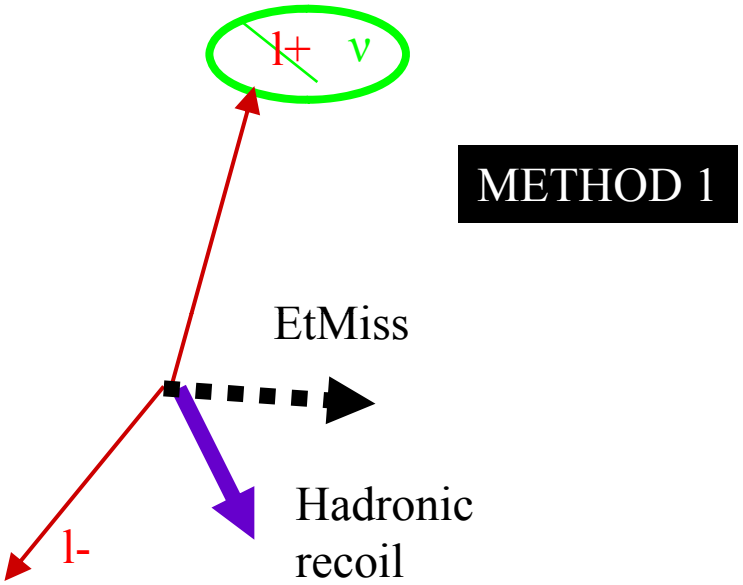
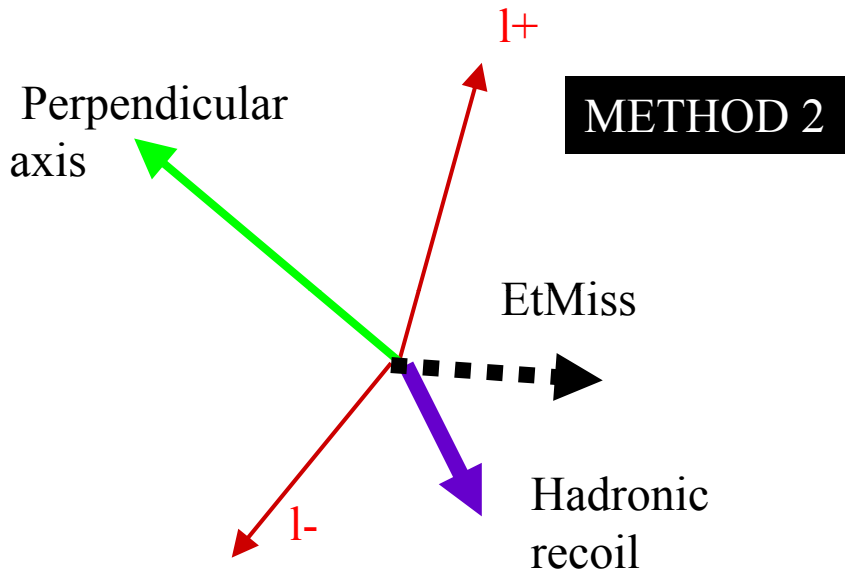
MEt scale and resolution from Zee

Motivation: No real MEt in Zee event → eliminate problem of separating real and fake MEt!



'Neutrinofy' Z event: pretend lepton is neutrino and recompute MEt in event

'truth' MEt = l_1
'reco' MEt = $-l_2$ – Hadronic Recoil
where Hadronic Recoil= $-l_1 - l_2$ - MEt

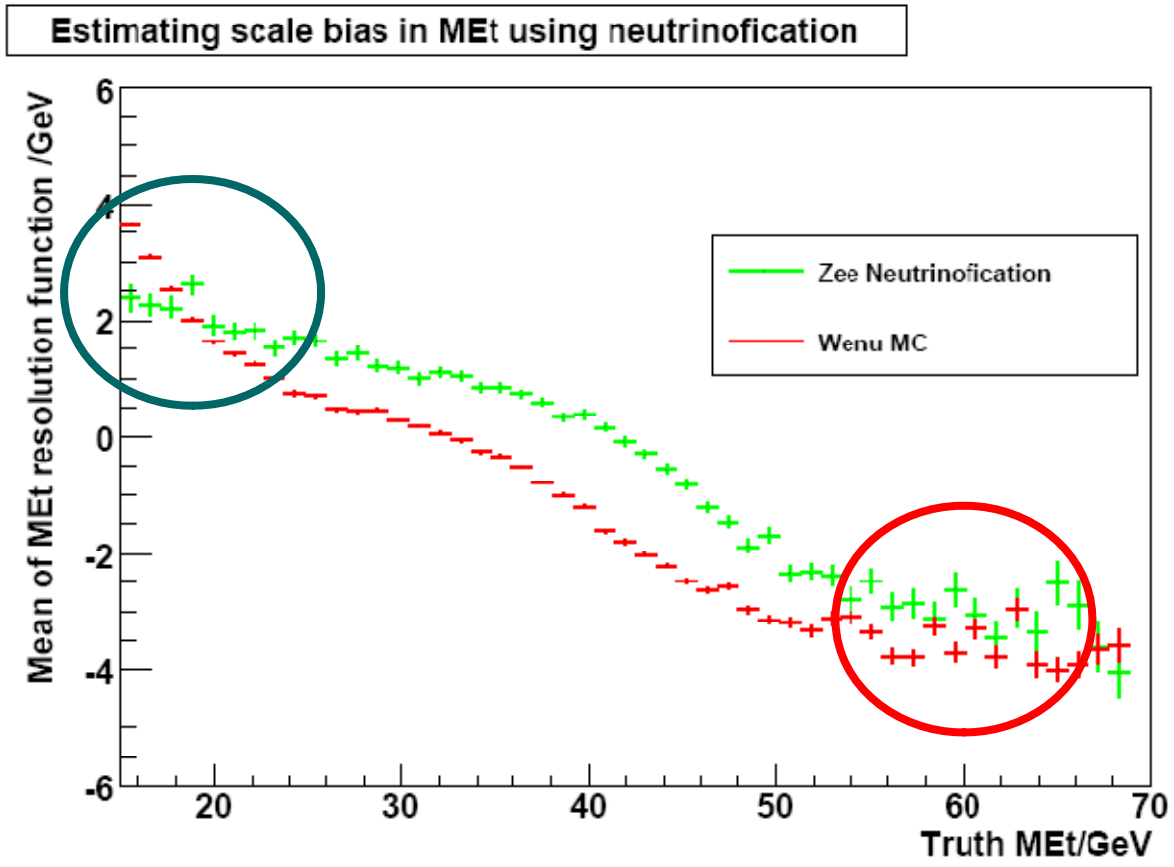


Define axis ('perpendicular') in transverse plane along which to resolve MEt.
Axis at right angles ('parallel') defined

$$\overrightarrow{v_\perp} = \frac{\overrightarrow{p_t^{e+}}}{\left|p_t^{e+}\right|} + \frac{\overrightarrow{p_t^{e-}}}{\left|p_t^{e-}\right|}$$

Method 1: Measuring scale

Neutrinofication allows a binning of MEt scale wrt MEt itself (unlike axis resolution…..)
→ bias detected in this distribution (for both neutrinofication and MC comparison)

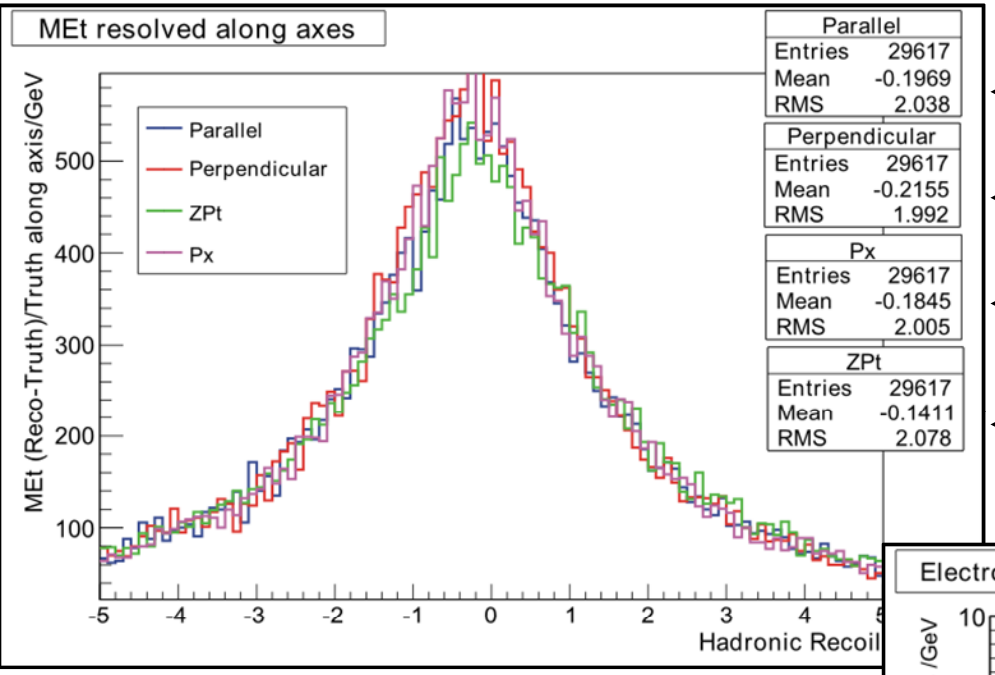


Bias in low MEt region understood (bias by construction)

Bias in high MEt region not yet understood

Disagreements between insitu and MC: remove electron cluster from MEt calculation (ATLAS work in progress….)

Method 2 : measuring resolution

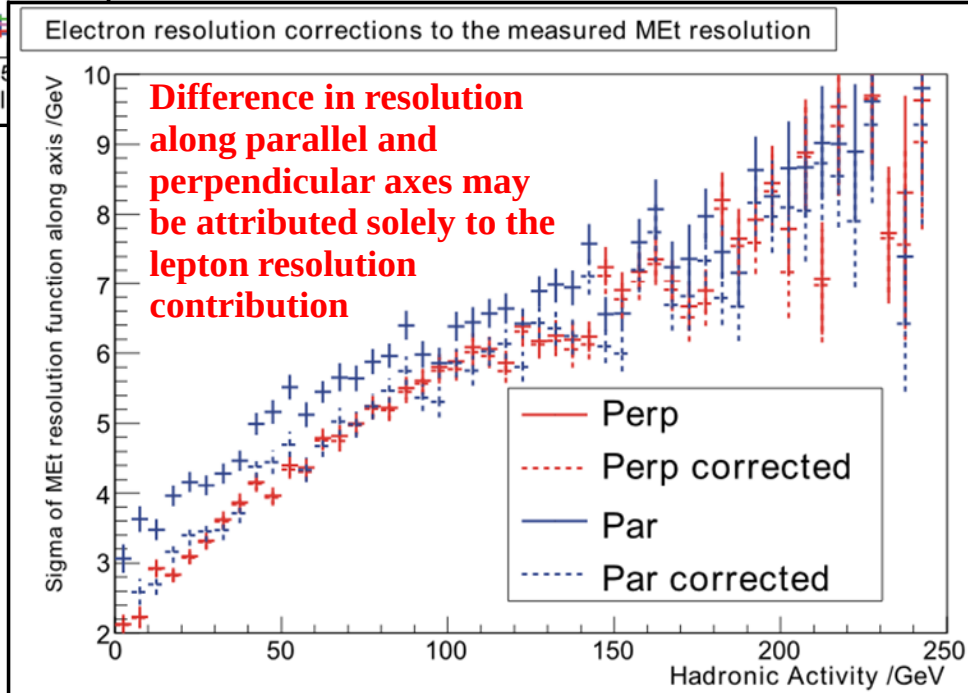


Axis defined from lepton angles alone (very well defined in atlas) and dependence of axis on lepton Pt eliminated

- optimal resolution in MEt resolved along this axis

$$\sigma^2(\mathrm{MEt}) = \sigma^2(\mathrm{had}) + \sigma^2(\mathrm{leptons})$$

This contribution (although small) is maximised along the parallel, and minimised along the perpendicular



Method 2 : measuring scale

Rel 13

MEt resolved along the perpendicular yields a (large) bias

Parallel sees no such bias

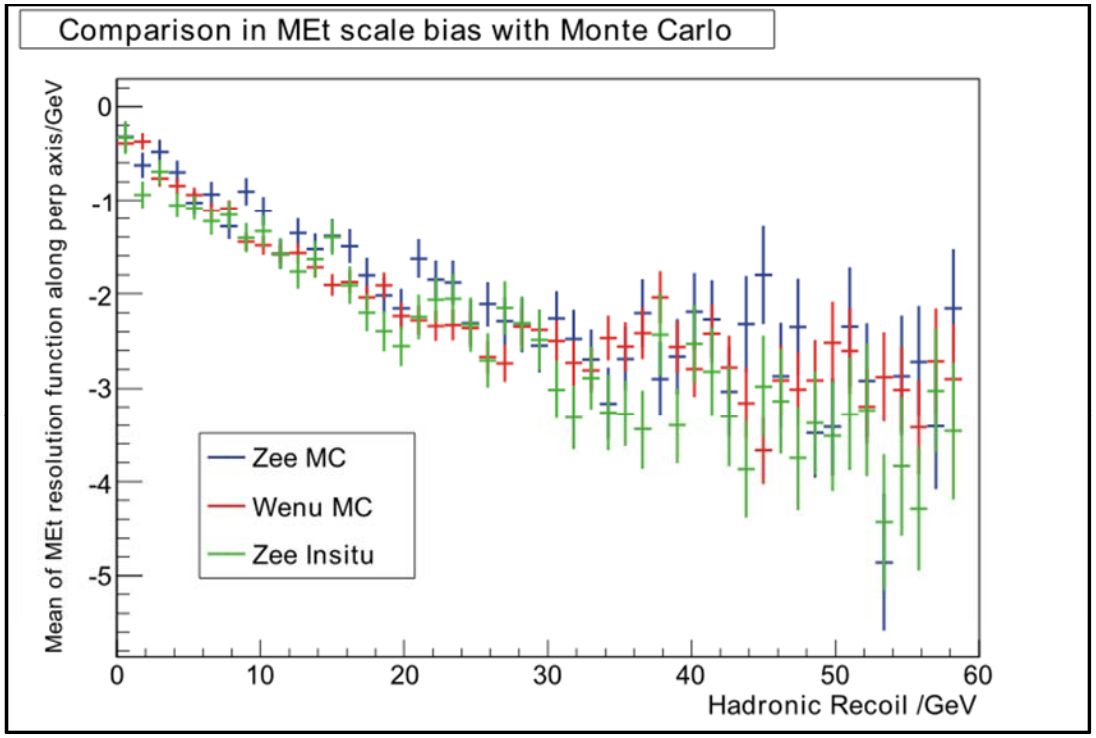
Bias suggests a problem with the jet-electron balance

The axis points in (almost) the same direction as ZPt

Either HadRecoil is underestimated or electron energies overestimated

Same bias is seen in Zμμ events

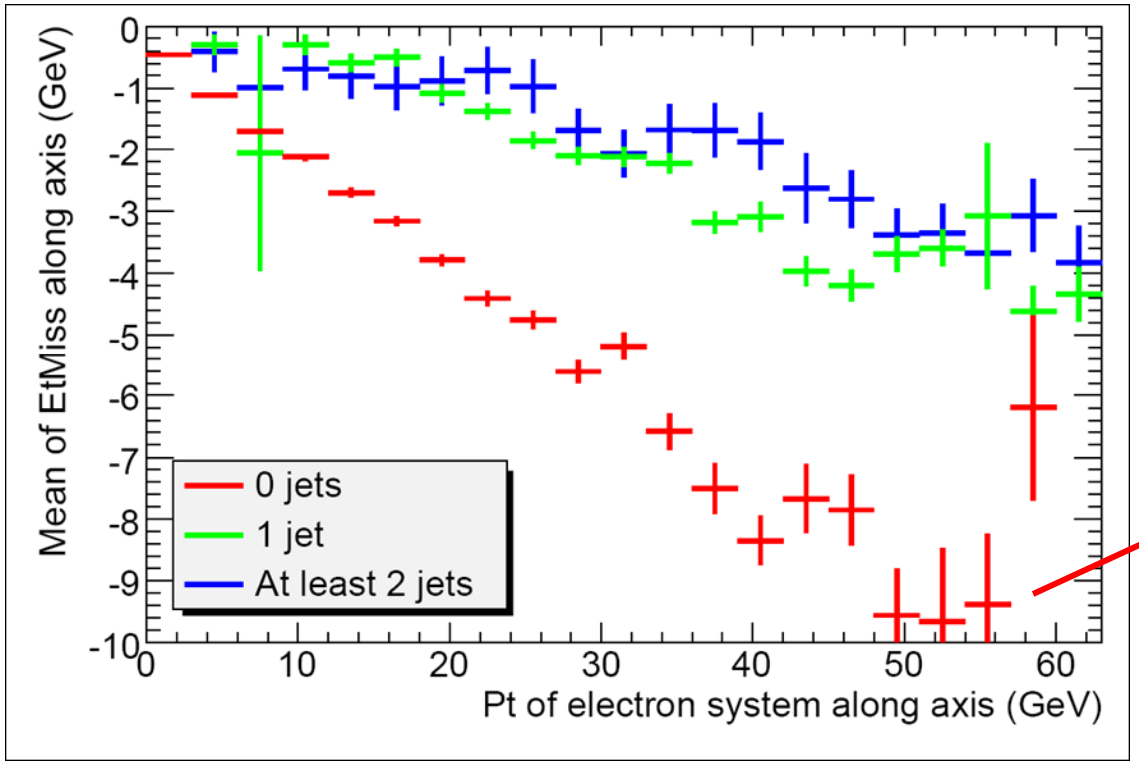
Bias worsens with lower jet multiplicity (next slide)



Sum of lepton energies resolved along axis

Bias thought to be due energy getting lost upstream of the calorimeters
→ or wrongly calibrated out-of-cone deposits

Method 2 : aside on the scale bias



Performance perspective: bias is worst in the case of 0 jets- problems with soft deposits (ongoing study: E.Williams)

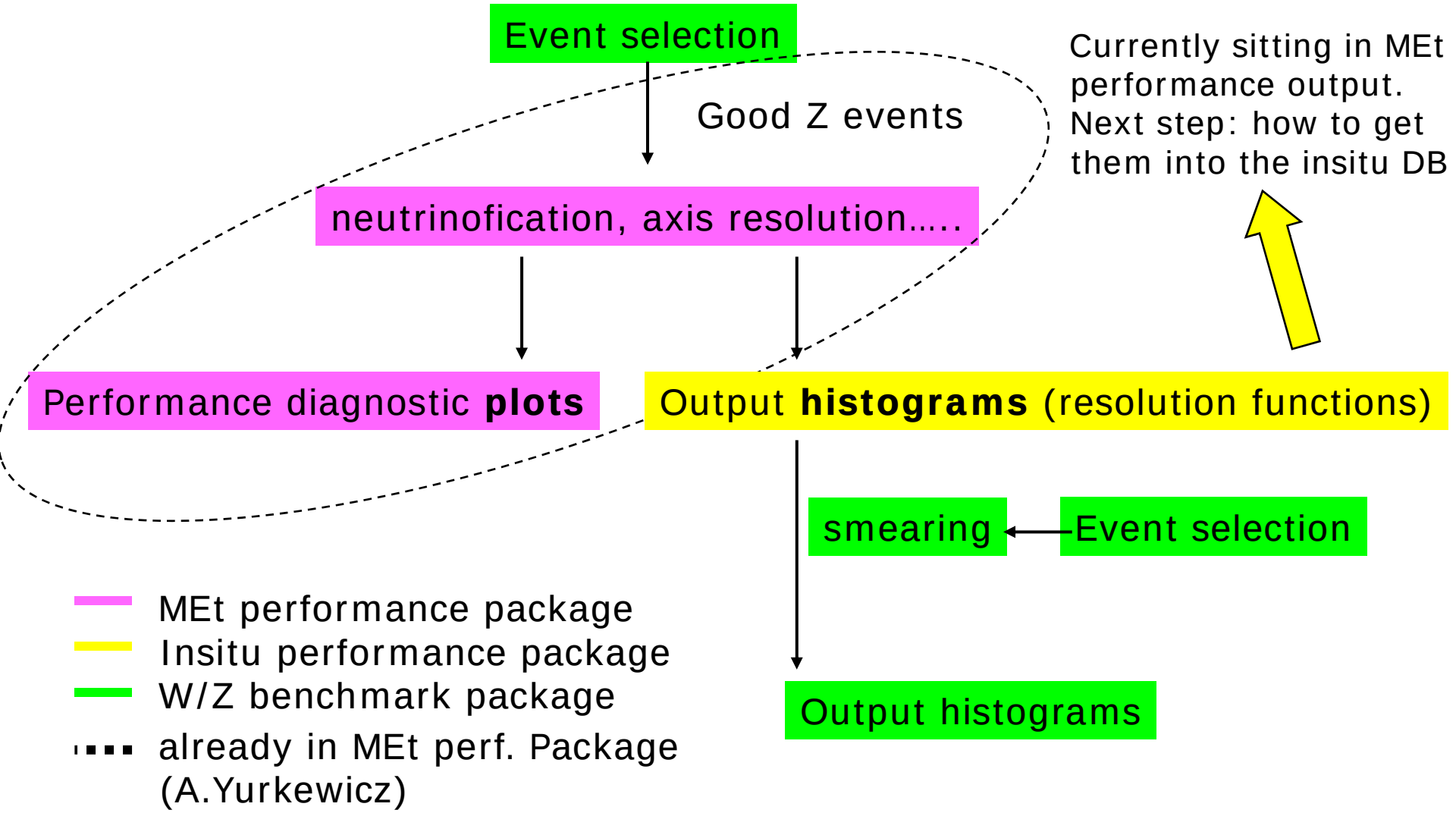
Physics perspective: can we use these plots to smear MEt components rather than MEt itselt?

~~$\sigma_{MEt} = \sigma_{electrons} + \sigma_{hadronic}$~~

~~$\overline{x}_{MEt} = \overline{x}_{electrons} + \overline{x}_{hadronic}$~~

$$\sigma_{MEt} = \sigma_{electrons} + \sigma_{jets} + \sigma_{soft}$$

Preliminary benchmark analysis



Backup

- Additional material: attached pdf files:
  - MEt response from Zee (resolutions.pdf)
  - Use of MEt in acceptace calculations (acceptance.pdf)

- Recent talks
  - Performance package update:
    - http://indico.cern.ch/subContributionDisplay.py?subContId=1&contribId=7&confId=48120
  - Acceptance corrections from MEt
    - http://indico.cern.ch/contributionDisplay.py?contribId=36&confId=41483
  - MEt response from Zee
    - http://indico.cern.ch/contributionDisplay.py?contribId=14&confId=39747