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 = 40
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_signal/Events/1MeV_gurrola_cuts_cross_sec/-
unweighted_events.lhe.gz as signal1MeV
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_signal/Events/100GeV_gurrola_cuts_cross_sec/
unweighted_events.lhe.gz as signal100GeV1TeV
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_signal/Events/mass100GeV_Lambda1p5TeV/-
unweighted_events.lhe.gz as signal100GeV1p5TeV
ma5>import /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_signal/Events/mass100GeV_Lambda4TeV/-
unweighted_events.lhe.gz as signal100GeV4TeV
ma5>#  define bg and signal samples
ma5>set signal1MeV = signal
ma5>set signal100GeV1TeV = signal
ma5>set signal100GeV1p5TeV = signal
ma5>set signal100GeV4TeV = signal
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>#  define which plots to make
ma5>plot E(ax)
ma5>plot P(ax)
ma5>#set the plot/graph parameters
ma5>set selection[1].xmin = 0
ma5>set selection[1].xmax = 3000
ma5>set selection[1].nbins = 200
ma5>set selection[1].titleX = "E[ax] (GeV)"
ma5>set selection[2].xmin = 0
ma5>set selection[2].xmax = 3000
ma5>set selection[2].nbins = 200
ma5>set selection[2].titleX = "P[ax] (GeV)"
ma5>submit axion_energy_momentum
```

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 signal1mev

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-post_optimization_studies .
- Sample consisting of: signal events.
- Generated events: 1000 events.
- Normalization to the luminosity: 406568+/- 2950 events.
- Ratio (event weight): 406 - 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_signal/Events/-1MeV_gurrola_cuts_cross_sec/-unweighted_events.lhe.gz	1000	10.2 @ 0.73%	0.0

2.2 signal100gev1tev

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-post_optimization_studies .
- Sample consisting of: signal events.
- Generated events: 1000 events.
- Normalization to the luminosity: 340913+/- 3026 events.
- Ratio (event weight): 340 - 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_signal/Events/-100GeV_gurrola_cuts_cross_sec/-unweighted_events.lhe.gz	1000	8.52 @ 0.89%	0.0

2.3 signal100gev1p5tev

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-post_optimization_studies .
- Sample consisting of: signal events.
- Generated events: 10000 events.
- Normalization to the luminosity: 71082+/- 222 events.

- Ratio (event weight): 7.1 - 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_signal/Events/-mass100GeV_Lambda1p5TeV/-unweighted_events.lhe.gz	10000	1.78 @ 0.31%	0.0

2.4 signal100gev4tev

- Samples stored in the directory: /Users/elijahsheridan/MG5_aMC_v2_6_5/axion_pheno/-post_optimization_studies .
- Sample consisting of: signal events.
- Generated events: 10000 events.
- Normalization to the luminosity: 7153+/- 20 events.
- Ratio (event weight): 0.72 .

Path to the event file	Nr. of events	Cross section (pb)	Negative wgts (%)
/Users/elijahsheridan/-MG5_aMC_v2_6_5/-axion_signal/Events/-mass100GeV_Lambda4TeV/-unweighted_events.lhe.gz	10000	0.179 @ 0.28%	0.0

3 Histos and cuts

3.1 Histogram 1

*** Plot: E (ax)**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal1mev	406162	1.0	441.141	406.1	0.0	0.0
signal100gev1tev	340572	1.0	541.244	409.7	0.0	0.2002
signal100gev1p5t	71075	1.0	521.35	443.7	0.0	0.15
signal100gev4tev	7152	1.0	487.484	435.3	0.0	0.2

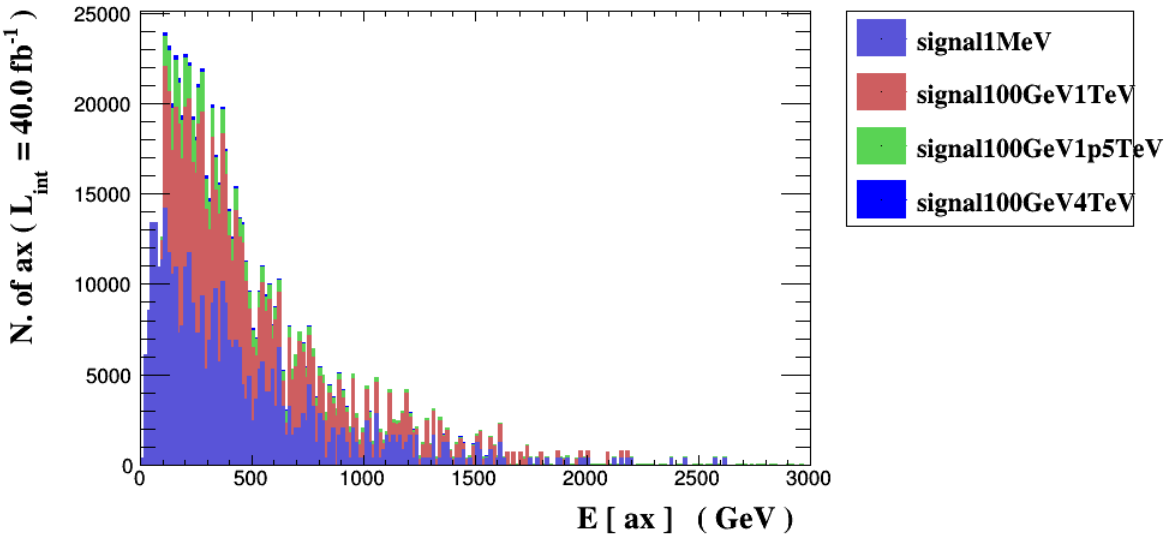

Figure 1.

3.2 Histogram 2

*** Plot: P (ax)**

Dataset	Integral	Entries per event	Mean	RMS	% underflow	% overflow
signal1mev	406162	1.0	441.141	406.1	0.0	0.0
signal100gev1tev	340572	1.0	524.841	418.8	0.0	0.2002
signal100gev1p5t	71075	1.0	503.665	452.8	0.0	0.15
signal100gev4tev	7152	1.0	468.376	444.7	0.0	0.2

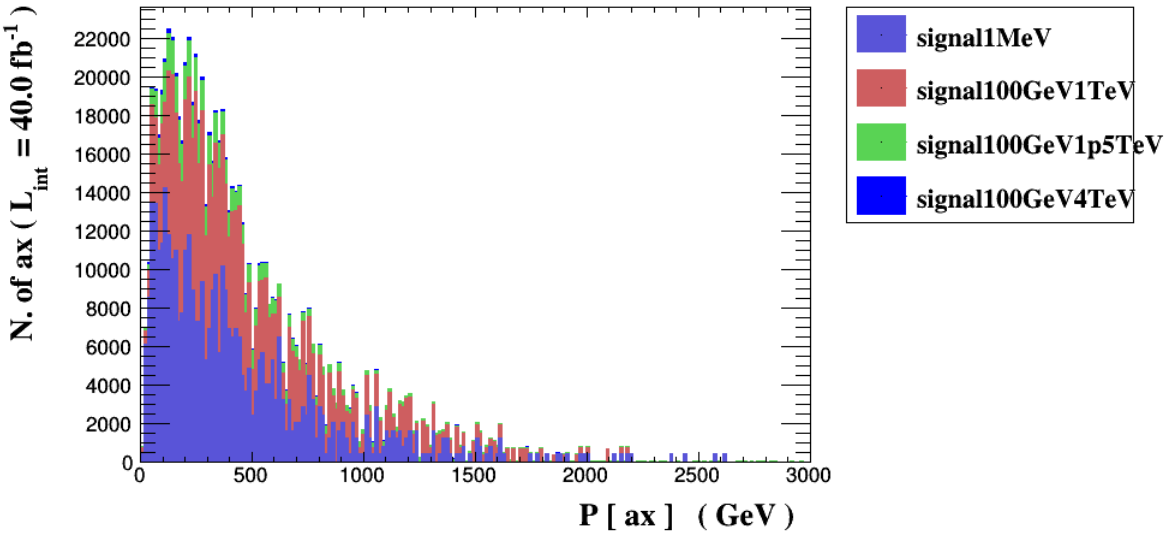

Figure 2.