

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

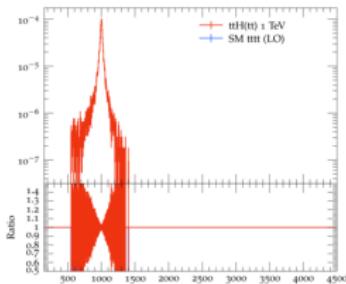
Hui-Chi Lin (UMich), Meng-Ju Tsai (UMich), Philipp Gadow
(CERN)

November 29, 2023

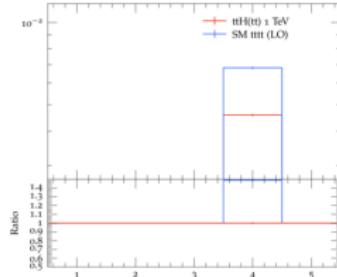
Introduction

- ▶ 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)

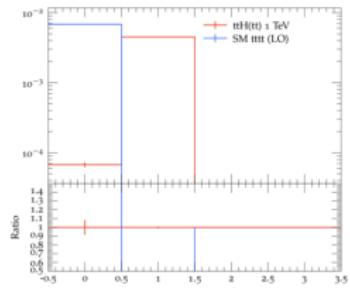
Sample: ttH 1000 GeV - parton level plots



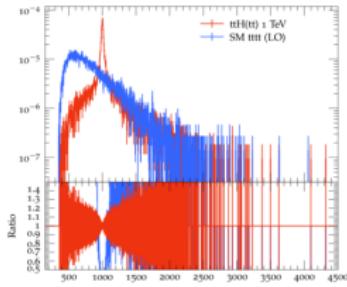
Inclusive mH



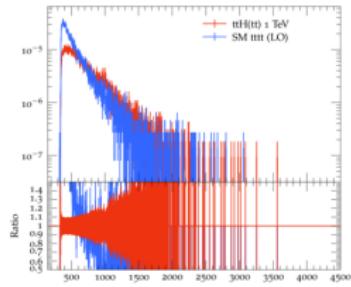
Inclusive $nTop$



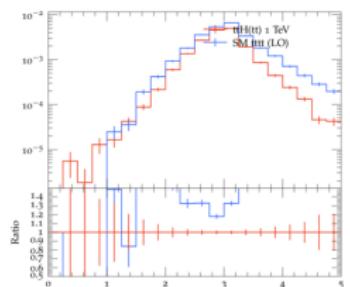
Inclusive nH



Inclusive $InvM$
 $ttbar12$

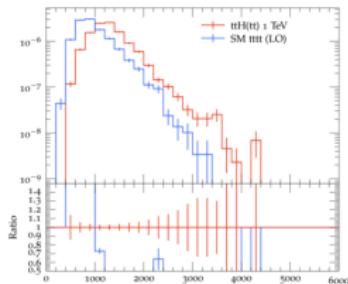


Inclusive $InvM$
 $ttbar34$

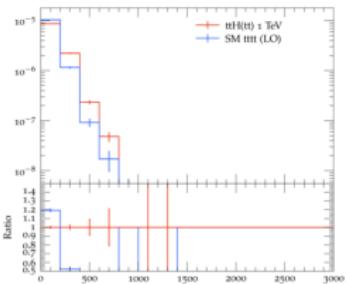


Inclusive dR $ttbar12$

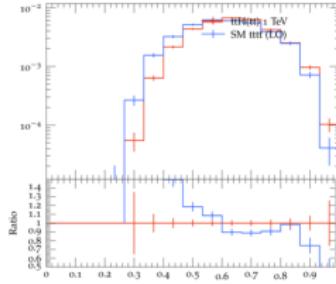
Sample: ttH 1000 GeV - event level plots



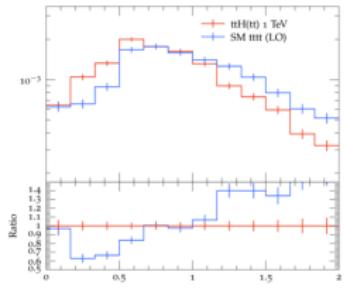
BaselineSR HT 3



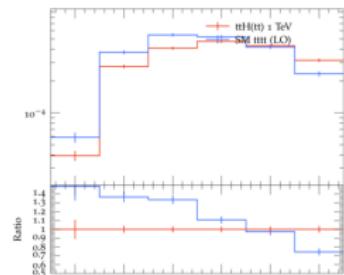
BaselineSR MET



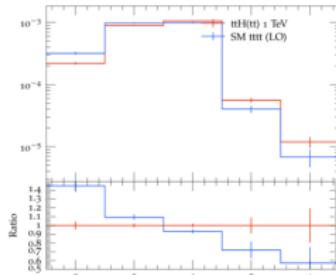
BaselineSR centrality



*BaselineSR deltaR bl
min*

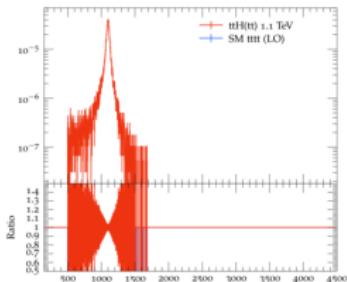


BaselineSR nJets

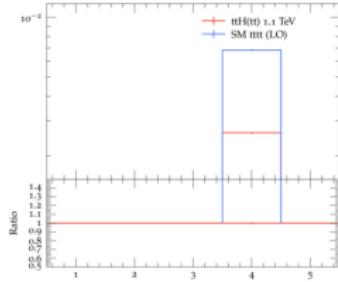


BaselineSR nBjets

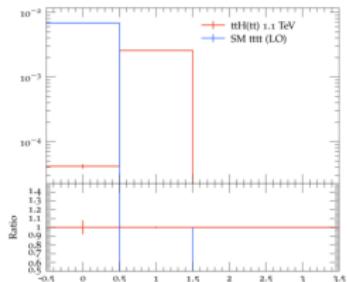
Sample: ttH 1100 GeV - parton level plots



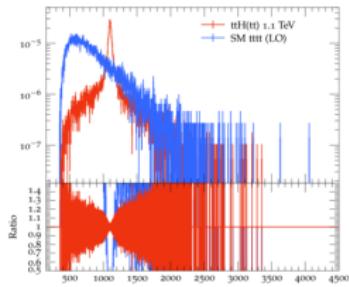
Inclusive m_H



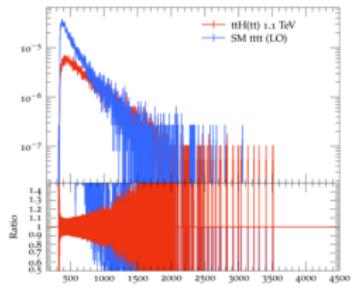
Inclusive n_{Top}



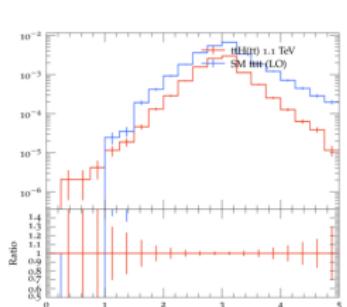
Inclusive n_H



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

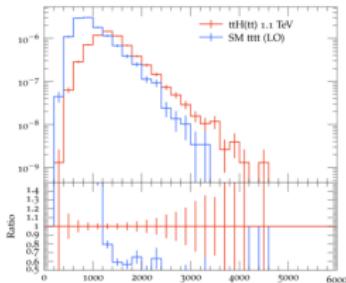


Inclusive $InvM_{tt\bar{b}ar34}$

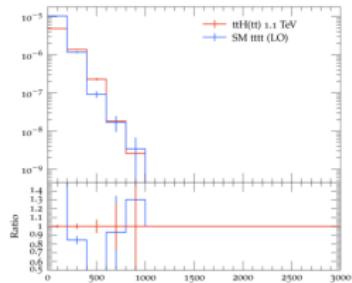


Inclusive $dR_{tt\bar{b}ar12}$

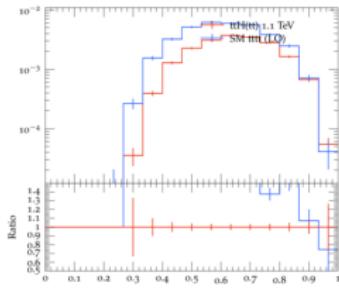
Sample: ttH 1100 GeV - event level plots



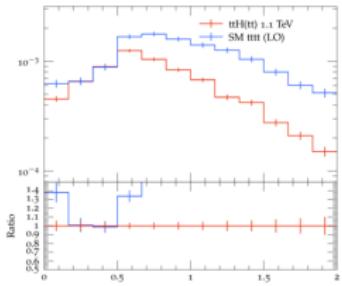
BaselineSR HT 3



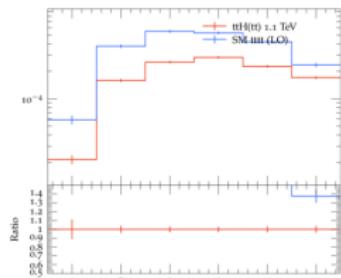
BaselineSR MET



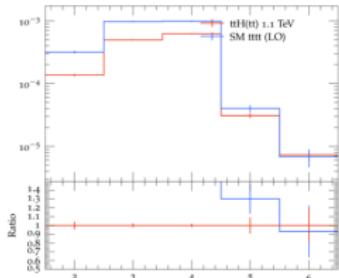
BaselineSR centrality



*BaselineSR deltaR bl
min*

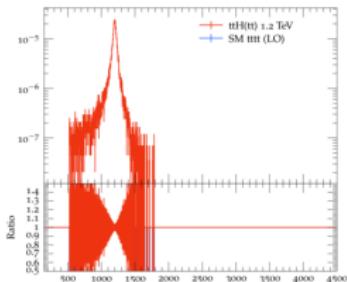


BaselineSR nJets

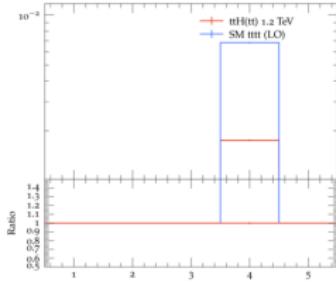


BaselineSR nBjets

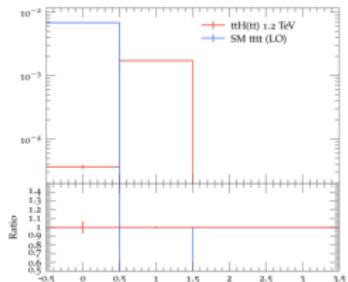
Sample: ttH 1200 GeV - parton level plots



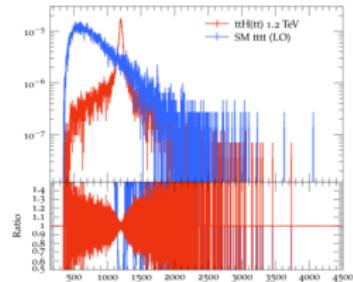
Inclusive m_H



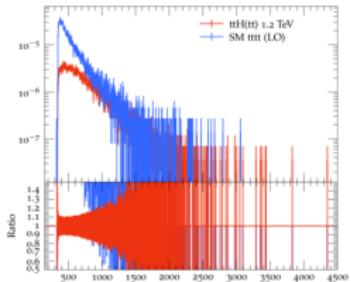
Inclusive n_{Top}



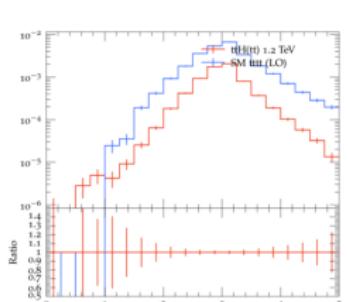
Inclusive n_H



Inclusive $InvM$
 $ttbar12$

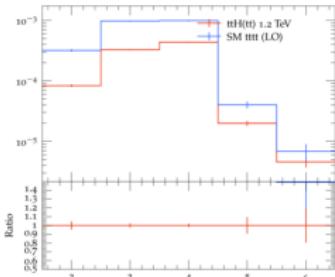
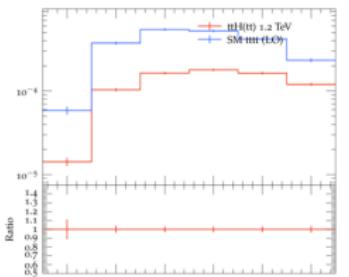
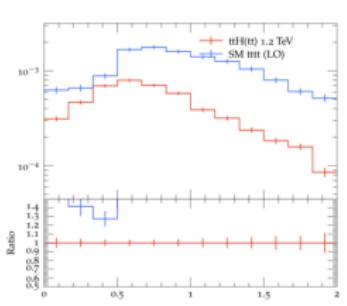
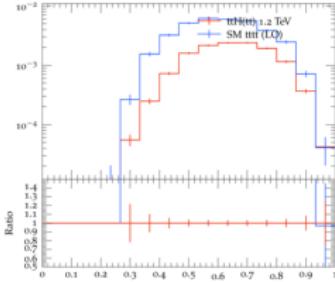
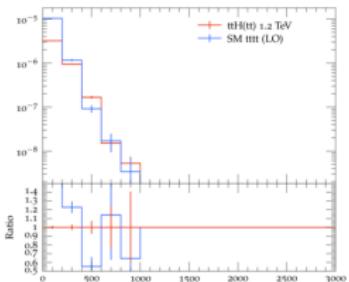
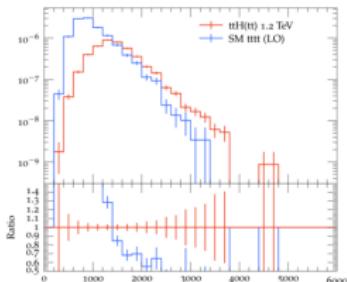


Inclusive $InvM$
 $ttbar34$

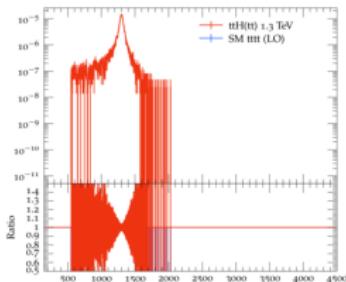


Inclusive dR $ttbar12$

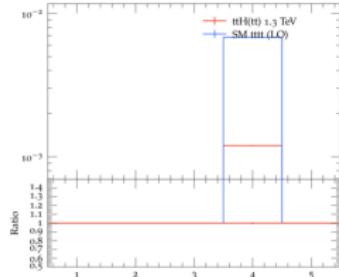
Sample: ttH 1200 GeV - event level plots



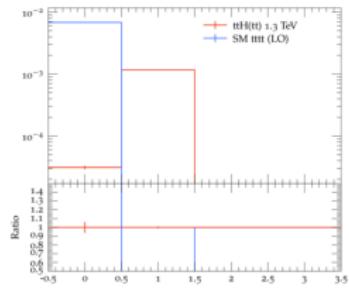
Sample: ttH 1300 GeV - parton level plots



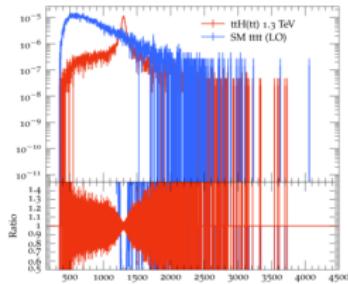
Inclusive mH



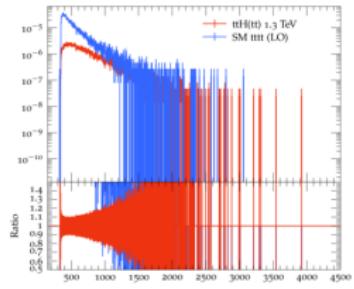
Inclusive $nTop$



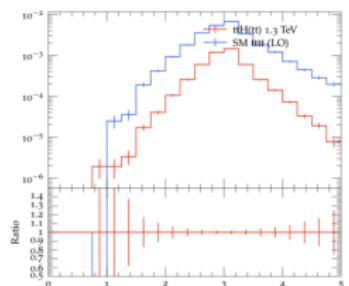
Inclusive nH



Inclusive $InvM$
 $ttbar12$

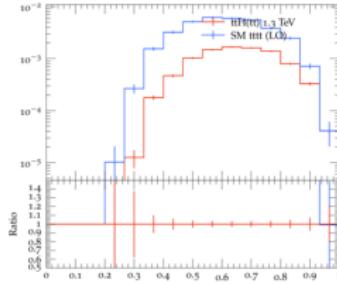
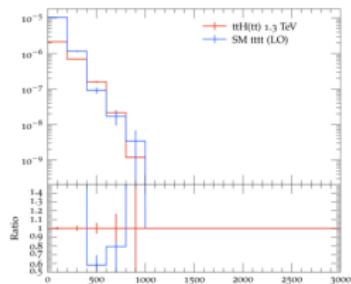
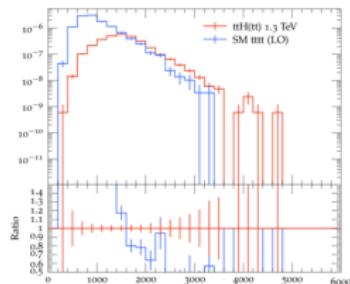


Inclusive $InvM$
 $ttbar34$



Inclusive dR $ttbar12$

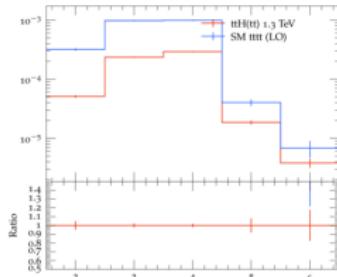
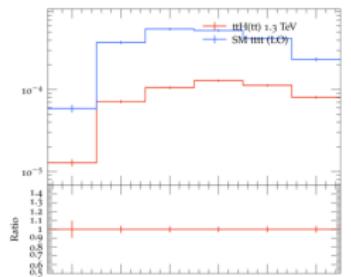
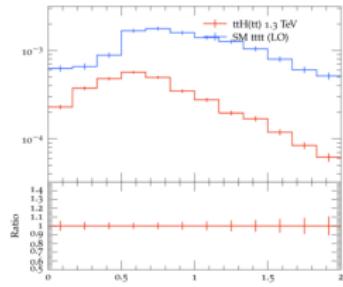
Sample: ttH 1300 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

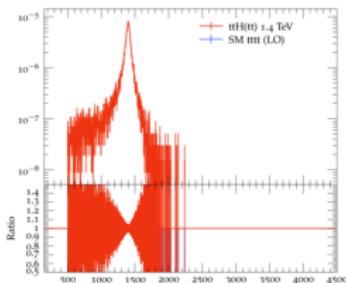


BaselineSR deltaR bl min

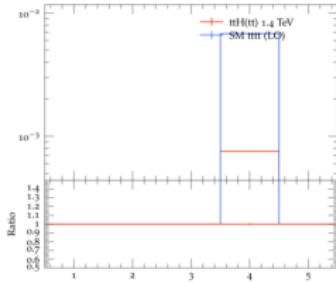
BaselineSR nJets

BaselineSR nBjets

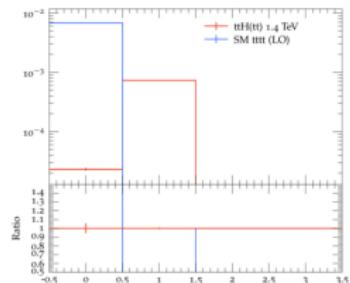
Sample: ttH 1400 GeV - parton level plots



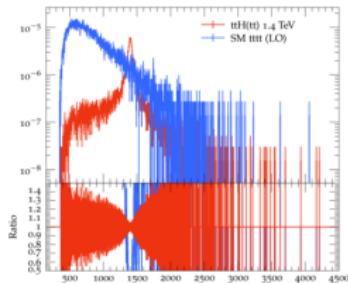
Inclusive mH



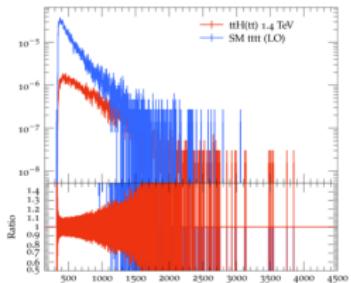
Inclusive $nTop$



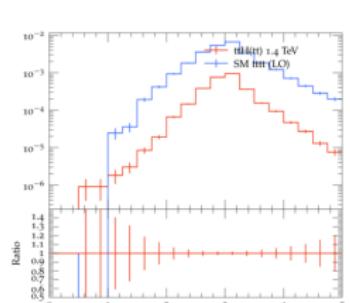
Inclusive nH



Inclusive $InvM$
 $ttbar12$

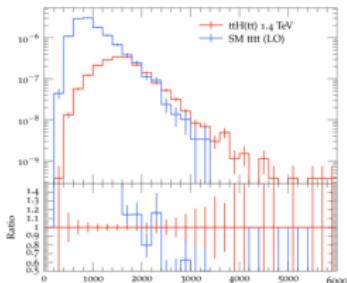


Inclusive $InvM$
 $ttbar34$

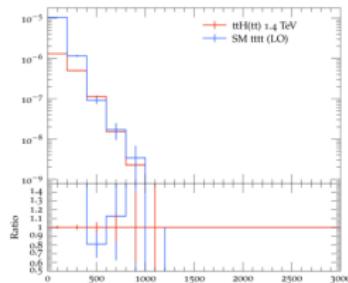


Inclusive dR $ttbar12$

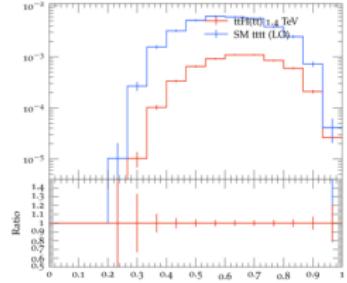
Sample: ttH 1400 GeV - event level plots



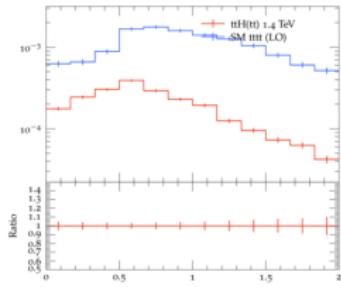
BaselineSR HT 3



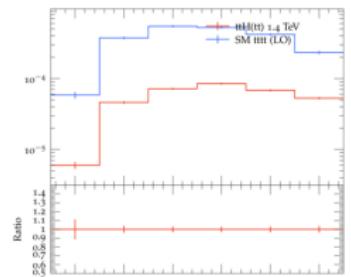
BaselineSR MET



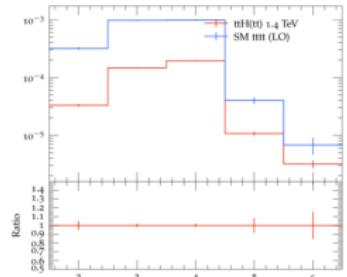
BaselineSR centrality



*BaselineSR deltaR bl
min*

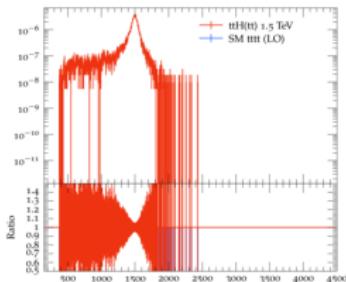


BaselineSR nJets

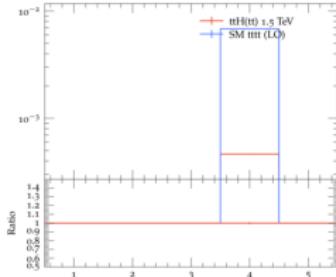


BaselineSR nBjets

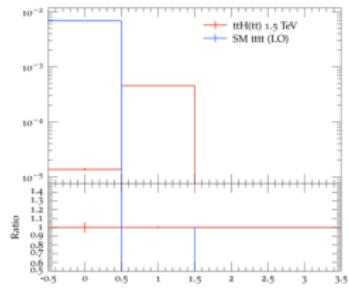
Sample: ttH 1500 GeV - parton level plots



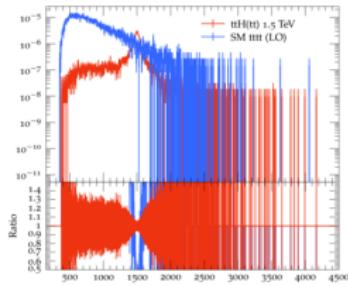
Inclusive m_H



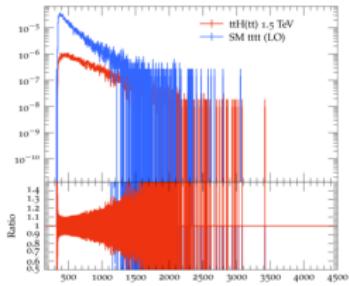
Inclusive n_{Top}



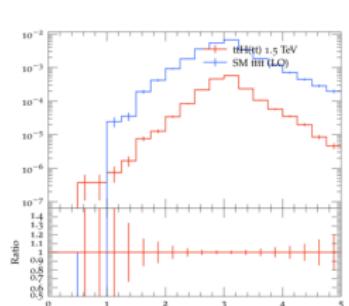
Inclusive n_H



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

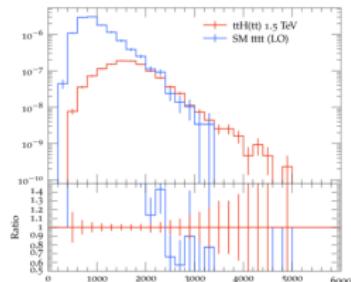


Inclusive $\text{InvM}_{tt\bar{b}34}$

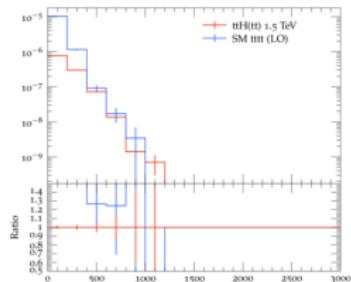


Inclusive $dR_{tt\bar{b}12}$

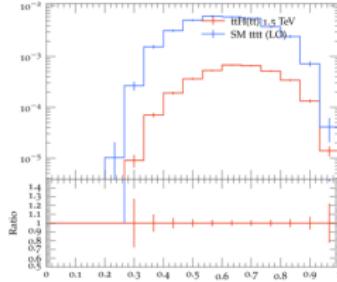
Sample: ttH 1500 GeV - event level plots



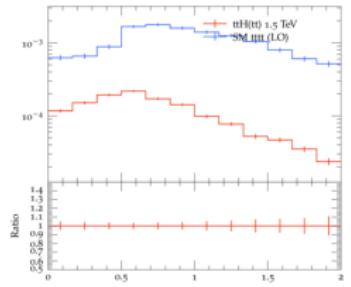
BaselineSR HT 3



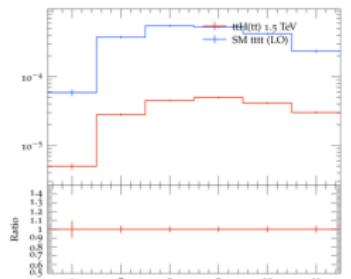
BaselineSR MET



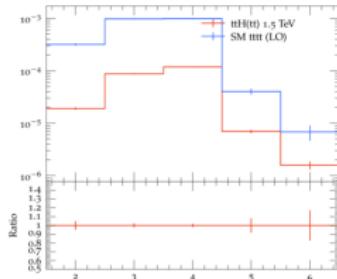
BaselineSR centrality



*BaselineSR deltaR bl
min*

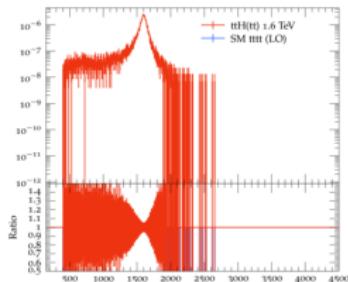


BaselineSR nJets

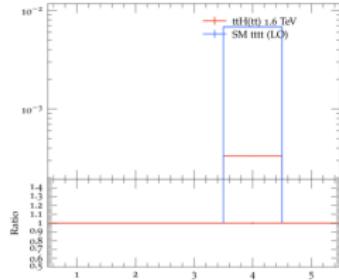


BaselineSR nBjets

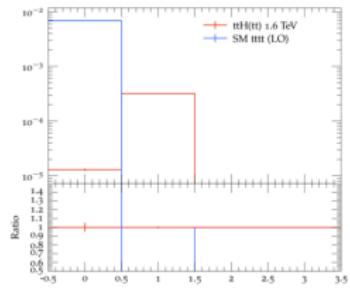
Sample: ttH 1600 GeV - parton level plots



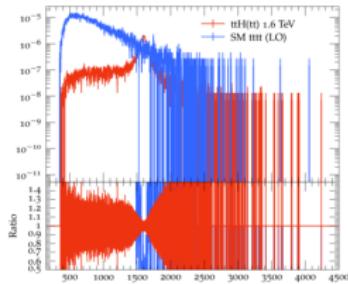
Inclusive mH



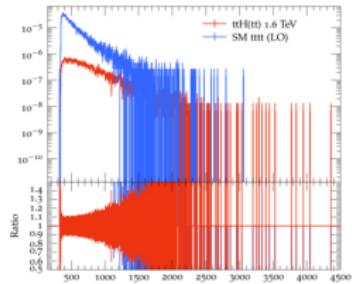
Inclusive $nTop$



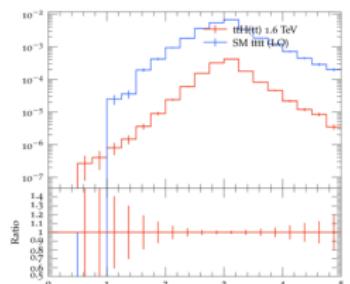
Inclusive nH



Inclusive $InvM$
 $ttbar12$

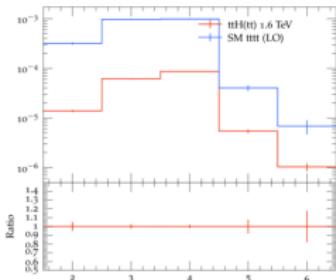
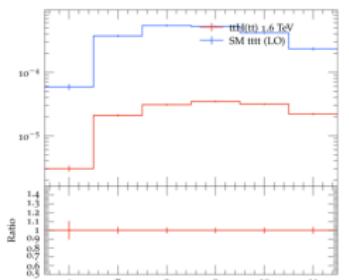
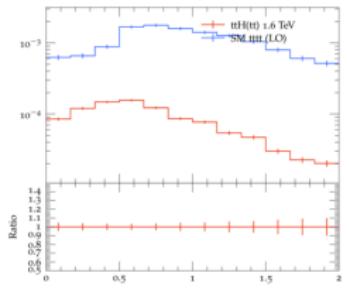
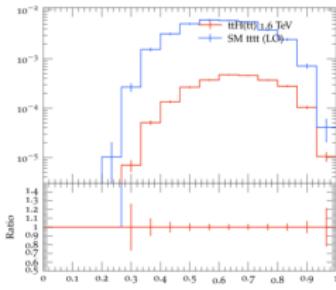
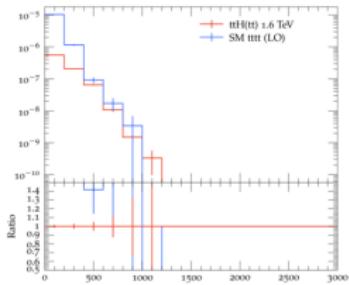
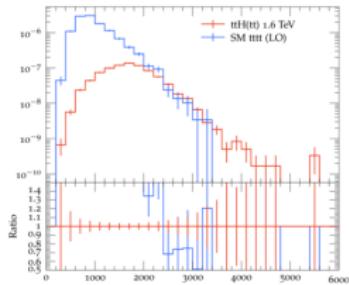


Inclusive $InvM$
 $ttbar34$

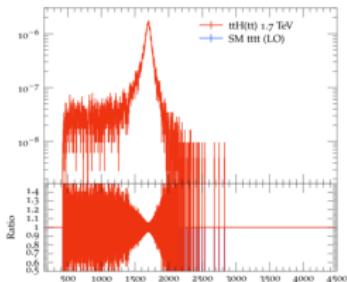


Inclusive dR $ttbar12$

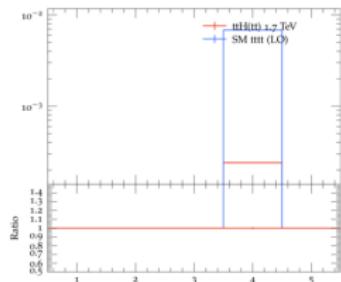
Sample: ttH 1600 GeV - event level plots



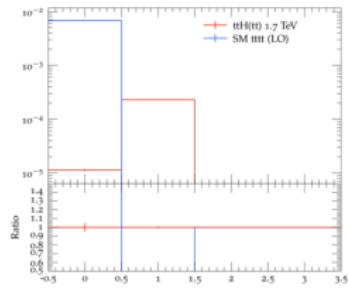
Sample: ttH 1700 GeV - parton level plots



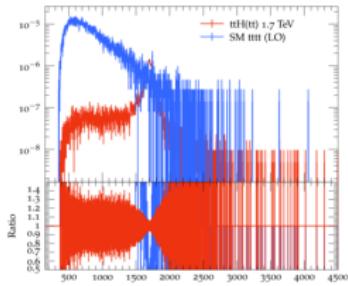
Inclusive mH



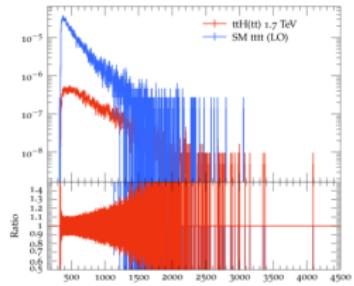
Inclusive $nTop$



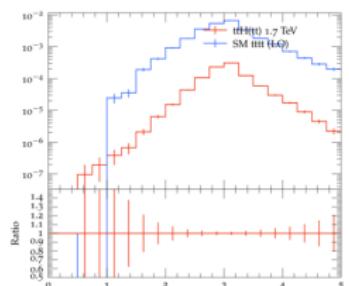
Inclusive nH



Inclusive $InvM_{ttbar12}$

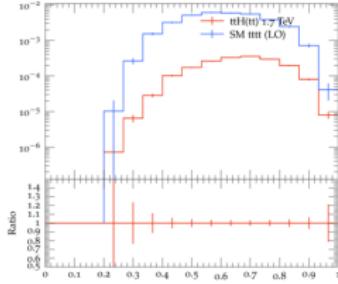
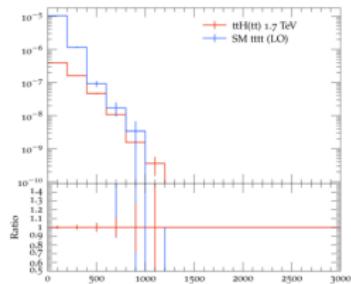
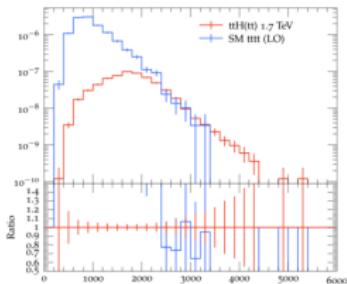


Inclusive $InvM_{ttbar34}$



Inclusive $dR_{ttbar12}$

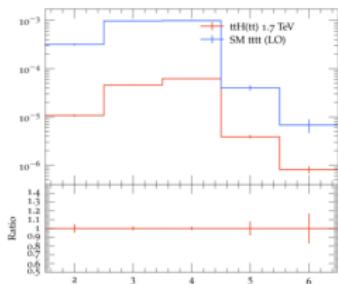
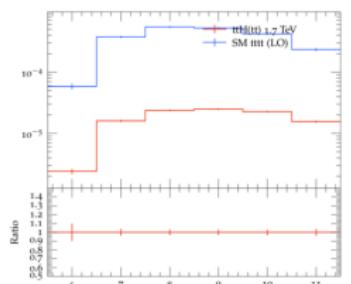
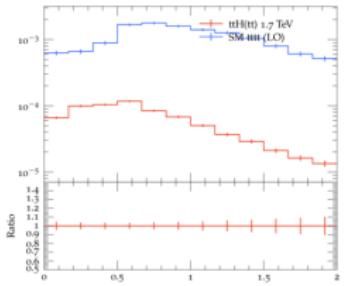
Sample: ttH 1700 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

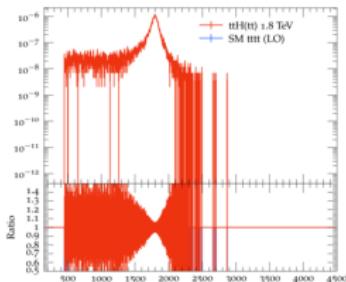


BaselineSR deltaR bl min

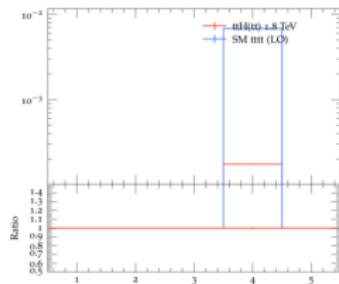
BaselineSR nJets

BaselineSR nBjets

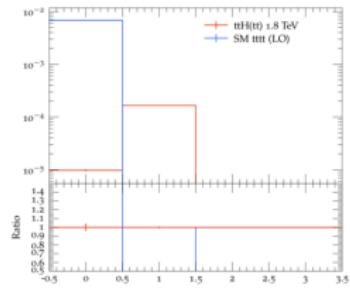
Sample: ttH 1800 GeV - parton level plots



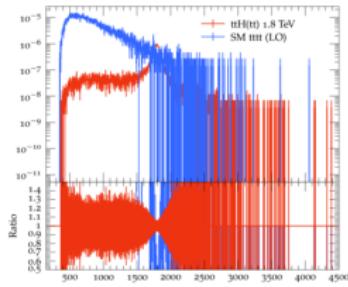
Inclusive mH



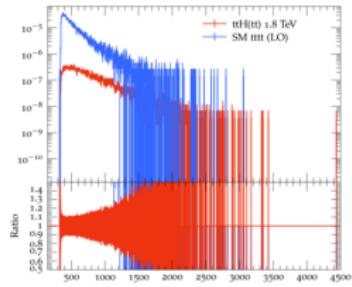
Inclusive $nTop$



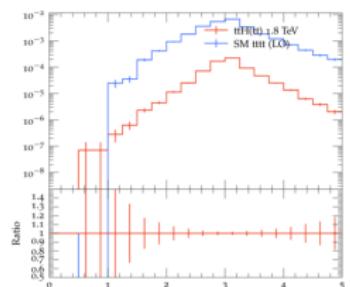
Inclusive nH



Inclusive $InvM$
 $ttbar12$

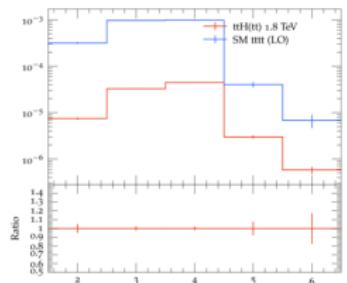
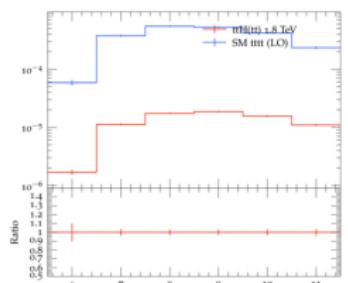
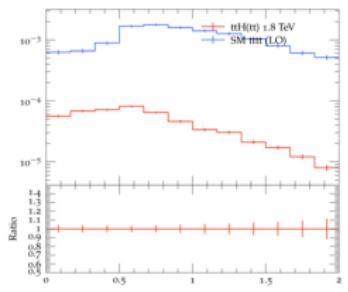
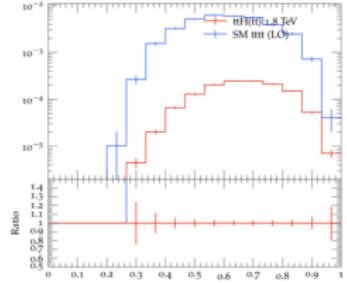
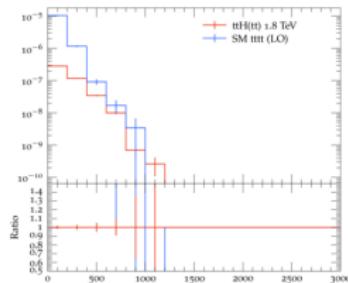
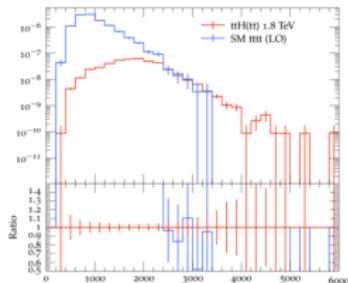


Inclusive $InvM$
 $ttbar34$

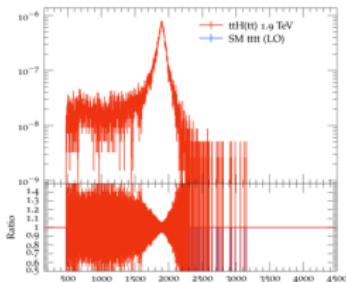


Inclusive dR $ttbar12$

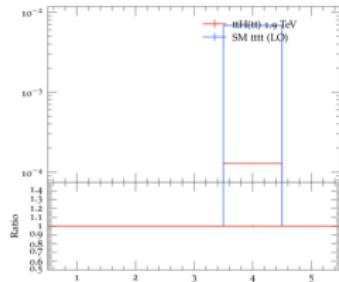
Sample: ttH 1800 GeV - event level plots



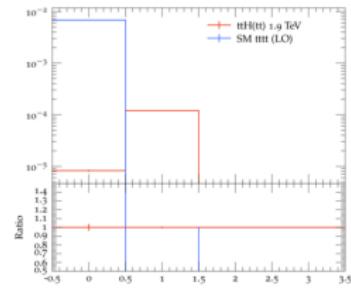
Sample: ttH 1900 GeV - parton level plots



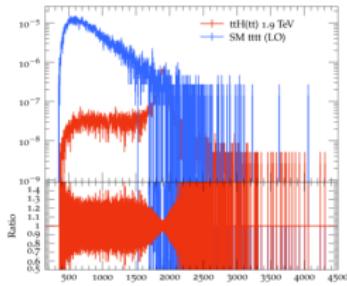
Inclusive mH



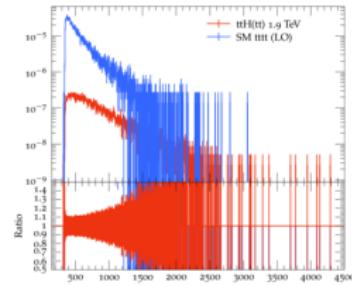
Inclusive $nTop$



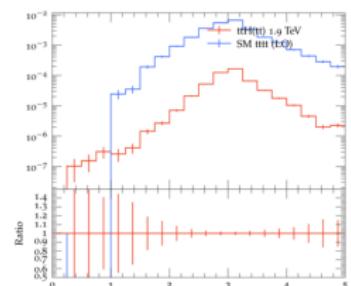
Inclusive nH



Inclusive $InvM$
 $ttbar12$

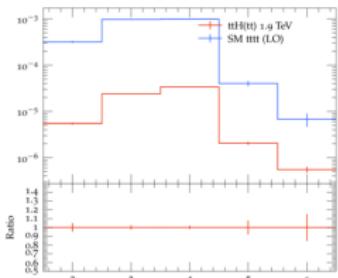
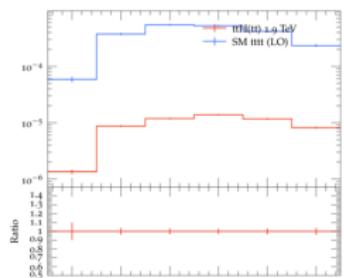
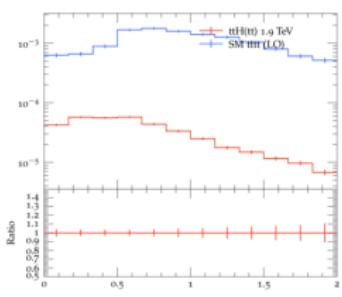
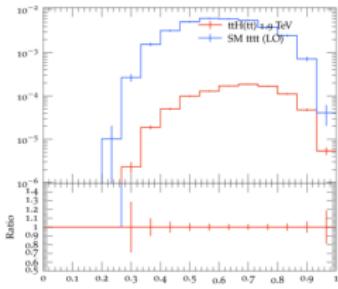
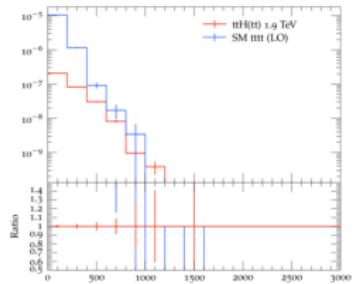
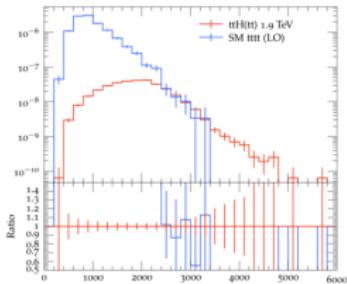


Inclusive $InvM$
 $ttbar34$

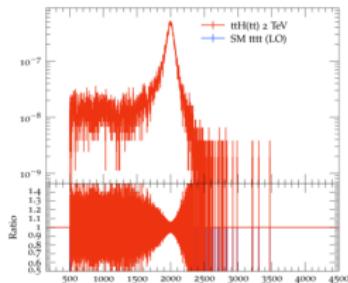


Inclusive dR $ttbar12$

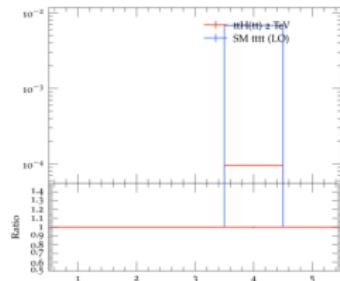
Sample: ttH 1900 GeV - event level plots



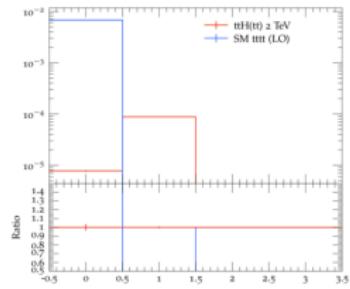
Sample: ttH 2000 GeV - parton level plots



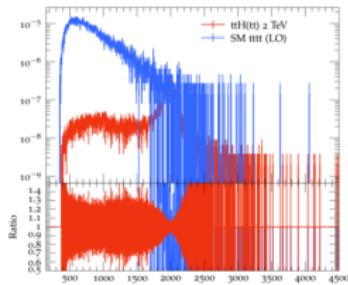
Inclusive mH



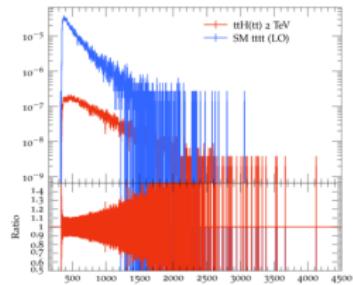
Inclusive $nTop$



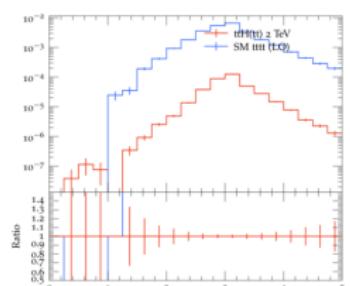
Inclusive nH



Inclusive $InvM_{ttbar12}$

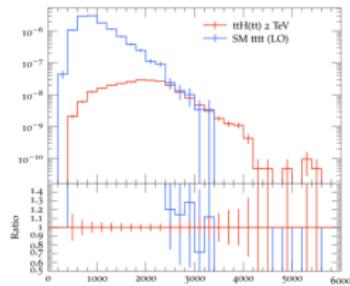


Inclusive $InvM_{ttbar34}$

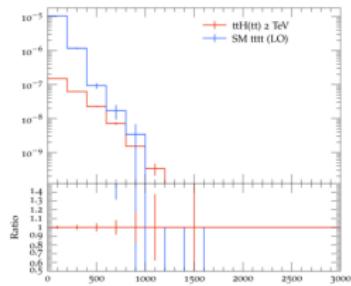


Inclusive $dR_{ttbar12}$

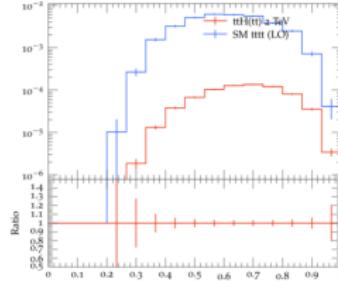
Sample: ttH 2000 GeV - event level plots



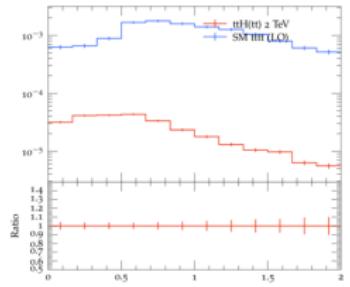
BaselineSR HT 3



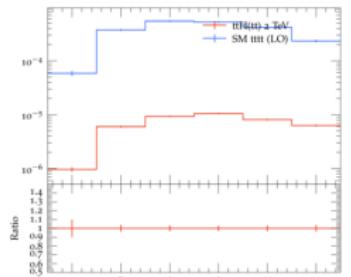
BaselineSR MET



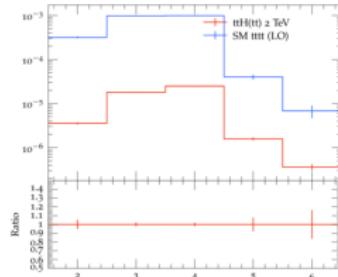
BaselineSR centrality



*BaselineSR deltaR bl
min*

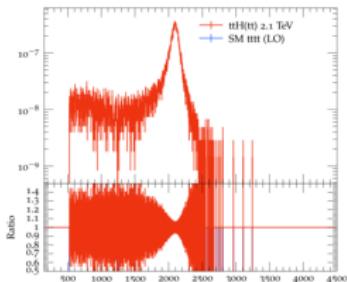


BaselineSR nJets

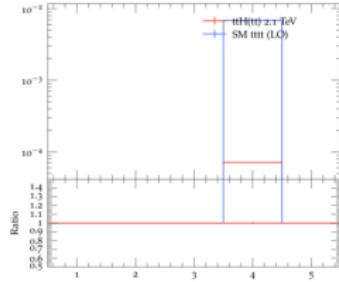


BaselineSR nBjets

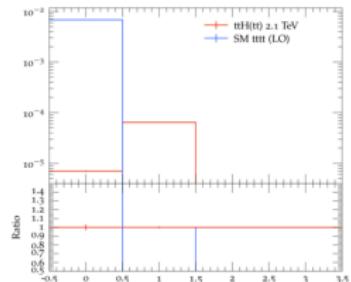
Sample: ttH 2100 GeV - parton level plots



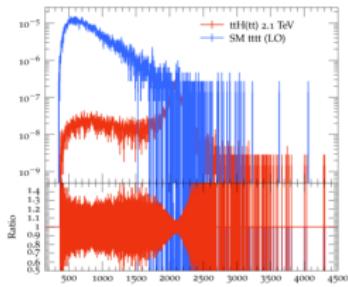
Inclusive mH



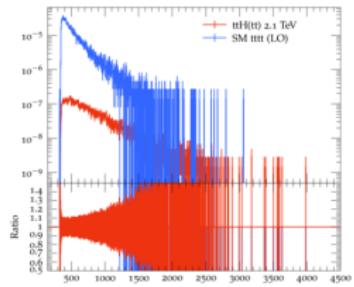
Inclusive $nTop$



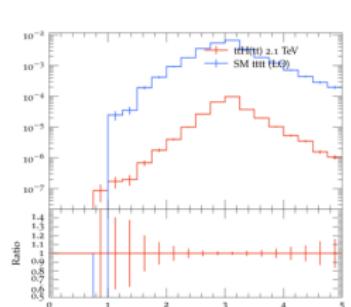
Inclusive nH



Inclusive $InvM_{ttbar12}$

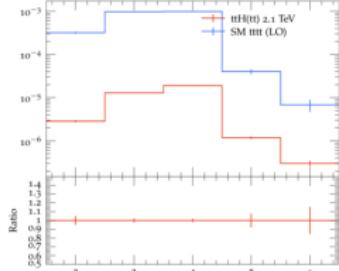
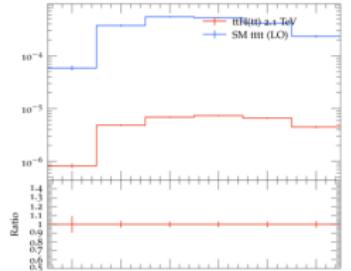
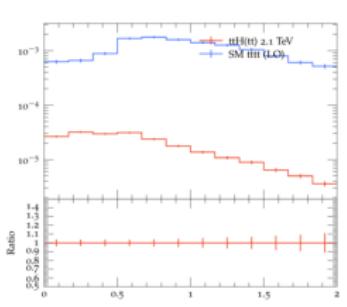
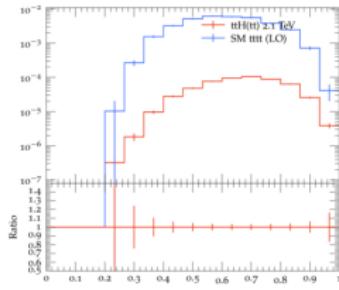
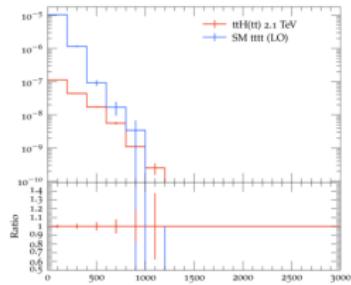
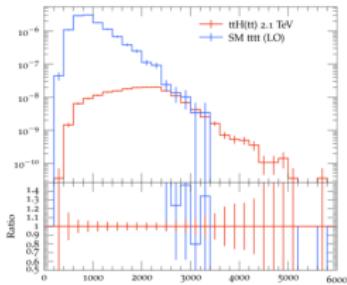


Inclusive $InvM_{ttbar34}$

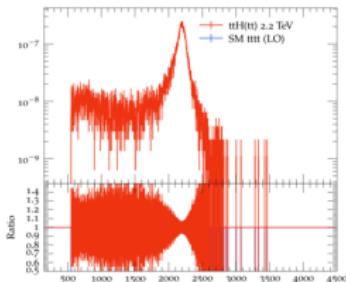


Inclusive $dR_{ttbar12}$

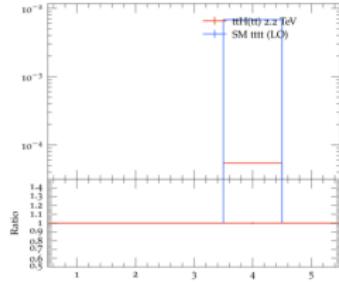
Sample: ttH 2100 GeV - event level plots



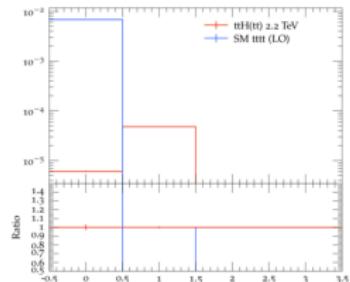
Sample: ttH 2200 GeV - parton level plots



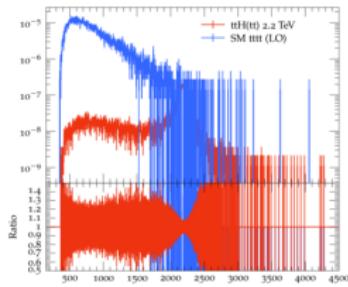
Inclusive mH



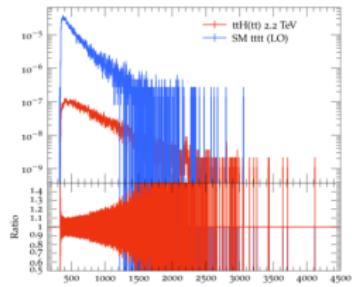
Inclusive $nTop$



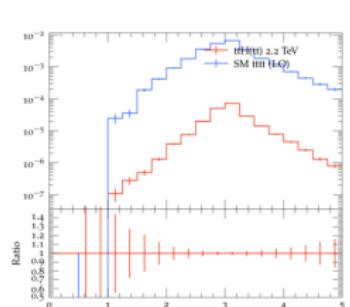
Inclusive nH



Inclusive $InvM$
 $ttbar12$

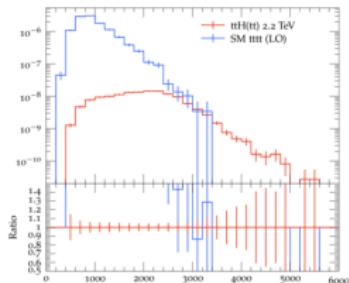


Inclusive $InvM$
 $ttbar34$

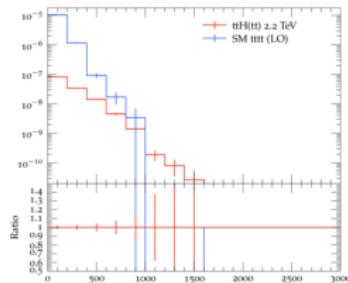


Inclusive dR $ttbar12$

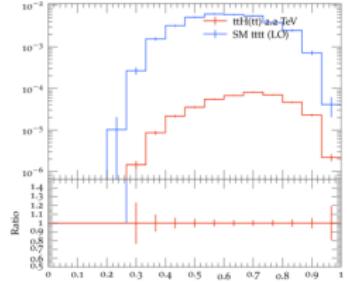
Sample: ttH 2200 GeV - event level plots



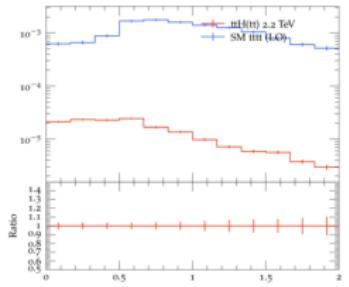
BaselineSR HT 3



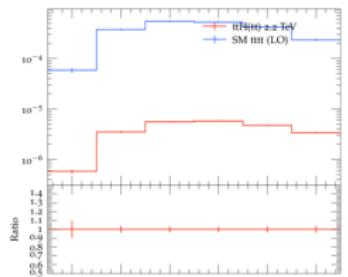
BaselineSR MET



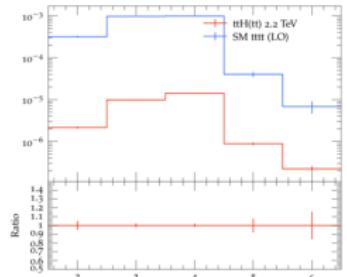
BaselineSR centrality



*BaselineSR deltaR bl
min*

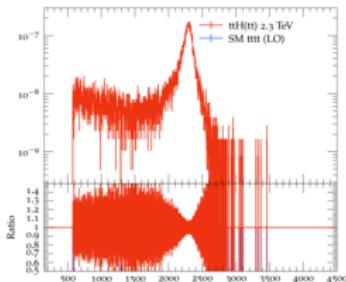


BaselineSR nJets

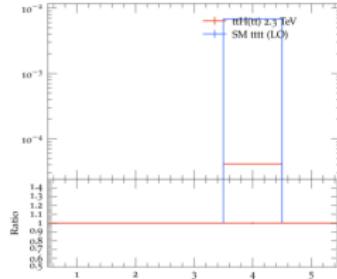


BaselineSR nBjets

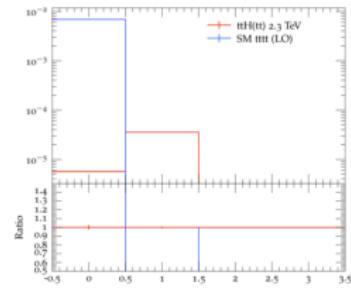
Sample: ttH 2300 GeV - parton level plots



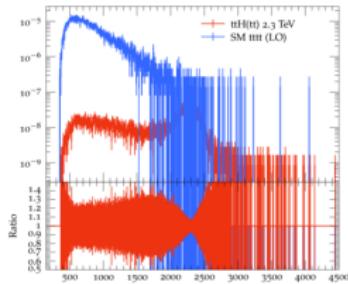
Inclusive mH



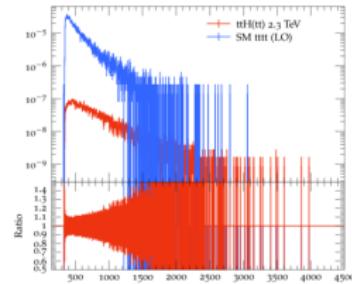
Inclusive $nTop$



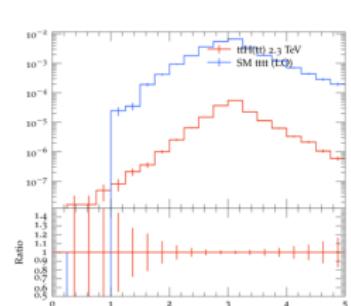
Inclusive nH



Inclusive $InvM_{ttbar12}$

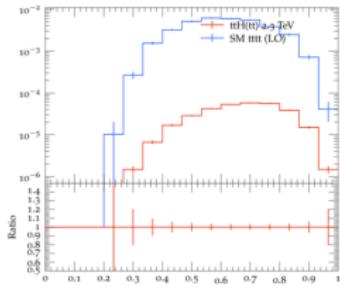
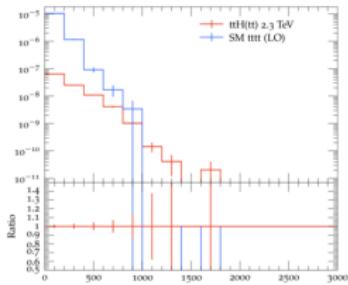
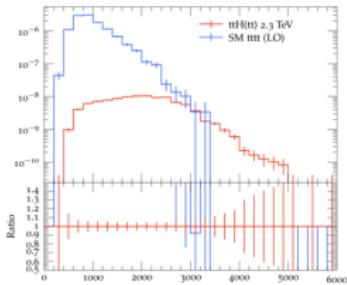


Inclusive $InvM_{ttbar34}$



Inclusive $dR_{ttbar12}$

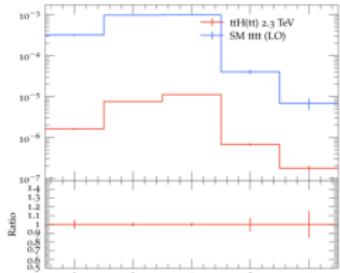
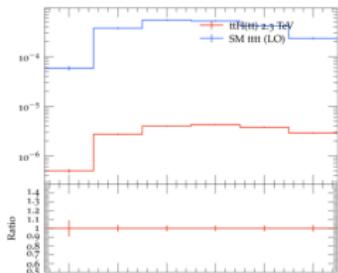
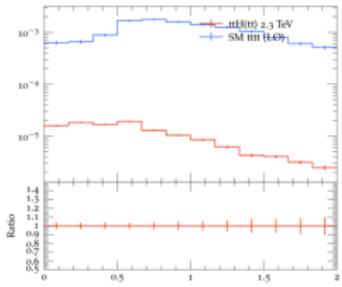
Sample: ttH 2300 GeV - event level plots



BaselineSR HT 3

BaselineSR MET

BaselineSR centrality

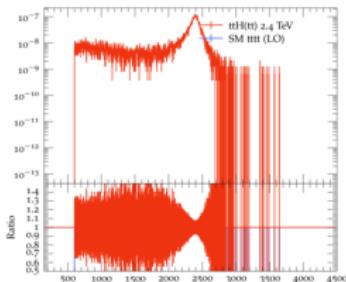


BaselineSR deltaR bl min

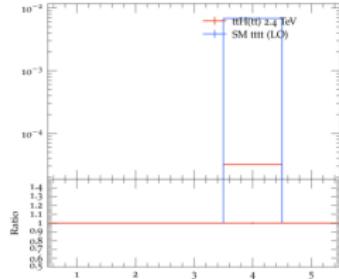
BaselineSR nJets

BaselineSR nBjets

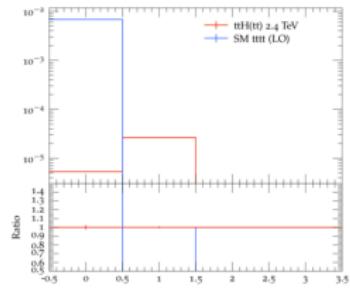
Sample: ttH 2400 GeV - parton level plots



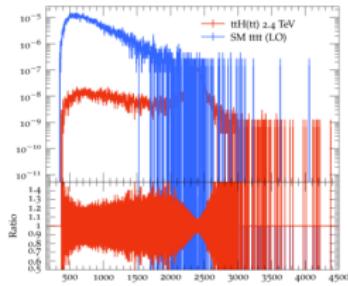
Inclusive mH



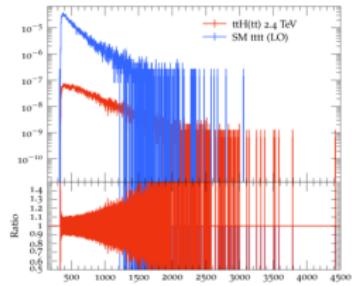
Inclusive $nTop$



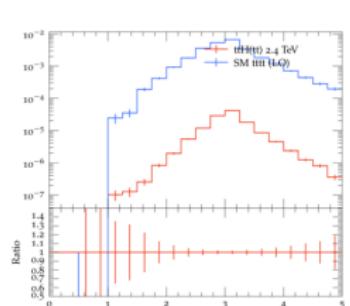
Inclusive nH



Inclusive $InvM_{ttbar12}$

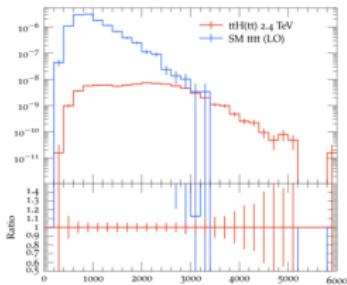


Inclusive $InvM_{ttbar34}$

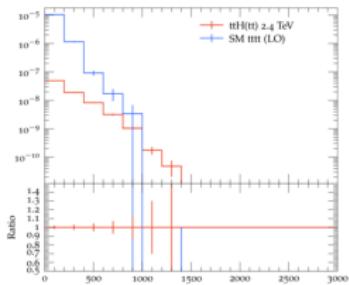


Inclusive $dR_{ttbar12}$

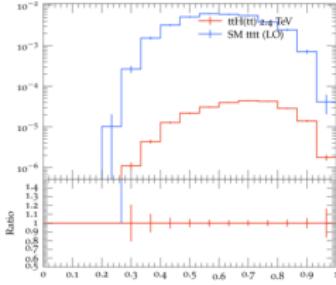
Sample: ttH 2400 GeV - event level plots



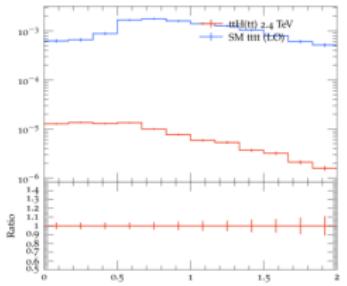
BaselineSR HT 3



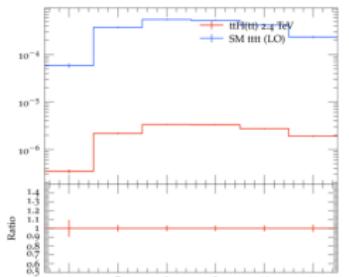
BaselineSR MET



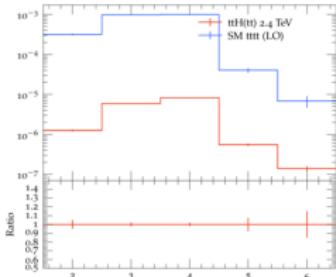
BaselineSR centrality



*BaselineSR deltaR bl
min*

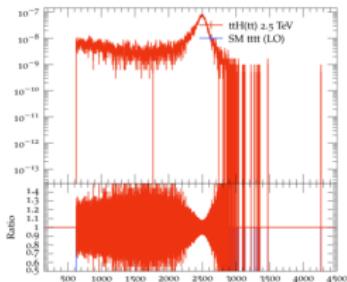


BaselineSR nJets

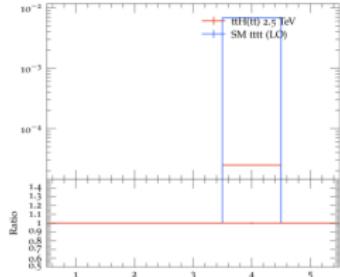


BaselineSR nBjets

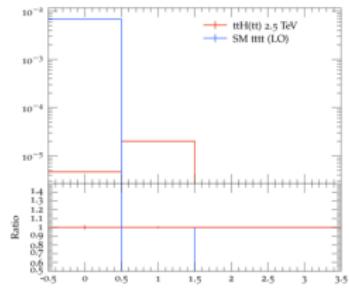
Sample: ttH 2500 GeV - parton level plots



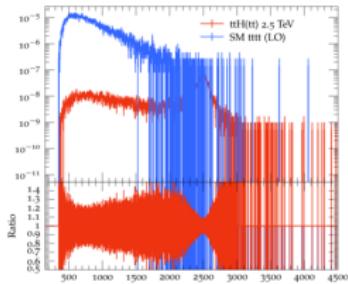
Inclusive mH



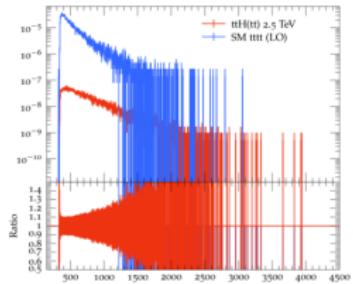
Inclusive $nTop$



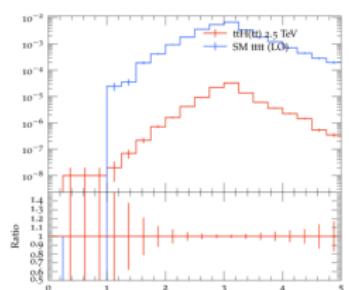
Inclusive nH



Inclusive $\text{InvM}_{ttbar12}$

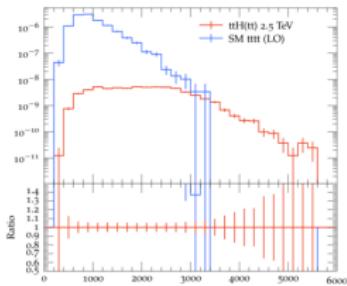


Inclusive $\text{InvM}_{ttbar34}$

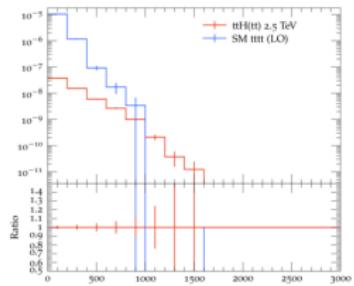


Inclusive $dR_{ttbar12}$

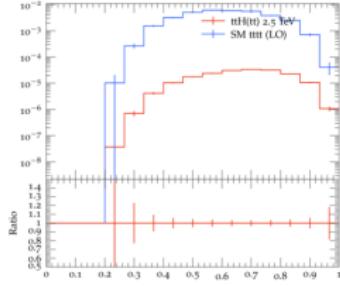
Sample: ttH 2500 GeV - event level plots



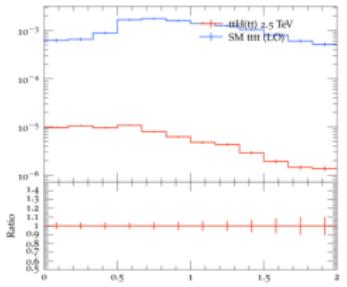
BaselineSR HT 3



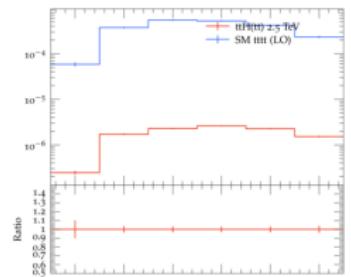
BaselineSR MET



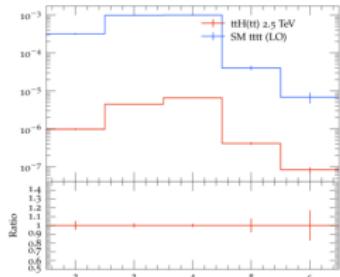
BaselineSR centrality



*BaselineSR deltaR bl
min*

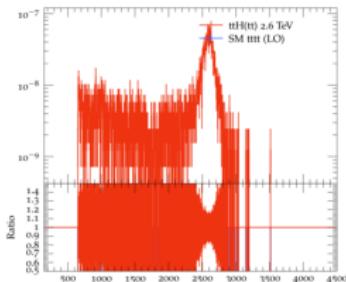


BaselineSR nJets

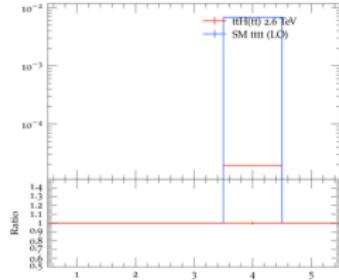


BaselineSR nBjets

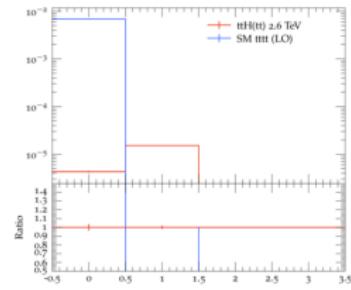
Sample: ttH 2600 GeV - parton level plots



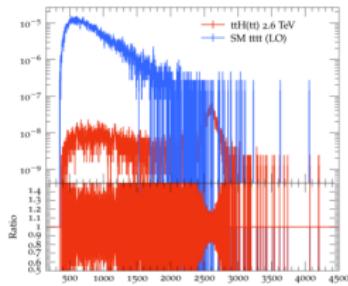
Inclusive mH



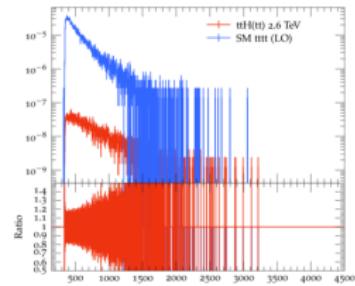
Inclusive $nTop$



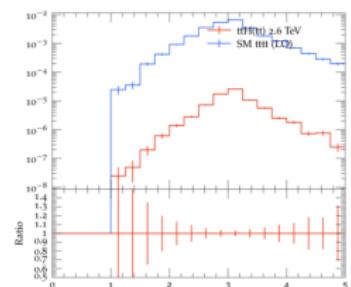
Inclusive nH



Inclusive $InvM$
 $ttbar12$

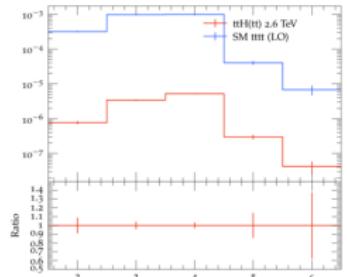
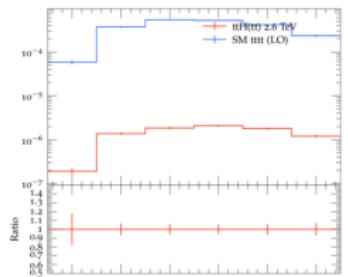
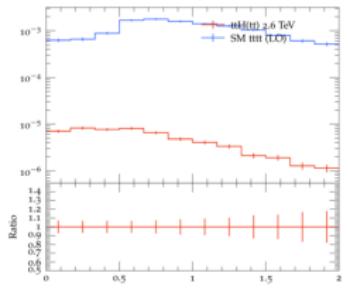
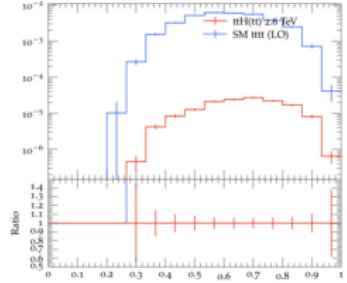
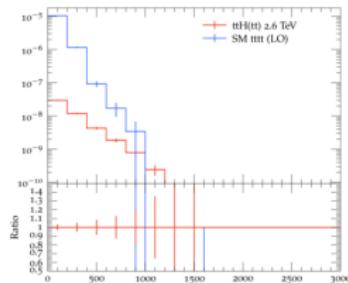
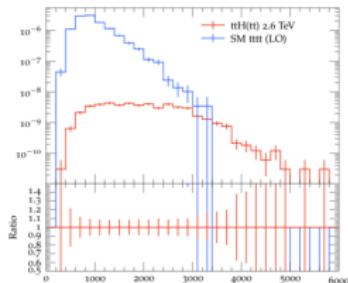


Inclusive $InvM$
 $ttbar34$

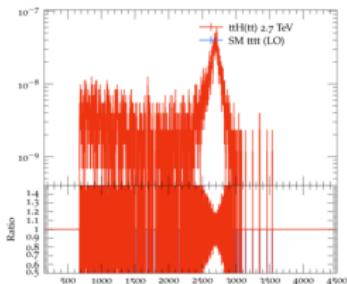


Inclusive dR $ttbar12$

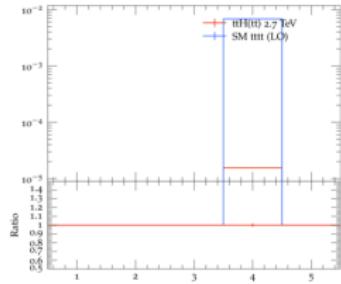
Sample: ttH 2600 GeV - event level plots



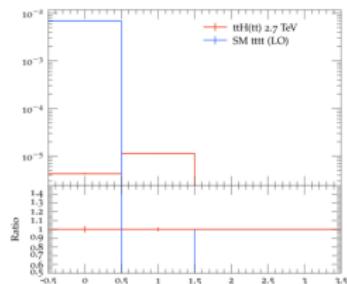
Sample: ttH 2700 GeV - parton level plots



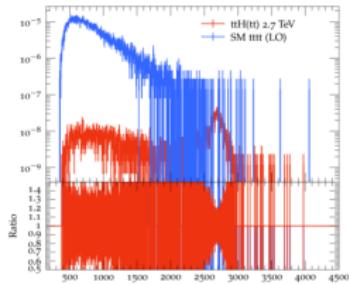
Inclusive mH



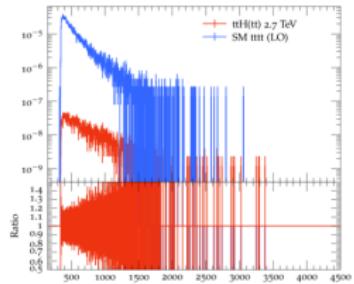
Inclusive $nTop$



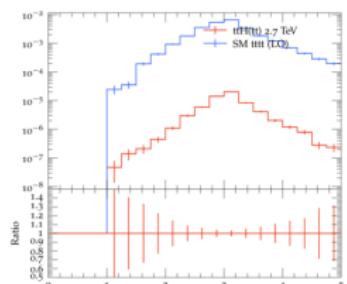
Inclusive nH



Inclusive $InvM_{ttbar12}$

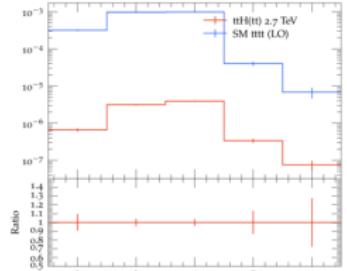
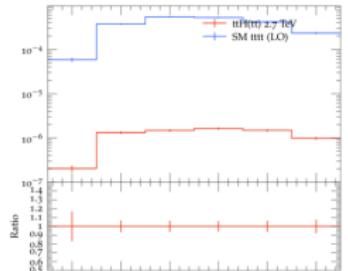
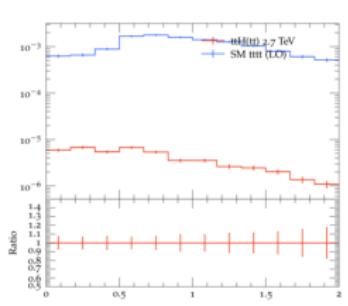
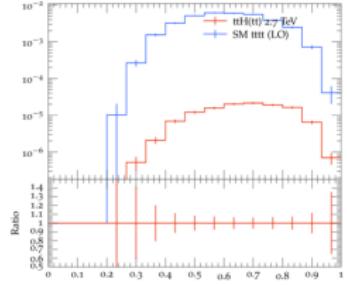
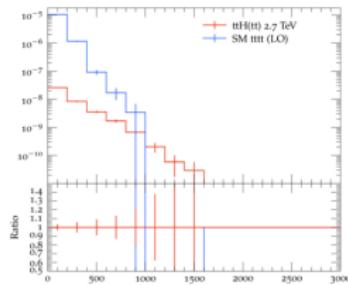
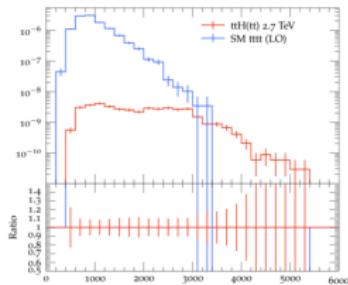


Inclusive $InvM_{ttbar34}$

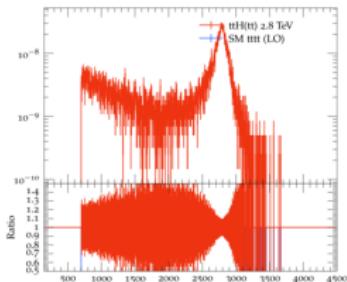


Inclusive $dR_{ttbar12}$

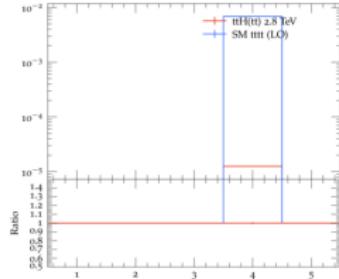
Sample: ttH 2700 GeV - event level plots



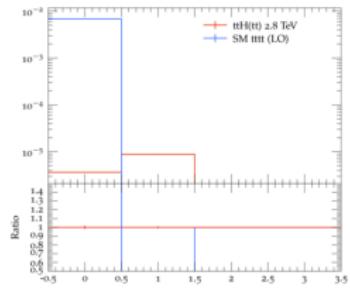
Sample: ttH 2800 GeV - parton level plots



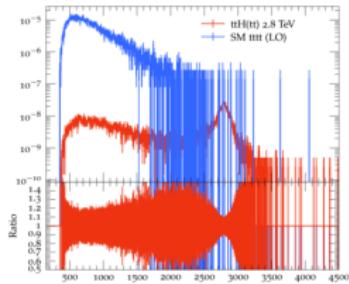
Inclusive mH



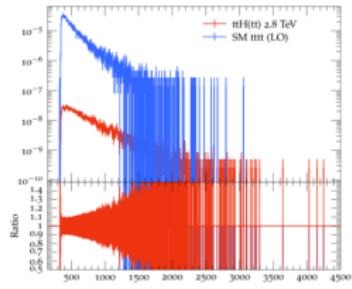
Inclusive $nTop$



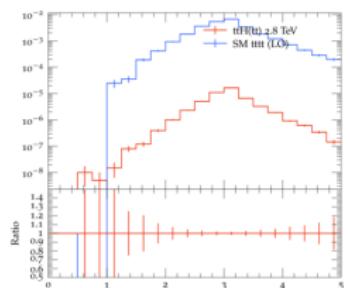
Inclusive nH



Inclusive $InvM_{ttbar12}$

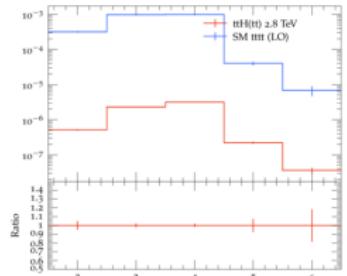
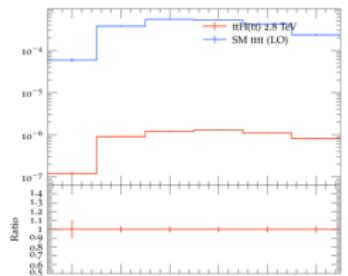
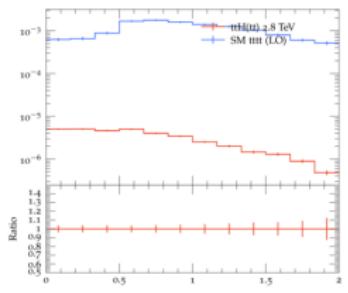
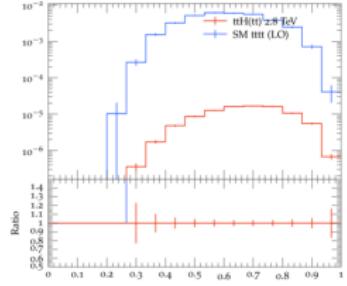
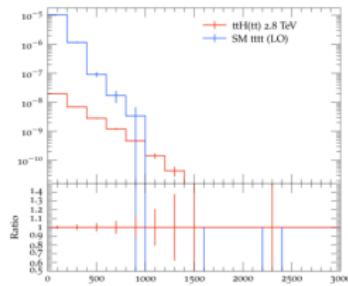
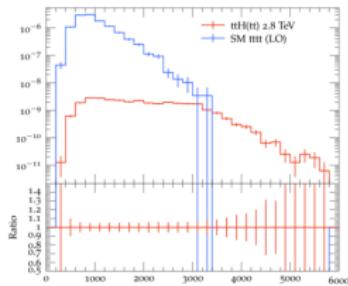


Inclusive $InvM_{ttbar34}$

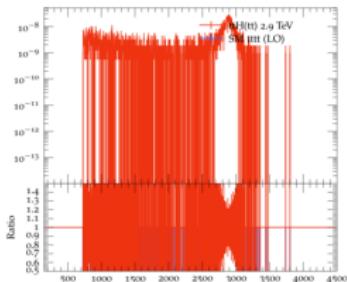


Inclusive $dR_{ttbar12}$

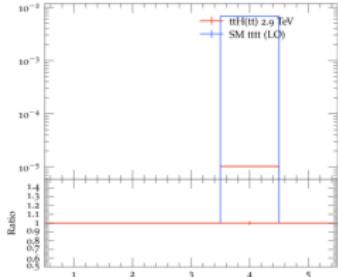
Sample: ttH 2800 GeV - event level plots



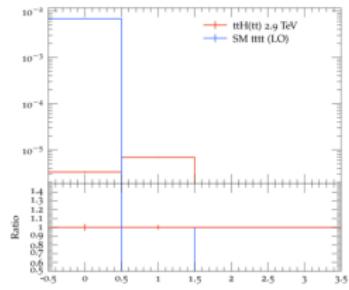
Sample: ttH 2900 GeV - parton level plots



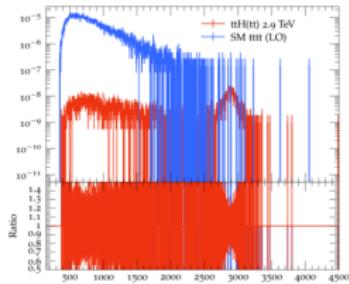
Inclusive mH



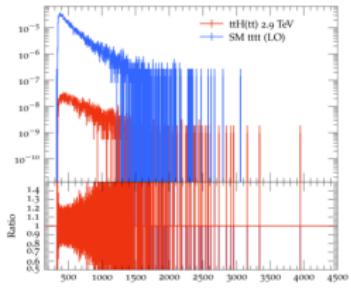
Inclusive $nTop$



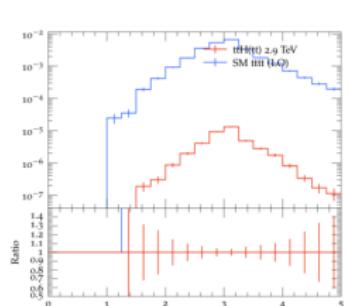
Inclusive nH



Inclusive $InvM_{ttbar12}$

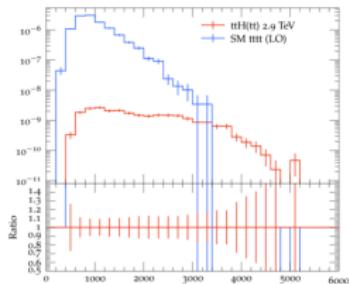


Inclusive $InvM_{ttbar34}$

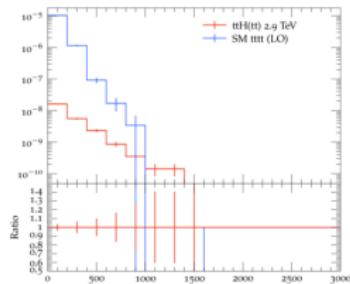


Inclusive $dR_{ttbar12}$

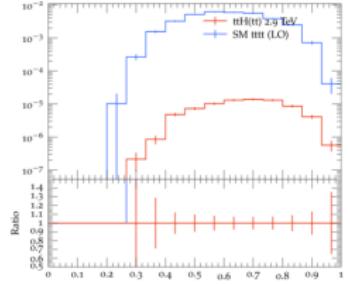
Sample: ttH 2900 GeV - event level plots



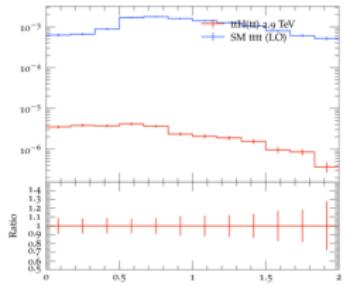
BaselineSR HT 3



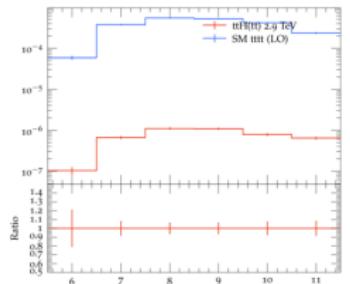
BaselineSR MET



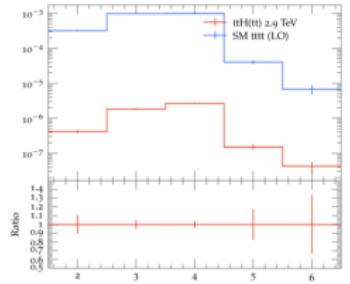
BaselineSR centrality



*BaselineSR deltaR bl
min*

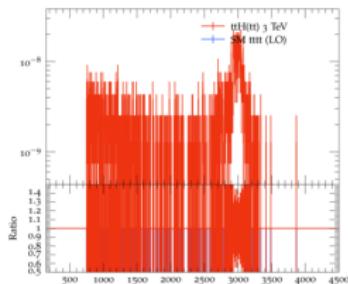


BaselineSR nJets

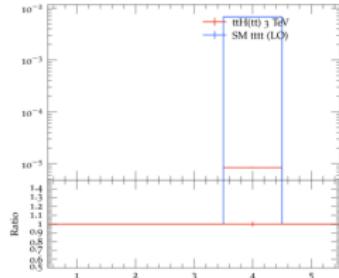


BaselineSR nBjets

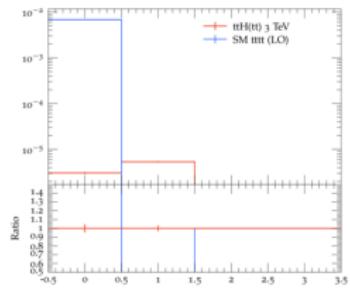
Sample: ttH 3000 GeV - parton level plots



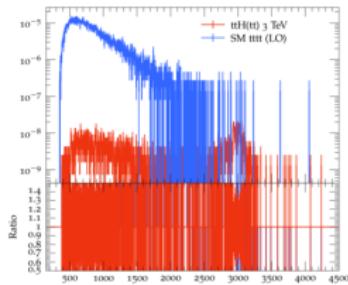
Inclusive m_H



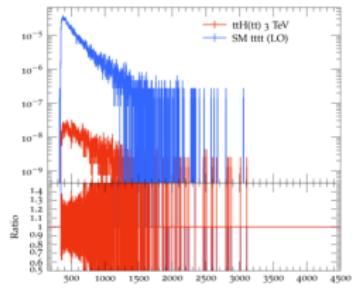
Inclusive n_{Top}



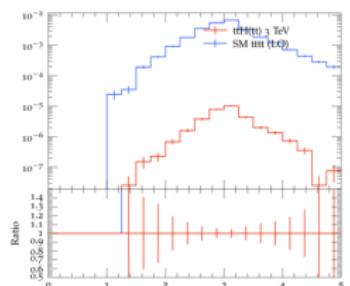
Inclusive n_H



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

