# The LaTeX report

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# 1 Setup

## 1.1 Command history

```
ma5>define invisible = -14 12 16 -16 14 -12
ma5>set main.fastsim.package = fastjet
ma5>set main.fastsim.algorithm = antikt
ma5>set main.fastsim.radius = 0.4
ma5>set main.fastsim.ptmin = 5.0
ma5>set main.fastsim.bjet_id.matching_dr = 0.4
ma5>set main.fastsim.bjet_id.efficiency = 1.0
ma5>set main.fastsim.bjet_id.misid_cjet = 0.0
ma5>set main.fastsim.bjet_id.misid_ljet = 0.0
ma5>set main.fastsim.tau_id.efficiency = 1.0
ma5>set main.fastsim.tau_id.misid_ljet = 0.0
ma5>import /home/sandeep/software/MG5_aMC_v2_9_21/pp24tops/Events/run_07/tag_1_pythia8_events.hepm
as reco_events
ma5>set main.outputfile=tag_1_pythia8_BasicReco.lhe.gz
ma5>submit /home/sandeep/software/MG5_aMC_v2_9_21/pp24tops/MA5_HADRON_ANALYSIS_reco_BasicReco_1
ma5>remove reco_events
ma5>import /home/sandeep/software/MG5_aMC_v2_9_21/pp24tops/Events/run_07/tag_1_pythia8_BasicReco.l
as tag_1_pythia8_BasicReco
ma5>set main.stacking_method = normalize2one
ma5>define e = e+ e-
ma5>define mu = mu+ mu-
ma5>select (j) PT > 20
ma5>select (b) PT > 20
ma5>select (e) PT > 10
ma5>select (mu) PT > 10
ma5>select (j) ABSETA < 2.5
ma5>select (b) ABSETA < 2.5
ma5>select (e) ABSETA < 2.5
ma5>select (mu) ABSETA < 2.5
ma5>plot MET 40 0 500
ma5>plot THT 40 0 500
ma5>plot PT(j[1]) 40 0 500 [logY]
ma5>plot ETA(j[1]) 40 -10 10 [logY]
ma5>plot MT_MET(j[1]) 40 0 500 [logY]
ma5>plot PT(j[2]) 40 0 500 [logY]
ma5>plot ETA(j[2]) 40 -10 10 [logY]
ma5>plot MT_MET(j[2]) 40 0 500 [logY]
ma5>plot M(j[1] j[2]) 40 0 500 [logY]
ma5>plot DELTAR(j[1],j[2]) 40 0 10 [logY]
ma5>submit /home/sandeep/software/MG5_aMC_v2_9_21/pp24tops/MA5_HADRON_ANALYSIS_analysis2_BasicReco
```

## 1.2 Configuration

- MadAnalysis version 1.9.60 (2024-10-01).
- Histograms given for an integrated luminosity of $10 \text{fb}^{-1}$.

## 2 Datasets

### 2.1 tag_1_pythia8_basicreco

- Sample consisting of: signal events.
- Generated events: 20000 events.
- Normalization to the luminosity: 0+/- 0 events.
- Ratio (event weight): 0.0 .

| Path to the event file | Nr. of events | Cross section (pb) | Negative wgts (%) |
|---|---|---|---|
| pp24tops/Events/run_07/-tag_1_pythia8_BasicReco.lhe.gz | 20000 | 0.0 @ 0.0% | 0.0 |

## 3 Histos and cuts

### 3.1 Object definition 1

*** Cut: select ( j ) PT > 20.0**

### 3.2 Object definition 2

*** Cut: select ( b ) PT > 20.0**

### 3.3 Object definition 3

*** Cut: select ( e ) PT > 10.0**

### 3.4 Object definition 4

*** Cut: select ( mu ) PT > 10.0**

### 3.5 Object definition 5

*** Cut: select ( j ) ABSETA < 2.5**

### 3.6 Object definition 6

*** Cut: select ( b ) ABSETA < 2.5**

### 3.7 Object definition 7

*** Cut: select ( e ) ABSETA < 2.5**

### 3.8 Object definition 8

*** Cut: select ( mu ) ABSETA < 2.5**

### 3.9 Histogram 1

*** Plot: MET**

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 92.1241 | 84.6 | 0.0 | 0.2694 |

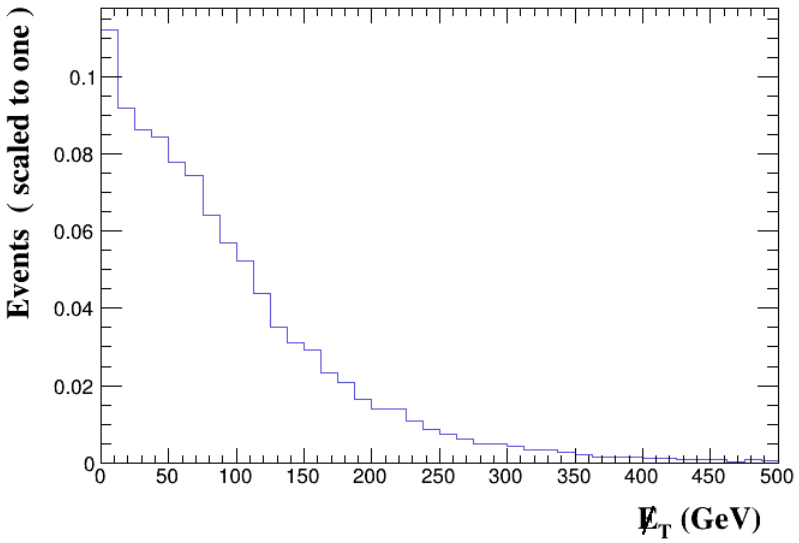
Events ( scaled to one )
0.1
0.08
0.06
0.04
0.02
0
0
50
100
150
200
250
300
350
400
450
500
$\not{E}_T$ (GeV)

**Figure 1**.

### 3.10 Histogram 2

*** Plot: THT**

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 1018.16 | 396.0 | 0.0 | 96.35 |

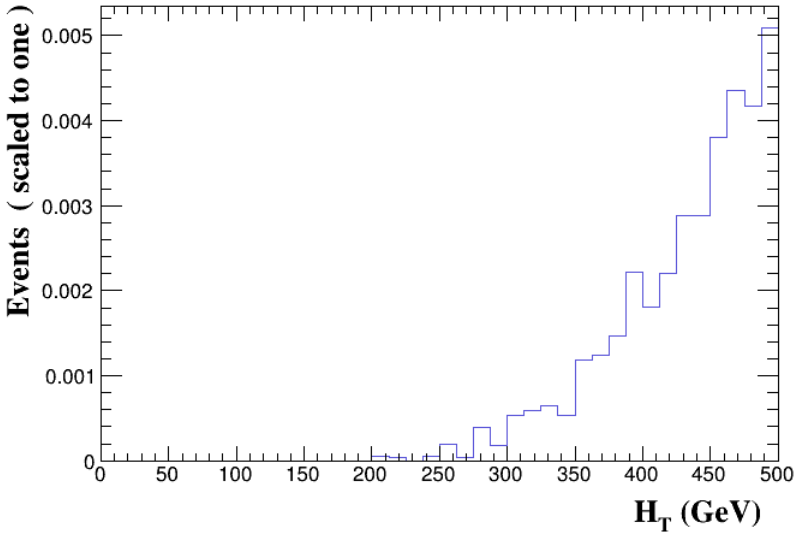


**Figure 2.**

### 3.11 Histogram 3

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 189.061 | 130.3 | 0.0 | 3.443 |

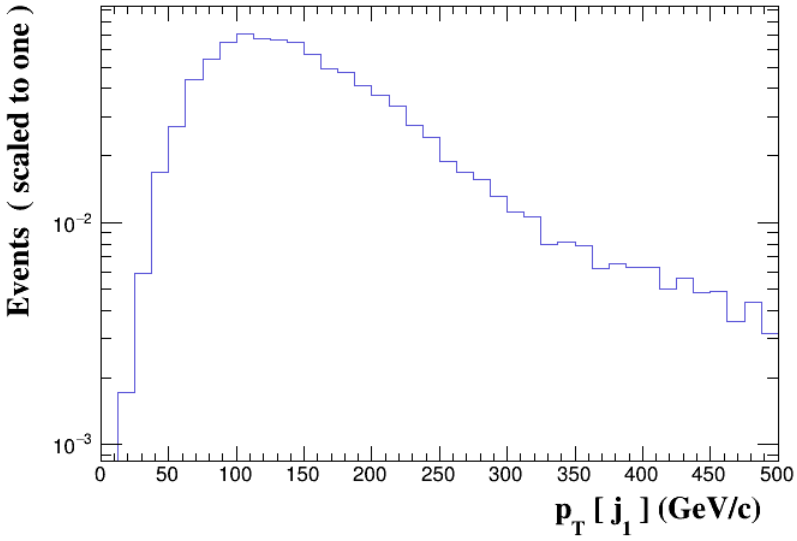


**Figure 3.**

### 3.12 Histogram 4

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 0.00262959 | 1.118 | 0.0 | 0.0 |

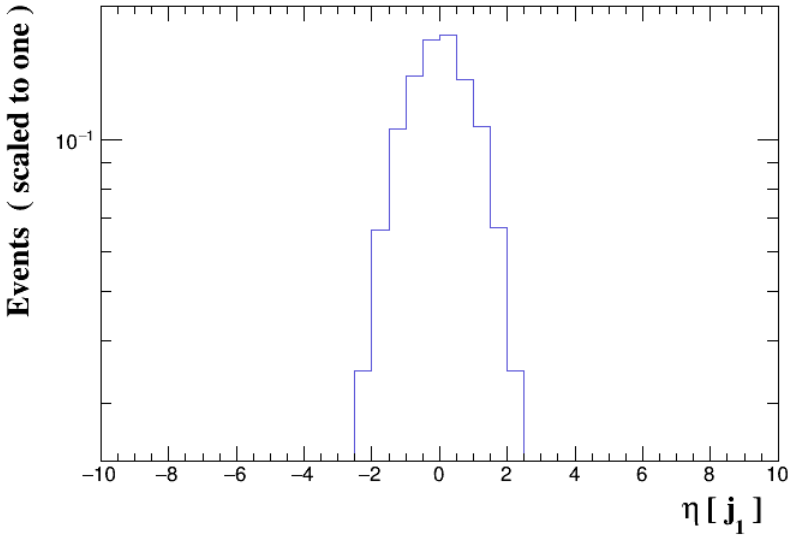


**Figure 4.**

### 3.13 Histogram 5

*** Plot: MT_MET ( j[1] )**

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 184.516 | 151.3 | 0.0 | 4.067 |

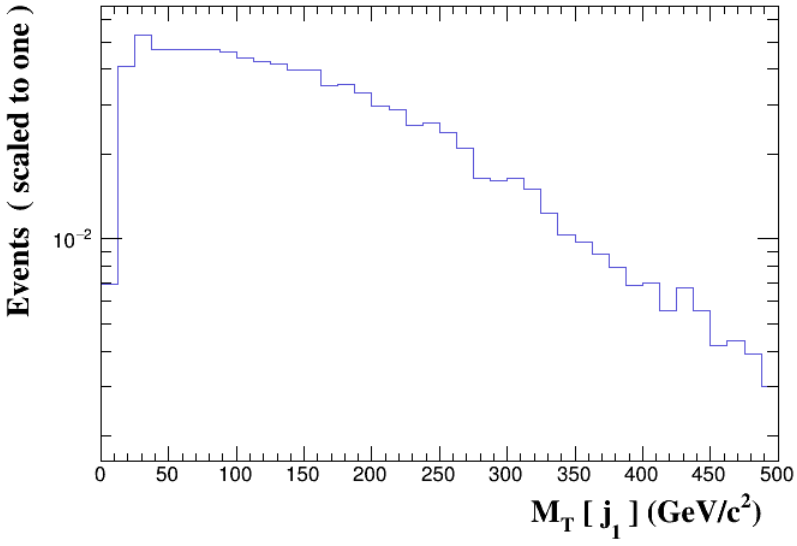


**Figure 5.**

### 3.14 Histogram 6

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 111.026 | 68.02 | 0.0 | 0.2914 |

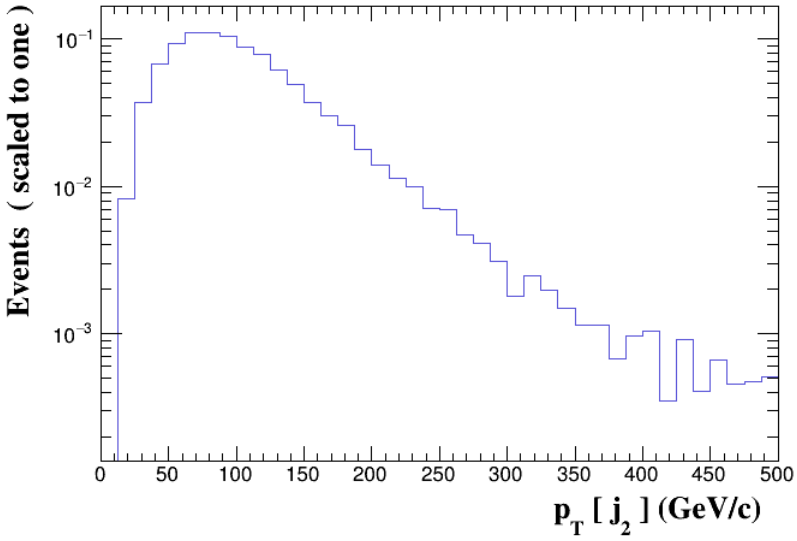


**Figure 6.**

### 3.15 Histogram 7

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 0.00349146 | 1.156 | 0.0 | 0.0 |

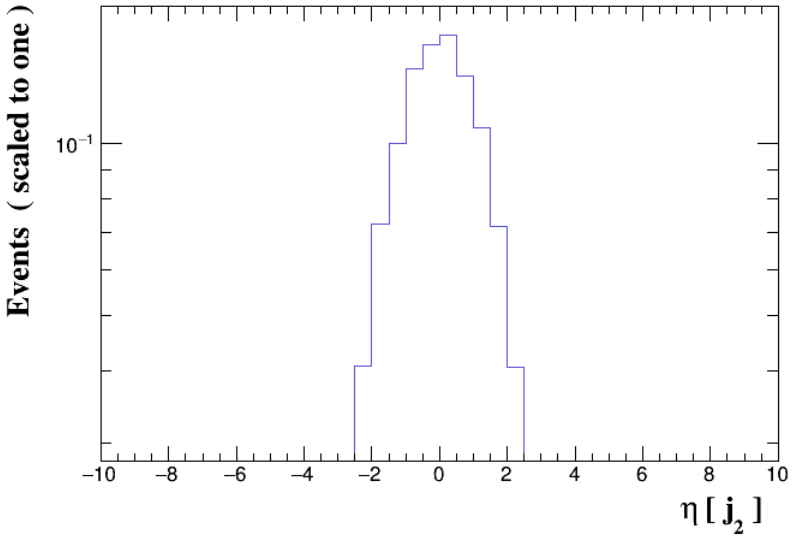


**Figure 7.**

### 3.16 Histogram 8

*** Plot: MT_MET ( j[2] )**

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 124.349 | 96.06 | 0.0 | 0.5413 |

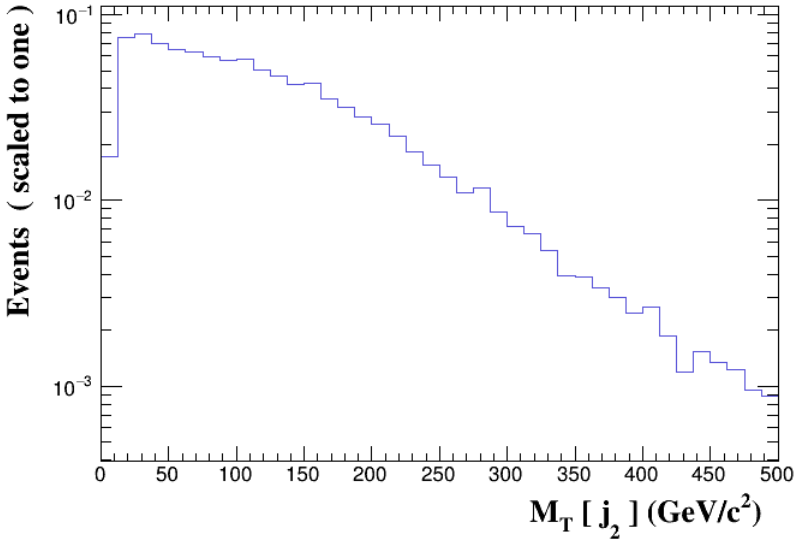


**Figure 8.**

### 3.17 Histogram 9

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 313.417 | 259.1 | 0.0 | 16.29 |

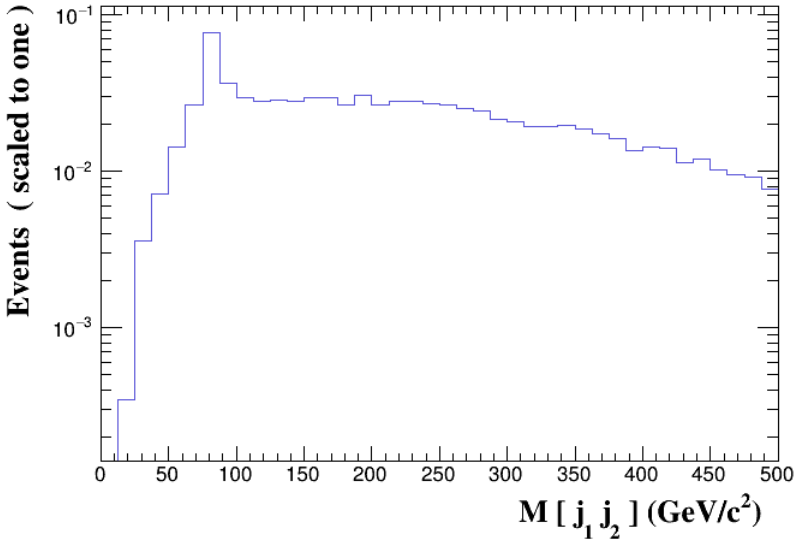


**Figure 9**.

### 3.18 Histogram 10

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

| Dataset | Integral | Entries per event | Mean | RMS | % underflow | % overflow |
|---|---|---|---|---|---|---|
| tag_1_pythia8_ | 1.0 | 1.0 | 2.28805 | 0.9806 | 0.0 | 0.0 |

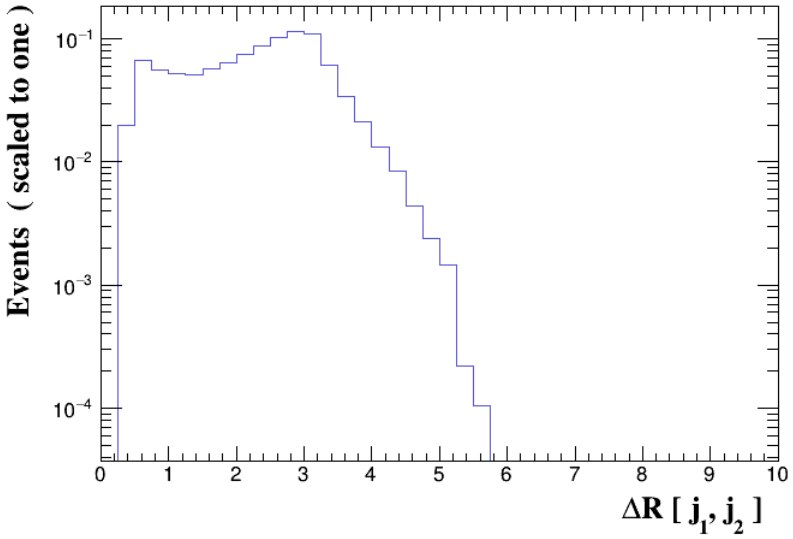


**Figure 10.**

# 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) | 0.0 +/- 0.0 | | |