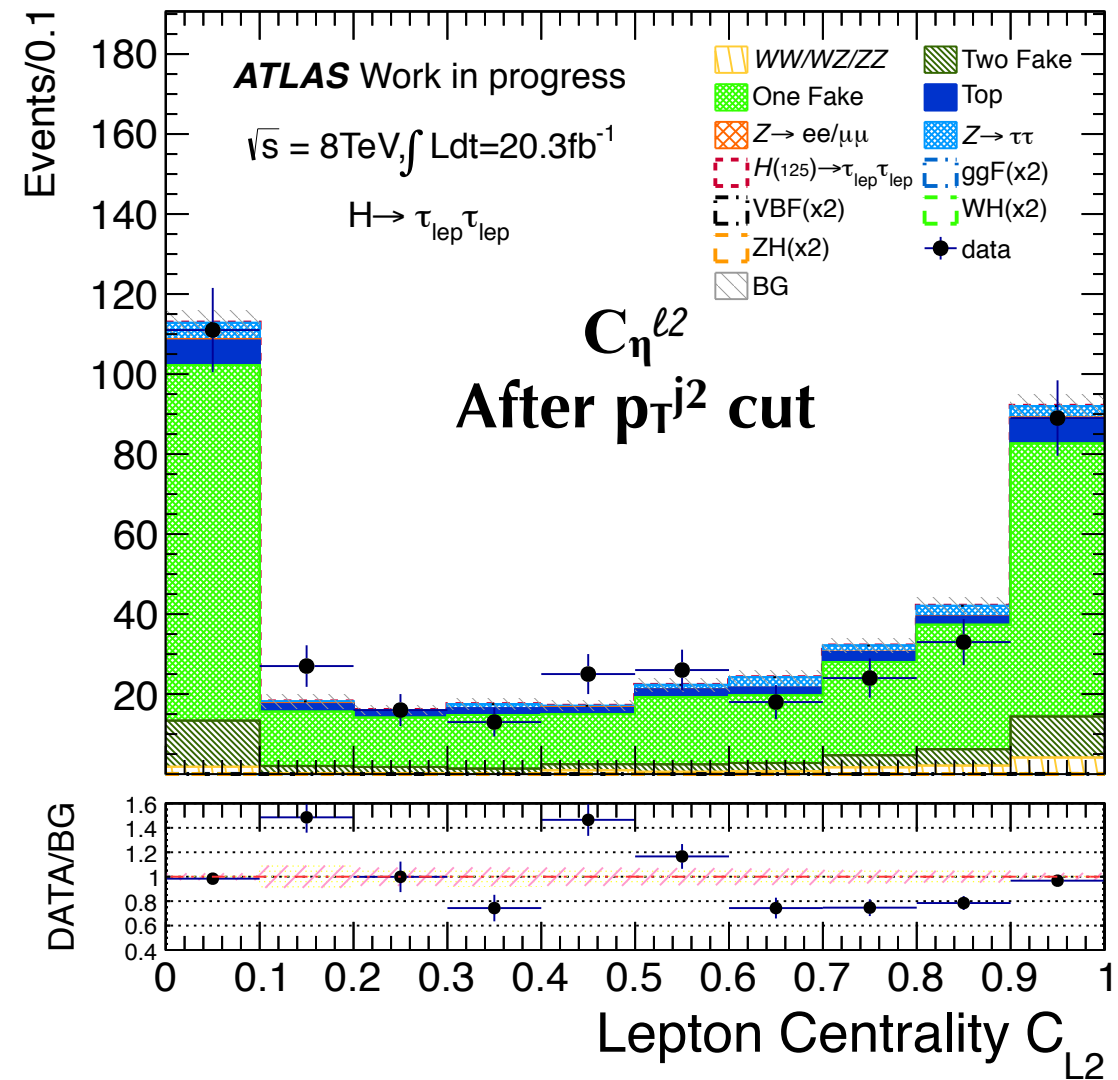
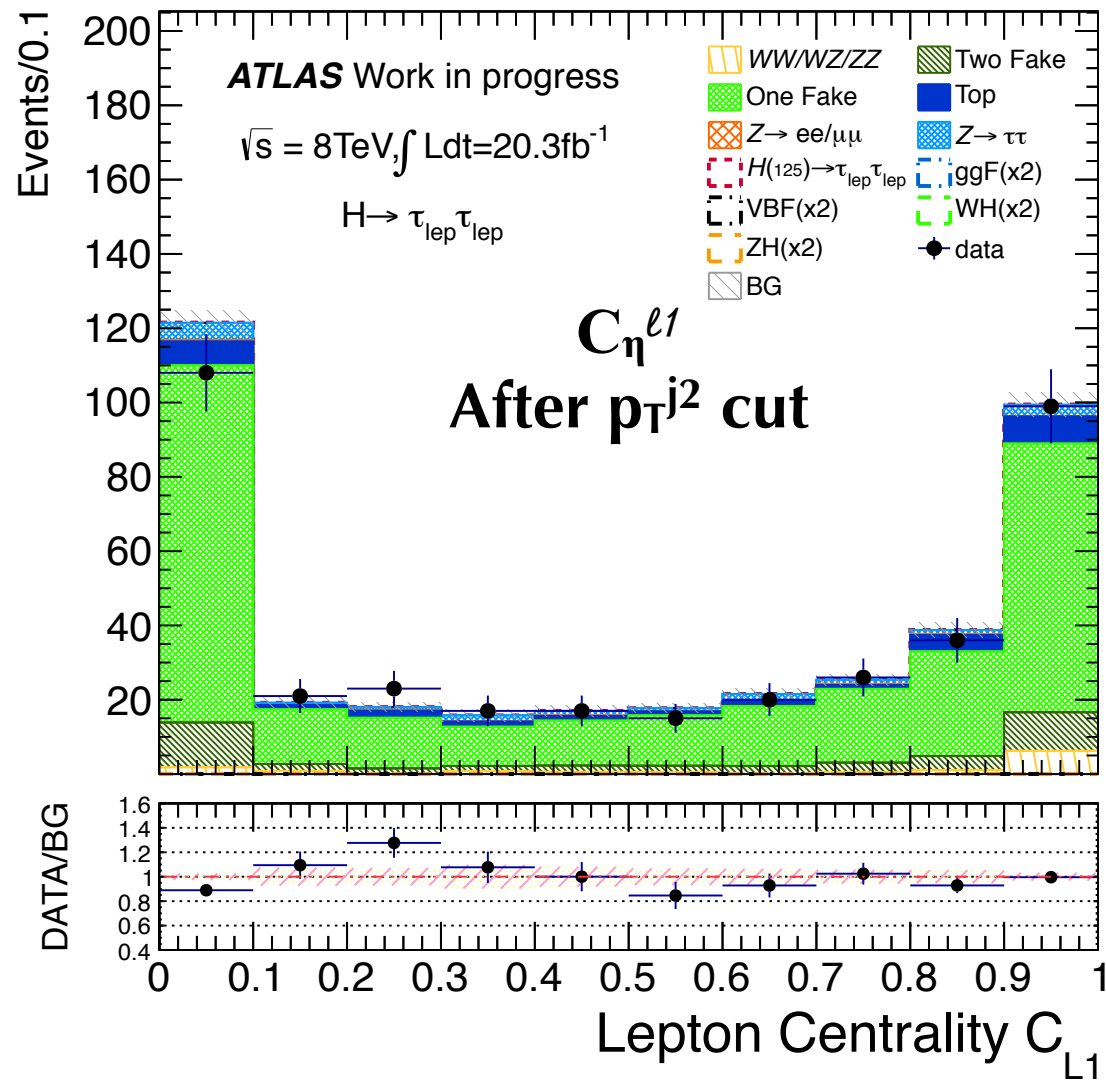
Same Sign validation

- More validations...
- VBF variables...



Same Sign validation

- More validations...
- VBF variables...



Conclusion

- Fake factor were updated by changing the definition of the fakable objects.
- Muon fake factor improved by increasing its control sample stats.
- However fake factor uncertainty are still large, 50% level.
 - To decrease fake leptons, how about increase sum pT threshold? ($35 \rightarrow 40 \text{ GeV}$)
- In the same sign CR, fake factor method works very well.
 - Most of VBF variables can be validated.
- Calculation of systematics uncertainties are going on.