Status of the Top Mass Measurements with the $P_\perp$ balance method

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Introduction

- I will give an update on the studies of the top mass measurements using "$P_\perp$ balance method"
- This method uses btagging. One of the most difficult thing for me at the moment is to find top MC data samples that have jets with btagging information
  - Only the Cone4H1Tower jet collection, that is in the standard DPDs and AODs, has jets with btagging information.
  - My study of top measurements using different jets algorithms are limited by the missing btagging information
- Trigger information are also a bit complicate to include in the analysis, I am using release 15.1.0
- It seems that the trigger definitions are easier to be accessed in release 15.2.0 (to be tried)

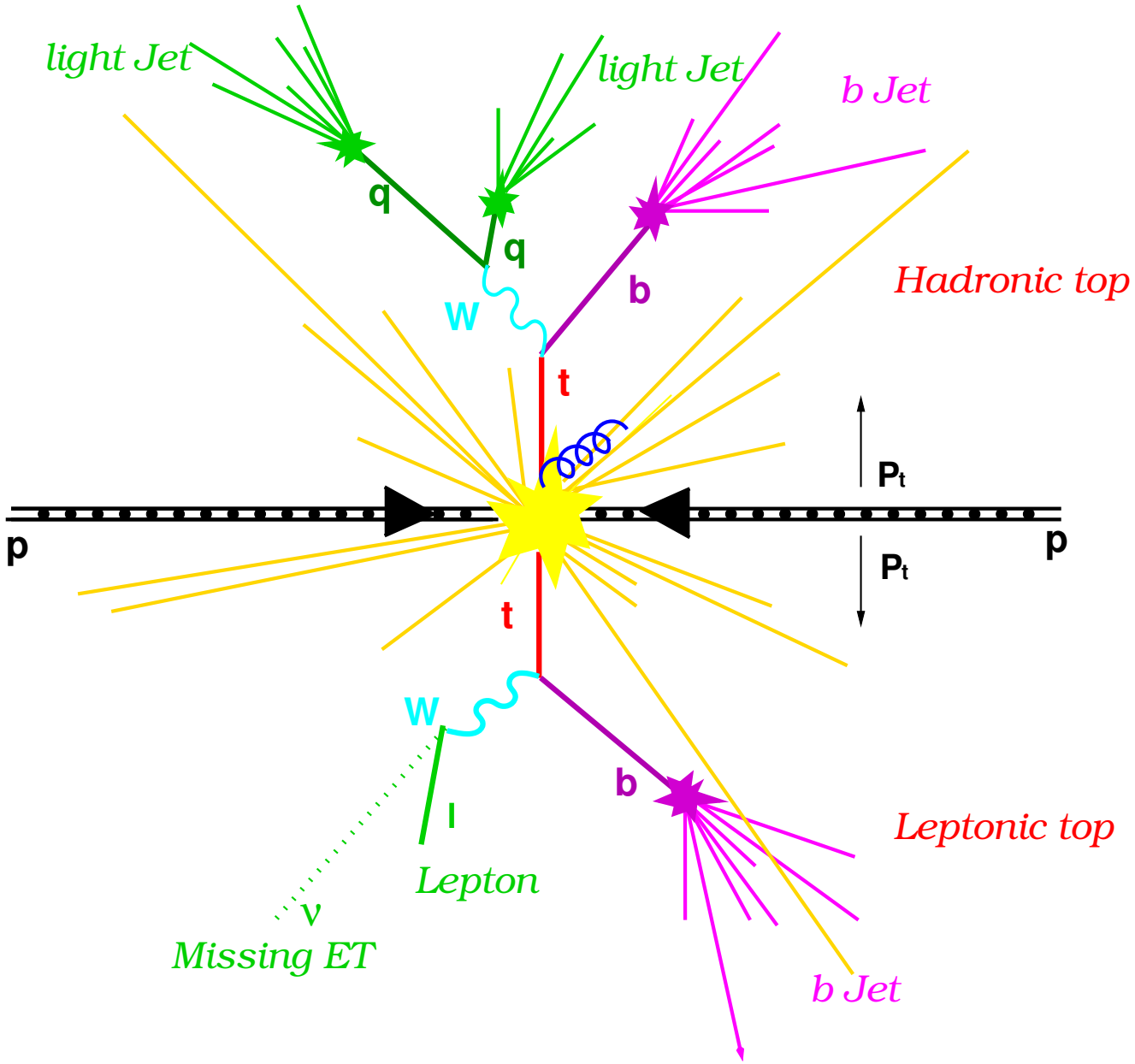
D3PD making

- Used ARA to make new D3PD
- Used the "$P_{\perp}$ balance method" to reconstruct the top mass from the analysed data
- D3PD have been produced using:
  - the mc08 data sample
    user09.KojiTerashi.mc08.105200.T1_McAtNlo_Jimmy.recon.DPD_NOSKIM.e357_s462_r635_DPDMaker000164_p1
    produced by Koji Terashi for the Jet Performance group with the HEC C Quadrant 8
  - These DPDs have different jet algorithms included
  - To overcome the btagging problem, I have matched the candidate b-jet to its truth jet, within a cone of 0.1
  - D2PD from this data sample were produced using release 15.1.0
  - Top measurements results are here presented for Cone4H1ToweJets, AntiKt4H1TopoJets, and AntiKt4LCTopoJets

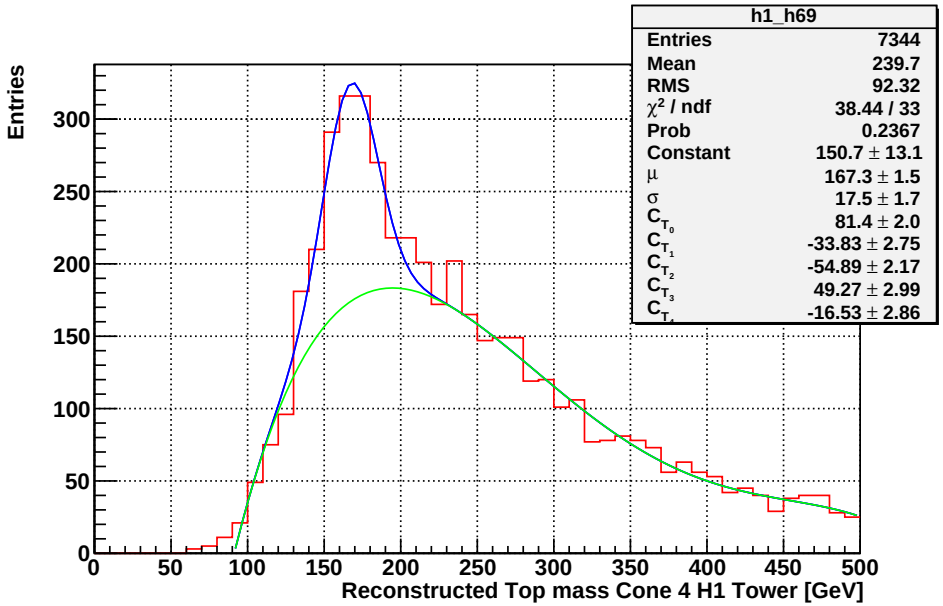
Top: lepton + jets event selection

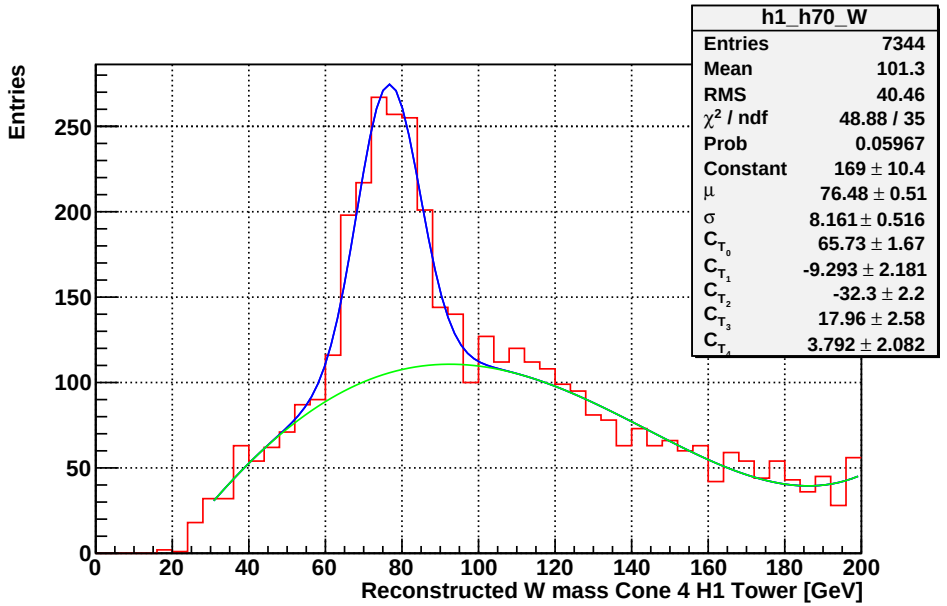
- Jets selection:
  - 3 jets with $p_\perp > 40$ GeV
  - 1 jets with $p_\perp > 20$ GeV
  - $|\eta| < 2.5$
  - B-tag used on two jet (or b-matched jets)
- Exactly one isolated electron or muon with:
  - $p_\perp > 20$ GeV, $|\eta| < 2.5$
  - Muons reconstructed with STACO; electrons with Egamma and isEM $= 0$
- MET > 20 GeV (used MET_RefFinal)
- Used the $P_\perp$ balance method to combine the 4 good selected jets (2 b-jets and 2 light-jets) into top

Top: lepton + jets event



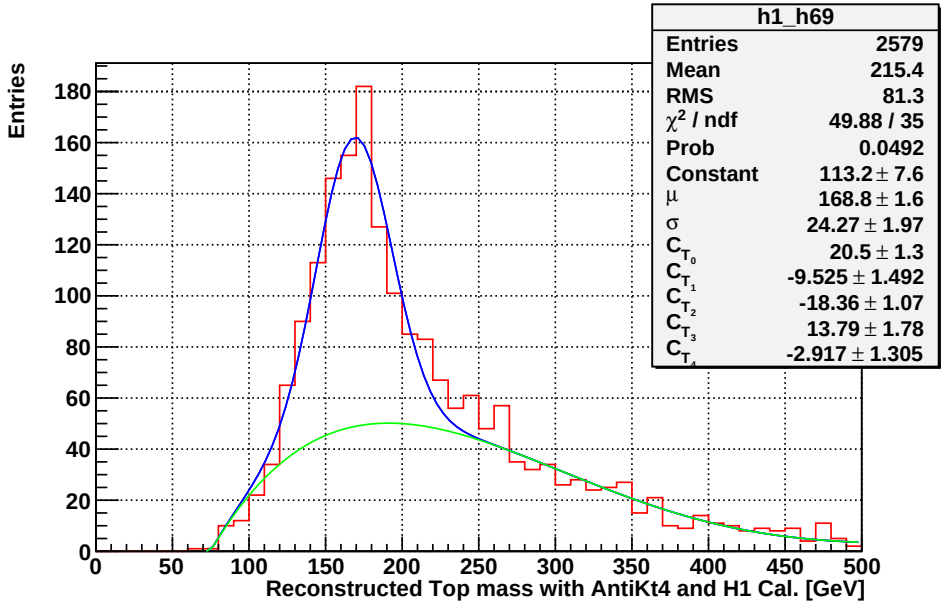
Reconstructed top mass with Cone4H1Tower jets

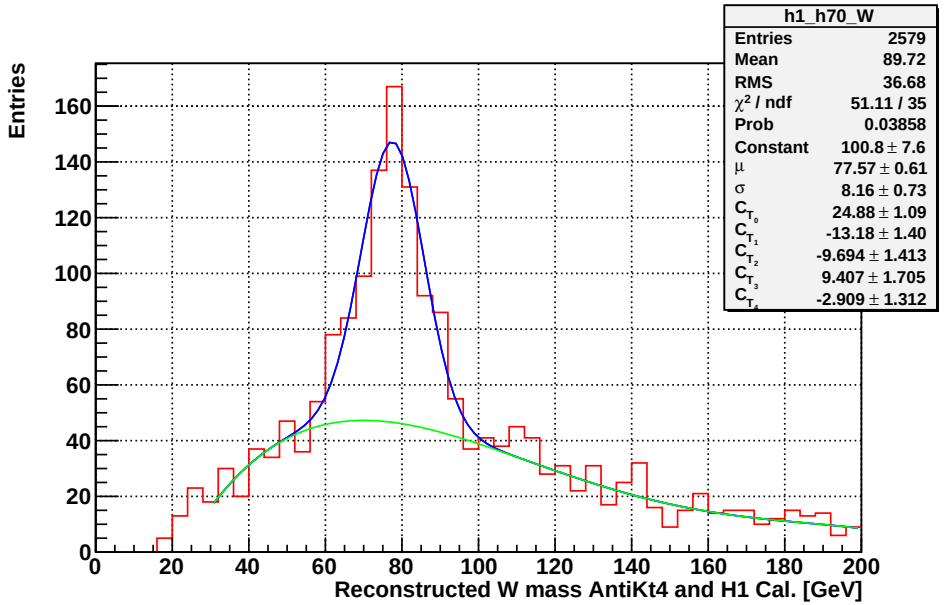




- Left plot shows the reconstructed top mass obtained with Cone4H1Tower jets using two btagged jets in the events selection
- Right plot shows the reconstructed W mass obtained with the standard event selection (two btagged jets required)

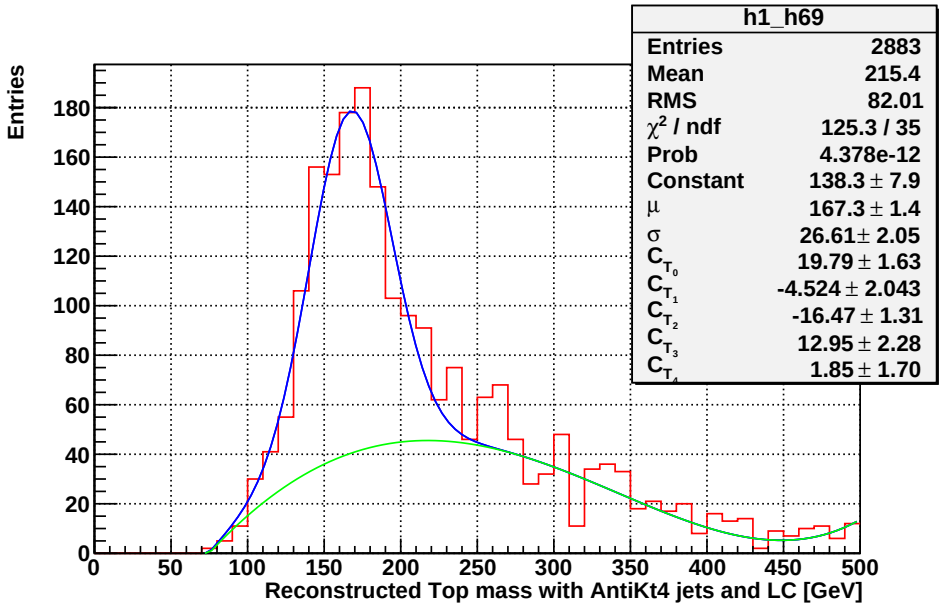
Reconstructed top mass with AntiKt4 H1 jets

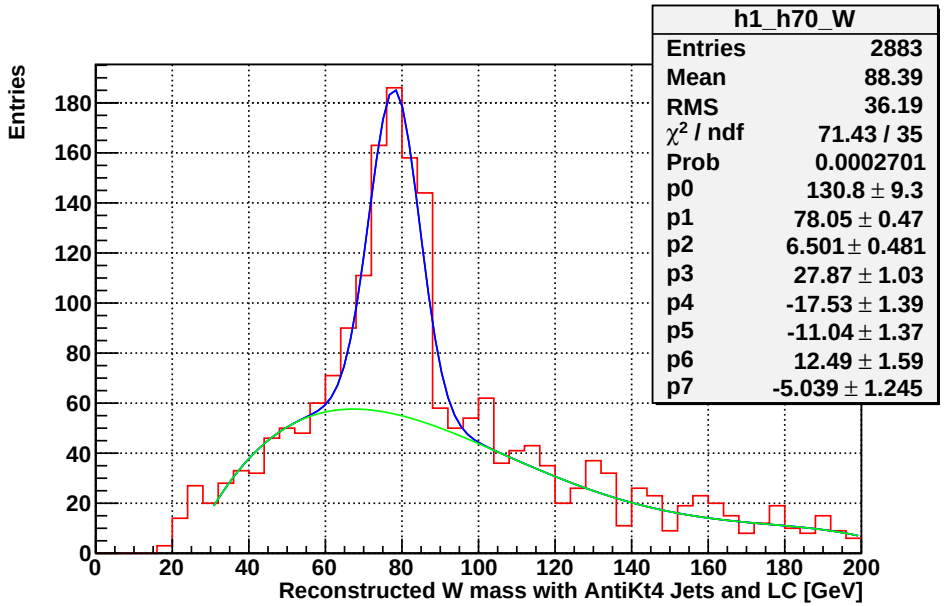




- Left plot shows the reconstructed top mass obtained with AntKt4 H1 Cal.jets. The candidate b-jets are here matched to their truth jets, in order to have “btagging” in the events selection
- Right plot shows the reconstructed W mass obtained with the b-matched in the event selection

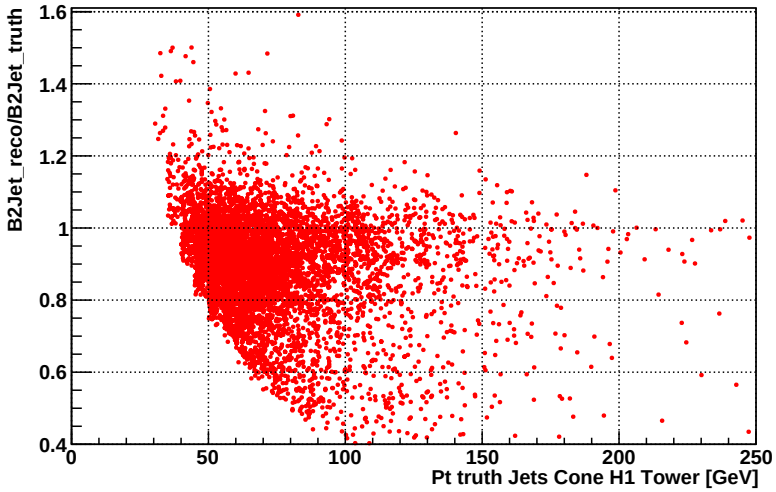
Reconstructed top mass with AntiKt4 LC jets and truth ma

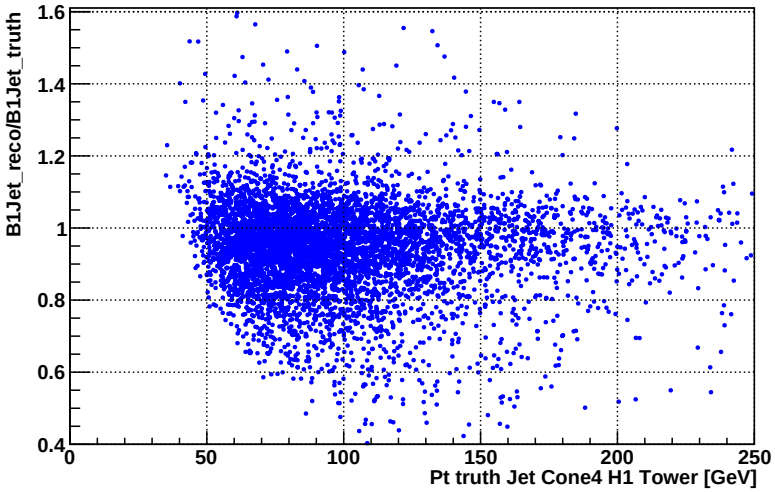


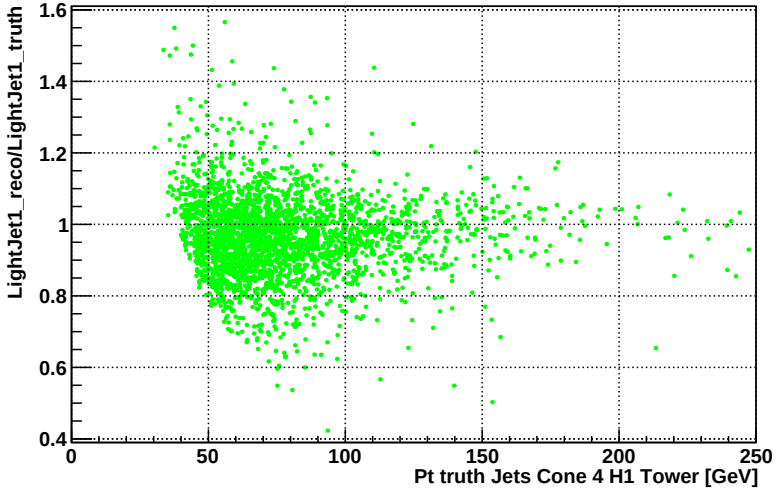


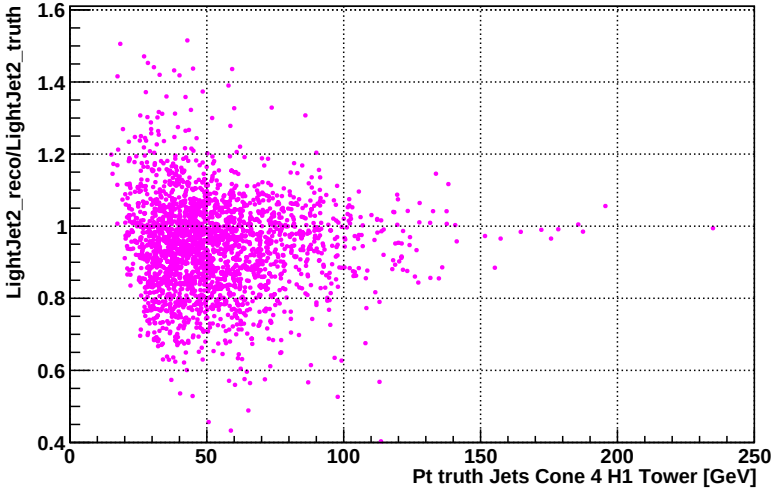
- Left plot shows the reconstructed top mass obtained with AntKt4 LC jets. The candidate b-jets are here matched to their truth jets, in order to have “btagging” in the events selection
- Right plot shows the reconstructed W mass obtained with the b-matched in the event selection

$JetP_{\perp}^{reco}/JetP_{\perp}^{truth}$ *versus* $JetP_{\perp}^{truth}$ *distributions*



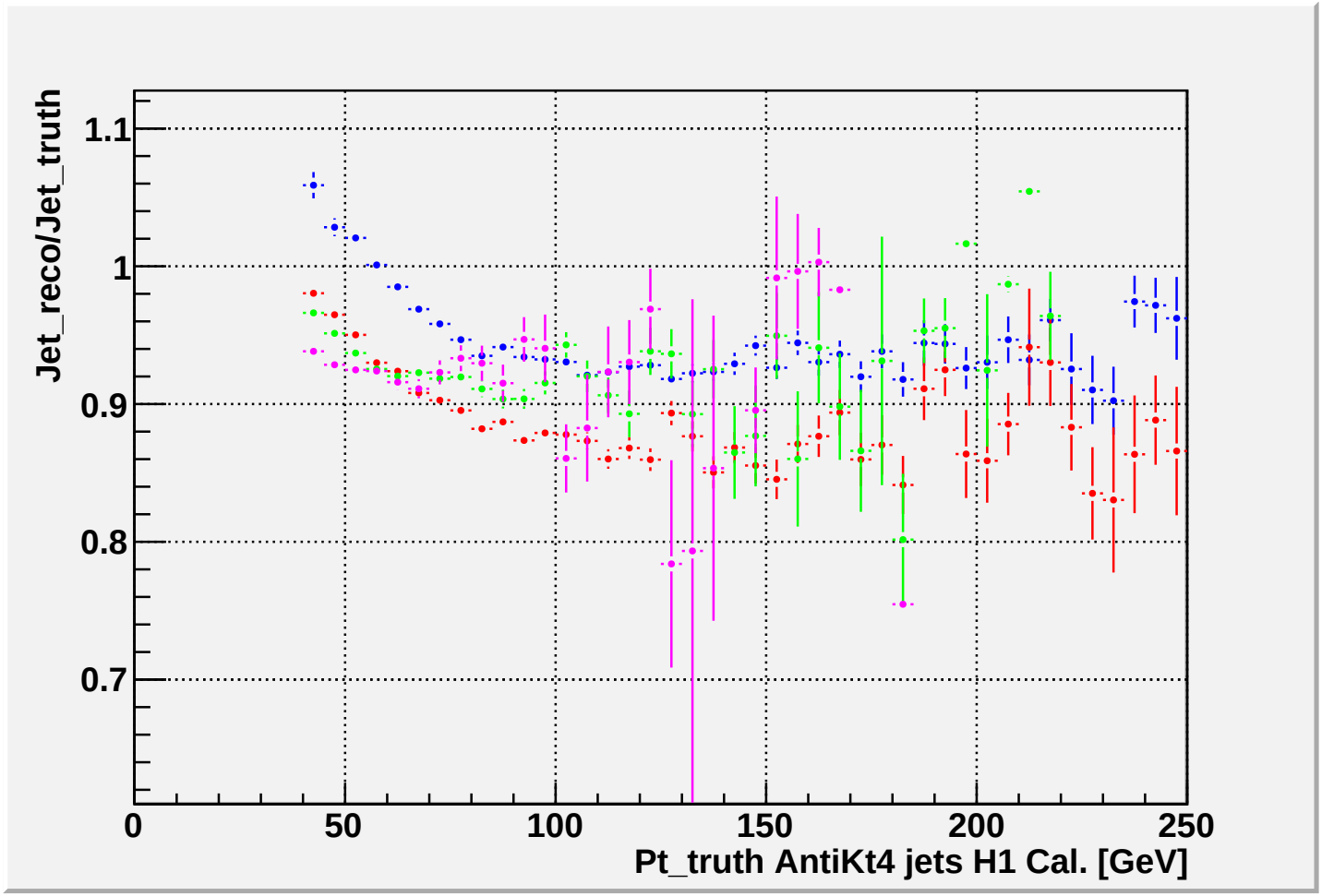






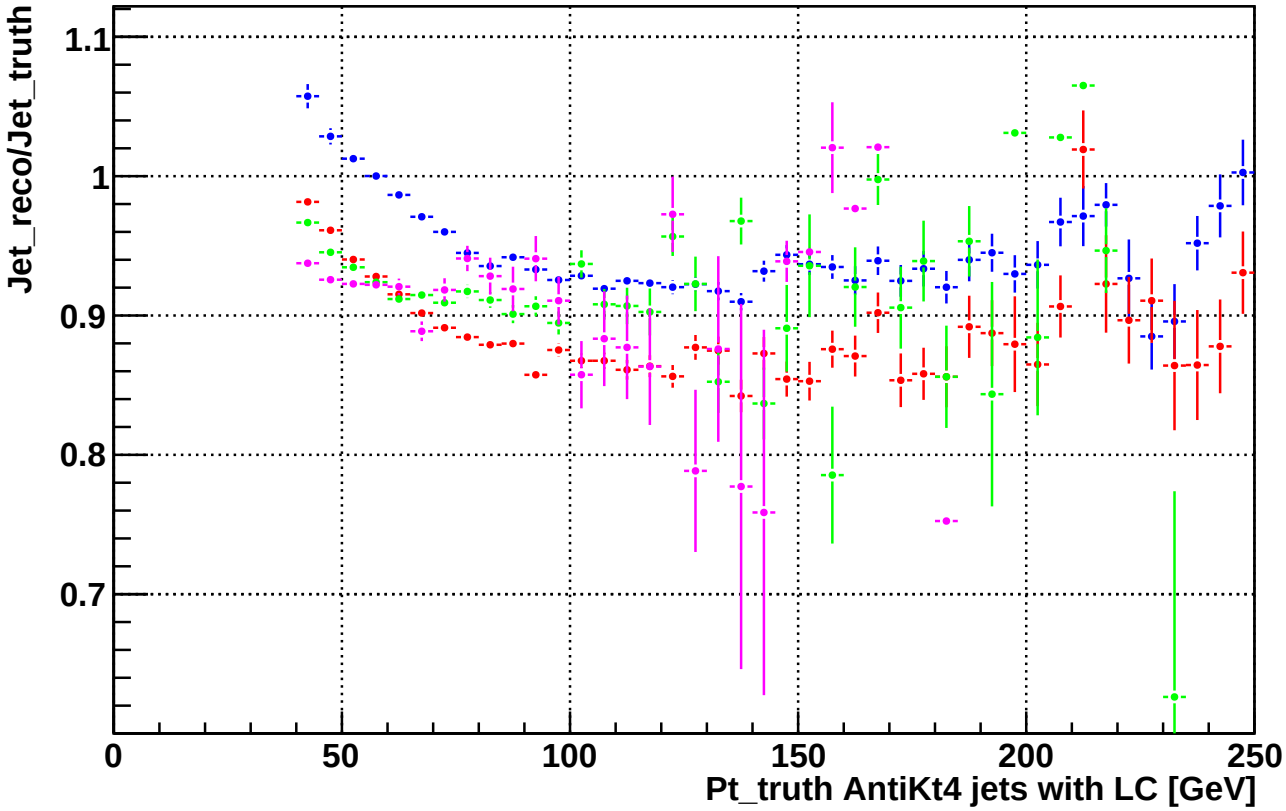
Distributions obtained with Cone4H1Tower jets. The bias introduced by the $P_{\perp}$ cut (40 GeV and 20 GeV) to the reco jets is clearly visible. Top left (right) first (second) btagged jet, bottom left (right) first (second) selected light jet

AntiKt4 H1 Cal. jets linearity



Jets linearity distributions obtained with AntiKt4 H1 jets. Blue (red) distribution is for the first (second) btagged jets, green (magenta) distribution is for the first (second) selected light jets. in these plots the $P_{\perp}^{reco} > 20GeV$, and $P_{\perp}^{truth} > 40GeV$

AntiKt4 LC jets linearity



Jets linearity distributions obtained with AntiKt LC jets. Blue (red) distribution is for the first (second) btagged jets, green (magenta) distribution is for the first (second) selected light jets. in these plots the $P_{\perp}^{reco} > 20GeV$, and $P_{\perp}^{truth} > 40GeV$

Conclusions and Outlook

- Similar top mass distributions obtained with Cone4 jet and AntiKt4 jets and with H1 Cal. and LC jets
- Continue to study the $P_{\perp}$ balance method using eventually background MC samples (if enough statistics)