

HLLHC Calibrations and rho Update

Content

- Schedule/organization
- MC status
- Calibrations –My only focus lately because we need to have easy access to resolution and response
- Clusters and local rho terms

Schedule/Organization

- PU subtraction and Residual Calibration is now integrated with Inversion packages—single grid run for full calibration and any revisions/adjustments in the whole process
- Bad noise calibration—tagged early next week mon/tue
 - Shouldn't need software update, just calibration file
- Waiting for samples for real calibration
- Next week would be a great time to integrate your method/idea into the calibrations (please send me a brief email letting me know which ideas are of current interest to include.)
 - E.g. alternate pileup mitigation technique/NI technique
- I will release combined calibration package next Friday so you can follow development/use it yourself.

MC status

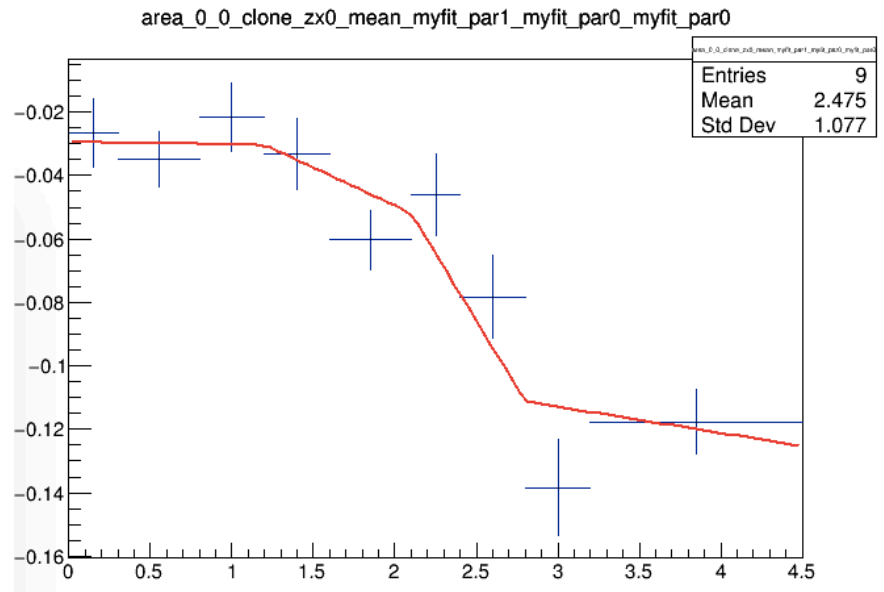
DET. GEOMETRY	RTAG DESC	RTAG	MISSING (April 6, 9:45 AM)
FCal + ITK Lol	r-tag mu=70-90	r7709	J1-3,J5-7
FCal + ITK Lol	r-tag mu=130-150	r7768	ALL
FCal + ITK Lol	r-tag mu=190-210	r7769	ALL
sFCal (small LAr gaps) + ITK Lol	r-tag mu=70-90	r7699	J3
sFCal (small LAr gaps) + ITK Lol	r-tag mu=130-150	r7700	J3-7
sFCal (small LAr gaps) + ITK Lol	r-tag mu=190-210	r7701	J1,J3-7
sFCal (large LAr gaps) + ITK Lol	r-tag mu=70-90	r7702	J1
sFCal (large LAr gaps) + ITK Lol	r-tag mu=130-150	r7703	NONE
sFCal (large LAr gaps) + ITK Lol	r-tag mu=190-210	r7704	J1,J3

Residuals look alright.

After area subtraction.

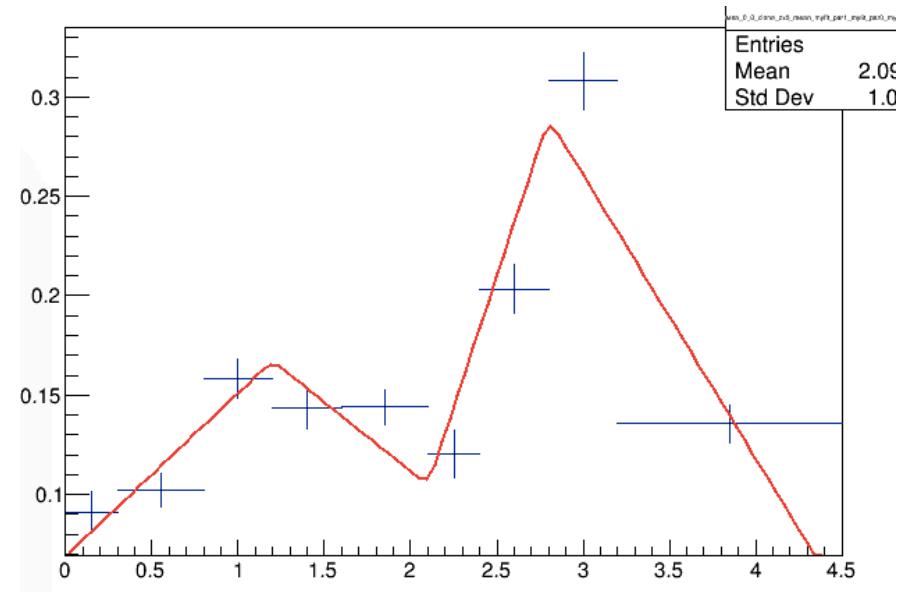
- Optimized binning in pt, NPV/mu, eta
- Using mean not fit for peak of distributions.

dpT/dmu



|eta|

dpT/dNPV

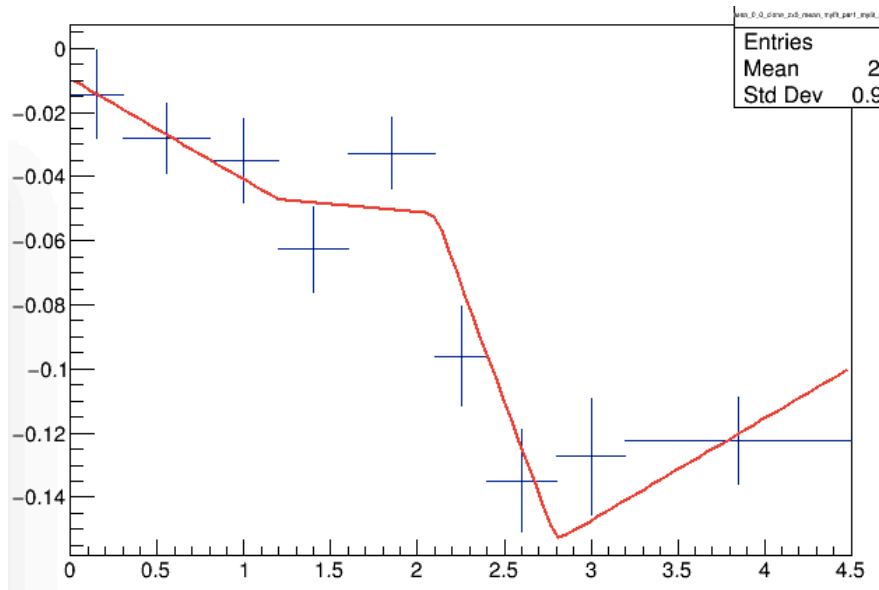


|eta|

Residuals

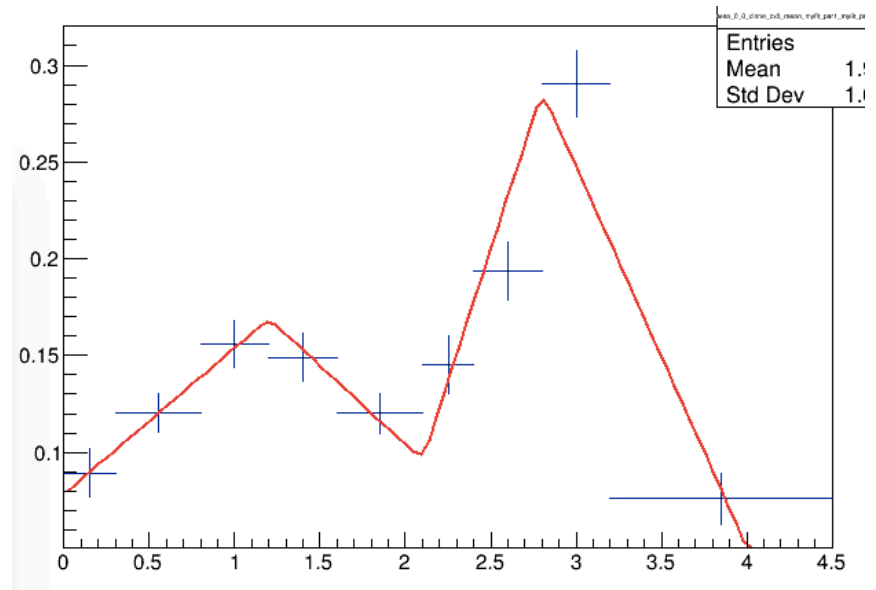
After area subtraction.

dpT/dmu



|eta|

dpT/dNPV

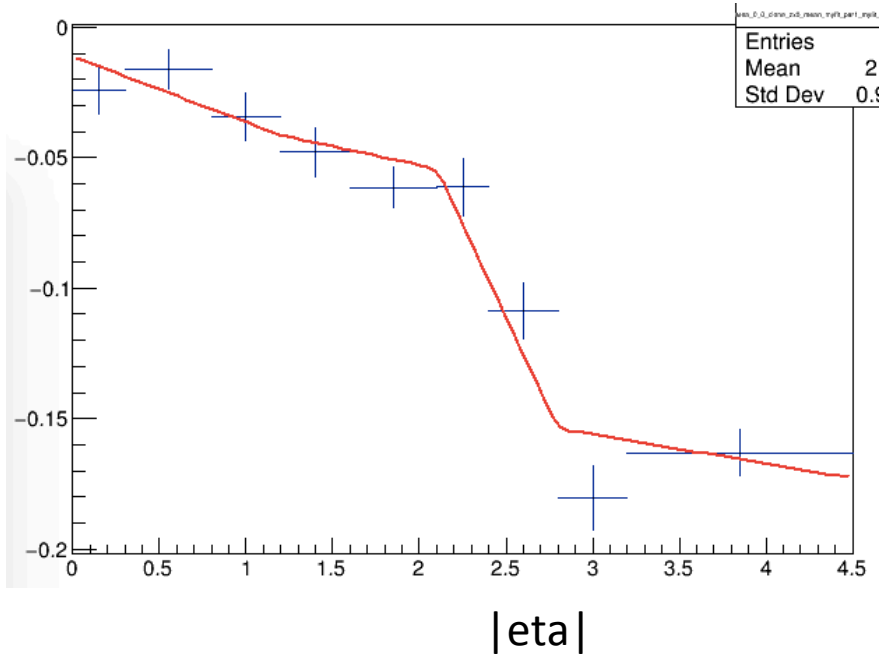


|eta|

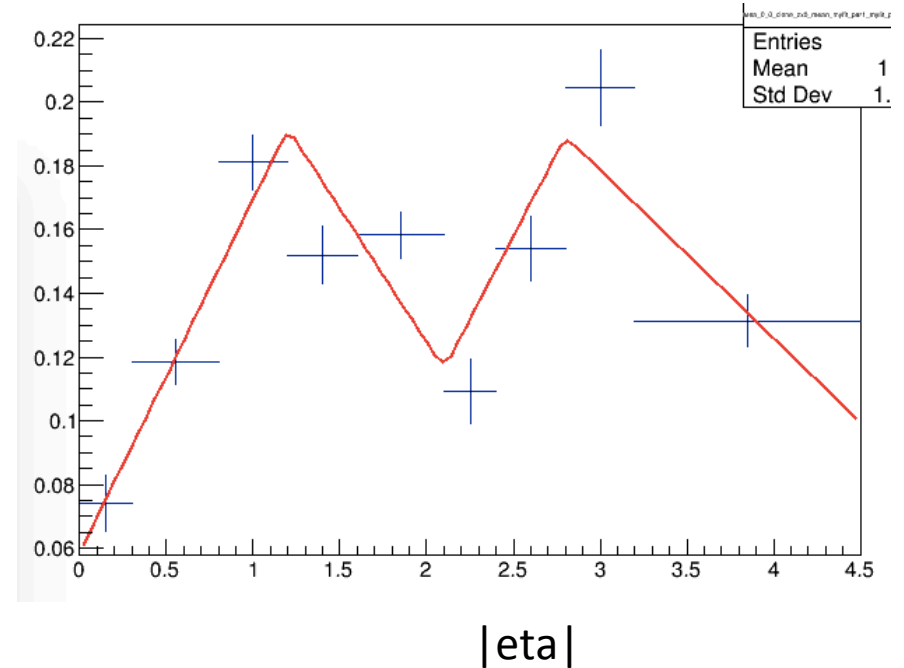
Residuals

After area subtraction.

dpT/dmu

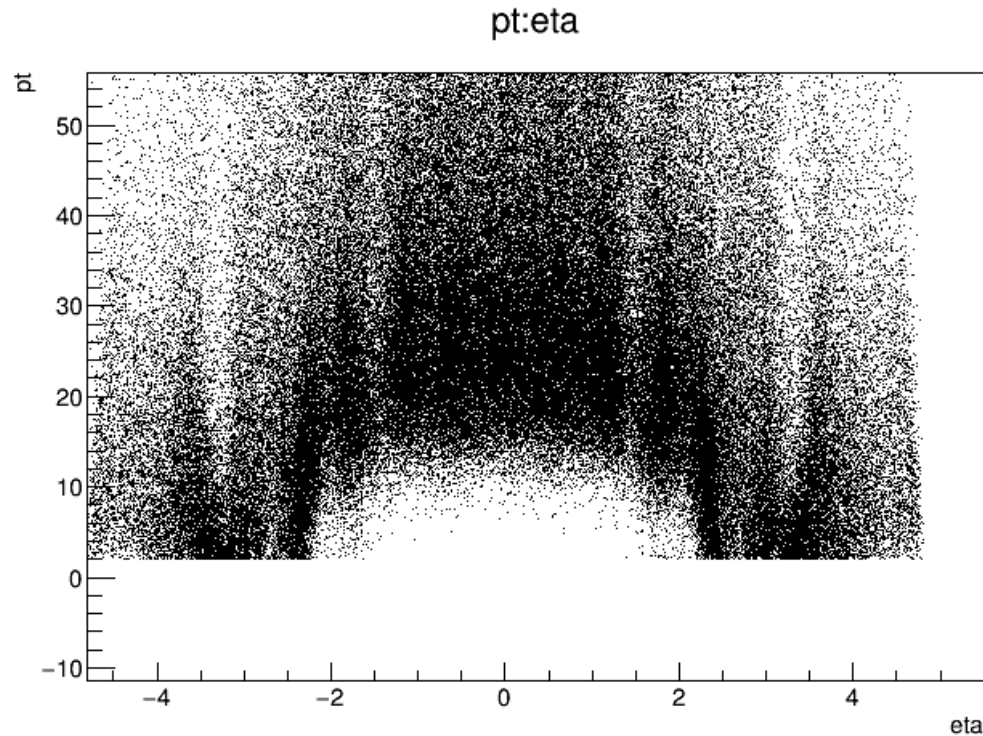


dpT/dNPV



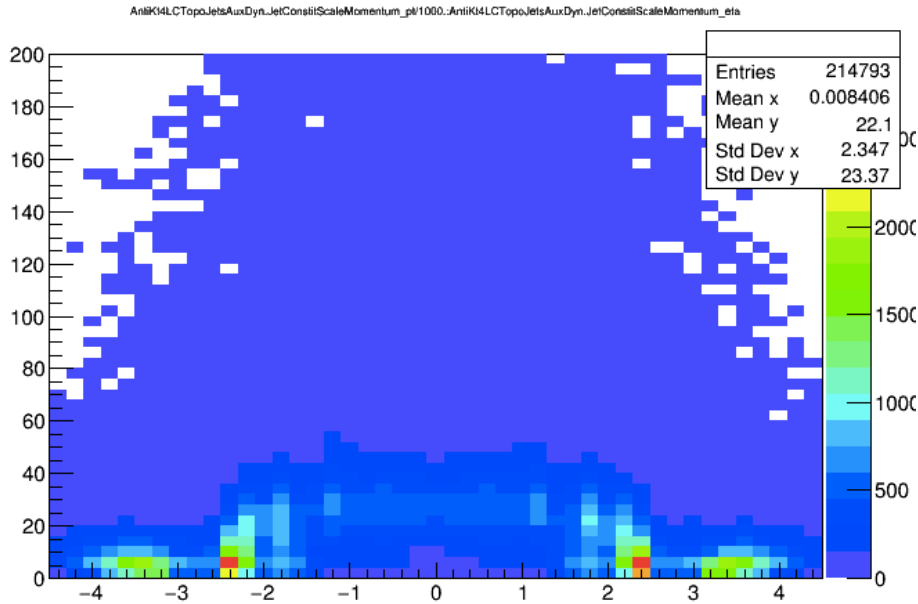
Possibly negative E jets--Prior to ANY calibration

- Looks like clipping of the jet distribution in forward region.
- Reco energy is way too low. Presumably only those with significant pile-up contribution survive.
- Suggests calorimeter energies need to be adjusted UP before jet reconstruction?

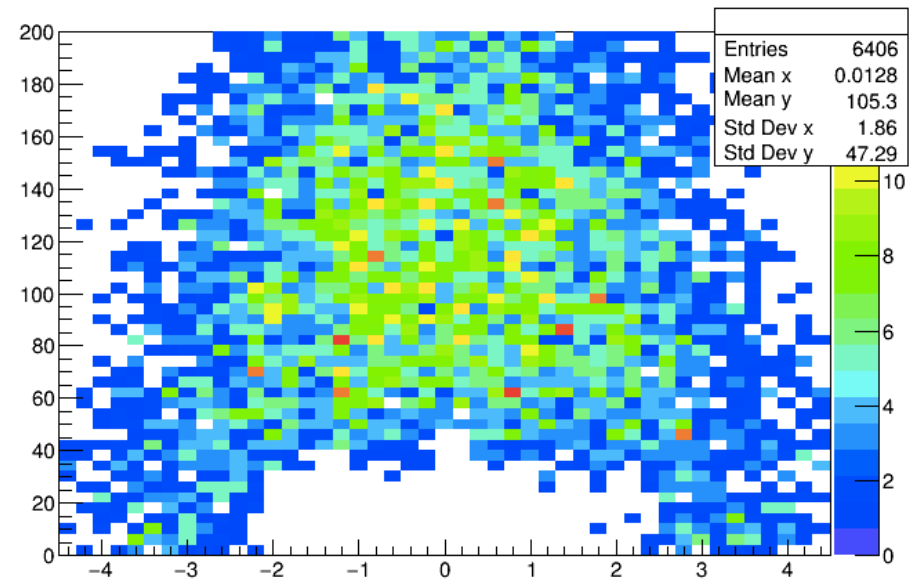


Remade with no cuts, new J2 sFCAL-LG

no matching

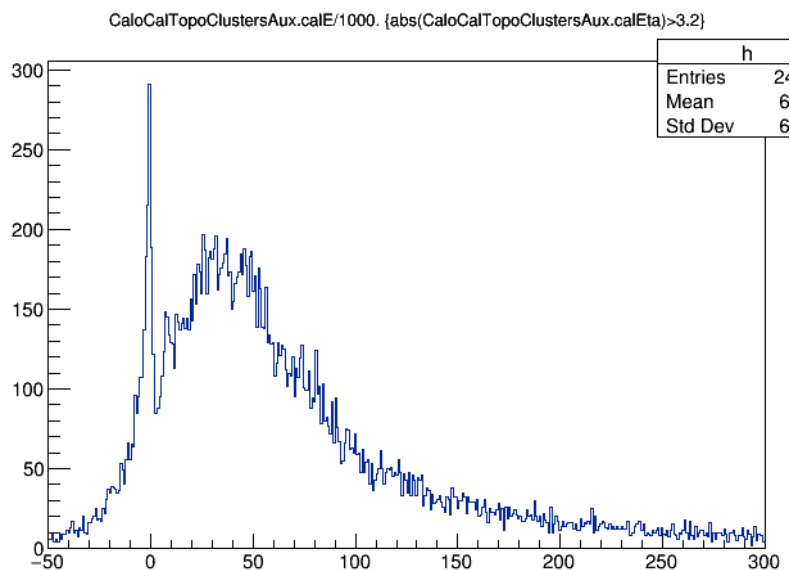


matching



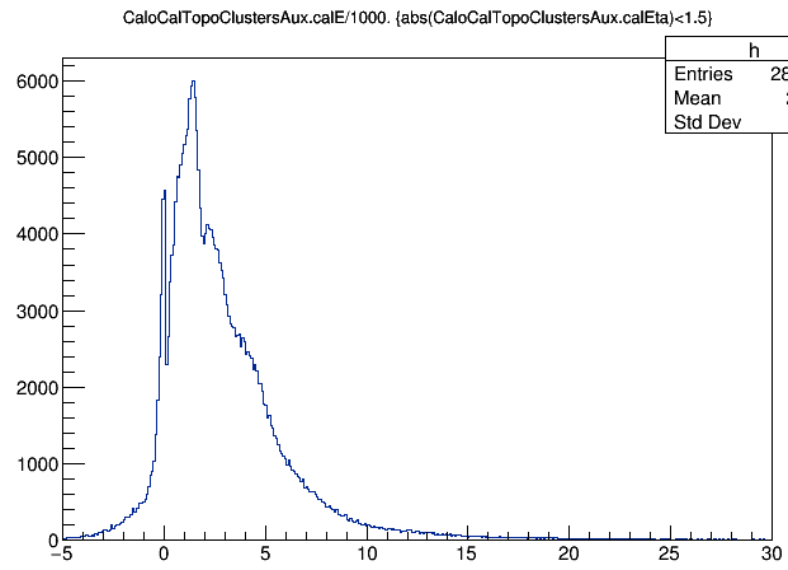
Negative E clusters

Forward



cluster E

Central

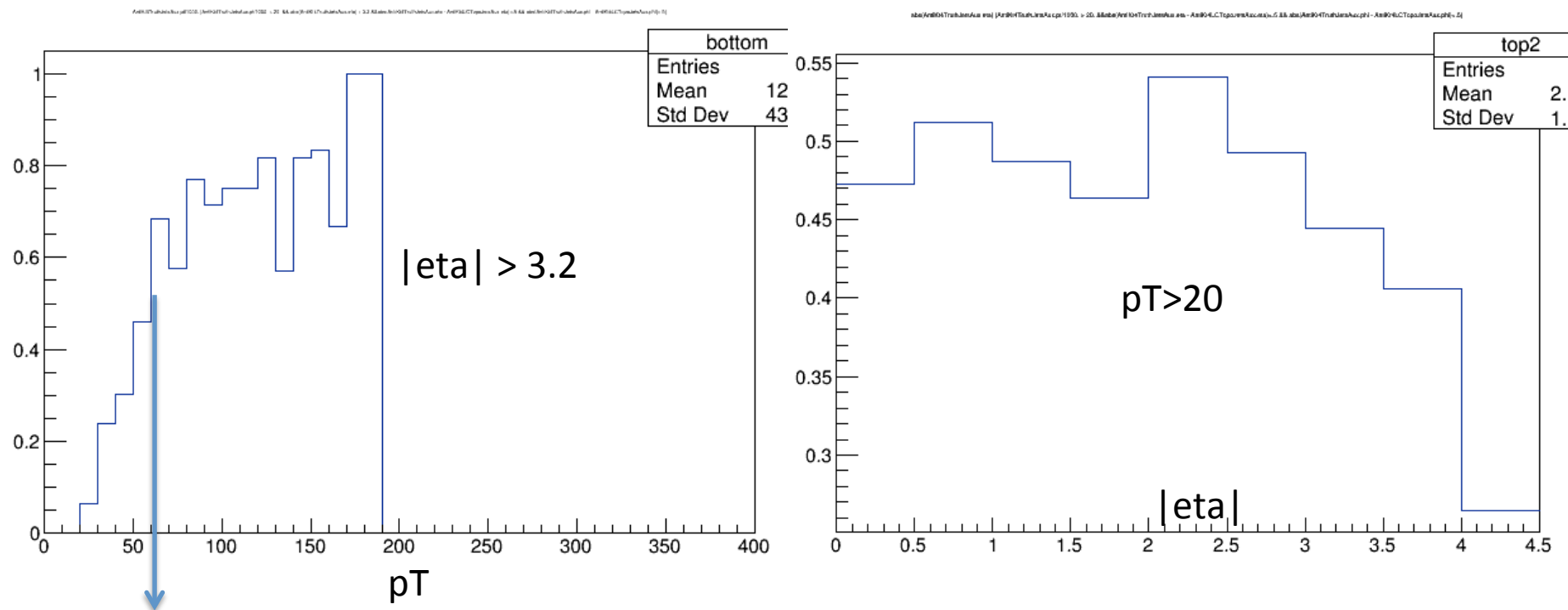


cluster E

Can you remind me how negative clusters are constructed?

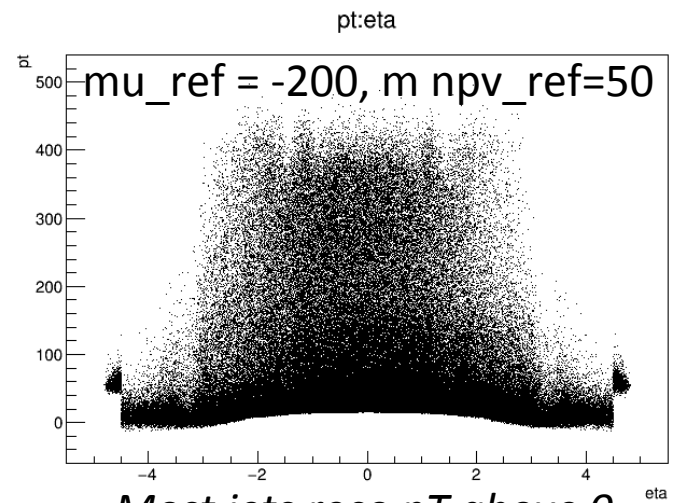
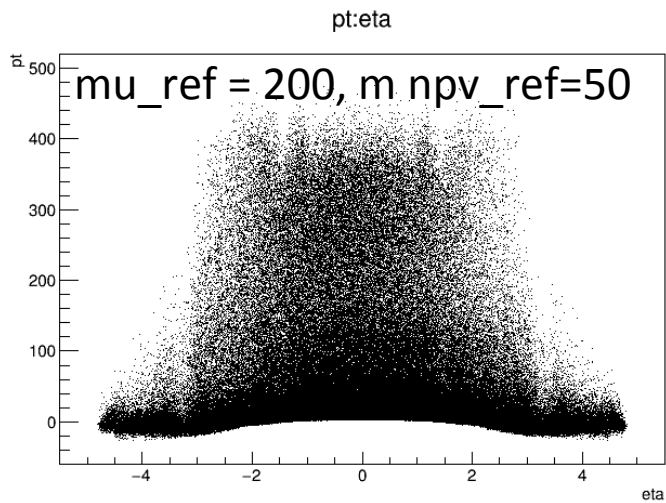
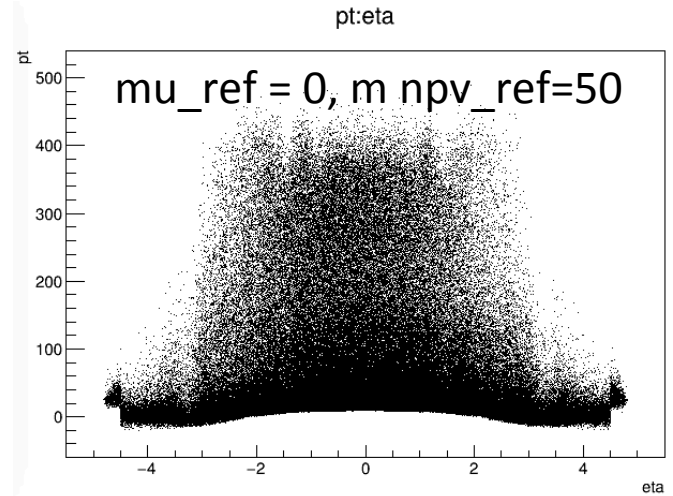
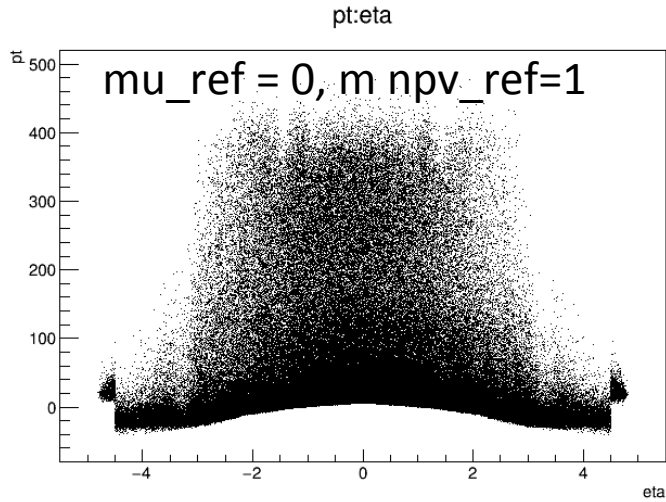
I would like to know if we are losing info even if we include negative clusters.

True jet reconstruction efficiency



50% reco efficiency—60 GeV. Around this value probability of reconstruction will be strongly correlated with PU coincidence and reconstructed energy will not be correlated with true energy really at all. Do we have cell energies outside of jets saved that we could recluster? If not we may want to consider building jets from towers. Either way, I think 100+ GeV should be used for minimizing resolution for now—not the usual 20-30 GeV bin.

Negative pT—after residual



Most jets reco pT above 0.

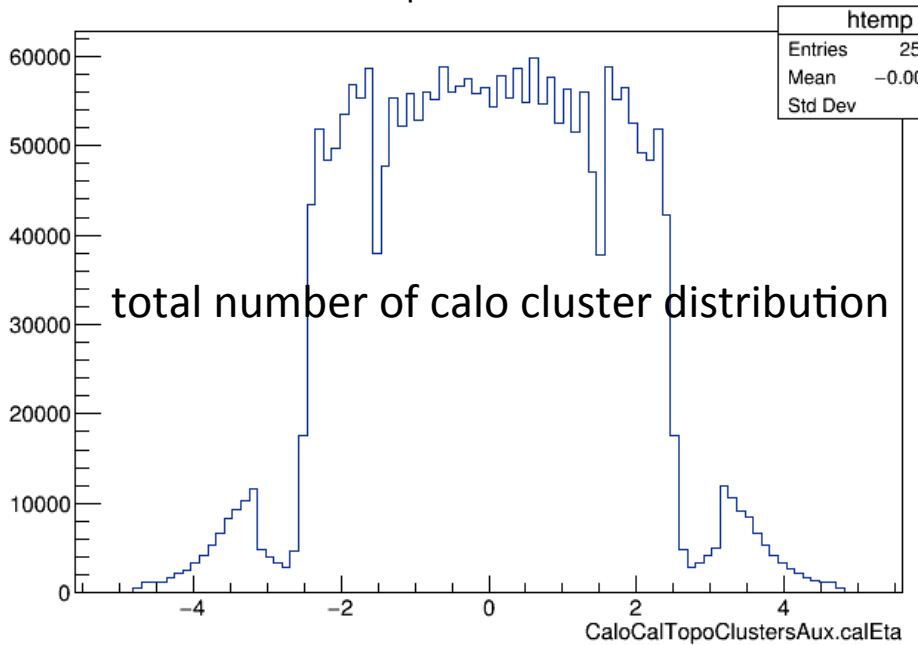
General Format for improved PU subtraction

- $A \cdot \rho_{\text{event}} \cdot \text{area} + B \cdot \rho_{\text{local eta}} + C \cdot \rho_{\text{local eta-phi}} + \dots$
 - Coefficients determined by minimizing resolution or multivariate fit.
 - Requires quick evaluation of resolution and adjustment of parameter and re-evaluation. Any ML/non-linear fit technique requires this as well.
- Only interesting in forward region b/c we have track-based PU mitigation in central.
- Unfortunately we have few clusters (see next few slides) in forward region
- Tower-based rho terms should hopefully improve this.

Availability of information at the cluster level—eta-dependent term

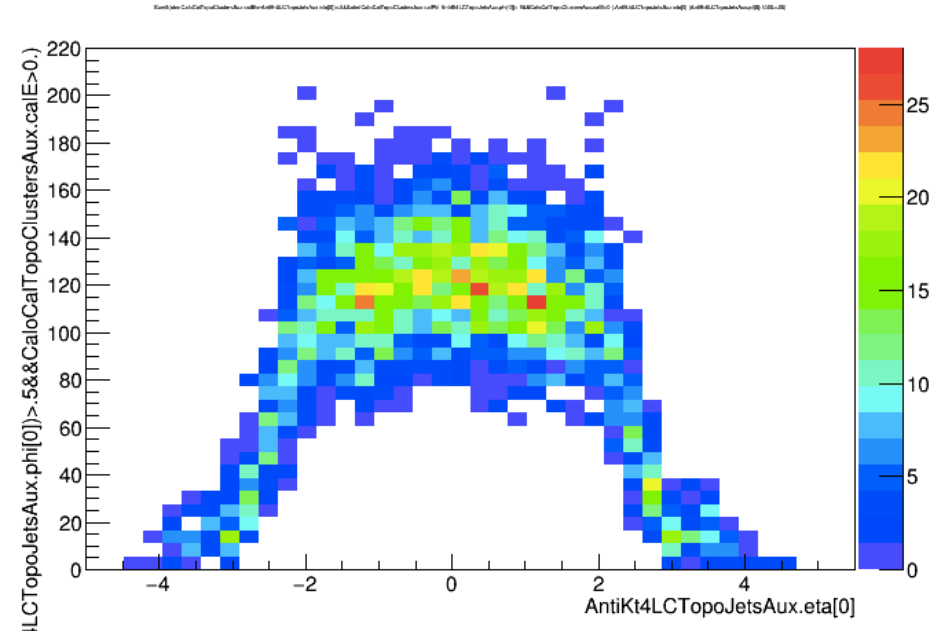
number of posE clusters
matched to jet < .5 eta, > .5 phi

CaloCalTopoClustersAux.calEta



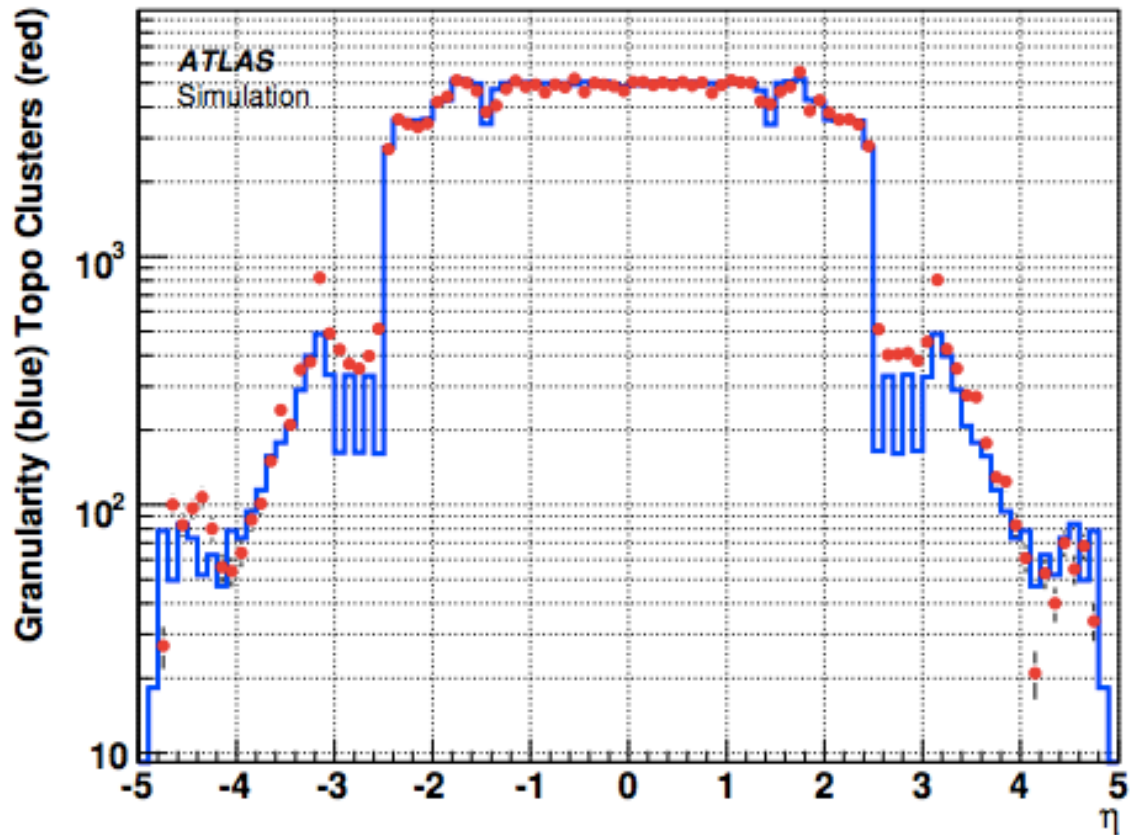
total number of calo cluster distribution

eta



eta

From 8TeV

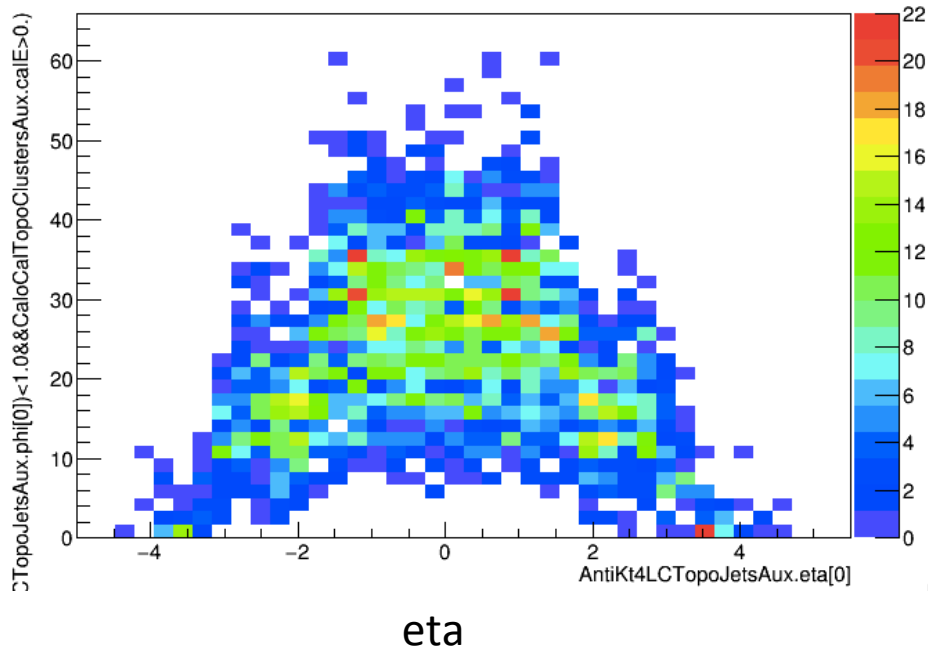


(a) Granularity and positive cluster distribution vs η

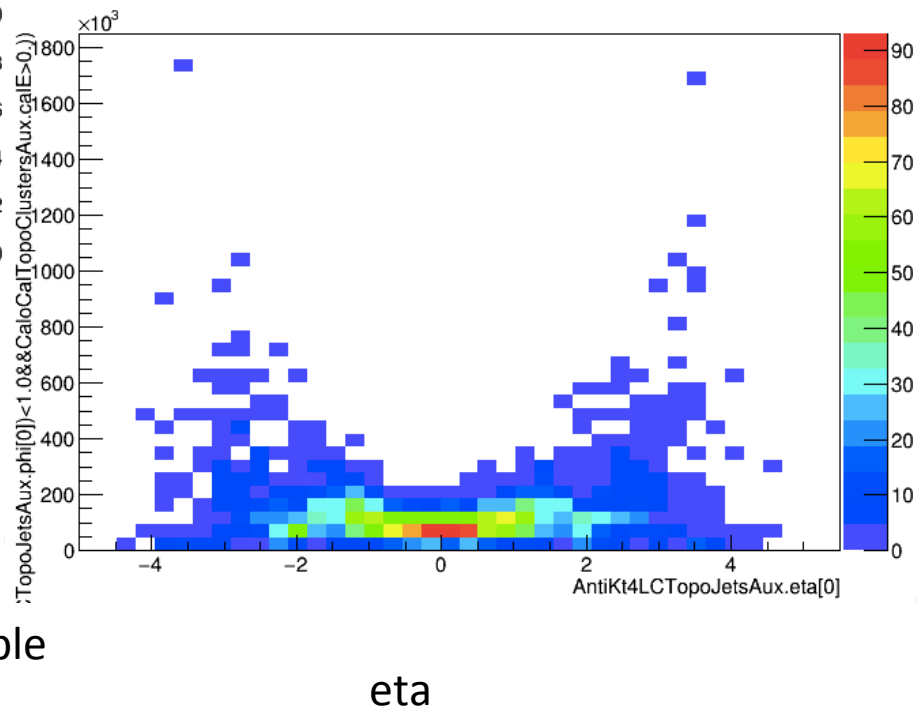
Availability of information at the cluster level—local term

After area subtraction. $pT_true > 20$ GeV

number of posE clusters in eta-phi torus $> .4, < 1.0$



sum of positive cluster energy in torus



- a median-based approach to rho is not viable
- too few clusters
- need towers or other discriminant

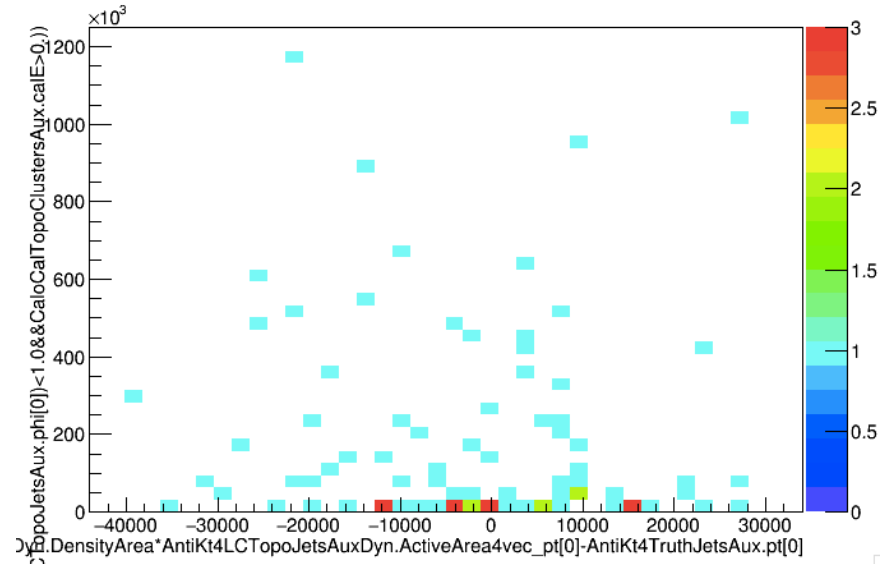
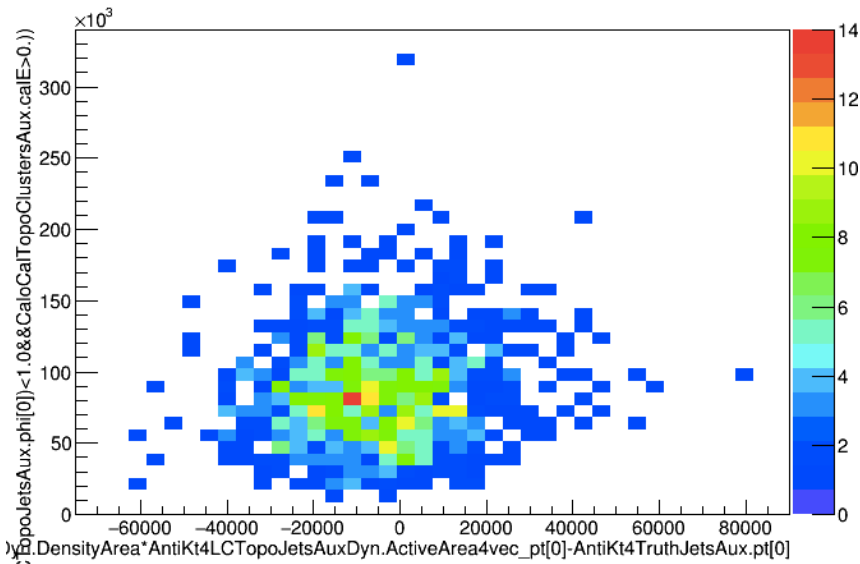
Availability of information at the cluster level—local term

After area subtraction. $p_{T_true} > 20$ GeV

sum positive cluster energy in torus vs. p_T -offset

Central

Forward



No evidence of correlation

p_T -offset

Conclusions

- Residual and NI packages are combined now (with some remaining debugging and refactoring)
- Bad noise calibrations will be done this week, will tag on monday or tue.
- Various PU mitigation methods/jet collections should be integrated next week so resolutions/response can be compared (send me an email to remind me!)
- Waiting on MCs for the real calibrations.