

Track-Assisted Mass Topological Uncertainties

James Frost, Cigdem Issever, **Mike Nelson**

University of Oxford

michael.nelson@physics.ox.ac.uk

ATLAS Jet Substructure Meeting

January 28, 2016



- New Track-Assisted (TA) mass approach: **Fikri's TA talk**.
- TA-mass (m_{TA}) = $\frac{pT_{calo} \times m_{track}}{pT_{track}}$
- Two different TA-mass uncertainties: *topological* uncertainties and *generator modelling* uncertainties.
- *Topological*: compare *JZXW* with different signal jet samples (Oxford: Mike Nelson).
- *Generator Modelling*: Pythia vs. Herwig for the same sample (Heidelberg: Oleg Brandt & Daniel Villar).

Objects and Topologies

Objects

- Derivation: JETM8_p2425
- Objects: AntiKt10LCTopoTrimmedPtFrac5SmallR20

Sample Topologies

- Background topology: *JZXW* (QCD multijets)
- Signal topologies: *W'*, *Z'*, *RSG*

Binning

- Bin in pT_{reco} and $|\eta_{det}|$.
- $200 < pT_{reco} [\text{GeV}] < 3000$; $0 < |\eta_{det}| < 2.0$

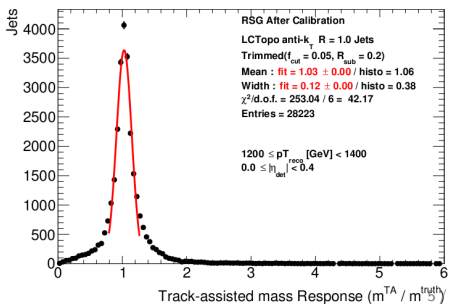
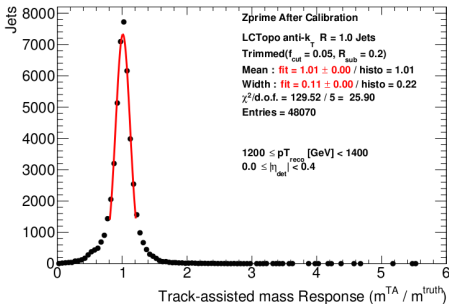
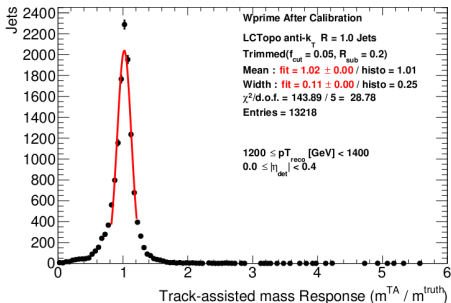
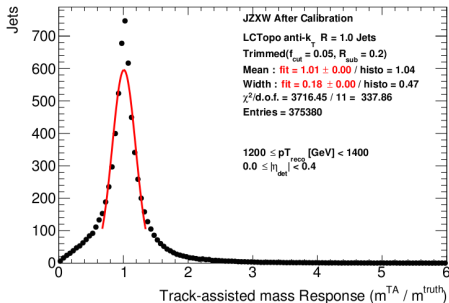
Determining Topological Uncertainties

- Track-assisted mass calibration has been applied to the jets from each of the four samples .
- Topological differences quantified by $\sim R(JZXW) - R(\text{SignalJet})$

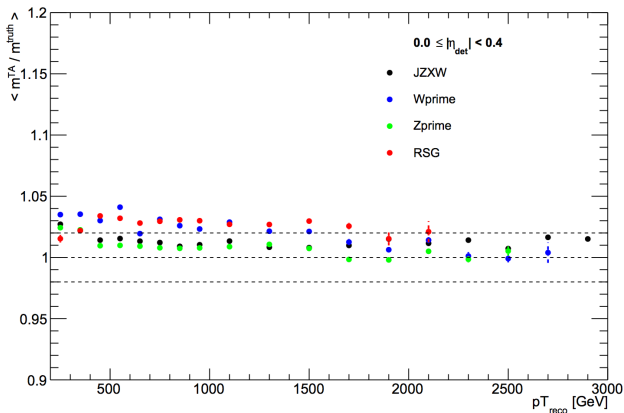
Three Signals

- $W' \rightarrow W/Z$ jets
- $Z' \rightarrow t\bar{t}$
- $RSG \rightarrow HH \rightarrow b\bar{b}b\bar{b}$

TA-mass Responses (I)

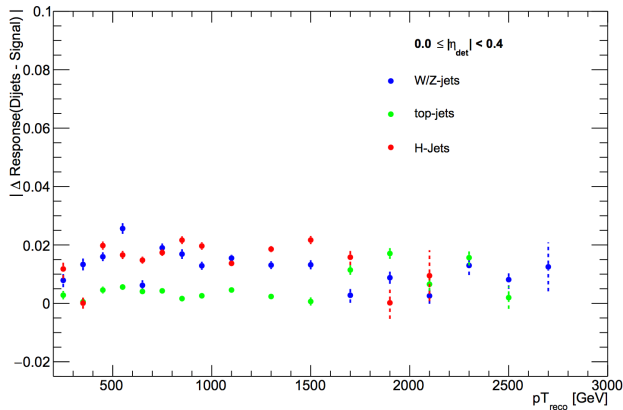


TA-mass Responses (II)



- TA-response, $R = \frac{m_{TA}}{m_{truth}}$, as a function of pT_{reco} .
- Response plots for central jets. Consistent with higher $|\eta_{det}|$ bins (backup).
- Responses are within 0 - 5 % of unity.

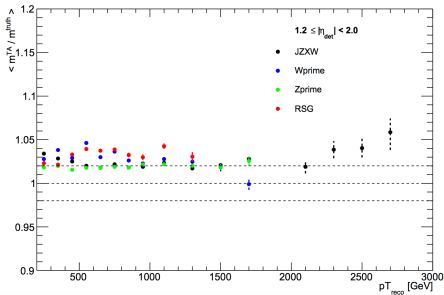
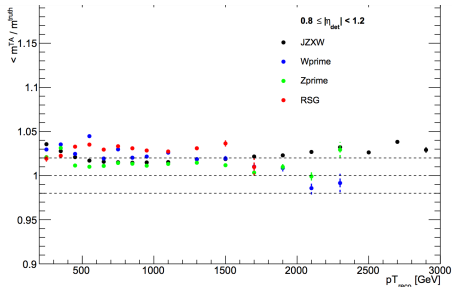
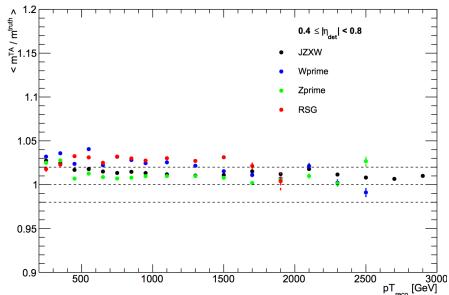
Topological Uncertainties: $R(JZXW) - R(\text{SignalJets})$



- Uncertainty: absolute difference of the fitted mean response of each signal sample.
- Uncertainty $\sim 0 - 2 \%$ across the pT_{reco} range, for all samples.
- Not a significant topological dependence.

- Topological dependence of track-assisted mass for large R-jets has been studied.
- Uncertainties at the level of 1 - 2 % for the different samples → **small**.
- Seek advice from uncertainty experts to check that uncertainties are being calculated in the correct way.

Responses



Uncertainties

