Event Selection and Reconstruction

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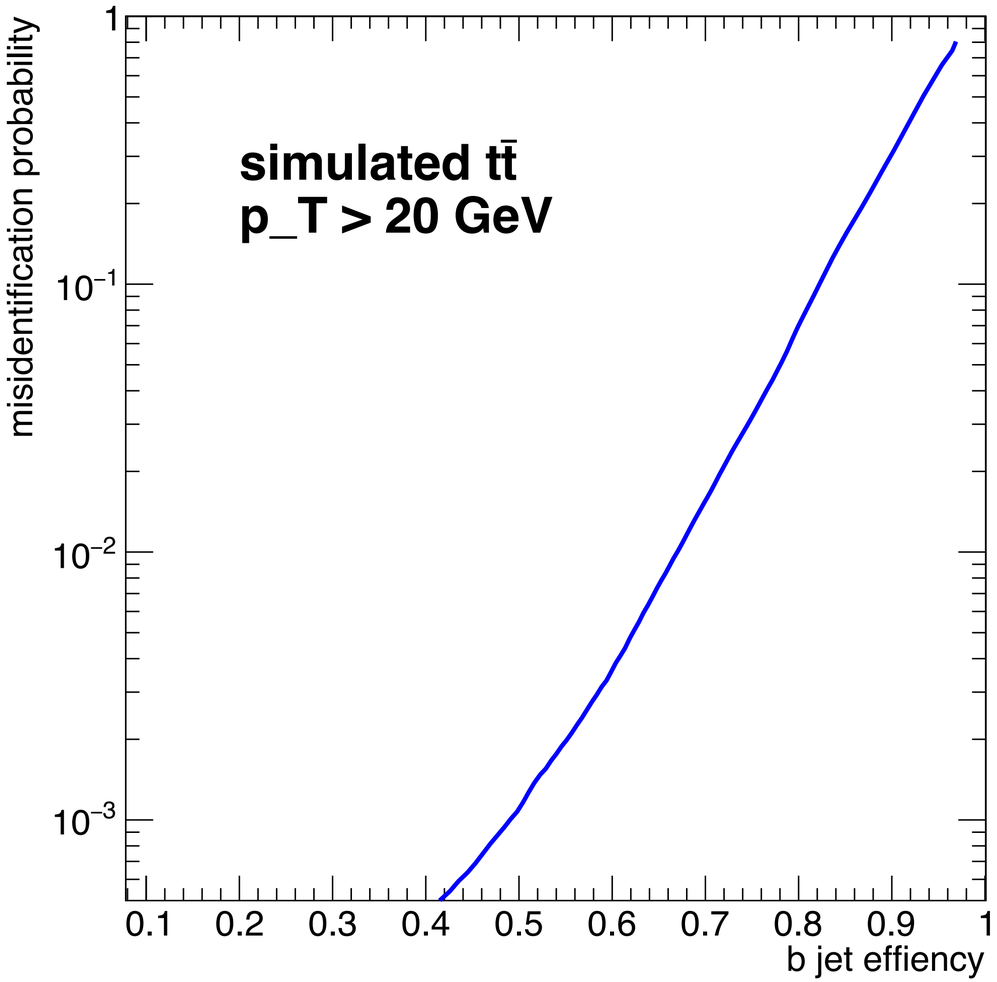
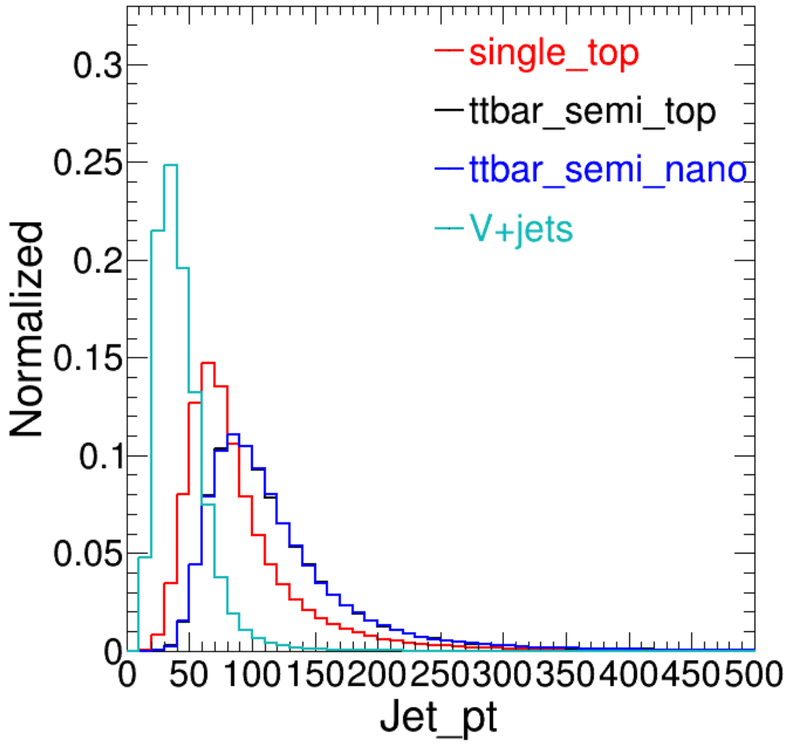
Bjet Tag

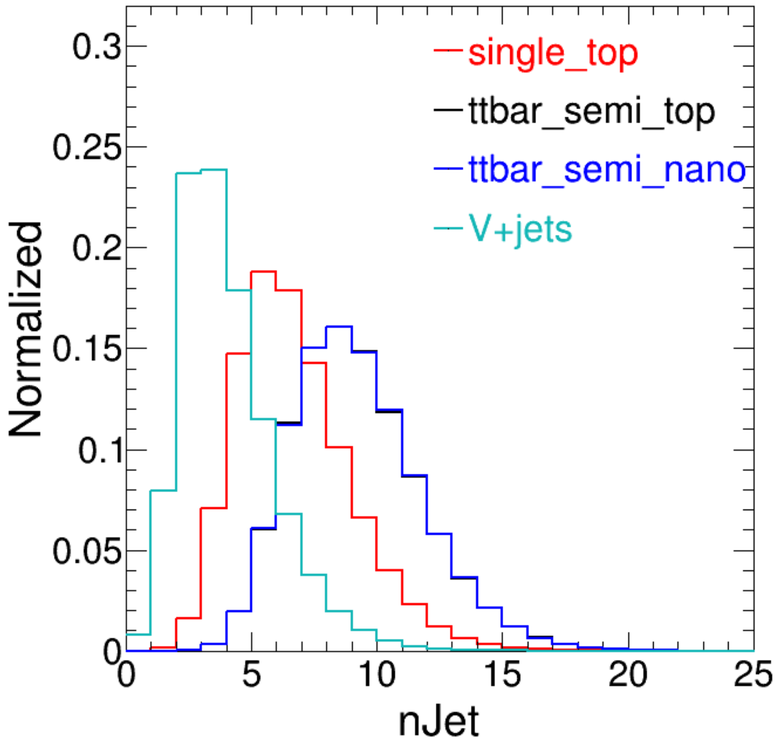
DeepCSV:

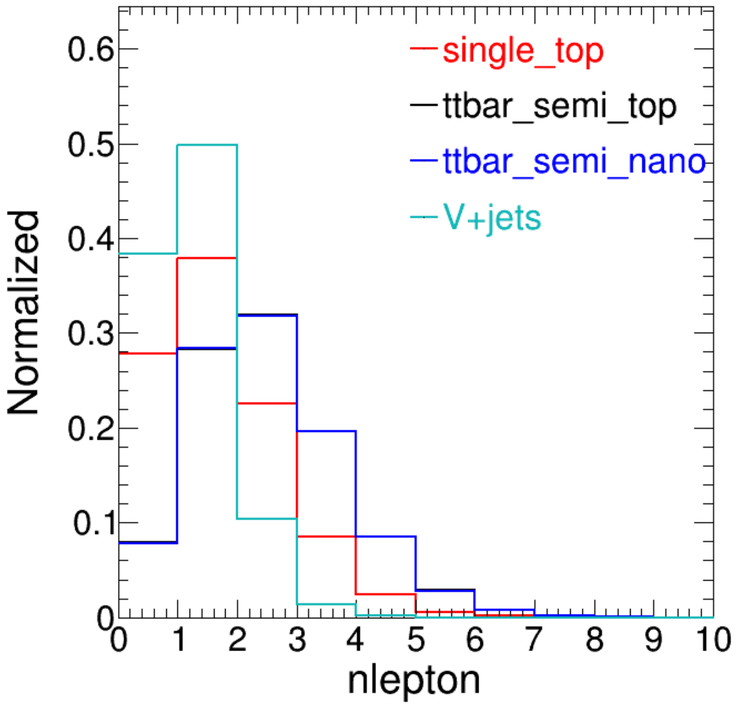
- Criteria: 0.14, efficiency 80%, misidentification 10%
- Criteria: 0.45, efficiency 64%, misidentification 1%
- Criteria :0.79, efficiency 49%, misidentification 0.1%



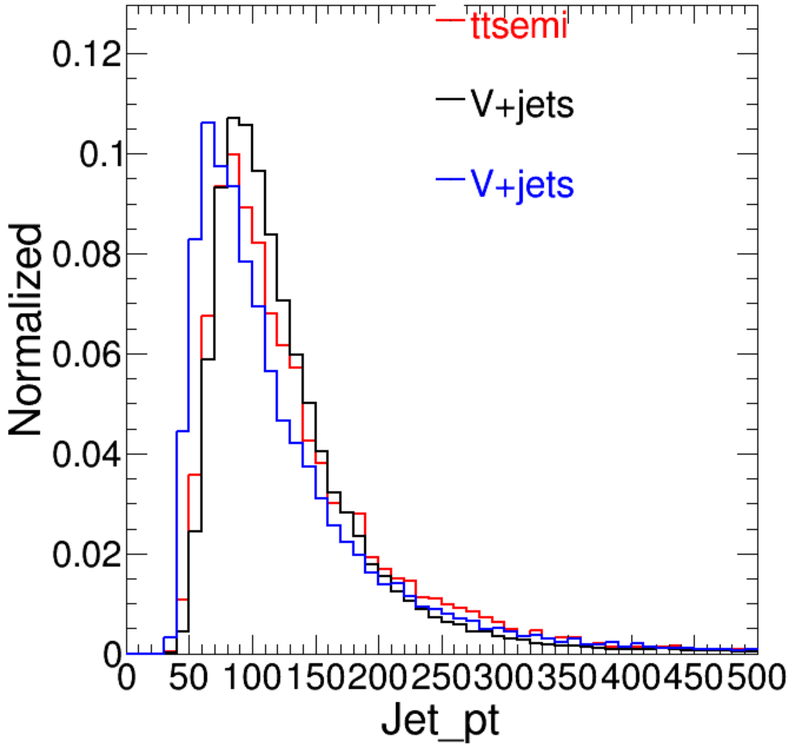
Event Distribution Without Selection

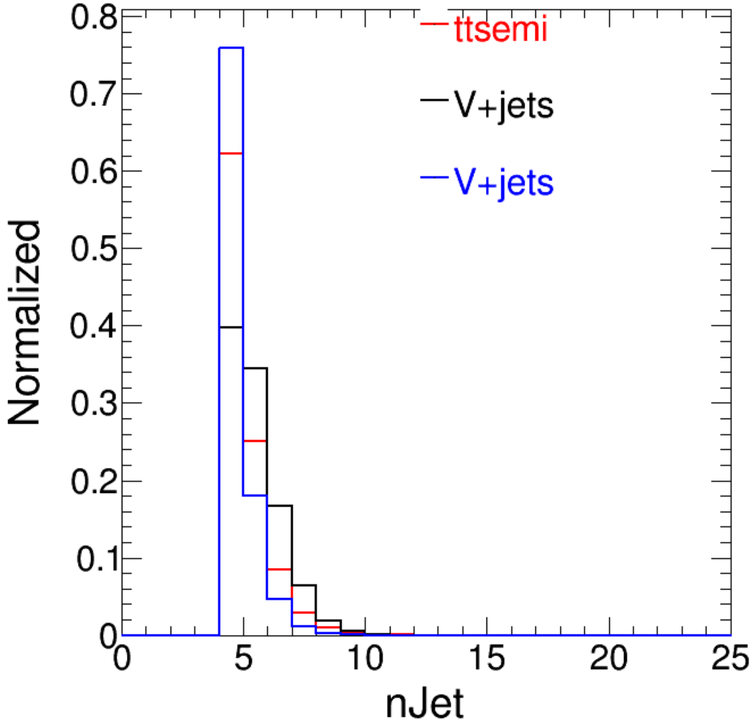


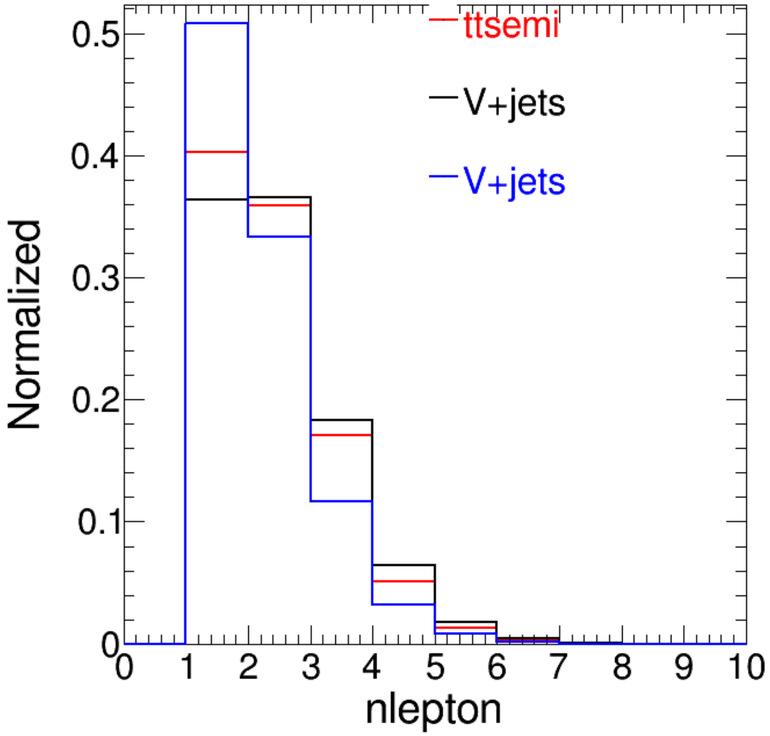




Event Distribution After Selection





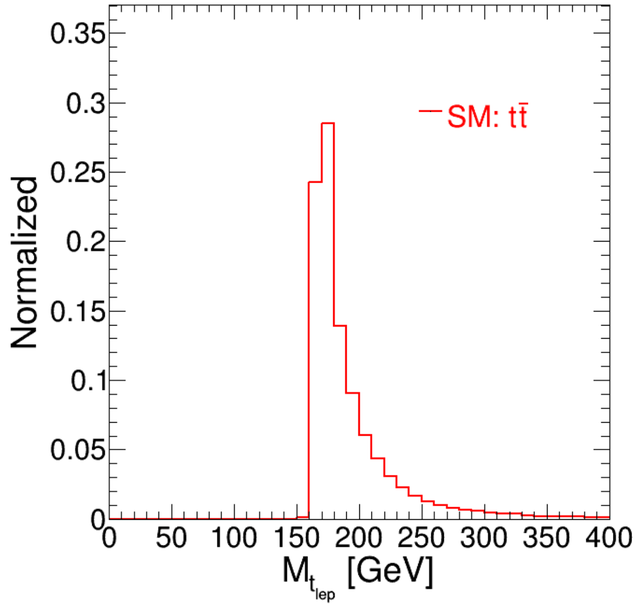


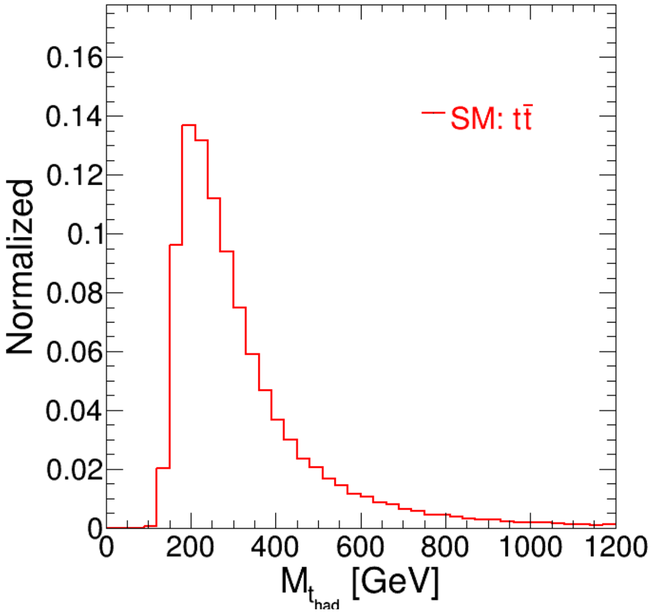
Event Selection

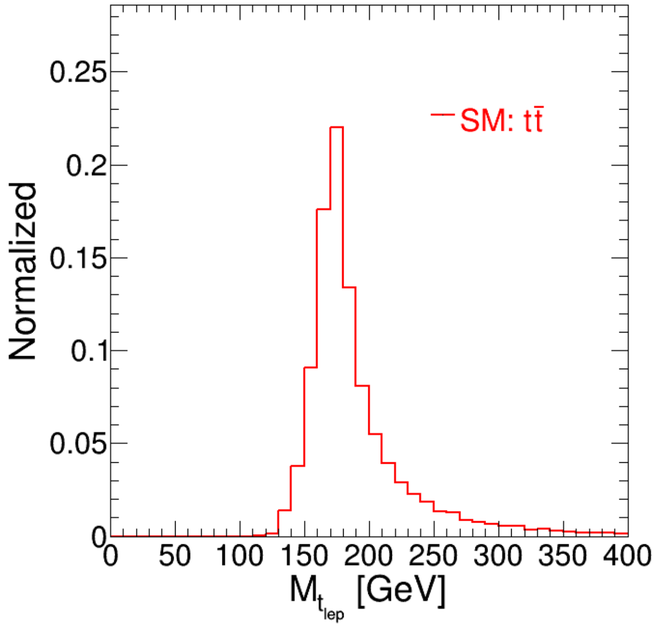
Required Criteria:

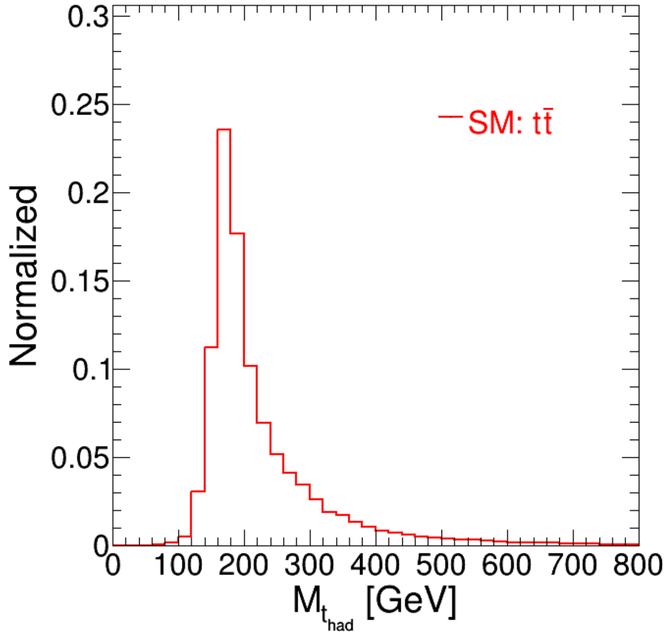
- At least 4 jets and at least two of them have to b-tagged
- Jets: $p_T > 30\ GeV, \quad |\eta| < 2.4$
- Exactly one lepton(μ, e): $p_T > 30\ GeV, \quad |\eta| < 2.4$
- Veto additional lepton(μ, e): $p_T > 30\ GeV, \quad |\eta| < 2.4$

Event Reconstruction









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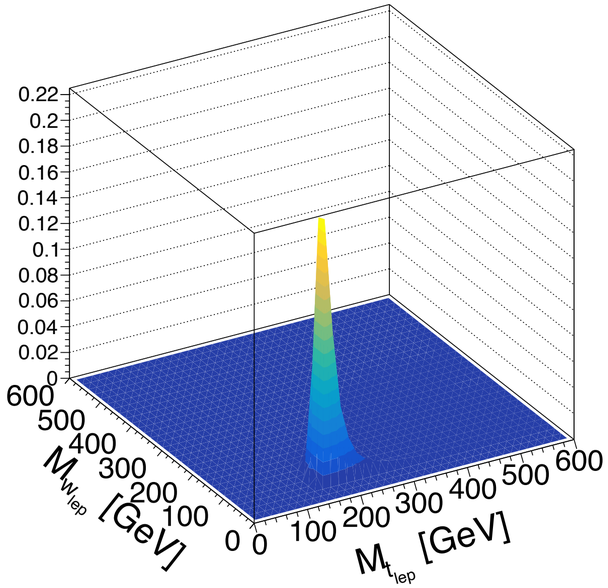
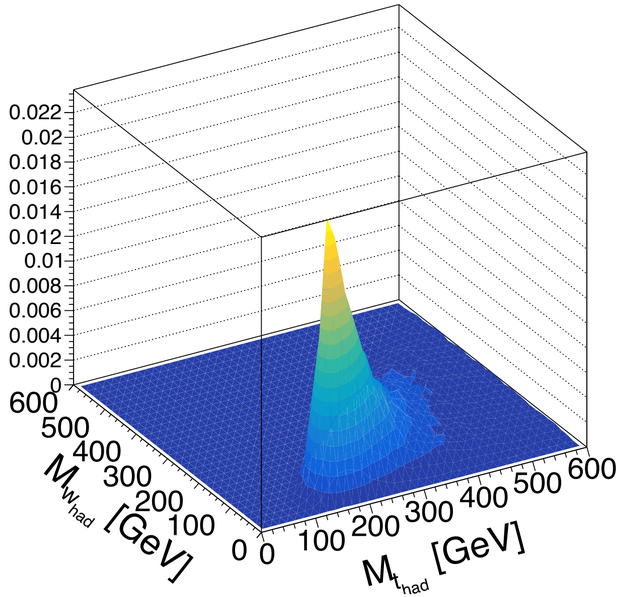
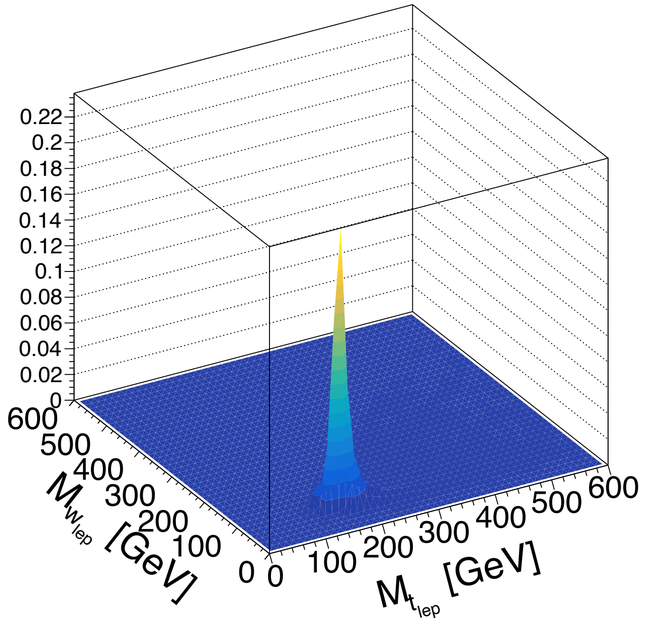
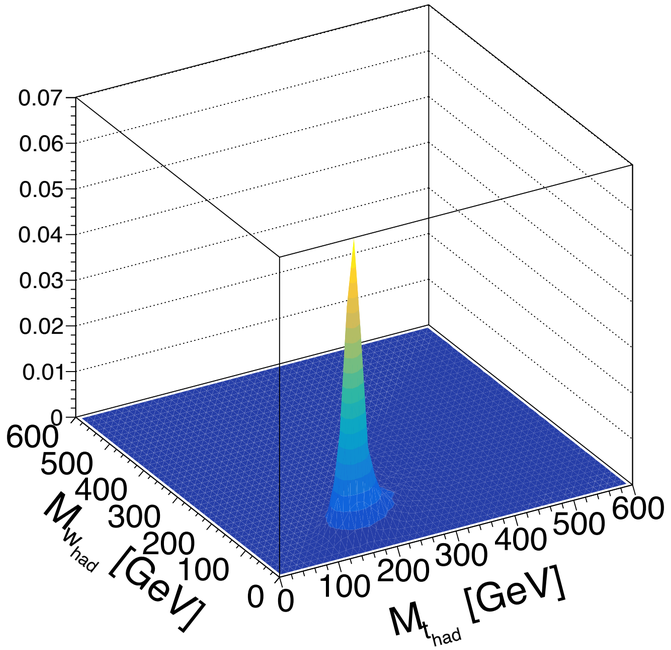
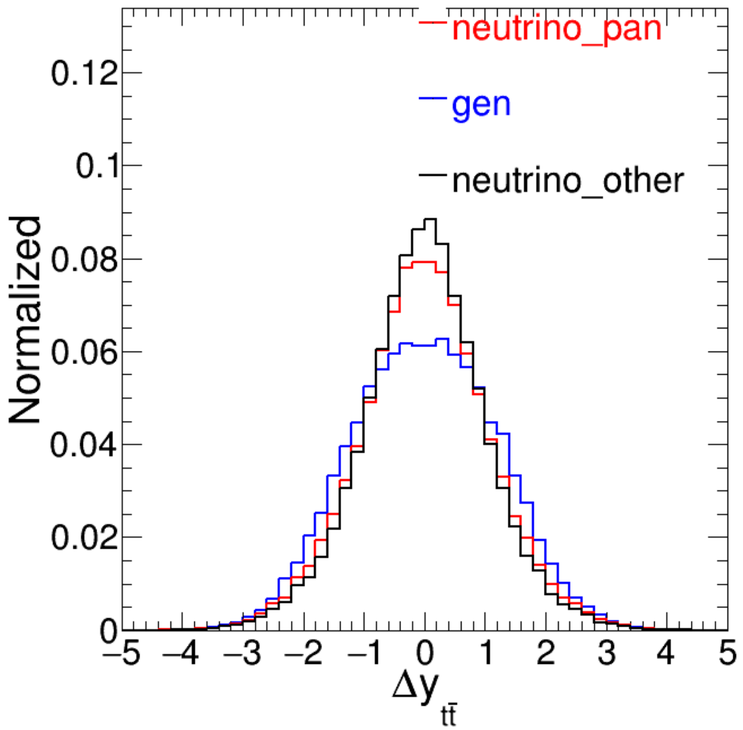


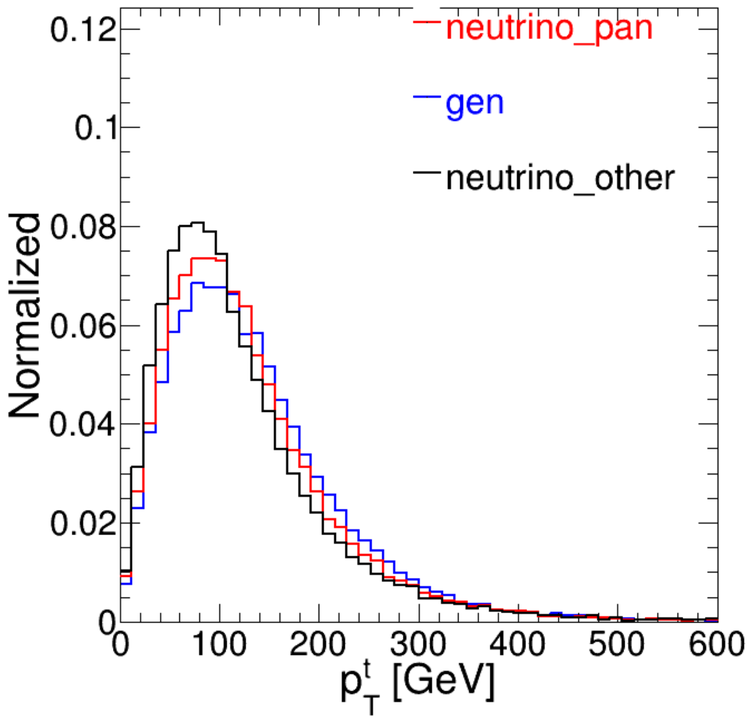


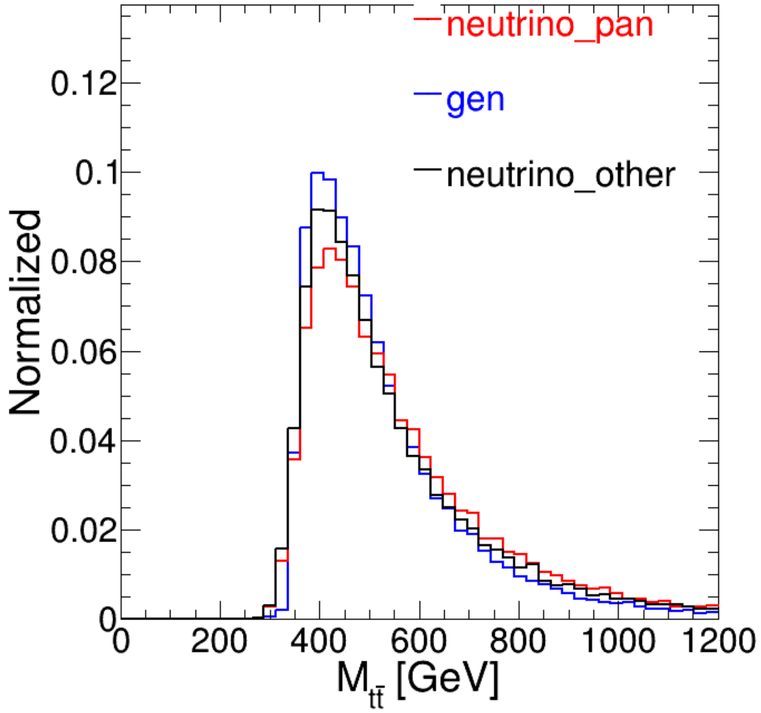




Even Distribution in Reconstruction Level







Number of events and efficiency

	3jets	4jets	>=5jets	efficiency (>=4jets)
tt right reco	130520	92900	71640	0.37
tt wrong reco	29298	17356	43073	0.14
tt nonreco	50465	88760	80960	0.38
tt background	53465	26085	25047	0.11
tt total	263748	225101	220720	1.00

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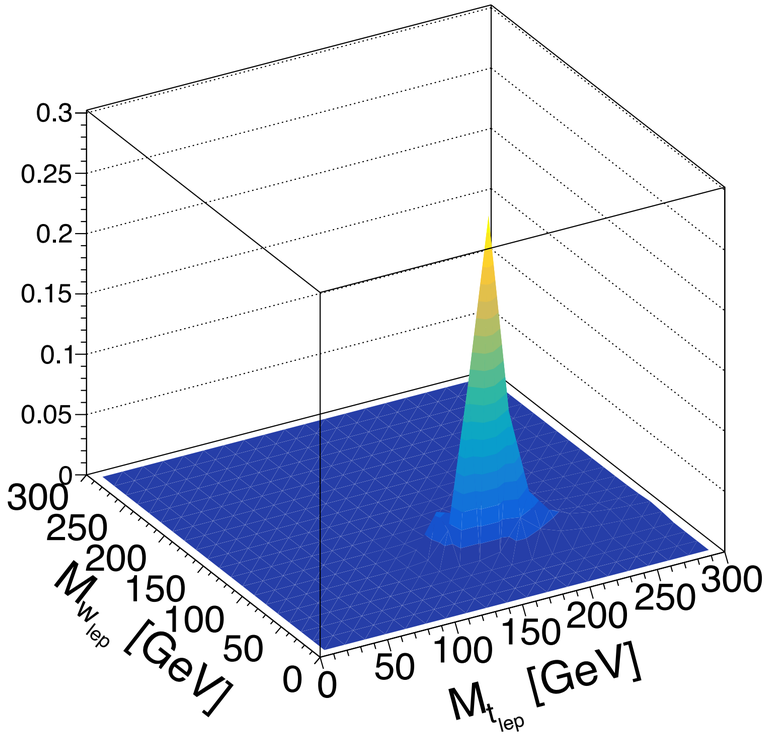
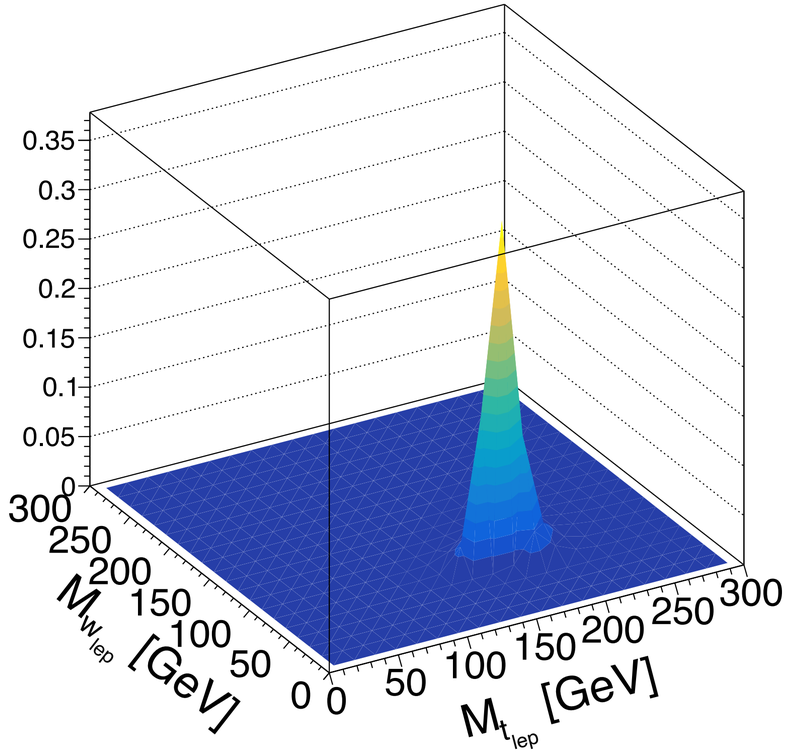
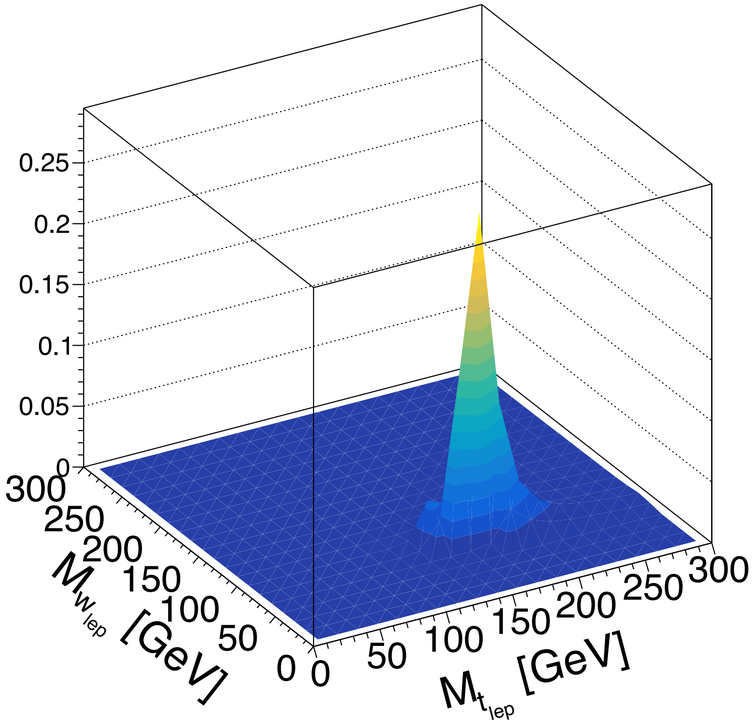


All

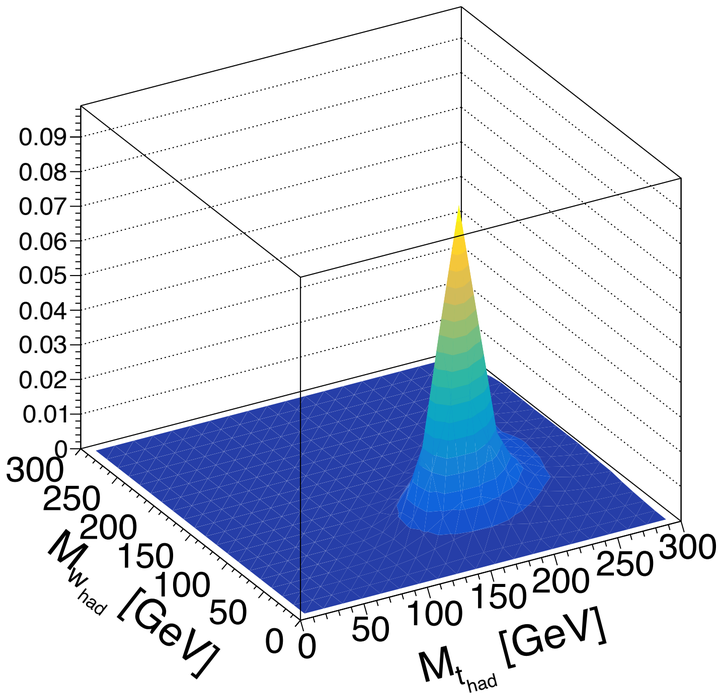


Right

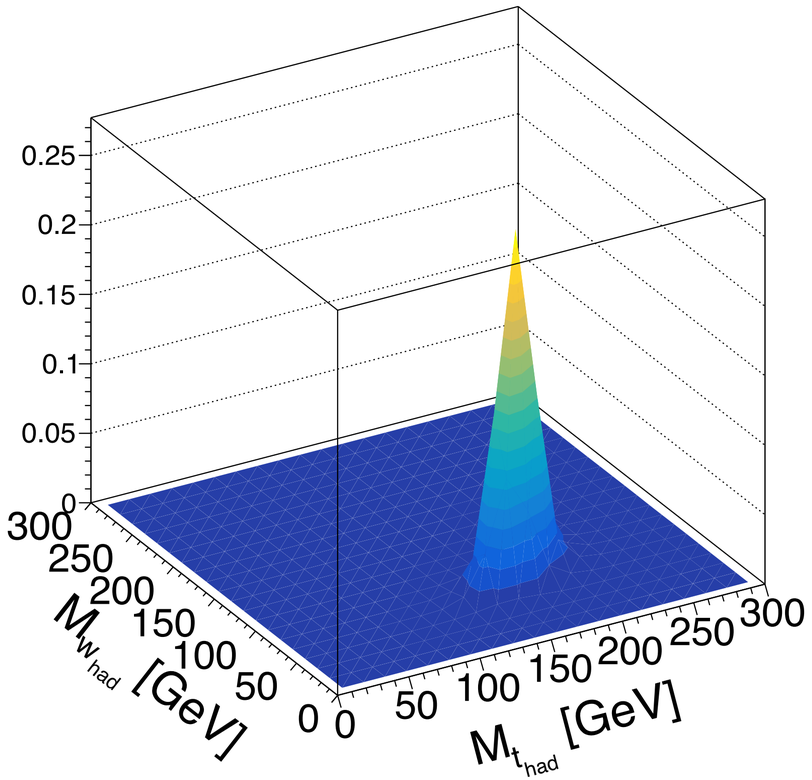


Wrong

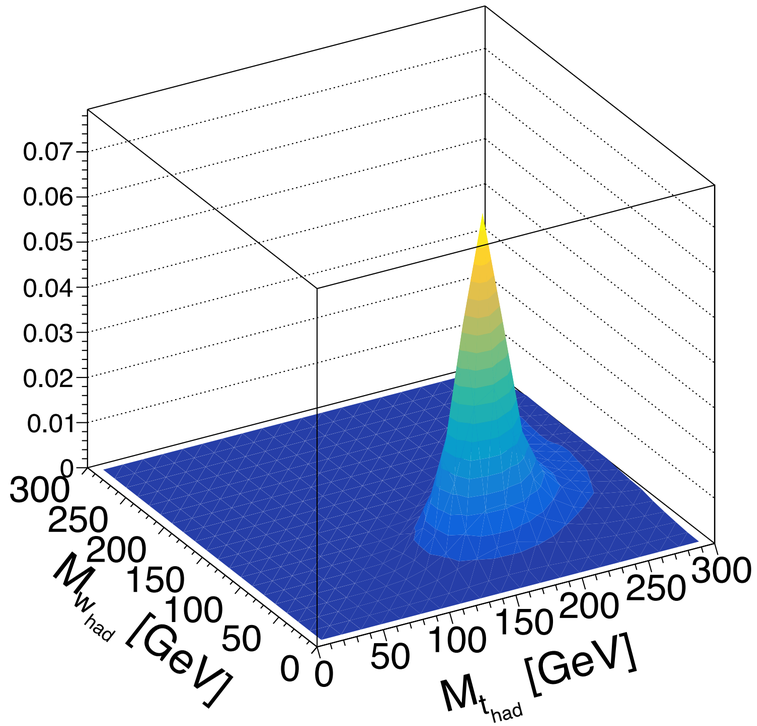
$$\text{Probability} = P_{tw}(m_t, m_w)$$



All



Right



Wrong

$$-ln\left(P_{tw,had}^{right}\right) - ln\left(P_{tw,had}^{wrong}\right) - ln\left(P_{tw,lep}^{right}\right) - ln\left(P_{tw,lep}^{wrong}\right)$$

Comparison Efficiency

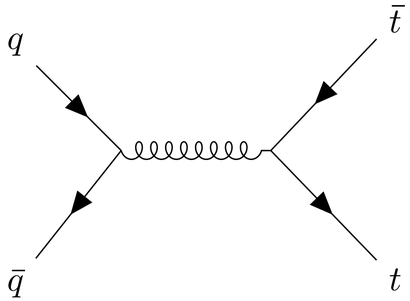
	efficiency (>=4jets)	temporary
tt right reco	0.37	0.16
tt wrong reco	0.14	0.35
tt nonreco	0.38	0.34
tt bkg	0.11	0.15
tt total	1.00	1.00

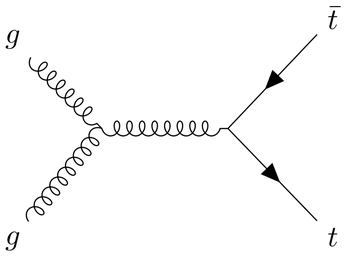
Misidentify: 13%; light jets wrong match: 20%; bjet wrong match: 2%

tHW Sample with Anomalous Couplings

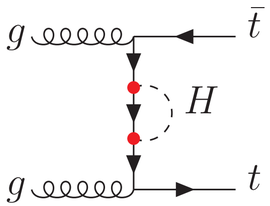
```
tHW_H4l125_JHUGen_couplings0010.lhe  tHW_H4l125_JHUGen_couplings1000.lhe
tHW_H4l125_JHUGen_couplings0011.lhe  tHW_H4l125_JHUGen_couplings1001.lhe
tHW_H4l125_JHUGen_couplings0020.lhe  tHW_H4l125_JHUGen_couplings1010.lhe
tHW_H4l125_JHUGen_couplings0021.lhe  tHW_H4l125_JHUGen_couplings1011.lhe
tHW_H4l125_JHUGen_couplings0100.lhe  tHW_H4l125_JHUGen_couplings1020.lhe
tHW_H4l125_JHUGen_couplings0101.lhe  tHW_H4l125_JHUGen_couplings1021.lhe
tHW_H4l125_JHUGen_couplings0110.lhe  tHW_H4l125_JHUGen_couplings1101.lhe
tHW_H4l125_JHUGen_couplings0111.lhe  tHW_H4l125_JHUGen_couplings1110.lhe
tHW_H4l125_JHUGen_couplings0120.lhe  tHW_H4l125_JHUGen_couplings1120.lhe
tHW_H4l125_JHUGen_couplings0121.lhe  tHW_H4l125_JHUGen_couplings1121.lhe
```

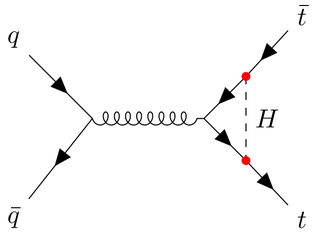
Top Quark Pairs Production

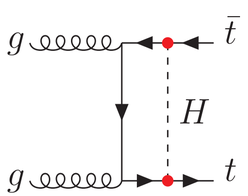




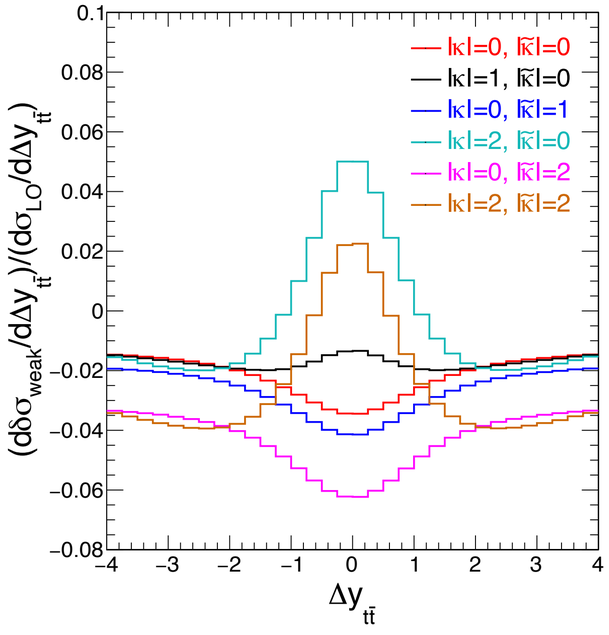
$t\bar{t}$ production at LO

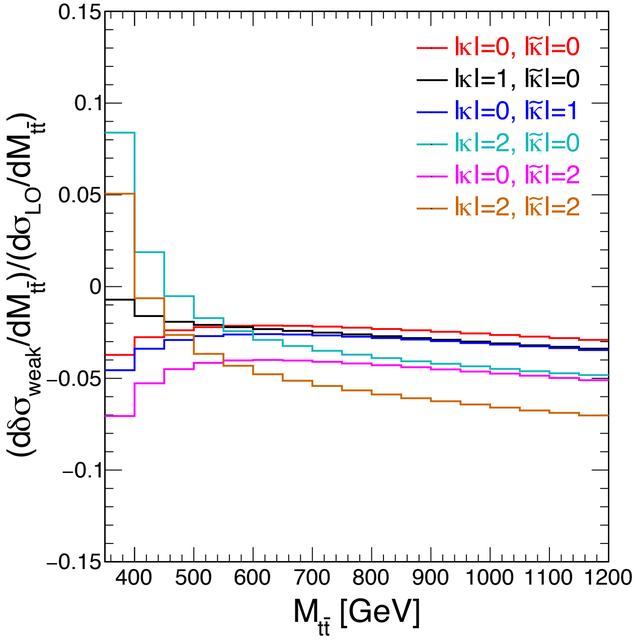




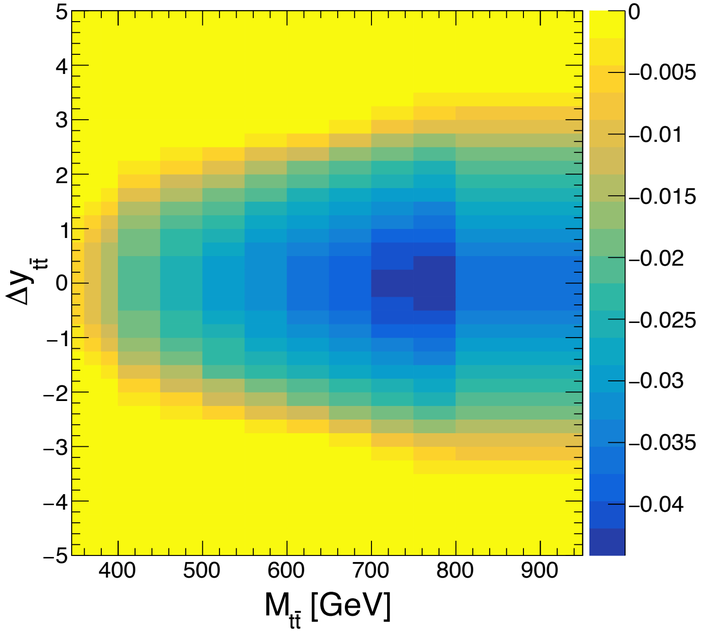


Higgs loop corrections





NLO EW corrections



EW Corrections in 2D

EW NLO Corrections at $t\bar{t}$

```
(base) renqi@ubuntu:EW_2Dcorrection$ ls
draw.cpp          EWci0110.root  EWci1020.root
EWci0010.root     EWci0120.root  EWci1110.root
EWci0020.root     EWci1010.root  EWci1120.root
```

Expected Number of Events

Cross Sections and Number of Events							
Process	Cross section(pb)	Events without cuts	Events after cuts	Efficiency(%)	weights	Expected Events	K Factor
TT_inclusive	831.7						1
TTToSemiLeptonic	366.9142888	520000	42802	8.231	96.738	4,140,595.432	1
TTTo2L2Nu	89.0482256						1
TTToHadronic	377.9600616						1
QCD HT100to200	27990000	19263057	107	0.001	199,211.838	21,315,666.719	1
QCD HT200to300	1712000	32971159	9055	0.027	7,118.803	64,460,765.119	1
QCD HT300to500	347700						1
QCD HT500to700	32100	57339690	27146	0.047	76.752	2,083,497.537	1
QCD HT700to1000	6831	47569353	131174	0.276	19.688	2,582,511.461	1
QCD HT1000to1500	1207	15675643	43689	0.279	10.556	461,202.300	1
QCD HT1500to2000	119.9	10612885	25260	0.238	1.549	39,125.196	1
QCD HT2000toInf	25.2	965706	395	0.041	3.578	1,413.156	1
WW	118.7	14842000	12253	0.083	1.096	13,435.016	1
ZZ	16.5	3907000	6190	0.158	0.579	3,584.005	1
WZ	47.1	6926000	9251	0.134	0.932	8,625.108	1
ST s-channel	3.36						1
ST t-channel top	136.02						1
ST t-channel antitop	80.95						1
ST tW top	35.6	9598000	181081	1.887	0.509	92,083.028	1
ST tW antitop	35.6	7623000	204502	2.683	0.640	130,936.007	1
WJetsToLNu HT-100To200	1345.7						1.21

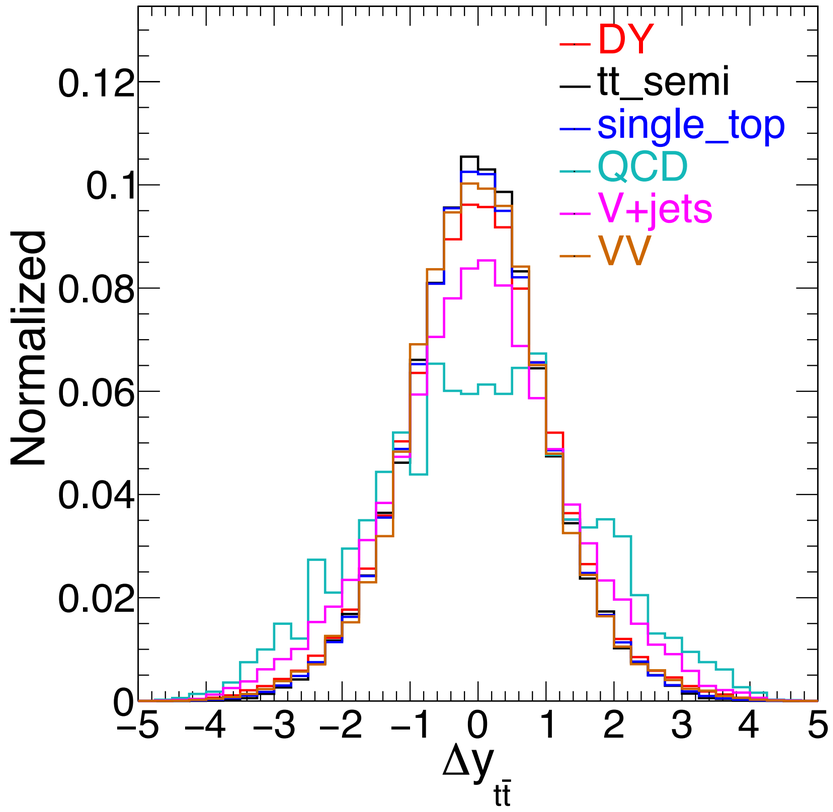
QCD Multijets

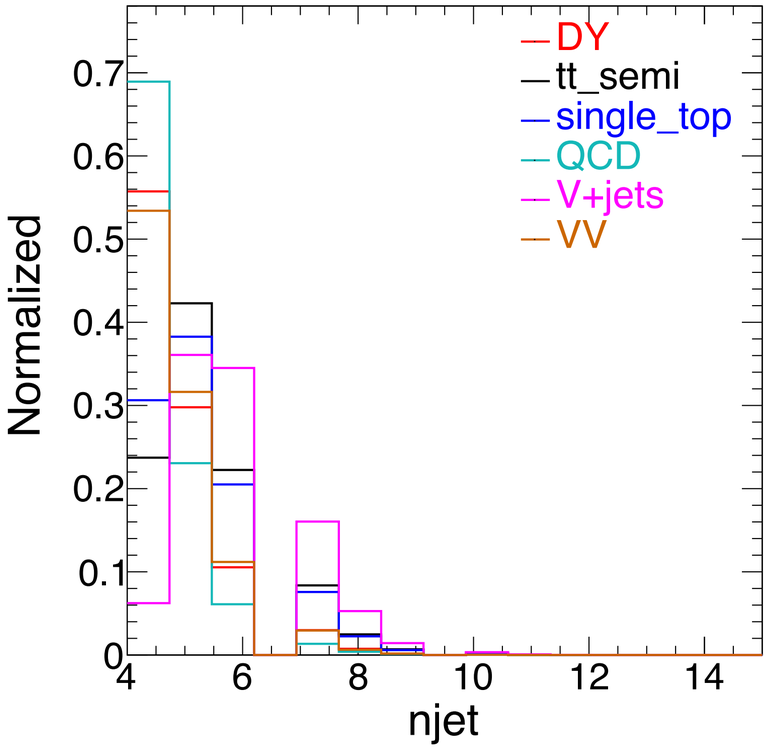
Table 6: The expected composition of SM processes in signal region in percent. The results are from SM simulation.

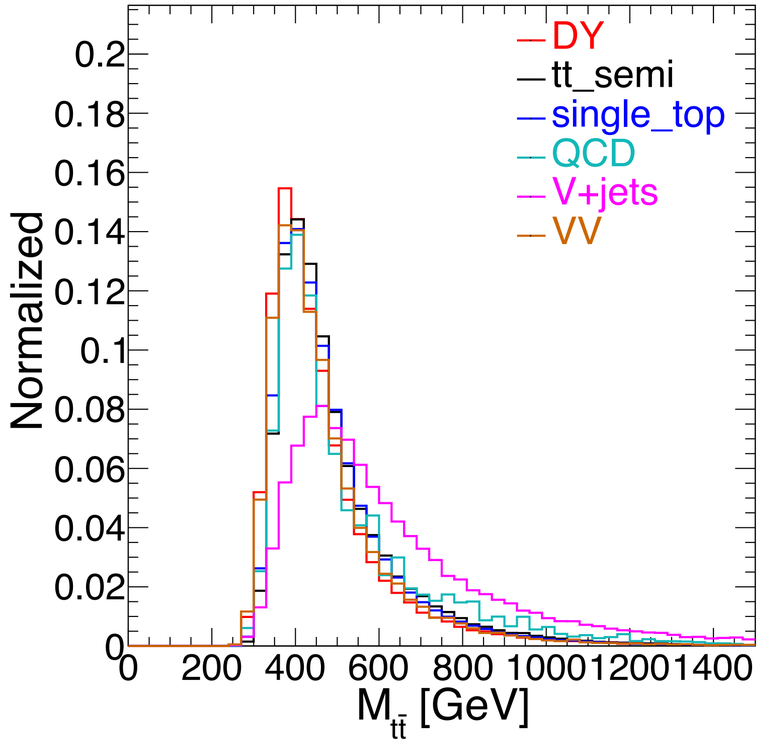
Process	Electron channel (%)	Muon channel (%)
	2016	
QCD	0.25	0.21
Z +Jets	0.29	0.17
Single t	2.54	2.58
Z Z/ WW/ WZ	0.04	0.03
W+Jets	0.61	0.64
$t\bar{t}$ (semi-leptonic)	90.79	90.79
$t\bar{t}$ (dileptonic)	5.43	5.51
$t\bar{t}$ (hadronic)	0.05	0.07
	2017	
QCD	0.21	0.97
Z +Jets	0.33	0.19
Single t	2.70	2.78
Z Z/ WW/ WZ	0.04	0.04
W+Jets	0.80	0.86
$t\bar{t}$ (semi-leptonic)	90.50	89.69
$t\bar{t}$ (dileptonic)	5.36	5.36
$t\bar{t}$ (hadronic)	0.05	0.11
	2018	

DRAFT

Event Distributions







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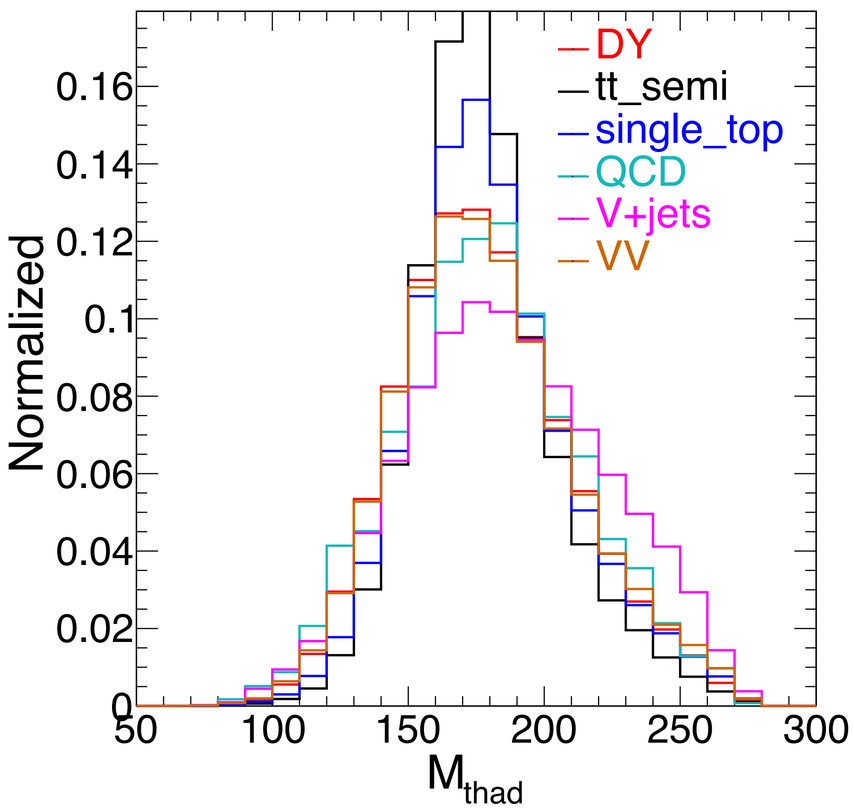

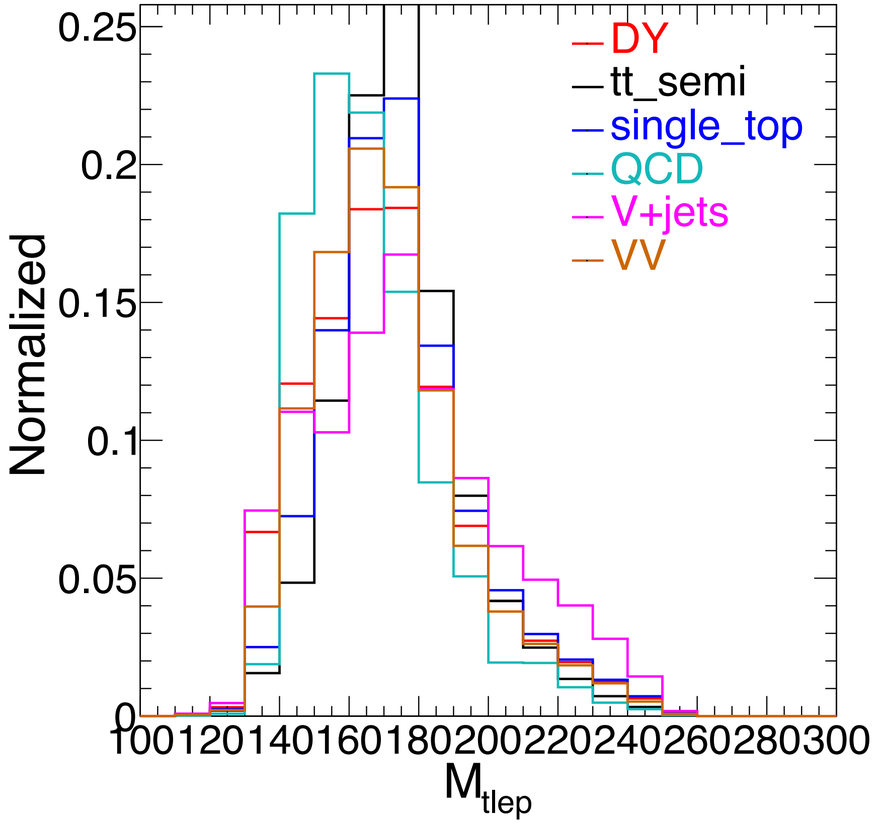

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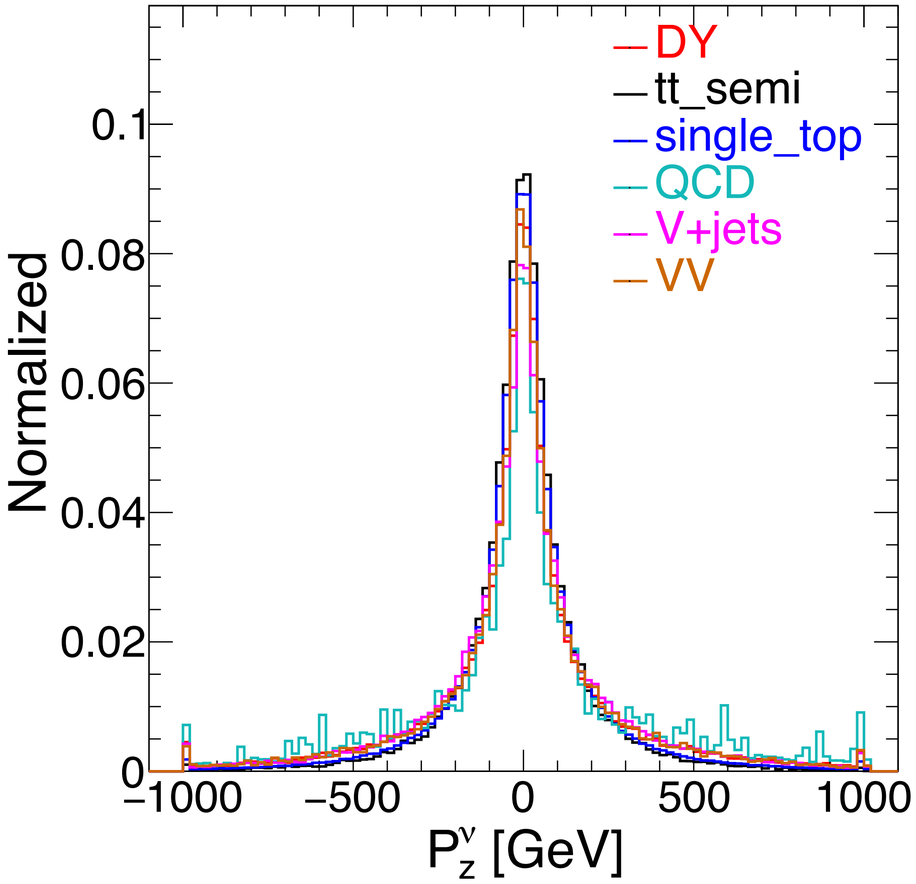

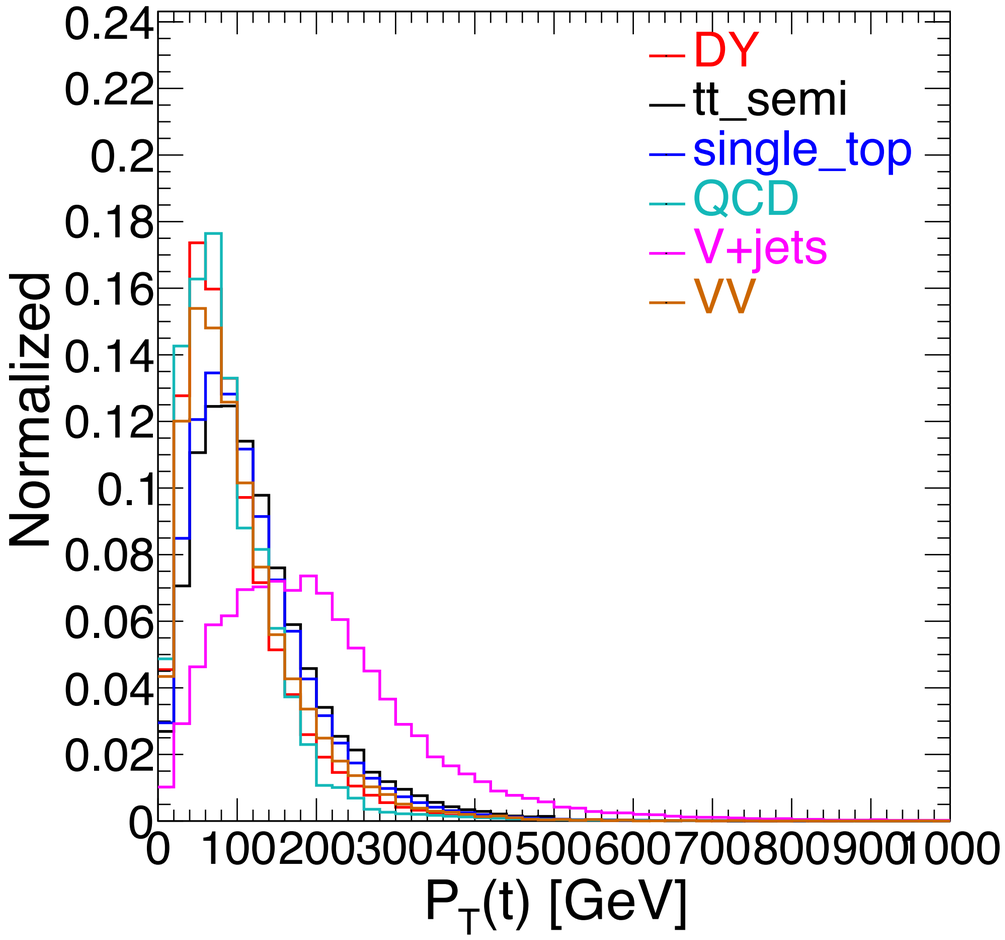

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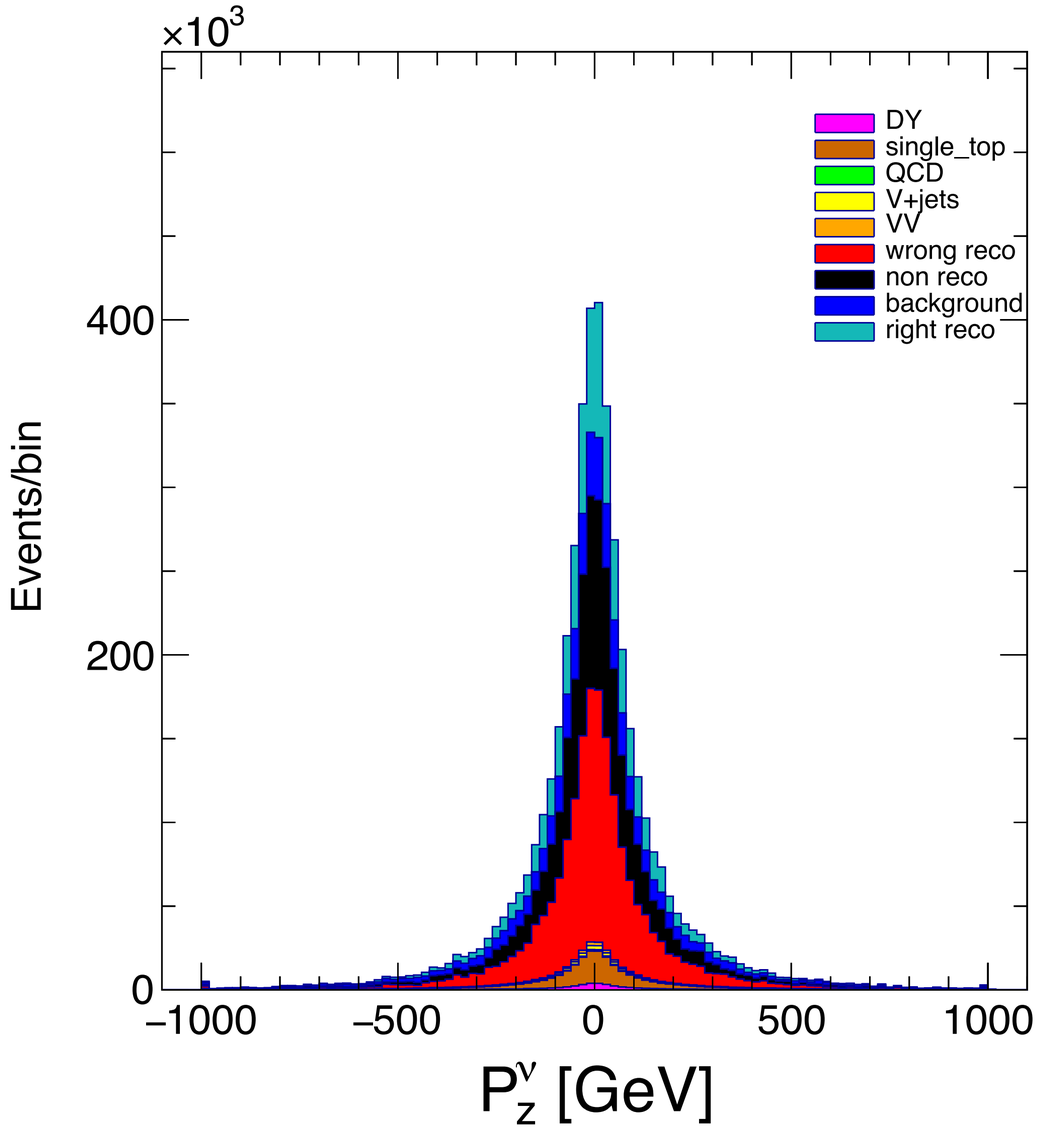
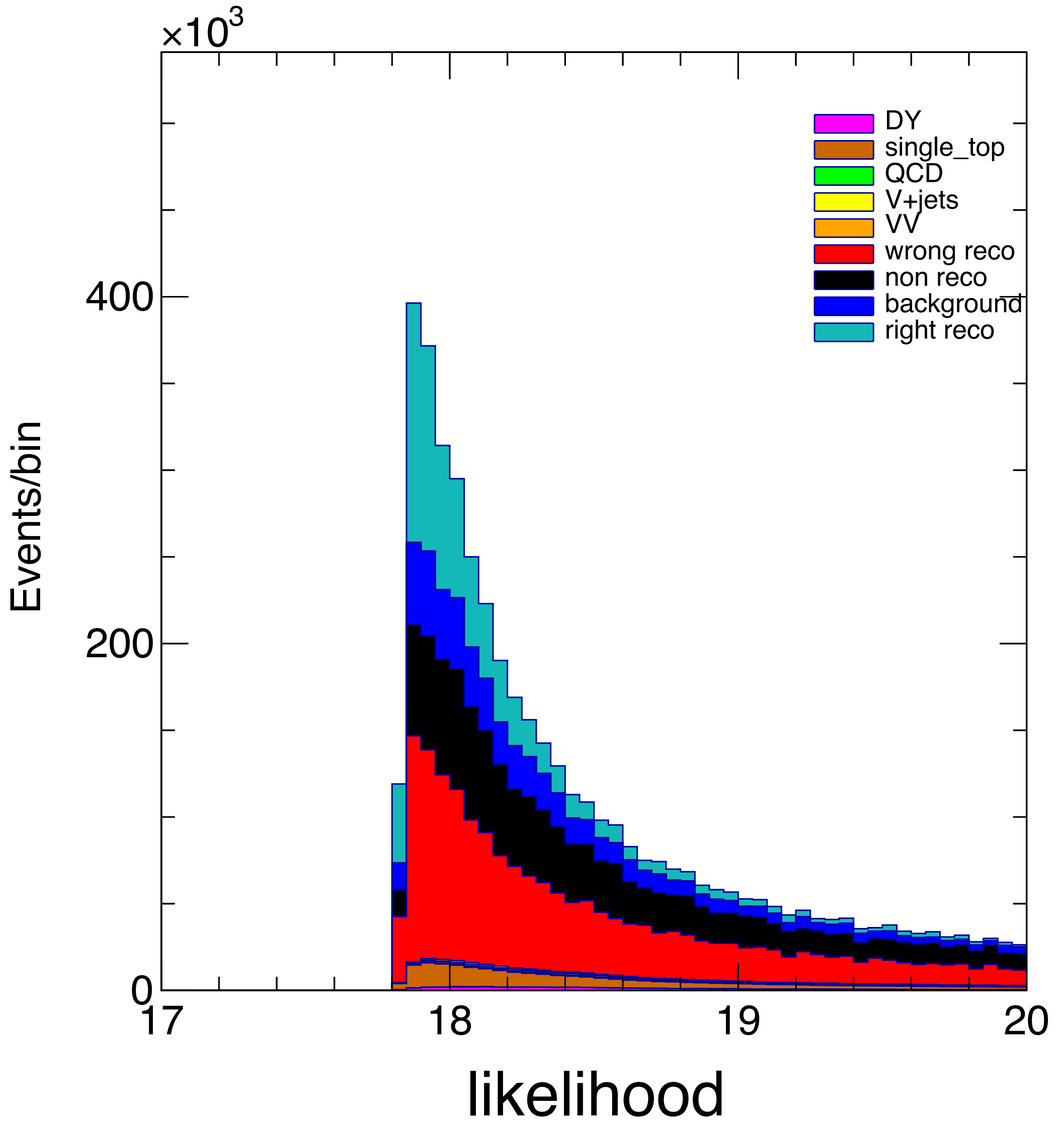
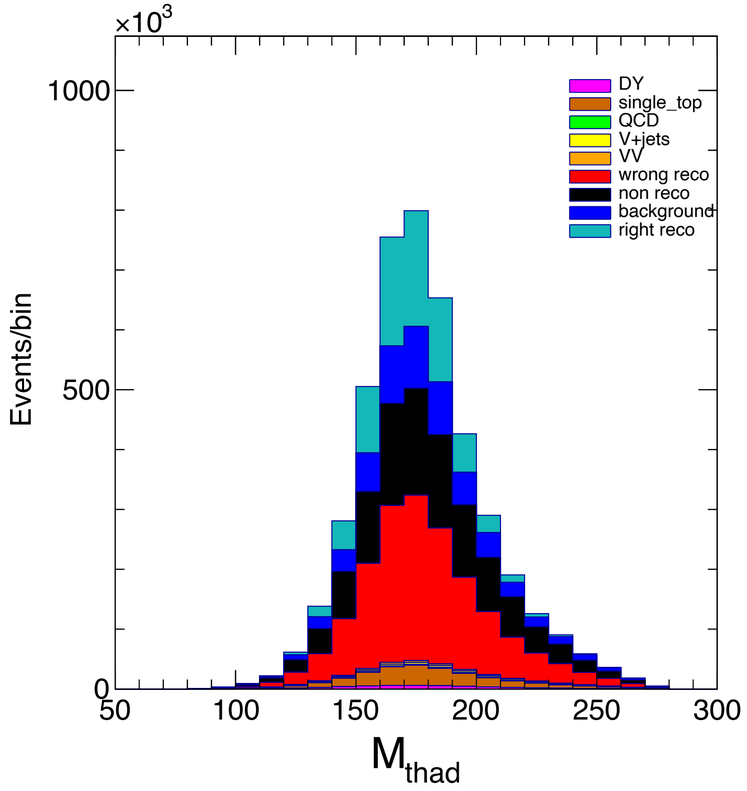
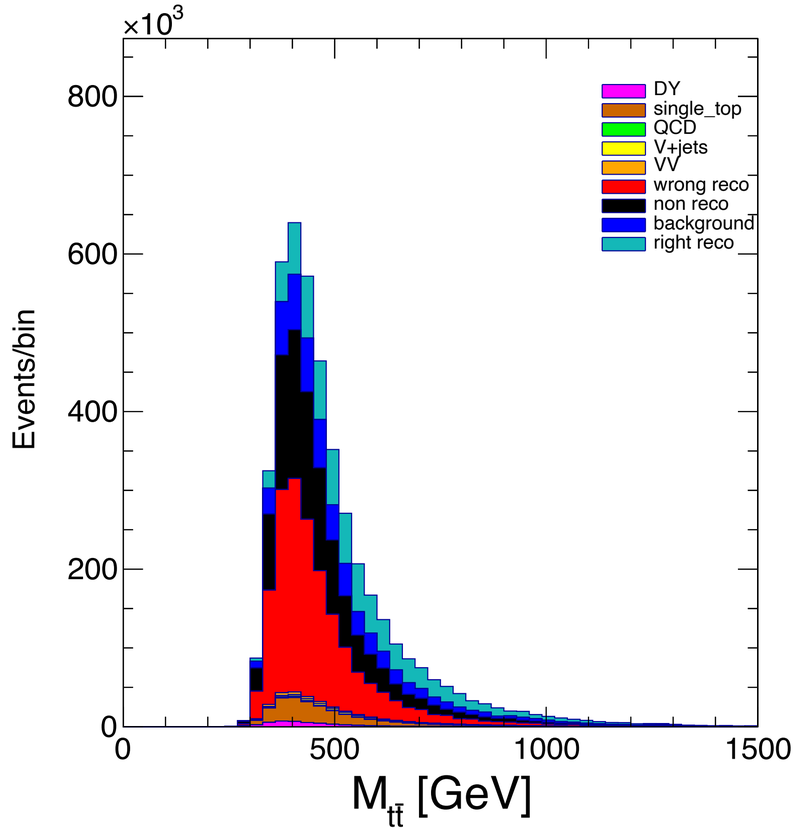
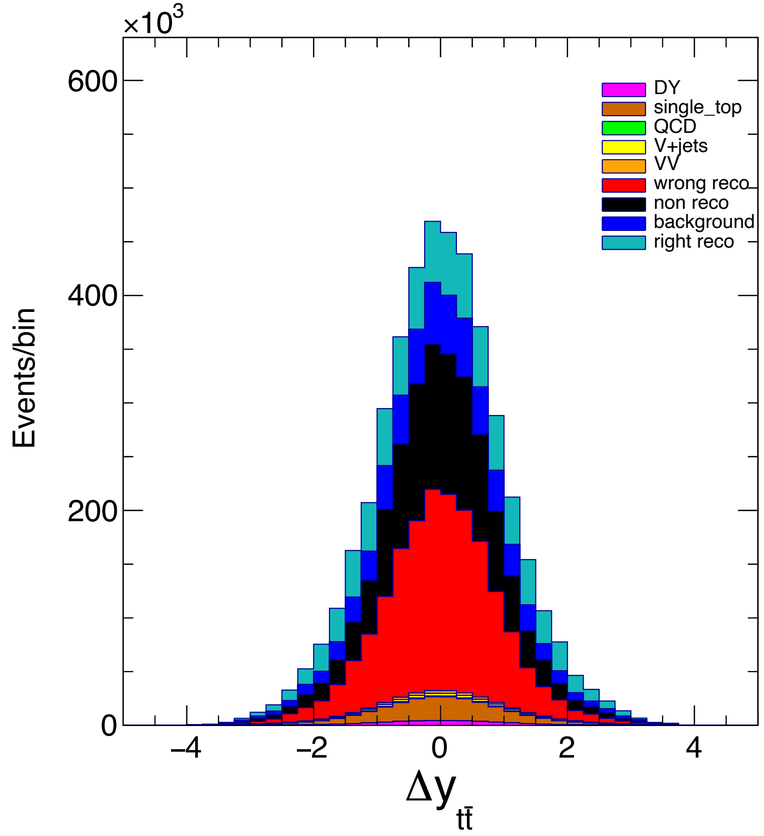




Event Distributions

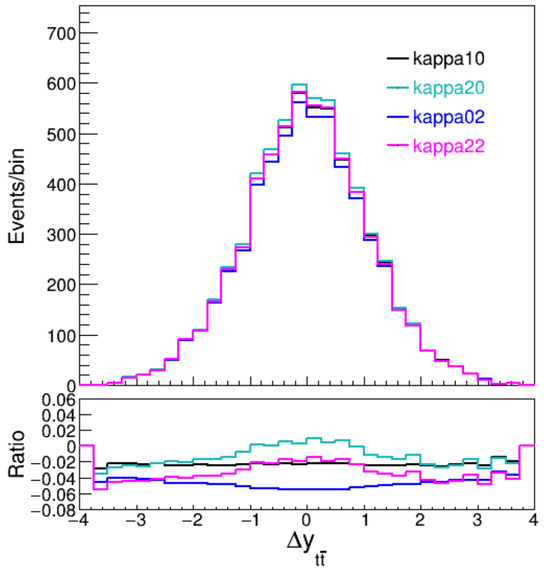




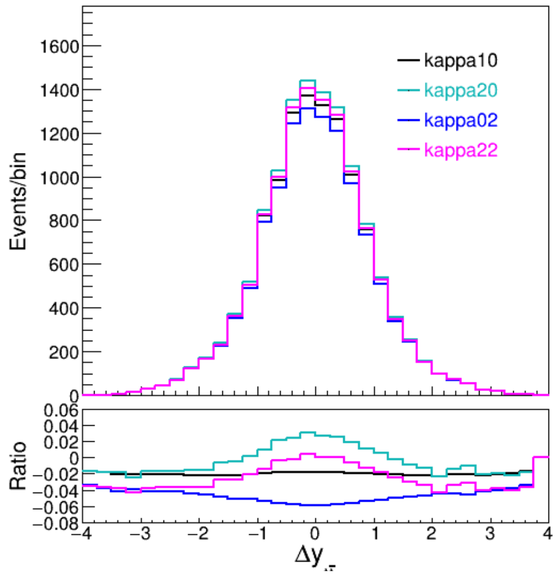


EW Corrections at Reconstruction Level

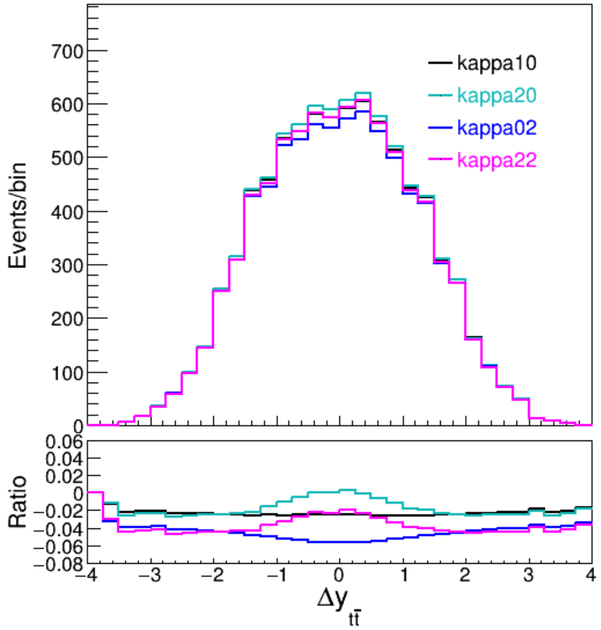
tt background



Non rec



tt right



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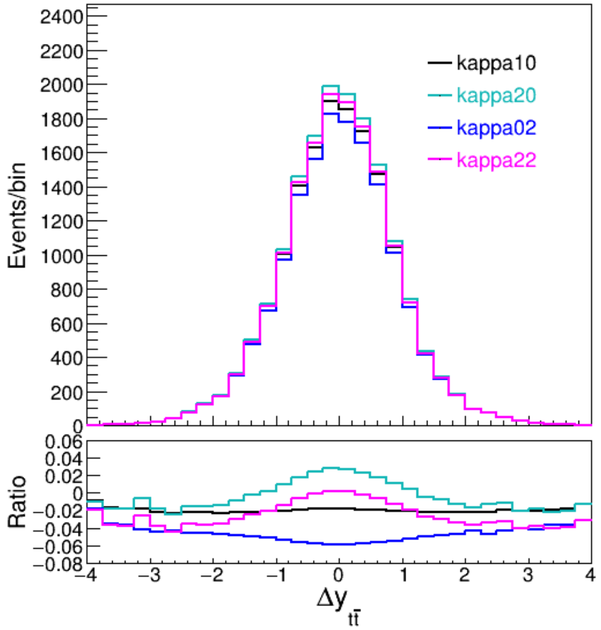
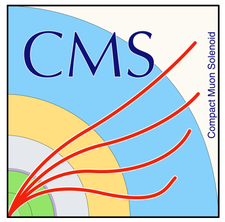
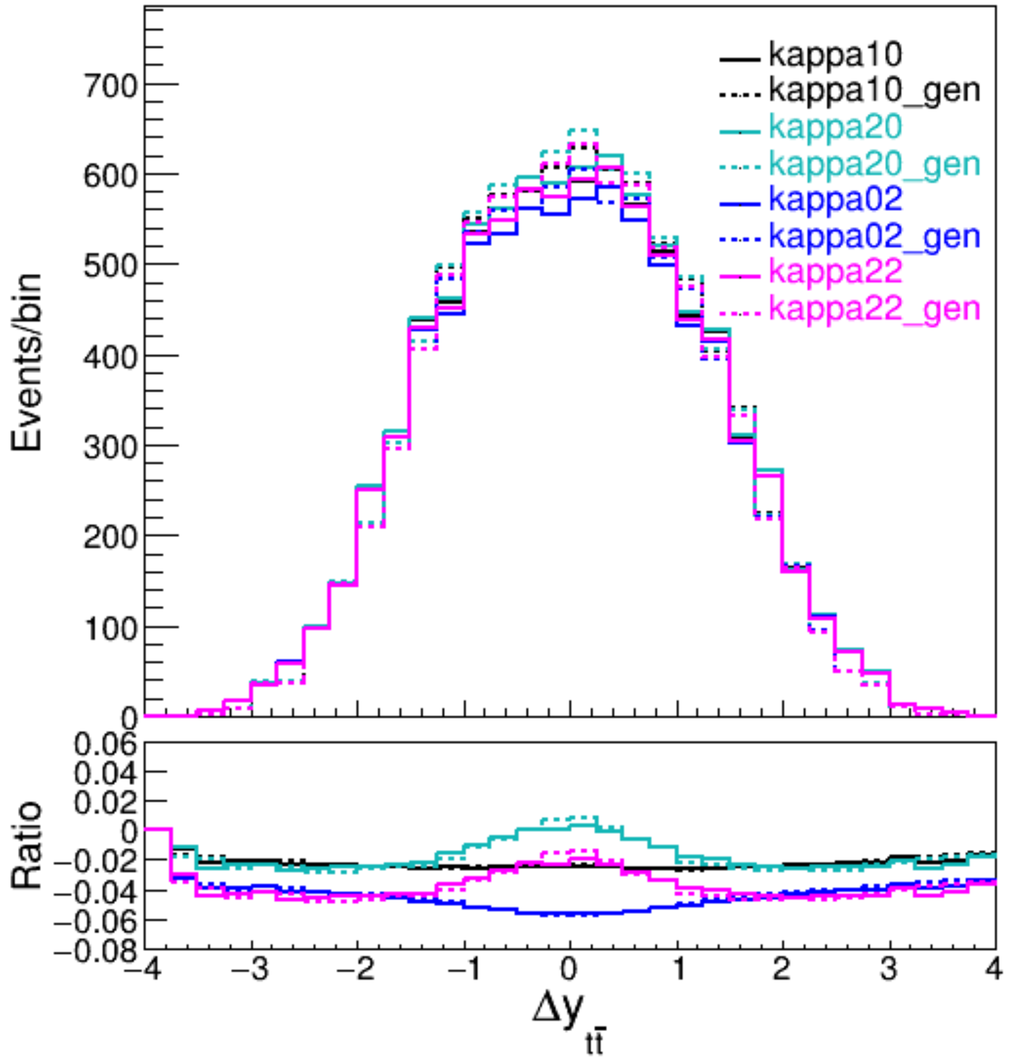




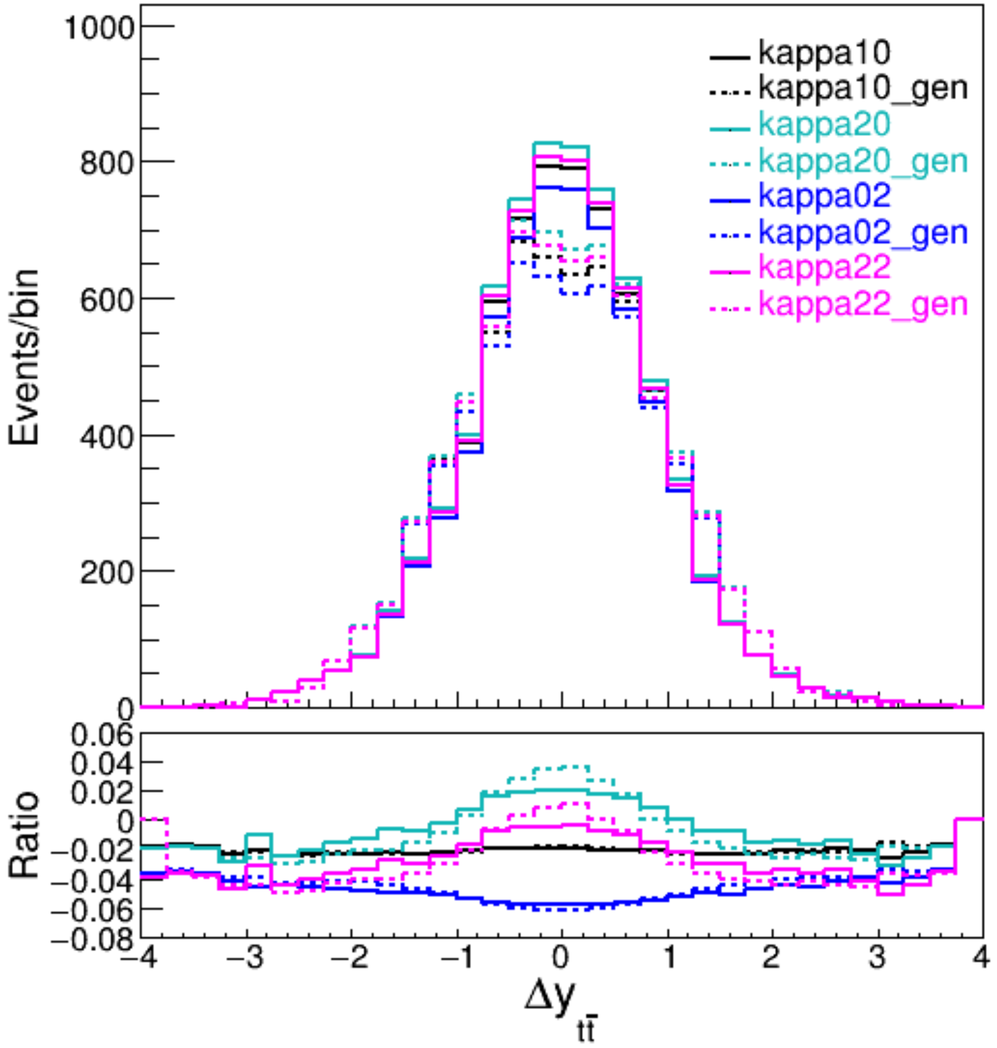
Signal vs Background

Ren-Qi Pan, Yue-Kai Song, Ming Tang
Zhejiang University
renqi.pan@cern.ch

EW Corrections in $\Delta y_{t\bar{t}}$

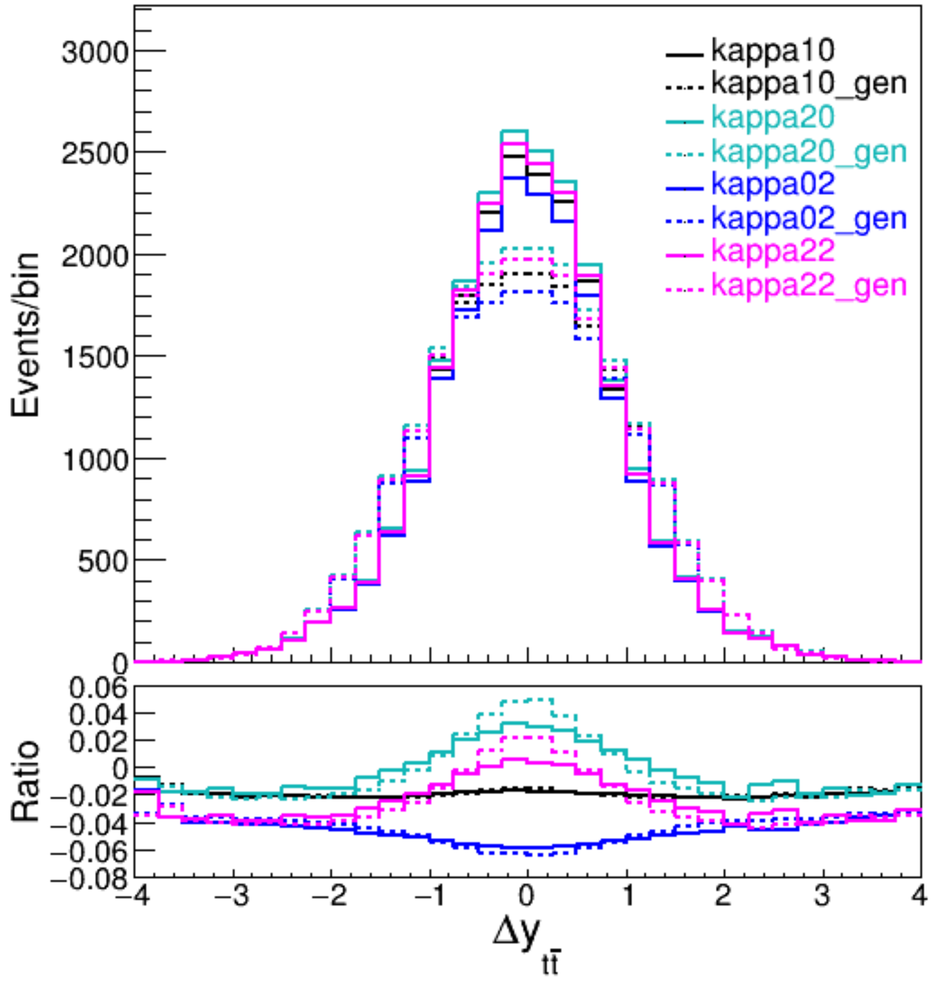


Right reco

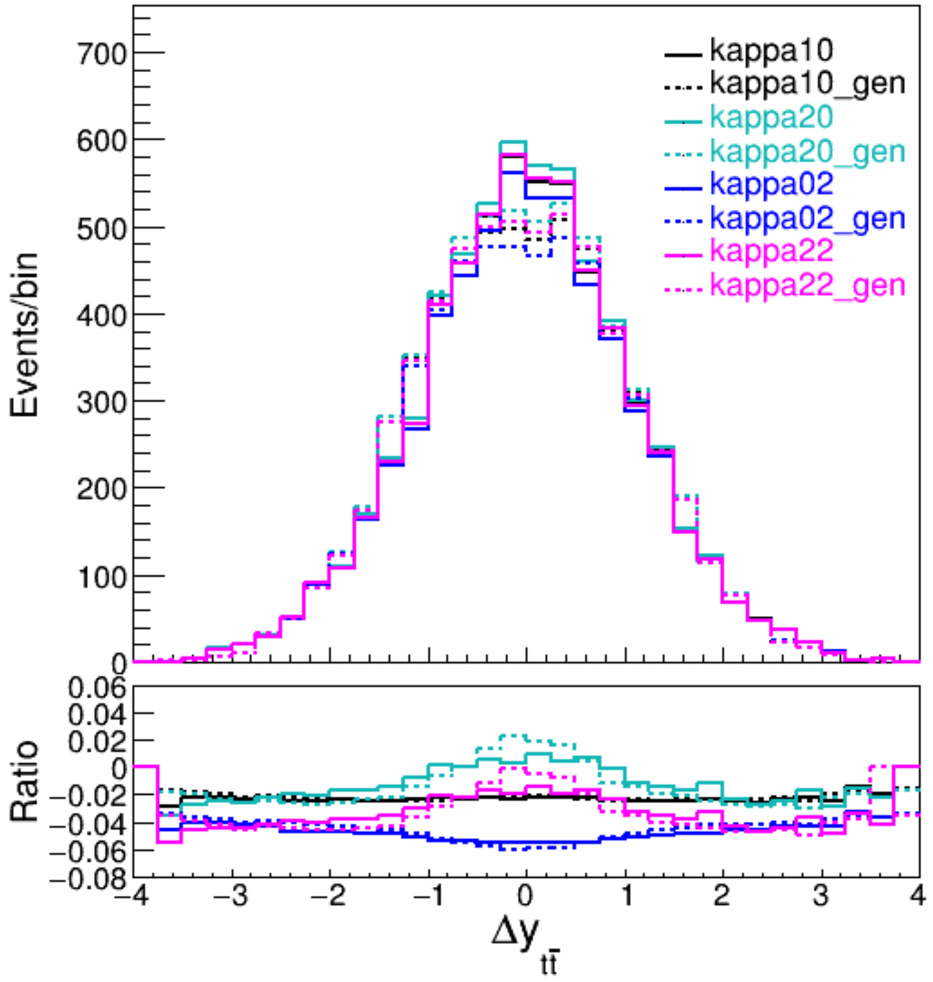


Wrong reco

EW Corrections in $\Delta y_{t\bar{t}}$

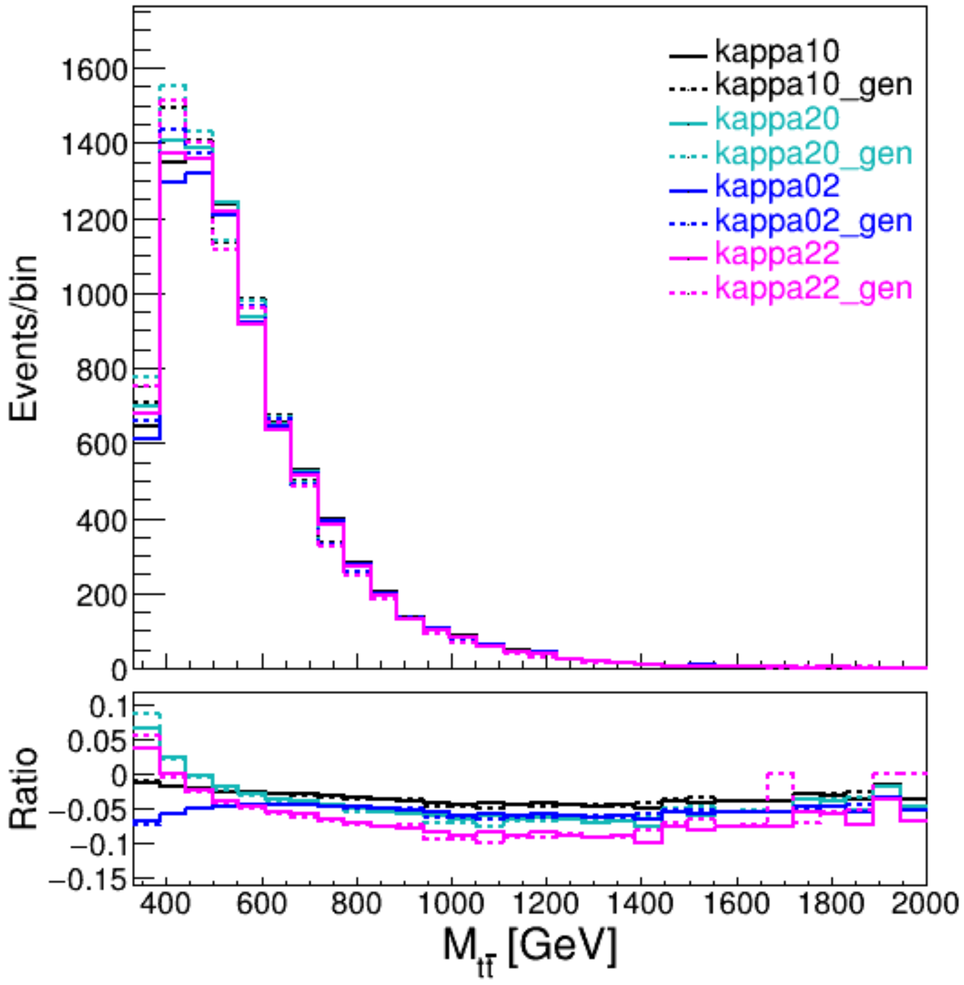


Non reco

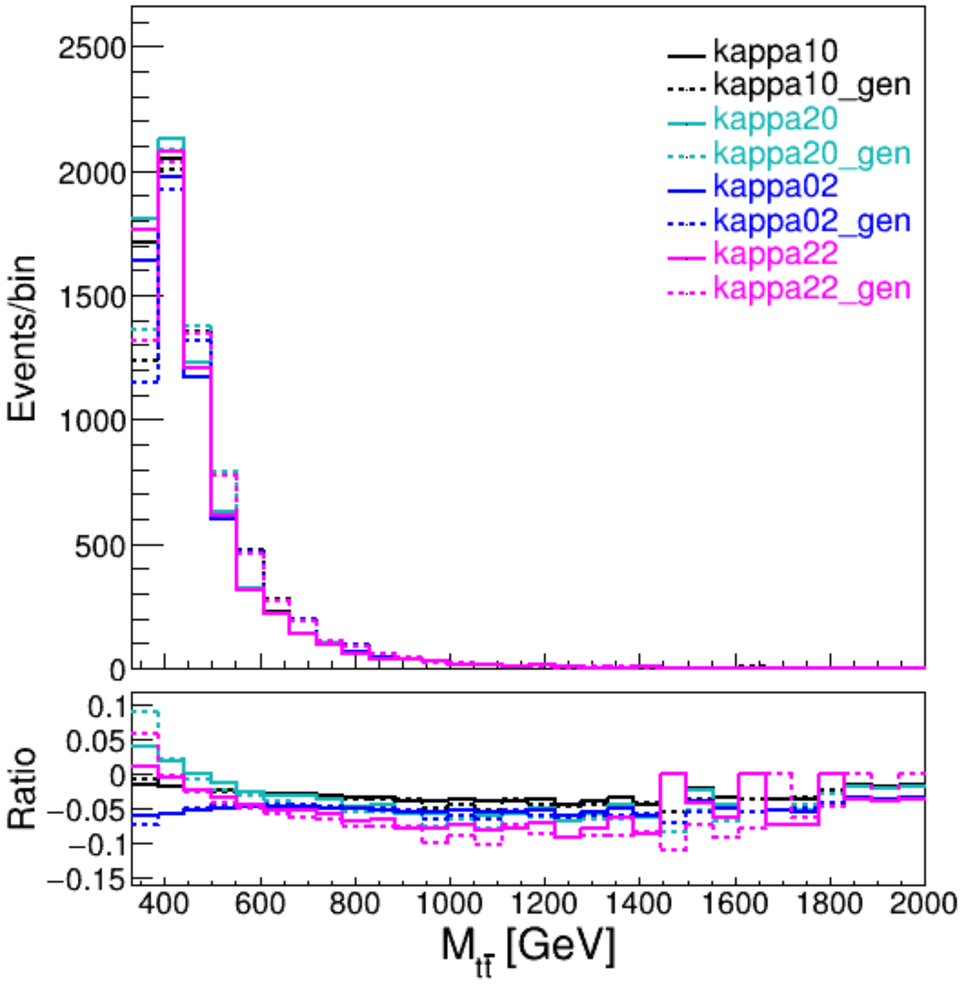


tt background

EW Corrections in $M_{t\bar{t}}$

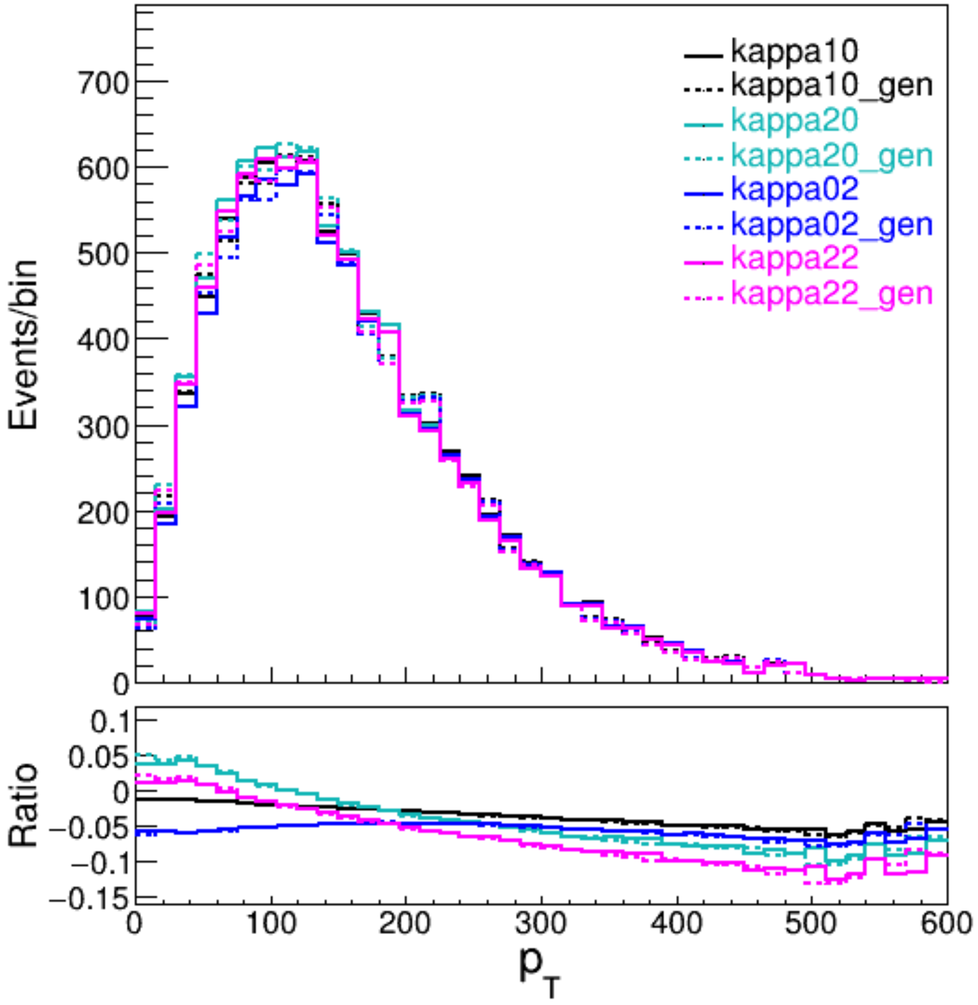


Right reco

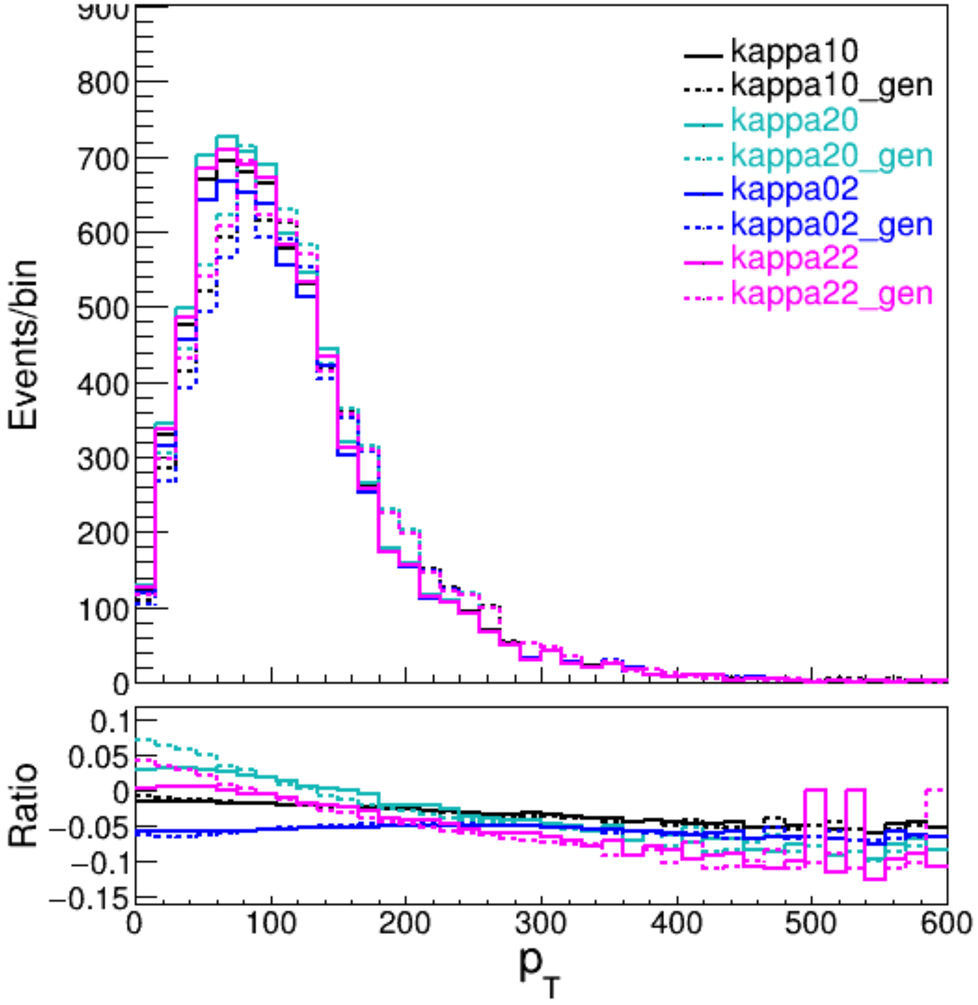


Wrong reco

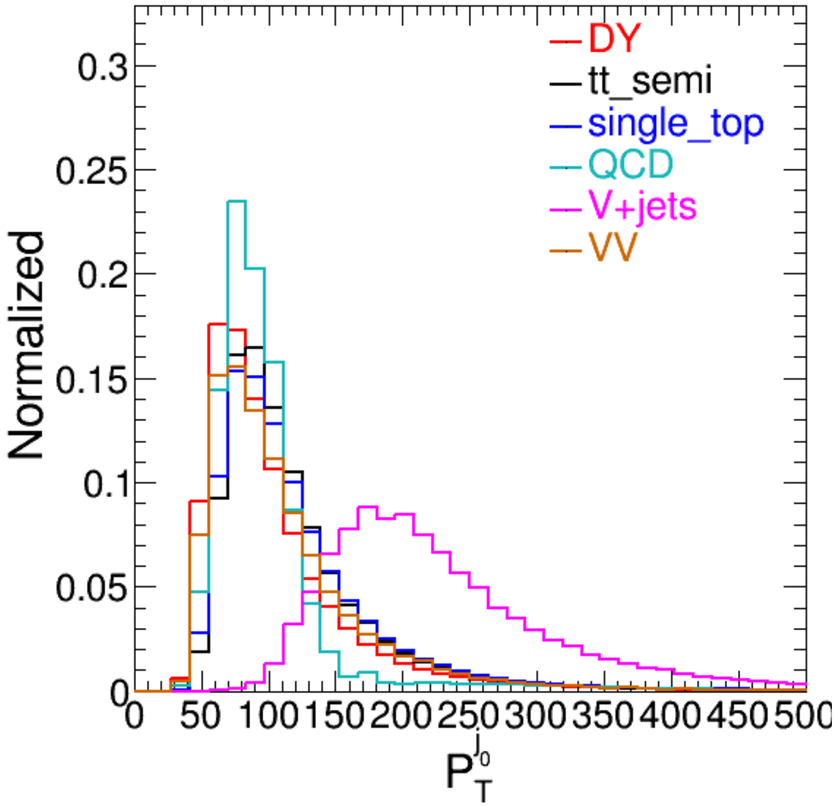
EW Corrections in p_T^t



Right reco



Wrong reco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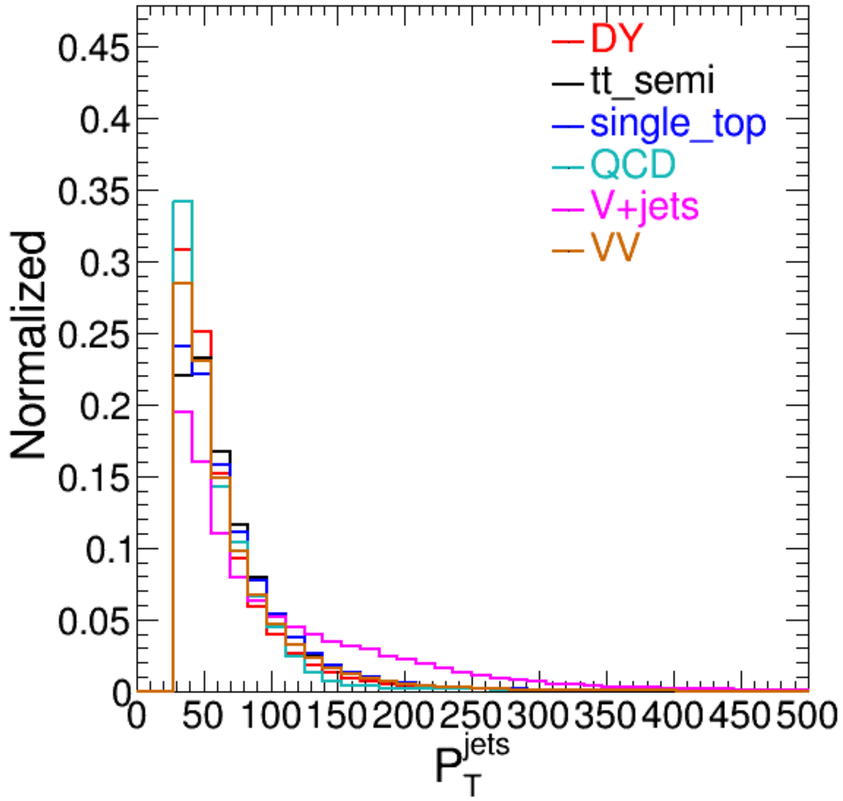
single_top
QCD
V+jets
VV
Normalized
$P_T^{j_0}$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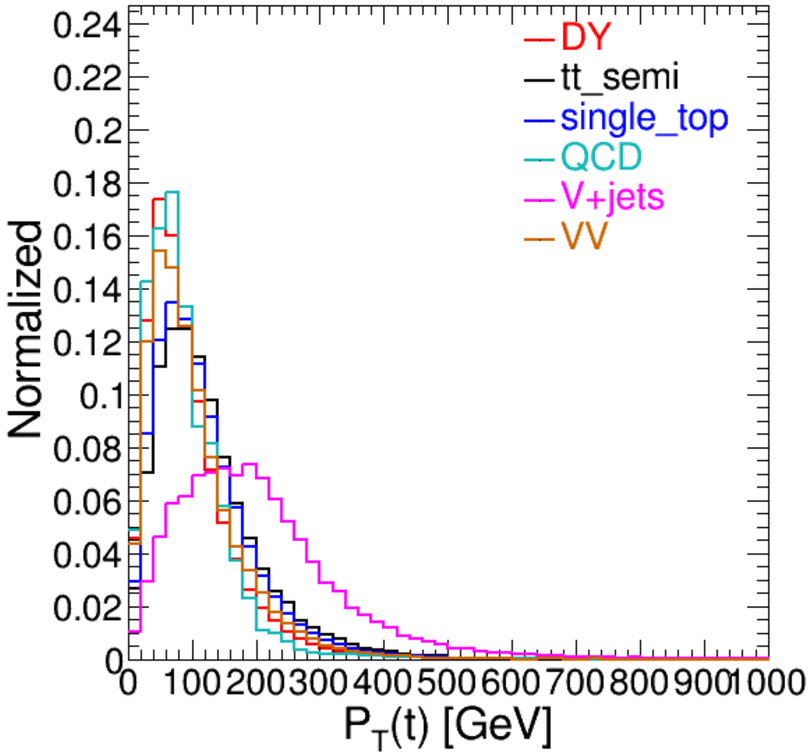
P_T^{jets}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VV
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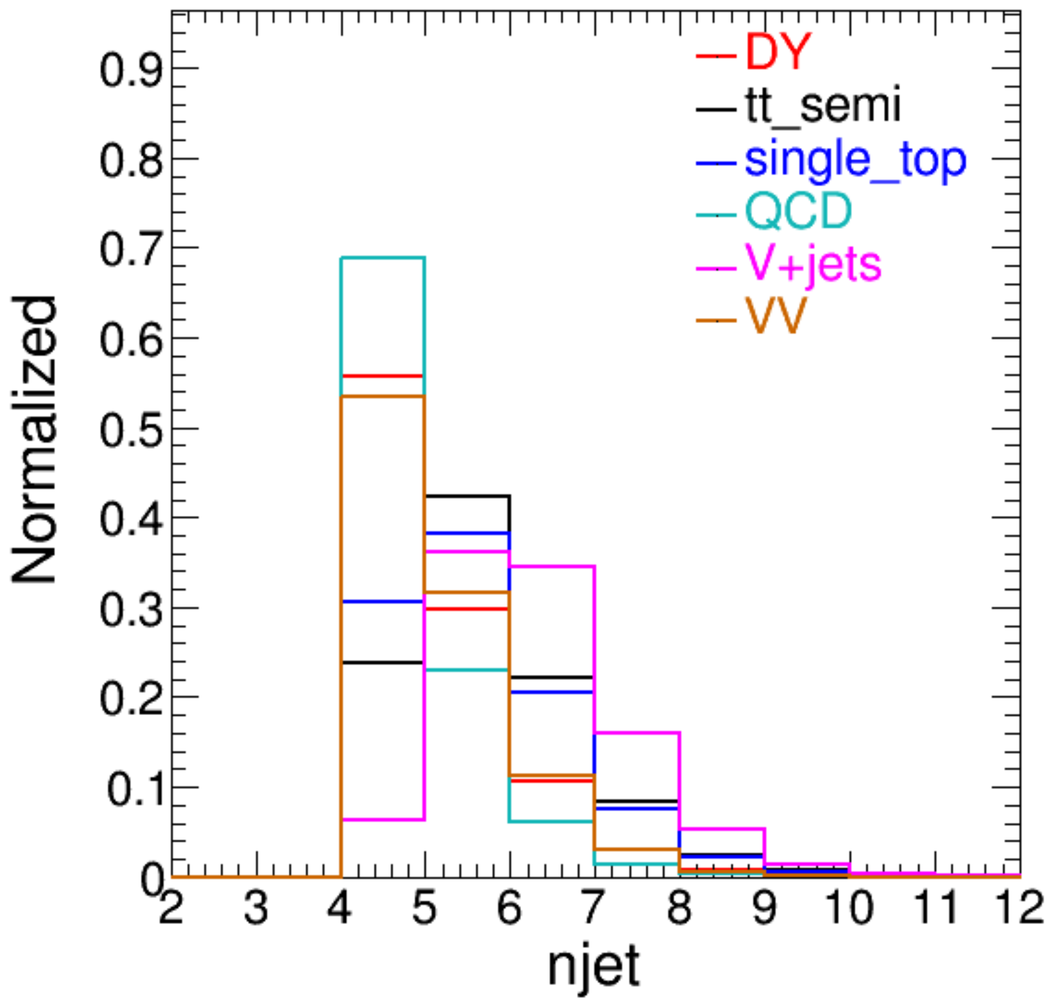
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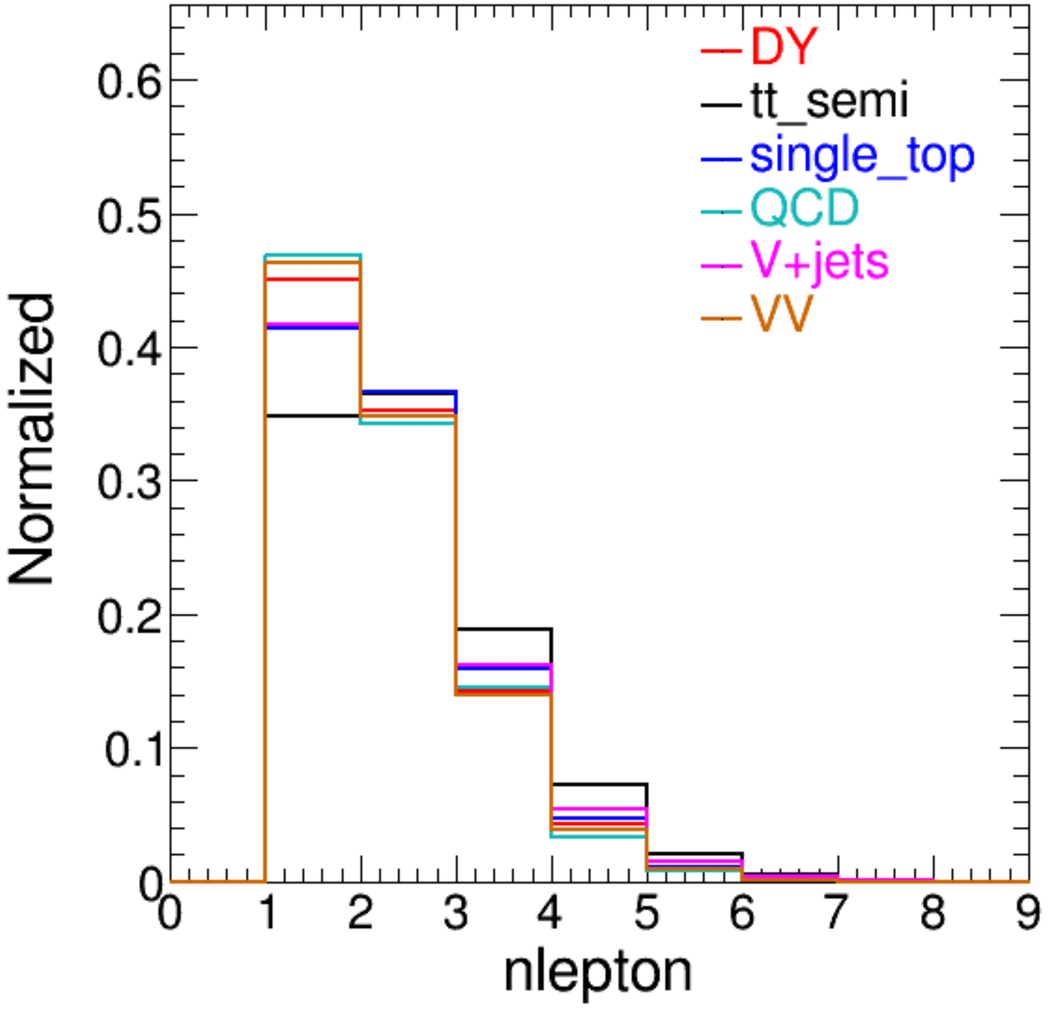
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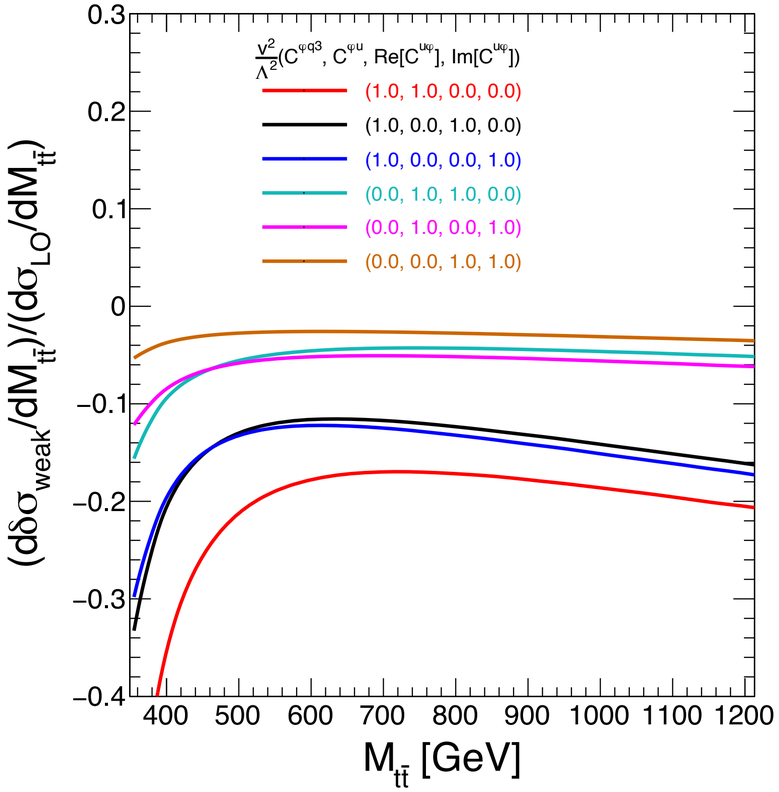
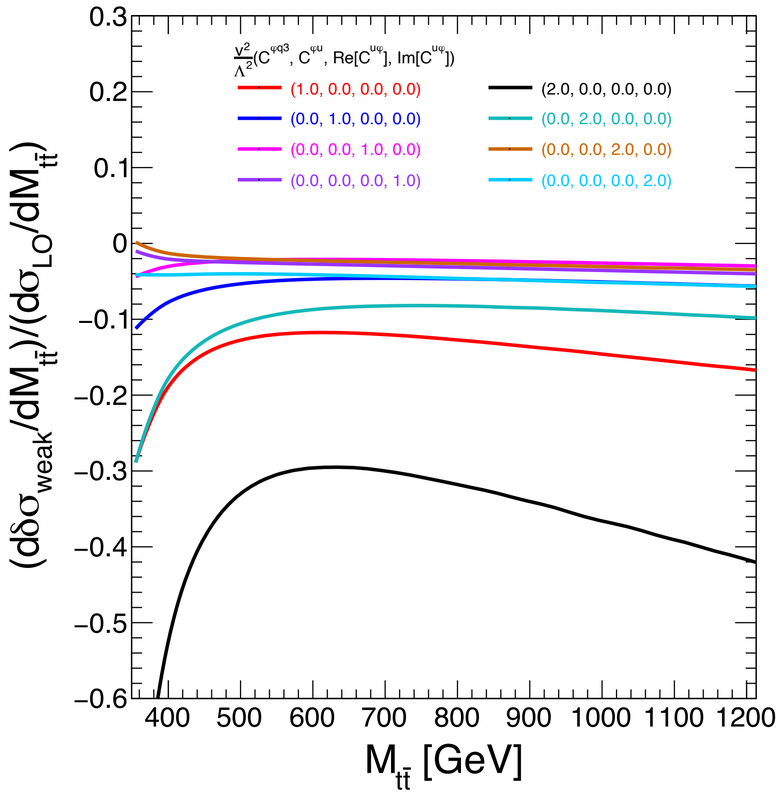
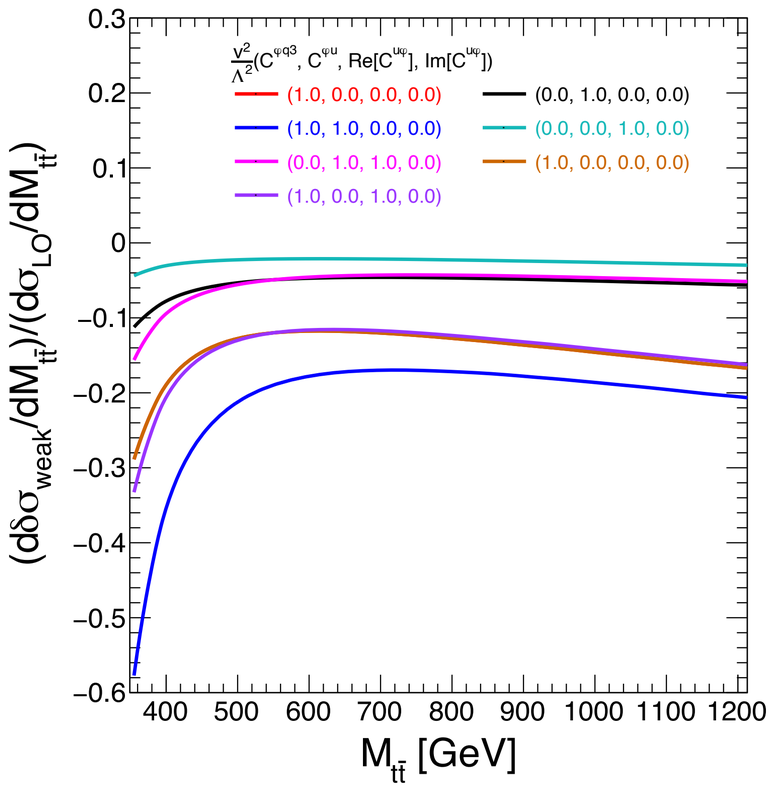
9

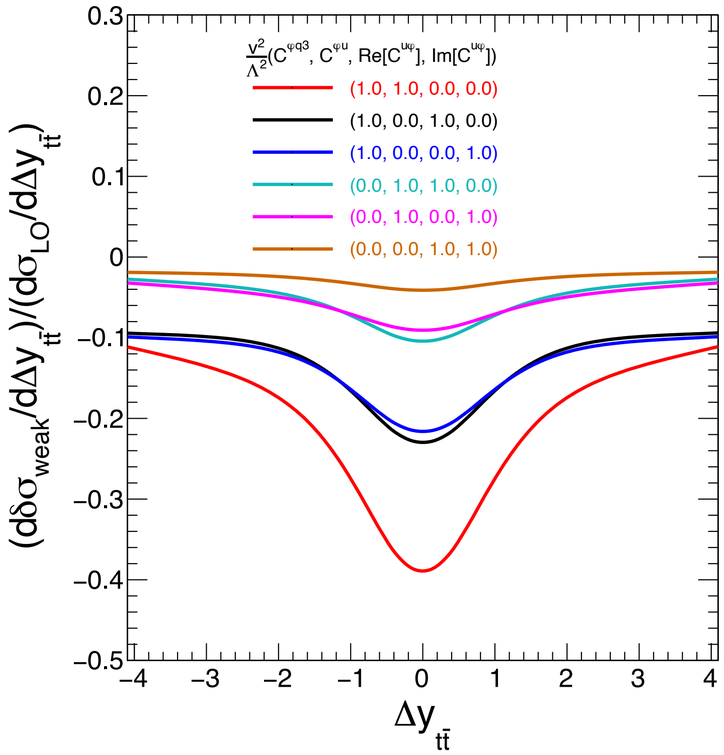
Anomalous Couplings

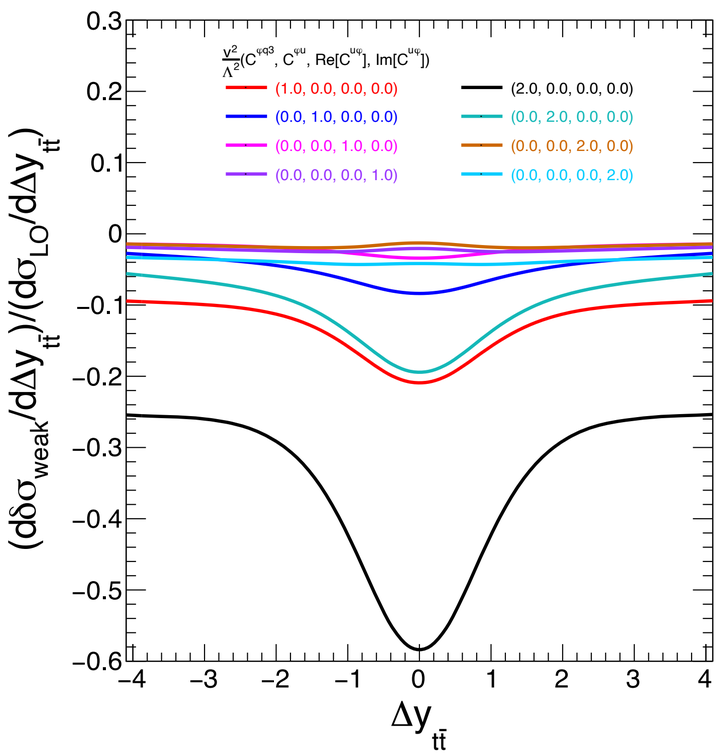


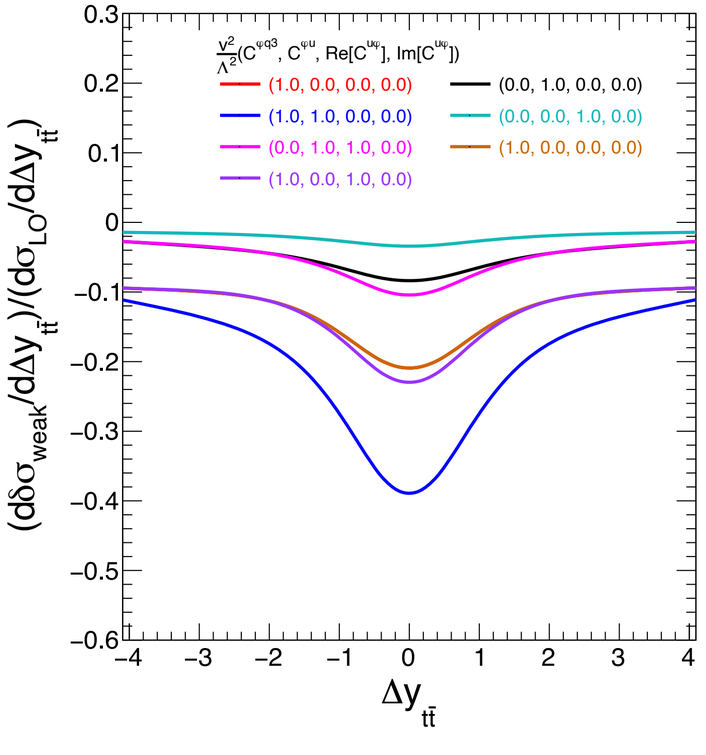




Anomalous Couplings







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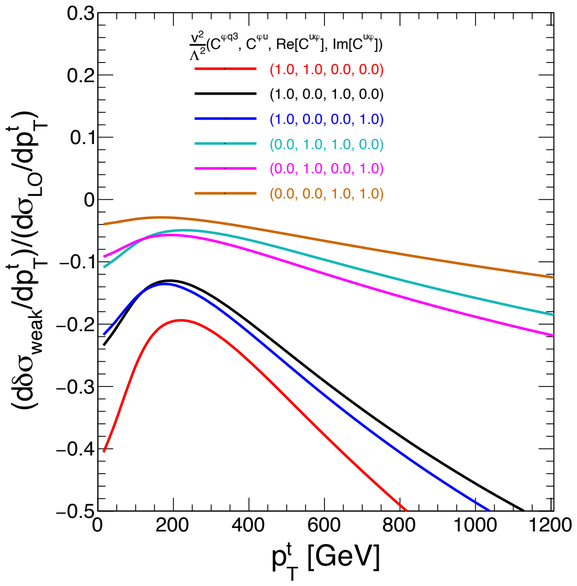
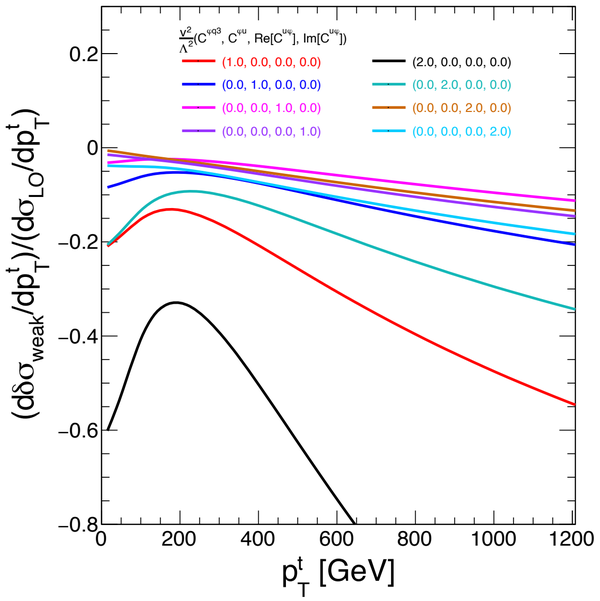
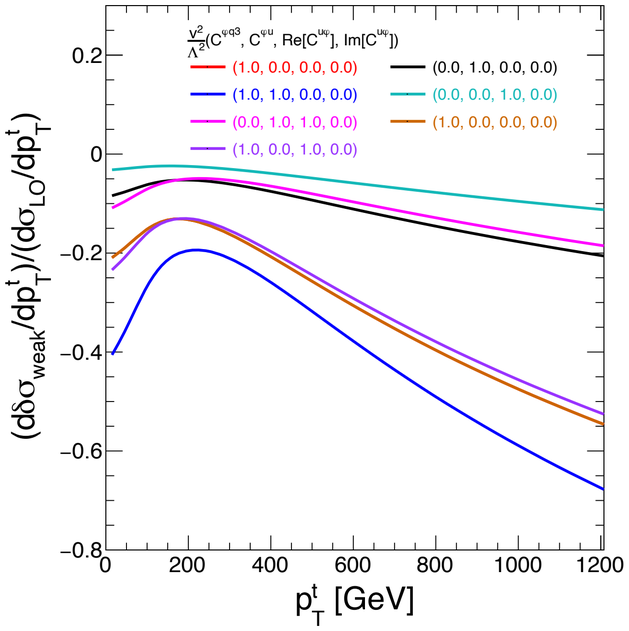
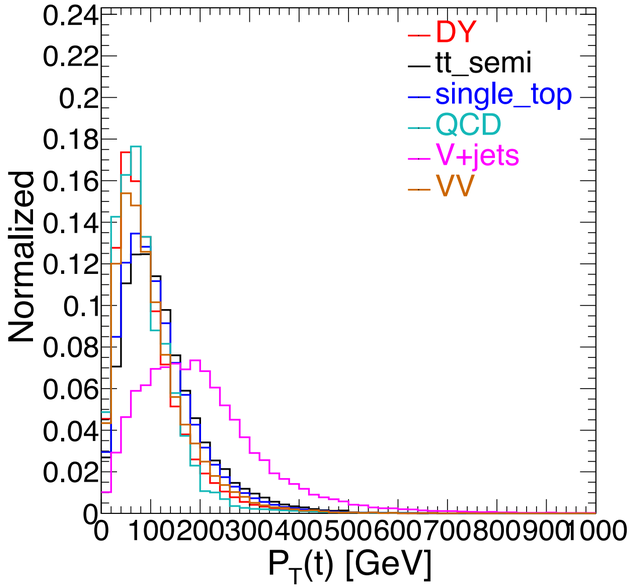
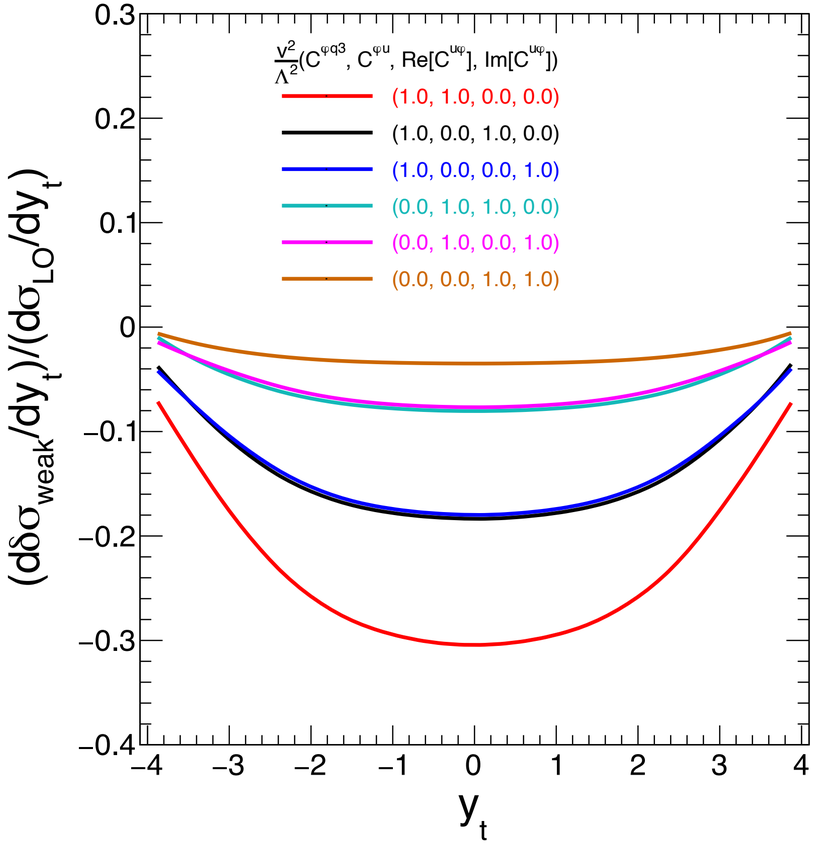


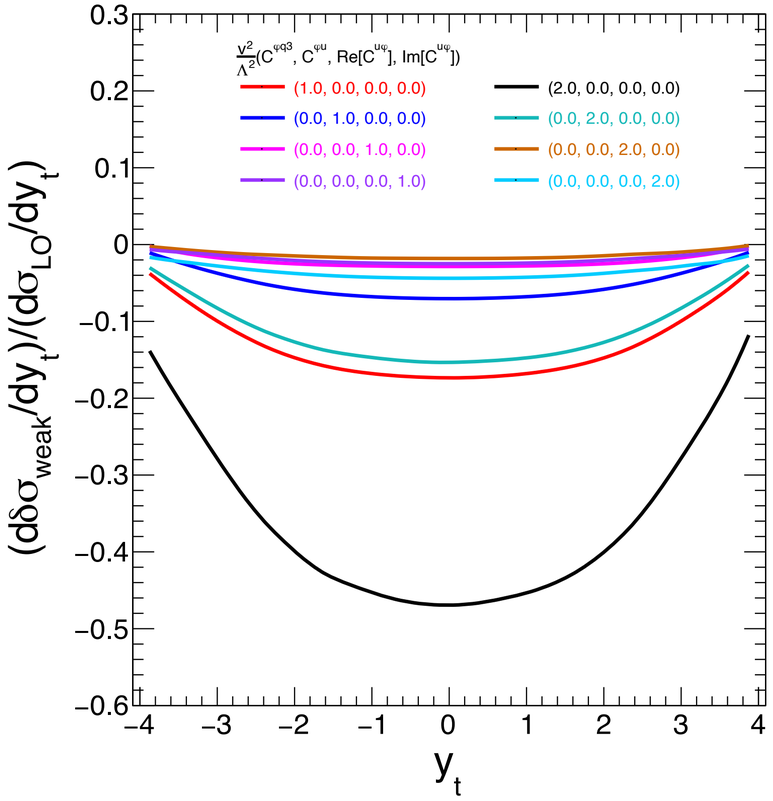


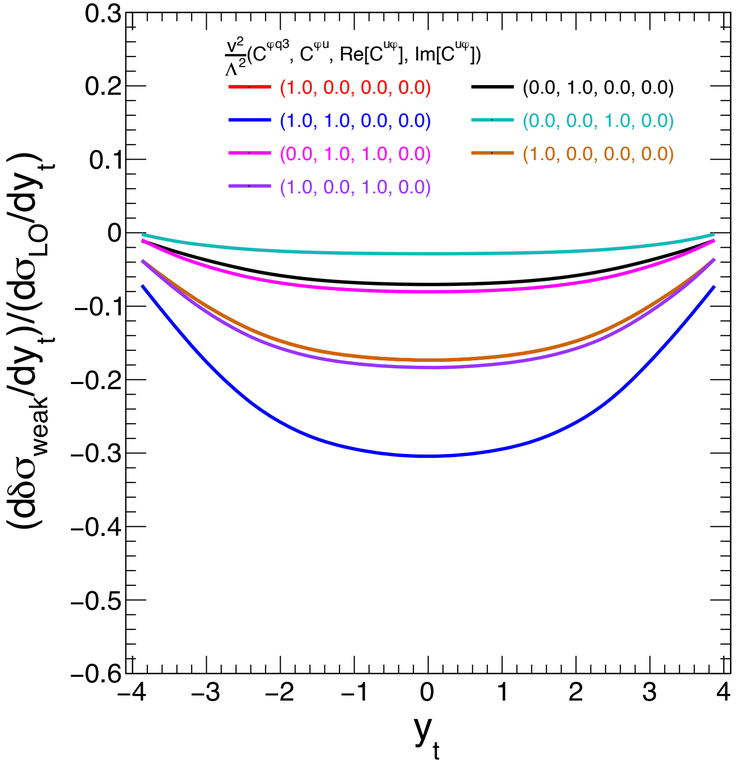




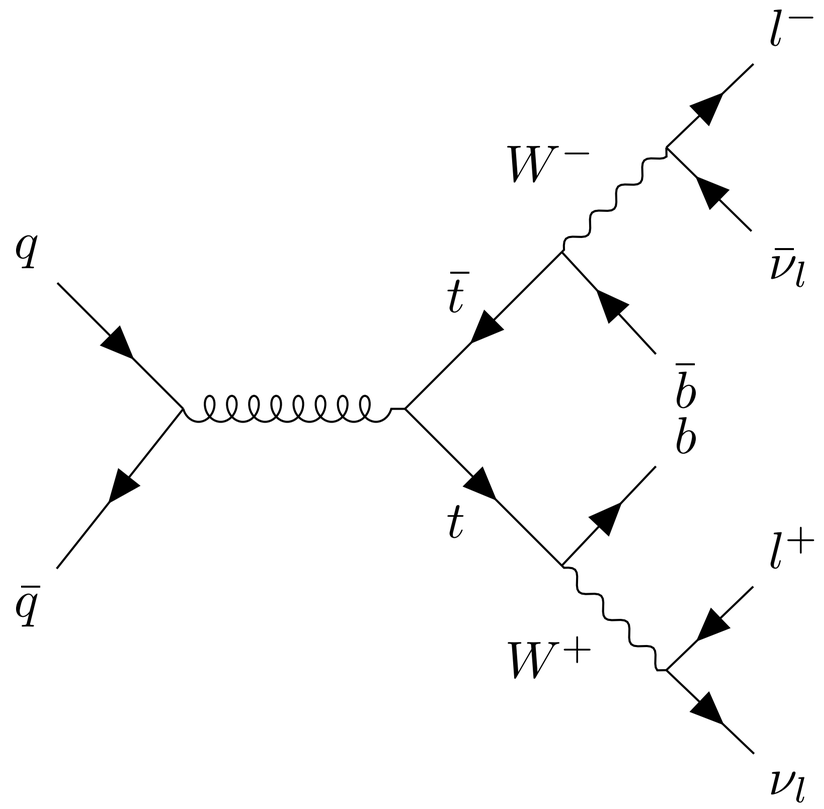
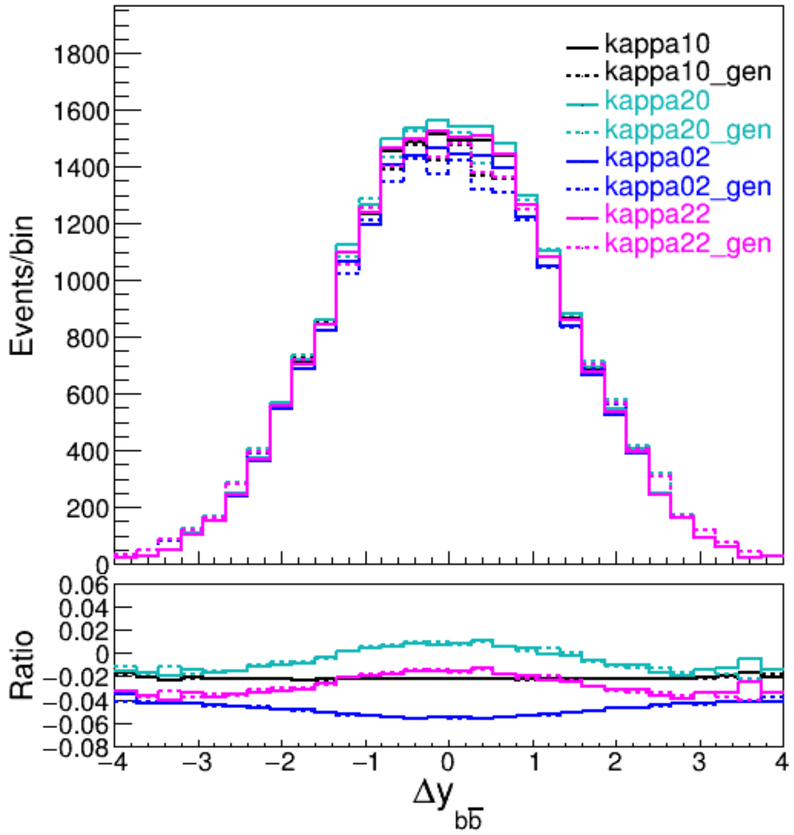
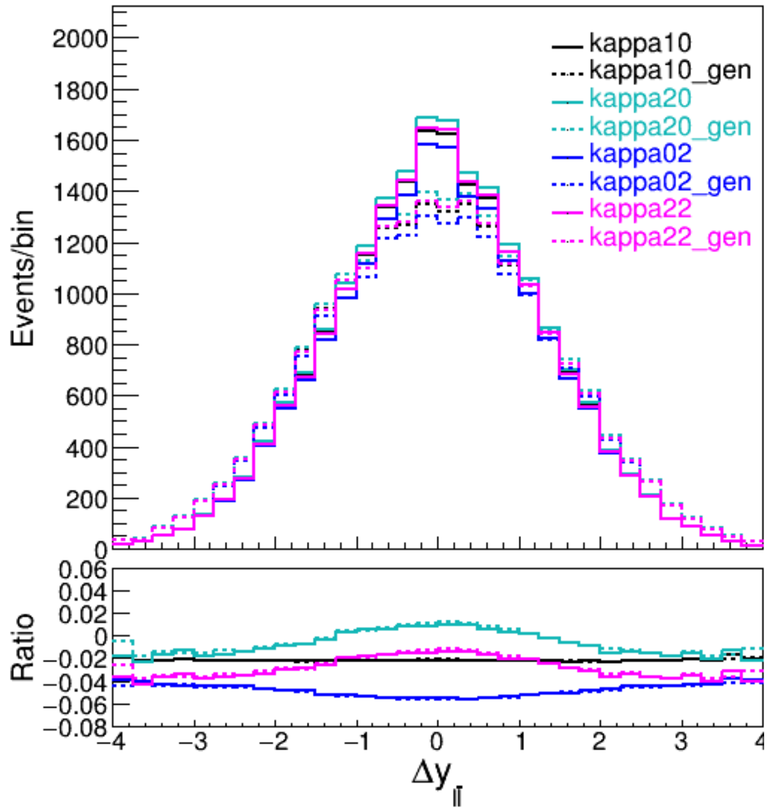
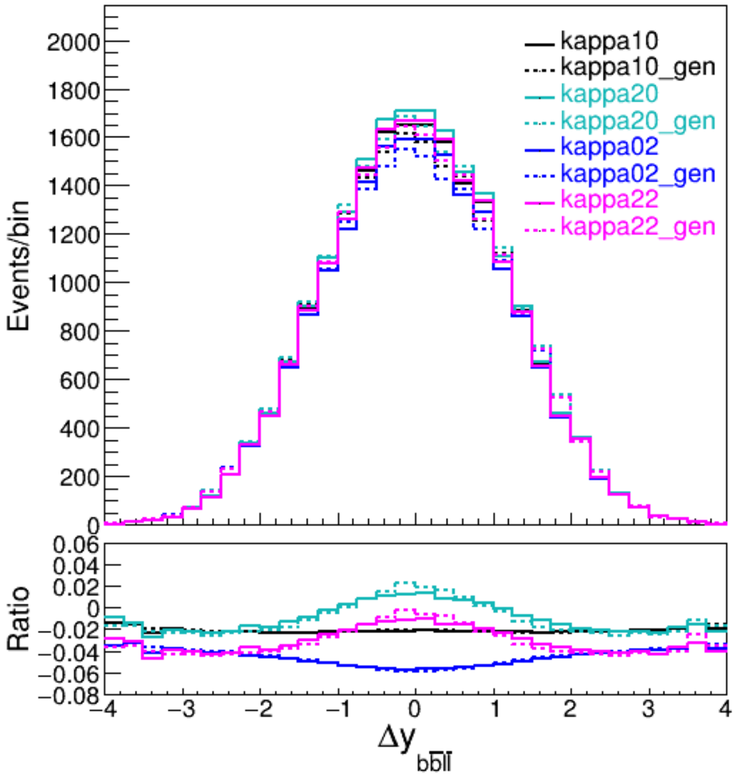
Anomalous Couplings







$t\bar{t}$ Production in Dileptonic Channel



EW Corrections