VLL in 1tau2L

Branching ratio of 1tau1l, 1tau2l and 1tau0l for 2018

```
const Bool_t tauLepCut = (eleTopMVAFSel.getSize()+muTopMVAFSel.getSize())==0 && tauSel.getSize()==1;
//const Bool_t tauLepCut1 = (eleTopMVAFSel.getSize()+muTopMVAFSel.getSize())==1 && tauSelF.getSize()==1;
//const Bool_t tauLepCut2 = (eleTopMVAFSel.getSize()+muTopMVAFSel.getSize())==2 && tauSelF.getSize()==1;
```

```
branchRatio_noFakeTau = {
    "1tau0l" : {
        "EE" : 29.80,
        "EN" : 88.20,
        "NN" : 19.94,
    },
    "1tau1l" : {
        "EE" : 10.82,
        "EN" : 50.98,
        "NN" : 15.08,
    },
    "1tau2l" : {
        "EE" : 0.09,
        "EN" : 5.90,
        "NN" : 3.26,
    },
}
```

Cut flow for each process (1tau1l

	Process	initial	METFilter	HLT	tauF>=1	jet>=6	bjet>1	HT>480&6thjet>38
0	tttt	799.93	798.40	682.77	170.34	151.48	138.83	105.55
1	tt	49754030.30	49720227.91	4017214.16	666905.99	380154.30	257346.88	109403.07
2	qcd	14880267801327.50	14879104461777.76	48938989.37	3271372.43	1676889.91	351294.21	126663.88
3	ttX	1063938.98	1062639.35	196875.23	34093.46	18789.45	12595.73	5963.60
4	Minor	23357118.38	23349793.73	6253.40	1136.25	395.68	107.04	39.31
5	singleTop	4294213.27	4291198.85	130872.99	21306.58	10506.55	6355.37	2793.49
6	WJets	36688820.97	36650752.95	51886.07	10335.06	4233.42	979.59	380.92
7	DY	1309512370.25	1309384072.68	9560.64	340.50	100.15	30.04	0.00
8	VLLm600	685.41	683.42	573.47	320.59	197.74	190.70	121.46

	Process	initial	METFilter	HLT	tauF>=1	jet>=6	bjet>1	HT>480&6thjet>38
0	qcd_200to300	102967430000.00	102936958178.31	1986199.60	111342.11	34120.97	1795.84	0.00
1	WJetsToLNu_HT-2500ToInf	1483.78	1457.12	71.67	12.88	8.66	2.65	1.86
2	zz	987195.00	986736.12	1532.03	182.82	57.12	29.96	9.52
3	st_tW_top	2144905.55	2143409.49	65259.41	10695.39	5286.76	3192.71	1410.59
4	ttbar_2l	5282390.93	5279709.36	132600.31	36192.69	10645.95	7540.13	2679.22
5	ZGToLLG	3319368.25	3318559.95	431.24	130.65	28.15	6.37	2.12
6	WGToLNuG	11487360.47	11484752.05	868.02	201.87	54.35	14.29	4.35
7	ttG	950698.74	949542.07	160633.01	26878.60	13949.58	9045.88	4055.24
8	DYJetsToLL_M-50	363600070.25	363529887.72	7798.06	0.00	0.00	0.00	0.00
9	ZZZ	883.09	882.29	21.88	3.51	1.56	0.86	0.30
10	qcd_50to100	14754078000000.00	14752960724024.62	6115776.81	382236.05	382236.05	0.00	0.00
11	qcd_2000toInf	1510707.50	1489670.58	69227.85	3643.04	2649.43	764.25	555.97
12	WJetsToLNu_HT-600To800	741892.00	739973.54	10975.99	2102.91	987.30	218.09	101.40
13	ttbar_0l	22613347.04	22596186.26	2612755.42	371605.52	246626.45	164410.97	72747.11
14	qcd_700to1000	408459410.00	407560595.96	7174075.19	425454.42	244544.72	61302.49	33017.45
15	st_tW_antitop	2144905.43	2143393.22	65407.98	10547.24	5202.90	3150.91	1379.06
16	WJetsToLNu_HT-1200To2500	61206.09	60670.08	2734.78	465.98	277.88	66.51	42.08
17	DYJetsToLL_M-10to50	945912300.00	945854184.96	1762.58	340.50	100.15	30.04	0.00
18	VLL_NN_M600	117.61	117.33	104.11	60.08	45.37	43.20	29.82
19	WWZ	9877.93	9864.48	266.67	48.53	25.14	8.22	4.13
20	VLL_EN_M600	443.41	442.12	372.59	208.70	129.87	125.56	79.35
21	qcd_500to700	1918149800.00	1915801132.90	14539046.50	972241.48	473446.11	128462.23	51634.49
22	ttbar_1l	21858292.32	21844332.29	1271858.43	259107.77	122881.91	85395.78	33976.73
23	ww	7059940.00	7056719.62	2762.90	462.88	188.67	37.82	14.86
24	qcd_300to500	20814857000.00	20802933579.27	16512782.27	1240924.98	452044.00	136829.46	27365.89
25	WJetsToLNu_HT-800To1200	345219.10	343728.45	9383.28	1680.45	892.04	194.10	107.35
26	ttH_nonbb	12504.47	12490.27	3800.28	992.38	664.99	452.43	232.34
27	ttH_bb	17332.75	17316.43	8354.86	1339.57	888.79	830.89	410.92
28	ttW	36556.13	36504.04	9477.63	1959.26	1291.99	854.21	486.56
29	WWW	12480.54	12464.71	145.61	29.41	15.48	2.01	1.32
30	qcd_1500to2000	7179600.00	7114357.12	311275.74	15299.31	10756.47	2815.48	1944.56
31	WZTo3LNu	294202.05	294085.20	75.29	30.91	7.35	1.45	0.23
32	ttZ	46846.89	46786.54	14609.46	2923.66	1994.10	1412.32	778.55
33	ggH_tautau	182481.50	182404.17	33.41	25.26	7.28	1.62	0.55
34	WJetsToLNu_HT-400To600	3685528.00	3679608.60	19504.40	4004.36	1535.80	360.93	107.44
35	WZZ	3329.54	3325.14	116.37	20.43	10.58	4.43	1.92
36	tttt	799.93	798.40	682.77	170.34	151.48	138.83	105.55
37	WJetsToLNu_HT-200To400	31853492.00	31825315.16	9215.94	2068.47	531.75	137.31	20.79
38	VLL_EE_M600	124.39	123.97	96.77	51.81	22.50	21.94	12.30
39	st_tZq	4402.29	4396.14	205.60	63.95	16.89	11.75	3.83
40	qcd_1000to1500	72214810.00	71880239.00	2230605.42	120231.04	77092.15	19324.46	12145.51

input list:

```
elesTopMVAT_num
elesTopMVAT_1pt
elesTopMVAT_1eta
elesTopMVAT_1phi
elesTopMVAT_2pt
elesTopMVAT_2eta
elesTopMVAT_2phi
elesTopMVAT_2mass
lepTopMVAT_num
lepTopMVAT_1pt
lepTopMVAT_1eta
lepTopMVAT_1phi
lepTopMVAT_2invariantMass
lepTopMVAT_2pt
lepTopMVAT_2eta
lepTopMVAT_2phi
lepTopMVAT_2charge
lepTopMVAF_num
lepTopMVAF_1pt
lepTopMVAF_1eta
lepTopMVAF_1phi
lepTopMVAF_2invariantMass
lepTopMVAF_2pt
lepTopMVAF_2eta
lepTopMVAF_2phi
lepTopMVAF_2charge
elesTopMVAF_1isTight
elesTopMVAF_2isTight
elesTopMVAF_1ptCorrected
elesTopMVAF_2ptCorrected
lepTopMVAF_1ptCorrected
lepTopMVAF_2ptCorrected
elesTopMVAF_num
tausT_num
tausT_1pt
tausT_1eta
tausT_1phi
tausT_MHT
tausT_HT
tausT_invariantMass
```

```
tausT_minDeltaR
tausT_leptonsT_transMass
tausT_leptonsT_invariantMass
tausT_leptonsTMVA_minDeltaR
tausT_leptonsTopMVA_chargeMulti
tausT_prongNum
tausT_1decayMode
tausT_1prongNum
tausT_1lepton1_charge
tausT_leptons_charge
tausT_1jetPt
tausT_1jetEtaAbs
tausT_1charge
tausT_1neutralIso
tausT_1lepton1_deltaR
tausT_1Met_transMass
tausT_1lepton1Met1_stransMass
tausT_jet_invariantMass
tausT_jet1_Met_transMass
leptons_2charge
jets_num
jets_1pt
jets_1eta
jets_1phi
jets_rationHT_4toRest
jets_MHT
jets_HT
jets_invariantMass
jets_transMass
jets_minDeltaR
jets_centrality
jets_average_deltaR
jets_HTDivideMET
jets_METDivideHT
jets_sphericity
jets_aplanarity
jets_2pt
jets_2eta
jets_2phi
jets_3pt
```

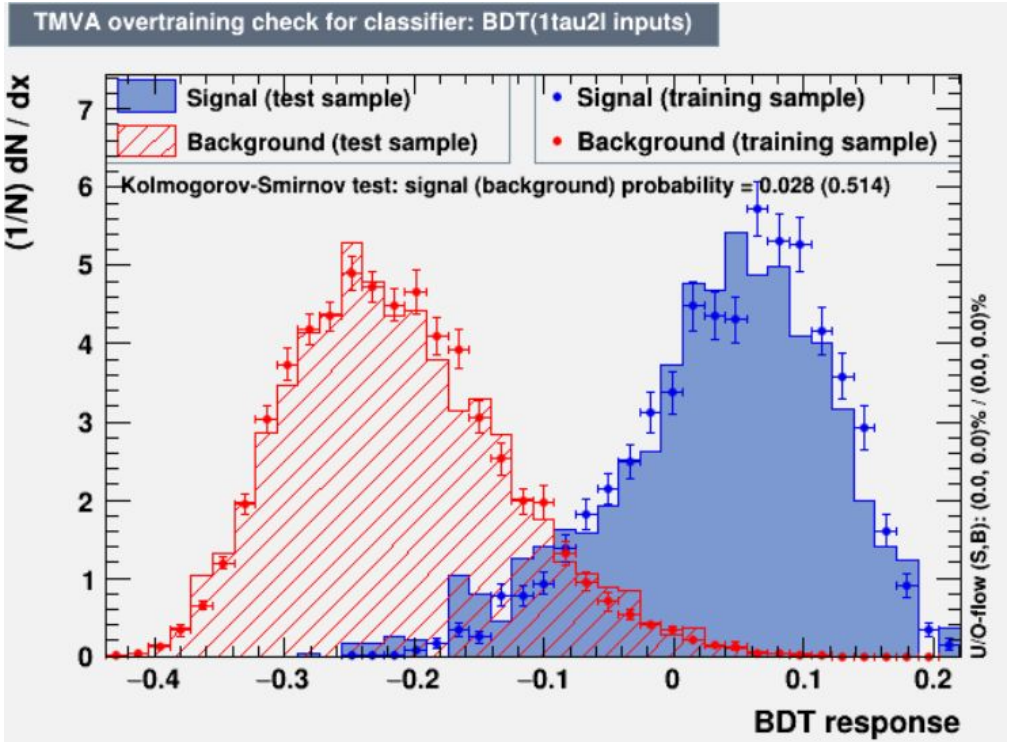
```
jets_3eta
jets_3phi
jets_4pt
jets_4eta
jets_4phi
jets_5pt
jets_5eta
jets_5phi
jets_6pt
jets_6eta
jets_6phi
jets_7pt
jets_7eta
jets_7phi
jets_8pt
jets_8eta
jets_8phi
jets_9pt
jets_9eta
jets_9phi
jets_tausT_minDeltaR
jets_tausT_invariantMass
bjetsM_num
bjetsM_1pt
bjetsM_1eta
bjetsM_1phi
bjetsM_MHT
bjetsM_HT
bjetsM_invariantMass
bjetsM_transMass
bjetsM_minDeltaR
bjetsM_2leptons2_stransMass
bjetsM_2tauT1lep1_stransMass
bjetsM_2MET_stransMass
bjetsM_leptons_minDeltaR
bjetsM_tausT_minDeltaR
bjetsM_tausF_minDeltaR
```

```
bjetsM_2pt
bjetsM_3pt
bjetsT_num
bjetsT_1pt
bjetsT_1eta
bjetsT_1phi
bjetsT_MHT
bjetsT_HT
bjetsT_invariantMass
bjetsT_transMass
bjetsT_minDeltaR
bjetsT_2leptons2_stransMass
bjetsT_2tauT1lep1_stransMass
bjetsT_2MET_stransMass
bjetsT_leptons_minDeltaR
bjetsT_tausT_minDeltaR
bjetsT_tausF_minDeltaR
bjetsT_2pt
bjetsT_3pt
MET_pt
MET_phi
```

解释下tau的cut效率

come soon!

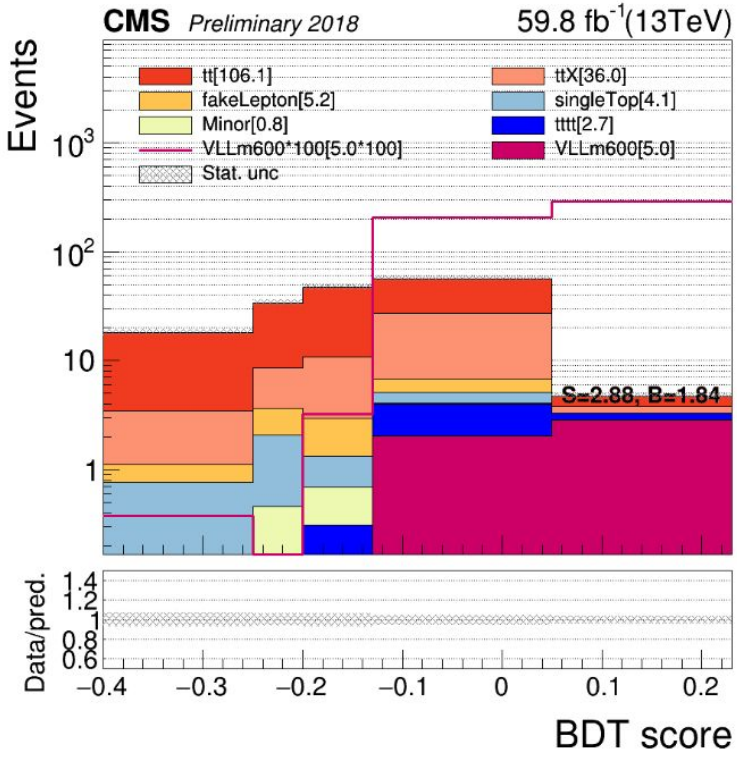
Overtraining check at VLLm600 for 2018



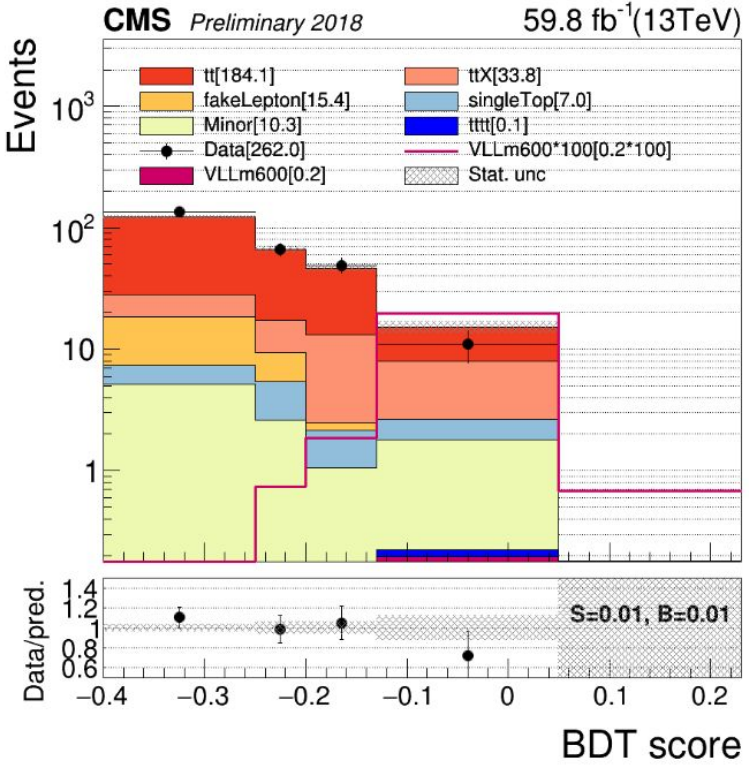
AUC score: 0.97
n_bkg: 6803
n_sig: 427447

60% samples are used for training

BDT distribution for 2018

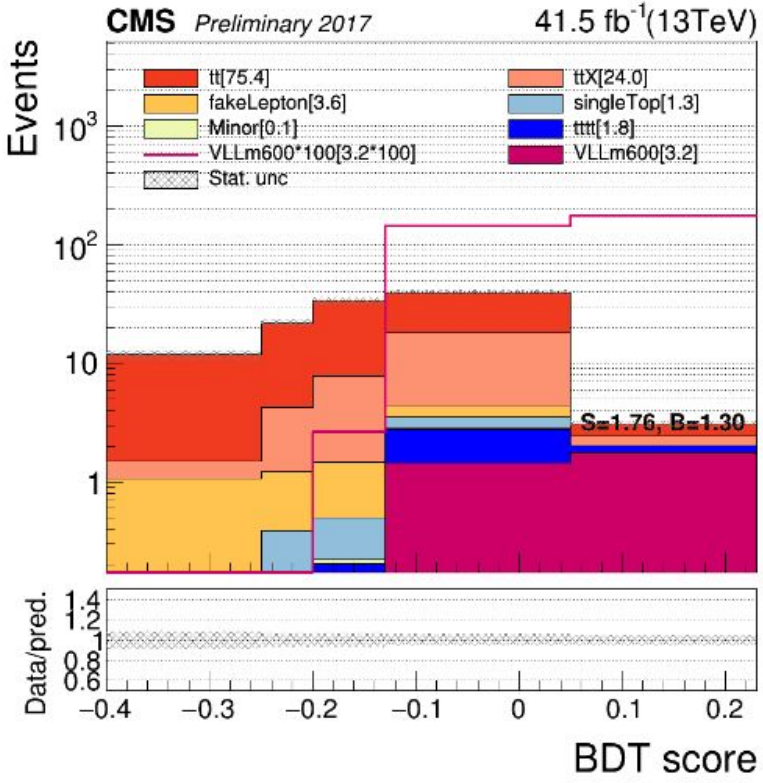


SR of 1tau2l for 2018

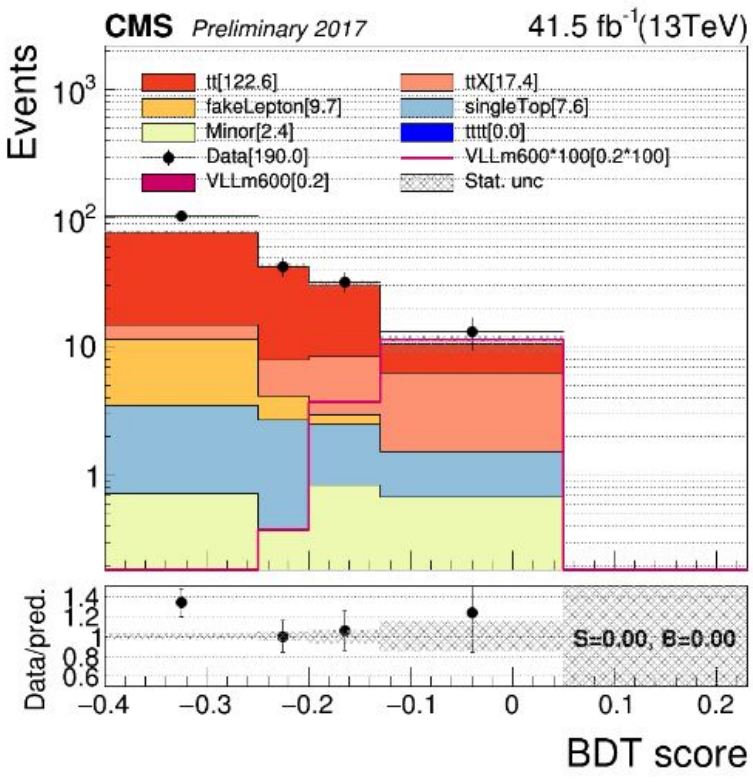


CR3 of 1tau2l for 2018

BDT distribution for 2017

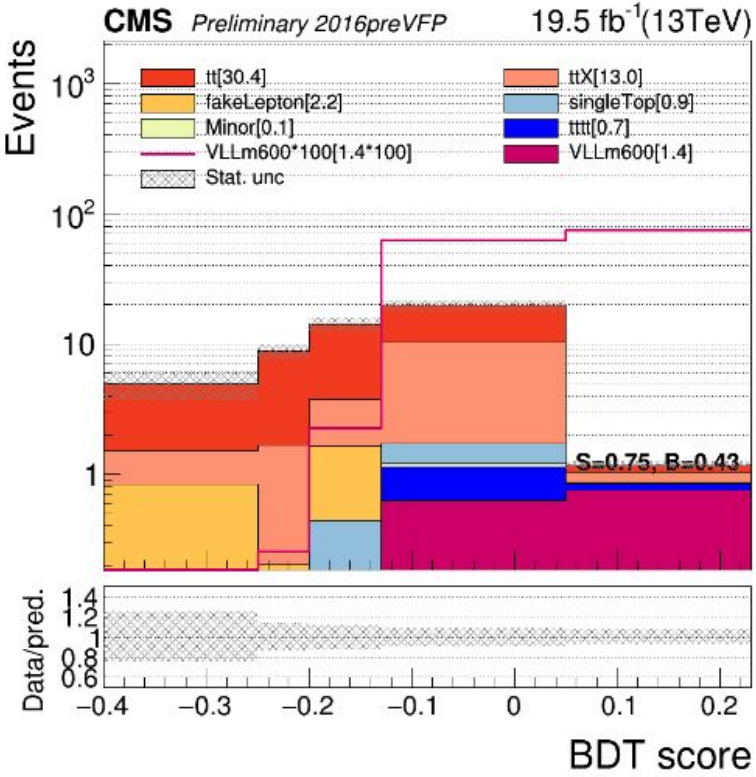


SR of 1tau2l for 2017

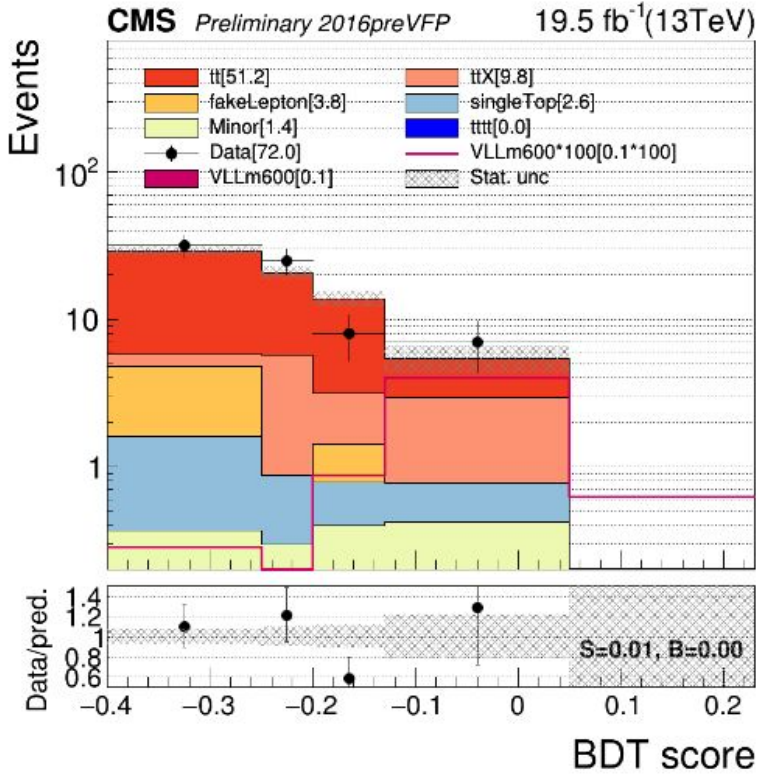


CR3 of 1tau2l for 2017

BDT distribution for 2016preVFP

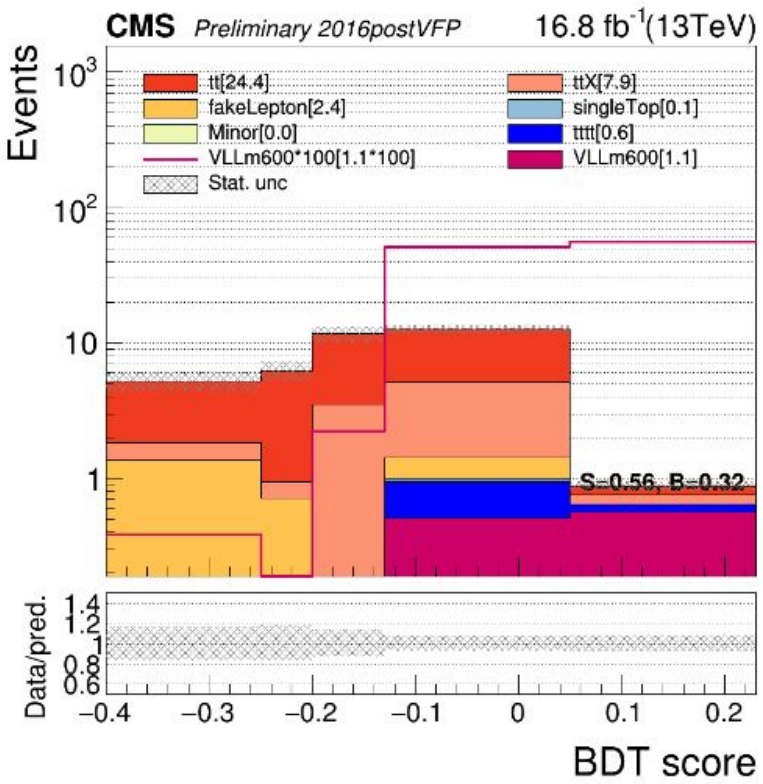


SR of 1tau2l for 2016preVFP

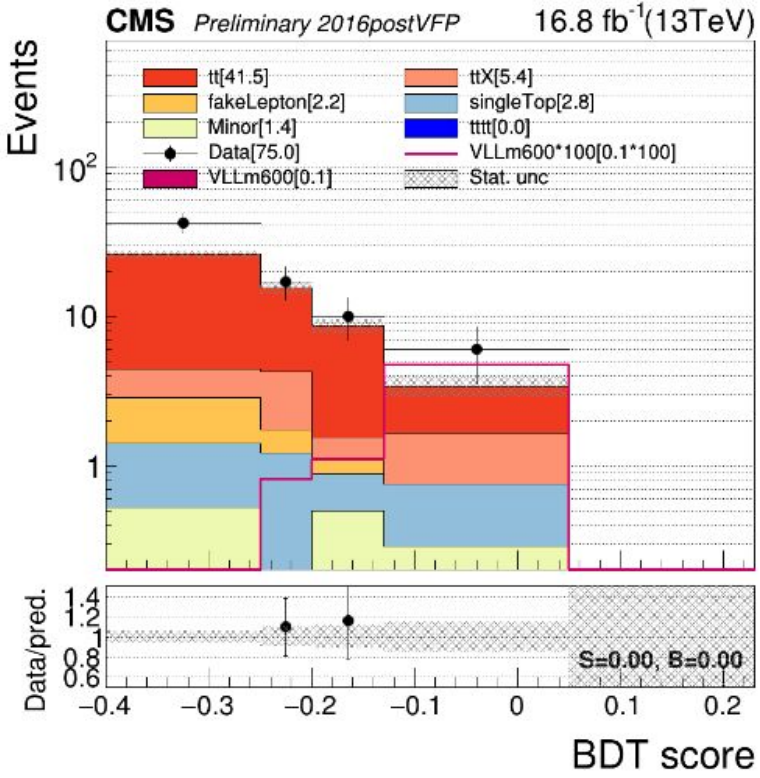


CR3 of 1tau2l for 2016preVFP

BDT distribution for 2016postVFP

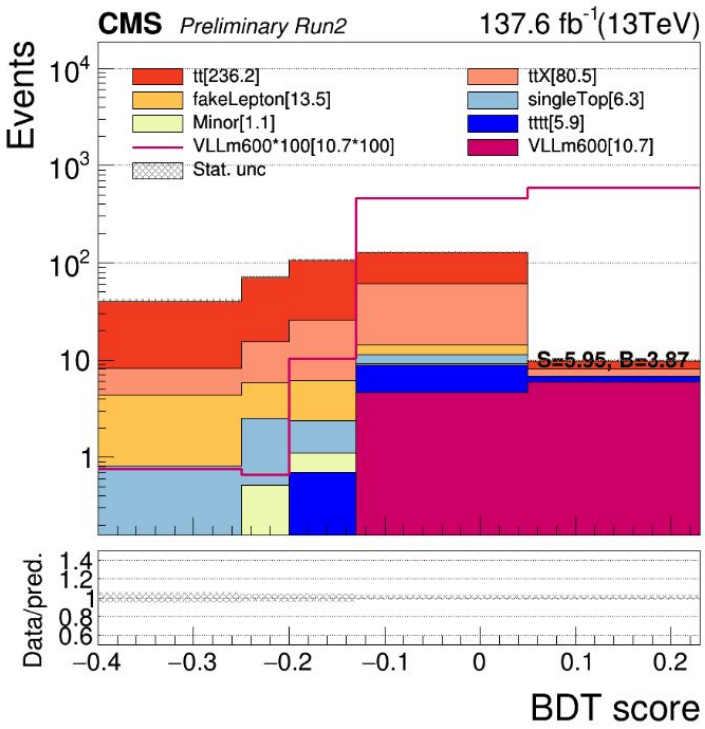


SR of 1tau2l for 2016postVFP

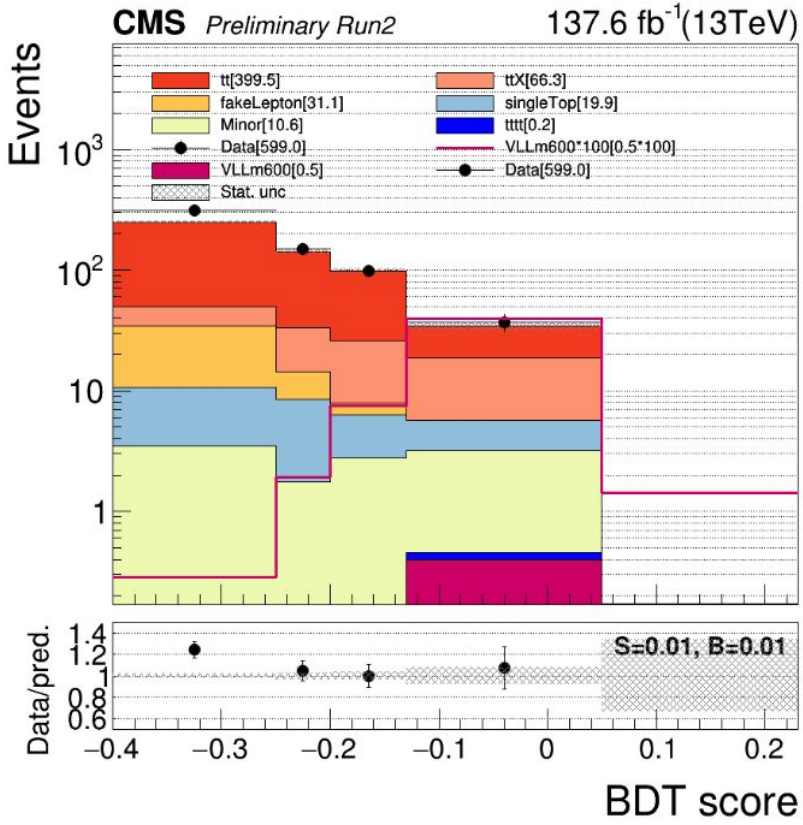


CR3 of 1tau2l for 2016postVFP

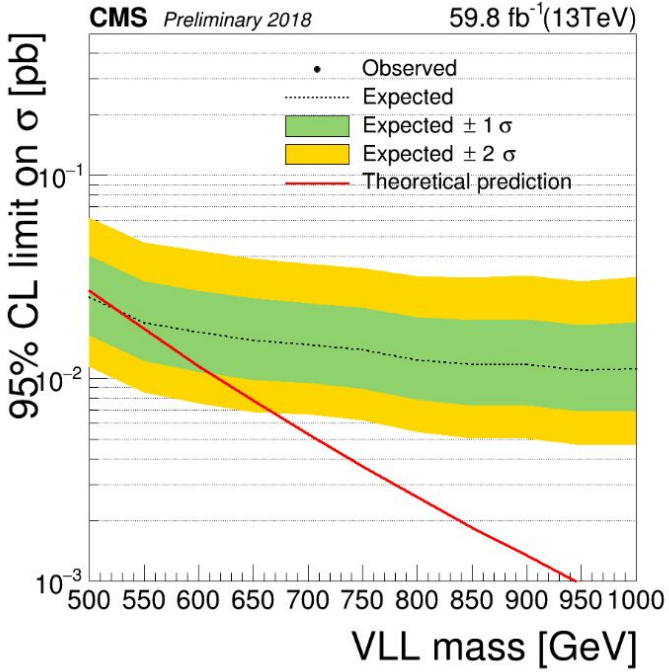
BDT distribution for Run2

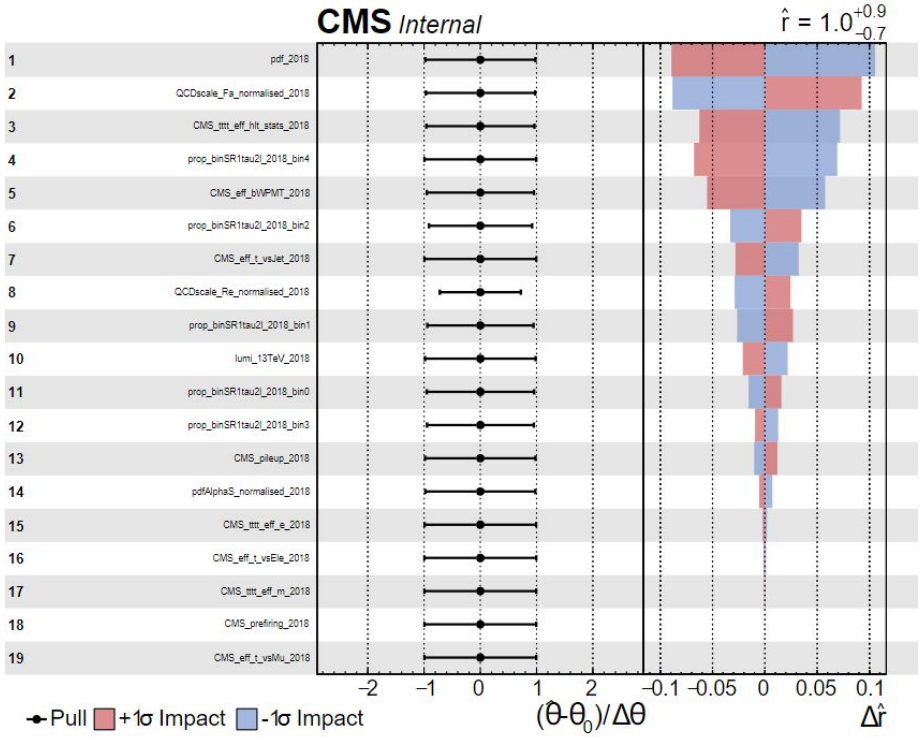


SR of 1tau2l for Run2

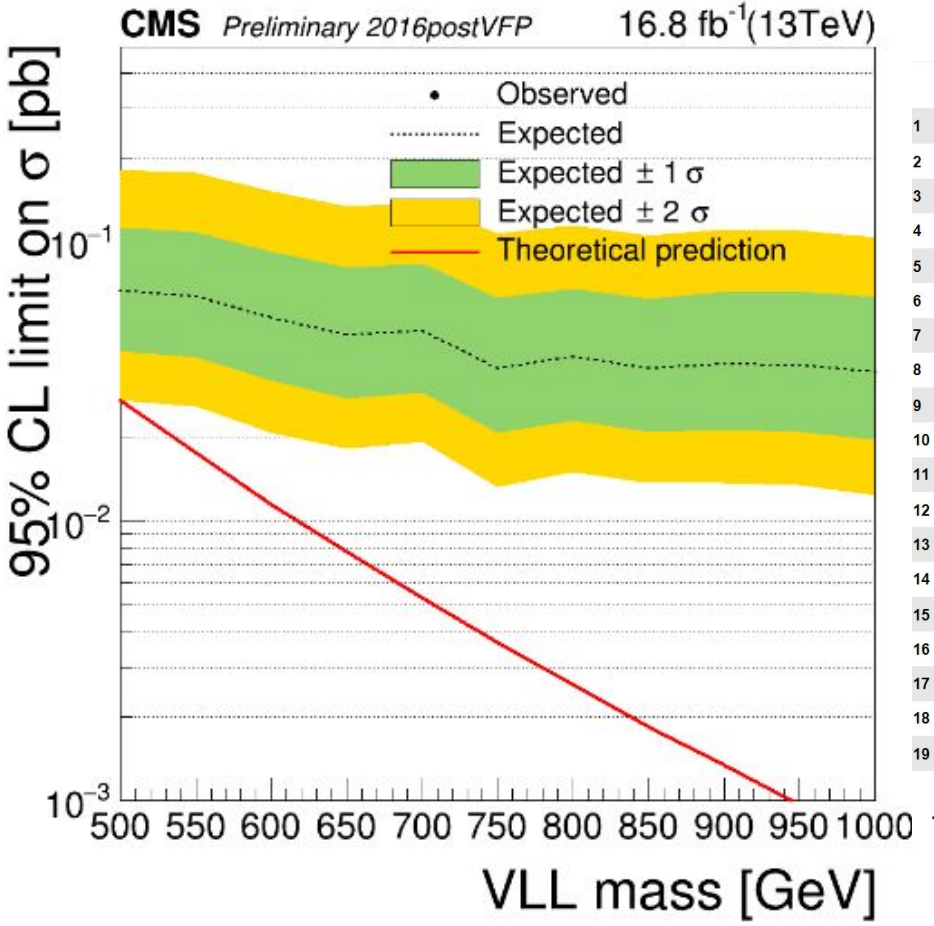


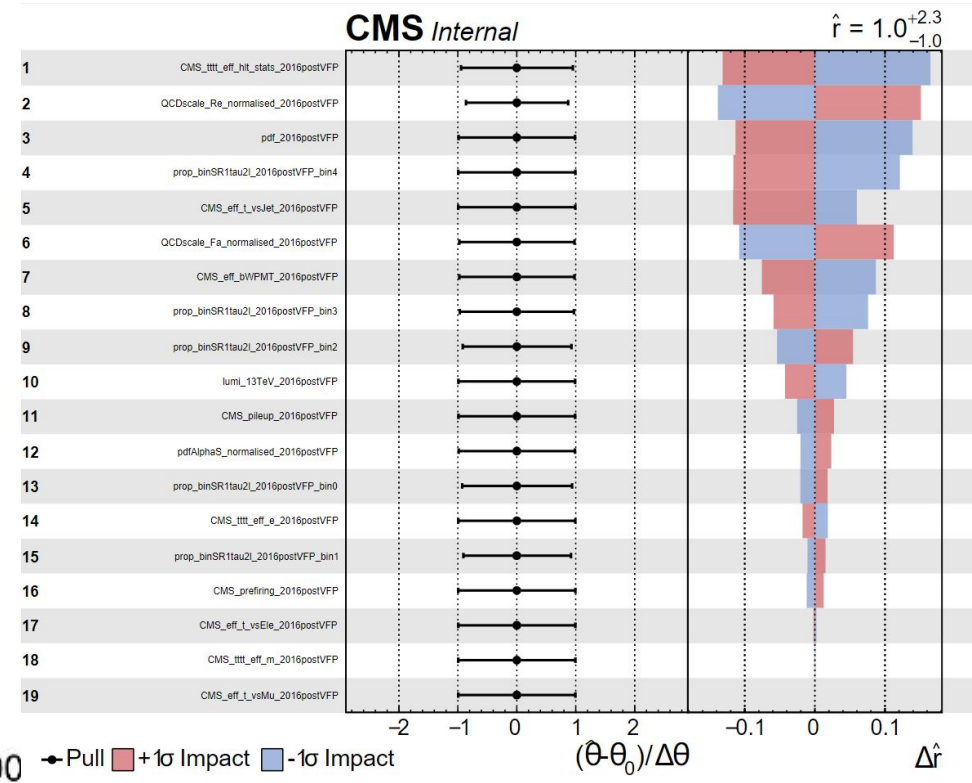
CR of 1tau2l for Run2

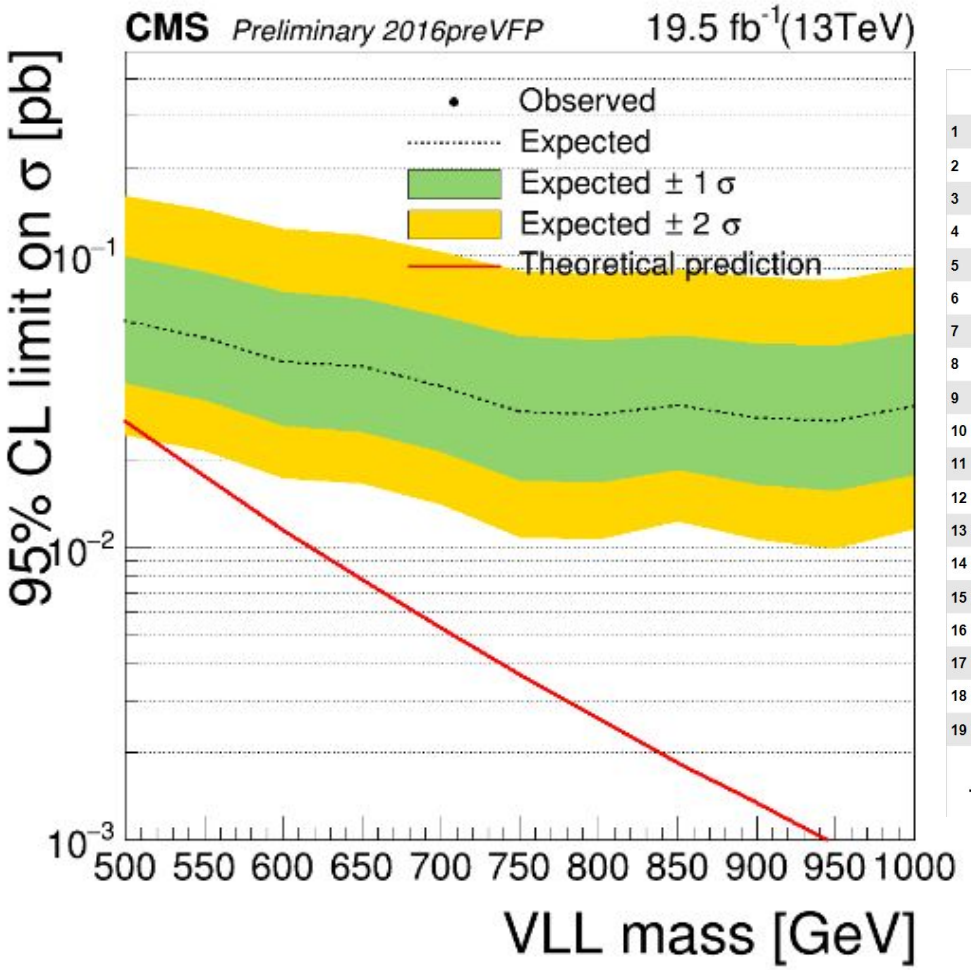


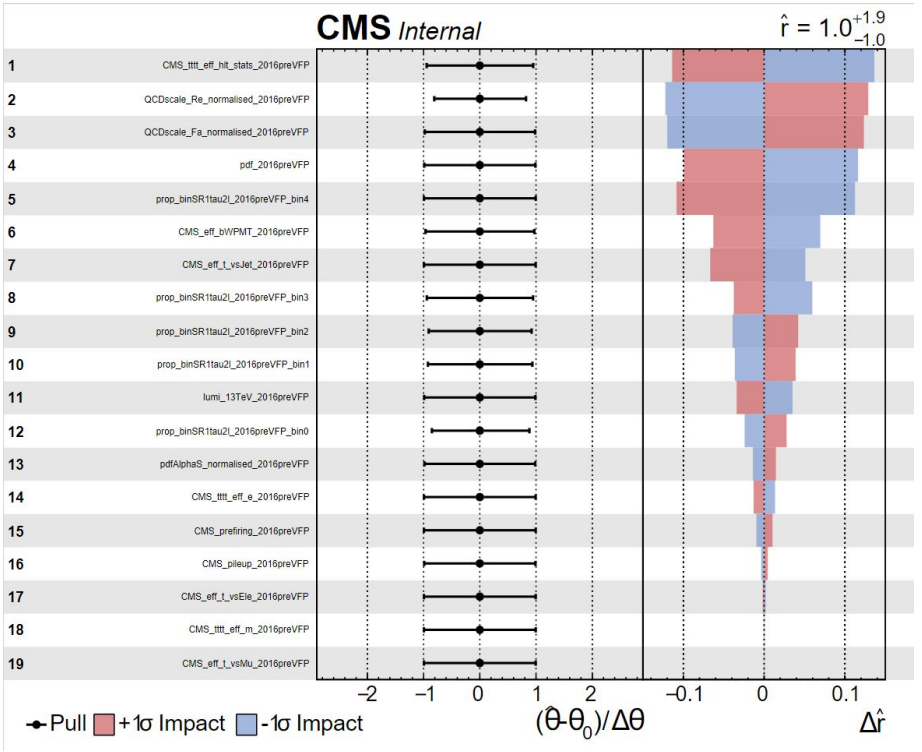


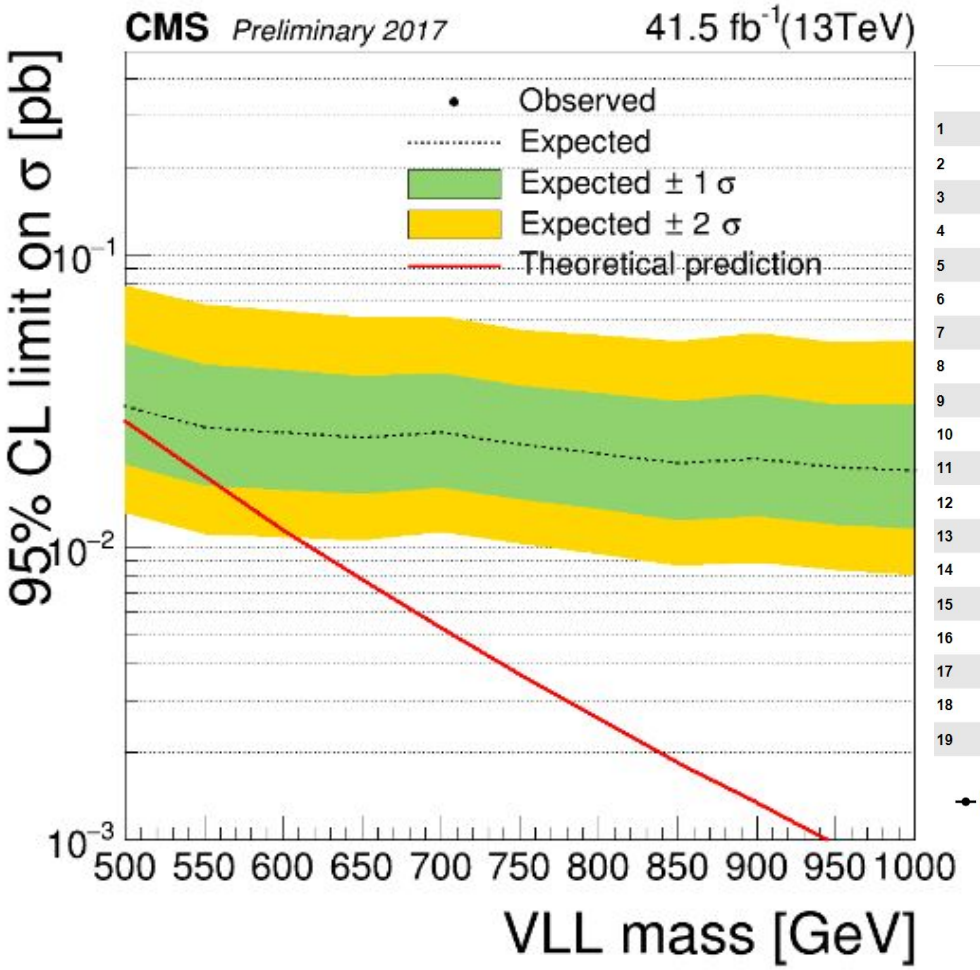
impact of 1tau2l for 2018 at VLm600

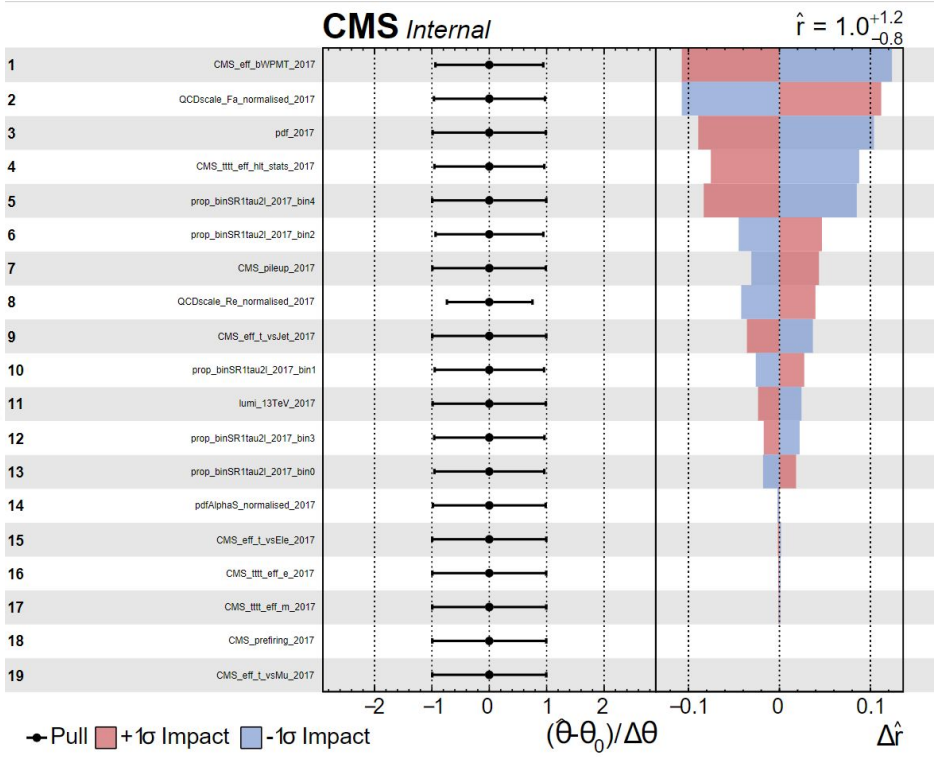

CMS Preliminary 2016postVFP
16.8 fb^{-1}(13TeV)
Observed
Expected
Expected ± 1 σ
Expected ± 2 σ
Theoretical prediction
95% CL limit on σ [pb]
10^{-1}
10^{-2}
10^{-3}
500 550 600 650 700 750 800 850 900 950 1000
VLL mass [GeV]

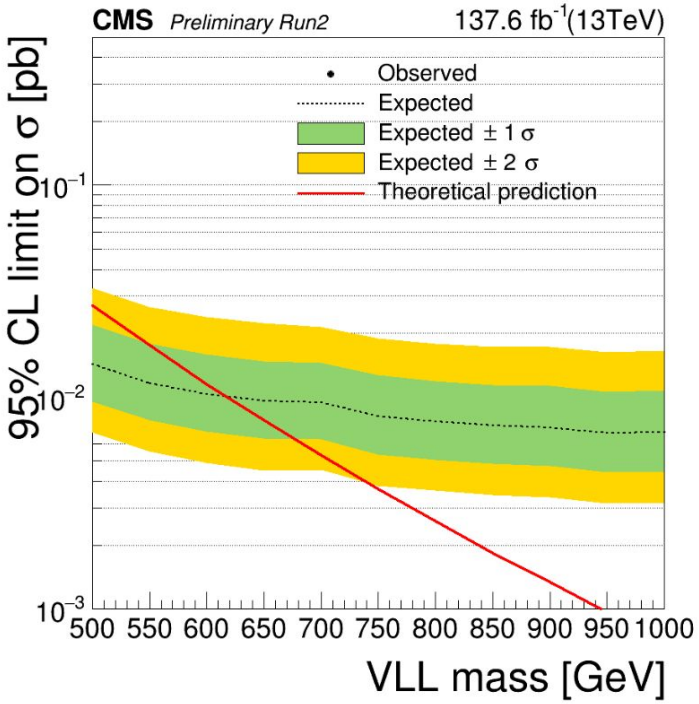

CMS Internal
$\hat{r} = 1.0^{+2.3}_{-1.0}$
1 CMS_tttt_eff_hlt_stats_2016postVFP
2 QCDscale_Re_normalised_2016postVFP
3 pdf_2016postVFP
4 prop_binSR1tau2l_2016postVFP_bin4
5 CMS_eff_t_vsJet_2016postVFP
6 QCDscale_Fa_normalised_2016postVFP
7 CMS_eff_bWPMT_2016postVFP
8 prop_binSR1tau2l_2016postVFP_bin3
9 prop_binSR1tau2l_2016postVFP_bin2
10 lumi_13TeV_2016postVFP
11 CMS_pileup_2016postVFP
12 pdfAlphaS_normalised_2016postVFP
13 prop_binSR1tau2l_2016postVFP_bin0
14 CMS_tttt_eff_e_2016postVFP
15 prop_binSR1tau2l_2016postVFP_bin1
16 CMS_prefiring_2016postVFP
17 CMS_eff_t_vsEle_2016postVFP
18 CMS_tttt_eff_m_2016postVFP
19 CMS_eff_t_vsMu_2016postVFP
−2 −1 0 1 2
Pull
+1σ Impact
-1σ Impact
$(\hat{\theta}-\theta_0)/\Delta\theta$
−0.1 0 0.1
$\Delta\hat{r}$

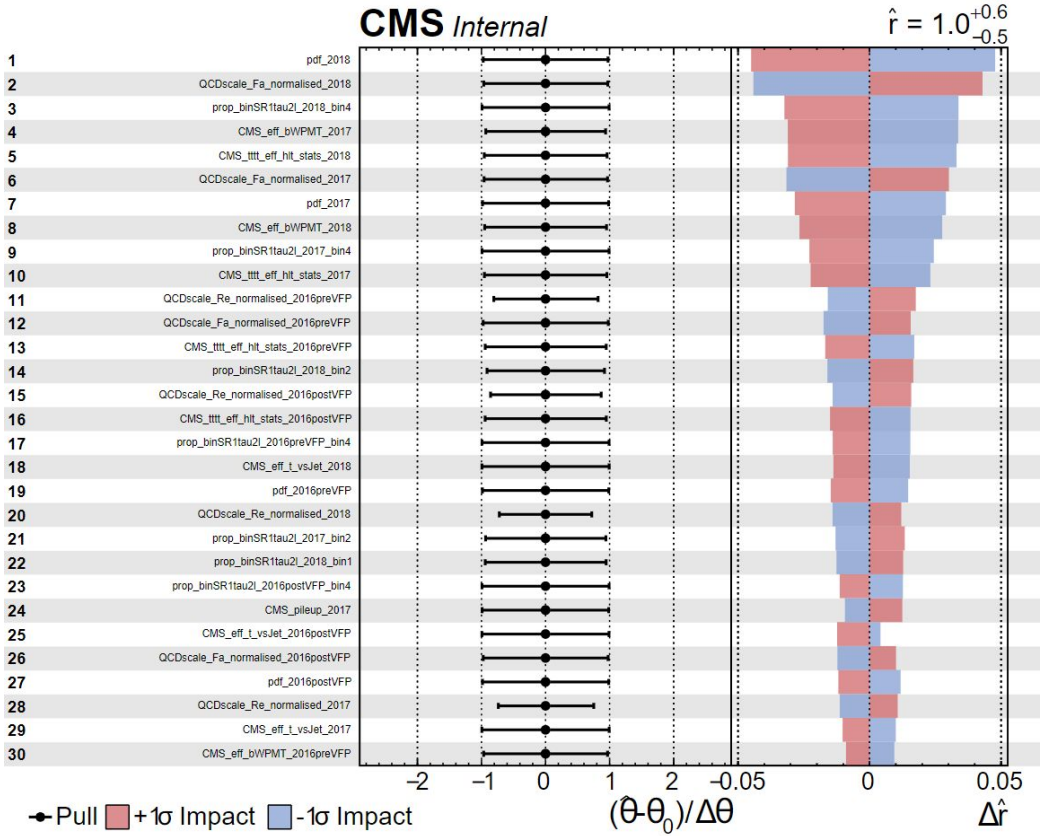

CMS Preliminary 2016preVFP
19.5 fb^{-1}(13TeV)
Observed
Expected
Expected ± 1 σ
Expected ± 2 σ
Theoretical prediction
95% CL limit on σ [pb]
10^{-1}
10^{-2}
10^{-3}
500 550 600 650 700 750 800 850 900 950 1000
VLL mass [GeV]


CMS Internal
$\hat{r} = 1.0^{+1.9}_{-1.0}$
1 CMS_tttt_eff_hlt_stats_2016preVFP
2 QCDscale_Re_normalised_2016preVFP
3 QCDscale_Fa_normalised_2016preVFP
4 pdf_2016preVFP
5 prop_binSR1tau2l_2016preVFP_bin4
6 CMS_eff_bWPMT_2016preVFP
7 CMS_eff_t_vsJet_2016preVFP
8 prop_binSR1tau2l_2016preVFP_bin3
9 prop_binSR1tau2l_2016preVFP_bin2
10 prop_binSR1tau2l_2016preVFP_bin1
11 lumi_13TeV_2016preVFP
12 prop_binSR1tau2l_2016preVFP_bin0
13 pdfAlphaS_normalised_2016preVFP
14 CMS_tttt_eff_e_2016preVFP
15 CMS_prefiring_2016preVFP
16 CMS_pileup_2016preVFP
17 CMS_eff_t_vsEle_2016preVFP
18 CMS_tttt_eff_m_2016preVFP
19 CMS_eff_t_vsMu_2016preVFP
−2 −1 0 1 2
−0.1 0 0.1
Pull +1σ Impact -1σ Impact
$(\hat{\theta}-\theta_0)/\Delta\theta$
$\Delta\hat{r}$


CMS Preliminary 2017
41.5 fb-1(13TeV)
Observed
Expected
Expected ± 1 σ
Expected ± 2 σ
Theoretical prediction
95% CL limit on σ [pb]
10−1
10−2
10−3
500 550 600 650 700 750 800 850 900 950 1000
VLL mass [GeV]


CMS Internal
r̂ = 1.0+1.2−0.8
1 CMS_eff_bWPMT_2017
2 QCDscale_Fa_normalised_2017
3 pdf_2017
4 CMS_tttt_eff_hlt_stats_2017
5 prop_binSR1tau2l_2017_bin4
6 prop_binSR1tau2l_2017_bin2
7 CMS_pileup_2017
8 QCDscale_Re_normalised_2017
9 CMS_eff_t_vsJet_2017
10 prop_binSR1tau2l_2017_bin1
11 lumi_13TeV_2017
12 prop_binSR1tau2l_2017_bin3
13 prop_binSR1tau2l_2017_bin0
14 pdfAlphaS_normalised_2017
15 CMS_eff_t_vsEle_2017
16 CMS_tttt_eff_e_2017
17 CMS_tttt_eff_m_2017
18 CMS_prefiring_2017
19 CMS_eff_t_vsMu_2017
−2 −1 0 1 2
−0.1 0 0.1
Pull +1σ Impact -1σ Impact
(θ̂-θ0)/Δθ
Δr̂





Combination of 1tau2l for Run2