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UNIVERSITÉ Clermont Auvergne

Bi-weekly updates

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May the fourth be with you!

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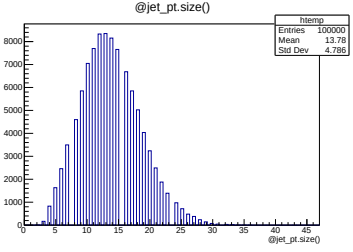
Agenda

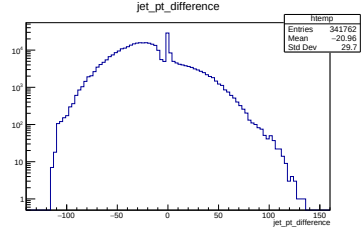
1. Event definition from the raw samples and jet clustering
2. Overlap removal for jets and the lepton
3. (Final?) W- and t-mass distributions
4. Outlook

Event definition from the raw samples and jet clustering

- So far: Using exclusive clustering to cluster objects up to $N_{\text{“jets”}} = 4$ (for semileptonic channel)
  → **But:** Didn't exclude the (highest energetic) lepton from clusterin
  → Could be that $N_{\text{“jets”}} = N_\ell + N_{\text{jets}}$ → Partly incorrect light jets matched from $W \to qq'$
- Now: using inclusive clustering with $k_\perp$-clustering algorithm with default settings (radius parameter $R = 0.5$, p_{T}-ordered jets, E-scheme)
  → Results in a much wider N_{jets} distribution
- b-jet matching done with uniform distribution and $p = 0.8$
- Need for a overlap removal for misidentified jets, which have the same kinematics as the lepton



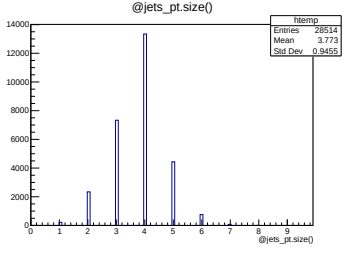
N_{jets} after incl. clustering.



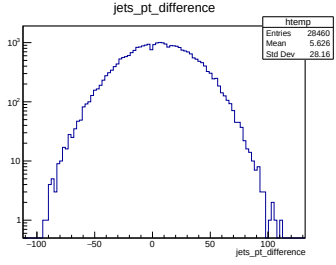
$p_{\text{T}}^{\text{jet}} - p_{\text{T}}^{\ell}$ for $N_\ell = 1$.

Object definition and overlap removal

- Object definition to remove soft jets and overlap removal needed due to mismatched jets
- Different stages
  1. Require the event to have $p_{\mathrm{T}}^{\mathrm{jet}} > 10.0\,\mathrm{GeV}$
  2. $\frac{|p_{\mathrm{T}}^{\mathrm{jet}} - p_{\mathrm{T}}^{\ell}|}{p_{\mathrm{T}}^{\mathrm{jet}}} > 1\,\%$
  3. $\Delta R(j, e) > 0.4$ and $\Delta R(j, \mu) > 0.2$



N_{jets} after OLR.

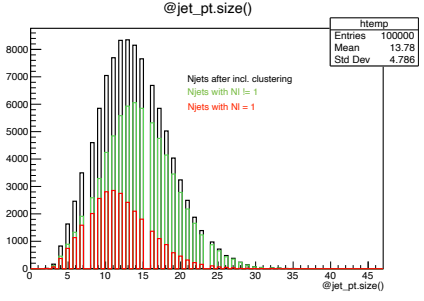


$p_{\mathrm{T}}^{\mathrm{jet}} - p_{\mathrm{T}}^{\ell}$ for $N_{\ell} = 1, N_{\mathrm{jets}} = 4, N_{\mathrm{b-jets}} = 2$ after OLR.

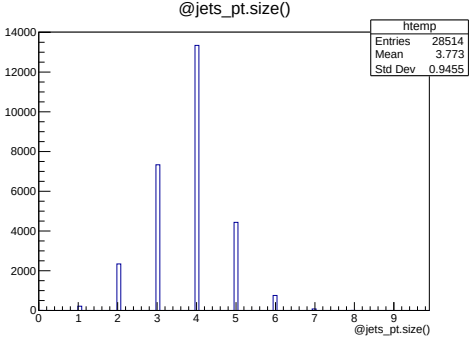
- Afterwards: Events with $N_{\mathrm{jet}} \neq 4$ and $N_{b-\mathrm{jet}} \neq 2$ are discarded

Requiring one lepton and overlap removal

- Requiring one lepton already removes events with the largest numbers of jets
- After OLR: Migration to 4 jets in the final state
- Could be, that in $N_{\text{jets}} = 4$, there are not always 2 b-tagged jets: With $p = 0.8$, having to b jets reduces ~ 13000 events to ~ 8000 events



N_{jets} for $N_\ell \neq 1$ (green) and $N_\ell = 1$.



N_{jets} after OLR.

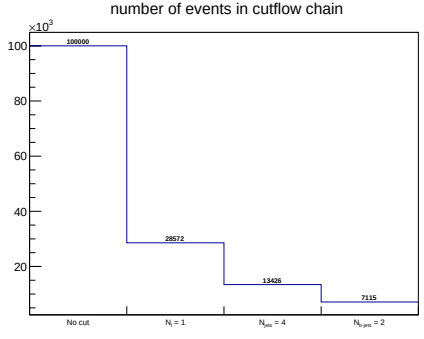
Cutflow chain

1. Require the event to have exactly one lepton, so $N_\ell = 1$

   Overlap removal

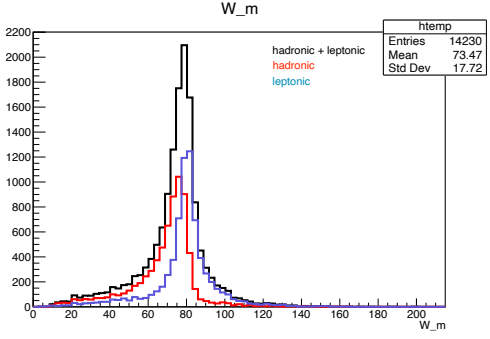
   Require the event to have $p_{\mathrm{T}}^{\mathrm{jet}} > 10.0\,\mathrm{GeV}$, $\frac{|p_{\mathrm{T}}^{\mathrm{jet}} - p_{\mathrm{T}}^{\ell}|}{p_{\mathrm{T}}^{\mathrm{jet}}} > 1\,\%, \Delta R(j, e) > 0.4$ and $\Delta R(j, \mu) > 0.2$

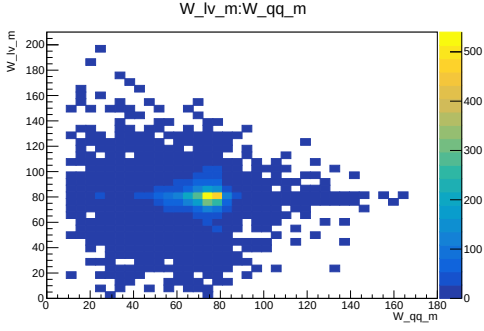
2. Require the event to have exactly 4 jets, so $N_{\mathrm{jets}} = 4$
3. Require the event to have exactly 2 b-jets, so $N_{\mathrm{b-jets}} = 2$



W-boson reconstruction

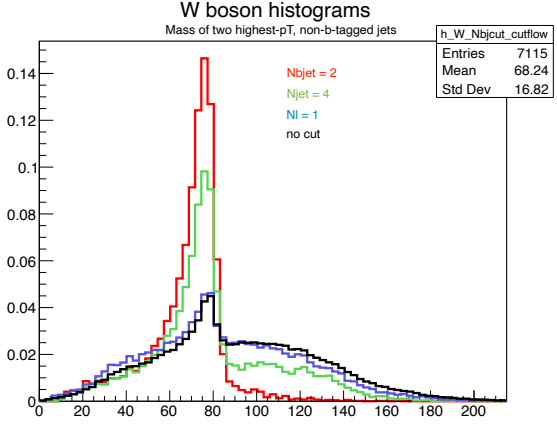
- W bosons once in the leptonic ($W \to \ell\nu_\ell$) and in the hadronic ($W \to qq'$) channel
- No distinction between any flavor in the final state of the hadronic W boson





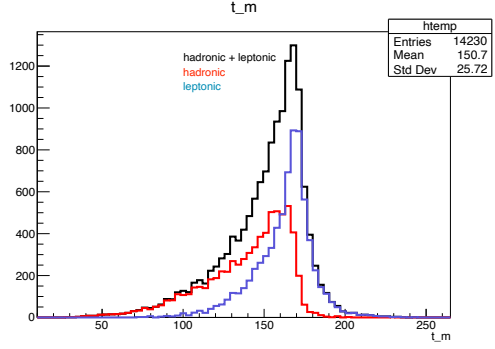
W-boson mass distribution

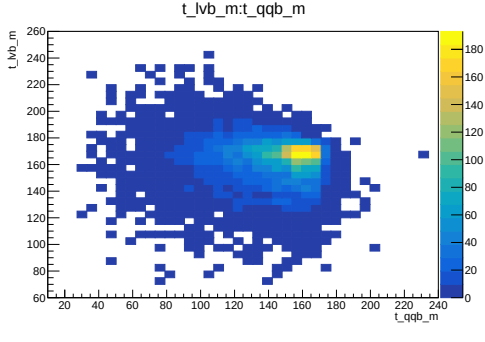
- W boson mass distribution for the different stages of event selection, normalised to unity
- Between $N_\ell = 1$ and $N_{\text{jets}} = 4$: OLR
  →Removing low p_{T}-jets reduces high-m_{qq} tail



Top-mass distribution

- Similar trend in leptonic and hadronic top-quark distribution





Next?

- Compare distribution between reco-level and MC-truth
- Compute first observables out of the reconstructed objects (A_{FB} could be a good start)
- Idea from Emmanuel: put some requirements on subdetectors for top-quark measurements?