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Average and Peak ET of probe jet vs iEta

1. Intro

It was found in the Hcal Dijet Logbook page 1 (Sec.4.2.1) from the ET_peak / Pthat_threshold for tag jets in 2009 sample (PThat > 30) that the the uncorrected tag jet energy is ***underestimated by factor ~2.*** And the "unbiased" HF correction was found to be 0.50 (Sec.5.5). => It looks like the jet energy scale in HF is roughly correct.

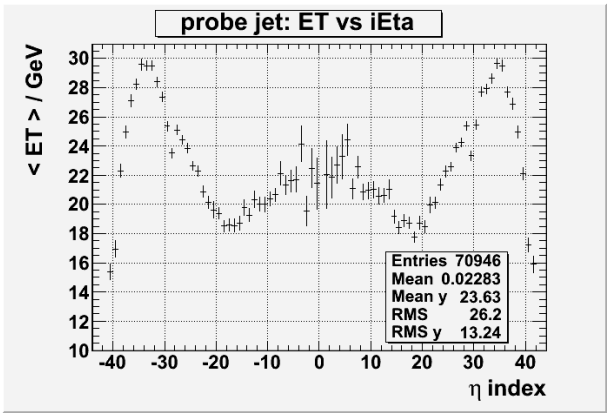
Puprose of this study: try to see the jet scale recovery for probe jets as going from barrel region to HF, by looking at the ***evolution of the ET(probe jet) distribution.***

Input sample: 2009 PThat>30, 10 TeV Version 1 , one root file `QCD_Pt30_10TeV.hi_100.root` with 70946 evs

Plots were made interactively with the script .

2. Probe jet only

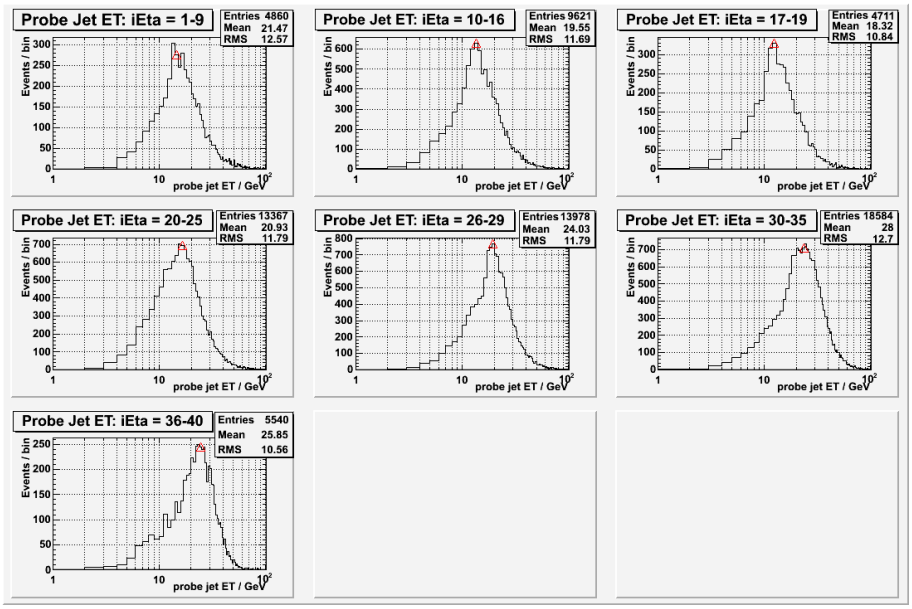
The < ET > vs iEta plot:



Original size: gif , eps

- ET growth in HF as |iEta| increases, stops at |iEta| ~34, and changes to a fall off. This must be a reflection of boudary condition E(true probe jet) < E(beam), thus only the lowest values of ET(probe) get allowed in this region. For the same reason, a third jet contribution may become more important near this boundary.

The ET distributions are shown below for 7 bins in |iEta|. The peak positions as found by the standard root peak finder (function `ShowPeaks`) are marked with red triangles.



Original size: gif , eps

The ET peak values from the above plots are tabulated below:

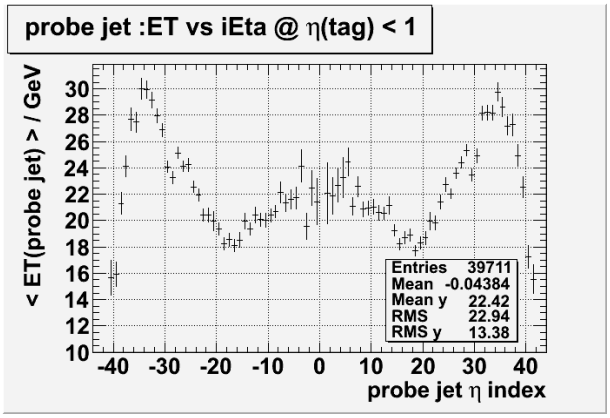
iEta range	Peak ET / GeV	peak(1-9) / peak(iEta)
1-9	14.5	1.000
10-16	13.5	1.074
17-19	12.4	1.169
20-25	16.4	0.884
26-29	19.2	0.755
30-35	23.1	0.628
36-40	24.1	0.602

- we do not get .50 , rather .60 only
- are numerous cutoffs applied in the calibrtion, important? May well be...

3. Selecting (tag) < 1 . Zooming HF region. Use tag jet directly for a probe in HF.

Now we add cutoff (tag jet) < 1, used in calibration normally.

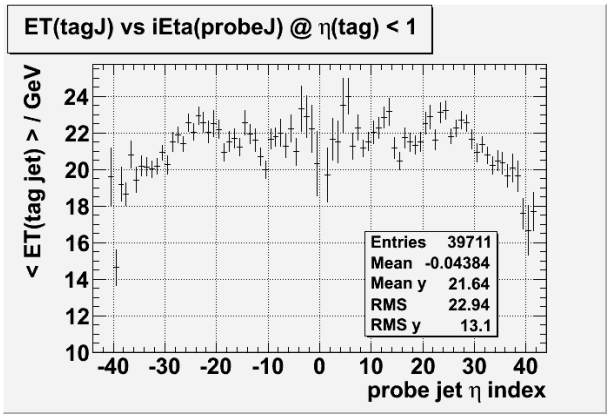
Probe jet ET :



Original size: gif , eps

- In HF region, the average ET is only few percent bigger than on the plot w/o cutoff . This seems to be insignificant.

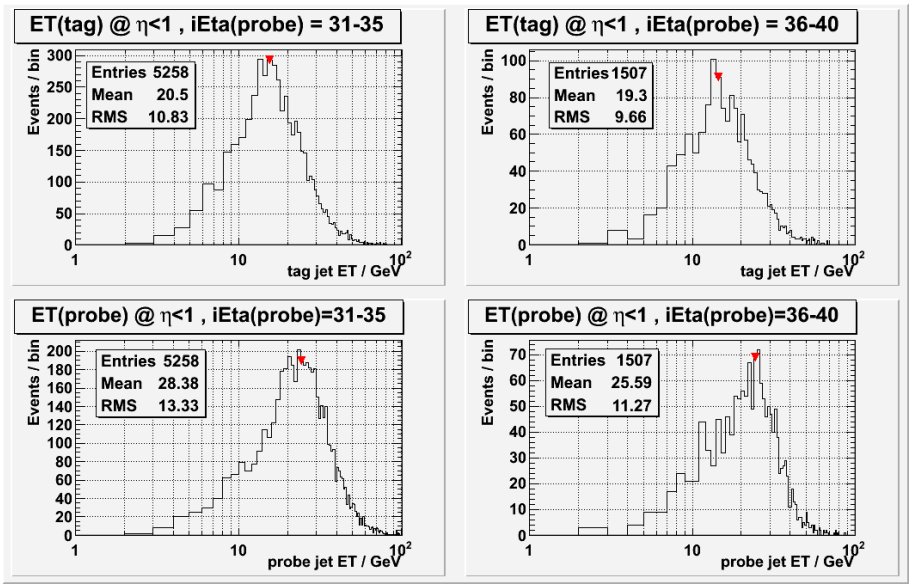
Tag jet ET but still vs ***probe*** jet iEta:



Original size: gif , eps

- The average ET(***tag*** jet) in HF region (~20 GeV) is ~10% lower than ET(***probe***) on the very first plot (~22 GeV at |iEta| <=12) .
- What about the shape of the ET(tag) distribution relative to the ET(probe) one:
  - ♦ does it shrink?
  - ♦ does the peak value move?

Let us see:



Original size: gif , eps

Peak values are collected in the table:

iEta range	Peak ET(tag) / GeV	Peak ET(probe) / GeV	peak_tag / peak_probe
31-35	15.3	24.1	0.635
36-40	14.4	24.3	0.593

- Nothing good! We still get ~0.6 but not 0.5
- Peak method seems to be quite imprecise.
- Other cuts may be much more important than < 1 (e.g. ET(third jet) < 5 is a very stong one!)

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