

SimpleAnalysis + KiSelector

Code validation



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Introduction

- SimpleAnalysis - Created ntuples from two MC files, tW +MET production for scalar and pseudoscalar mediators respectively
- KiSelector – Choose several variables and applies cuts on their values
 - Two different selections : 1L and 2L in the final state
- KiPlotter – Plots the resulting normalised histograms for each selection

Introduction – Initial selection

- SimpleAnalysis created ntuples from two files containing the results for tW production:

DSID	Mediator type	Mediator mass (GeV)	Xsec (fb)
123006	scalar	100	60.97
123041	pseudo	100	39.60

- We applied two different selections to this ntuples:

Selection 1 (1L)

$n_{lep} == 1$

$n_{jet} \Rightarrow 3$

$Met > 200 \text{ GeV}$

Selection 2 (2L)

$n_{lep} == 2$

- Then we obtained the normalised plots for different variables

Introduction – Claudia's selection

- We will also compare with Claudia's [1] results for validation purposes
- For that, we will apply her variable cuts for 1 lepton and 2 lepton selections

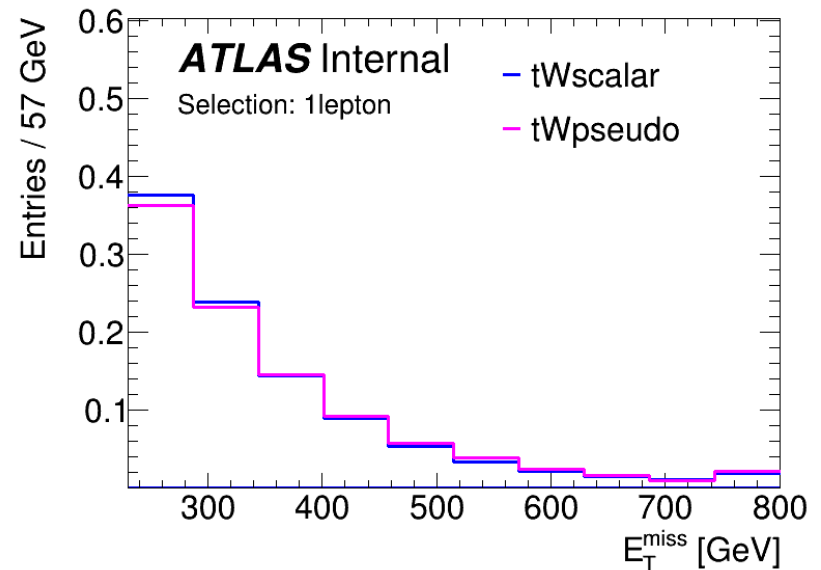
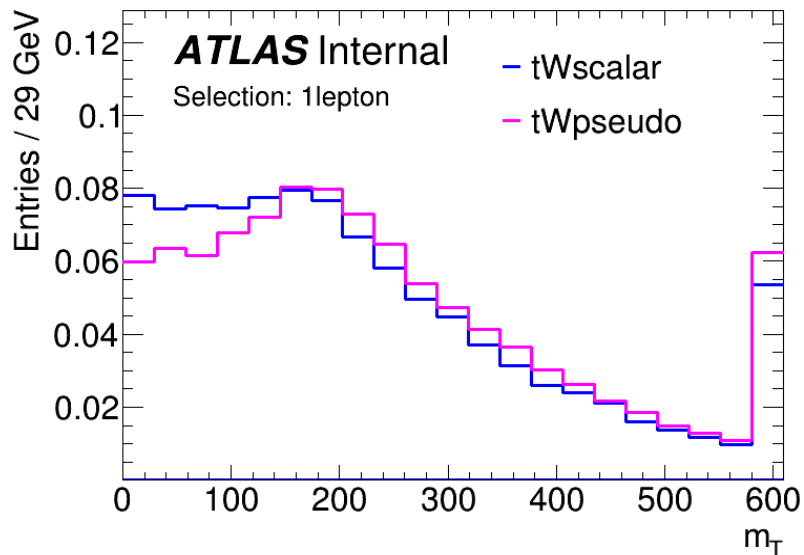
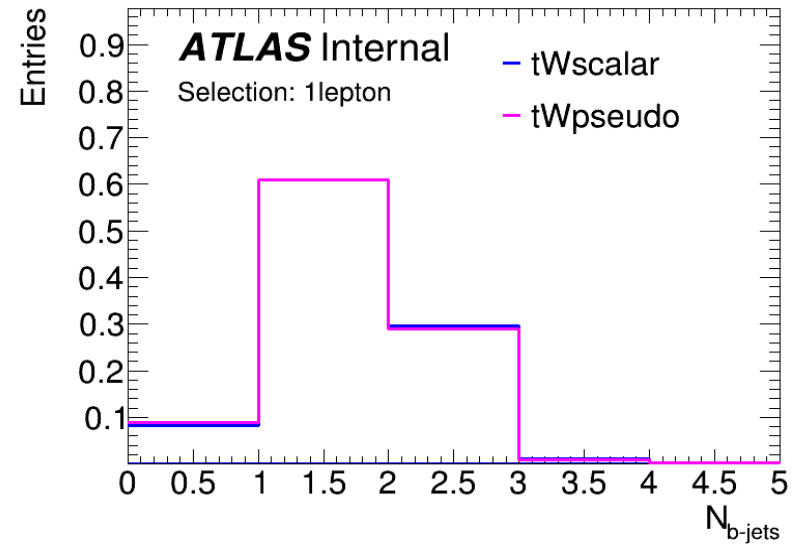
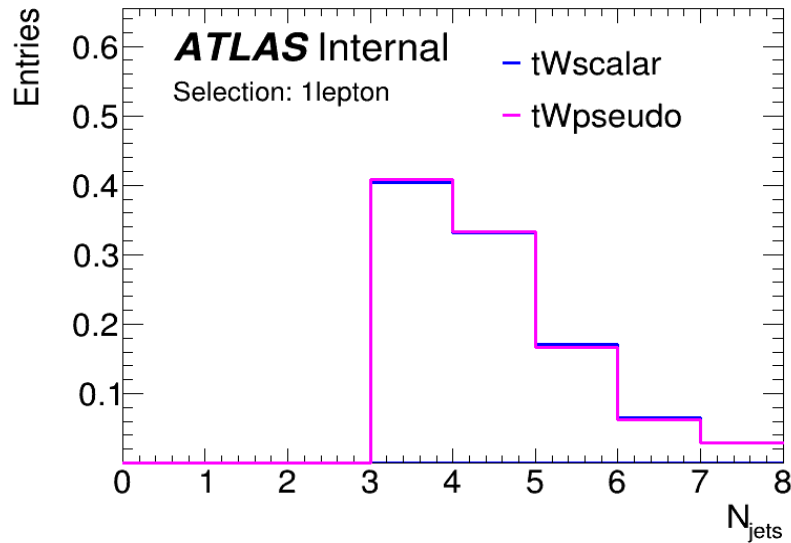
```

nJets >=3 (relaxed from >=4)
nBjets >=1 (relaxed from >=2)
preselHighMet ==1
  (Met > 230 && mT > 30
   && baseLeptons[0].Pt() > 25
   && absDPhiJMet[0] > 0.4
   && absDPhiJMet[1] > 0.4)
signalJets_0_pt > 80
signalJets_1_pt > 60
signalJets_2_pt > 30
signalBJets_0_pt > 80
mT >= 180
HtSigMiss > 15
topness > 8
topRecl_M > 0 (relaxed from 150)
dphiMin > 0.9
mT2Tau > 80
dPhiMetLep > 1.1
        
```

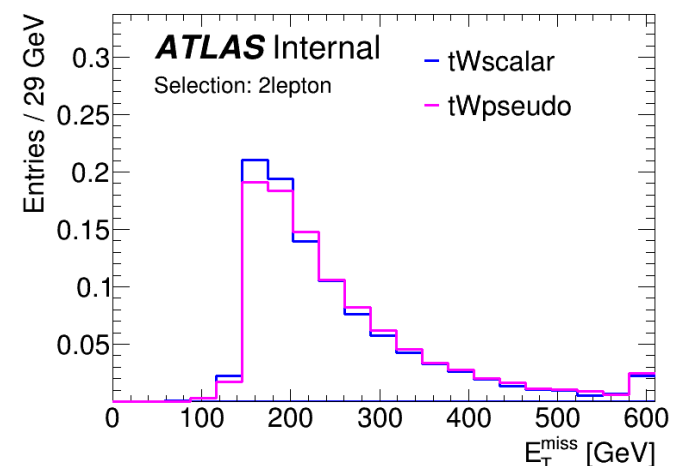
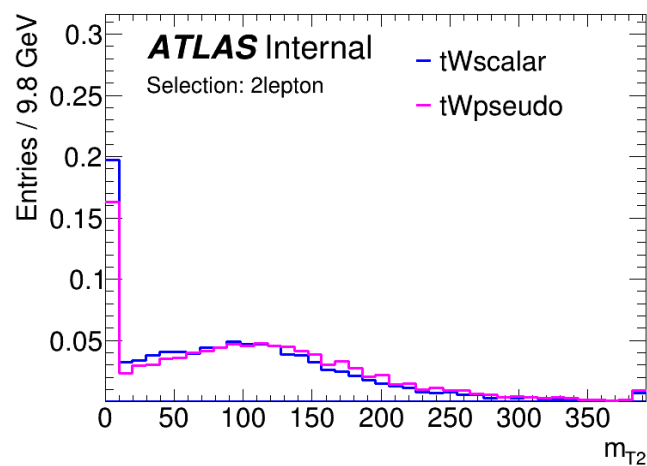
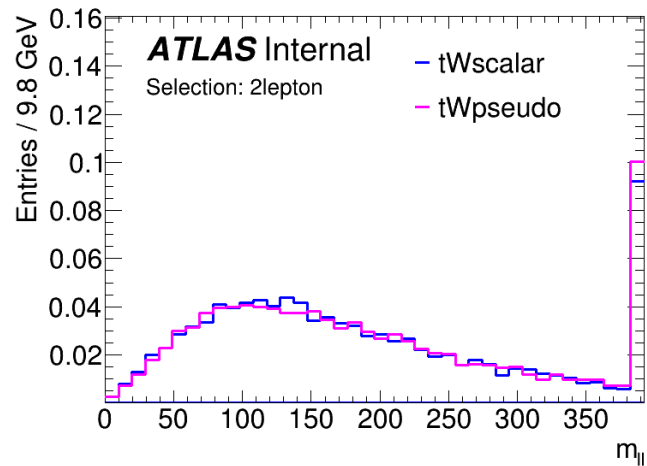
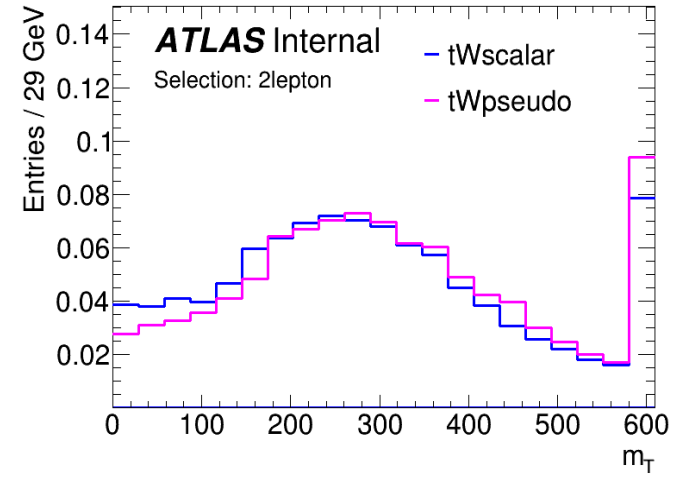
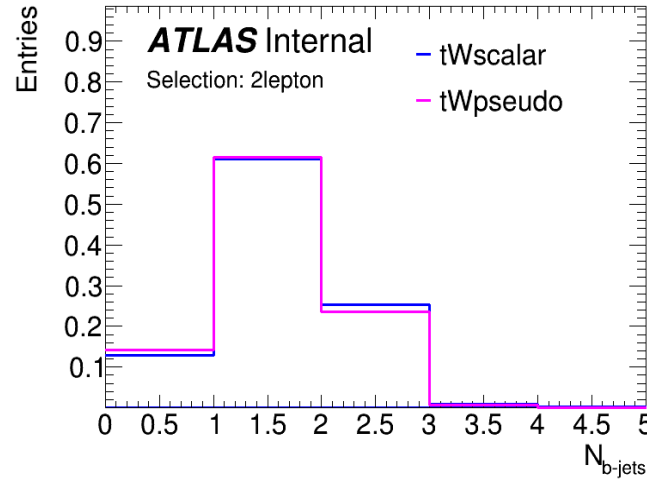
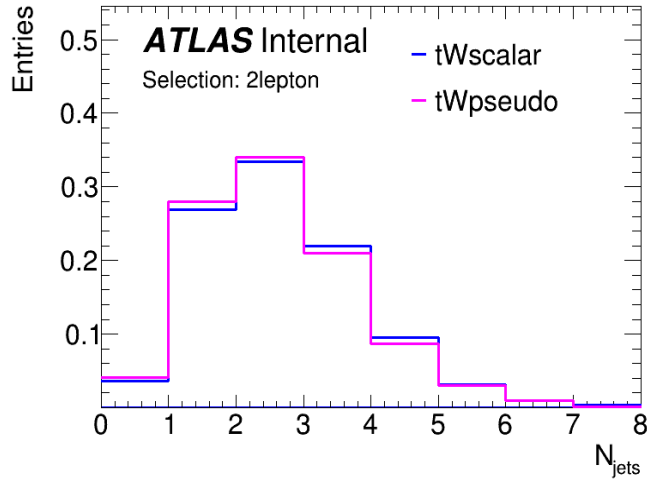
	SR ^{2-body}	
Lepton flavour	SF	DF
$p_T(\ell_1)[GeV]$	> 25	
$p_T(\ell_2)[GeV]$	> 20	
$m_{\ell\ell}$ [GeV]	[20, 71.2]	> 20
	or	> 111.2
$n_{b\text{-jets}}$	≥ 1	
$\Delta\phi_{boost}$	< 1.5	
S	> 12	
m_{T2} [GeV]	> 110	

[1] Single top simplified model requests or How to make an MC request, Claudia Seitz, https://indico.cern.ch/event/884557/contributions/3758474/attachments/1991868/3321482/clseitz_tWSimplifiedModelRequest_DMZeuthenHamburg.pdf

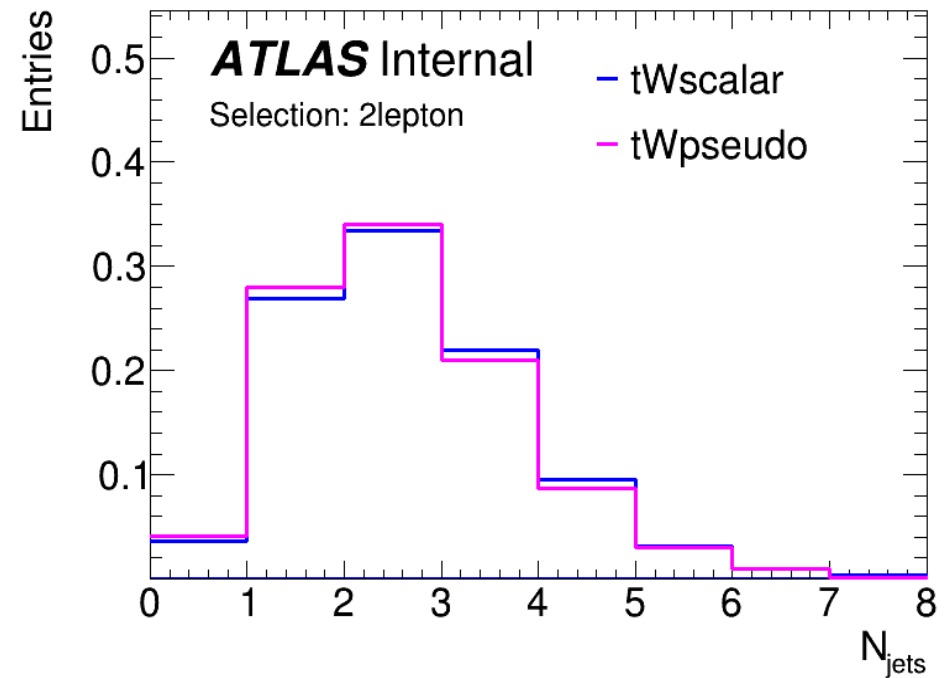
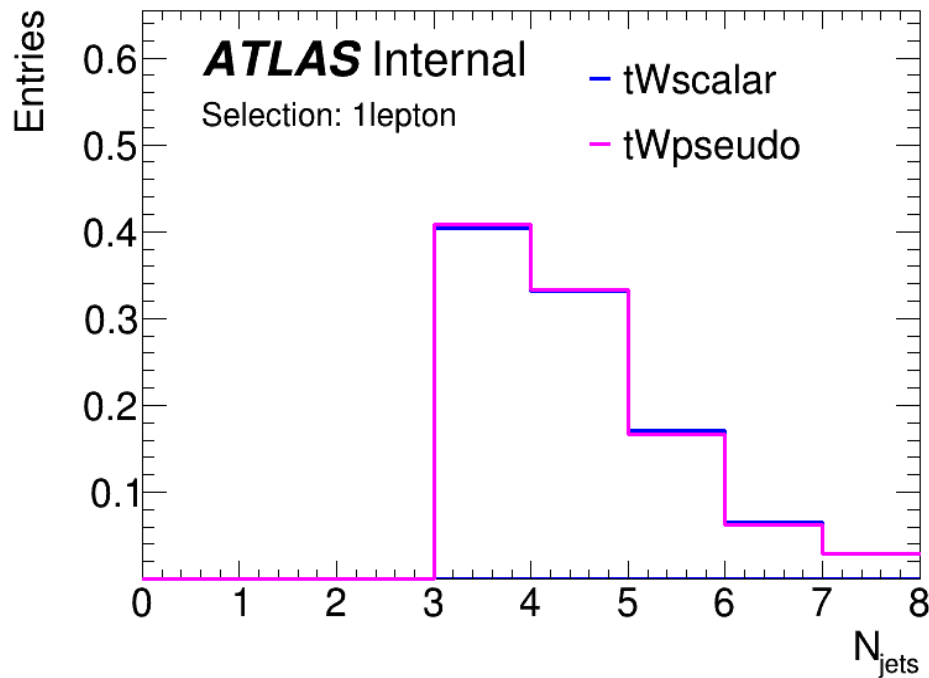
Resulting plots for the 1L selection



Resulting plots for the 2L selection



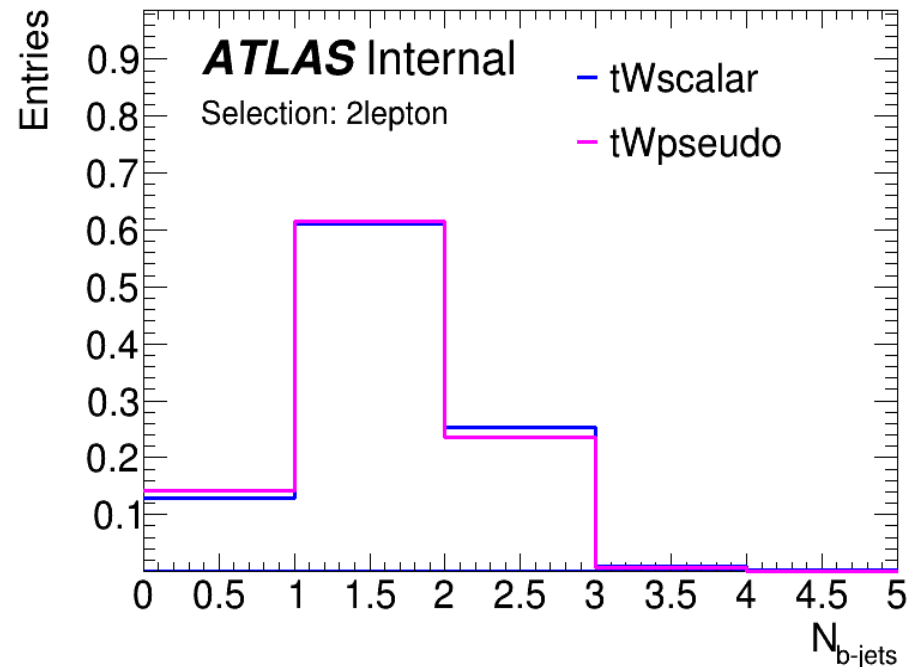
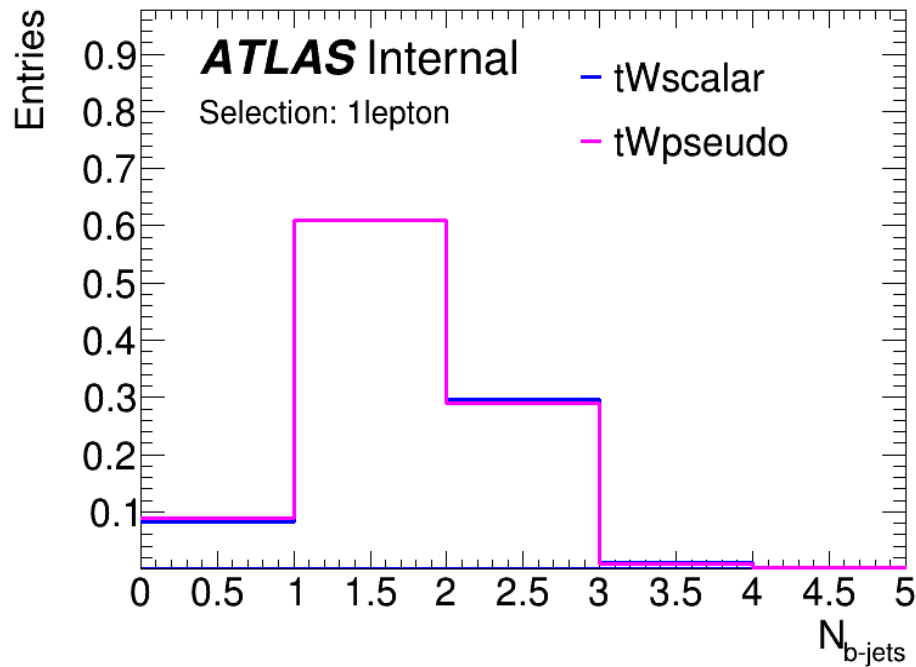
Comparison between 1L and 2L results



Number of jets

- The difference between tWscalar and tWpseudo is unnoticeable for 1 lepton
- For 2 leptons it is bigger, but we don't know if it is significant

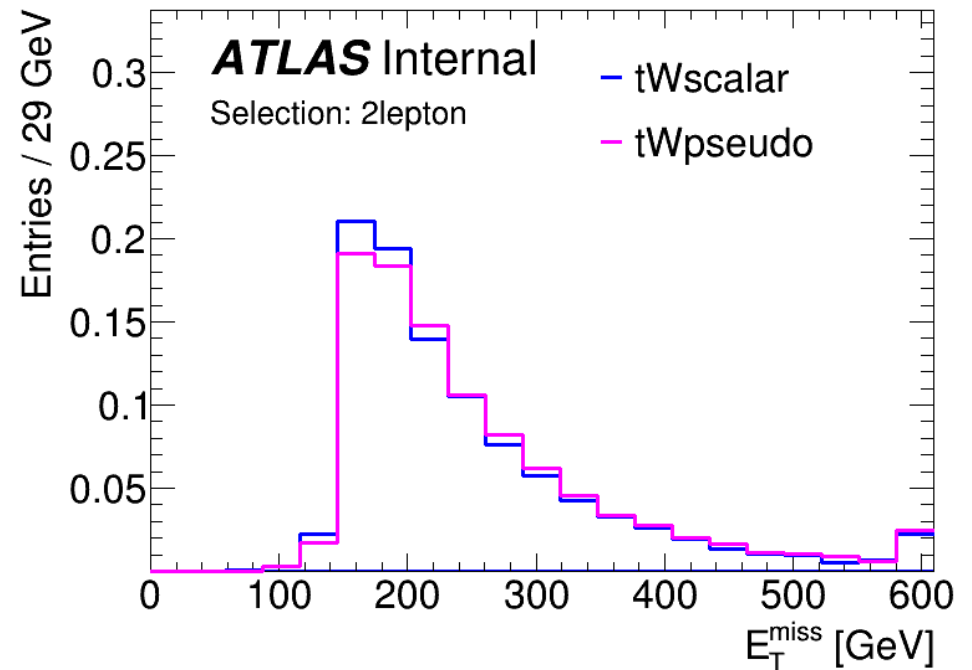
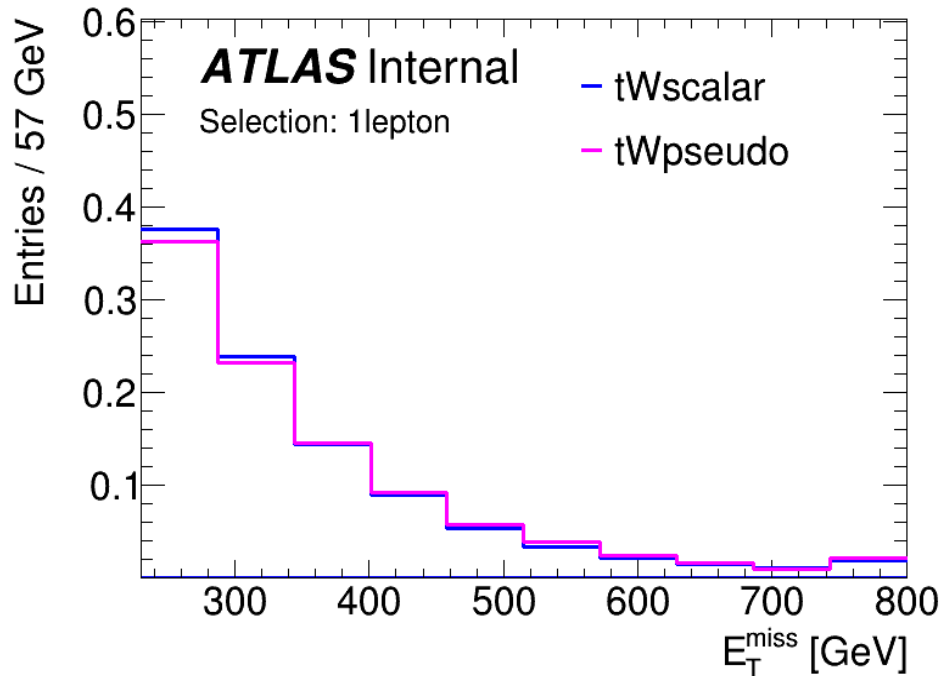
Comparison between 1L and 2L results



Number of b-jets

- Slightly less b-jets for the 2 lepton selection
- For 2L, the difference between tWscalar and tWpseudo is bigger

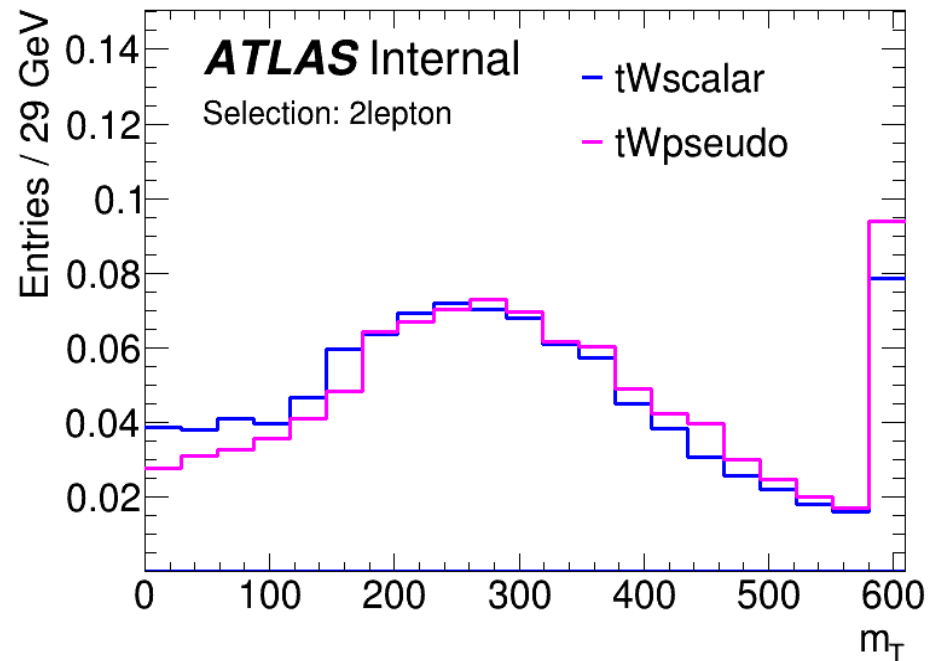
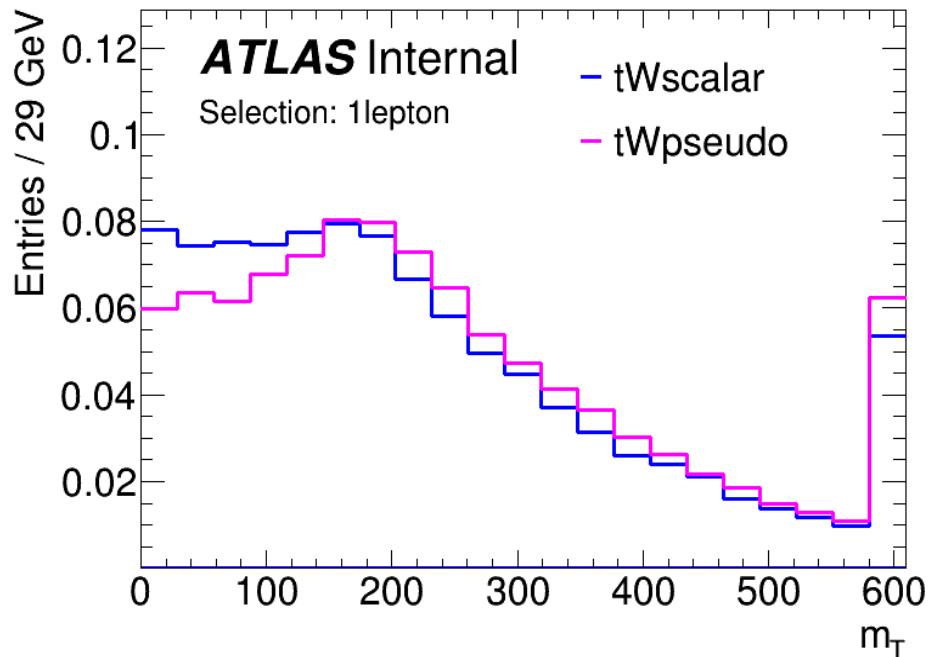
Comparison between 1L and 2L results



MET

- In general, for tWscalar less MET is produced
- This is much more noticeable in the 2 lepton case
- Different binning because our focus is the comparison with Claudia's results

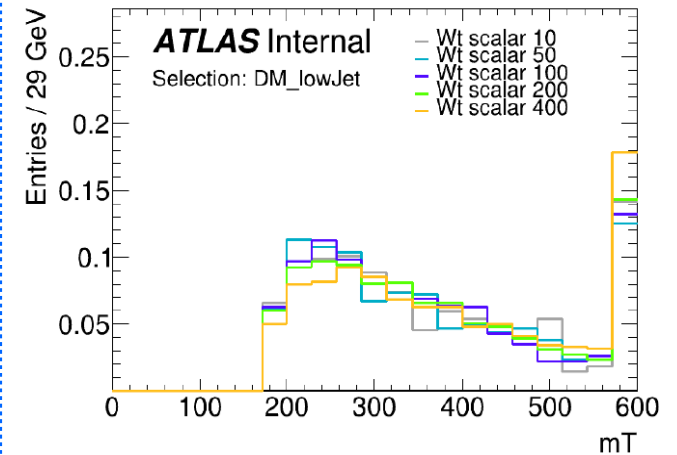
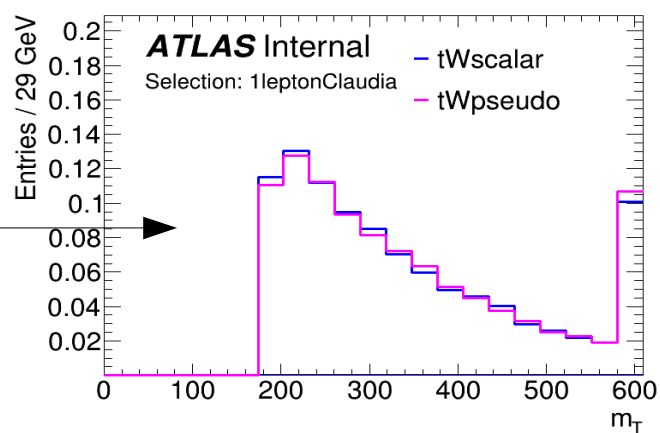
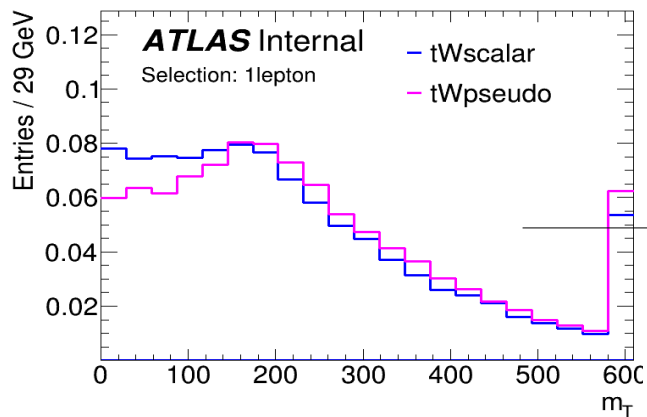
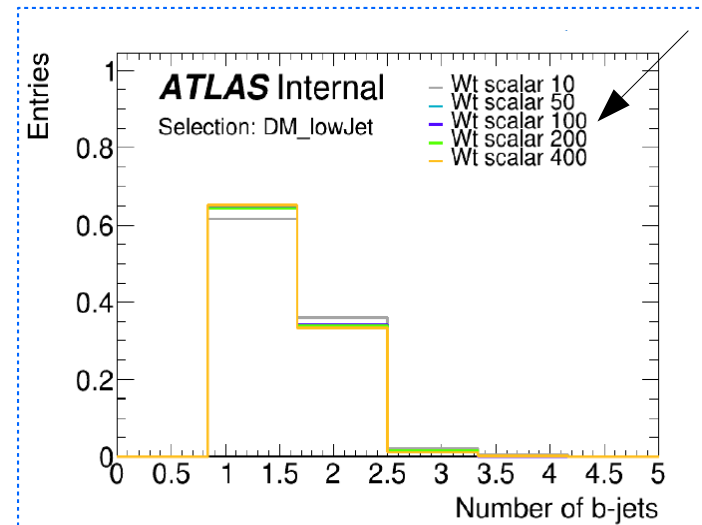
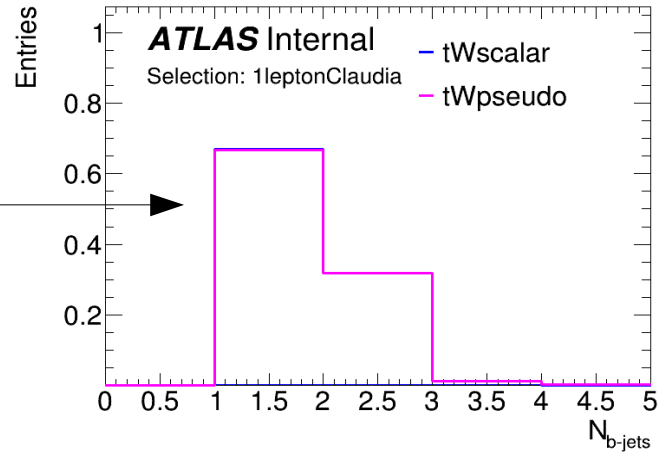
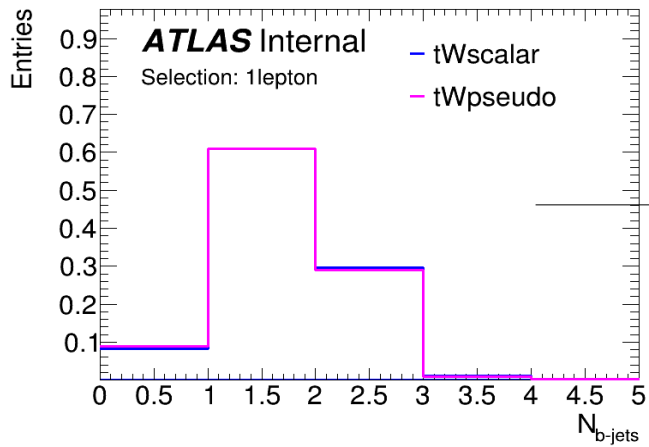
Comparison between 1L and 2L results



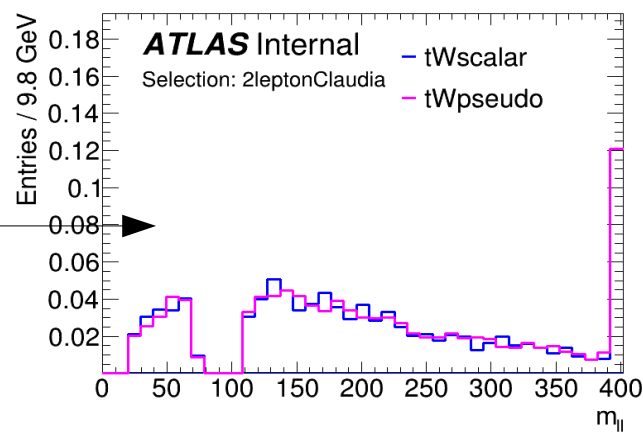
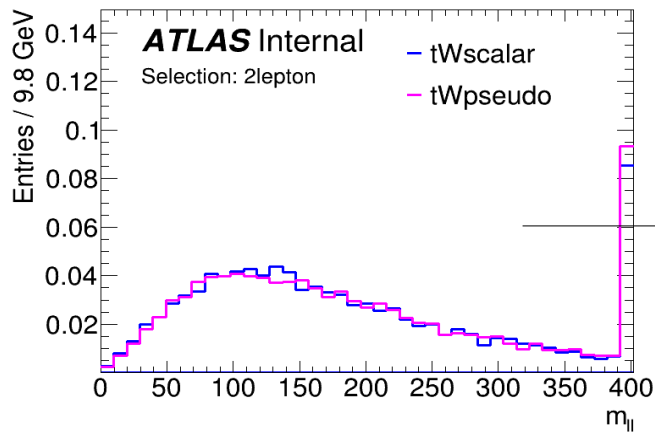
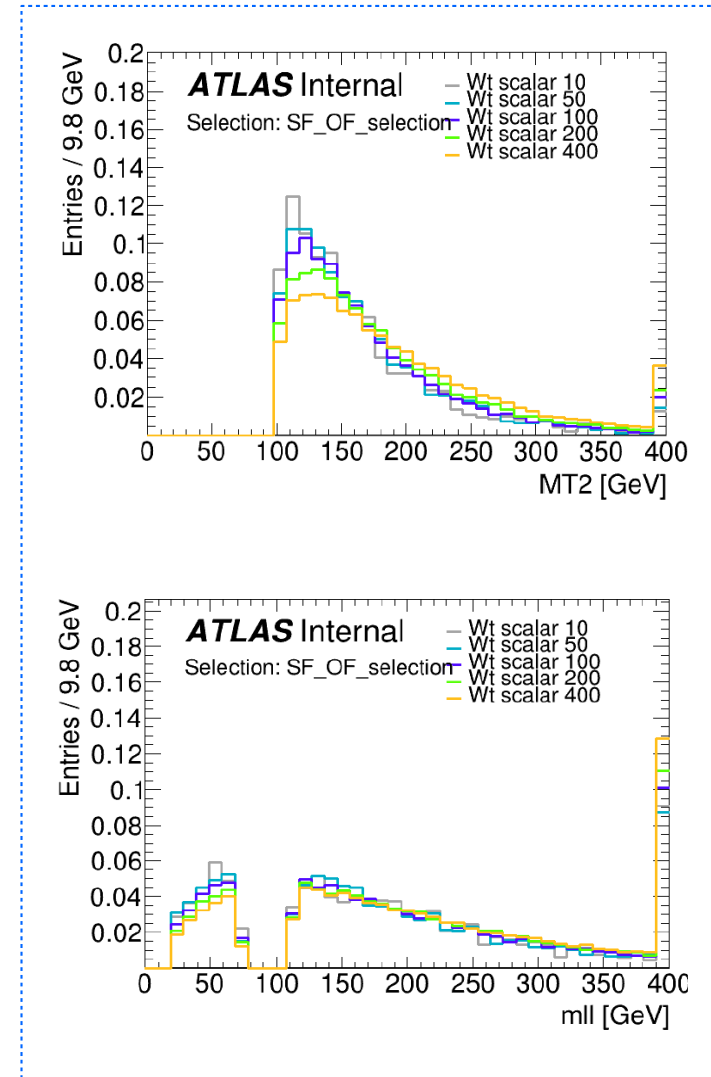
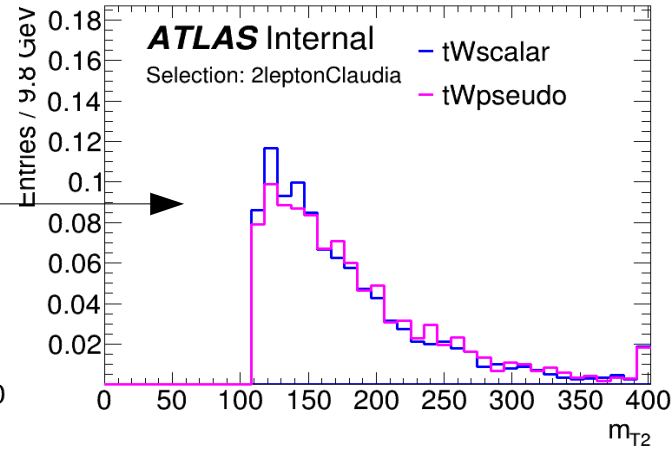
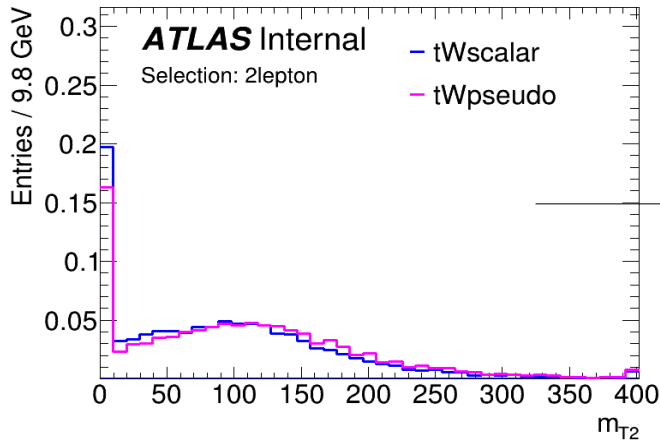
MT

- For 1L the m_T values are lower in general
- For tWscalar the values are also lower, for both selections
- The peak is at ~ 180 GeV for 1L and at ~ 250 GeV for 2L

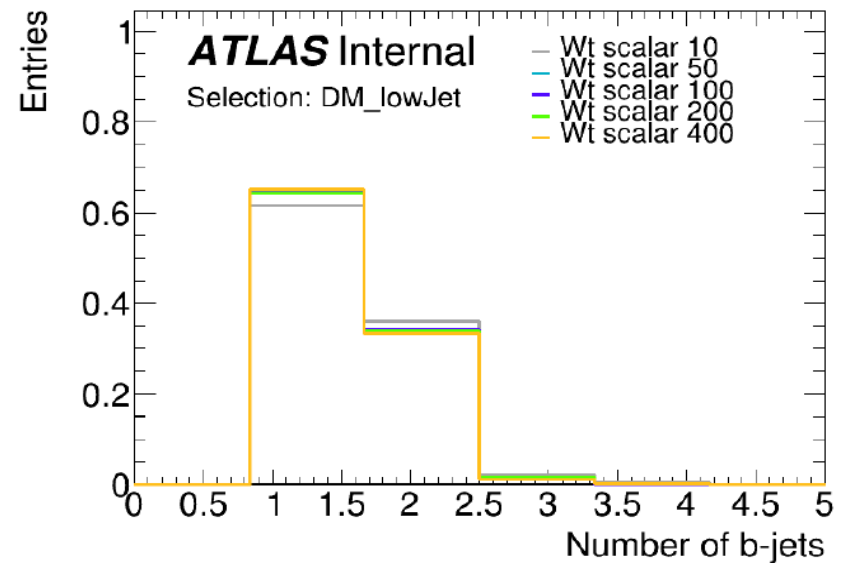
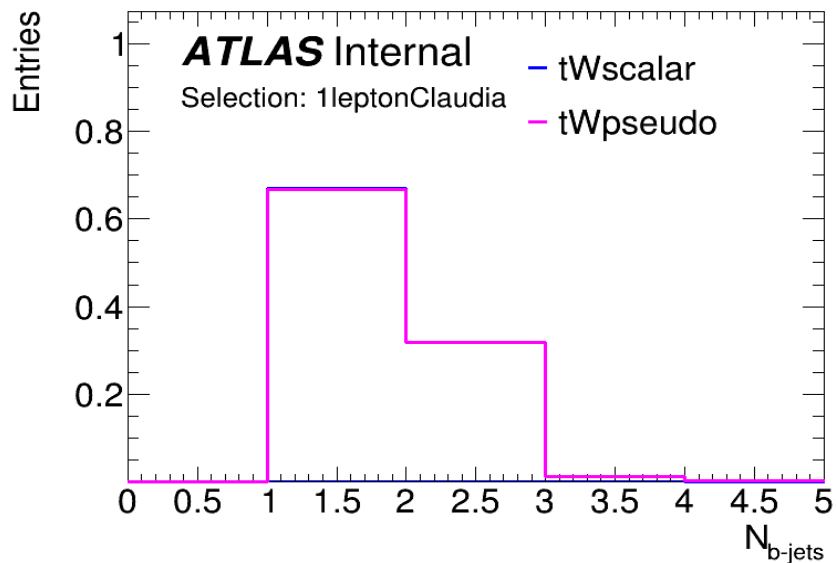
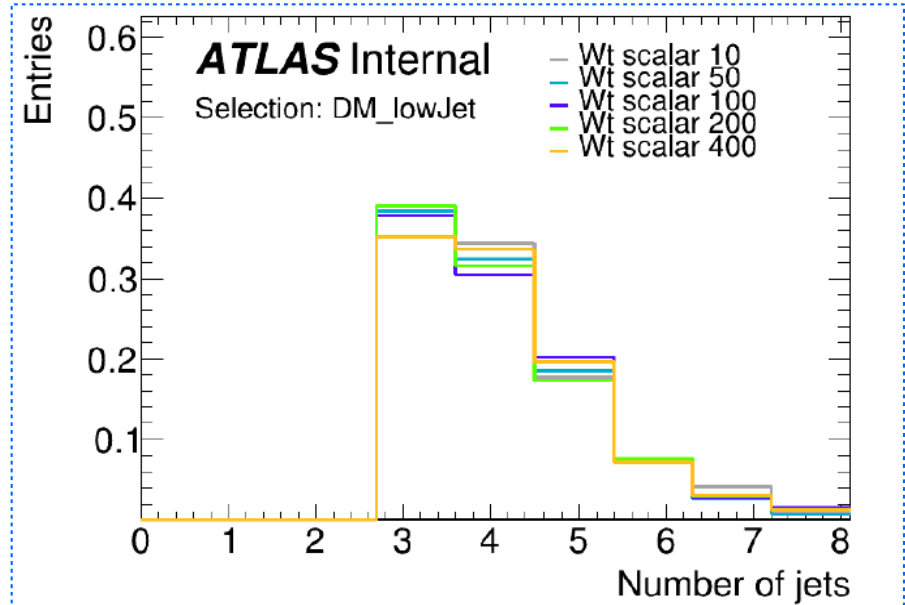
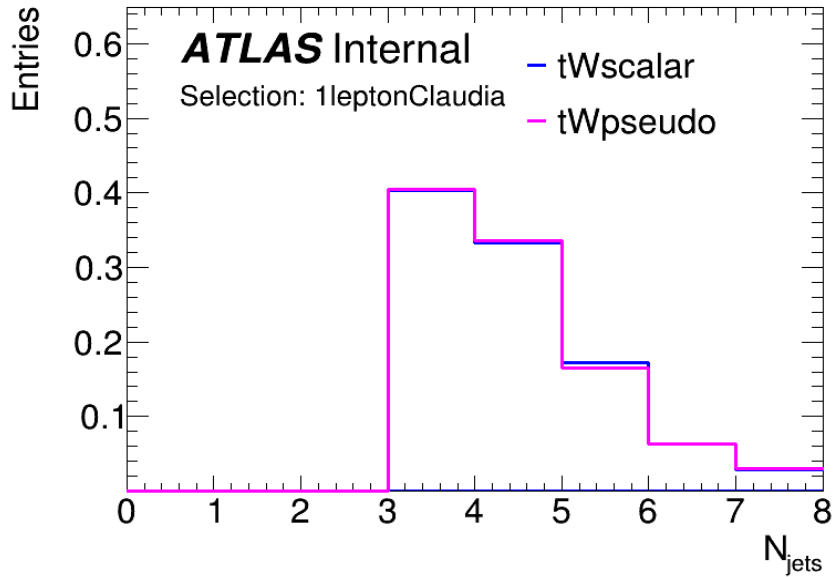
Application of Claudia's cuts (1L)



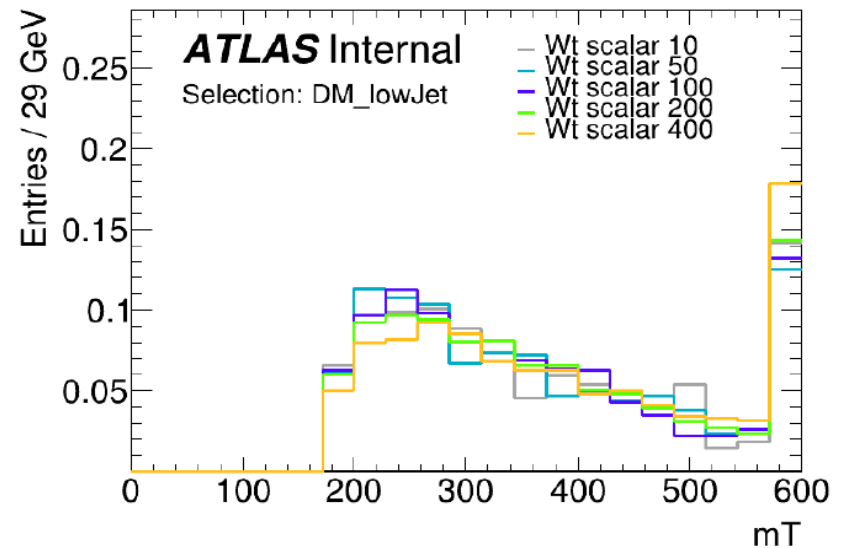
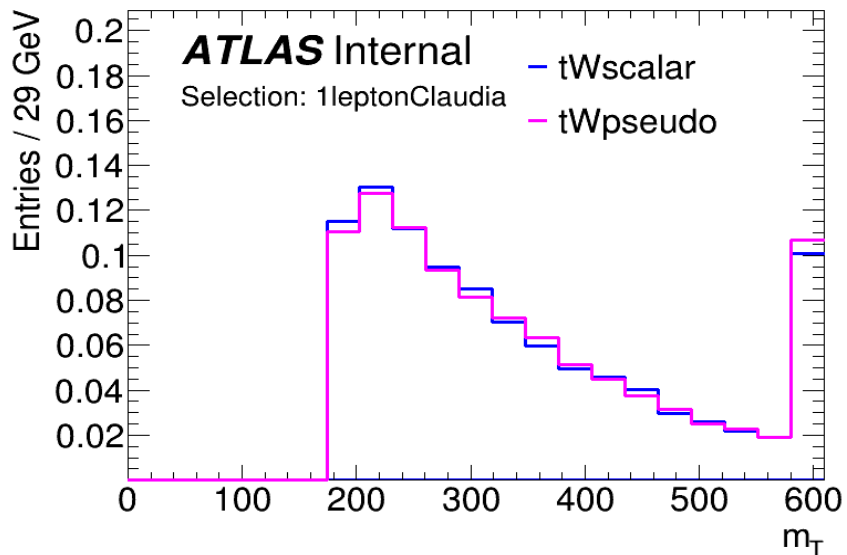
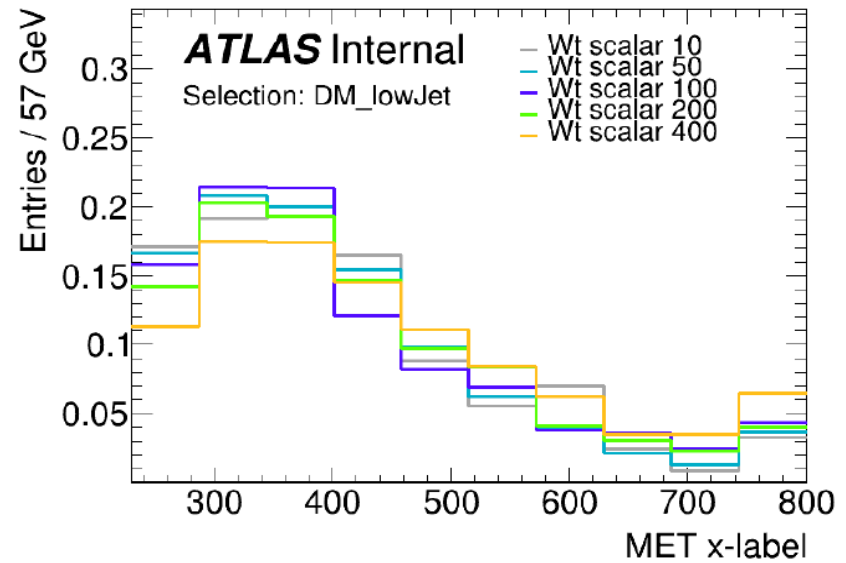
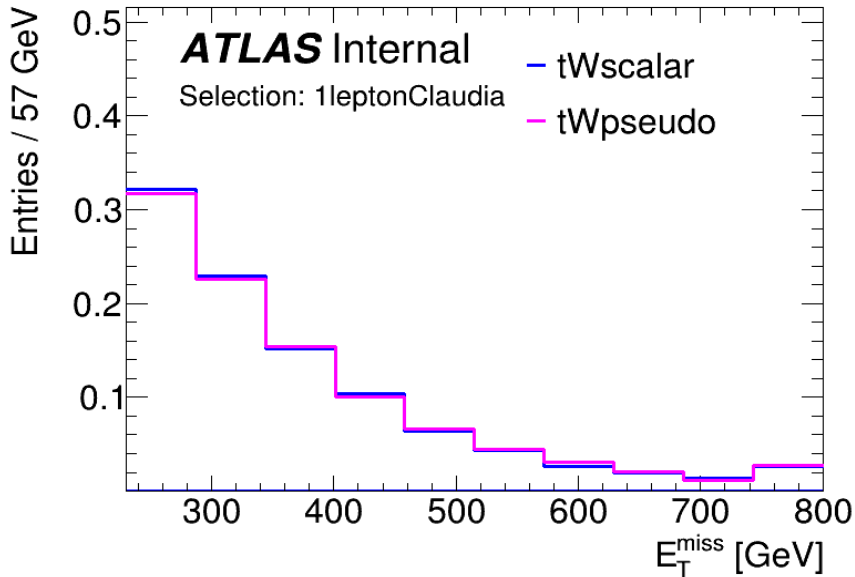
Application of Claudia's cuts (2L)



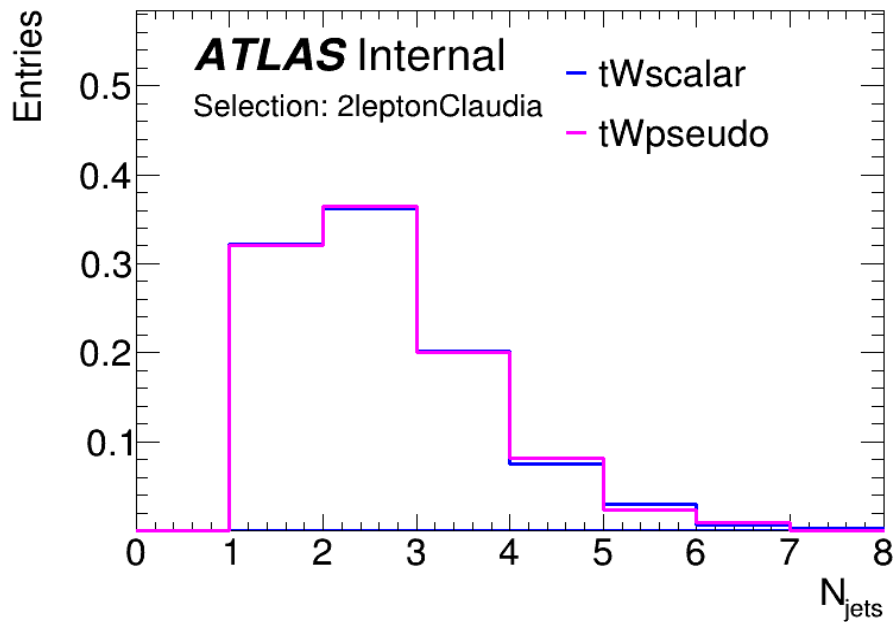
Comparison with Claudia's results (1L)



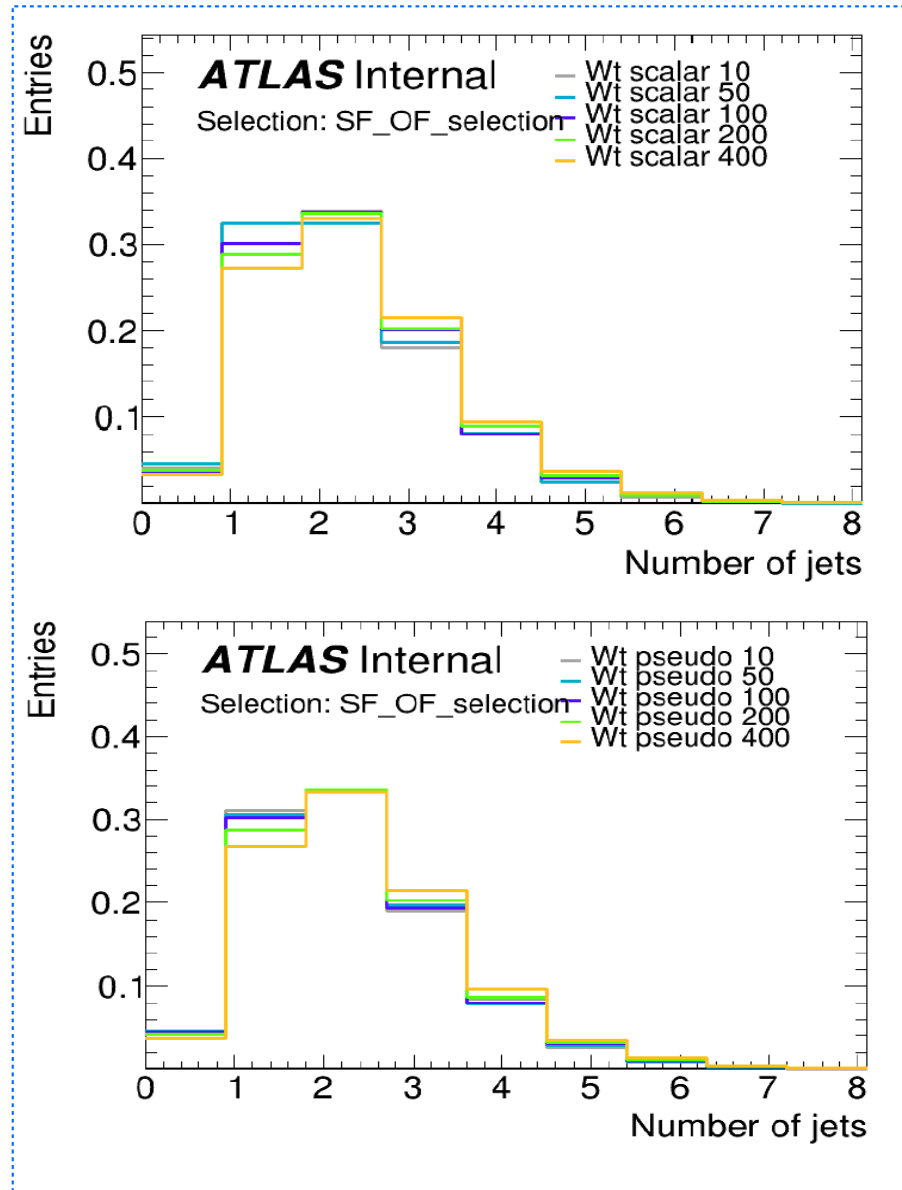
Comparison with Claudia's results (1L)



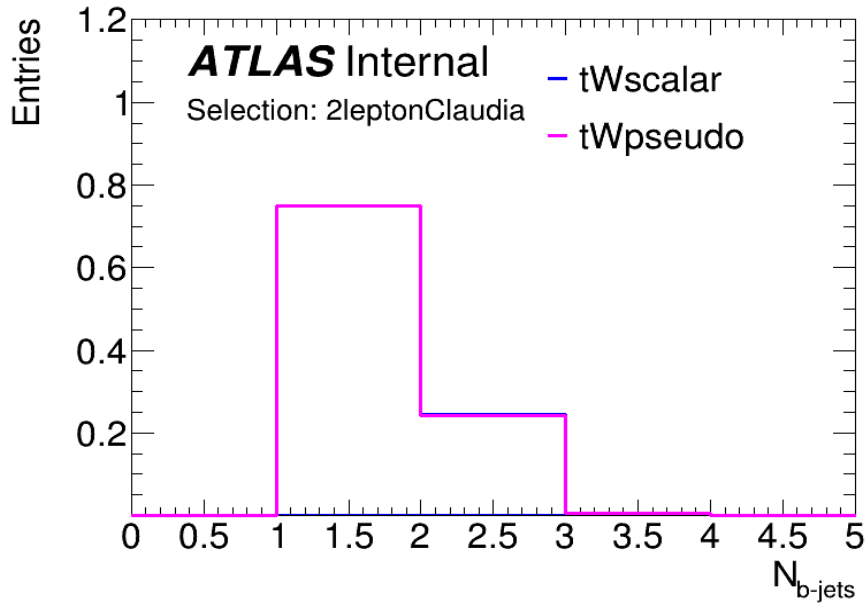
Comparison with Claudia's results (2L)



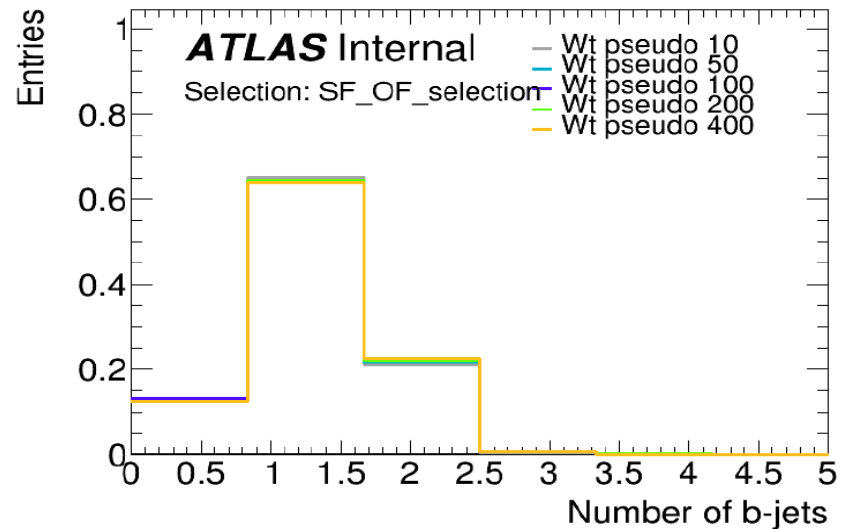
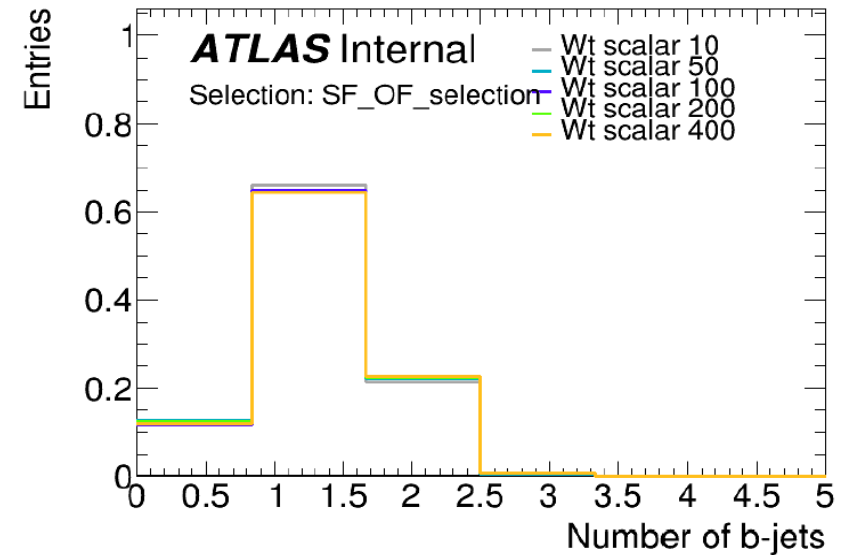
- In Claudia's results there are entries with 0 jets
- We can't see a difference between tWscalar and tWpseudo in Claudia's plots



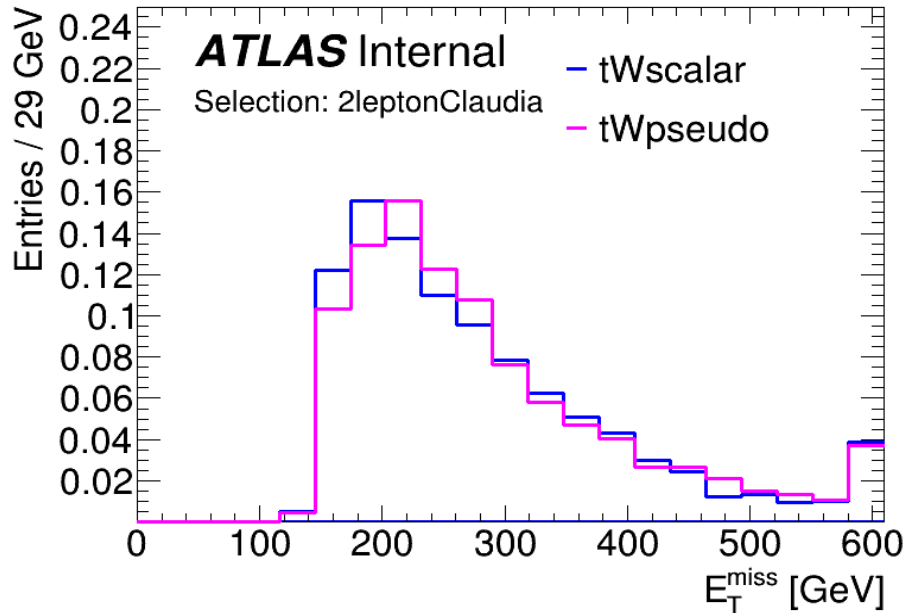
Comparison with Claudia's results (2L)



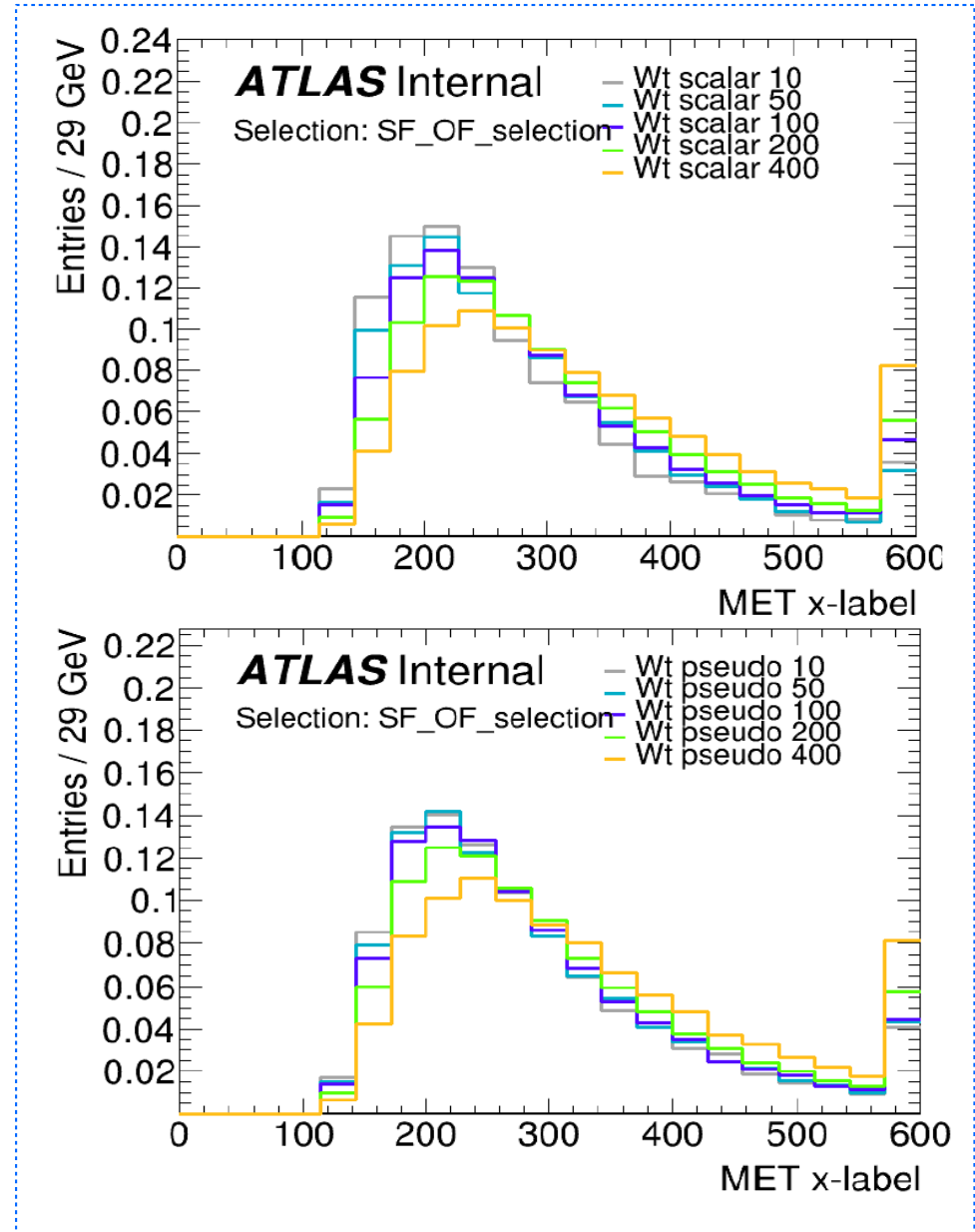
- I can't see a difference between tWscalar and tWpseudo in Claudia's plots
- In Claudia's results there are entries with 0 b-jets



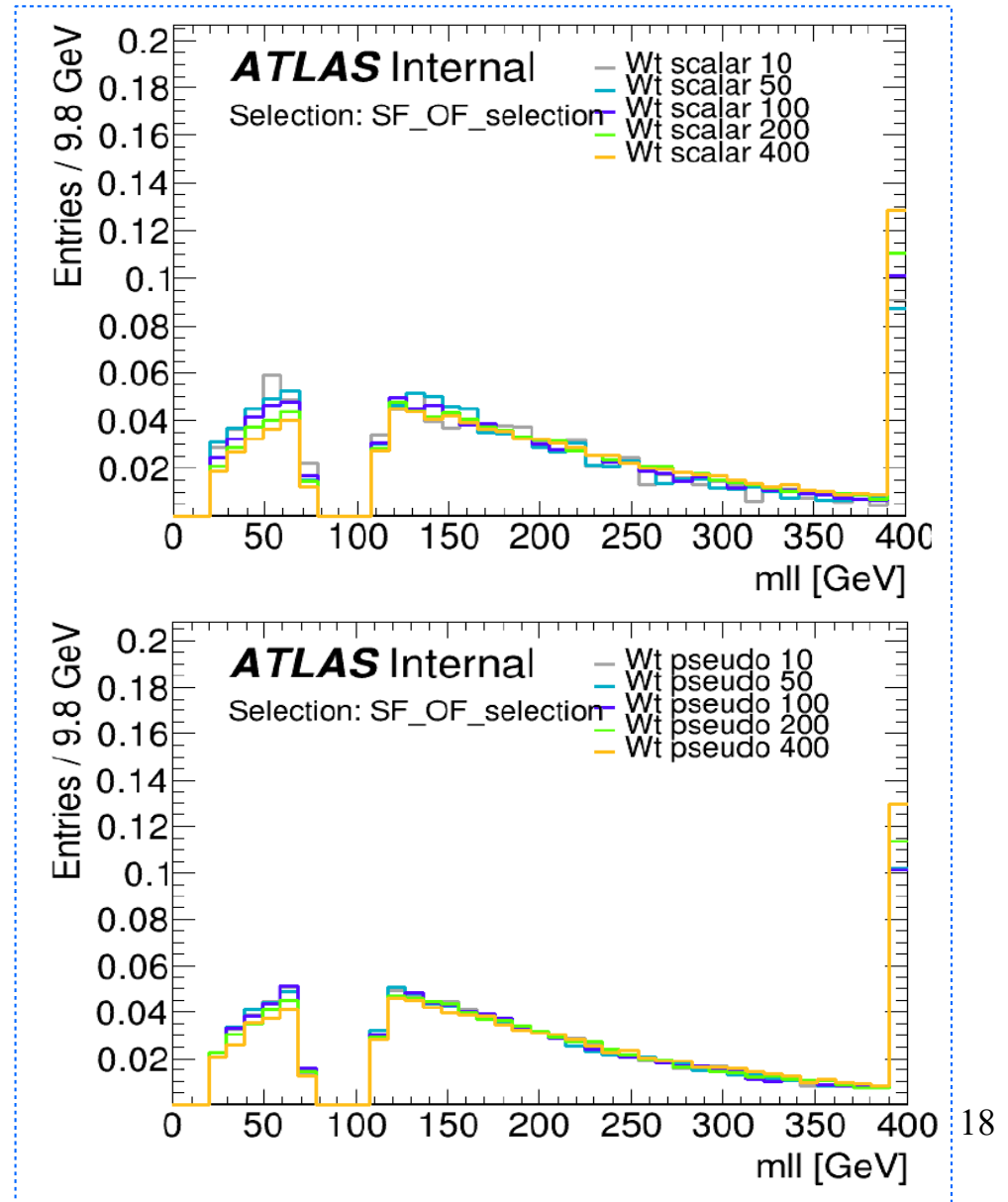
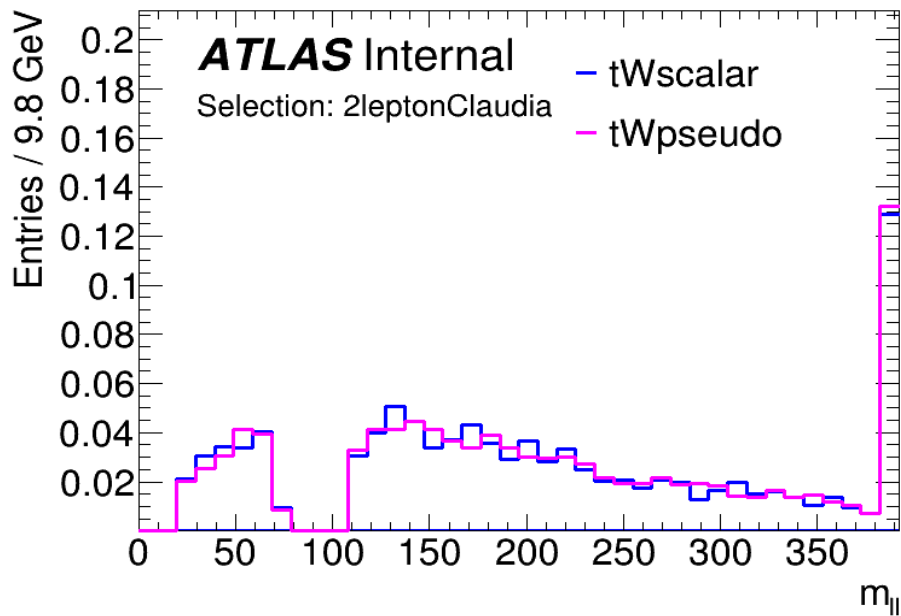
Comparison with Claudia's results (2L)



- Both met entries start at 100 GeV
- In our results the peak is at the 3rd bin for tWscalar and the 4th bin for tWpseudo
- In Claudia's results the peak is at the 4th bin in both cases

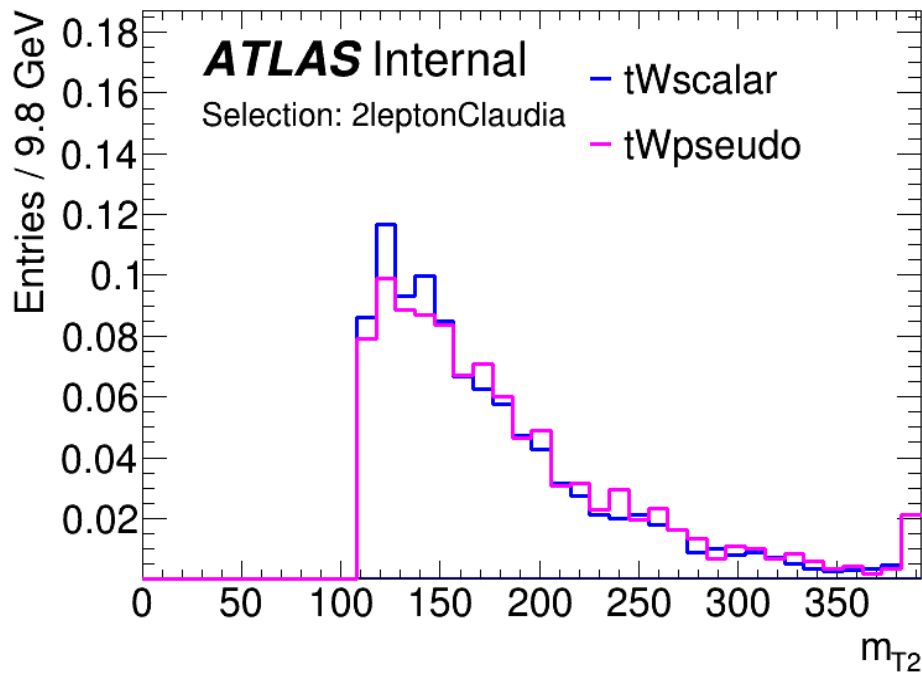


Comparison with Claudia's results (2L)

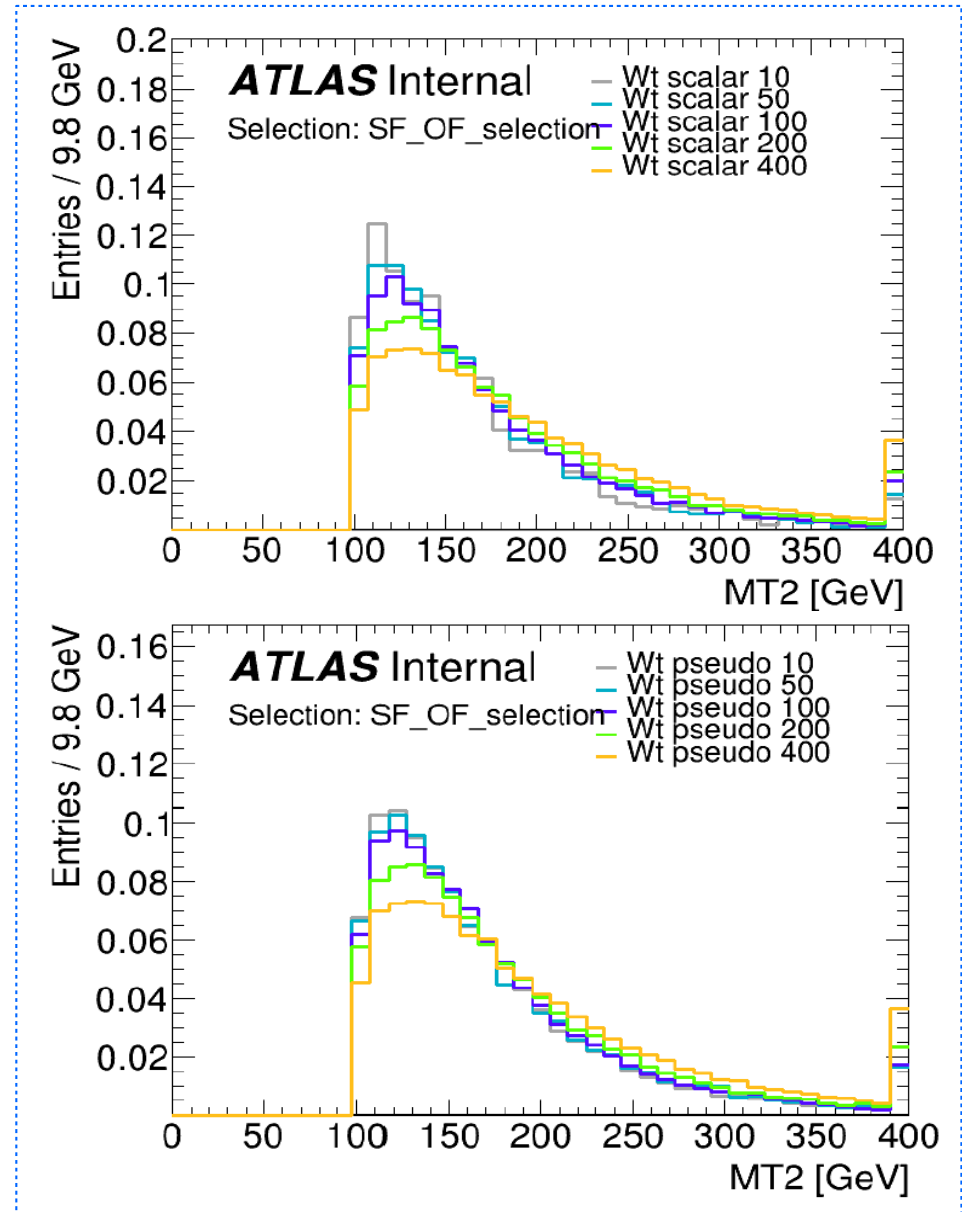


- All the plots look very similar
- Without the cut, the $m_{||}$ peak is at ~ 110 GeV in my results
- The difference between tWscalar and tWpseudo is not noticeable

Comparison with Claudia's results (2L)



- In our plot the peak is at the 2nd bin while in Claudia's results it is at the 3rd bin for both mediator types.
- The peak is also sharper in our results
- Our m_{T2} values are smaller for tWscalar, but the comparison is not clear in Claudia's results



Conclusions

- The main difference with Claudia's results are found in the 1 lepton case: MT and MET show a different behaviour
- In general there is very good agreement so we can consider that SimpleAnalysis and KiSelector are correctly used
- We should apply more of Claudia's cuts to see what changes – paying special attention to MET and MT for 1L
- The HtSig and dPhiMetLep cuts would be a good option for this

Thank you