

$t\bar{t}H(bb)$ P-Flow b-tagging calibration overflow

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- Using the latest L2 ntuples (as of Nov 2022) , Powheg+Pythia8 mc16, nominal loose, P-flow jets.
- ttH for signal ttbb for background.
- Using the whole of run 2 (a,d and e)
- Focusing on the small-R jets, boosted selection.
- Looking for the fraction of events with at least one jet outside the calibration range also the total number of jets outside the calibration range.
 - b-jets, c-jets and light jets.
 - [Previous study \(done with EM-Topo\).](#)



b-tagging calibration thresholds per jet flavor

Jet truth flavor	b-tagging calibration threshold p_t
b	400 GeV
c	250 GeV
light	300 GeV

- b-jets are at a lower calibration energy than before, previously 600 GeV(EM-Topo) now 400 GeV (P-flow).
- c and light jets have the same calibration cutoff as before.



The Fractions outside the calibration, signal.

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	11.2%	3.1%
c	13.9%	12.4%
light	12.7%	5.8%
combined	19.3%	3.9%

- Main things to note: 3.9% Signal for P-flow compared to 18% for EM-Topo. Should have little effect on fit.



The Fractions outside the calibration, background.

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	10.1%	3.3%
c	14.4%	12.6%
light	5.3%	13.9%
combined	-	4.1%

Boosted STXS bin 5 [300,450) GeV

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	0.9%	3.5%
c	10.5%	11.9%
light	5.1%	11.5%
combined	14.3%	2.1%

Boosted STXS bin 6 [450,inf) GeV

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	15.9%	55.3%
c	23.5%	27.3%
light	9.1%	21.0%
combined	57.3%	15.7%

Accessing the signal and control regions

- With `L2_DeepSets_tth_fraction`
- If `L2_DeepSets_tth_fraction < 0.05` we are in the control region
- If `L2_DeepSets_tth_fraction > 0.05` we are in the signal region

Boosted Signal ($t\bar{t}H$) sample SR

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	3.0%	10.9%
c	12.0%	13.3%
light	5.8%	12.8%
combined	21.4%	4.0%

Boosted signal (ttH) sample CR

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	3.6%	12.4%
c	13.3%	15.7%
light	5.5%	12.5%
combined	20.1%	3.8%

Boosted background (ttbb) sample SF

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	2.6%	0.9%
c	12.5%	14.1%
light	6.4%	14.8%
combined	27.4%	4.6%

Jet truth flavor	Fraction of events with at least one jet outside the calibration	Fraction of total jets outside the calibration
b	3.1%	10.7%
c	12.7%	14.7%
light	6.2%	14.2%
combined	23.5%	3.7%

Thanks for listening, any question?

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