DiJet Balancing

Anwar A Bhatti

March 06 , 2007

DiJet Balancing

- **Purpose:**

  Make the detector jet response uniform vs pseudo-rapidity.

- **Advantage:**
  - Jet absolute calibration need to be done only in a limited region in η
  - Cross check of the simulated data.
  - Good enough for physics which does not require accurate jet energy scale in range where calorimeter response to jets is linear.

- **Issues:**
  - In $2 \rightarrow 2$ approximation, Pt1=Pt2 at parton level.
  - Final/initial state radiation spoil the exact balance but the effect should average out.
    - Reduce ISR/FSR effects: $\Delta\varphi > 2.7$ radians, PtJet 3< PtJet3Max
  - May not be true at particle-level (η dependence in OOC radiation?)
  - Pile-up and underlying event (Low Pt, probably uniform in η but non-linearity may be different, calorimeter cares about energy.)
  - Noise contribution (Different in different regions of calorimeter)
  - Different resolution/smearing in different regions of calotimeter.

DiJet Balancing

B =(PtTriggerJet-PtProbeJet)/AvePt

Correction=(2+<B>)/(2-<B>)

Cleanup

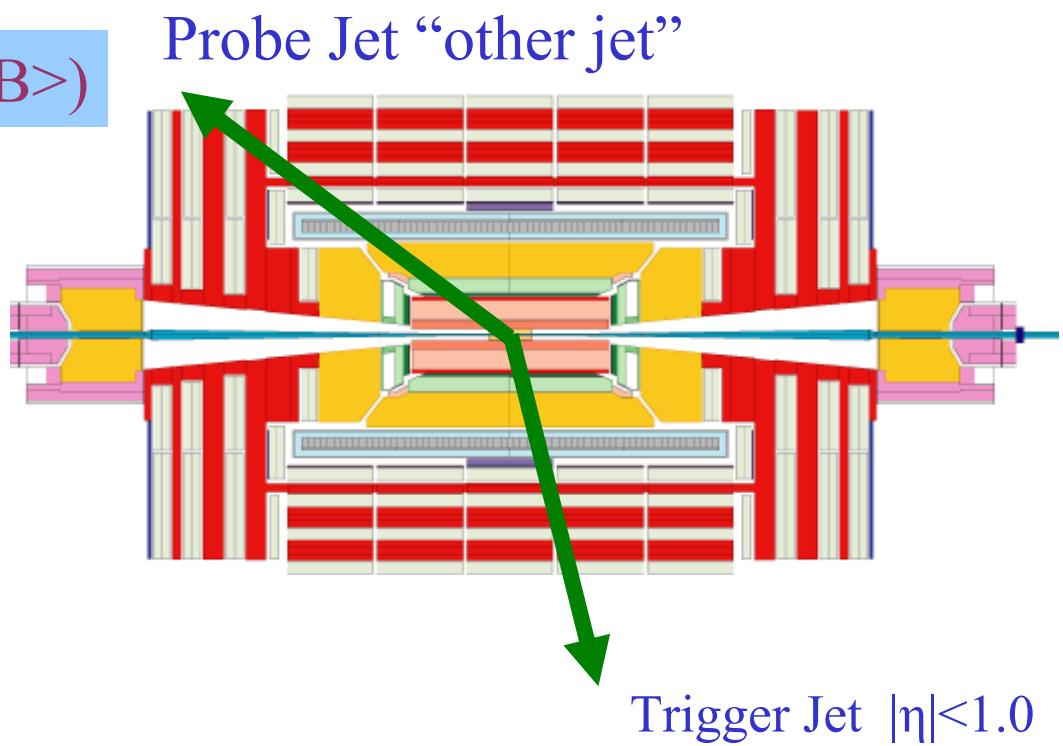
PtAve=(PtJet1+PtJet2)/2

PtAve>PtAveMin

(φJet1-φJet2)>172

PtJet3<PtJet3Max

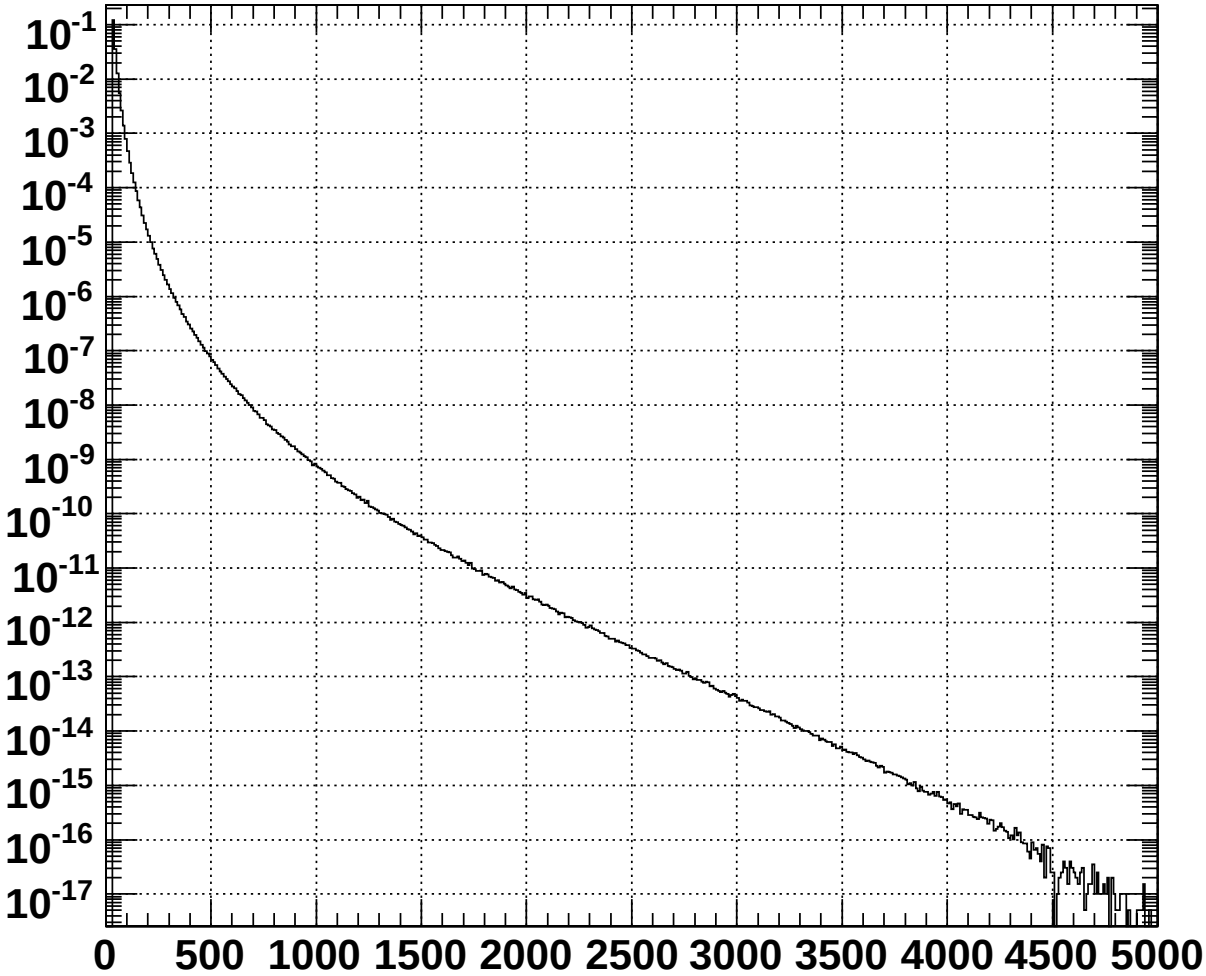
PtJet3Max=Max(10,0.1PtAve)



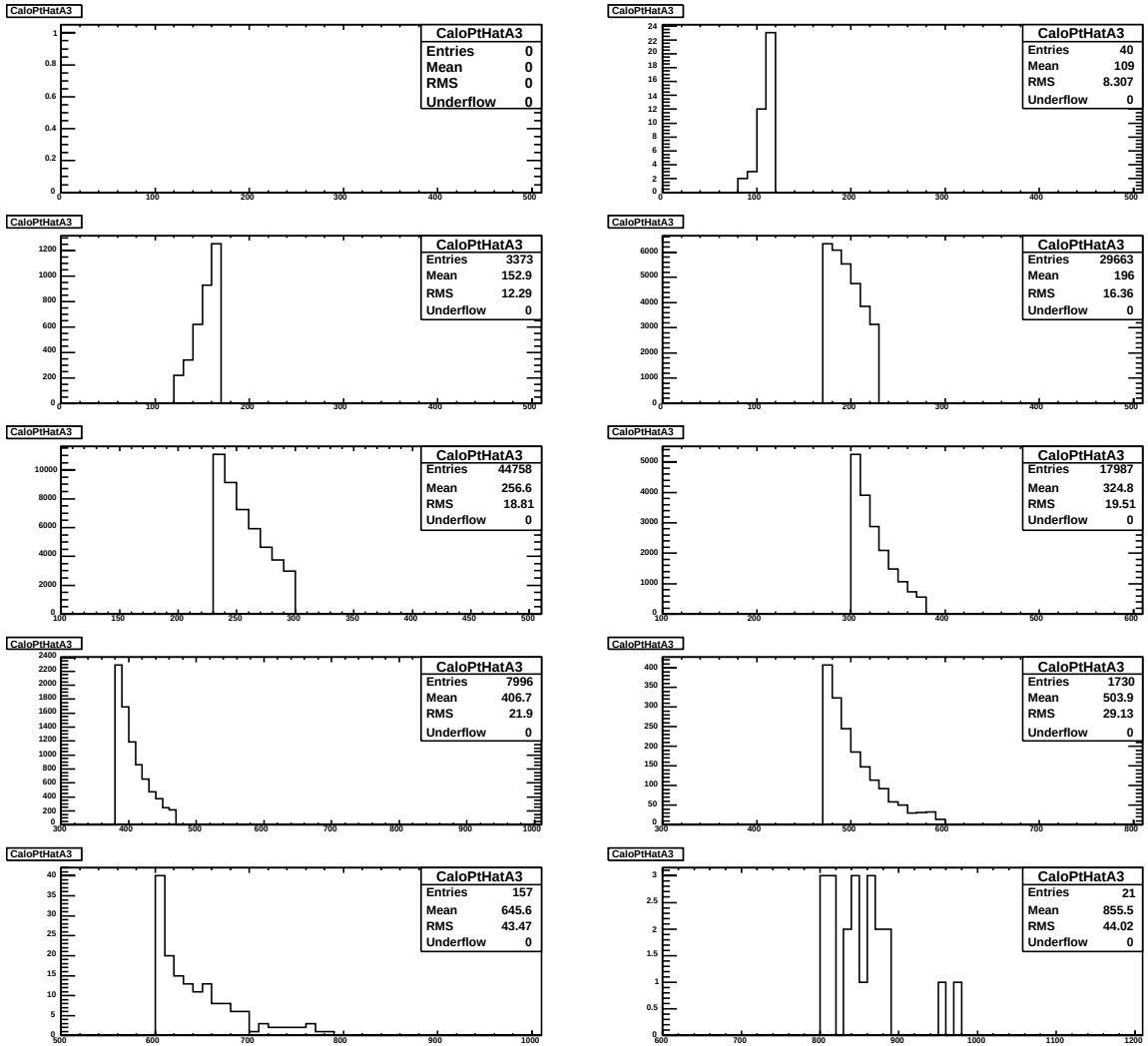
Data Set

- CMSSW_1_2_0 QCD Dijet sample
- No pile-up
- Look at PtMin 30, 50, 80,120,170,230, 300,… GeV samples
- Combine samples using weights

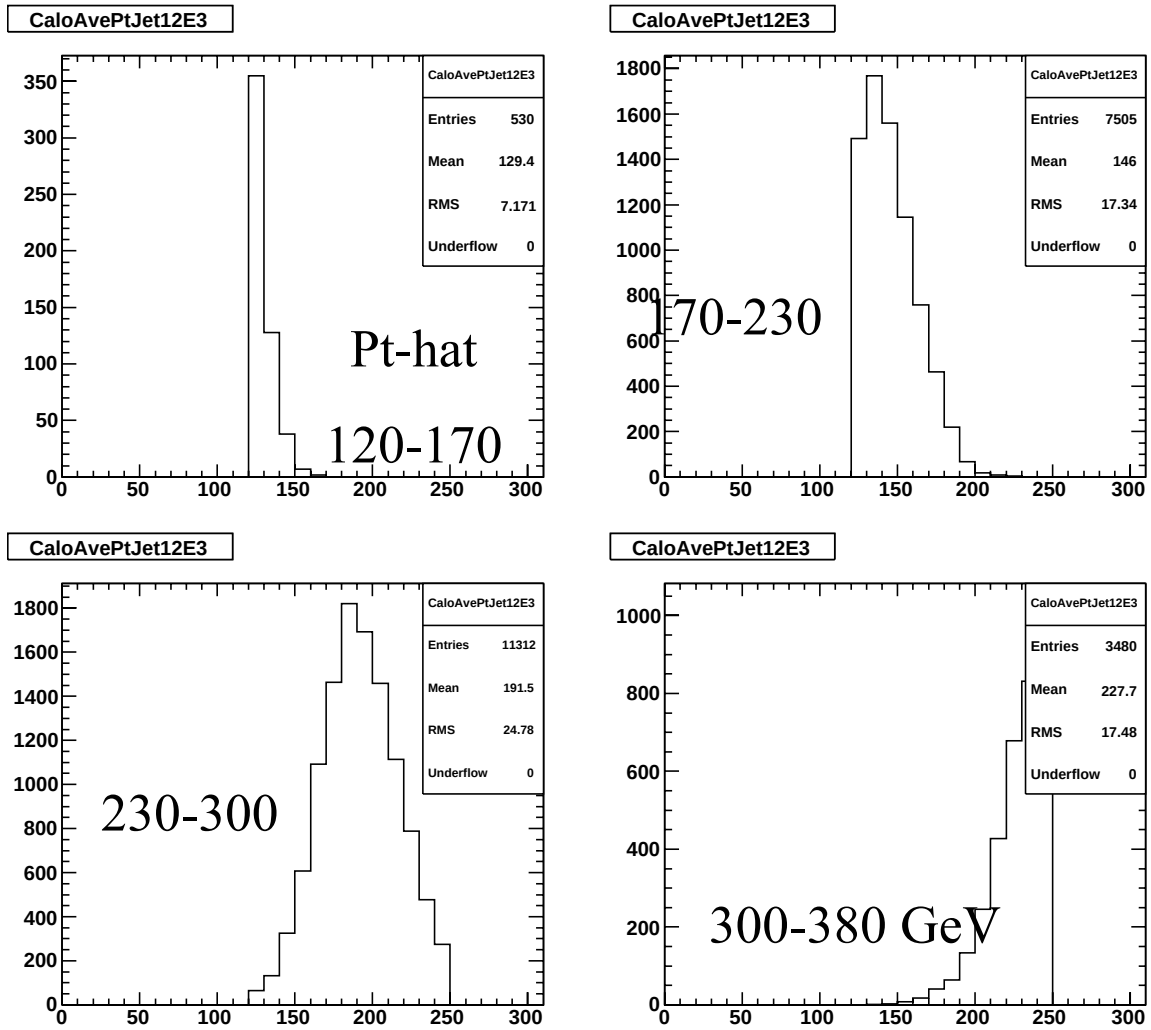
Pt-hat sprectrum of QCD data set



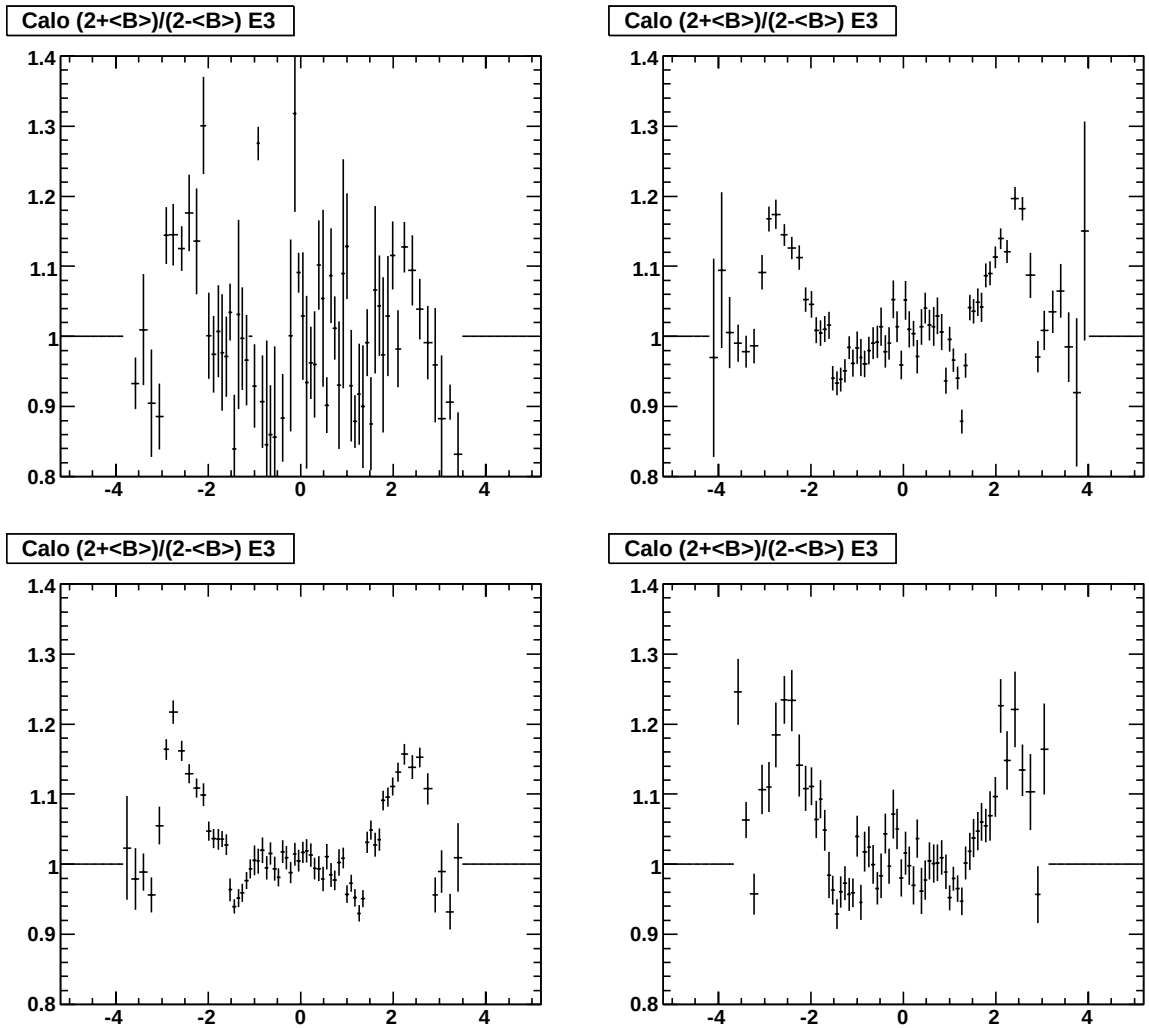
Pt-hat of Events with 120< (PtJet1+PtJet2)/2 < 250 GeV



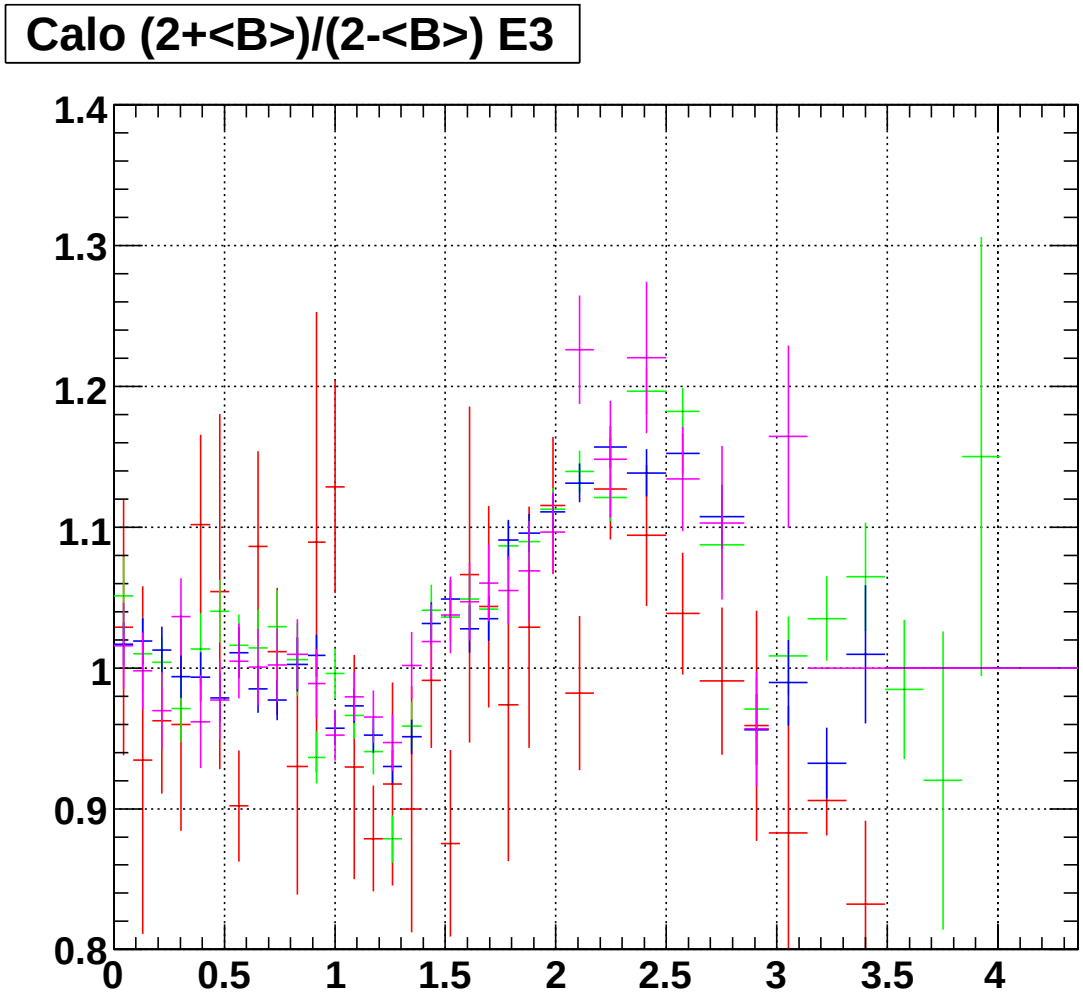
120 < AvePtJet12 <250 GeV passing all cuts and



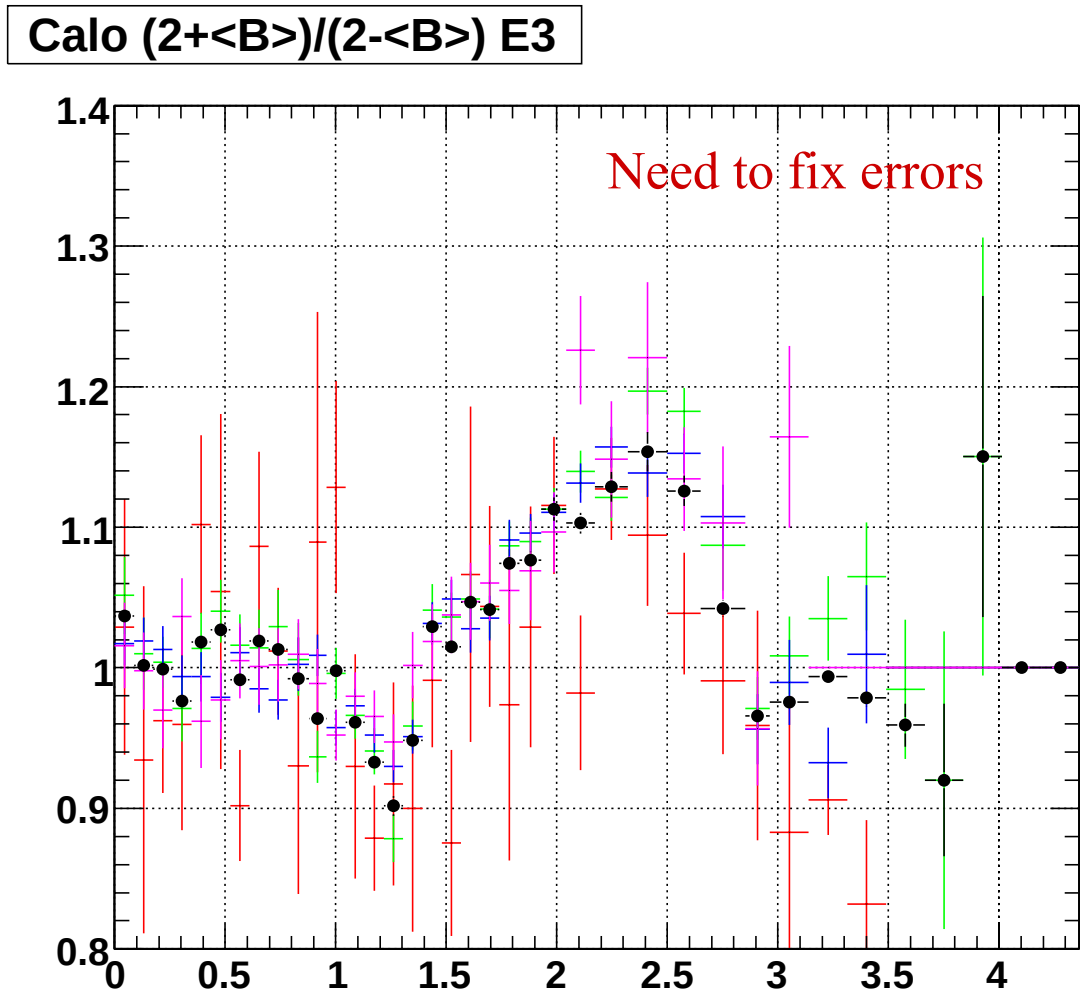
Dijet Balancing for 4 Pt-hat samples



Dijet Balancing (overlayed)



Dijet balance with weighted averaged

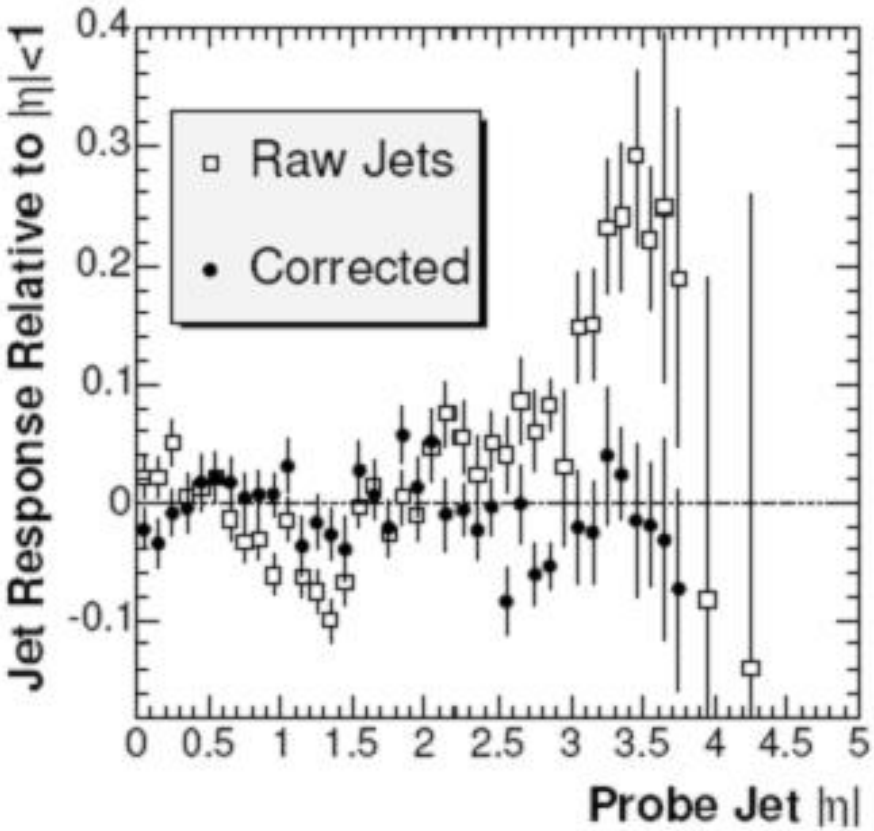


Dijet Balance Response in ORCA

ORCA definition

Response=2B/(2-B)

= PtProbe/PtTrigger-1



The agreement between ORCA and CMSSW 120 is reasonable given large statistical uncertainties and possible difference in thresholds/noise simulation etc.