

$H \rightarrow W W + 2 \text{ jets}$ Analysis



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Variables at 125 GeV

ggH		VH/VBF		Limits
dimass	104.798793	dimass	244.282757	7.82
addEt	38.6863041	JetMass	125.096772	
dPhiLepSumMet	31.5498751	Ht	97.4717646	
MetSpec	16.781146	dPhiLepSumMet	78.9068694	
lep1_Pt	9.21722025	dRLeptons	62.3379228	
SumEtLeptonsJets	9.13531656	MetSpec	56.2677372	
Mt_Hincl	9.97182513	CosDPhiLeptons_CM	37.6414234	
CosDPhiLeptons_CM	8.99414995	sumJetPt	30.471134	
lep2_Pt	9.59525302	JetdEta	29.0589872	
Mt_H	9.01101596	Mt_H	28.3755292	
MetSig	6.10230423	MetSig	25.3830067	8.22
Ht	5.40820117	jet2_Eta	24.4494784	
Aplanarity_wMet	3.30796633	Mt_Hincl	23.7301554	
dRLeptons	3.02969821	CosPsiLepton2	21.0760743	
dPhiLeptons	2.42550783	dPhiLeptons	16.811398	7.68
sumJetPt	1.70368388	jet2_E	13.3984451	
CosPsiLepton2	1.35519674	DeltaRJet12	12.6793252	
		jet1_Eta	12.7361976	
		jet2_Et	7.8642994	7.43
		jet1_Et	10.0884491	
		addEt	9.11455709	
		lep1_Pt	8.16744878	
		SumEtLeptonsJets	7.3011235	
		lep2_Pt	2.79680385	
		Aplanarity_wMet	1.72449432	
		JetAngle	1.64262007	
		jet1_E	0.950312009	

- Old limit 7.96
- 6.7% improvement in limit with 23 variables
- A check for stability:
5% improvement at 130
6% improvement at 120

Variables at 140 GeV

ggH

dimass	114.896748
Ht	52.1648573
dPhiLepSumMet	36.4880305
MetSpec	23.5145085
dRLeptons	14.791208
Mt_H	16.5882151
Mt_Hincl	14.7028473
MetSig	11.409568
SumEtLeptonsJets	6.85354059
lep2_Pt	6.53825792
CosDPhiLeptons_CM	7.06582048
lep1_Pt	5.67251379
addEt	6.25021761
sumJetPt	2.3968458
dPhiLeptons	1.9366183
Aplanarity_wMet	1.9815992
CosPsiLepton2	0.357195832

5.7% improvement

VH/VBF

dRLeptons	279.490257
JetMass	151.618225
Ht	97.0062131
dimass	82.5269788
dPhiLepSumMet	78.310207
MetSig	54.9266119
JetdEta	41.2644464
Mt_H	40.6191747
sumJetPt	29.1641229
jet1_E	30.4978997
CosDPhiLeptons_CM	31.2654943
MetSpec	24.2379147
jet2_Eta	20.0314287
DeltaRJet12	16.0245209
dPhiLeptons	12.1311885
CosPsiLepton2	11.1176601
SumEtLeptonsJets	10.6629339
jet1_Et	10.4378042
jet2_E	11.4353601
JetAngle	10.7455297
Mt_Hincl	7.03416433
jet2_Et	5.23908507
Aplanarity_wMet	3.02213763
jet1_Eta	3.02551164
lep2_Pt	2.66403142
lep1_Pt	2.49628277
addEt	0.385821679

Variables at 160 GeV

ggH		VH/VBF	
dimass	138.080404	dRLeptons	373.532591
dPhiLepSumMet	64.7167438	JetMass	200.68281
Ht	45.2128616	dPhiLepSumMet	92.2060359
dRLeptons	35.0356477	Ht	83.4637698
MetSpec	21.8647519	dimass	70.5405412
lep1_Pt	21.2862209	lep2_Pt	52.3418968
Mt_H	13.513585	MetSig	49.8246022
Mt_Hincl	10.4551266	Mt_H	42.9334634
SumEtLeptonsJets	9.98513571	JetdEta	37.2154792
MetSig	6.52257312	sumJetPt	31.3817383
dPhiLeptons	5.97559024	Mt_Hincl	32.1952017
addEt	4.79656726	jet2_E	25.4494352
CosPsiLepton2	4.01868213	JetAngle	22.5618745
sumJetPt	3.09318062	jet1_E	21.3868722
CosDPhiLeptons_CM	2.33009981	jet2_Et	19.4170953
lep2_Pt	1.55616174	CosDPhiLeptons_CM	18.5311772
Aplanarity_wMet	0.325750258	Aplanarity_wMet	16.0484448
		SumEtLeptonsJets	14.6006046
		lep1_Pt	12.5974141
		dPhiLeptons	10.4345202
		jet1_Et	10.3061521
		DeltaRJet12	7.4715554
		jet2_Eta	5.62589869
		jet1_Eta	4.54074149
		CosPsiLepton2	3.84616807
		addEt	2.32701343
		MetSpec	2.31856675

2.5% improvement
 Not surprising that the
 improvement is minimal, as
 the original variables were
 optimized for 160 GeV

Variables at 185 GeV

ggH		VH/VBF	
dRLeptons	122.110326	dRLeptons	323.249474
Ht	74.0063643	JetMass	247.799736
dPhiLepSumMet	51.6132564	Mt_H	156.016485
Mt_H	34.6830532	MetSig	78.1362301
dimass	29.4885768	dPhiLepSumMet	64.5342945
MetSpec	22.4414214	JetdEta	56.5247583
sumJetPt	19.2456867	lep2_Pt	51.6271968
Mt_Hincl	15.6813915	dimass	49.4311407
SumEtLeptonsJets	13.0098136	sumJetPt	45.7482033
MetSig	12.810801	jet2_E	34.6638454
lep1_Pt	10.9924118	Ht	34.2188995
CosDPhiLeptons_CM	8.35249487	jet1_E	34.5060154
lep2_Pt	7.59418817	JetAngle	27.5092275
dPhiLeptons	6.5521623	DeltaRJet12	28.8313422
CosPsiLepton2	5.89571994	jet2_Et	29.8496557
addEt	5.79239636	CosDPhiLeptons_CM	29.1592641
Aplanarity_wMet	2.09286785	Aplanarity_wMet	25.1141096
		Mt_Hincl	23.1629877
		SumEtLeptonsJets	18.3078187
		lep1_Pt	16.9543073
		jet2_Eta	16.1132364
		jet1_Eta	15.6320518
		addEt	12.7079387
		jet1_Et	11.9930454
		CosPsiLepton2	7.11013896
		MetSpec	7.53003933
		dPhiLeptons	2.26225417

3.7% improvement