

# Validation plots for ttH BSM high mass samples (s+t channel)

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(CERN)

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# Introduction

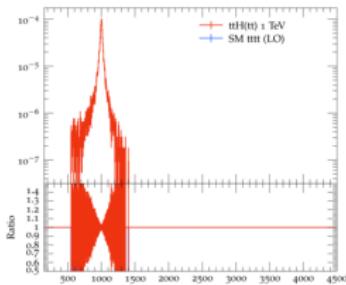
- ▶ Study of ttH signal samples on parton and particle/event level.
  - ▶ Samples studied range from 1 TeV to 3 TeV with 100 GeV spacing in mass.
  - ▶ Both s-channel and t-channel simulations were conducted.
  - ▶ Utilized the release AthGeneration,21.6.106 for the generation of samples.
- ▶ Link to the code used for producing results:  
[https://github.com/philippgadow/  
atlas-run3-multitops-bsm-joboptions/tree/r21](https://github.com/philippgadow/atlas-run3-multitops-bsm-joboptions/tree/r21)

# Signal Mass and Width

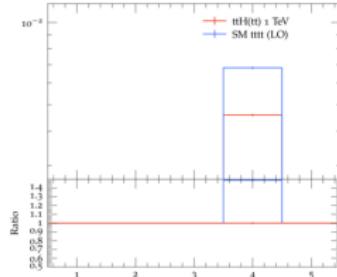
Signal Mass (GeV)	Signal Width (GeV)
1000	30
1100	40
1200	45
1300	50
1400	60
1500	75
1600	80
1700	85
1800	90
1900	95
2000	100

Signal Mass (GeV)	Signal Width (GeV)
2100	105
2200	110
2300	115
2400	120
2500	125
2600	130
2700	135
2800	140
2900	145
3000	150

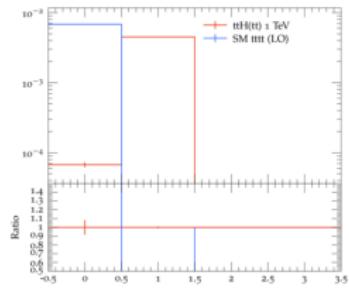
# Sample: ttH 1000 GeV - parton level plots



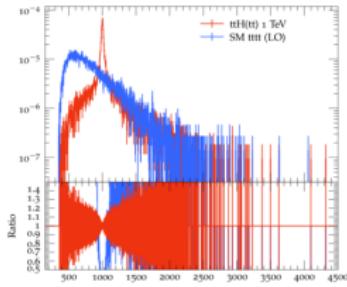
Inclusive  $mH$



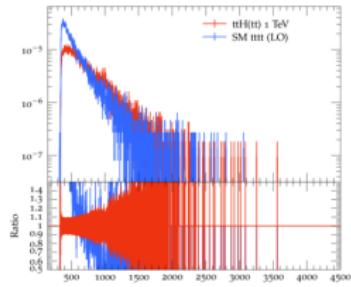
Inclusive  $nTop$



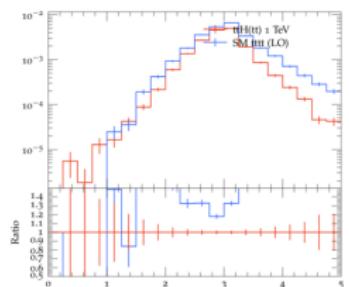
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

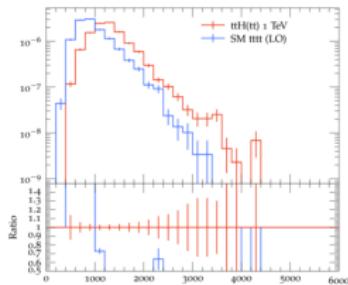


Inclusive  $InvM$   
 $ttbar34$

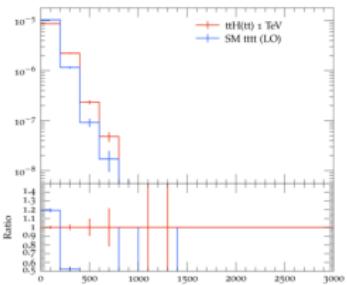


Inclusive  $dR$   $ttbar12$

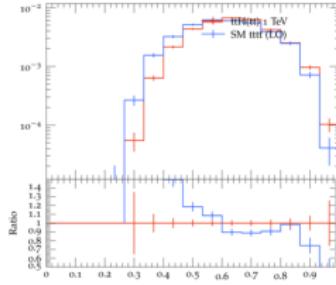
# Sample: ttH 1000 GeV - event level plots



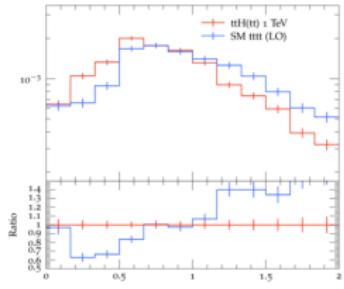
*BaselineSR HT 3*



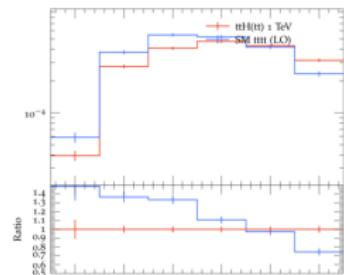
*BaselineSR MET*



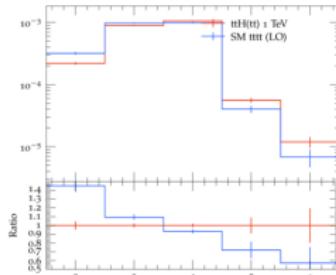
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

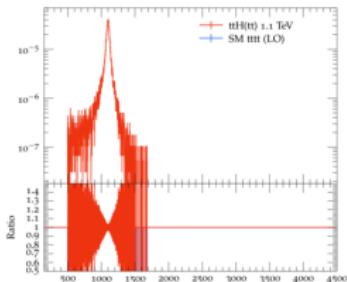


*BaselineSR nJets*

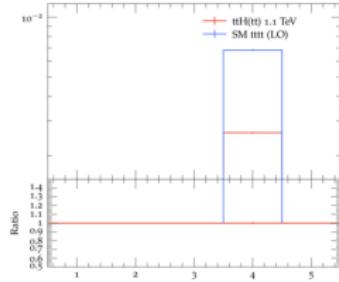


*BaselineSR nBjets*

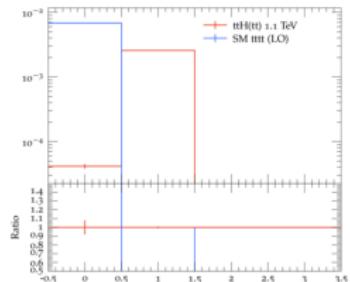
# Sample: ttH 1100 GeV - parton level plots



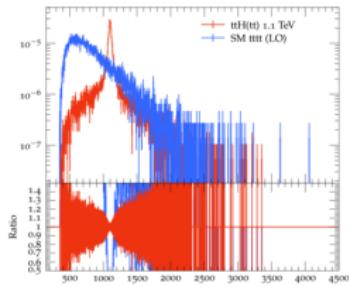
Inclusive  $m_H$



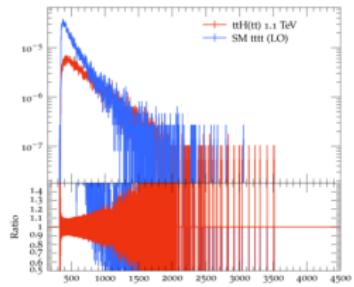
Inclusive  $n_{Top}$



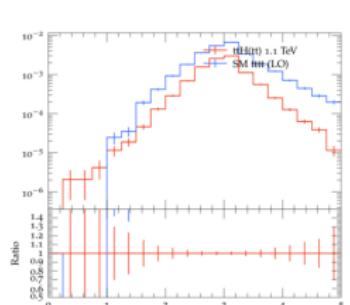
Inclusive  $n_H$



Inclusive  $InvM_{tt\bar{b}ar12}$

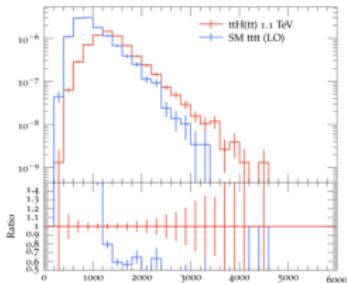


Inclusive  $InvM_{tt\bar{b}ar34}$

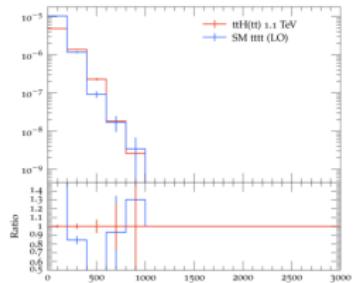


Inclusive  $dR_{tt\bar{b}ar12}$

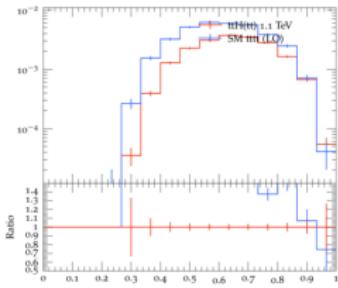
# Sample: ttH 1100 GeV - event level plots



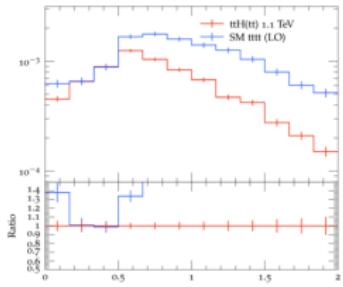
*BaselineSR HT 3*



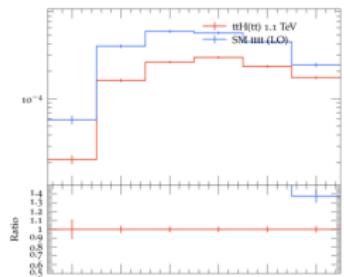
*BaselineSR MET*



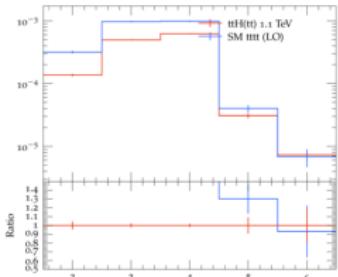
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

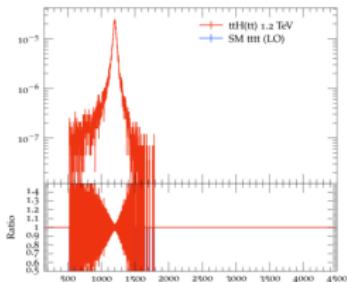


*BaselineSR nJets*

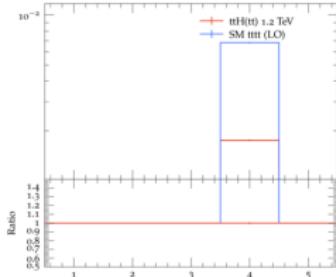


*BaselineSR nBjets*

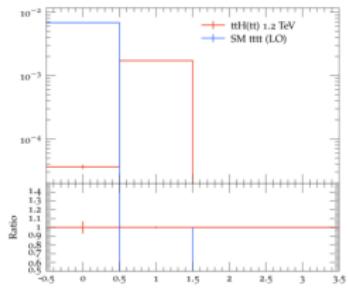
# Sample: ttH 1200 GeV - parton level plots



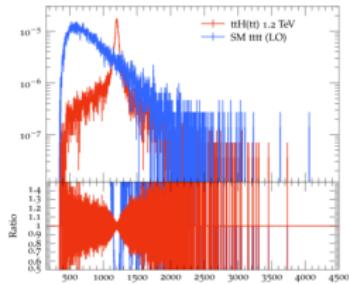
Inclusive  $mH$



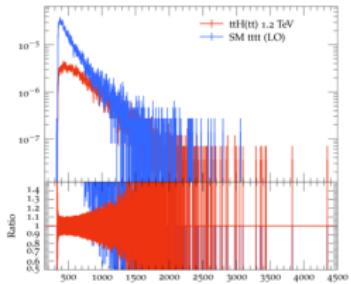
Inclusive  $nTop$



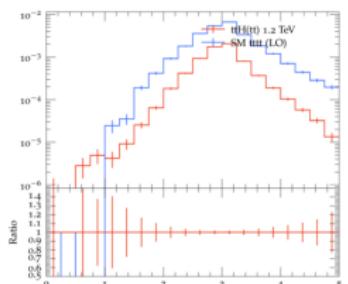
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

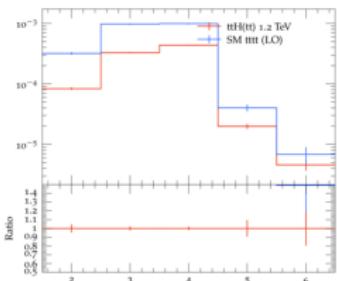
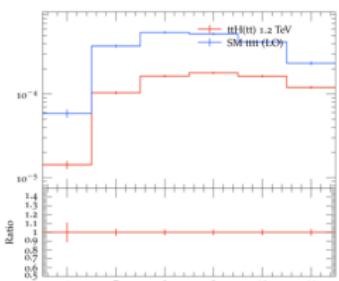
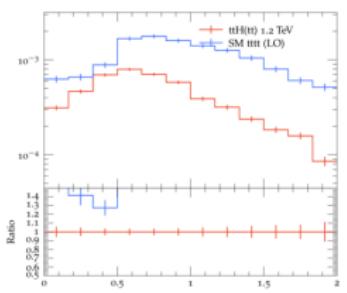
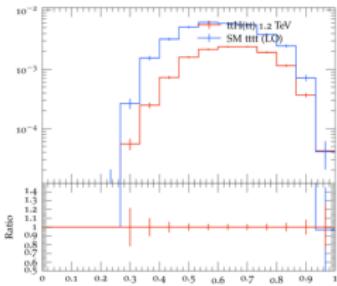
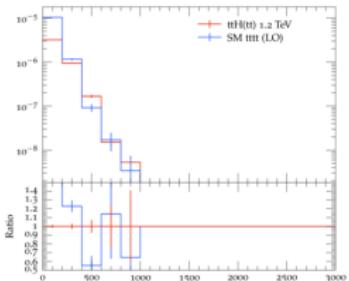
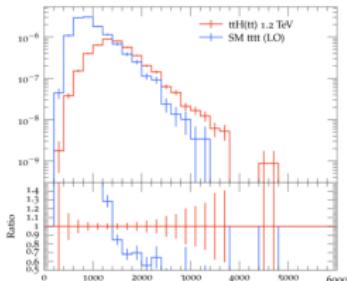


Inclusive  $InvM$   
 $ttbar34$

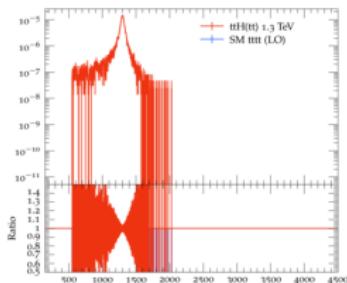


Inclusive  $dR$   $ttbar12$

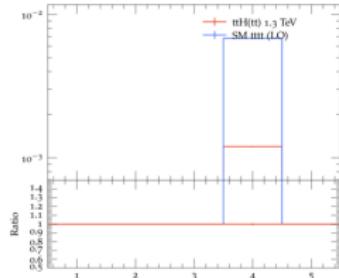
# Sample: ttH 1200 GeV - event level plots



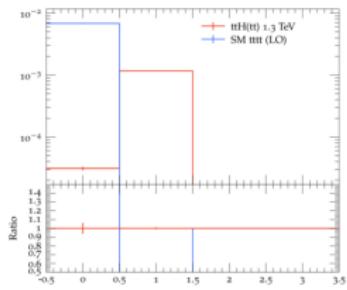
# Sample: ttH 1300 GeV - parton level plots



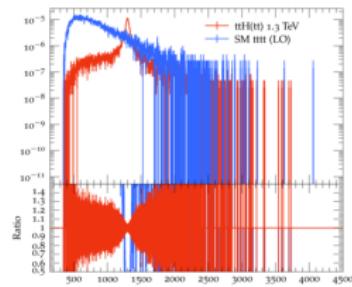
Inclusive  $mH$



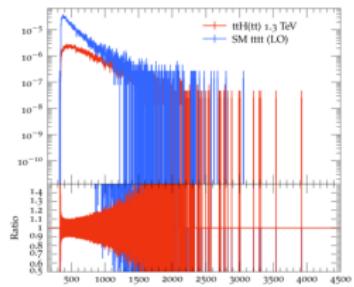
Inclusive  $nTop$



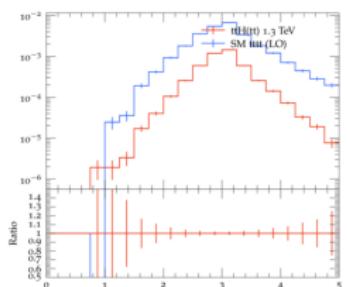
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

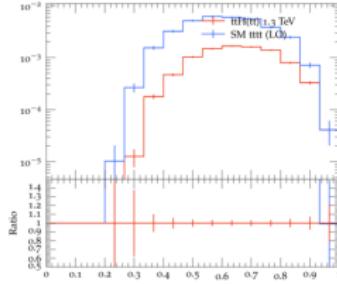
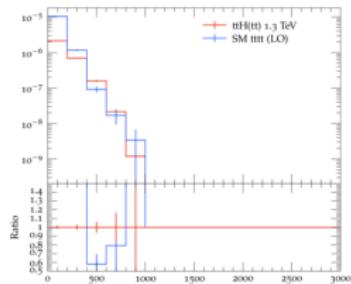
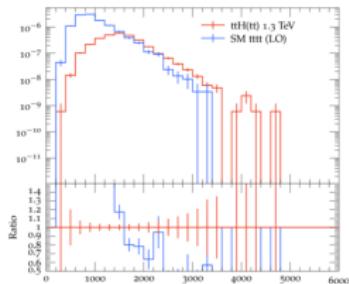


Inclusive  $InvM$   
 $ttbar34$



Inclusive  $dR$   $ttbar12$

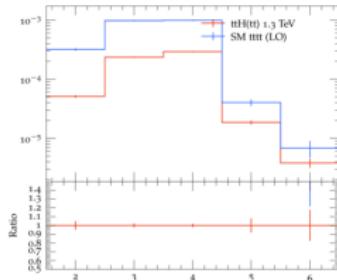
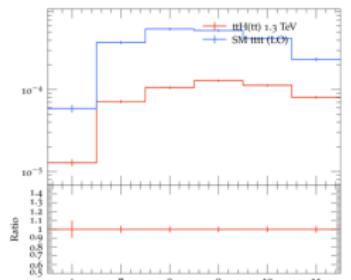
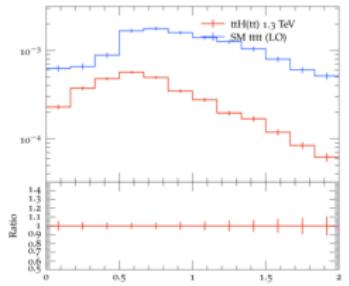
# Sample: ttH 1300 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

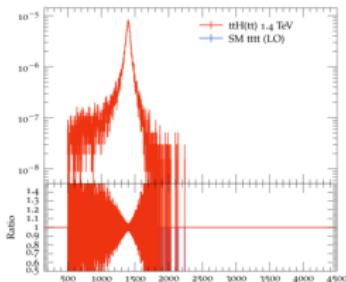


BaselineSR deltaR bl min

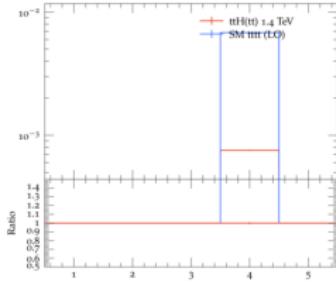
BaselineSR nJets

BaselineSR nBjets

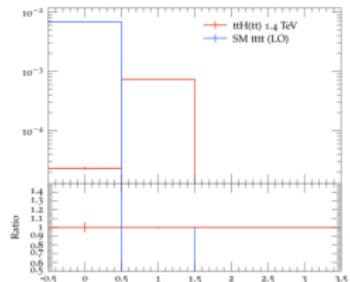
# Sample: ttH 1400 GeV - parton level plots



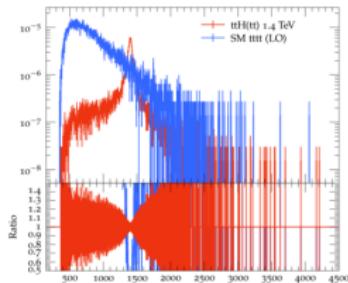
Inclusive  $mH$



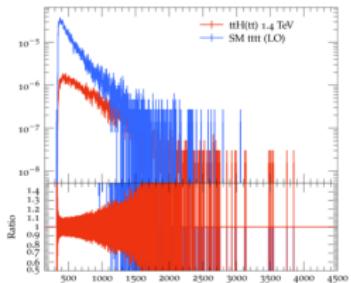
Inclusive  $nTop$



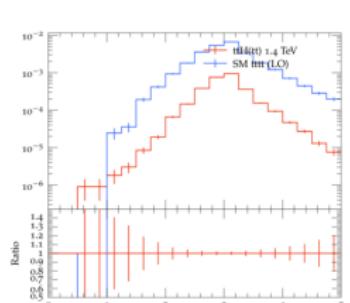
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

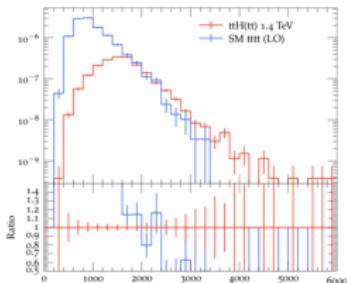


Inclusive  $InvM$   
 $ttbar34$

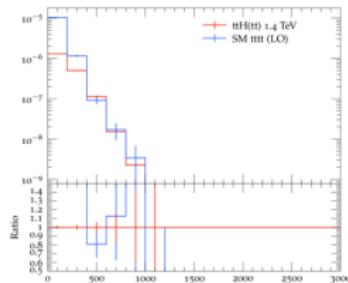


Inclusive  $dR$   $ttbar12$

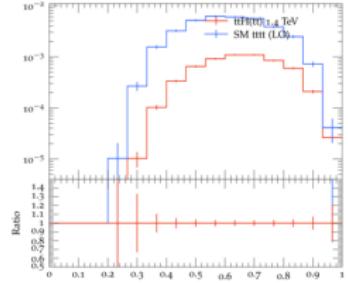
# Sample: ttH 1400 GeV - event level plots



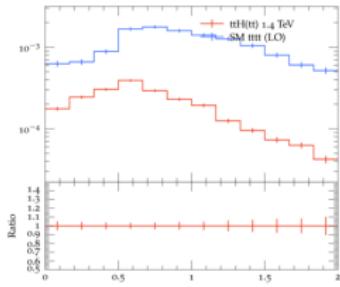
*BaselineSR HT 3*



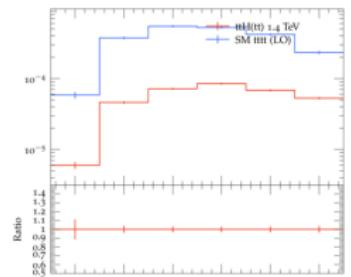
*BaselineSR MET*



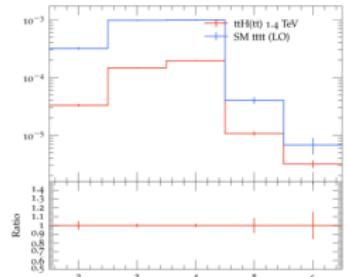
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

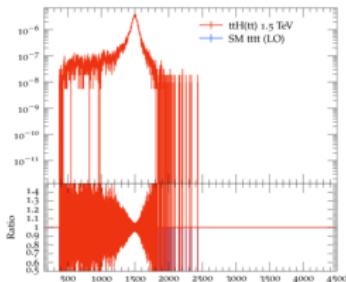


*BaselineSR nJets*

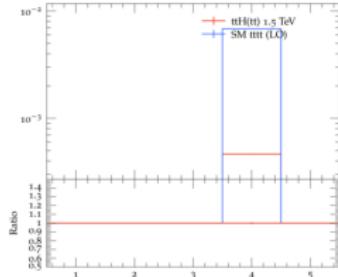


*BaselineSR nBjets*

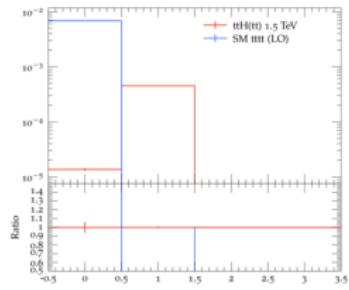
# Sample: ttH 1500 GeV - parton level plots



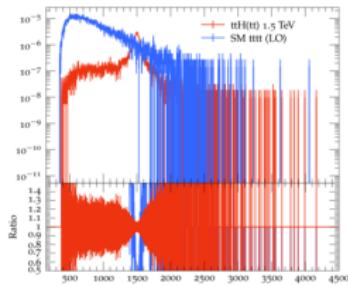
Inclusive  $m_H$



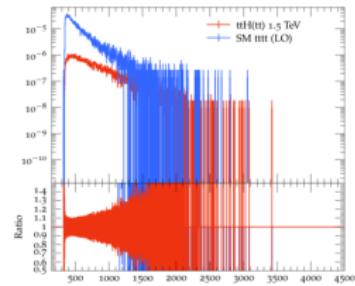
Inclusive  $n_{Top}$



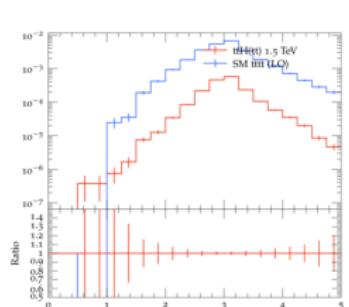
Inclusive  $n_H$



Inclusive  $\text{InvM}_{tt\bar{b}12}$

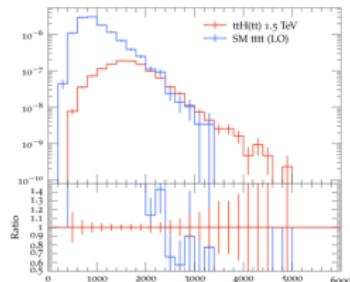


Inclusive  $\text{InvM}_{tt\bar{b}34}$

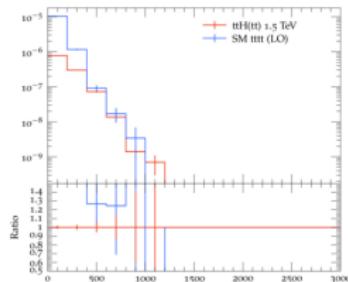


Inclusive  $dR_{tt\bar{b}12}$

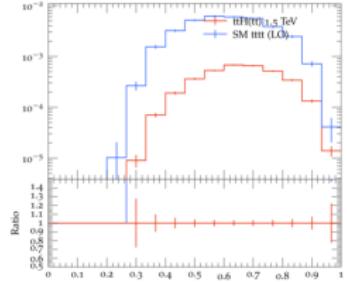
# Sample: ttH 1500 GeV - event level plots



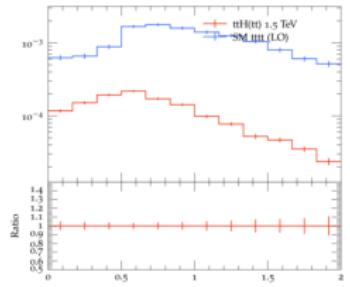
*BaselineSR HT 3*



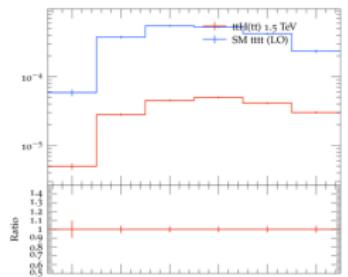
*BaselineSR MET*



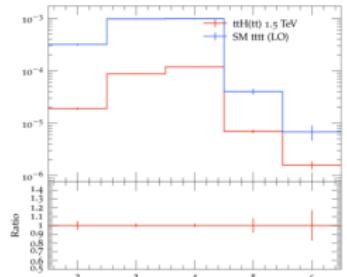
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

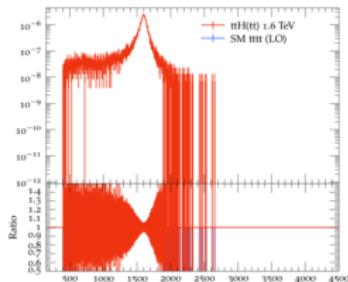


*BaselineSR nJets*

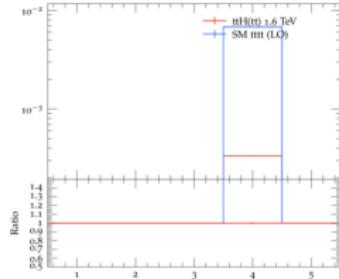


*BaselineSR nBjets*

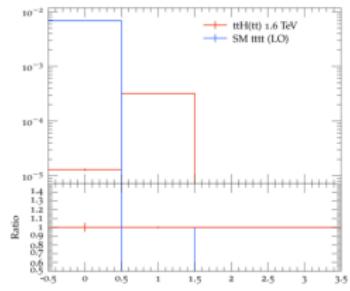
# Sample: ttH 1600 GeV - parton level plots



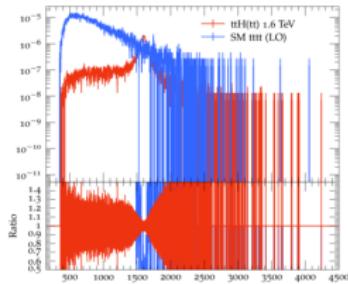
Inclusive  $mH$



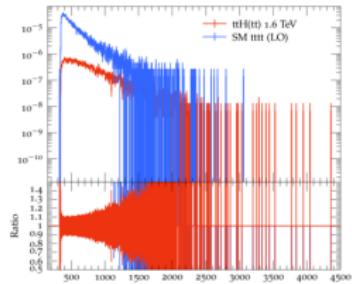
Inclusive  $nTop$



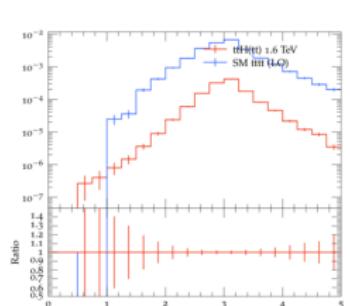
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

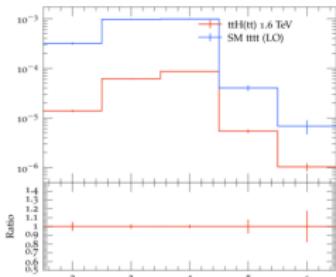
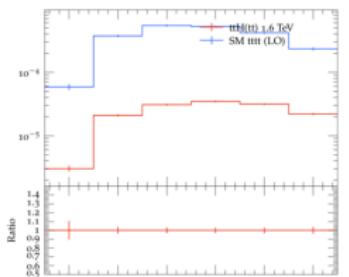
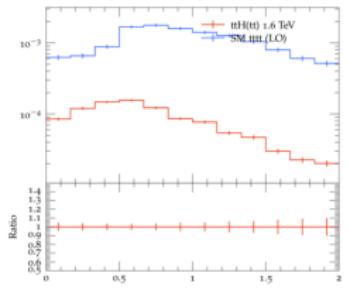
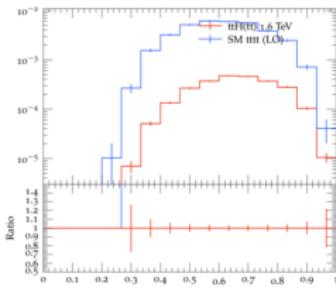
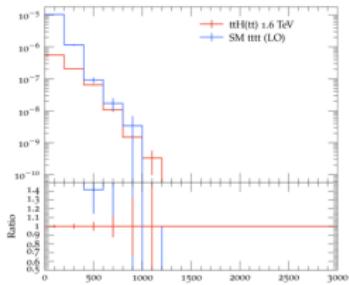
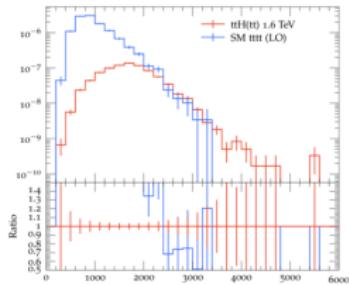


Inclusive  $InvM$   
 $ttbar34$

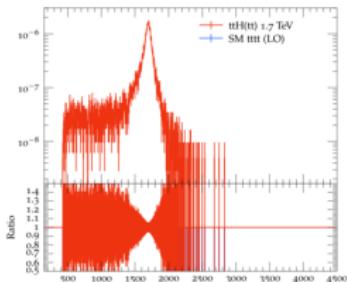


Inclusive  $dR$   $ttbar12$

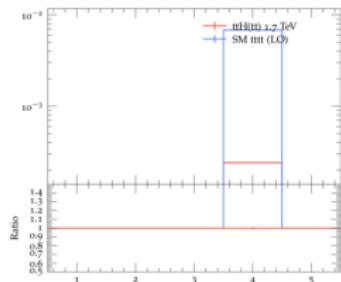
# Sample: ttH 1600 GeV - event level plots



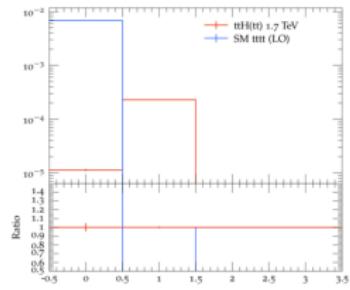
# Sample: ttH 1700 GeV - parton level plots



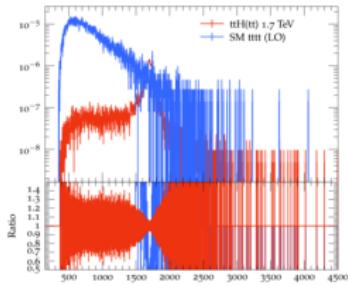
Inclusive  $mH$



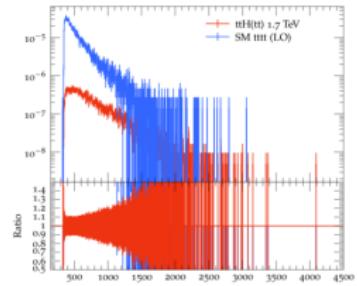
Inclusive  $nTop$



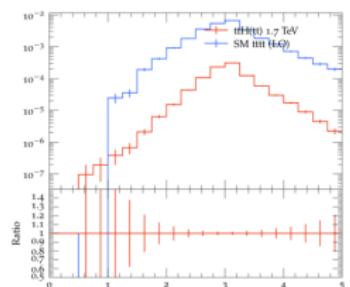
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

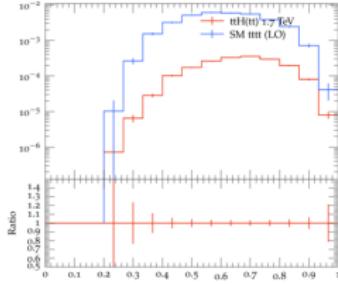
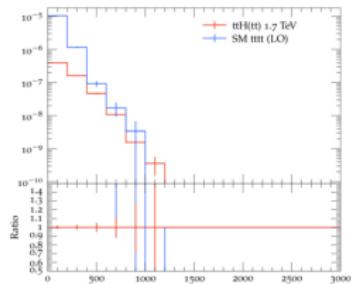
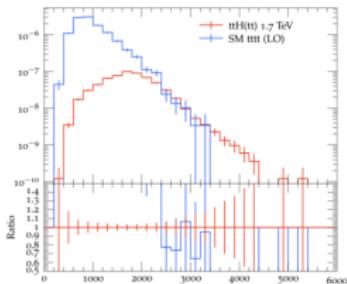


Inclusive  $InvM_{ttbar34}$



Inclusive  $dR_{ttbar12}$

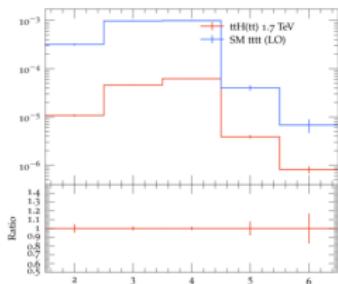
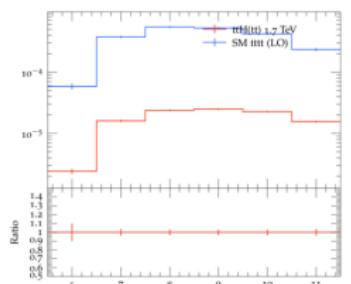
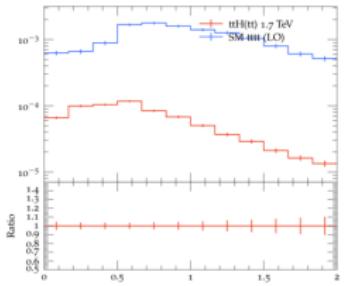
# Sample: ttH 1700 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

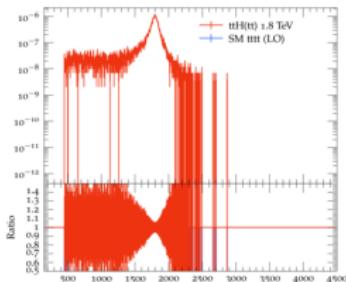


BaselineSR deltaR bl min

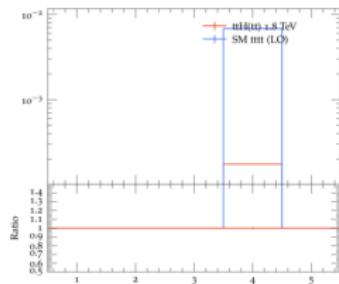
BaselineSR nJets

BaselineSR nBjets

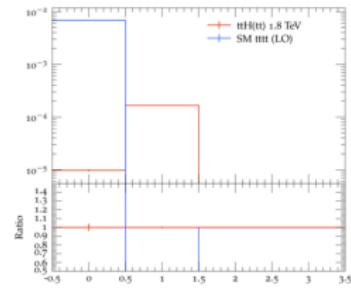
# Sample: ttH 1800 GeV - parton level plots



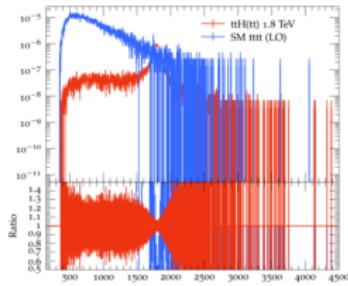
Inclusive  $mH$



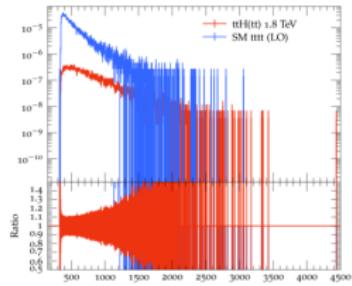
Inclusive  $nTop$



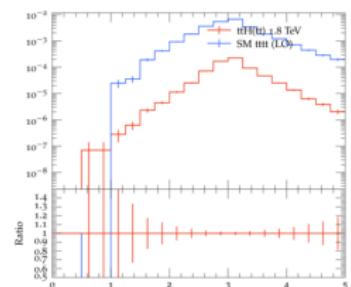
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

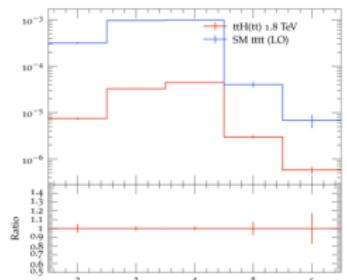
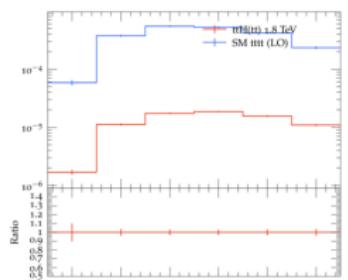
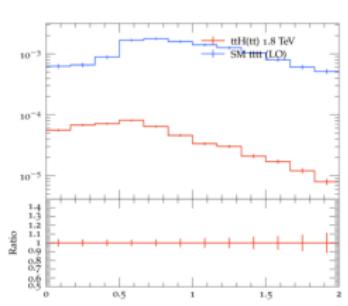
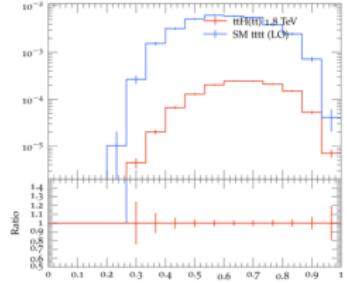
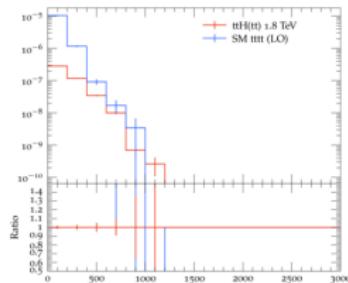
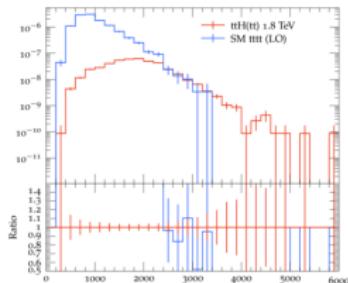


Inclusive  $InvM$   
 $ttbar34$

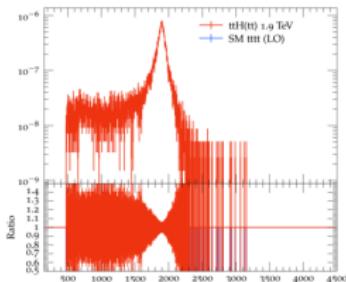


Inclusive  $dR$   $ttbar12$

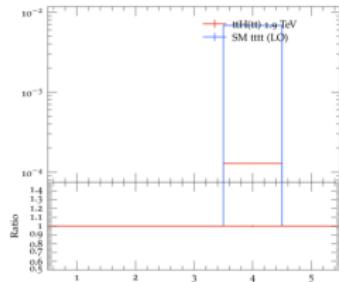
# Sample: ttH 1800 GeV - event level plots



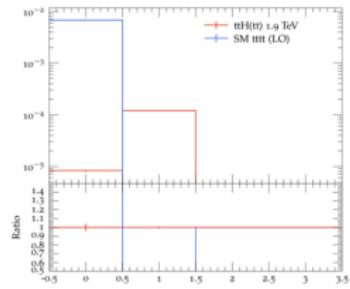
# Sample: ttH 1900 GeV - parton level plots



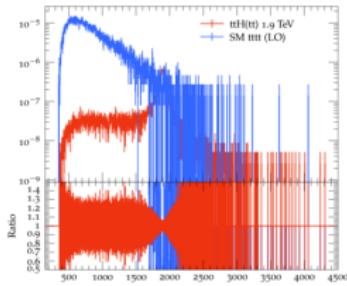
Inclusive  $mH$



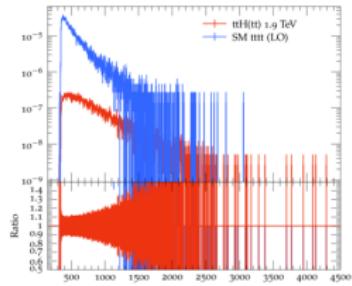
Inclusive  $nTop$



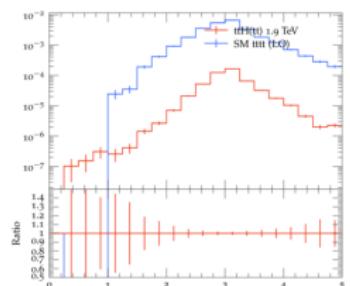
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

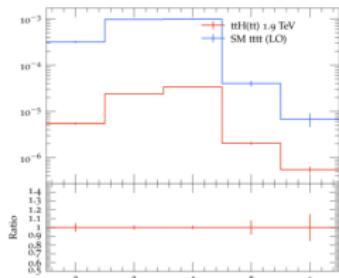
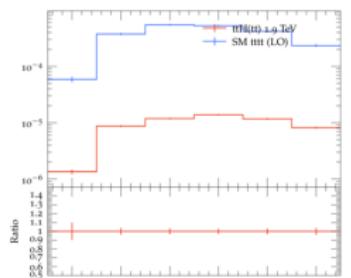
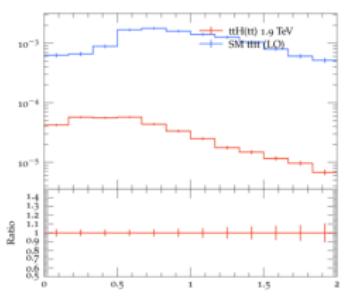
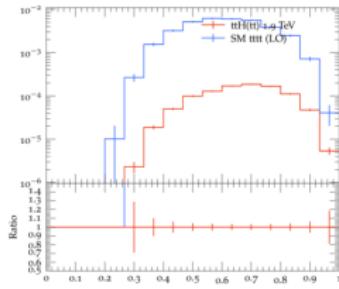
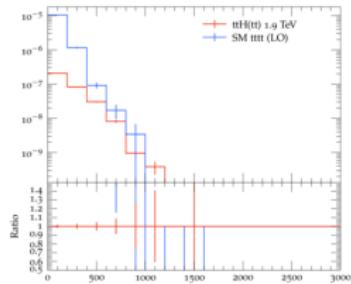
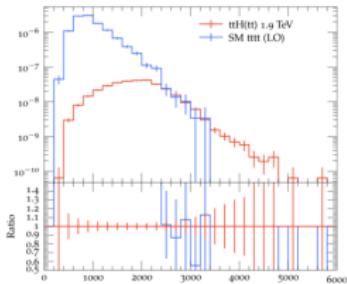


Inclusive  $InvM$   
 $ttbar34$

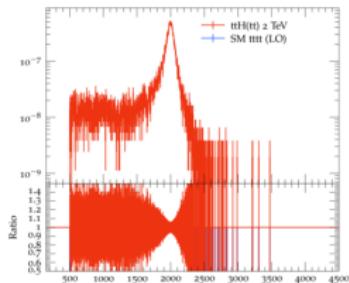


Inclusive  $dR$   $ttbar12$

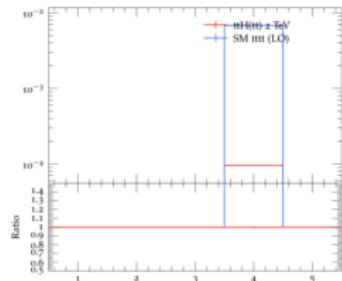
# Sample: ttH 1900 GeV - event level plots



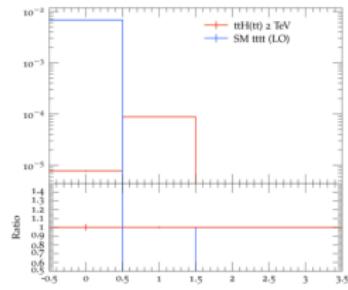
# Sample: ttH 2000 GeV - parton level plots



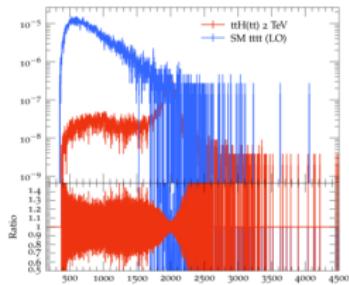
Inclusive  $mH$



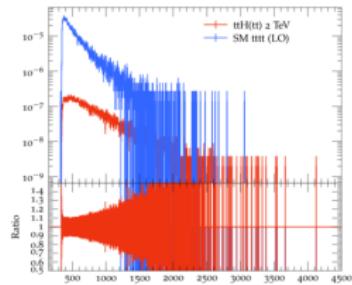
Inclusive  $nTop$



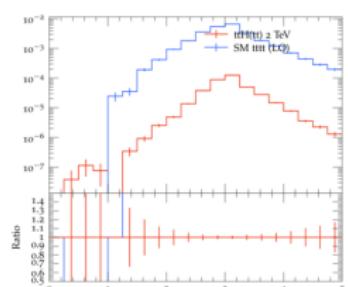
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

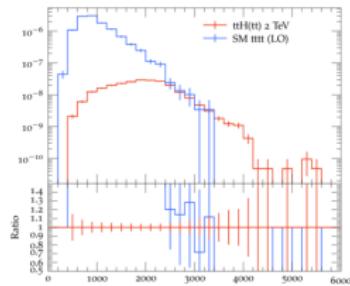


Inclusive  $InvM_{ttbar34}$

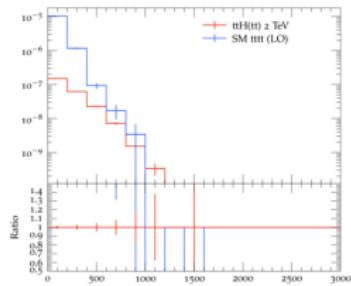


Inclusive  $dR_{ttbar12}$

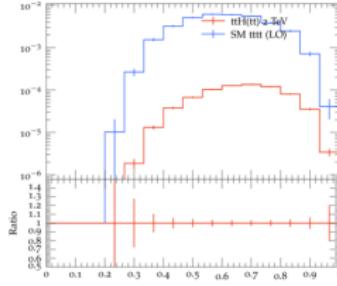
# Sample: ttH 2000 GeV - event level plots



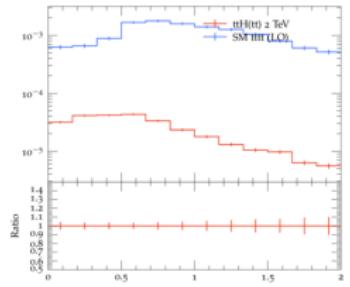
*BaselineSR HT 3*



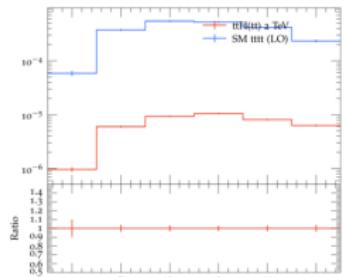
*BaselineSR MET*



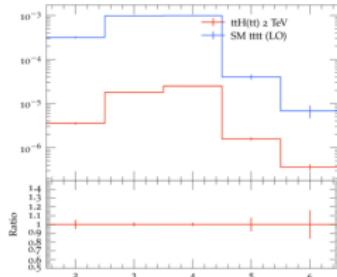
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

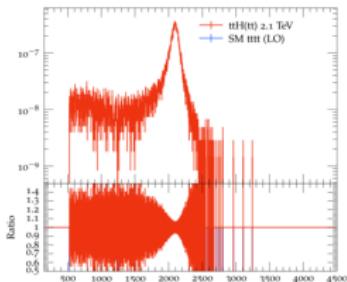


*BaselineSR nJets*

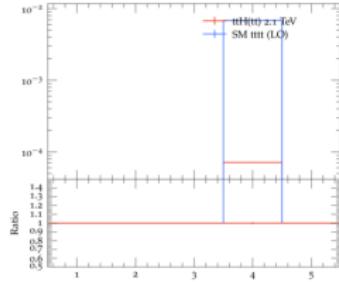


*BaselineSR nBjets*

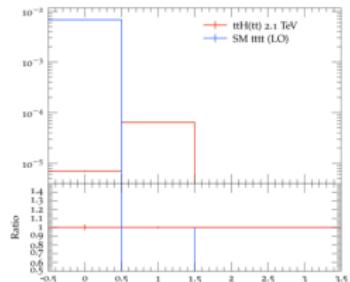
# Sample: ttH 2100 GeV - parton level plots



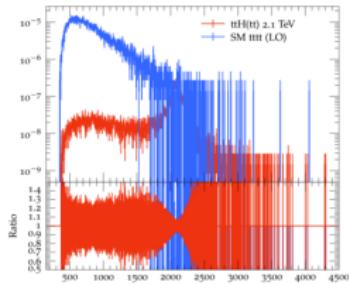
Inclusive  $mH$



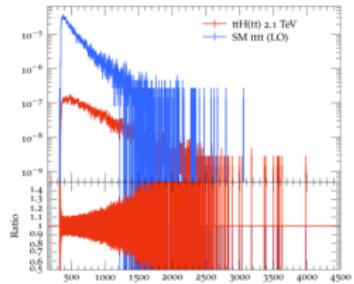
Inclusive  $nTop$



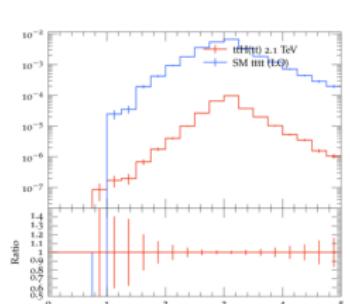
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

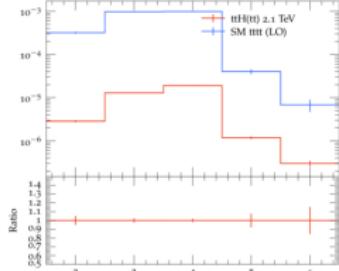
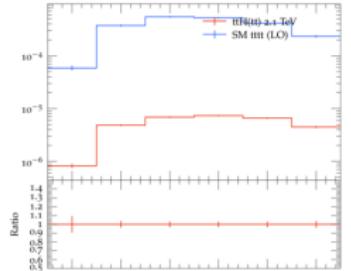
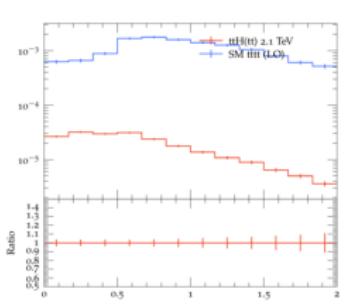
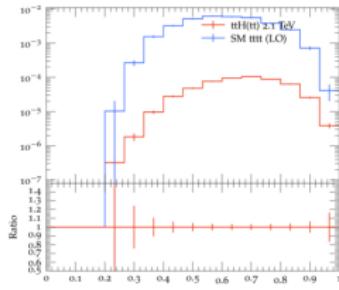
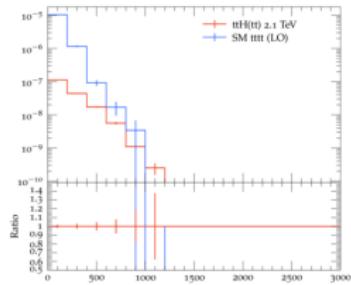
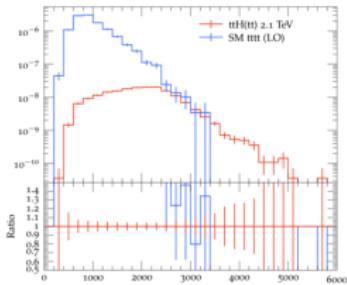


Inclusive  $InvM_{ttbar34}$

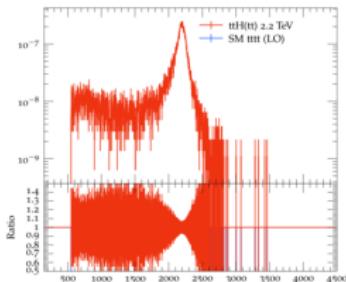


Inclusive  $dR_{ttbar12}$

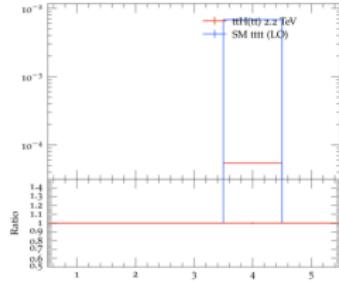
# Sample: ttH 2100 GeV - event level plots



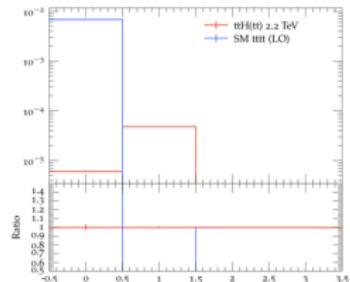
# Sample: ttH 2200 GeV - parton level plots



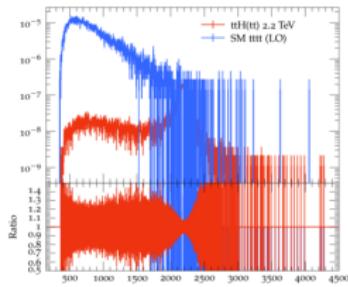
Inclusive  $mH$



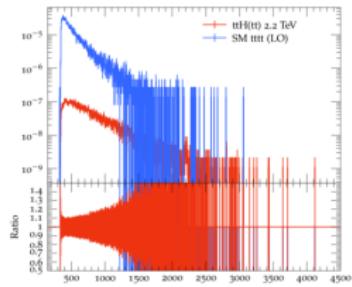
Inclusive  $nTop$



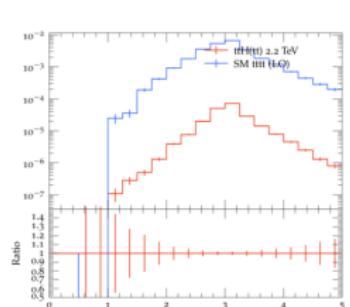
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

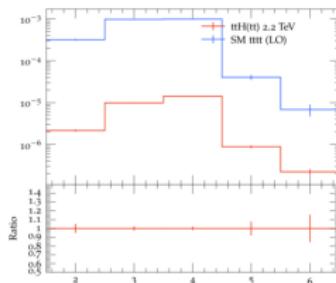
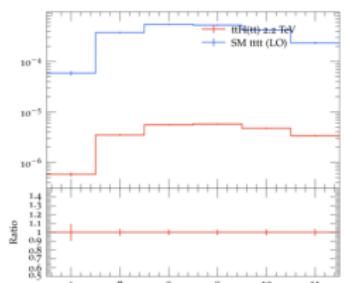
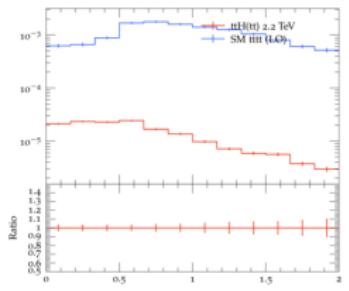
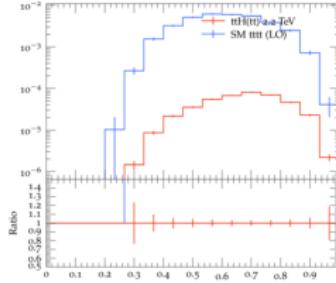
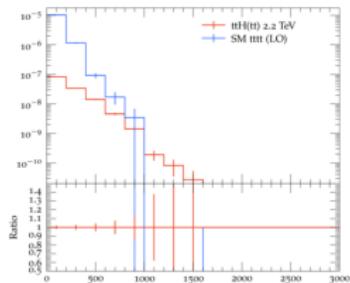
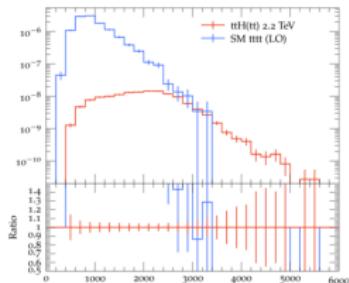


Inclusive  $InvM$   
 $ttbar34$

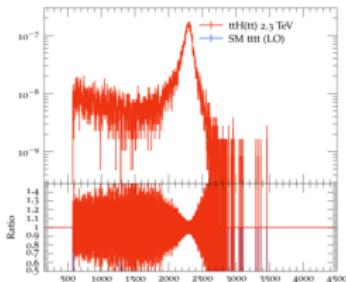


Inclusive  $dR$   $ttbar12$

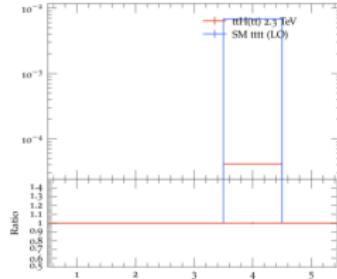
# Sample: ttH 2200 GeV - event level plots



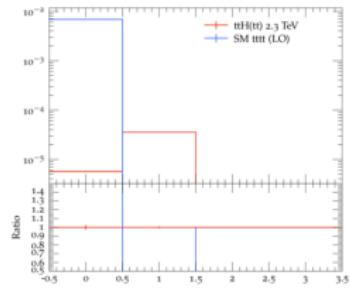
# Sample: ttH 2300 GeV - parton level plots



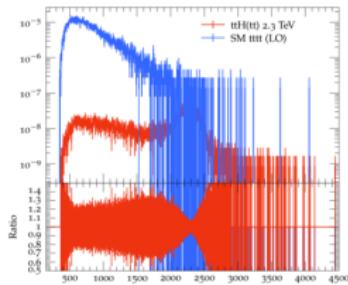
Inclusive  $mH$



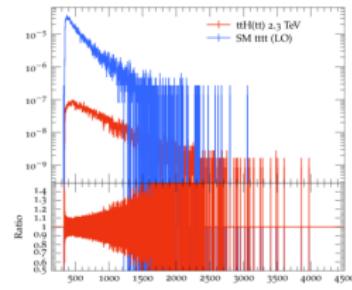
Inclusive  $nTop$



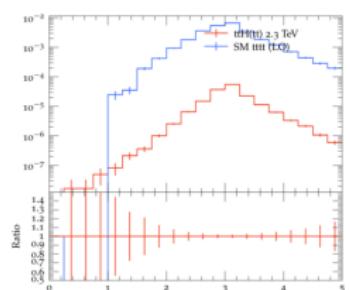
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

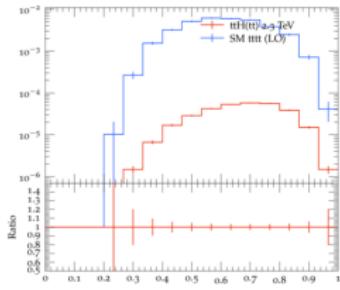
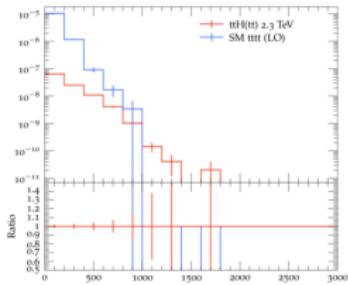
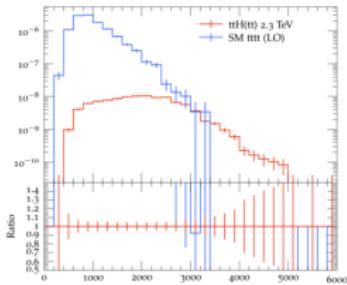


Inclusive  $InvM_{ttbar34}$



Inclusive  $dR_{ttbar12}$

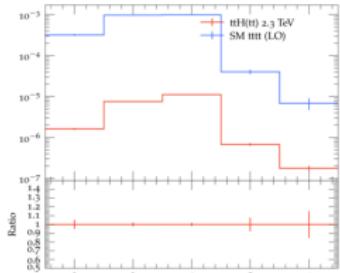
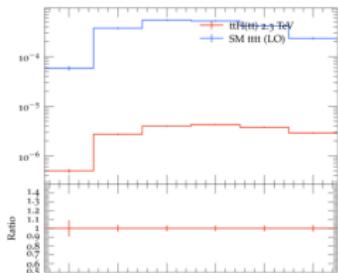
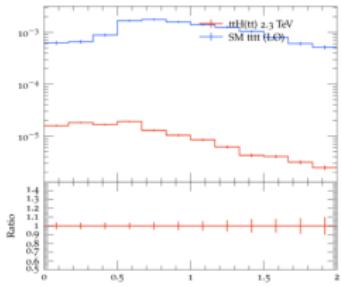
# Sample: ttH 2300 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

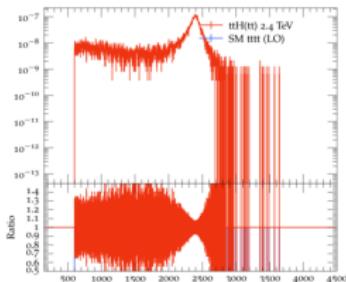


BaselineSR deltaR bl min

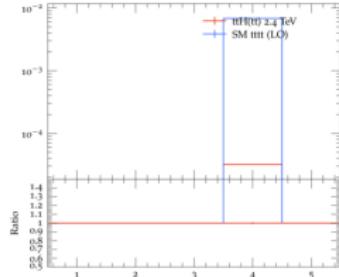
BaselineSR nJets

BaselineSR nBjets

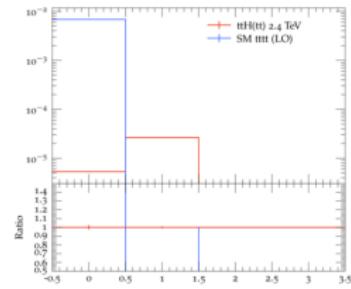
# Sample: ttH 2400 GeV - parton level plots



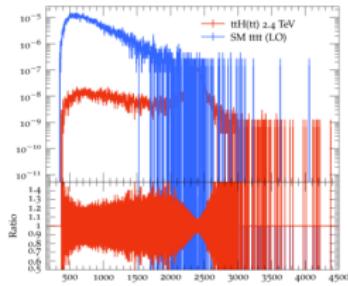
Inclusive  $mH$



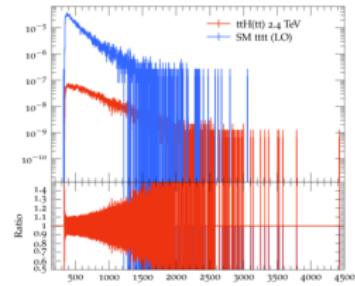
Inclusive  $nTop$



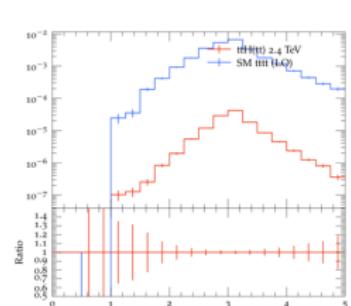
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

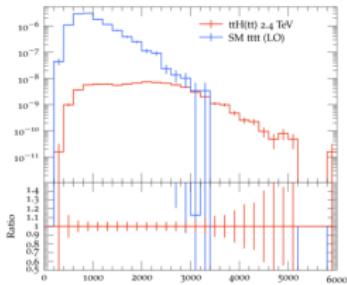


Inclusive  $InvM_{ttbar34}$

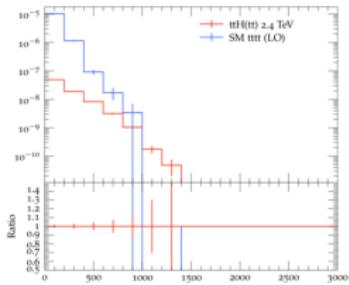


Inclusive  $dR_{ttbar12}$

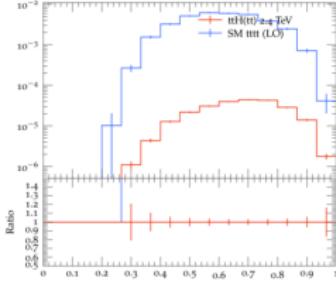
# Sample: ttH 2400 GeV - event level plots



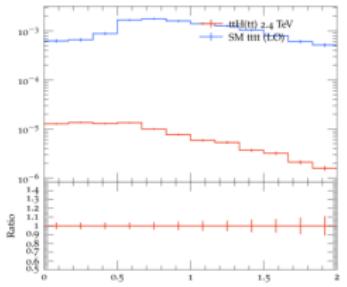
*BaselineSR HT 3*



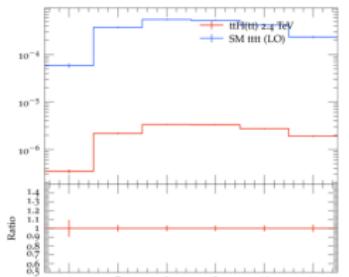
*BaselineSR MET*



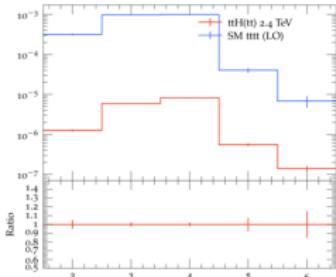
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

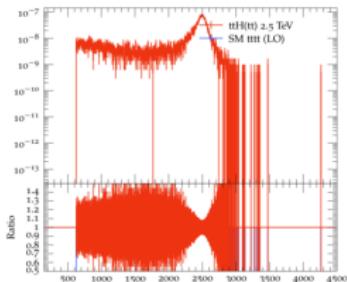


*BaselineSR nJets*

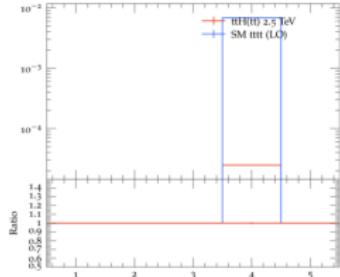


*BaselineSR nBjets*

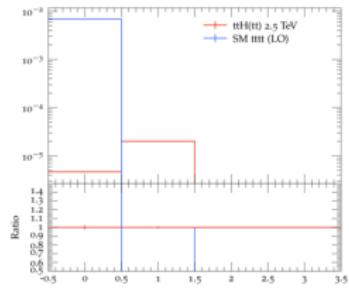
# Sample: ttH 2500 GeV - parton level plots



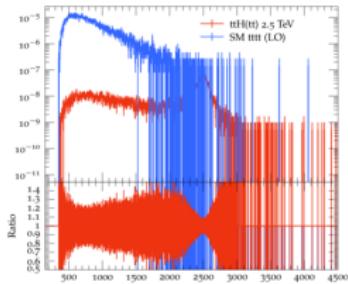
Inclusive  $mH$



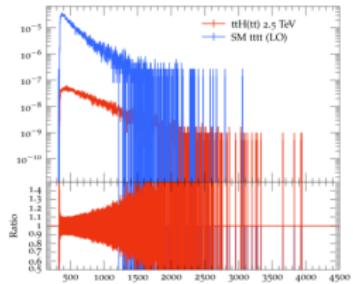
Inclusive  $nTop$



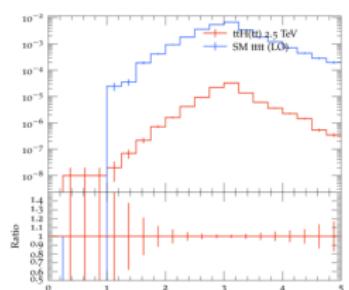
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

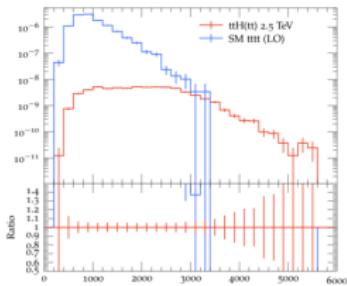


Inclusive  $InvM$   
 $ttbar34$

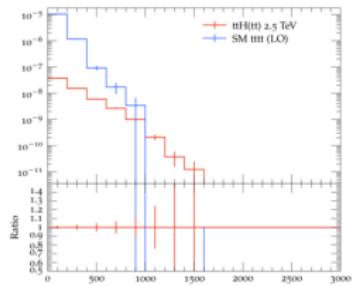


Inclusive  $dR$   $ttbar12$

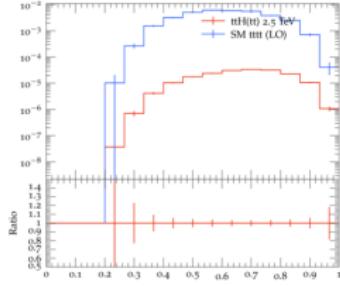
# Sample: ttH 2500 GeV - event level plots



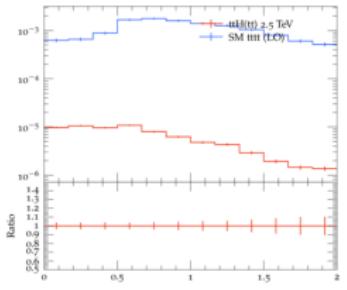
*BaselineSR HT 3*



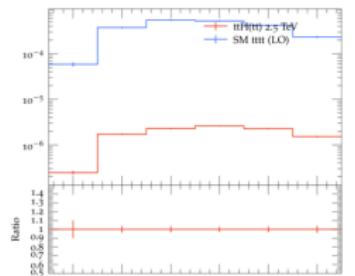
*BaselineSR MET*



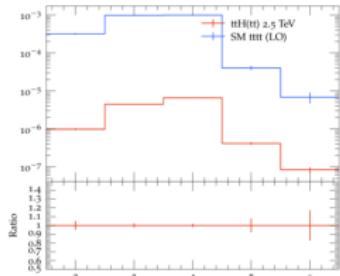
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

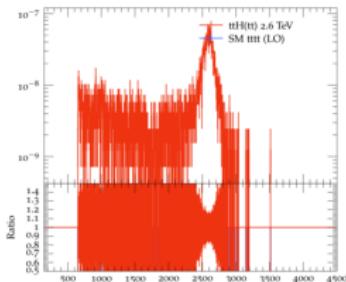


*BaselineSR nJets*

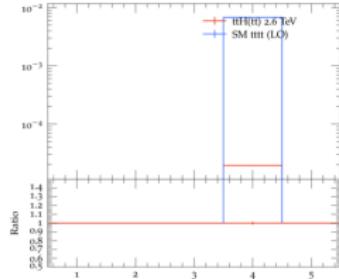


*BaselineSR nBjets*

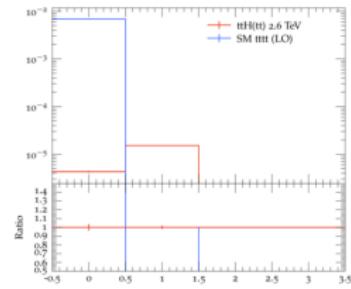
# Sample: ttH 2600 GeV - parton level plots



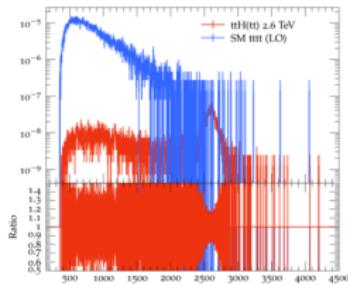
Inclusive  $mH$



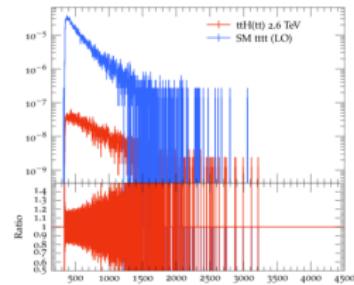
Inclusive  $nTop$



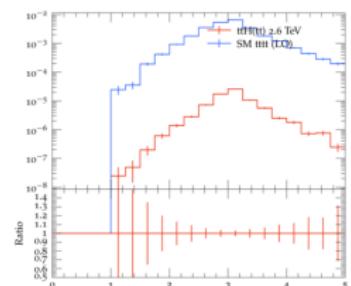
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

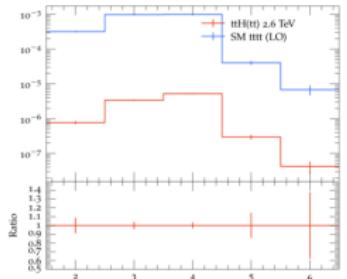
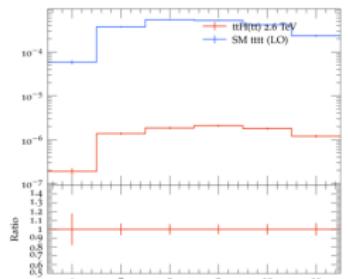
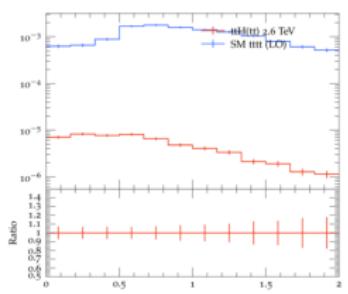
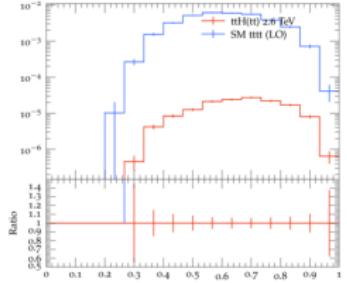
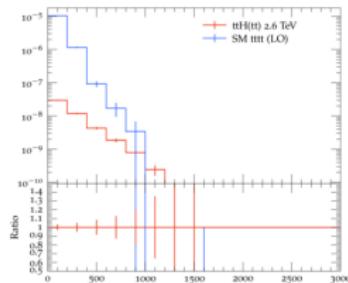
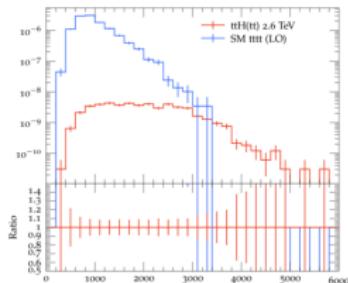


Inclusive  $InvM$   
 $ttbar34$

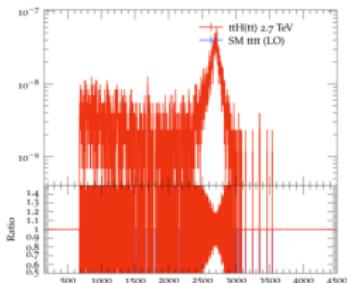


Inclusive  $dR$   $ttbar12$

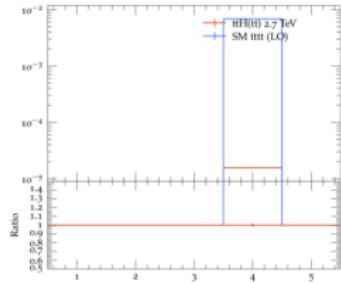
# Sample: ttH 2600 GeV - event level plots



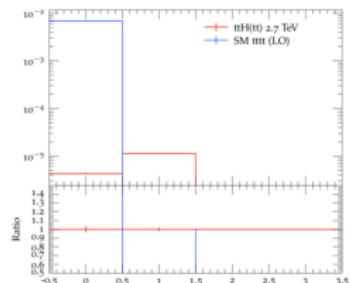
# Sample: ttH 2700 GeV - parton level plots



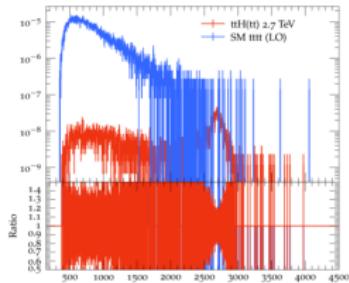
Inclusive  $mH$



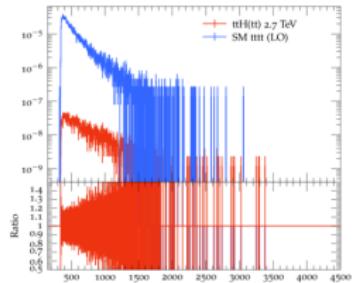
Inclusive  $nTop$



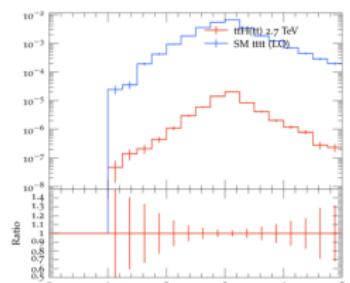
Inclusive  $nH$



Inclusive  $InvM$   
 $ttbar12$

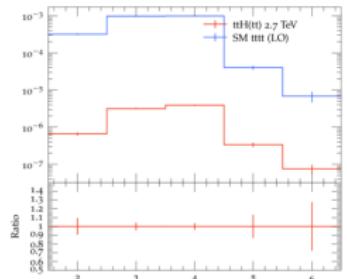
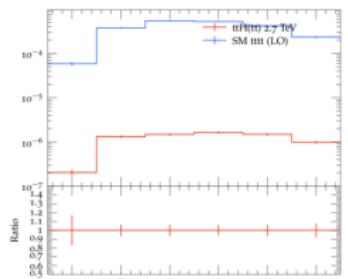
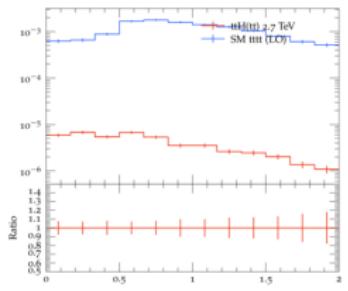
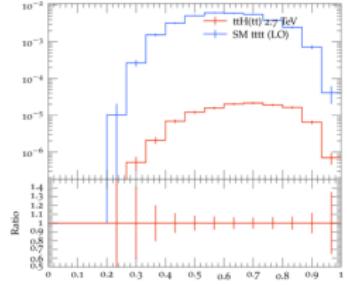
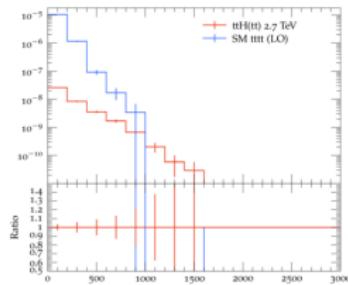
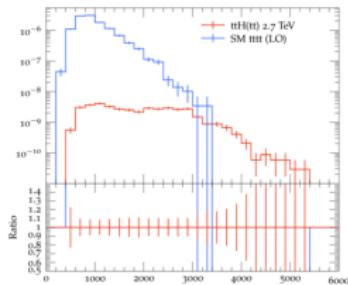


Inclusive  $InvM$   
 $ttbar34$



Inclusive  $dR$   $ttbar12$

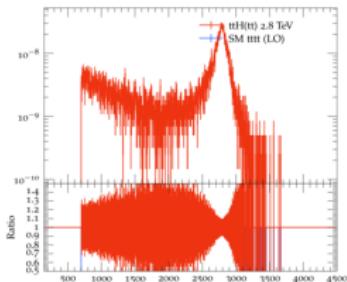
# Sample: ttH 2700 GeV - event level plots



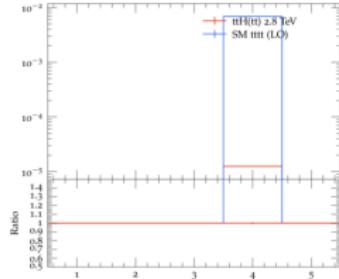
Navigation icons:

A set of small, semi-transparent navigation icons typically used in Beamer presentations for navigating between slides and sections.

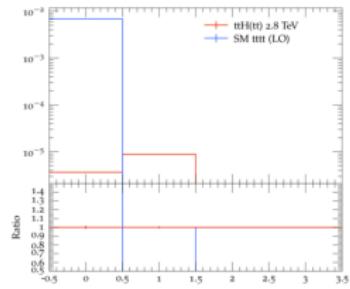
# Sample: ttH 2800 GeV - parton level plots



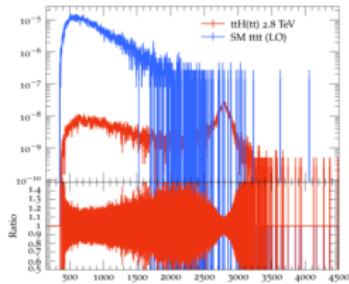
Inclusive  $mH$



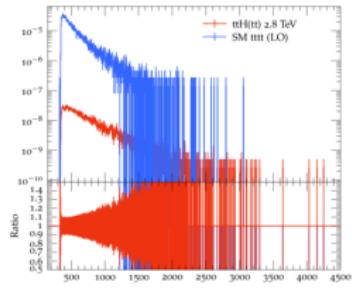
Inclusive  $nTop$



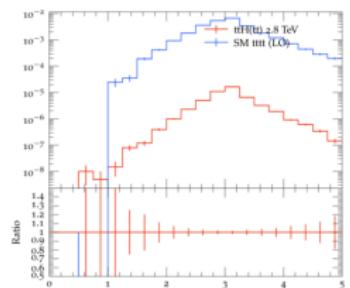
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

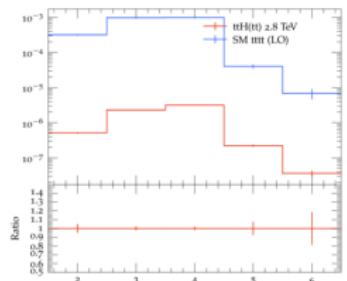
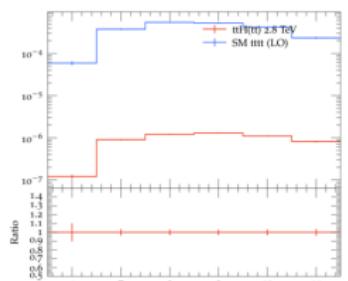
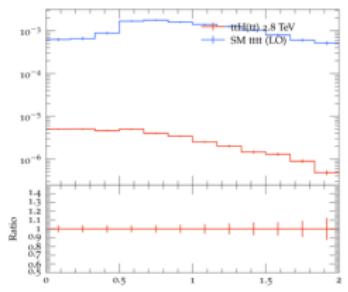
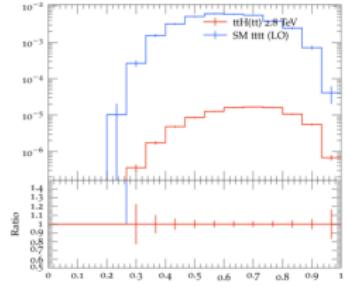
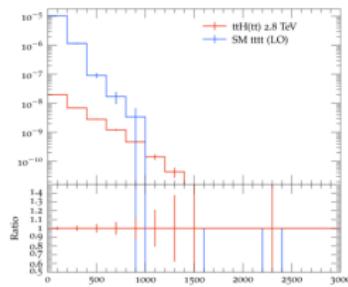
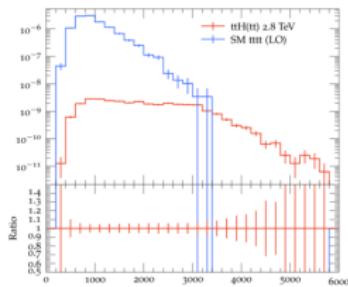


Inclusive  $InvM_{ttbar34}$

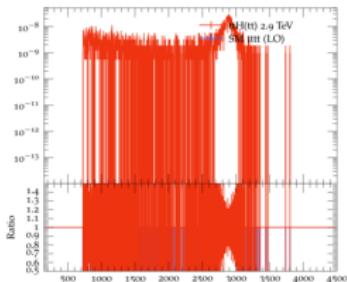


Inclusive  $dR_{ttbar12}$

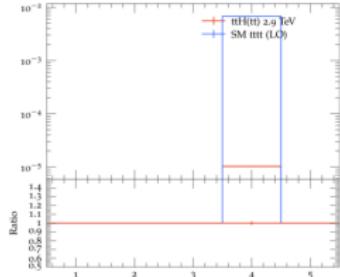
# Sample: ttH 2800 GeV - event level plots



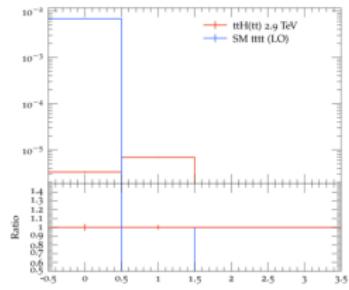
# Sample: ttH 2900 GeV - parton level plots



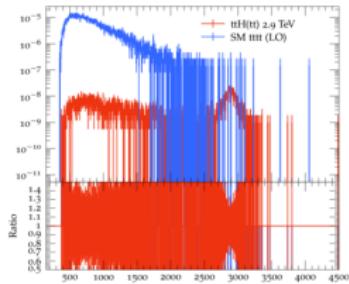
Inclusive  $mH$



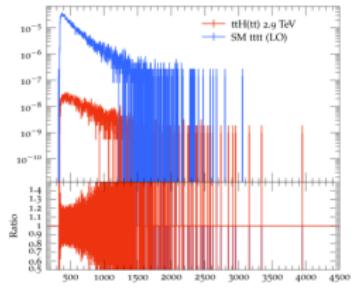
Inclusive  $nTop$



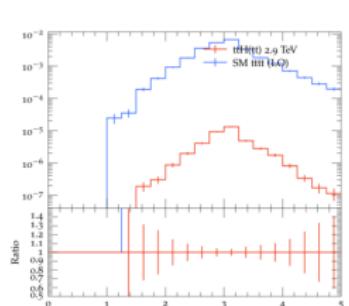
Inclusive  $nH$



Inclusive  $InvM_{ttbar12}$

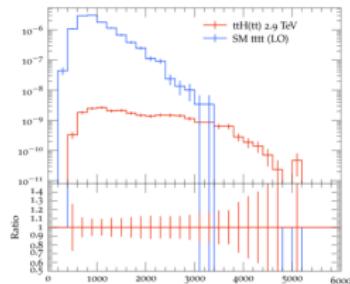


Inclusive  $InvM_{ttbar34}$

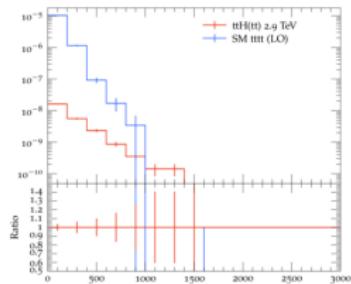


Inclusive  $dR_{ttbar12}$

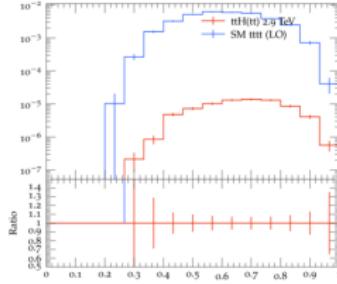
# Sample: ttH 2900 GeV - event level plots



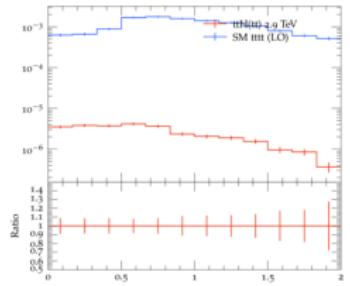
*BaselineSR HT 3*



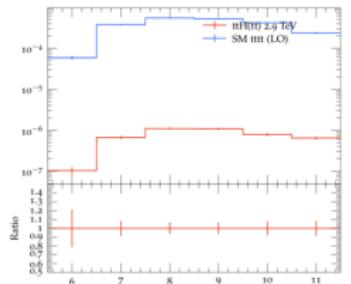
*BaselineSR MET*



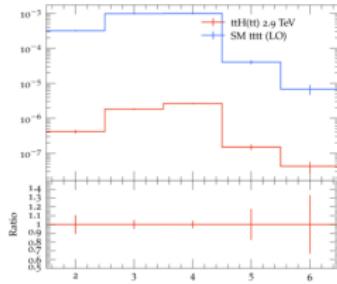
*BaselineSR centrality*



*BaselineSR deltaR bl  
min*

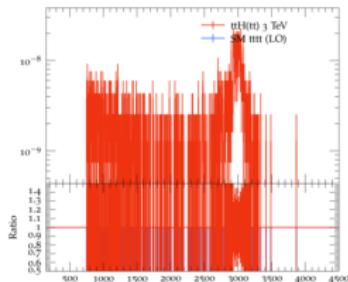


*BaselineSR nJets*

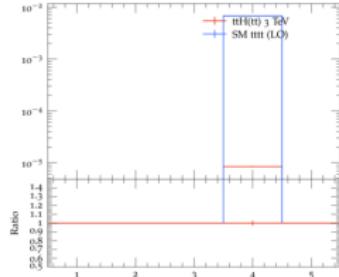


*BaselineSR nBjets*

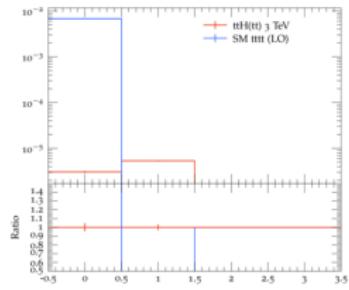
# Sample: ttH 3000 GeV - parton level plots



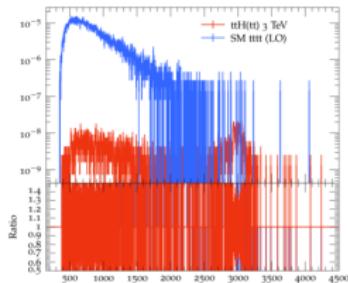
Inclusive  $m_H$



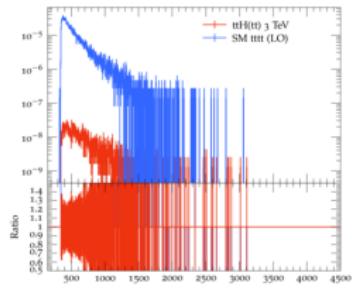
Inclusive  $n_{Top}$



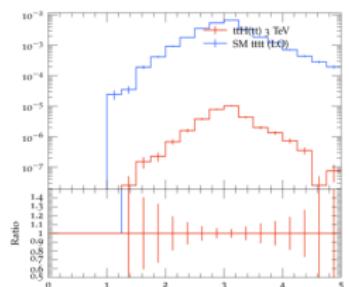
Inclusive  $n_H$



Inclusive  $\text{InvM}_{tt\bar{b}12}$



Inclusive  $\text{InvM}_{tt\bar{b}34}$



Inclusive  $dR_{tt\bar{b}12}$

# Sample: ttH 3000 GeV - event level plots

