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# ggH contamination in VBF phase space

## The technique of the study

The gluon fusion Higgs production enters the VBF phase space because of perturbative effects of the Higgs + 0jets generation, and because of higher order diagrams. A calculation is being performed with MCFM for the contribution of Higgs + 2jets at NLO, after the selections listed here below.

## selections applied

cut	CMS	ATLAS	common
tag jets	highest pT	highest pT	highest pT
jets num	2 jets w pT > 30 GeV	2 jets w pT > 25 GeV	?
jets eta	< 4.5	< 4.5	< 4.5
Deta_jj	> 3.5	> 3.8	?
M_jj	> 450 GeV	> 500 GeV	?
etaProd_jj	--	<0	?
additional jets veto	no other jets with pT > 30 GeV between tag jets	no other jets with pT > 25 GeV and eta < 3.2	?
leptons pT	20, 10 GeV	25, 15 GeV	?
leptons eta	< 2.5	< 2.5	< 2.5

## cross sections obtained with POWHEG

- powheg running conditions: powheg.input.TEMP

## results with ATLAS cuts

Results on POWEGH sample Summer11 ggHtoWW2L2nu with Atlas selections:

mH	eff	eff uncertainty	XSWG XS	XSWG XS + uncertainty	XSWG XS - uncertainty	XSWG XS*eff
120	0.00265471	0.00015556148	0.10809427	0.0212945719	0.016322235	0.00028695942
130	0.00317299	0.00017011534	0.19575323	0.03758462	0.029558738	0.00062112243
140	0.00398202	0.00019130307	0.27733405	0.0521388	0.041322773	0.0011043501
150	0.005073	0.00021530143	0.33313413	0.076645467	0.061489196	0.0016899907
160	0.0053296	0.00022441775	0.37475385	0.069704215	0.056213077	0.0019972875
170	0.0058839	0.00023585882	0.33866845	0.060621653	0.050461599	0.0019926917
180	0.0063824	0.0002416556	0.28548663	0.05167308	0.041966534	0.0018220894
190	0.00674216	0.00025089428	0.21064658	0.041497377	0.031807634	0.0014202123
200	0.00702772	0.00025365616	0.17679468	0.030408684	0.026872791	0.0012424635
210	0.00747327	0.00037000413	0.15521391	0.026231151	0.023747728	0.0011599556
220	0.00787373	0.00037987403	0.13916416	0.023379578	0.021292116	0.0010957409
230	0.00763706	0.00037407054	0.1257657	0.020877106	0.019493684	0.00096047994
250	0.00830834	0.00028107557	0.10553165	0.017412723	0.016462938	0.00087679311
300	0.0103101	0.00030774048	0.076182397	0.012798643	0.011808272	0.0007854498
350	0.0111827	0.00032063448	0.070856615	0.013958753	0.010486779	0.00079237061
400	0.0127372	0.00034245412	0.053755275	0.0084395782	0.0087621098	0.0006846903
450	0.0135938	0.00035395715	0	0	0	0

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500	0.014549	0.00036636201	0.021072977	0.0037299169	0.0037088439	0.00030659128
550	0.0143944	0.00036438276	0	0	0	0
600	0.0154585	0.00037780998	0.0082862443	0.0016075314	0.0014832377	0.00012809274

**results with CMS cuts**

Results on POWEGH sample Summer11 ggHtoWW2L2nu with CMS selections:

mH	eff	eff uncertainty	XSWG XS	XSWG XS + uncertainty	XSWG XS - uncertainty	XSWG XS*eff
120	0.00379115	0.00018600502	0.10809427	0.0212945719	0.016322235	0.00040980164
130	0.00463674	0.00020579389	0.19575323	0.03758462	0.029558738	0.00090765742
140	0.00534598	0.00022180868	0.27733405	0.0521388	0.041322773	0.0014826217
150	0.00605488	0.0002353309	0.33313413	0.076645467	0.061489196	0.0020170857
160	0.00644816	0.00024698422	0.37475385	0.069704215	0.056213077	0.0024164714
170	0.00696481	0.00025674812	0.33866845	0.060621653	0.050461599	0.0023587612
180	0.00747341	0.00026163721	0.28548663	0.05167308	0.041966534	0.0021335577
190	0.00794777	0.00027256736	0.21064658	0.041497377	0.031807634	0.0016741704
200	0.00788232	0.00026875058	0.17679468	0.030408684	0.026872791	0.0013935522
210	0.00845516	0.00039375281	0.15521391	0.026231151	0.023747728	0.0013123585
220	0.00900115	0.00040638813	0.13916416	0.023379578	0.021292116	0.0012526368
230	0.00887353	0.00040346426	0.1257657	0.020877106	0.019493684	0.0011159862
250	0.0098078	0.00030561489	0.10553165	0.017412723	0.016462938	0.0010350339
300	0.0117557	0.00032884243	0.076182397	0.012798643	0.011808272	0.00089557901
350	0.0130556	0.00034676616	0.070856615	0.013958753	0.010486779	0.00092507659
400	0.0139827	0.00035902806	0.053755275	0.0084395782	0.0087621098	0.00075164431
450	0.0152759	0.00037553015	0	0	0	0
500	0.0168132	0.00039427839	0.021072977	0.0037299169	0.0037088439	0.00035430455
550	0.0167678	0.00039373613	0	0	0	0
600	0.0183138	0.00041180196	0.0082862443	0.0016075314	0.0014832377	0.00015175223

**people involved from ATLAS (A), CMS (C), theory (T)**

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-- PietroGovoni - 11-Nov-2011

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