Delphes Studies on Angles of Acceptance

Nathan Wagner

August 21, 2023

Processes

1. I analyzed the total cross-section and retention of $\mu^+\mu^- \to H\nu_\mu\bar{\nu_\mu}$ and $\mu^+\mu^- \to HH\nu_\mu\bar{\nu_\mu}$ processes in the $11 - 17$TeV range.
2. The estimated optimal energy found using these data values for each process are higher than before, with the optimal value for single Higgs VBF being 18.463 TeV and the di-Higgs VBF being 25.909 TeV.
3. I also performed an analysis of the data by only keeping the jets with low $|\eta|$ values (3 lowest for single Higgs, 6 lowest for di-Higgs) and found a significant improvement in the retention.

Results

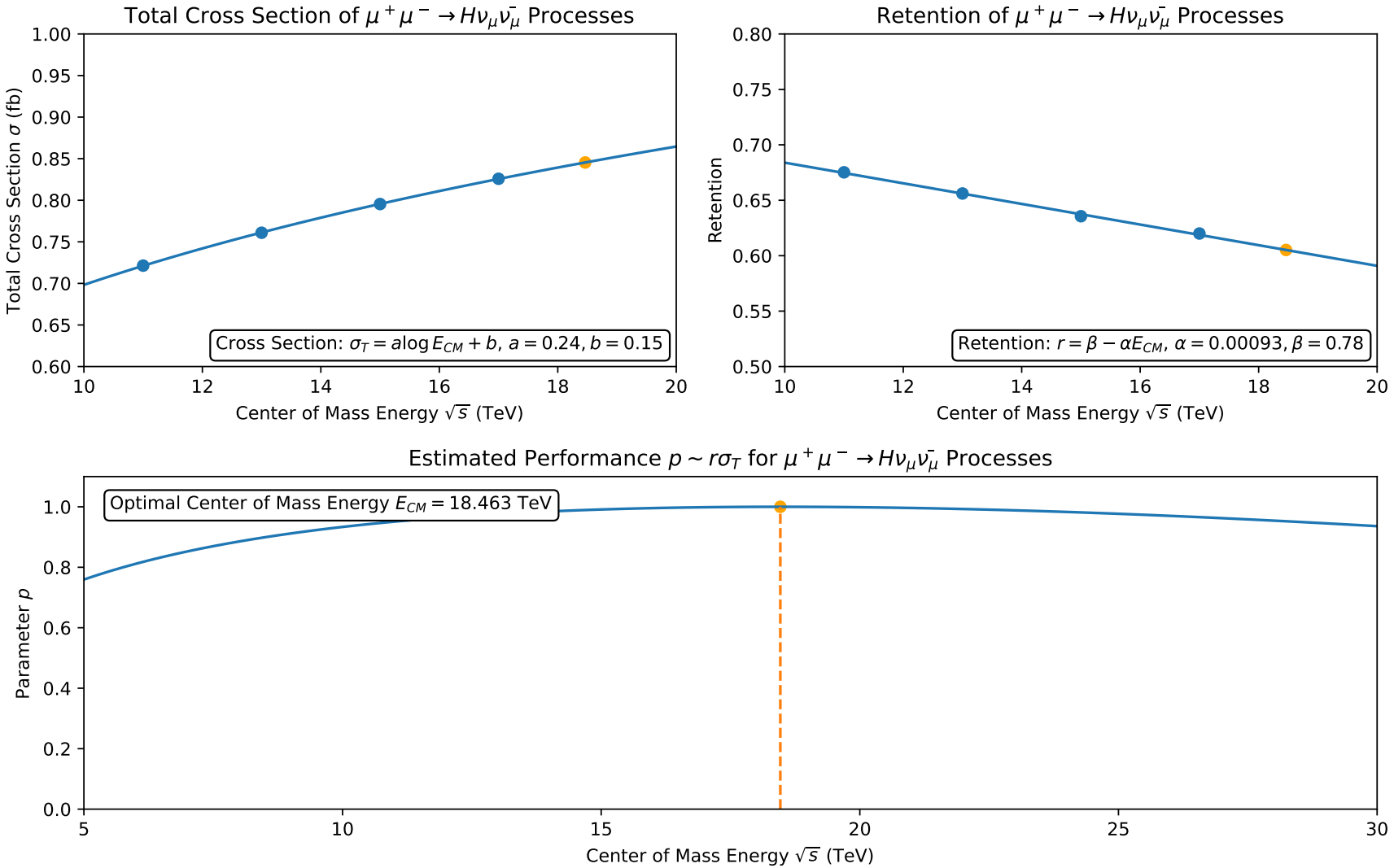

Figure: Process: $\mu^+\mu^- \to \nu_\mu\bar{\nu_\mu}H, H \to b\bar{b}, N_{\text{events}} = 50,000$

Results

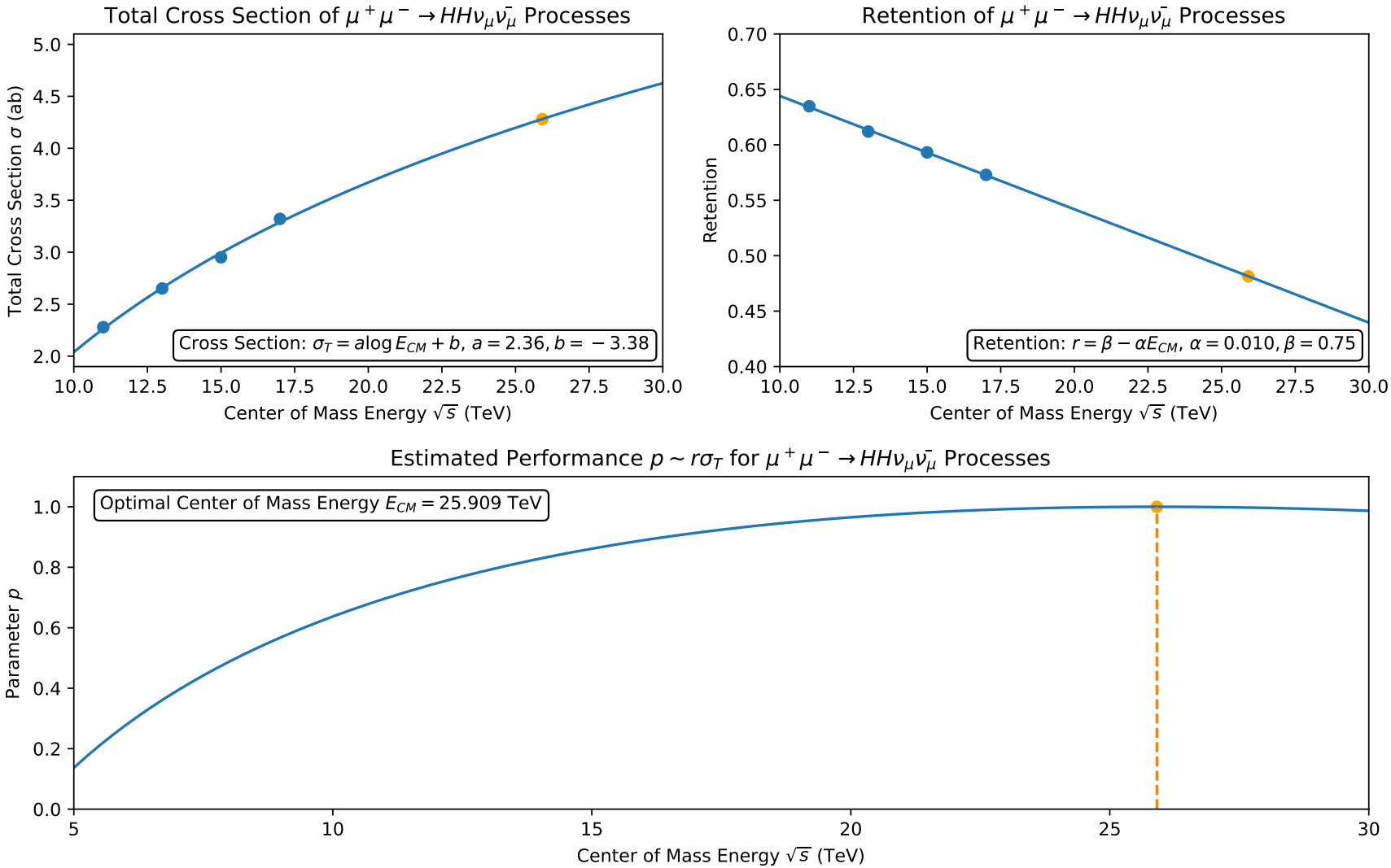

Figure: Process: $\mu^+\mu^- \to \nu_\mu\bar{\nu_\mu}HH, H \to b\bar{b}, N_{\text{events}} = 50,000$

Results - No Cutoff

The following are results for the analysis performed with no cutoff.

Results - No Cutoff

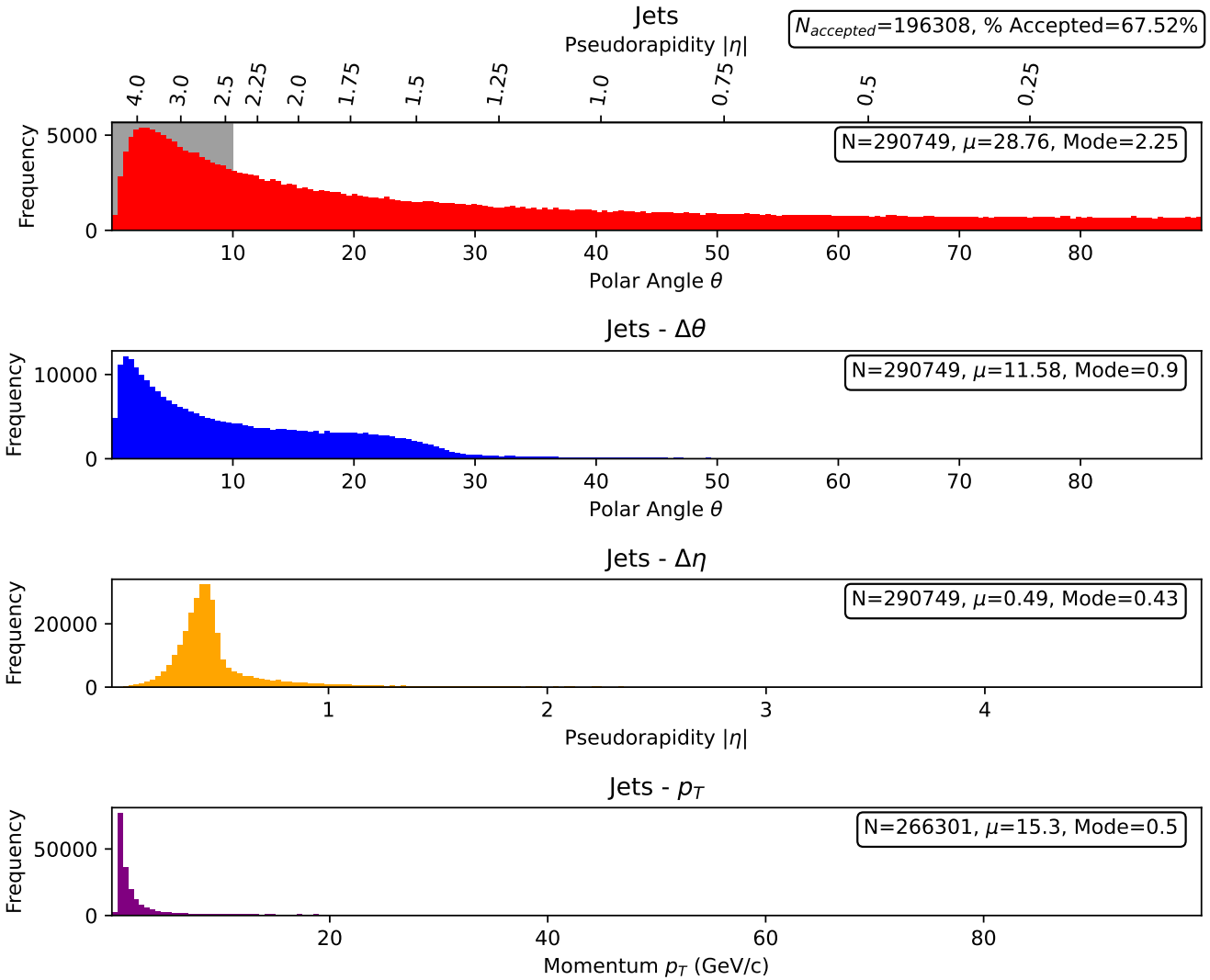

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 11\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

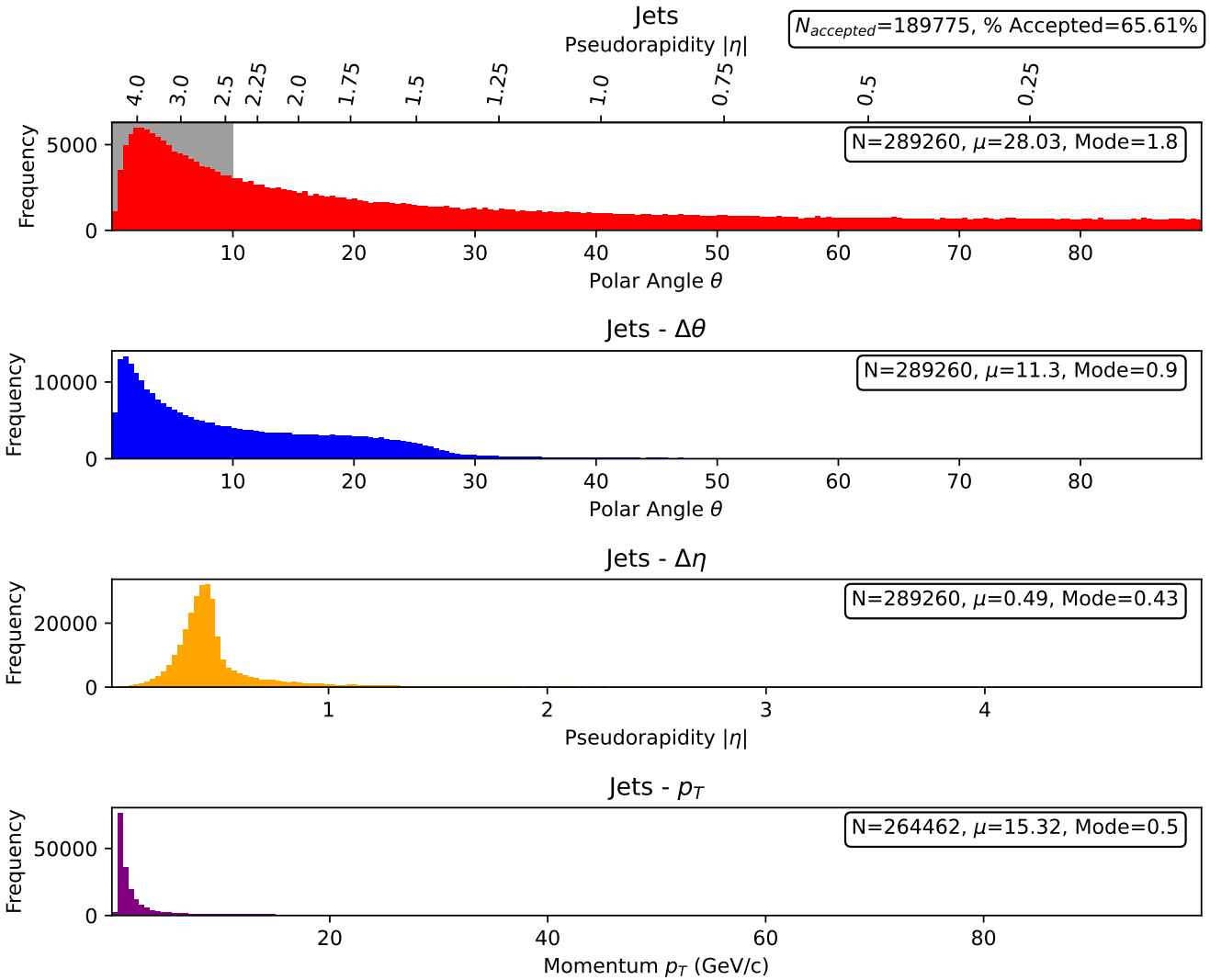

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu}_\mu H, H \to b\bar{b}$ at $\sqrt{s} = 13\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

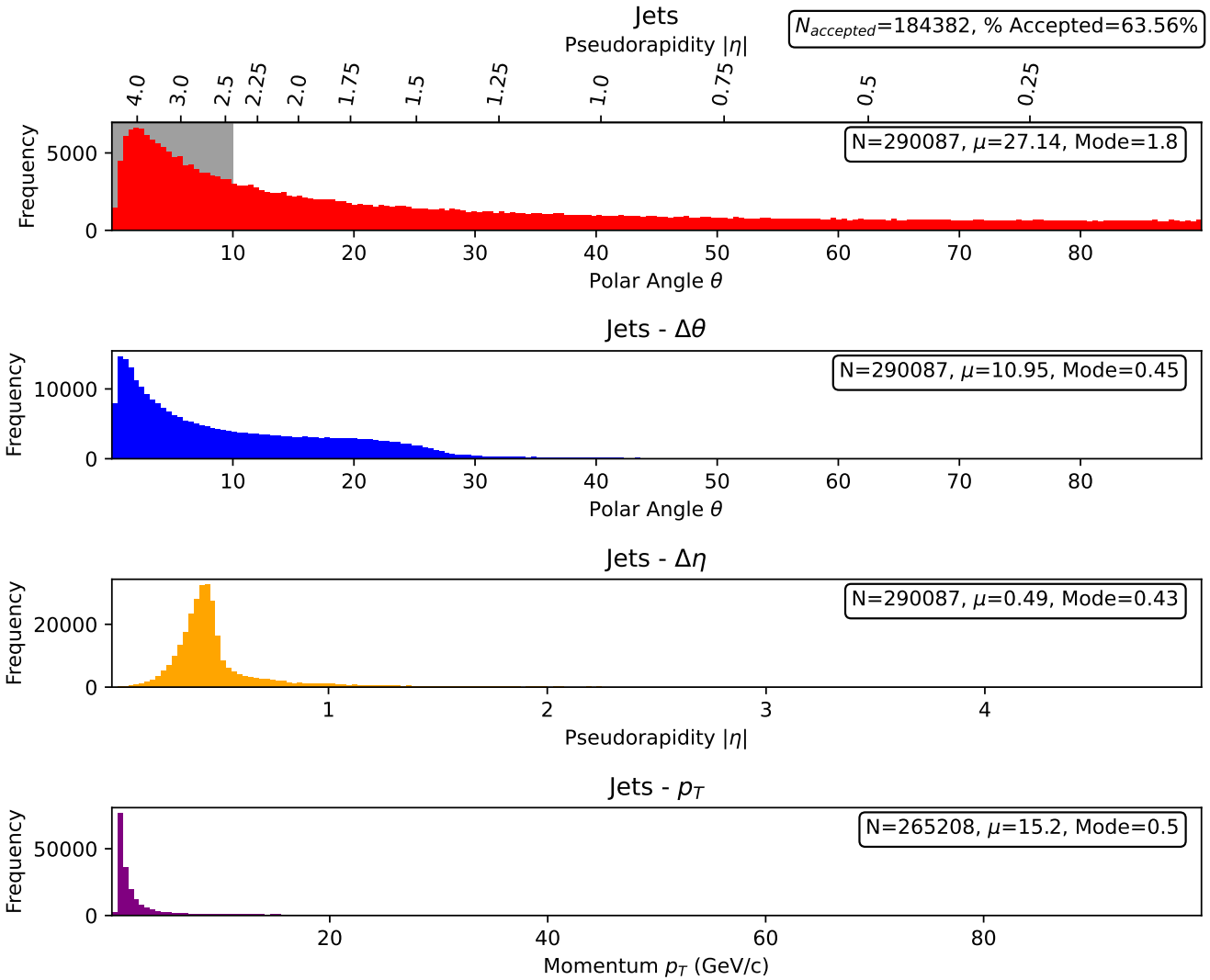

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 15\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

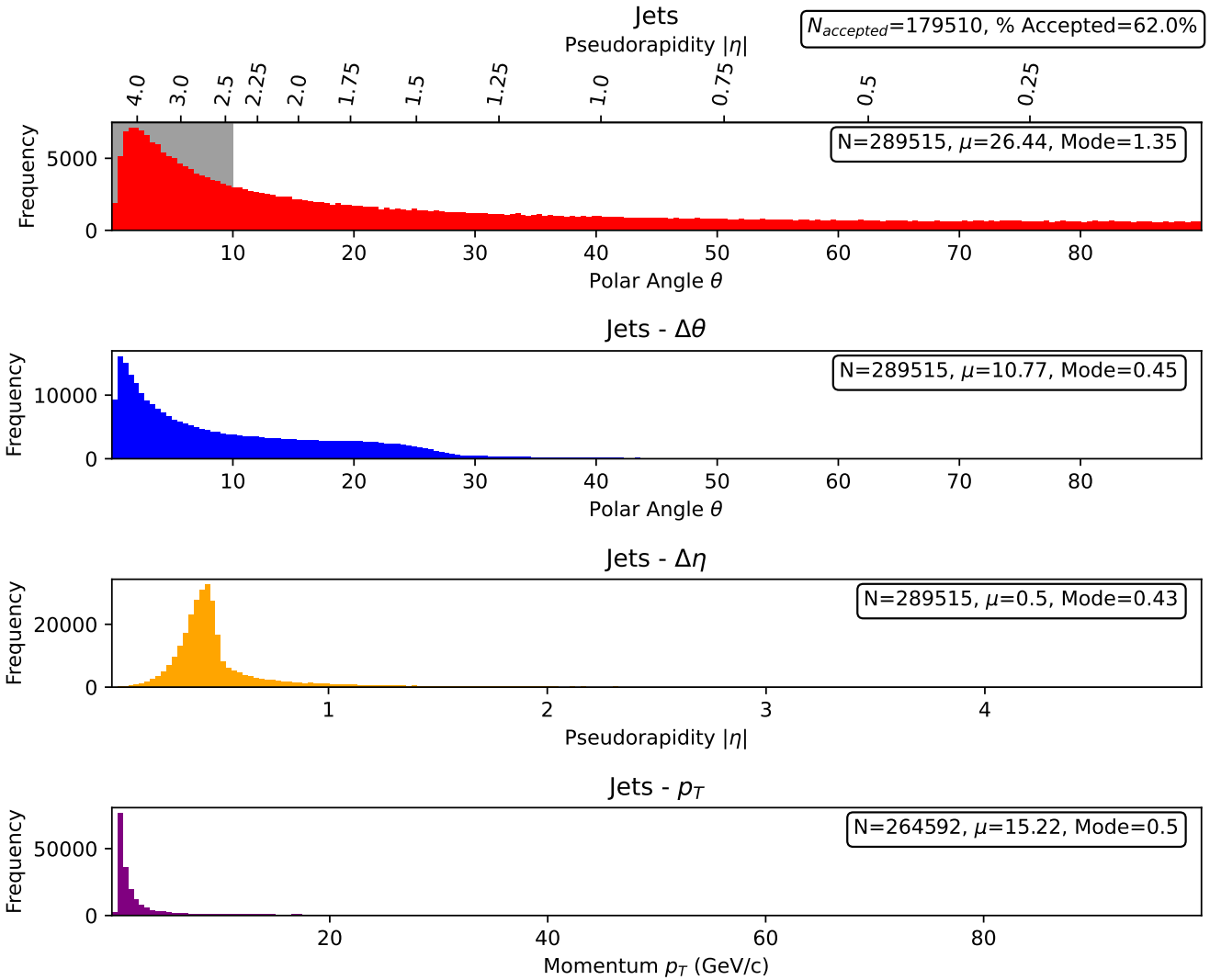

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 17\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

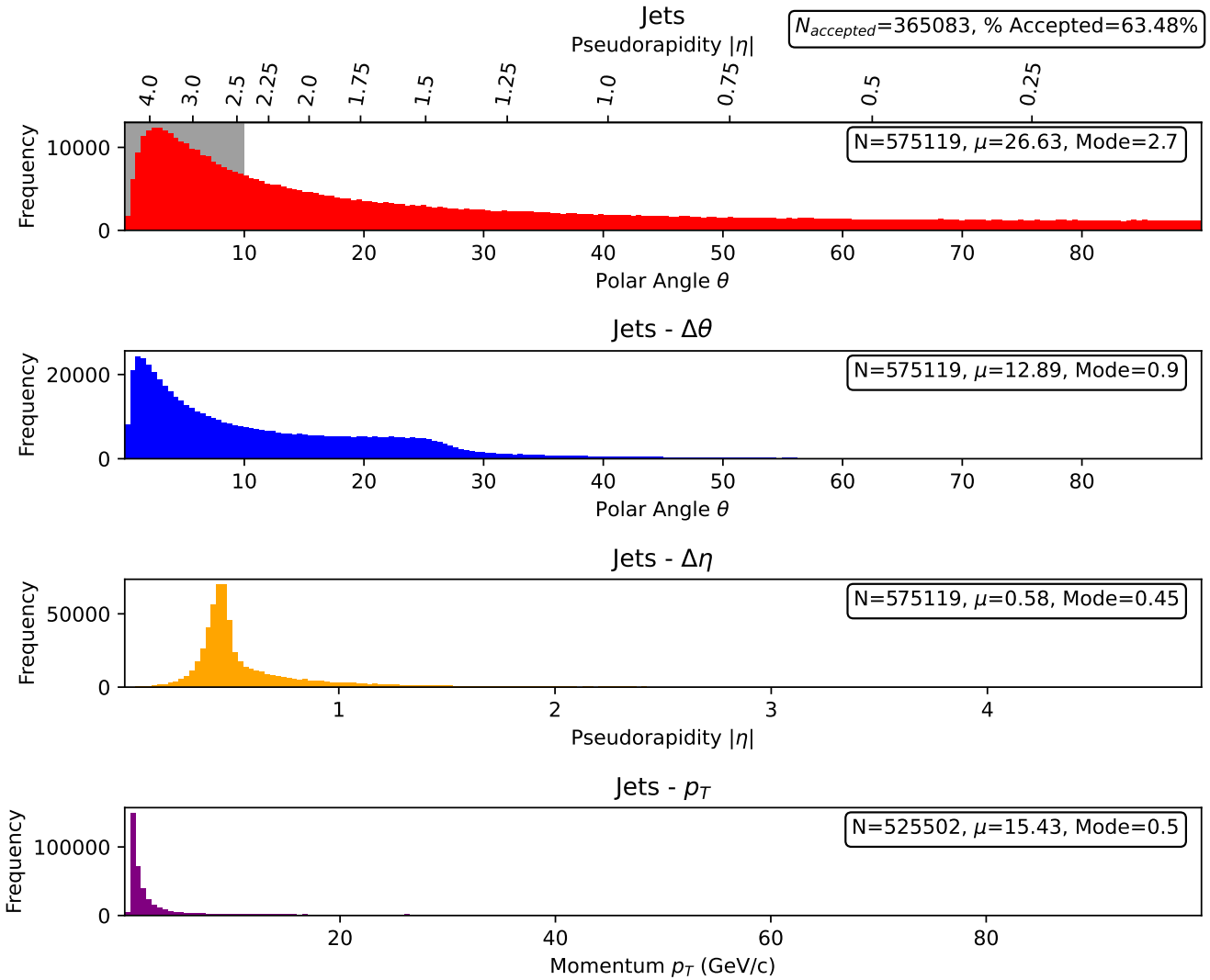

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} HH, H \to b\bar{b}$ at $\sqrt{s} = 11\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

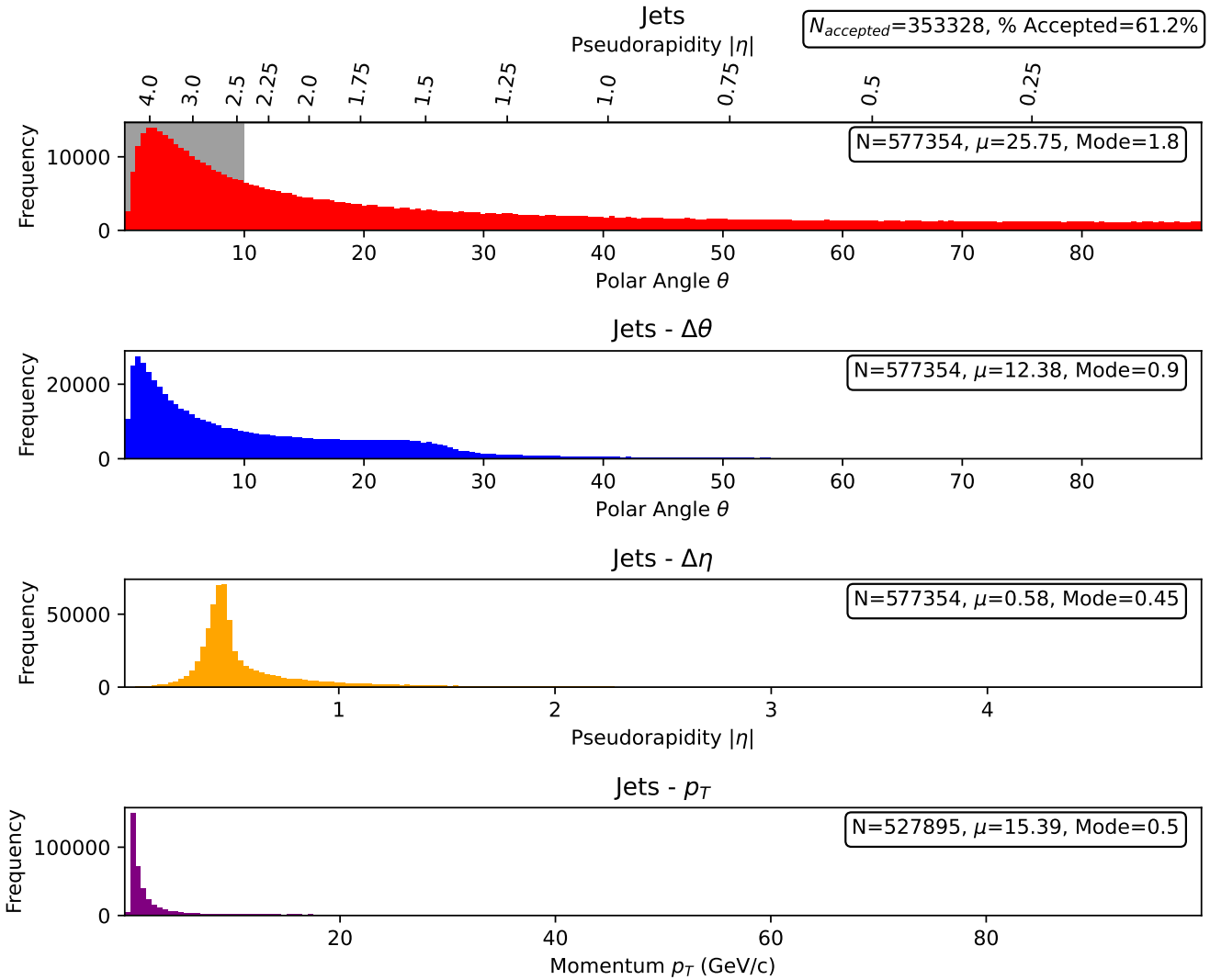

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} HH, H \to b\bar{b}$ at $\sqrt{s} = 13\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

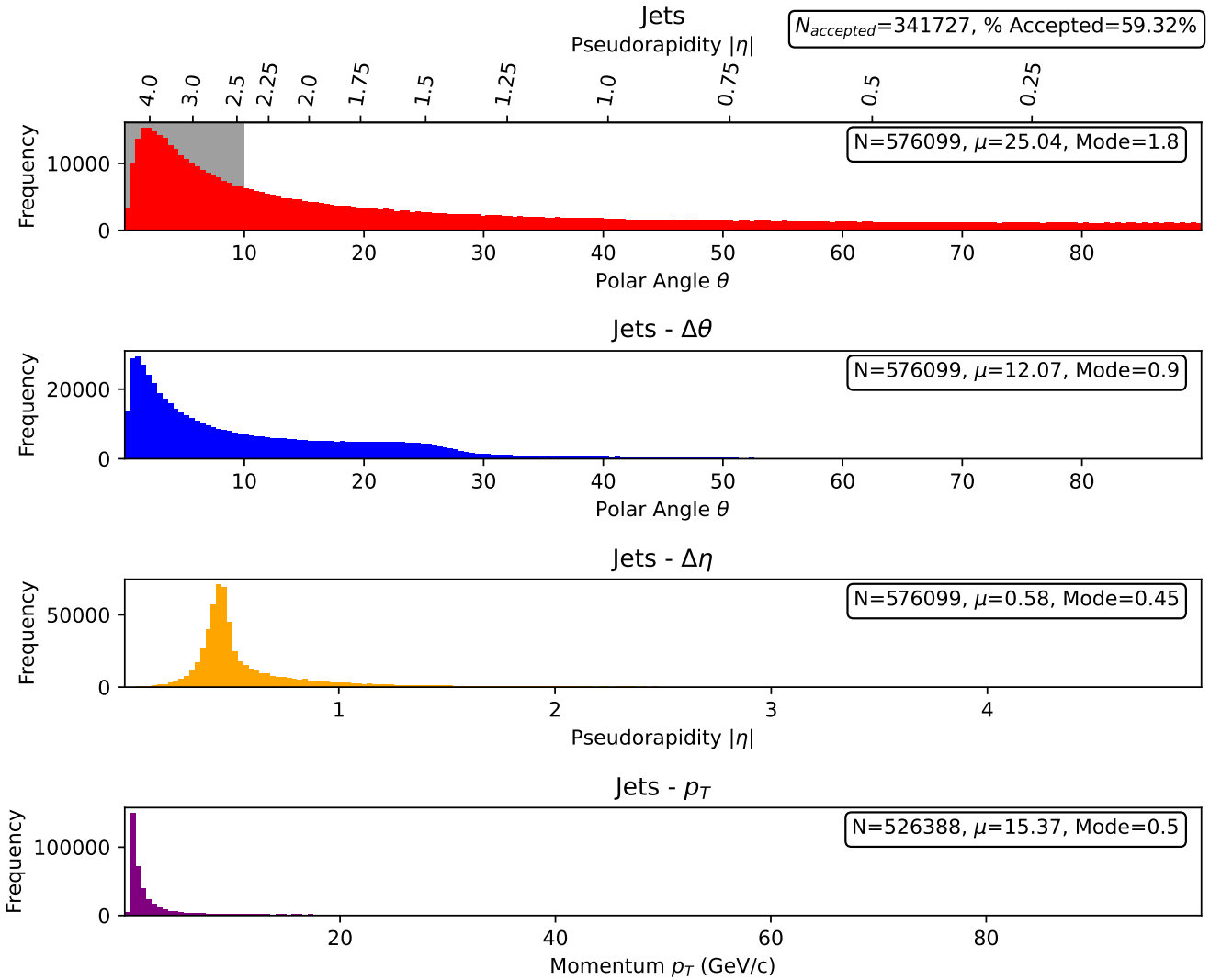

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} HH, H \to b\bar{b}$ at $\sqrt{s} = 15\text{TeV}, N_{\text{events}} = 50,000$

Results - No Cutoff

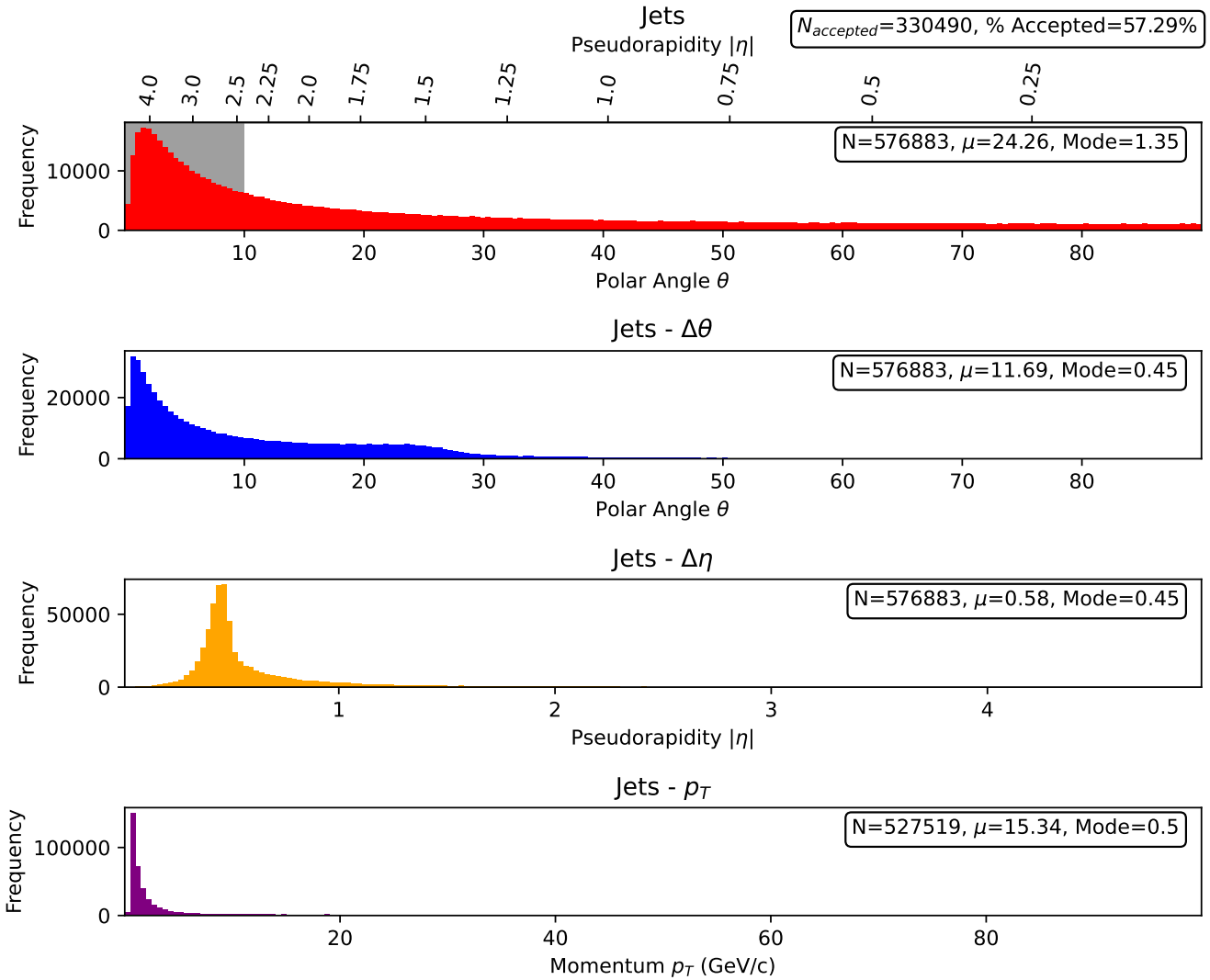

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} HH, H \to b\bar{b}$ at $\sqrt{s} = 17\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

The following are results for the analysis performed with cutoff. The jets with the 3 lowest $|\eta|$ values were kept for single Higgs processes, and the jets with the 6 lowest $|\eta|$ values were kept for di-Higgs processes.

Results - Cutoff

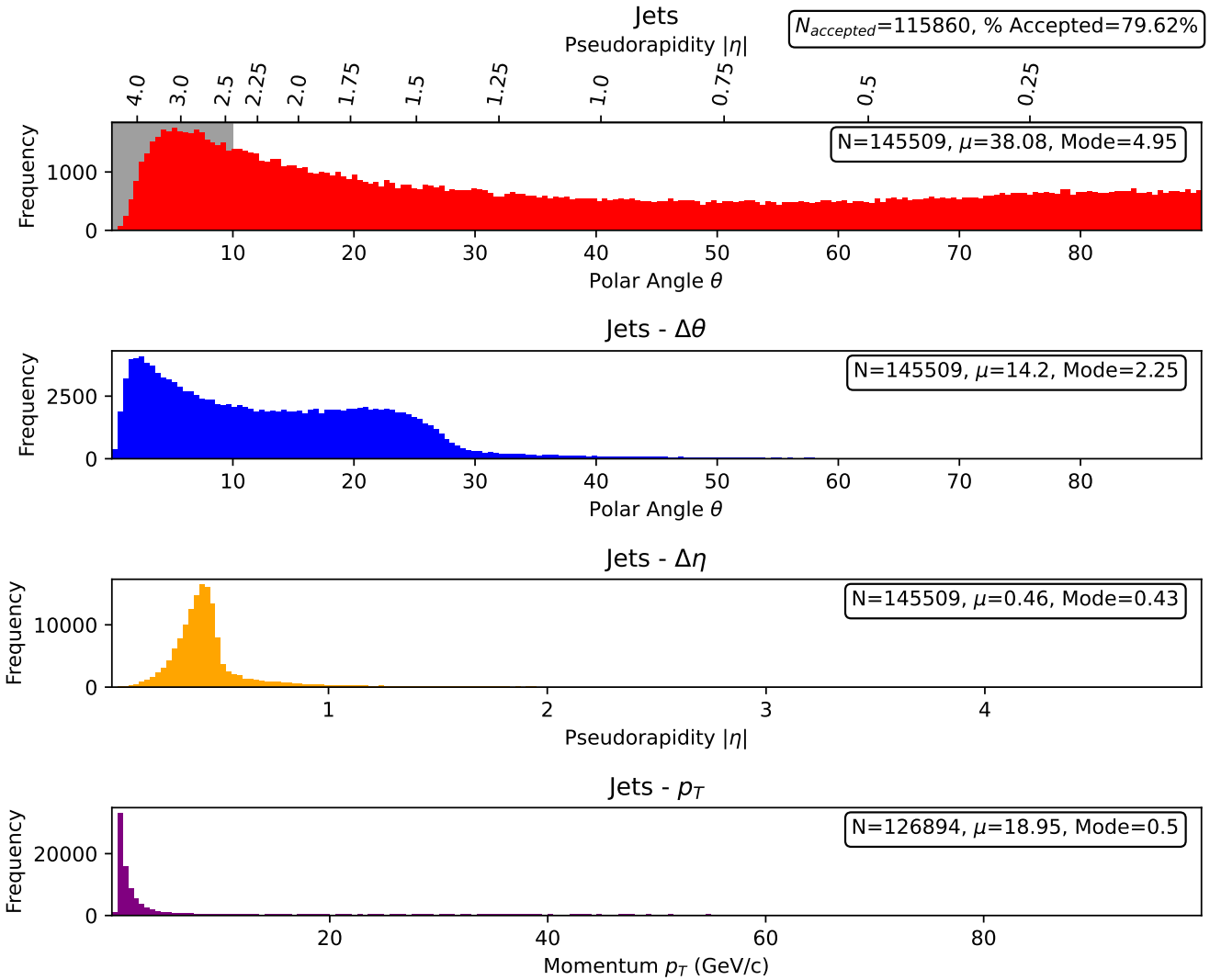

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 11\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

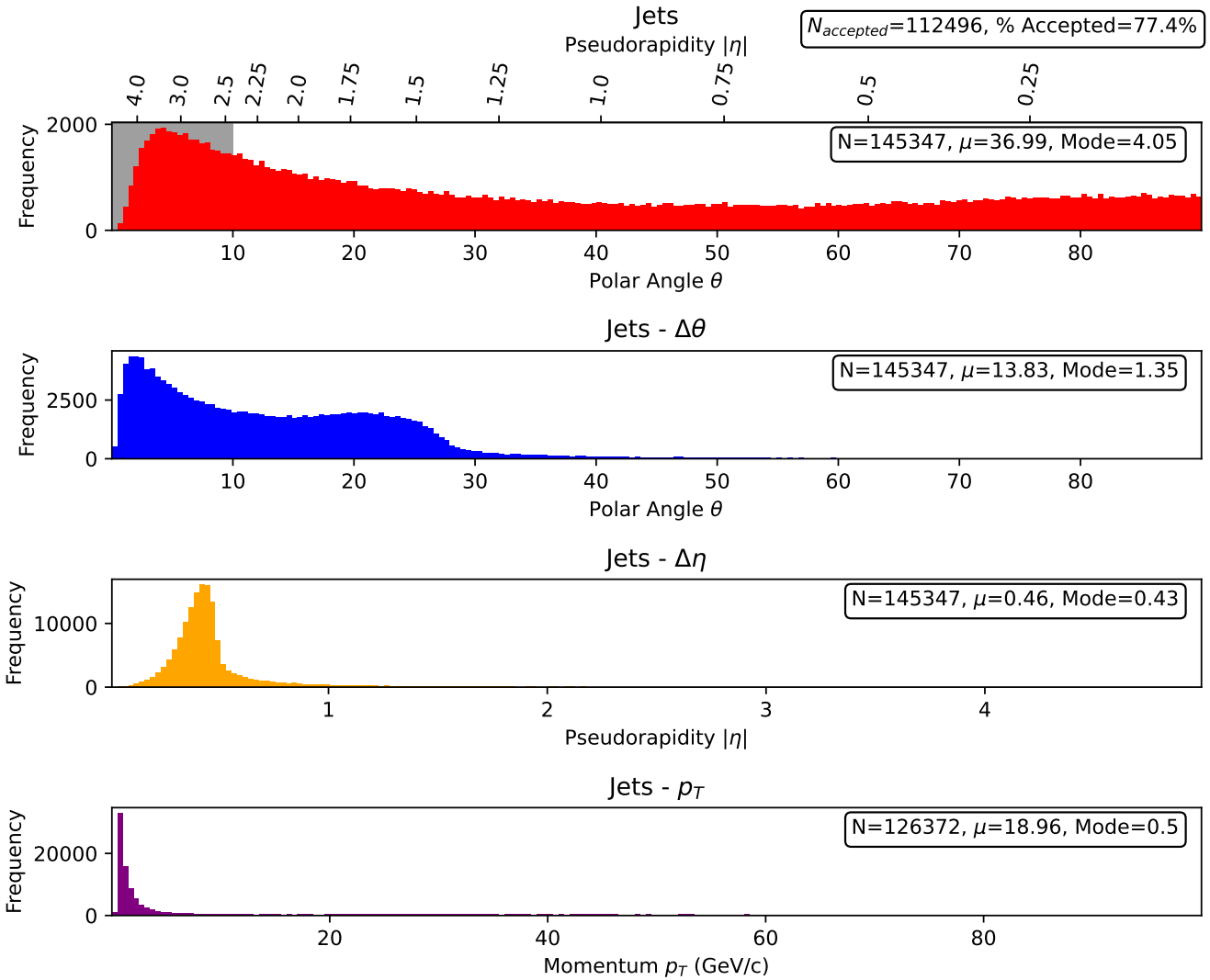

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 13\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

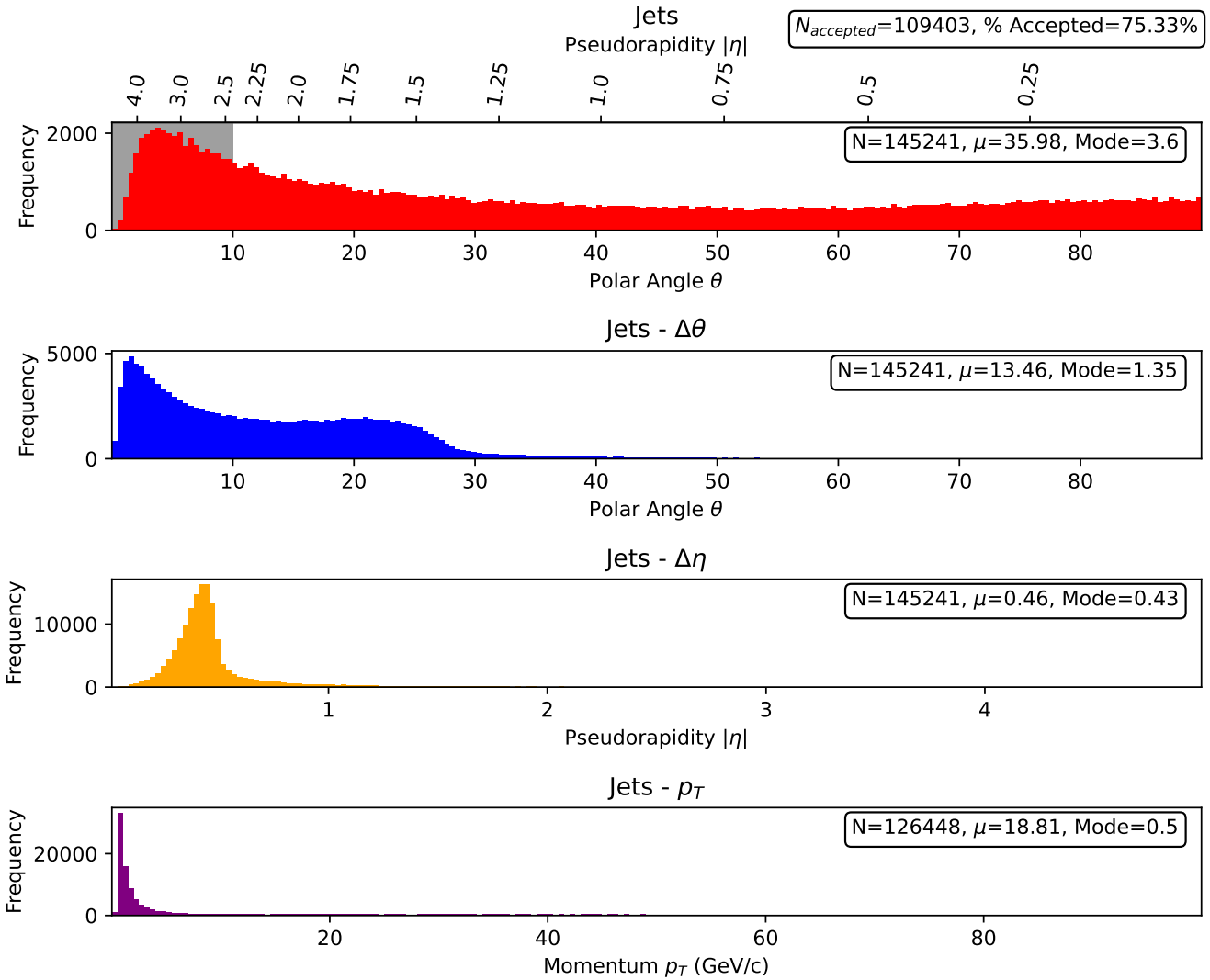

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 15\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

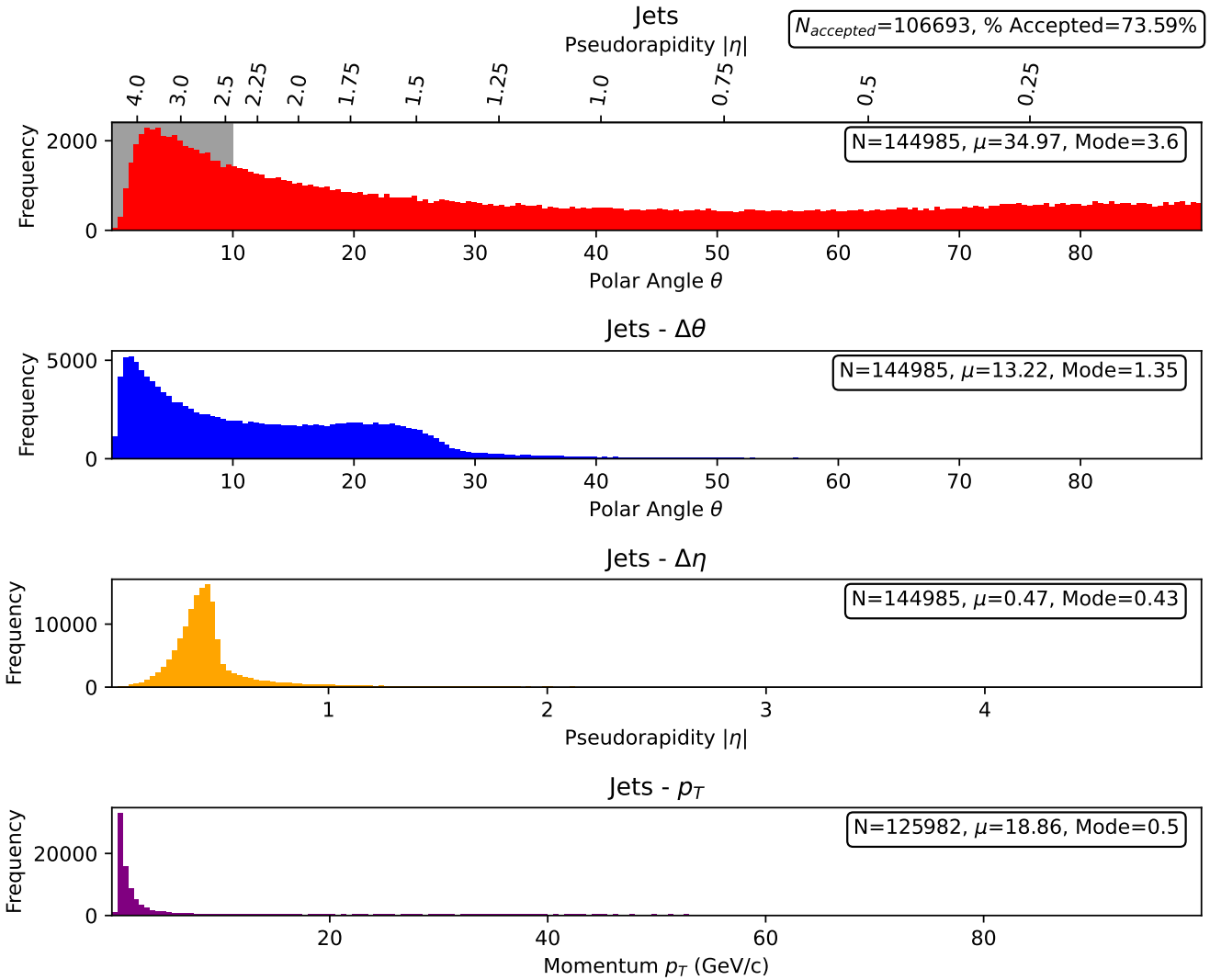

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} H, H \to b\bar{b}$ at $\sqrt{s} = 17\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

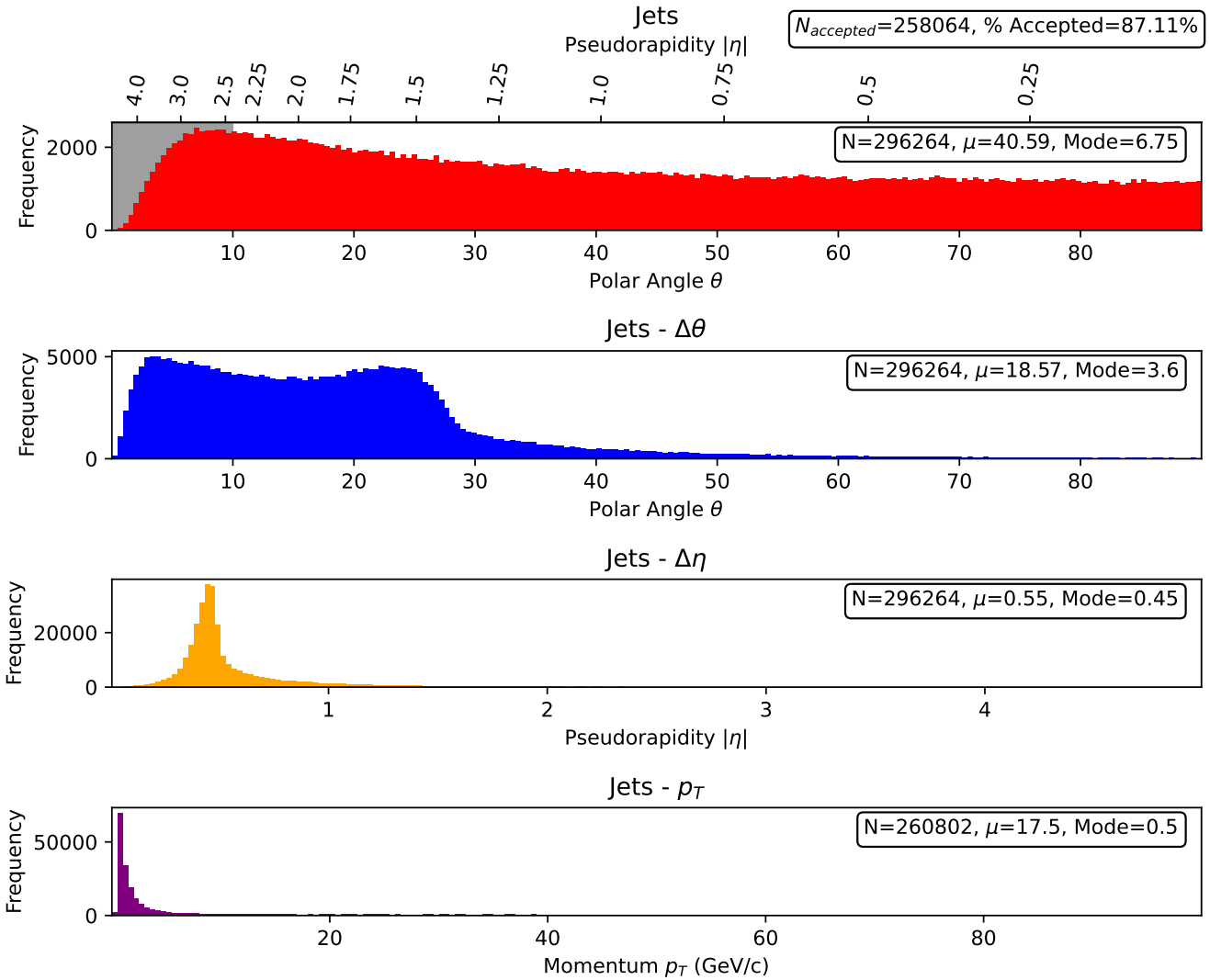

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu_\mu} HH, H \to b\bar{b}$ at $\sqrt{s} = 11\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

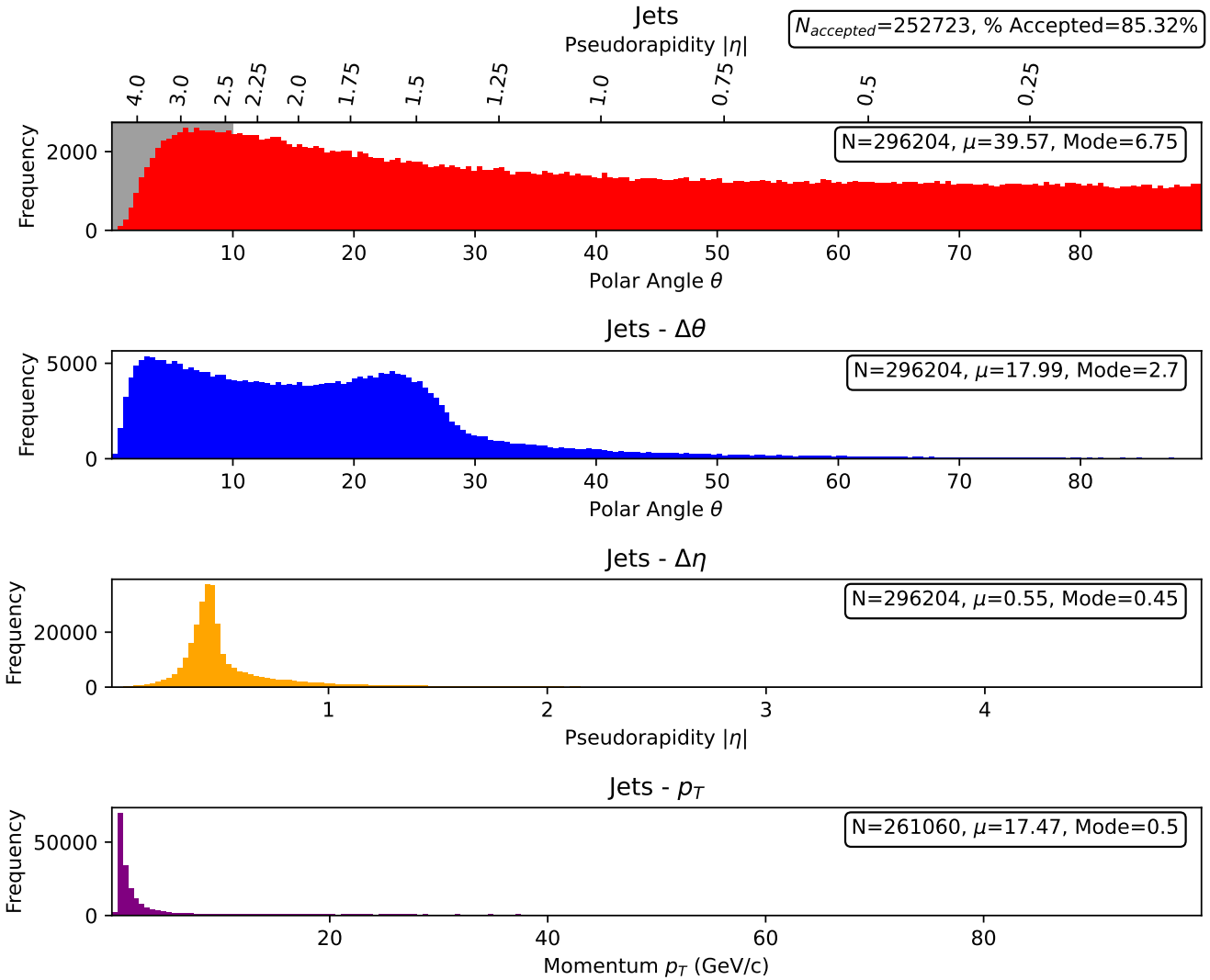

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu}_\mu HH, H \to b\bar{b}$ at $\sqrt{s} = 13\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

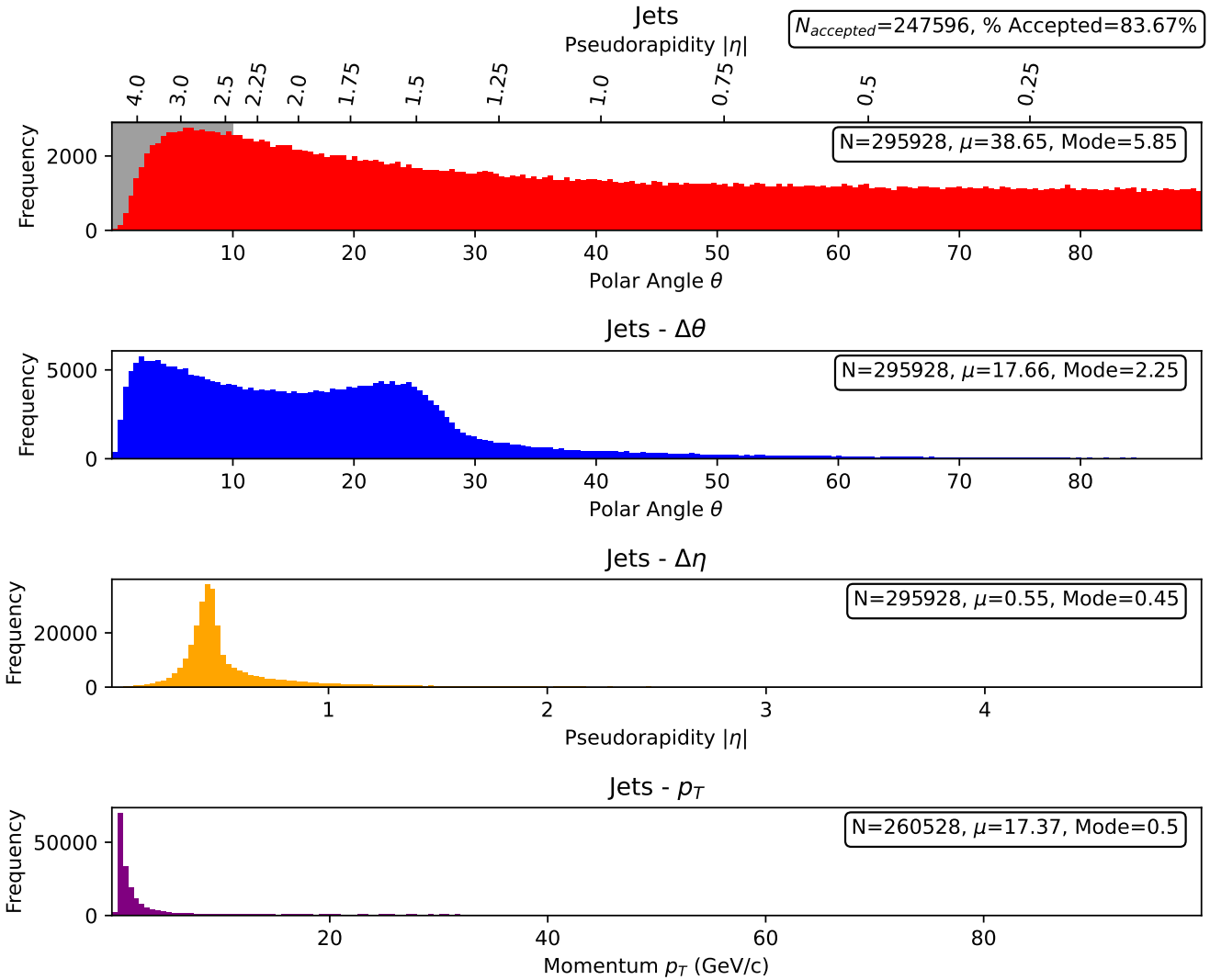

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu}_\mu HH, H \to b\bar{b}$ at $\sqrt{s} = 15\text{TeV}, N_{\text{events}} = 50,000$

Results - Cutoff

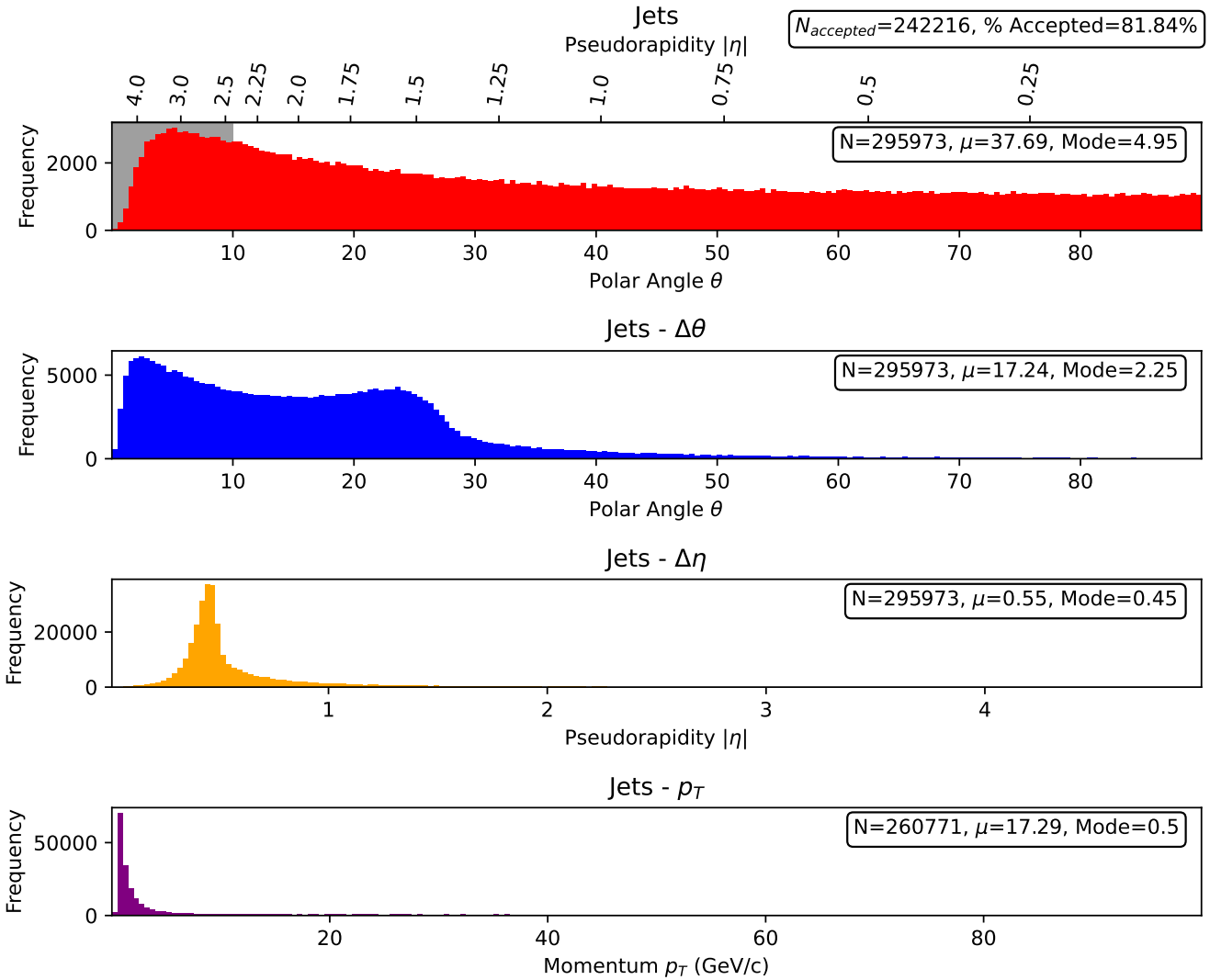

Figure: Process: $\mu^+\mu^- \to \nu_\mu \bar{\nu}_\mu HH, H \to b\bar{b}$ at $\sqrt{s} = 17\text{TeV}, N_{\text{events}} = 50,000$