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/madgraph_data
# need to change this directory path -> exit and type "pwd" to get the path
ma5>set main.lumi = 1000
ma5>set main.fom.formula = 5
ma5>set main.fom.x = 0.0
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
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># 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># cuts
ma5>select ((sdETA(jets[1] jets[2]) > 3.6 or sdETA(jets[1] jets[2]) < -3.6) and M(jets[1]
jets[2]) > 750) and (PT(a[1]) > 300 and M(a[1] a[2]) > 500)
ma5># define which plots to make
ma5>plot PT(jets[1])
ma5>plot ETA(jets[1])
ma5>plot PHI(jets[1])
ma5>plot PT(jets[2])
ma5>plot ETA(jets[2])
ma5>plot PHI(jets[2])
ma5>plot DELTAR(jets[1], jets[2])
ma5>plot M(jets[1] jets[2])
ma5>plot MET
ma5>plot sdETA(jets[1] jets[2])
ma5>plot M(a[1] a[2])
ma5>plot PT(a[1])
ma5>plot PT(a[2])
ma5>plot THT
ma5>plot MET
ma5>plot TET
ma5>#set the plot/graph parameters
ma5>set selection[2].xmax = 2000
ma5>set selection[2].xmin = 0
ma5>set selection[2].nbins = 200
ma5>set selection[2].logY = true
ma5>set selection[2].logX = false
ma5>set selection[2].rank = PTordering
```

```
ma5>#set selection[2].stacking_method = normalize2one
ma5>set selection[2].titleX = "p_{T}[j_{1}] (GeV)"
ma5>set selection[3].xmax = 8
ma5>set selection[3].xmin = -8
ma5>set selection[3].nbins = 160
ma5>set selection[3].logY = false
ma5>set selection[3].logX = false
ma5>set selection[3].rank = PTordering
ma5>#set selection[3].stacking_method = normalize2one
ma5>set selection[3].titleX = "#eta[j_{1}]"
ma5>set selection[4].xmax = 3.2
ma5>set selection[4].xmin = -3.2
ma5>set selection[4].nbins = 64
ma5>set selection[4].logY = false
ma5>set selection[4].logX = false
ma5>set selection[4].rank = PTordering
ma5>#set selection[4].stacking_method = normalize2one
ma5>set selection[4].titleX = "#phi[j_{1}]"
ma5>set selection[5].xmax = 1000
ma5>set selection[5].xmin = 0
ma5>set selection[5].nbins = 100
ma5>set selection[5].logY = true
ma5>set selection[5].logX = false
ma5>set selection[5].rank = PTordering
ma5>#set selection[5].stacking_method = normalize2one
ma5>set selection[5].titleX = "p_{T}[j_{2}] (GeV)"
ma5>set selection[6].xmax = 8
ma5>set selection[6].xmin = -8
ma5>set selection[6].nbins = 160
ma5>set selection[6].logY = false
ma5>set selection[6].logX = false
ma5>set selection[6].rank = PTordering
ma5>#set selection[6].stacking_method = normalize2one
ma5>set selection[6].titleX = "#eta[j_{2}]"
ma5>set selection[7].xmax = 3.2
ma5>set selection[7].xmin = -3.2
ma5>set selection[7].nbins = 64
ma5>set selection[7].logY = false
ma5>set selection[7].logX = false
ma5>set selection[7].rank = PTordering
ma5>#set selection[7].stacking_method = normalize2one
ma5>set selection[7].titleX = "#phi[j_{2}]"
ma5>set selection[8].xmax = 15
ma5>set selection[8].xmin = 0
ma5>set selection[8].nbins = 75
ma5>set selection[8].logY = false
ma5>set selection[8].logX = false
ma5>set selection[8].rank = PTordering
ma5>#set selection[8].stacking_method = normalize2one
```

```
ma5>set selection[8].titleX = "#DeltaR[j_{1},j_{2}]"
ma5>set selection[9].xmax = 8000
ma5>set selection[9].xmin = 0
ma5>set selection[9].nbins = 160
ma5>set selection[9].logY = false
ma5>set selection[9].logX = false
ma5>set selection[9].rank = PTordering
ma5>#set selection[9].stacking_method = normalize2one
ma5>set selection[9].titleX = "M[j_{1},j_{2}] (GeV)"
ma5>set selection[10].xmax = 1000
ma5>set selection[10].xmin = 0
ma5>set selection[10].nbins = 100
ma5>set selection[10].logY = true
ma5>set selection[10].logX = false
ma5>set selection[10].rank = PTordering
ma5>#set selection[10].stacking_method = normalize2one
ma5>set selection[10].titleX = "#slash{E}_{T} (GeV)"
ma5>#set selection[11].stacking_method = normalize2one
ma5>set selection[11].titleX = "#Delta#eta(j_{1},j_{2})"
ma5>set selection[11].xmax = 15
ma5>set selection[11].xmin = -15
ma5>set selection[12].xmax = 4000
ma5>set selection[12].xmin = 0
ma5>set selection[12].nbins = 400
ma5>set selection[12].logY = true
ma5>set selection[12].logX = false
ma5>set selection[12].rank = PTordering
ma5>#set selection[12].stacking_method = normalize2one
ma5>set selection[12].titleX = "M[a_{1},a_{2}] (GeV)"
ma5>set selection[13].xmax = 2000
ma5>set selection[13].xmin = 0
ma5>set selection[13].nbins = 80
ma5>set selection[13].logY = false
ma5>set selection[13].logX = false
ma5>set selection[13].rank = PTordering
ma5>#set selection[13].stacking_method = normalize2one
ma5>set selection[13].titleX = "p_{T}[a_{1}]"
ma5>set selection[14].xmax = 2000
ma5>set selection[14].xmin = 0
ma5>set selection[14].nbins = 400
ma5>set selection[14].logY = true
ma5>set selection[14].logX = false
ma5>set selection[14].rank = PTordering
ma5>#set selection[14].stacking_method = normalize2one
ma5>set selection[14].titleX = "p_{T}[a_{2}] (GeV)"
ma5>set selection[15].xmax = 4000
ma5>set selection[15].xmin = 0
ma5>set selection[15].nbins = 80
ma5>set selection[15].logY = false
```

```
ma5>set selection[15].logX = false
ma5>set selection[15].rank = PTordering
ma5>#set selection[15].stacking_method = normalize2one
ma5>set selection[15].titleX = "THT"
ma5>#set selection[16].xmax = 1000
ma5>#set selection[16].xmin = 0
ma5>set selection[16].nbins = 200
ma5>set selection[16].logY = true
ma5>set selection[16].logX = false
ma5>set selection[16].rank = PTordering
ma5>#set selection[16].stacking_method = normalize2one
ma5>set selection[16].titleX = "MET"
ma5>set selection[17].xmax = 8000
ma5>set selection[17].xmin = 0
ma5>set selection[17].nbins = 80
ma5>set selection[17].logY = false
ma5>set selection[17].logX = false
ma5>set selection[17].rank = PTordering
ma5>#set selection[17].stacking_method = normalize2one
ma5>set selection[17].titleX = "TET"
ma5>submit four_cuts_lum1000
```

1.2 Configuration

- MadAnalysis version 1.6.33 (2017/11/20).
- Histograms given for an integrated luminosity of 1000.0fb^{-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: 102352+/- 29 events.
- Ratio (event weight): 0.1 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_pheno/-madgraph_data/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: 303758+/- 578 events.
- Ratio (event weight): 0.3 .

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: 242383+/- 415 events.
- Ratio (event weight): 0.25 .

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: 135331+/- 273 events.
- Ratio (event weight): 0.14 .

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: 24671+/- 35 events.
- Ratio (event weight): 0.025 .

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: 6301+/- 8 events.
- Ratio (event weight): 0.0063 .

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: 2869+/- 5 events.
- Ratio (event weight): 0.0072 .

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: 514+/- 1 events.
- Ratio (event weight): 0.00054 .

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: 191+/- 1 events.
- Ratio (event weight): 0.00071 .

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: 67771180+/- 115331 events.

- Ratio (event weight): 65 - 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_c 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: 27384070+/- 38178 events.
- Ratio (event weight): 26 - 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_c 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: 5988721+/- 10345 events.
- Ratio (event weight): 5.8 - 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_c 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: 719967+/- 1306 events.
- Ratio (event weight): 0.69 .

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: 166859+/- 690 events.
- Ratio (event weight): 0.25 .

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: 73558+/- 127 events.

- Ratio (event weight): 0.071 .

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: 12837+/- 66 events.
- Ratio (event weight): 0.038 .

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: 4694+/- 7 events.
- Ratio (event weight): 0.0045 .

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 ((sdETA (jets[1] jets[2]) > 3.6 or sdETA (jets[1] jets[2]) < -3.6) and M (jets[1] jets[2]) > 750.0) and (PT (a[1]) > 300.0 and M (a[1] a[2]) > 500.0)**

Dataset	Events kept: K	Rejected events: R	Efficiency: K / (K + R)	Cumul. efficiency: K / Initial
signal	19174 +/- 124	83177 +/- 126	0.18734 +/- 0.00122	0.18734 +/- 0.00122
bg_vbf_0_10	1.2 +/- 1.1	303756 +/- 577	4.00e-06 +/- 3.63e-06	4.00e-06 +/- 3.63e-06
bg_vbf_100_	29.1 +/- 5.4	242354 +/- 414	1.20e-04 +/- 2.23e-05	1.20e-04 +/- 2.23e-05
bg_vbf_200_	151.1 +/- 12.3	135180 +/- 272	1.12e-03 +/- 9.08e-05	1.12e-03 +/- 9.08e-05
bg_vbf_400_	110.9 +/- 10.5	24560.3 +/- 35.8	0.004496 +/- 0.000426	0.004496 +/- 0.000426
bg_vbf_600_	40.99 +/- 6.38	6260.9 +/- 10.1	0.00650 +/- 0.00101	0.00650 +/- 0.00101
bg_vbf_800_	15.56 +/- 3.93	2853.50 +/- 5.97	0.00542 +/- 0.00137	0.00542 +/- 0.00137
bg_vbf_1200_	1.37 +/- 1.17	513.52 +/- 1.44	0.00266 +/- 0.00227	0.00266 +/- 0.00227
bg_vbf_1600_	0.143 +/- 0.377	191.320 +/- 0.434	0.000744 +/- 0.001971	0.000744 +/- 0.001971
bg_dip_0_10	0.0 +/- 0.0	67771180 +/- 115331	0.0 +/- 0.0	0.0 +/- 0.0
bg_dip_100_	79.05 +/- 8.89	27383990 +/- 38176	2.89e-06 +/- 3.25e-07	2.89e-06 +/- 3.25e-07
bg_dip_200_	477.9 +/- 21.9	5988243 +/- 10344	7.98e-05 +/- 3.65e-06	7.98e-05 +/- 3.65e-06
bg_dip_400_	306.7 +/- 17.5	719660 +/- 1304	4.26e-04 +/- 2.43e-05	4.26e-04 +/- 2.43e-05
bg_dip_600_	89.97 +/- 9.49	166769 +/- 689	5.39e-04 +/- 5.68e-05	5.39e-04 +/- 5.68e-05
bg_dip_800_	36.78 +/- 6.06	73521 +/- 126	5.00e-04 +/- 8.24e-05	5.00e-04 +/- 8.24e-05
bg_dip_1200_	2.63 +/- 1.62	12835.0 +/- 65.8	0.000205 +/- 0.000126	0.000205 +/- 0.000126
bg_dip_1600_	0.244 +/- 0.494	4694.35 +/- 6.98	5.19e-05 +/- 1.05e-04	5.19e-05 +/- 1.05e-04

3.2 Histogram 1

*** Plot: PT (jets[1])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	370.671	277.6	0.0	0.08114
bg_vbf_0_100	1.22	1.0	42.7818	7.815	0.0	0.0
bg_vbf_100_20	29.1	1.0	109.408	25.35	0.0	0.0
bg_vbf_200_40	151	1.0	214.843	58.14	0.0	0.0
bg_vbf_400_60	110	1.0	360.116	74.81	0.0	0.0
bg_vbf_600_80	41.0	1.0	512.148	95.26	0.0	0.0
bg_vbf_800_12	15.6	1.0	713.131	144.6	0.0	0.0
bg_vbf_1200_1	1.37	1.0	1037.47	214.8	0.0	0.0
bg_vbf_1600_i	0.145	1.0	1488.05	353.5	0.0	7.318
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	98.8303	32.52	0.0	0.0
bg_dip_200_40	477	1.0	243.87	57.21	0.0	0.0
bg_dip_400_60	306	1.0	405.044	76.84	0.0	0.0
bg_dip_600_80	90.0	1.0	583.265	92.47	0.0	0.0
bg_dip_800_12	36.8	1.0	800.398	151.0	0.0	0.0
bg_dip_1200_1	2.63	1.0	1173.89	227.2	0.0	0.0
bg_dip_1600_i	0.244	1.0	1675.33	329.4	0.0	11.11

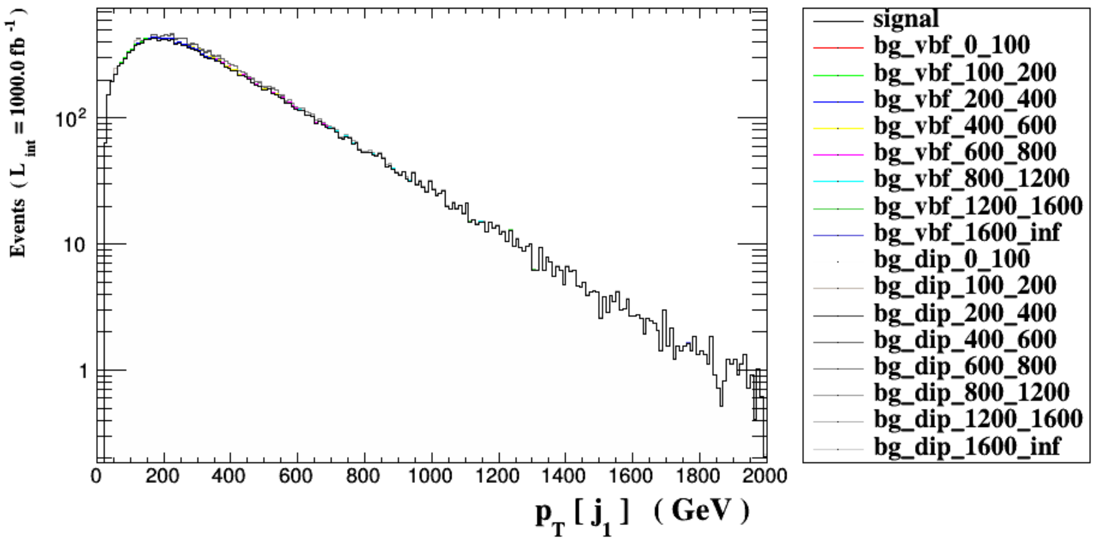

Figure 1.

3.3 Histogram 2

*** Plot: ETA (jets[1])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	-0.00426672	2.037	0.0	0.0
bg_vbf_0_100	1.22	1.0	0.873486	2.934	0.0	0.0
bg_vbf_100_20	29.1	1.0	0.133336	2.773	0.0	0.0
bg_vbf_200_40	151	1.0	-0.006481	2.235	0.0	0.0
bg_vbf_400_60	110	1.0	-0.0267496	1.928	0.0	0.0
bg_vbf_600_80	41.0	1.0	0.00605067	1.754	0.0	0.0
bg_vbf_800_12	15.6	1.0	-0.0592612	1.598	0.0	0.0
bg_vbf_1200_1	1.37	1.0	-0.0746631	1.45	0.0	0.0
bg_vbf_1600_i	0.145	1.0	0.0871655	1.227	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	1.65038	2.73	0.0	0.0
bg_dip_200_40	477	1.0	0.146548	1.676	0.0	0.0
bg_dip_400_60	306	1.0	0.1076	1.425	0.0	0.0
bg_dip_600_80	90.0	1.0	-0.0364249	1.3	0.0	0.0
bg_dip_800_12	36.8	1.0	-0.0506134	1.215	0.0	0.0
bg_dip_1200_1	2.63	1.0	0.0264047	1.124	0.0	0.0
bg_dip_1600_i	0.244	1.0	-0.0490747	0.8389	0.0	0.0

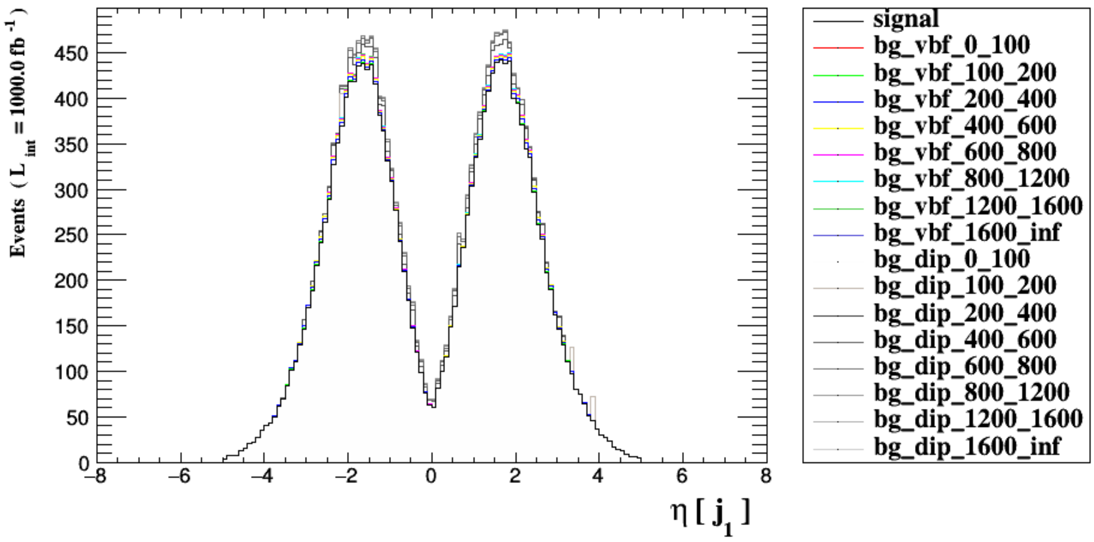

Figure 2.

3.4 Histogram 3

*** Plot: PHI (jets[1])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	0.00274665	1.814	0.0	0.0
bg_vbf_0_100	1.22	1.0	-0.168141	1.997	0.0	0.0
bg_vbf_100_20	29.1	1.0	-0.0767497	1.778	0.0	0.0
bg_vbf_200_40	151	1.0	-0.0816388	1.818	0.0	0.0
bg_vbf_400_60	110	1.0	0.0212645	1.801	0.0	0.0
bg_vbf_600_80	41.0	1.0	-0.00569695	1.808	0.0	0.0
bg_vbf_800_12	15.6	1.0	0.0641089	1.814	0.0	0.0
bg_vbf_1200_1	1.37	1.0	0.0646329	1.787	0.0	0.0
bg_vbf_1600_i	0.145	1.0	0.217904	1.755	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	0.466209	0.3607	0.0	0.0
bg_dip_200_40	477	1.0	-0.0522949	1.826	0.0	0.0
bg_dip_400_60	306	1.0	-0.125515	1.849	0.0	0.0
bg_dip_600_80	90.0	1.0	-0.113698	1.83	0.0	0.0
bg_dip_800_12	36.8	1.0	0.0576669	1.795	0.0	0.0
bg_dip_1200_1	2.63	1.0	-0.152016	1.941	0.0	0.0
bg_dip_1600_i	0.244	1.0	-0.0323032	1.815	0.0	0.0

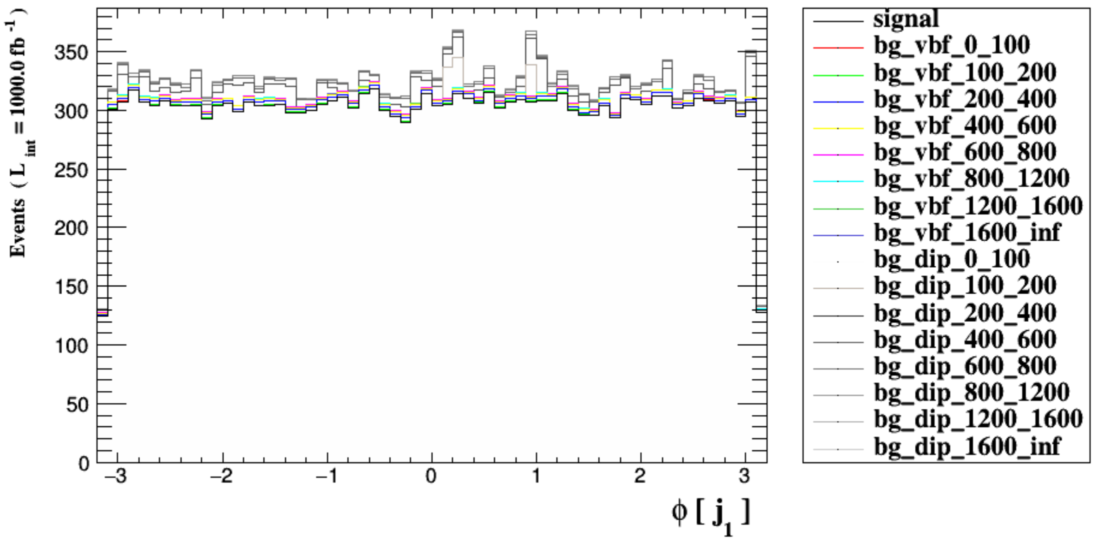

Figure 3.

3.5 Histogram 4

*** Plot: PT (jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	102.403	76.9	0.0	0.0
bg_vbf_0_100	1.22	1.0	31.916	8.29	0.0	0.0
bg_vbf_100_20	29.1	1.0	53.936	17.53	0.0	0.0
bg_vbf_200_40	151	1.0	90.5854	37.67	0.0	0.0
bg_vbf_400_60	110	1.0	125.017	60.47	0.0	0.0
bg_vbf_600_80	41.0	1.0	168.787	85.77	0.0	0.0
bg_vbf_800_12	15.6	1.0	215.936	127.0	0.0	0.0
bg_vbf_1200_1	1.37	1.0	286.77	196.2	0.0	0.0
bg_vbf_1600_i	0.145	1.0	301.151	261.1	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	49.3379	16.83	0.0	0.0
bg_dip_200_40	477	1.0	68.617	36.13	0.0	0.0
bg_dip_400_60	306	1.0	78.6224	56.28	0.0	0.0
bg_dip_600_80	90.0	1.0	94.6258	83.07	0.0	0.0
bg_dip_800_12	36.8	1.0	124.553	124.0	0.0	0.0
bg_dip_1200_1	2.63	1.0	176.706	198.4	0.0	0.0
bg_dip_1600_i	0.244	1.0	138.5	204.7	0.0	0.0

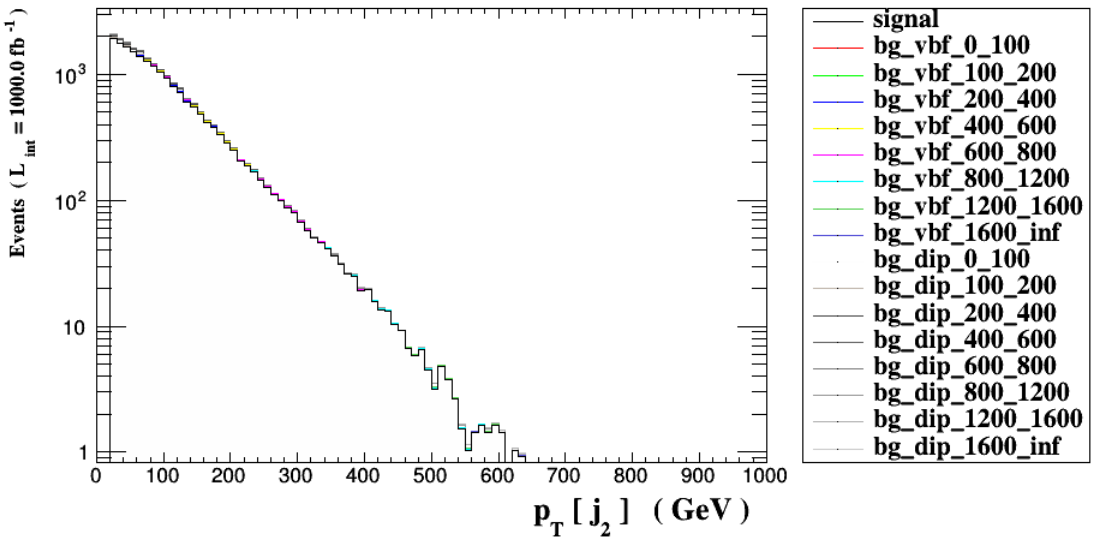

Figure 4.

3.6 Histogram 5

*** Plot: ETA (jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	0.00824761	3.058	0.0	0.0
bg_vbf_0_100	1.22	1.0	1.04772	3.507	0.0	0.0
bg_vbf_100_20	29.1	1.0	-0.324417	3.174	0.0	0.0
bg_vbf_200_40	151	1.0	0.0275519	2.946	0.0	0.0
bg_vbf_400_60	110	1.0	0.0664249	2.847	0.0	0.0
bg_vbf_600_80	41.0	1.0	-0.00657983	2.765	0.0	0.0
bg_vbf_800_12	15.6	1.0	0.123933	2.754	0.0	0.0
bg_vbf_1200_1	1.37	1.0	0.151477	2.787	0.0	0.0
bg_vbf_1600_i	0.145	1.0	-0.203626	2.95	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	0.140052	2.918	0.0	0.0
bg_dip_200_40	477	1.0	0.291332	3.134	0.0	0.0
bg_dip_400_60	306	1.0	-0.0693841	3.116	0.0	0.0
bg_dip_600_80	90.0	1.0	0.0792687	3.236	0.0	0.0
bg_dip_800_12	36.8	1.0	0.0158785	3.221	0.0	0.0
bg_dip_1200_1	2.63	1.0	-0.142349	3.23	0.0	0.0
bg_dip_1600_i	0.244	1.0	-0.328753	3.419	0.0	0.0

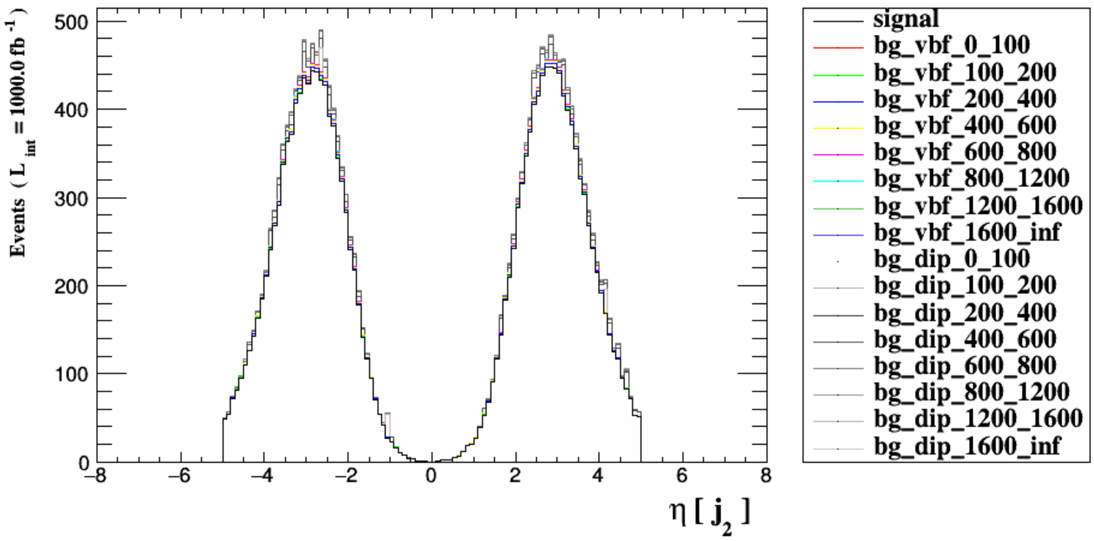

Figure 5.

3.7 Histogram 6

*** Plot: PHI (jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	-0.00468976	1.813	0.0	0.0
bg_vbf_0_100	1.22	1.0	0.0859607	1.498	0.0	0.0
bg_vbf_100_20	29.1	1.0	0.17327	1.879	0.0	0.0
bg_vbf_200_40	151	1.0	-0.0817648	1.828	0.0	0.0
bg_vbf_400_60	110	1.0	-0.0599984	1.828	0.0	0.0
bg_vbf_600_80	41.0	1.0	0.0117494	1.812	0.0	0.0
bg_vbf_800_12	15.6	1.0	-0.0684445	1.824	0.0	0.0
bg_vbf_1200_1	1.37	1.0	-0.0586342	1.806	0.0	0.0
bg_vbf_1600_i	0.145	1.0	-0.198205	1.858	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	1.00733	1.634	0.0	0.0
bg_dip_200_40	477	1.0	-0.0248154	1.887	0.0	0.0
bg_dip_400_60	306	1.0	-0.0373808	1.79	0.0	0.0
bg_dip_600_80	90.0	1.0	0.0797356	1.824	0.0	0.0
bg_dip_800_12	36.8	1.0	0.124598	1.781	0.0	0.0
bg_dip_1200_1	2.63	1.0	-0.323666	1.753	0.0	0.0
bg_dip_1600_i	0.244	1.0	-0.421228	1.806	0.0	0.0

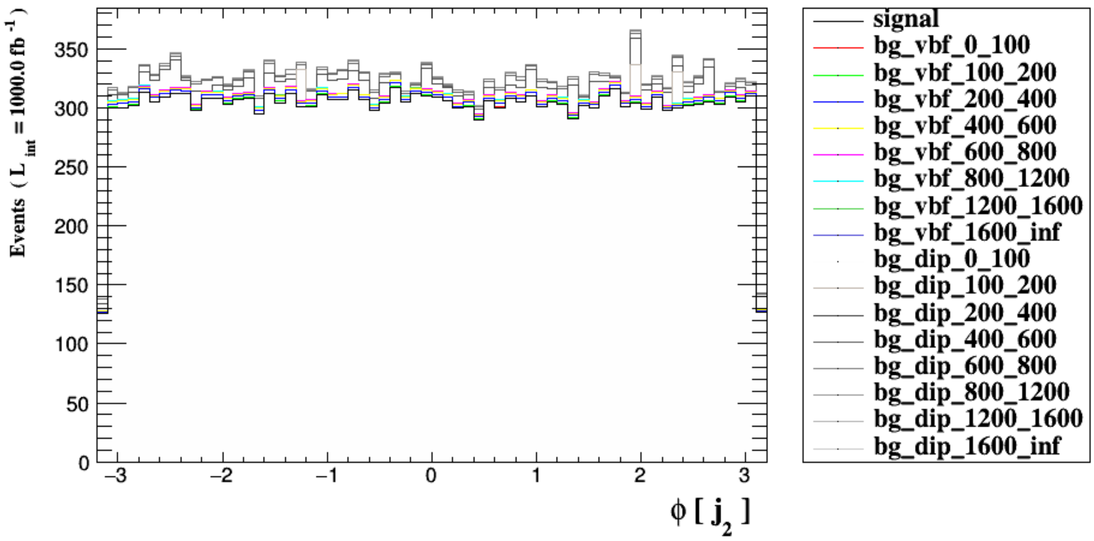

Figure 6.

3.8 Histogram 7

*** Plot: DELTAR (jets[1] , jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	5.1046	1.028	0.0	0.0
bg_vbf_0_100	1.22	1.0	6.62263	0.3293	0.0	0.0
bg_vbf_100_20	29.1	1.0	5.99091	0.8146	0.0	0.0
bg_vbf_200_40	151	1.0	5.24335	0.8413	0.0	0.0
bg_vbf_400_60	110	1.0	4.96829	0.7025	0.0	0.0
bg_vbf_600_80	41.0	1.0	4.83273	0.5935	0.0	0.0
bg_vbf_800_12	15.6	1.0	4.73982	0.5158	0.0	0.0
bg_vbf_1200_1	1.37	1.0	4.67427	0.4511	0.0	0.0
bg_vbf_1600_i	0.145	1.0	4.62399	0.461	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	5.99929	0.4811	0.0	0.0
bg_dip_200_40	477	1.0	4.87458	0.6286	0.0	0.0
bg_dip_400_60	306	1.0	4.6746	0.5749	0.0	0.0
bg_dip_600_80	90.0	1.0	4.64892	0.5595	0.0	0.0
bg_dip_800_12	36.8	1.0	4.61435	0.495	0.0	0.0
bg_dip_1200_1	2.63	1.0	4.51401	0.442	0.0	0.0
bg_dip_1600_i	0.244	1.0	4.44387	0.4353	0.0	0.0

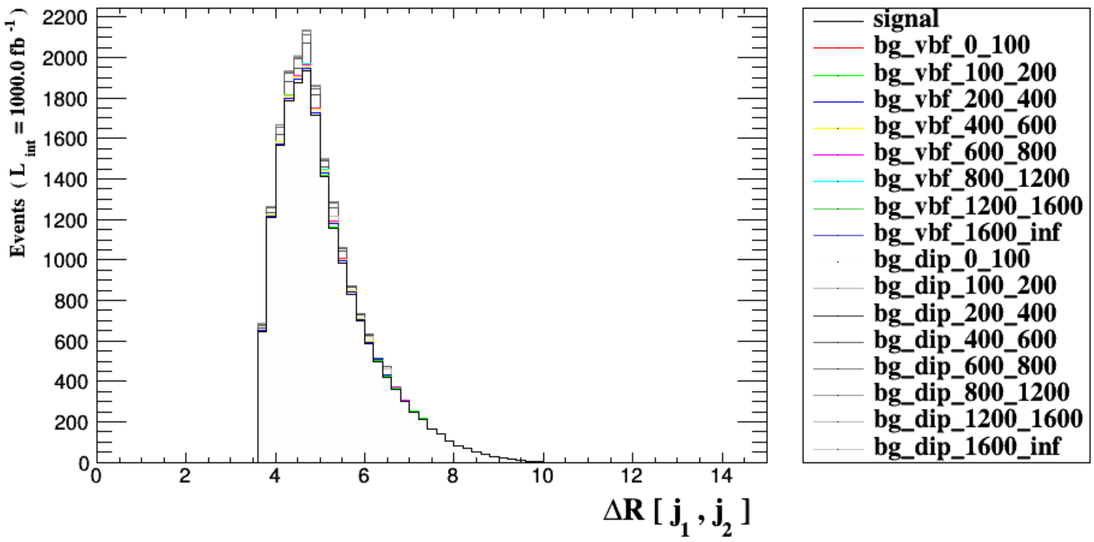

Figure 7.

3.9 Histogram 8

*** Plot: M (jets[1] jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	1797.17	804.0	0.0	0.0
bg_vbf_0_100	1.22	1.0	886.102	84.95	0.0	0.0
bg_vbf_100_20	29.1	1.0	1373.99	562.4	0.0	0.0
bg_vbf_200_40	151	1.0	1686.56	787.6	0.0	0.0
bg_vbf_400_60	110	1.0	2066.12	824.9	0.0	0.0
bg_vbf_600_80	41.0	1.0	2497.1	840.0	0.0	0.0
bg_vbf_800_12	15.6	1.0	2990.13	928.2	0.0	0.0
bg_vbf_1200_1	1.37	1.0	3719.45	1119	0.0	0.03938
bg_vbf_1600_i	0.145	1.0	4126.54	1410	0.0	0.4886
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	1172.68	166.8	0.0	0.0
bg_dip_200_40	477	1.0	1168.01	358.4	0.0	0.0
bg_dip_400_60	306	1.0	1373.0	458.4	0.0	0.0
bg_dip_600_80	90.0	1.0	1704.65	623.1	0.0	0.0
bg_dip_800_12	36.8	1.0	2097.6	885.2	0.0	0.0
bg_dip_1200_1	2.63	1.0	2709.62	1239	0.0	0.0
bg_dip_1600_i	0.244	1.0	2721.5	1274	0.0	0.0

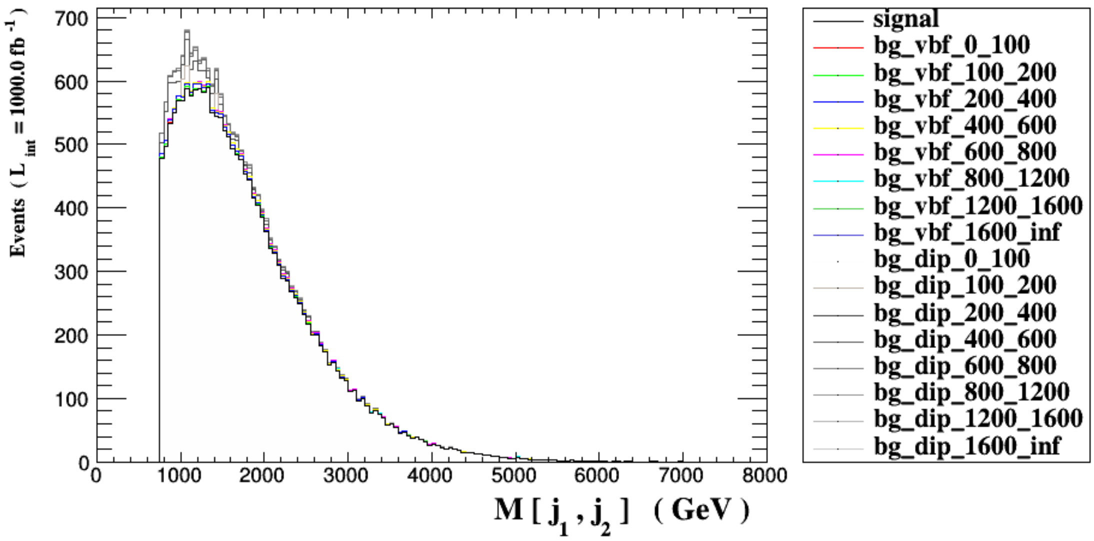

Figure 8.

3.10 Histogram 9

*** Plot: MET**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	9.23621e-09	1.193e-08	0.0	0.0
bg_vbf_0_100	1.22	1.0	2.92664e-09	2.061e-09	0.0	0.0
bg_vbf_100_20	29.1	1.0	4.59216e-09	2.634e-09	0.0	0.0
bg_vbf_200_40	151	1.0	5.28184e-09	3.059e-09	0.0	0.0
bg_vbf_400_60	110	1.0	5.56314e-09	3.759e-09	0.0	0.0
bg_vbf_600_80	41.0	1.0	5.7028e-09	3.425e-09	0.0	0.0
bg_vbf_800_12	15.6	1.0	6.73764e-09	5.92e-09	0.0	0.0
bg_vbf_1200_1	1.37	1.0	1.72505e-08	1.831e-08	0.0	0.0
bg_vbf_1600_i	0.145	1.0	3.09154e-08	2.364e-08	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	2.6048e-09	5.584e-10	0.0	0.0
bg_dip_200_40	477	1.0	5.15652e-09	2.886e-09	0.0	0.0
bg_dip_400_60	306	1.0	5.26293e-09	2.848e-09	0.0	0.0
bg_dip_600_80	90.0	1.0	5.42862e-09	2.905e-09	0.0	0.0
bg_dip_800_12	36.8	1.0	7.13192e-09	8.331e-09	0.0	0.0
bg_dip_1200_1	2.63	1.0	2.55869e-08	2.401e-08	0.0	0.0
bg_dip_1600_i	0.244	1.0	3.47198e-08	2.306e-08	0.0	0.0

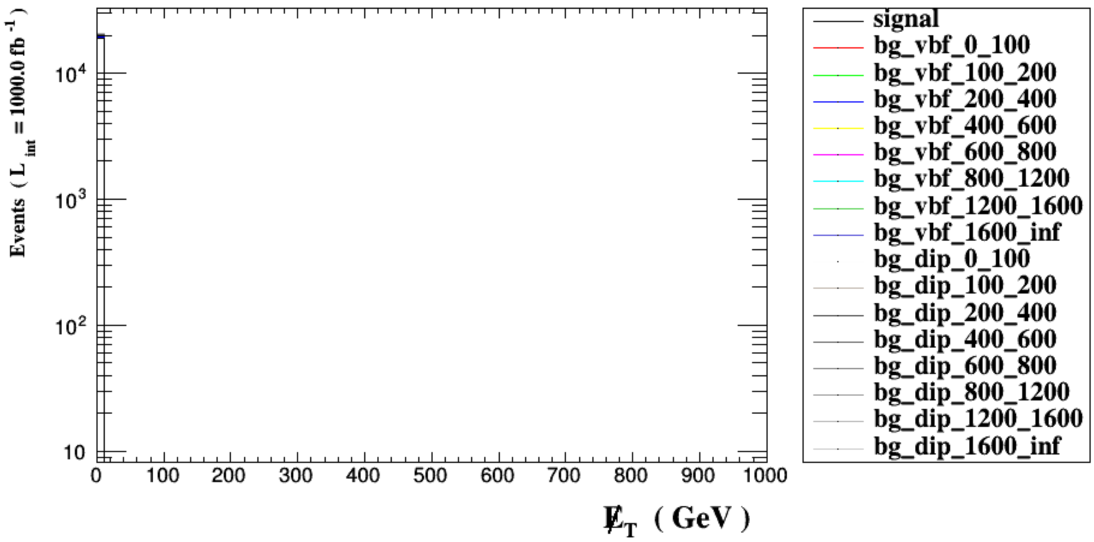

Figure 9.

3.11 Histogram 10

*** Plot: sdETA (jets[1] jets[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	-0.0125143	4.892	0.0	0.0
bg_vbf_0_100	1.22	1.0	-0.174236	6.403	0.0	0.0
bg_vbf_100_20	29.1	1.0	0.457753	5.752	0.0	0.0
bg_vbf_200_40	151	1.0	-0.0340329	5.008	0.0	0.0
bg_vbf_400_60	110	1.0	-0.0931745	4.618	0.0	0.0
bg_vbf_600_80	41.0	1.0	0.0126305	4.376	0.0	0.0
bg_vbf_800_12	15.6	1.0	-0.183195	4.209	0.0	0.0
bg_vbf_1200_1	1.37	1.0	-0.226141	4.078	0.0	0.0
bg_vbf_1600_i	0.145	1.0	0.290791	3.996	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	1.51032	5.585	0.0	0.0
bg_dip_200_40	477	1.0	-0.144784	4.518	0.0	0.0
bg_dip_400_60	306	1.0	0.176984	4.26	0.0	0.0
bg_dip_600_80	90.0	1.0	-0.115694	4.219	0.0	0.0
bg_dip_800_12	36.8	1.0	-0.0664918	4.119	0.0	0.0
bg_dip_1200_1	2.63	1.0	0.168753	4.051	0.0	0.0
bg_dip_1600_i	0.244	1.0	0.279678	4.007	0.0	0.0

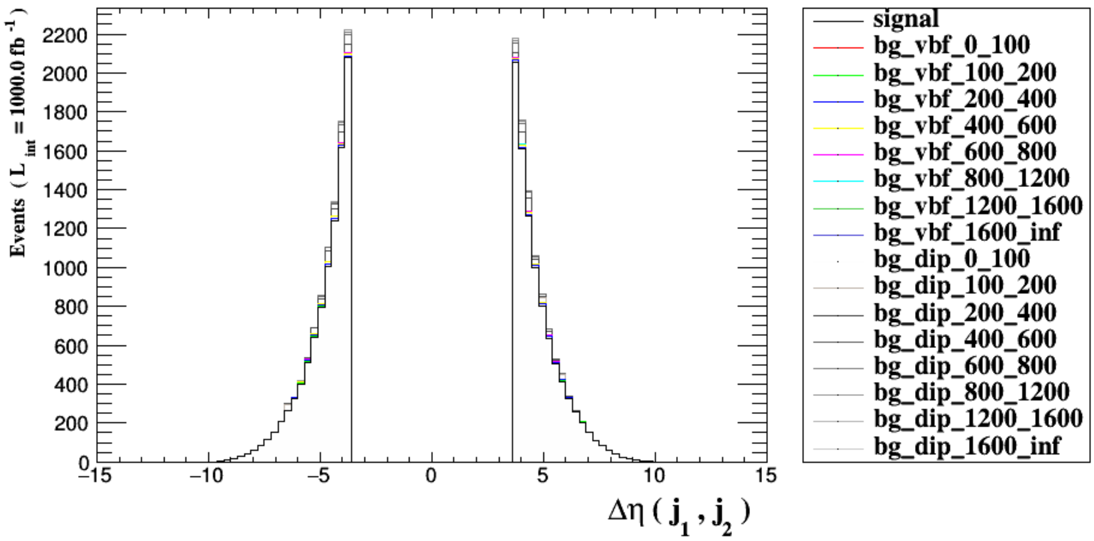

Figure 10.

3.12 Histogram 11

*** Plot: M (a[1] a[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	1364.91	757.5	0.0	0.9384
bg_vbf_0_100	1.22	1.0	999.408	375.3	0.0	0.0
bg_vbf_100_20	29.1	1.0	847.835	279.9	0.0	0.0
bg_vbf_200_40	151	1.0	806.306	333.7	0.0	0.0
bg_vbf_400_60	110	1.0	757.771	293.6	0.0	0.0
bg_vbf_600_80	41.0	1.0	774.989	292.6	0.0	0.0
bg_vbf_800_12	15.6	1.0	795.097	304.5	0.0	0.0
bg_vbf_1200_1	1.37	1.0	827.522	348.5	0.0	0.0
bg_vbf_1600_i	0.145	1.0	902.86	410.2	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	674.287	36.08	0.0	0.0
bg_dip_200_40	477	1.0	785.534	368.8	0.0	0.0
bg_dip_400_60	306	1.0	771.771	325.2	0.0	0.0
bg_dip_600_80	90.0	1.0	805.657	366.8	0.0	0.0
bg_dip_800_12	36.8	1.0	805.114	335.3	0.0	0.0
bg_dip_1200_1	2.63	1.0	924.629	435.1	0.0	0.0
bg_dip_1600_i	0.244	1.0	930.522	452.3	0.0	0.0

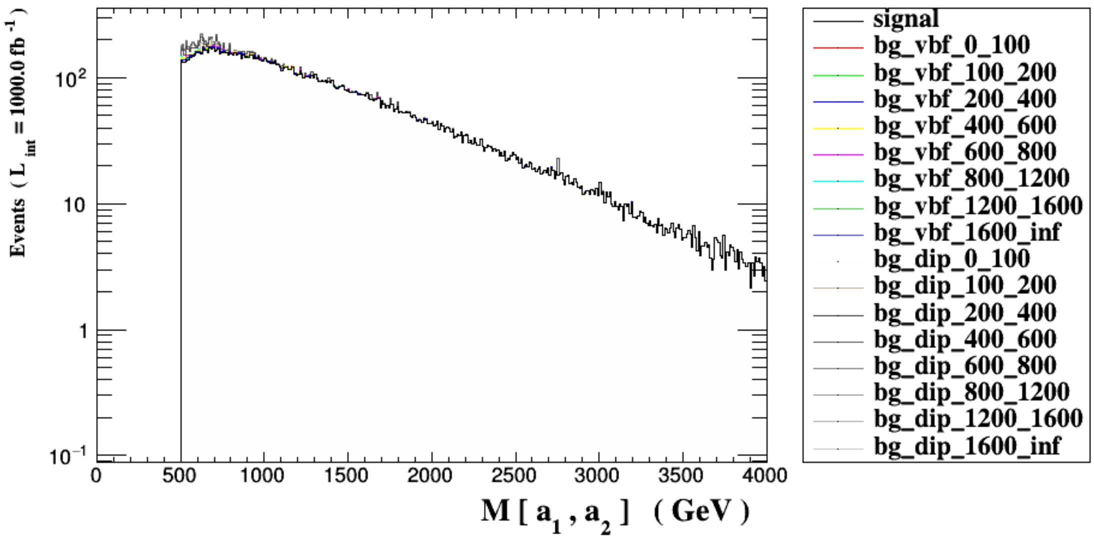

Figure 11.

3.13 Histogram 12

*** Plot: PT (a[1])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	718.918	350.1	0.0	0.7195
bg_vbf_0_100	1.22	1.0	379.899	64.59	0.0	0.0
bg_vbf_100_20	29.1	1.0	373.902	77.67	0.0	0.0
bg_vbf_200_40	151	1.0	391.46	92.25	0.0	0.0
bg_vbf_400_60	110	1.0	436.107	113.9	0.0	0.0
bg_vbf_600_80	41.0	1.0	516.8	150.3	0.0	0.0
bg_vbf_800_12	15.6	1.0	657.311	223.5	0.0	0.0
bg_vbf_1200_1	1.37	1.0	890.939	358.6	0.0	0.07854
bg_vbf_1600_i	0.145	1.0	1323.7	534.5	0.0	6.344
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	327.174	7.434	0.0	0.0
bg_dip_200_40	477	1.0	393.477	77.89	0.0	0.0
bg_dip_400_60	306	1.0	475.422	123.4	0.0	0.0
bg_dip_600_80	90.0	1.0	603.382	164.2	0.0	0.0
bg_dip_800_12	36.8	1.0	778.016	241.8	0.0	0.0
bg_dip_1200_1	2.63	1.0	1095.08	412.4	0.0	0.0
bg_dip_1600_i	0.244	1.0	1602.75	495.3	0.0	18.53

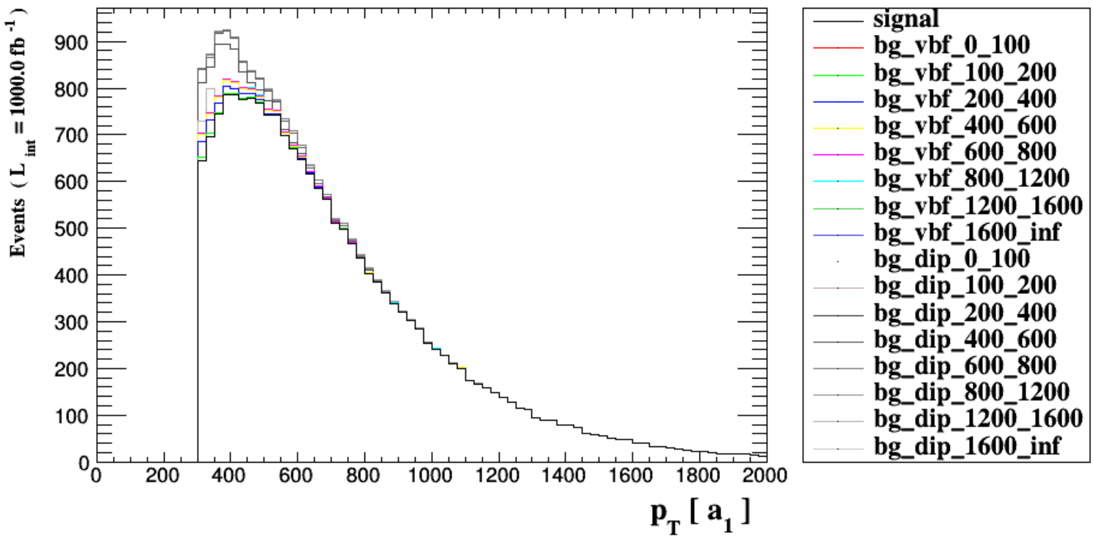

Figure 12.

3.14 Histogram 13

*** Plot: PT (a[2])**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	486.902	328.9	0.0	0.3176
bg_vbf_0_100	1.22	1.0	359.837	74.21	0.0	0.0
bg_vbf_100_20	29.1	1.0	285.217	94.57	0.0	0.0
bg_vbf_200_40	151	1.0	209.251	118.9	0.0	0.0
bg_vbf_400_60	110	1.0	159.332	118.8	0.0	0.0
bg_vbf_600_80	41.0	1.0	157.378	113.0	0.0	0.0
bg_vbf_800_12	15.6	1.0	159.508	121.4	0.0	0.0
bg_vbf_1200_1	1.37	1.0	167.561	142.6	0.0	0.0
bg_vbf_1600_i	0.145	1.0	183.782	190.2	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	253.391	44.39	0.0	0.0
bg_dip_200_40	477	1.0	186.1	97.8	0.0	0.0
bg_dip_400_60	306	1.0	144.408	100.8	0.0	0.0
bg_dip_600_80	90.0	1.0	140.303	115.8	0.0	0.0
bg_dip_800_12	36.8	1.0	130.659	108.9	0.0	0.0
bg_dip_1200_1	2.63	1.0	151.48	146.8	0.0	0.0
bg_dip_1600_i	0.244	1.0	125.146	119.5	0.0	0.0

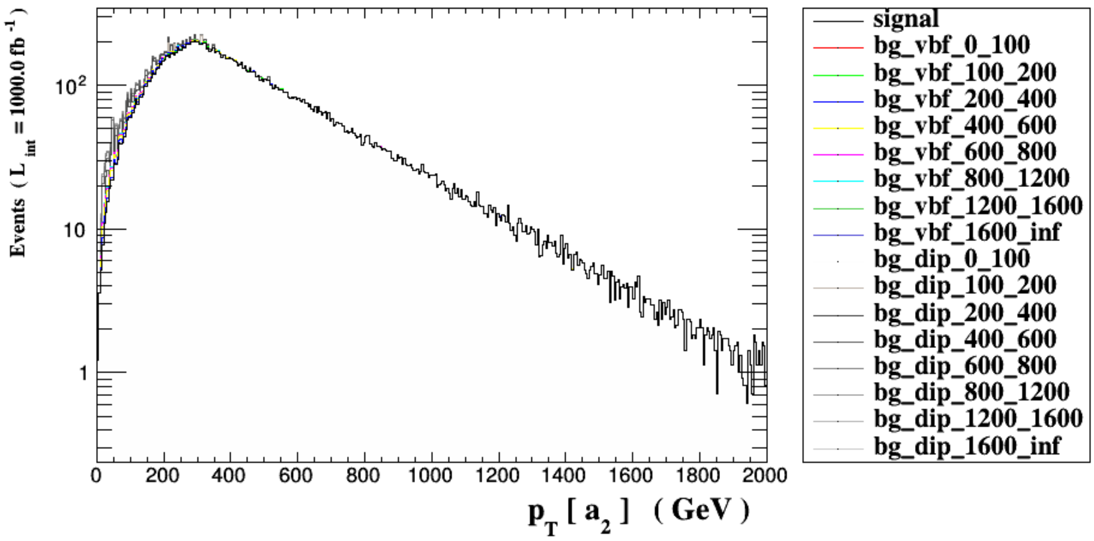

Figure 13.

3.15 Histogram 14

*** Plot: THT**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	473.074	297.8	0.0	0.0
bg_vbf_0_100	1.22	1.0	74.6978	15.53	0.0	0.0
bg_vbf_100_20	29.1	1.0	163.344	25.73	0.0	0.0
bg_vbf_200_40	151	1.0	305.428	55.11	0.0	0.0
bg_vbf_400_60	110	1.0	485.133	55.92	0.0	0.0
bg_vbf_600_80	41.0	1.0	680.936	55.85	0.0	0.0
bg_vbf_800_12	15.6	1.0	929.067	102.2	0.0	0.0
bg_vbf_1200_1	1.37	1.0	1324.24	99.5	0.0	0.0
bg_vbf_1600_i	0.145	1.0	1789.2	191.2	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	148.168	37.58	0.0	0.0
bg_dip_200_40	477	1.0	312.487	53.59	0.0	0.0
bg_dip_400_60	306	1.0	483.667	56.67	0.0	0.0
bg_dip_600_80	90.0	1.0	677.891	53.6	0.0	0.0
bg_dip_800_12	36.8	1.0	924.952	102.7	0.0	0.0
bg_dip_1200_1	2.63	1.0	1350.6	122.7	0.0	0.0
bg_dip_1600_i	0.244	1.0	1813.83	223.3	0.0	0.0

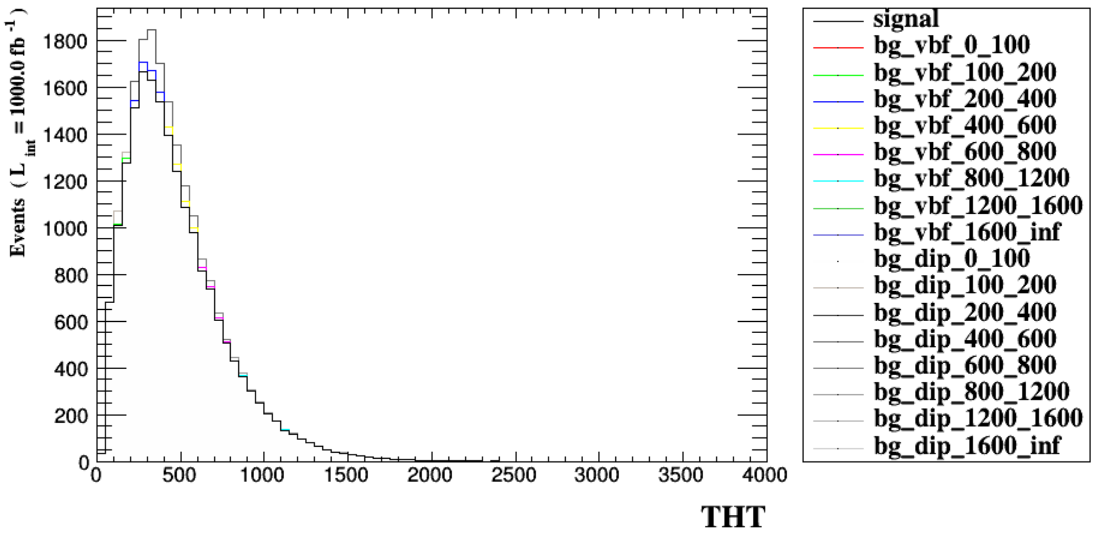

Figure 14.

3.16 Histogram 15

*** Plot: MET**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	9.23621e-09	1.193e-08	0.0	0.0
bg_vbf_0_100	1.22	1.0	2.92664e-09	2.061e-09	0.0	0.0
bg_vbf_100_20	29.1	1.0	4.59216e-09	2.634e-09	0.0	0.0
bg_vbf_200_40	151	1.0	5.28184e-09	3.059e-09	0.0	0.0
bg_vbf_400_60	110	1.0	5.56314e-09	3.759e-09	0.0	0.0
bg_vbf_600_80	41.0	1.0	5.7028e-09	3.425e-09	0.0	0.0
bg_vbf_800_12	15.6	1.0	6.73764e-09	5.92e-09	0.0	0.0
bg_vbf_1200_1	1.37	1.0	1.72505e-08	1.831e-08	0.0	0.0
bg_vbf_1600_i	0.145	1.0	3.09154e-08	2.364e-08	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	2.6048e-09	5.584e-10	0.0	0.0
bg_dip_200_40	477	1.0	5.15652e-09	2.886e-09	0.0	0.0
bg_dip_400_60	306	1.0	5.26293e-09	2.848e-09	0.0	0.0
bg_dip_600_80	90.0	1.0	5.42862e-09	2.905e-09	0.0	0.0
bg_dip_800_12	36.8	1.0	7.13192e-09	8.331e-09	0.0	0.0
bg_dip_1200_1	2.63	1.0	2.55869e-08	2.401e-08	0.0	0.0
bg_dip_1600_i	0.244	1.0	3.47198e-08	2.306e-08	0.0	0.0

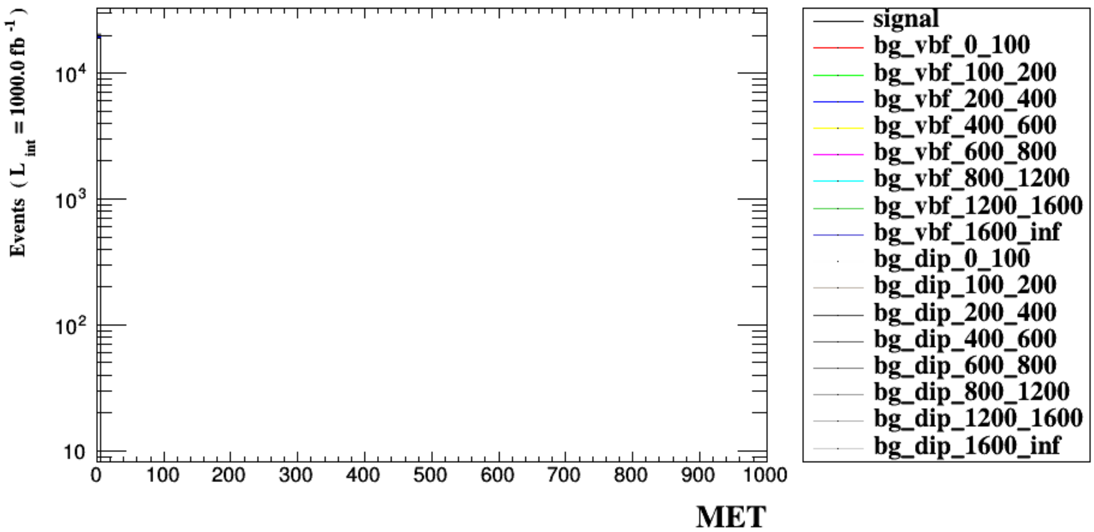

Figure 15.

3.17 Histogram 16

*** Plot: TET**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal	19174	1.0	1678.89	734.6	0.0	0.0
bg_vbf_0_100	1.22	1.0	814.434	141.3	0.0	0.0
bg_vbf_100_20	29.1	1.0	822.463	164.7	0.0	0.0
bg_vbf_200_40	151	1.0	906.139	195.9	0.0	0.0
bg_vbf_400_60	110	1.0	1080.57	211.3	0.0	0.0
bg_vbf_600_80	41.0	1.0	1355.11	216.7	0.0	0.0
bg_vbf_800_12	15.6	1.0	1745.89	291.5	0.0	0.0
bg_vbf_1200_1	1.37	1.0	2382.74	401.9	0.0	0.0
bg_vbf_1600_i	0.145	1.0	3296.68	649.6	0.0	0.0
bg_dip_0_100	0.0 +/- 0.0	0.	0.0	0.0	0.0	0.0
bg_dip_100_20	79.0	1.0	728.733	80.65	0.0	0.0
bg_dip_200_40	477	1.0	892.065	159.2	0.0	0.0
bg_dip_400_60	306	1.0	1103.5	208.7	0.0	0.0
bg_dip_600_80	90.0	1.0	1421.58	241.6	0.0	0.0
bg_dip_800_12	36.8	1.0	1833.63	311.4	0.0	0.0
bg_dip_1200_1	2.63	1.0	2597.16	496.1	0.0	0.0
bg_dip_1600_i	0.244	1.0	3541.73	662.3	0.0	0.0

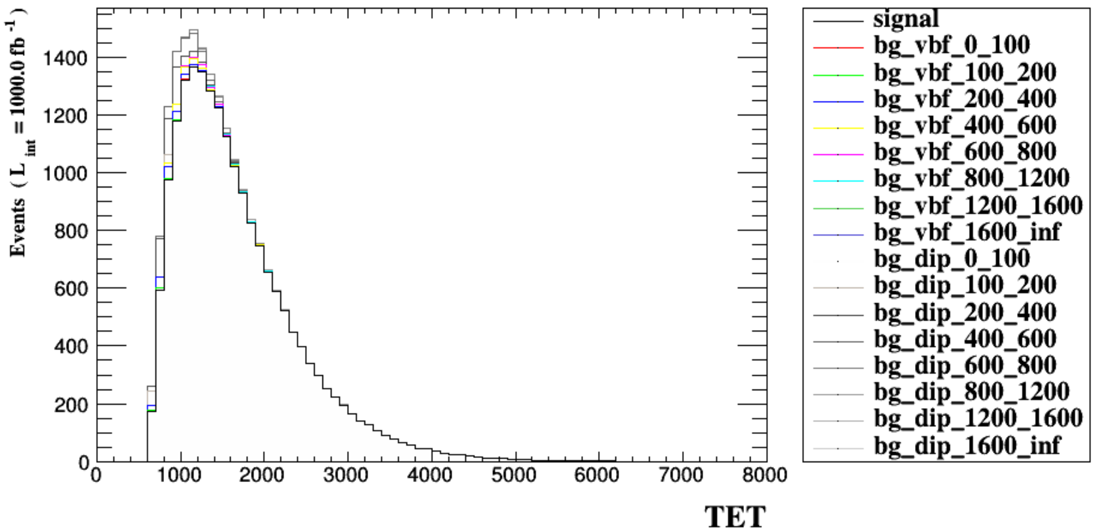

Figure 16.

4 Summary

4.1 Cut-flow charts

- How to compare signal (S) and background (B): S/sqrt(S+B+(xB)**2) .
- 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)	102352.1 +/- 28.2	102837909 +/- 121936	10.08798 +/- 0.00659
SEL: ((sdETA (jets[1] jets[2]) > 3.6 or sdETA	19174 +/- 124	1343.7 +/- 36.7	133.86 +/- 0.48