MadAnalysis 5 The LaTeX report

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Contents

1 Setup

1.1 Command history

```
ma5># set directory where running "./bin/ma5"; set lumi; define the signal significance
ma5>set main.currentdir = /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno # need to
change this directory path -> exit and type "pwd" to get the path
ma5>set main.lumi = 40.0
ma5>set main.SBratio = 'S/sqrt(S+B)'
ma5># import samples -> change the path to the LHE file
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/axion_signal/-
axion_signal_gurrola_cuts_1MeV.lhe.gz as signal
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_0_100_merged.lhe.gz as bg_vbf_0_100
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_100_200_merged.lhe.gz as bg_vbf_100_200
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_200_400_merged.lhe.gz as bg_vbf_200_400
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_400_600_merged.lhe.gz as bg_vbf_400_600
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_600_800_merged.lhe.gz as bg_vbf_600_800
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_800_1200_merged.lhe.gz as bg_vbf_800_1200
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_1200_1600_merged.lhe.gz as bg_vbf_1200_1600
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/vbf_diphoton_background_
merged_lhe/vbf_diphoton_background_ht_1600_inf_merged.lhe.gz as bg_vbf_1600_inf
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_0_100_merged.lhe.gz as bg_dip_0_100
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_100_200_merged.lhe.gz as bg_dip_100_200
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_200_400_merged.lhe.gz as bg_dip_200_400
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_400_600_merged.lhe.gz as bg_dip_400_600
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_600_800_merged.lhe.gz as bg_dip_600_800
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_800_1200_merged.lhe.gz as bg_dip_800_1200
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_1200_1600_merged.lhe.gz as bg_dip_1200_1600
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/madgraph_data/diphoton_double_isr_back
merged_lhe/diphoton_double_isr_background_ht_1600_inf_merged.lhe.gz as bg_dip_1600_inf
ma5># define bg and signal samples
ma5>set signal.type = signal
ma5>set bg_vbf_0_100.type = background
ma5>set bg_vbf_100_200.type = background
ma5>set bg_vbf_200_400.type = background
ma5>set bg_vbf_400_600.type = background
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ma5>set bg_vbf_600_800.type = background
ma5>set bg_vbf_800_1200.type = background
ma5>set bg_vbf_1200_1600.type = background
ma5>set bg_vbf_1600_inf.type = background
ma5>set bg_dip_0_100.type = background
ma5>set bg_dip_100_200.type = background
ma5>set bg_dip_200_400.type = background
ma5>set bg_dip_400_600.type = background
ma5>set bg_dip_600_800.type = background
ma5>set bg_dip_800_1200.type = background
ma5>set bg_dip_1200_1600.type = background
ma5>set bg_dip_1600_inf.type = background
ma5># define weights for the samples
ma5>#set sample_1.weight = 1
ma5>#set sample_2.weight = 1
ma5># line styles and colors
ma5>set signal.linecolor = red
ma5>set signal.linestyle = dashed
ma5>set signal.linewidth = 3
ma5>set bg_vbf_0_100.linecolor = blue-4
ma5>set bg_vbf_0_100.linestyle = dash-dotted
ma5>set bg_vbf_0_100.linewidth = 4
ma5>set bg_vbf_100_200.linecolor = blue-3
ma5>set bg_vbf_100_200.linestyle = dash-dotted
ma5>set bg_vbf_100_200.linewidth = 4
ma5>set bg_vbf_200_400.linecolor = blue-2
ma5>set bg_vbf_200_400.linestyle = dash-dotted
ma5>set bg_vbf_200_400.linewidth = 4
ma5>set bg_vbf_400_600.linecolor = blue-1
ma5>set bg_vbf_400_600.linestyle = dash-dotted
ma5>set bg_vbf_400_600.linewidth = 4
ma5>set bg_vbf_600_800.linecolor = blue
ma5>set bg_vbf_600_800.linestyle = dash-dotted
ma5>set bg_vbf_600_800.linewidth = 4
ma5>set bg_vbf_800_1200.linecolor = blue+1
ma5>set bg_vbf_800_1200.linestyle = dash-dotted
ma5>set bg_vbf_800_1200.linewidth = 4
ma5>set bg_vbf_1200_1600.linecolor = blue+2
ma5>set bg_vbf_1200_1600.linestyle = dash-dotted
ma5>set bg_vbf_1200_1600.linewidth = 4
ma5>set bg_vbf_1600_inf.linecolor = blue+3
ma5>set bg_vbf_1600_inf.linestyle = dash-dotted
ma5>set bg_vbf_1600_inf.linewidth = 4
ma5>set bg_dip_0_100.linecolor = green-4
ma5>set bg_dip_0_100.linestyle = dash-dotted
ma5>set bg_dip_0_100.linewidth = 4
ma5>set bg_dip_100_200.linecolor = green-3
ma5>set bg_dip_100_200.linestyle = dash-dotted
ma5>set bg_dip_100_200.linewidth = 4
```

```
ma5>set bg_dip_200_400.linecolor = green-2
ma5>set bg_dip_200_400.linestyle = dash-dotted
ma5>set bg_dip_200_400.linewidth = 4
ma5>set bg_dip_400_600.linecolor = green-1
ma5>set bg_dip_400_600.linestyle = dash-dotted
ma5>set bg_dip_400_600.linewidth = 4
ma5>set bg_dip_600_800.linecolor = green
ma5>set bg_dip_600_800.linestyle = dash-dotted
ma5>set bg_dip_600_800.linewidth = 4
ma5>set bg_dip_800_1200.linecolor = green+1
ma5>set bg_dip_800_1200.linestyle = dash-dotted
ma5>set bg_dip_800_1200.linewidth = 4
ma5>set bg_dip_1200_1600.linecolor = green+2
ma5>set bg_dip_1200_1600.linestyle = dash-dotted
ma5>set bg_dip_1200_1600.linewidth = 4
ma5>set bg_dip_1600_inf.linecolor = green+3
ma5>set bg_dip_1600_inf.linestyle = dash-dotted
ma5>set bg_dip_1600_inf.linewidth = 4
ma5># a jet can be from a light quark or b quark
ma5>define jets = j
ma5>define e = e+ e-
ma5>define mu = mu+ mu-
ma5>define ta = ta+ ta-
ma5>define lept = e mu ta
ma5>define ax = 9000005
ma5># apply selections
ma5>select PT(a[1]) > 350 and M(a[1] a[2]) > 400
ma5>select (sdETA(jets[1] jets[2]) > 3.6 or sdETA(jets[1] jets[2]) < -3.6) and M(jets[1]
jets[2]) > 2000
ma5>submit second_analysis_sdEta3.6_mjj2000
```

1.2 Configuration

- MadAnalysis version 1.6.33 (2017/11/20).

- Histograms given for an integrated luminosity of 40.0fb^{-1}.

2 Datasets

2.1 signal

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: signal events.

- Generated events: 1000000 events.

- Normalization to the luminosity: 4094+/- 2 events.

- Ratio (event weight): 0.0041 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/-madgraph_data/axion_signal/-axion_signal_gurrola_cuts_1MeV.lh	1000000	0.102 @ 0.028%	0.0

2.2 bg_vbf_0_100

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1000000 events.

- Normalization to the luminosity: 12150+/- 24 events.

- Ratio (event weight): 0.012 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-vbf_diphoton_background_data/-merged_lhe/-vbf_diphoton_background_ht_0_1(	1000000	0.304 @ 0.19%	0.0

2.3 bg_vbf_100_200

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 965662 events.

- Normalization to the luminosity: 9695+/- 17 events.

- Ratio (event weight): 0.01 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-vbf_diphoton_background_data/-merged_lhe/-vbf_diphoton_background_ht_100_	965662	0.242 @ 0.17%	0.0

2.4 bg_vbf_200_400

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 984165 events.

- Normalization to the luminosity: 5413+/- 11 events.

- Ratio (event weight): 0.0055 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-vbf_diphoton_background_data/-merged_lhe/-vbf_diphoton_background_ht_200_	984165	0.135 @ 0.2%	0.0

2.5 bg_vbf_400_600

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1000000 events.

- Normalization to the luminosity: 986+/- 2 events.

- Ratio (event weight): 0.00099 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- vbf_diphoton_background_data/- merged_lhe/- vbf_diphoton_background_ht_400_	1000000	0.0247 @ 0.14%	0.0

2.6   bg_vbf_600_800

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/- optimization .

- Sample consisting of: background events.

- Generated events: 1000000 events.

- Normalization to the luminosity: 252+/- 1 events.

- Ratio (event weight): 0.00025 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- vbf_diphoton_background_data/- merged_lhe/- vbf_diphoton_background_ht_600_	1000000	0.0063 @ 0.13%	0.0

2.7   bg_vbf_800_1200

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/- optimization .

- Sample consisting of: background events.

- Generated events: 400839 events.

- Normalization to the luminosity: 114+/- 1 events.

- Ratio (event weight): 0.00028 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- vbf_diphoton_background_data/- merged_lhe/- vbf_diphoton_background_ht_800_	400839	0.00287 @ 0.16%	0.0

2.8 bg_vbf_1200_1600

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 953803 events.

- Normalization to the luminosity: 20+/- 1 events.

- Ratio (event weight): 2.1e-05 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-vbf_diphoton_background_data/-merged_lhe/-vbf_diphoton_background_ht_1200	953803	0.000515 @ 0.16%	0.0

2.9 bg_vbf_1600_inf

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 270148 events.

- Normalization to the luminosity: 7+/- 1 events.

- Ratio (event weight): 2.6e-05 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-vbf_diphoton_background_data/-merged_lhe/-vbf_diphoton_background_ht_1600	270148	0.000191 @ 0.11%	0.0

2.10 bg_dip_0_100

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 2710847+/- 4614 events.

- Ratio (event weight): 2.6 - warning: please generate more events (weight larger than 1)!

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- diphoton_double_isr_background_d merged_lhe/- diphoton_double_isr_background_l	1040000	67.8 @ 0.17%	0.0

2.11 bg_dip_100_200

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/- optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 1095362+/- 1528 events.

- Ratio (event weight): 1.1 - warning: please generate more events (weight larger than 1)!

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- diphoton_double_isr_background_d merged_lhe/- diphoton_double_isr_background_l	1040000	27.4 @ 0.14%	0.0

2.12 bg_dip_200_400

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/- optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 239548+/- 414 events.

- Ratio (event weight): 0.23 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/- MG5_aMC_v2_6_5/- axion_pheno/madgraph_data/- diphoton_double_isr_background_d merged_lhe/- diphoton_double_isr_background_l	1040000	5.99 @ 0.17%	0.0

2.13 bg_dip_400_600

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 28798+/- 53 events.

- Ratio (event weight): 0.028 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-diphoton_double_isr_background_c merged_lhe/-diphoton_double_isr_background_l	1040000	0.72 @ 0.18%	0.0

2.14 bg_dip_600_800

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 662009 events.

- Normalization to the luminosity: 6674+/- 28 events.

- Ratio (event weight): 0.01 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-diphoton_double_isr_background_c merged_lhe/-diphoton_double_isr_background_l	662009	0.167 @ 0.41%	0.0

2.15 bg_dip_800_1200

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 2942+/- 6 events.

- Ratio (event weight): 0.0028 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-diphoton_double_isr_background_c merged_lhe/-diphoton_double_isr_background_l	1040000	0.0736 @ 0.17%	0.0

2.16   bg_dip_1200_1600

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 337115 events.

- Normalization to the luminosity: 513+/- 3 events.

- Ratio (event weight): 0.0015 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-diphoton_double_isr_background_c merged_lhe/-diphoton_double_isr_background_l	337115	0.0128 @ 0.51%	0.0

2.17   bg_dip_1600_inf

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-optimization .

- Sample consisting of: background events.

- Generated events: 1040000 events.

- Normalization to the luminosity: 187+/- 1 events.

- Ratio (event weight): 0.00018 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/madgraph_data/-diphoton_double_isr_background_c merged_lhe/-diphoton_double_isr_background_l	1040000	0.00469 @ 0.15%	0.0

3 Histos and cuts

3.1 Cut 1

* Cut: select PT (a[1]) > 350.0 and M (a[1] a[2]) > 400.0

Dataset	Events kept: K	Rejected events: R	Efficiency: K / (K + R)	Cumul. efficiency: K / Initial
signal	2606.2 +/- 30.8	1487.9 +/- 30.8	0.63657 +/- 0.00752	0.63657 +/- 0.00752
bg_vbf_0_10	0.377 +/- 0.614	12149.9 +/- 23.1	3.10e-05 +/- 5.05e-05	3.10e-05 +/- 5.05e-05
bg_vbf_100_	2.39 +/- 1.55	9692.9 +/- 16.7	0.000247 +/- 0.000159	0.000247 +/- 0.000159
bg_vbf_200_	10.50 +/- 3.24	5402.8 +/- 11.4	0.001939 +/- 0.000598	0.001939 +/- 0.000598
bg_vbf_400_	12.18 +/- 3.47	974.67 +/- 3.72	0.01234 +/- 0.00351	0.01234 +/- 0.00351
bg_vbf_600_	6.45 +/- 2.51	245.62 +/- 2.53	0.02560 +/- 0.00995	0.02560 +/- 0.00995
bg_vbf_800_	4.21 +/- 2.01	110.56 +/- 2.02	0.0366 +/- 0.0175	0.0366 +/- 0.0175
bg_vbf_1200	0.925 +/- 0.940	19.670 +/- 0.941	0.0449 +/- 0.0456	0.0449 +/- 0.0456
bg_vbf_1600	0.359 +/- 0.585	7.300 +/- 0.585	0.0469 +/- 0.0764	0.0469 +/- 0.0764
bg_dip_0_10	20.85 +/- 4.57	2710826 +/- 4613	7.69e-06 +/- 1.68e-06	7.69e-06 +/- 1.68e-06
bg_dip_100_	105.3 +/- 10.3	1095257 +/- 1526	9.62e-05 +/- 9.37e-06	9.62e-05 +/- 9.37e-06
bg_dip_200_	420.4 +/- 20.5	239128 +/- 413	1.75e-03 +/- 8.55e-05	1.75e-03 +/- 8.55e-05
bg_dip_400_	334.8 +/- 18.2	28463.9 +/- 54.7	0.011624 +/- 0.000632	0.011624 +/- 0.000632
bg_dip_600_	129.4 +/- 11.3	6545.0 +/- 29.3	0.01939 +/- 0.00169	0.01939 +/- 0.00169
bg_dip_800_	71.50 +/- 8.35	2870.8 +/- 9.7	0.02430 +/- 0.00284	0.02430 +/- 0.00284
bg_dip_1200	14.45 +/- 3.75	499.05 +/- 4.54	0.0281 +/- 0.0073	0.0281 +/- 0.0073
bg_dip_1600	5.74 +/- 2.36	182.04 +/- 2.37	0.0306 +/- 0.0126	0.0306 +/- 0.0126

3.2 Cut 2

* Cut: select (sdETA (jets[1] jets[2]) > 3.6 or sdETA (jets[1] jets[2]) < -3.6) and M (jets[1] jets[2]) > 2000.0

Dataset	Events kept: K	Rejected events: R	Efficiency: K / (K + R)	Cumul. efficiency: K / Initial
signal	250.1 +/- 15.3	2356.0 +/- 31.6	0.09598 +/- 0.00577	0.06110 +/- 0.00374
bg_vbf_0_10	0.0 +/- 0.0	0.377 +/- 0.614	0.0 +/- 0.0	0.0 +/- 0.0
bg_vbf_100_	0.0703 +/- 0.2652	2.32 +/- 1.52	0.0294 +/- 0.1093	7.25e-06 +/- 2.74e-05
bg_vbf_200_	1.04 +/- 1.02	9.46 +/- 3.07	0.0990 +/- 0.0922	0.000192 +/- 0.000188
bg_vbf_400_	2.12 +/- 1.45	10.06 +/- 3.16	0.174 +/- 0.109	0.00215 +/- 0.00147
bg_vbf_600_	1.5 +/- 1.2	5.00 +/- 2.21	0.226 +/- 0.165	0.00578 +/- 0.00477
bg_vbf_800_	0.743 +/- 0.859	3.46 +/- 1.83	0.177 +/- 0.186	0.00647 +/- 0.00749
bg_vbf_1200	0.0661 +/- 0.2567	0.859 +/- 0.907	0.0714 +/- 0.2677	0.00321 +/- 0.01246
bg_vbf_1600	0.00676 +/- 0.08218	0.352 +/- 0.580	0.0188 +/- 0.2270	0.000883 +/- 0.010730
bg_dip_0_10	0.0 +/- 0.0	20.85 +/- 4.57	0.0 +/- 0.0	0.0 +/- 0.0
bg_dip_100_	0.0 +/- 0.0	105.3 +/- 10.3	0.0 +/- 0.0	0.0 +/- 0.0
bg_dip_200_	0.692 +/- 0.832	419.7 +/- 20.5	0.00165 +/- 0.00198	2.89e-06 +/- 3.47e-06
bg_dip_400_	1.83 +/- 1.35	332.9 +/- 18.2	0.00546 +/- 0.00403	6.35e-05 +/- 4.69e-05
bg_dip_600_	1.35 +/- 1.16	128.0 +/- 11.2	0.01044 +/- 0.00894	0.000202 +/- 0.000174
bg_dip_800_	0.823 +/- 0.907	70.68 +/- 8.31	0.0115 +/- 0.0126	0.00028 +/- 0.00031
bg_dip_1200	0.0685 +/- 0.2618	14.38 +/- 3.74	0.00474 +/- 0.01807	0.000133 +/- 0.000510
bg_dip_1600	0.00758 +/- 0.08709	5.73 +/- 2.36	0.00132 +/- 0.01516	4.04e-05 +/- 4.64e-04

4   Summary

4.1   Cut-flow charts

- How to compare signal (S) and background (B): S/sqrt(S+B) .

- Object definition selections are indicated in cyan.

- Reject and select are indicated by 'REJ' and 'SEL' respectively

Cuts	Signal (S)	Background (B)	S vs B
Initial (no cut)	4094.08 +/- 1.13	4113516 +/- 4877	2.01760 +/- 0.00132
SEL: PT (a[1]) > 350.0 and M (a[1] a[2]) > 400	2606.2 +/- 30.8	1139.8 +/- 33.6	42.58 +/- 0.38
SEL: (sdETA (jets[1] jets[2]) > 3.6 or sdETA (	250.1 +/- 15.3	10.3 +/- 3.2	15.501 +/- 0.503