

# Software update

Holly Szumila-Vance

HPS Software Meeting

15 Dec 2016

# Change made to include event-by-event time:

New software:

ecal-recon/.../ecal/cluster/ClusterRFTTimeCorrDriver.java

ecal-recon/.../ecal/cluster/TriggerTime.java

- LCGenericObject "TriggerTime"

- getDoubleVal(0) returns trigger time

- getIntVal(0) returns seed "ix" used

- getIntVal(1) return seed "iy" used

What it does:

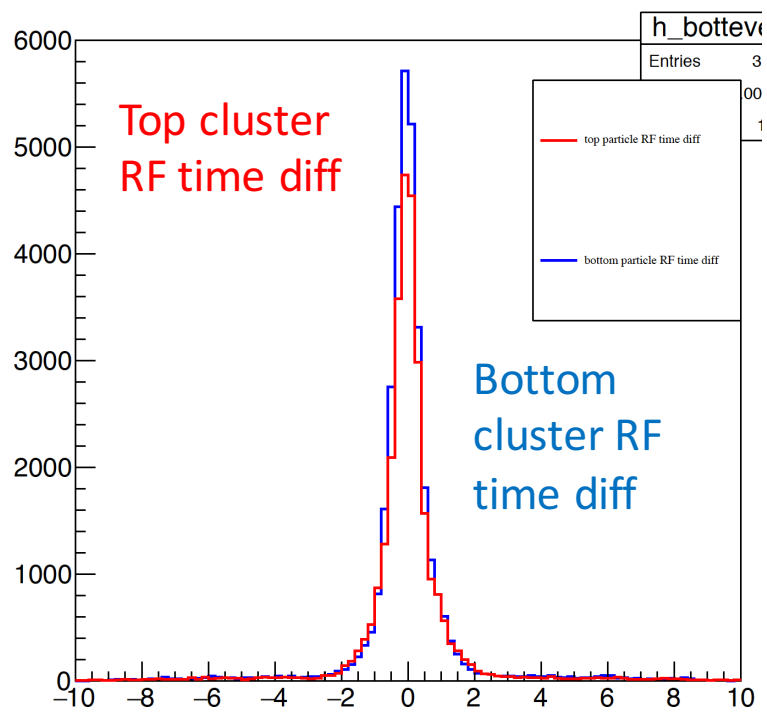
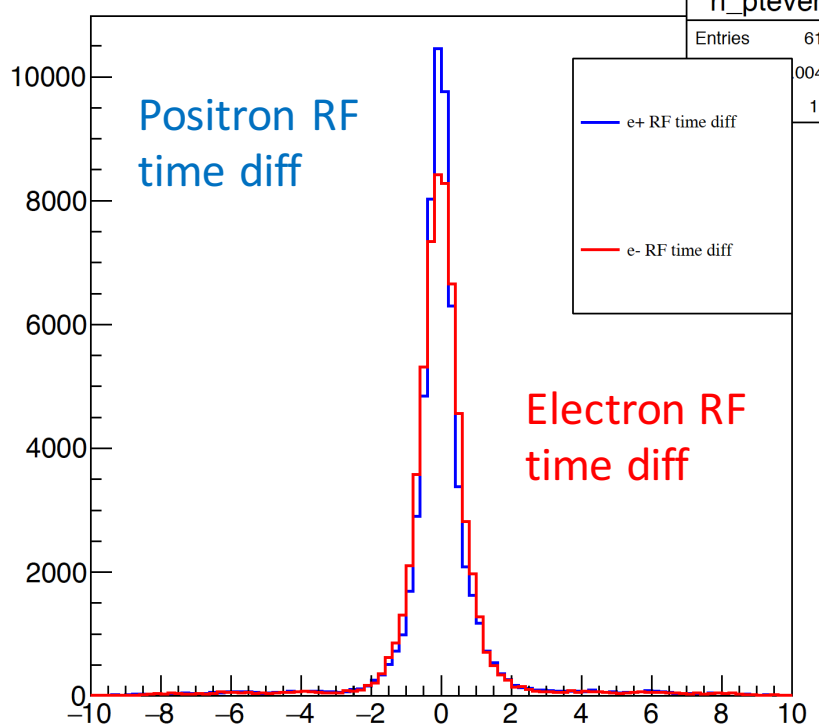
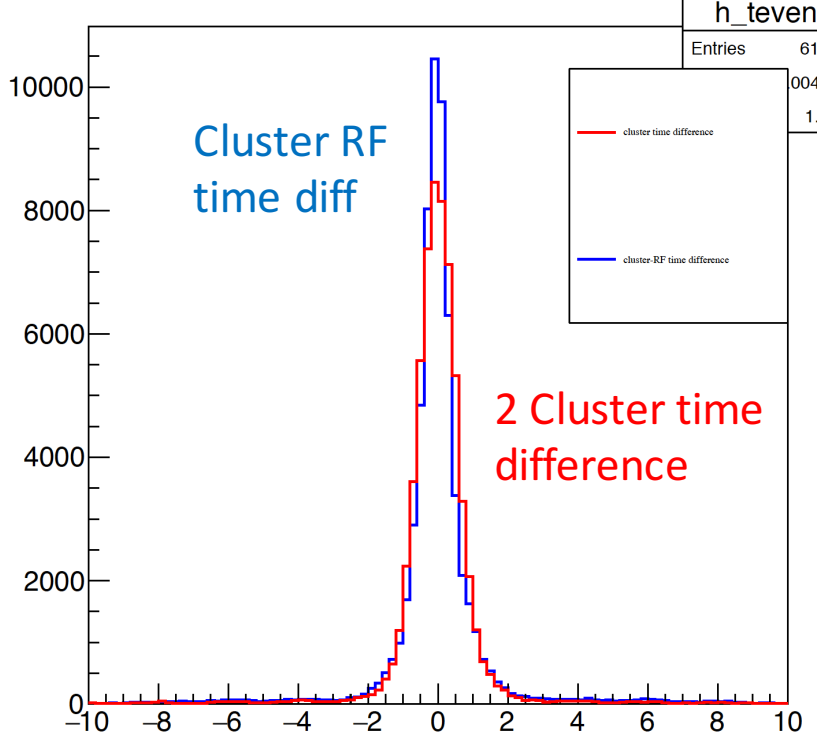
- 1-Find the highest energy seed hit in the event, in a reasonable trigger time window (accesses this from run database, different between 2015/2016 run sets). Increase time window size if no cluster found.

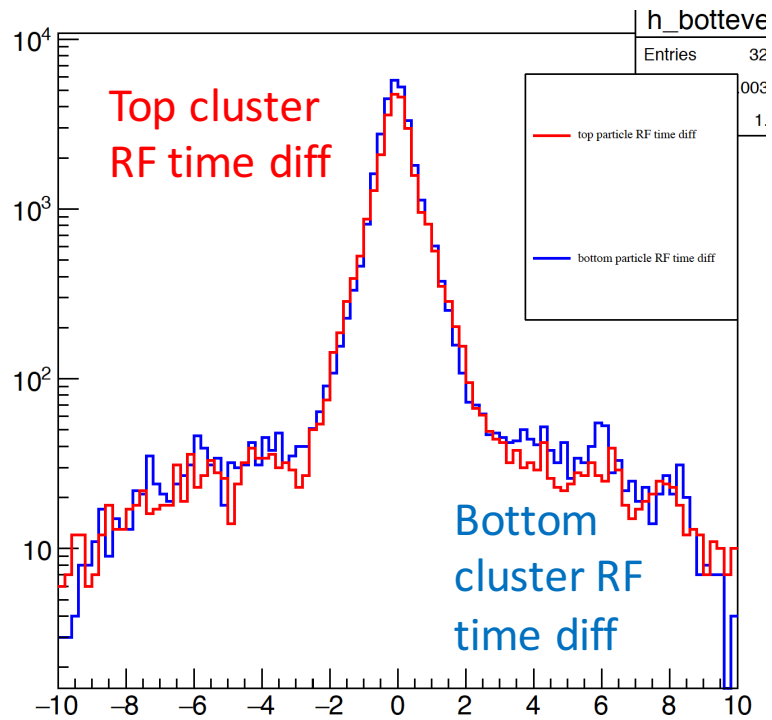
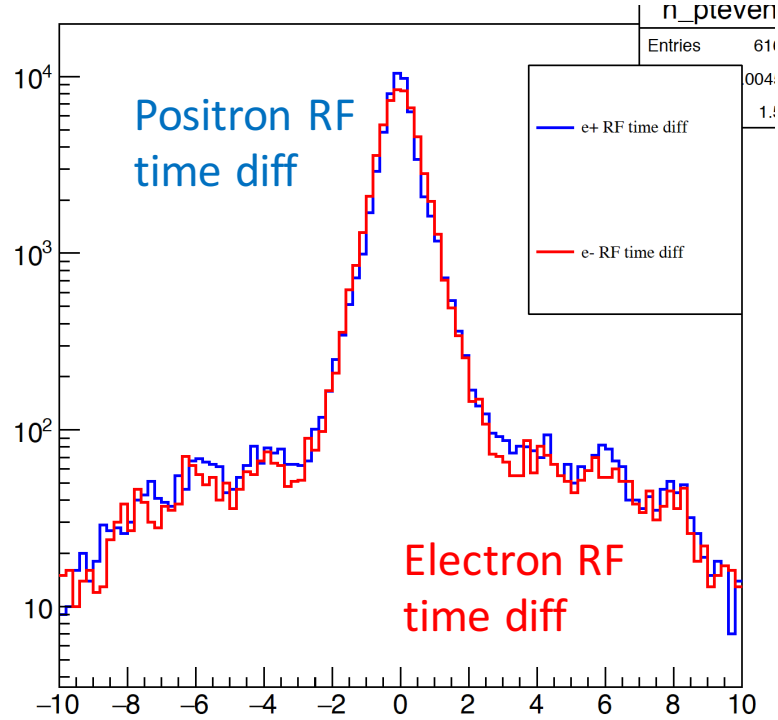
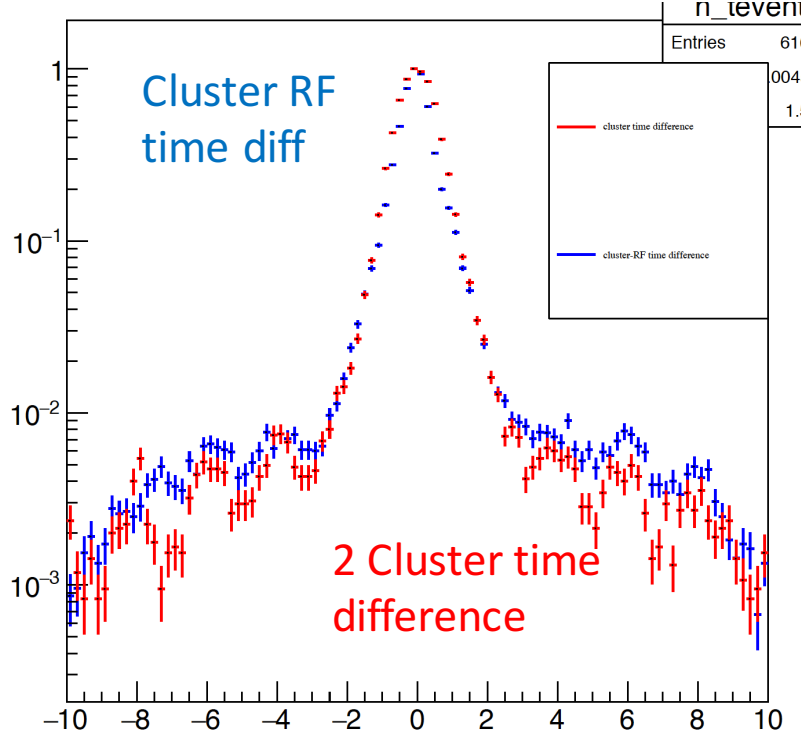
- 2-Find the difference\* between RF time and seed hit time

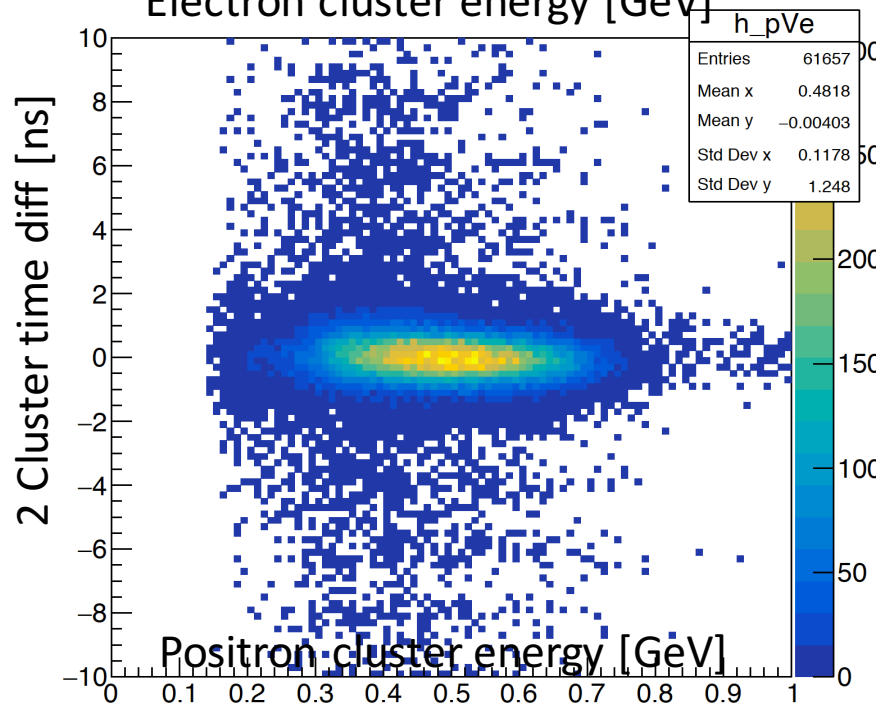
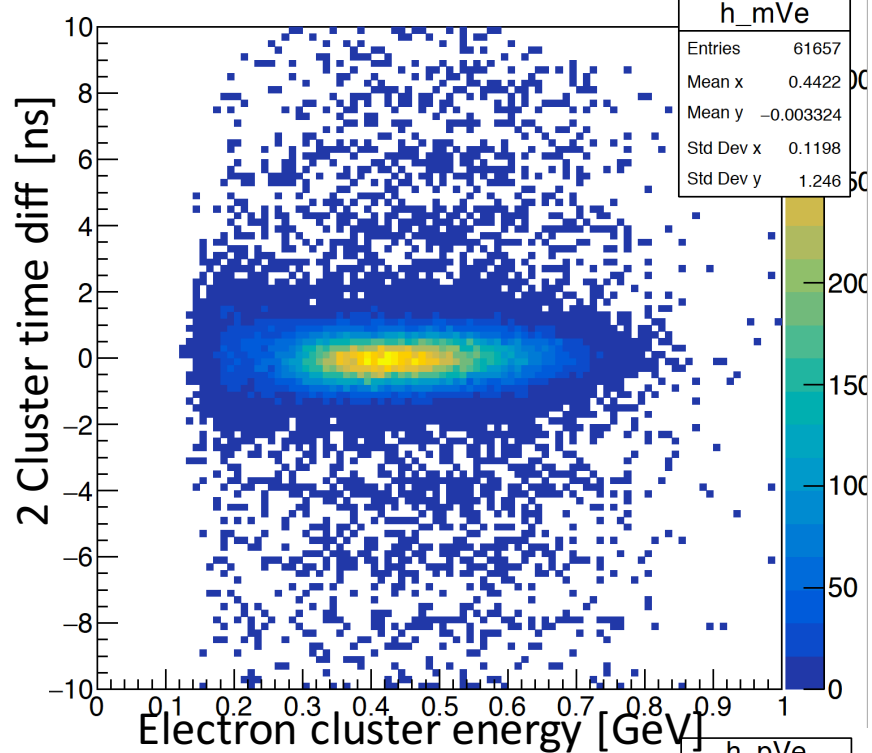
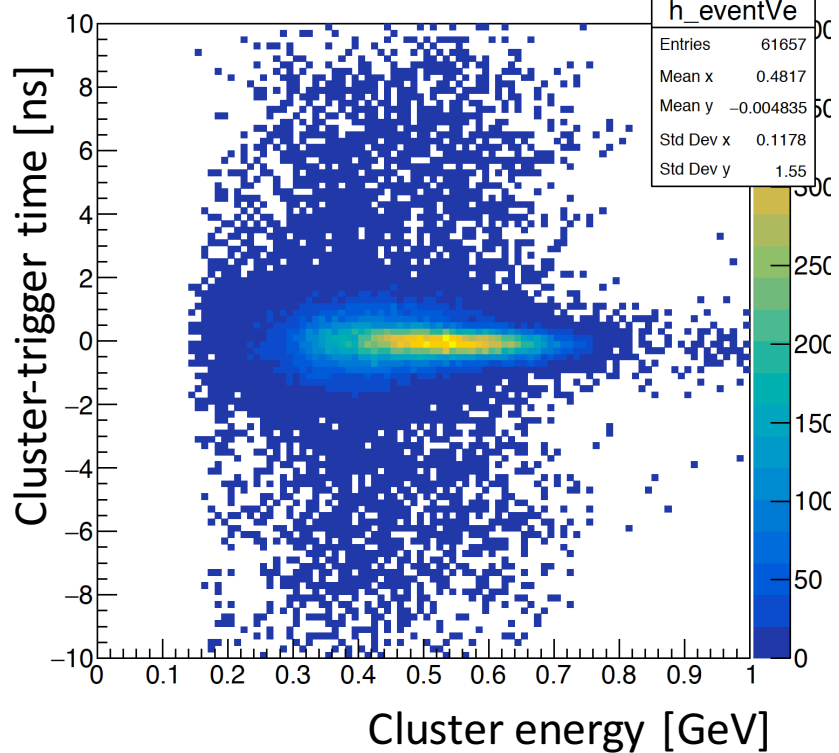
- 3-TriggerTime = seed hit – difference\*

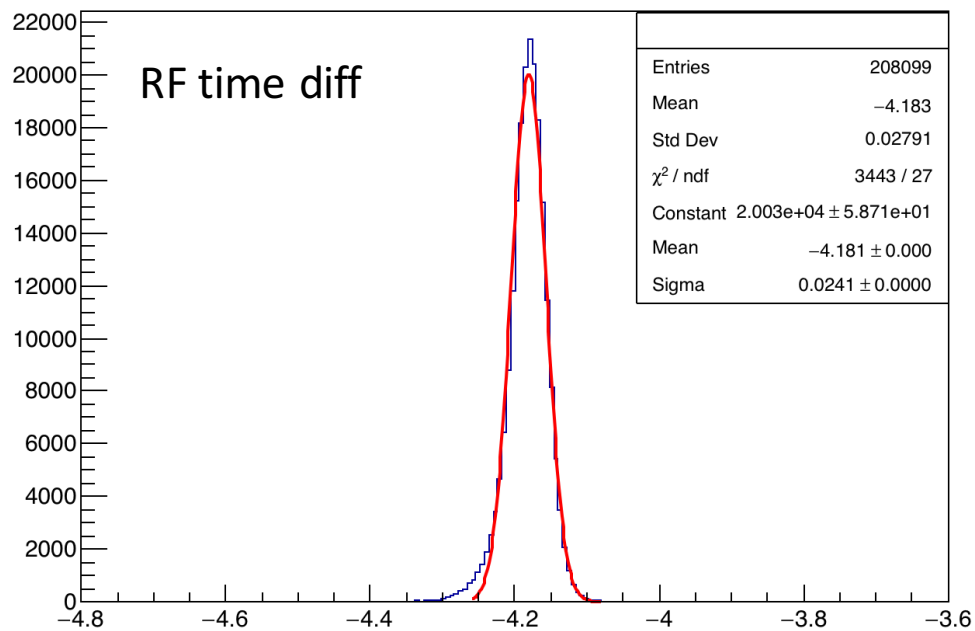
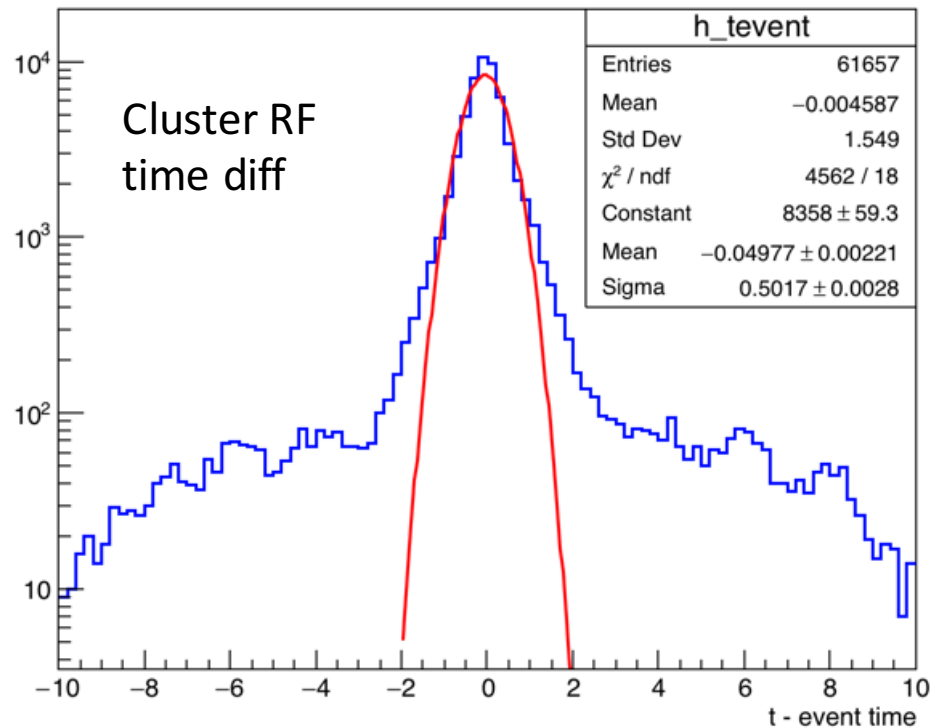
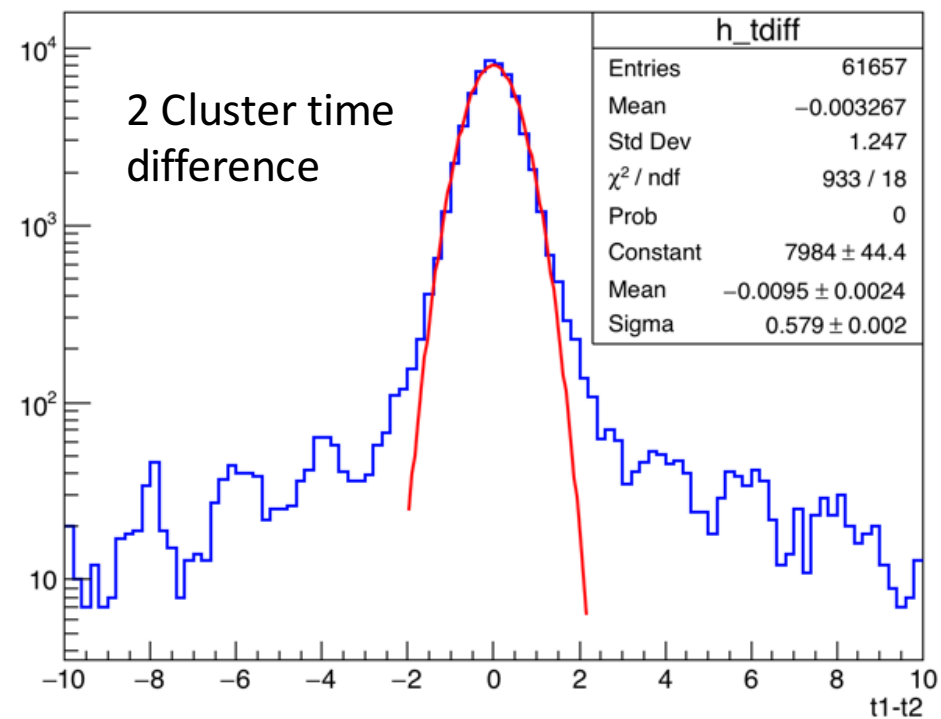
Analysis:

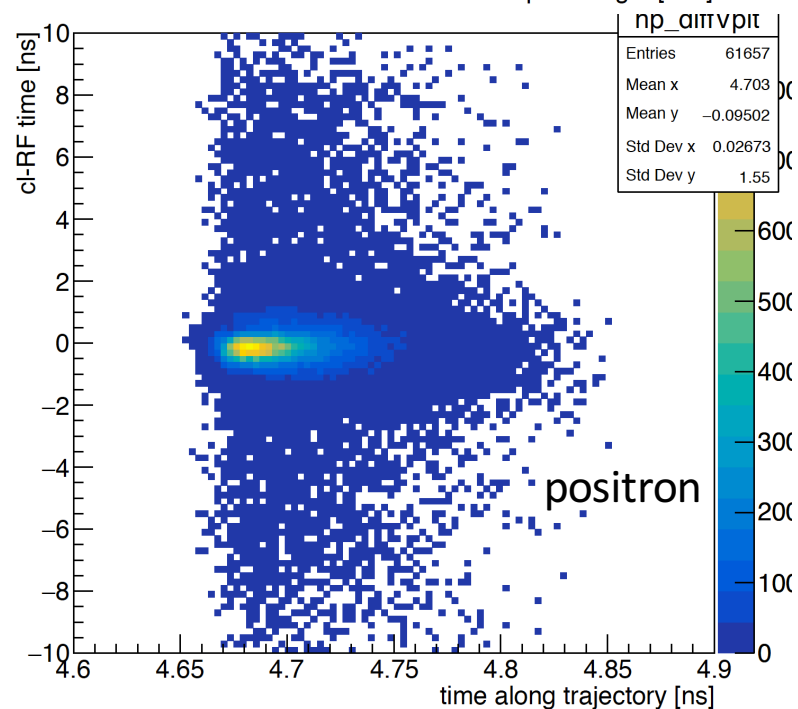
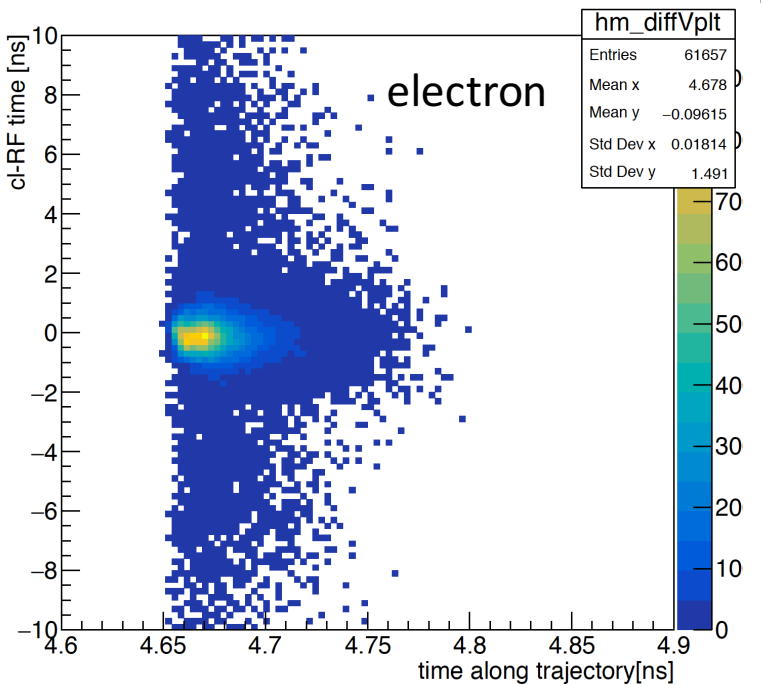
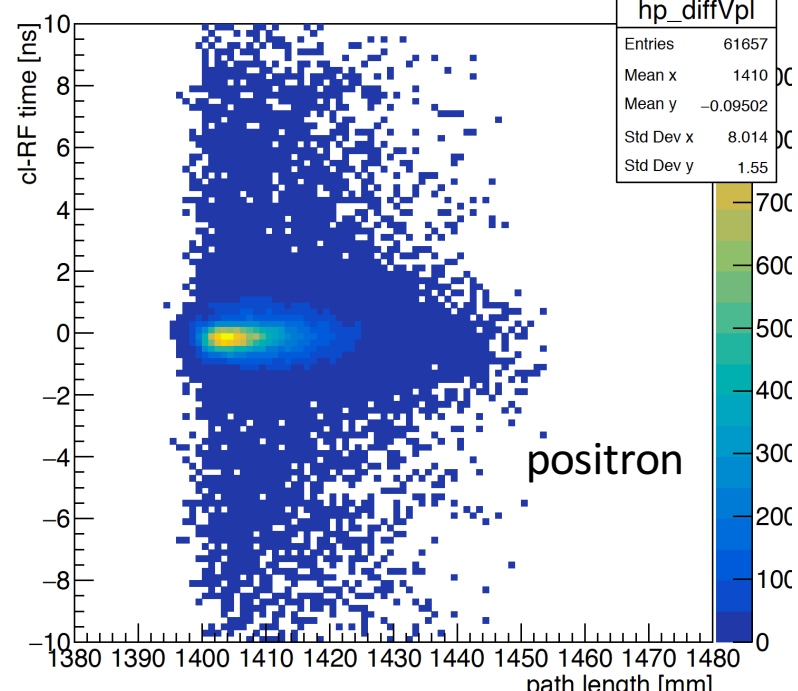
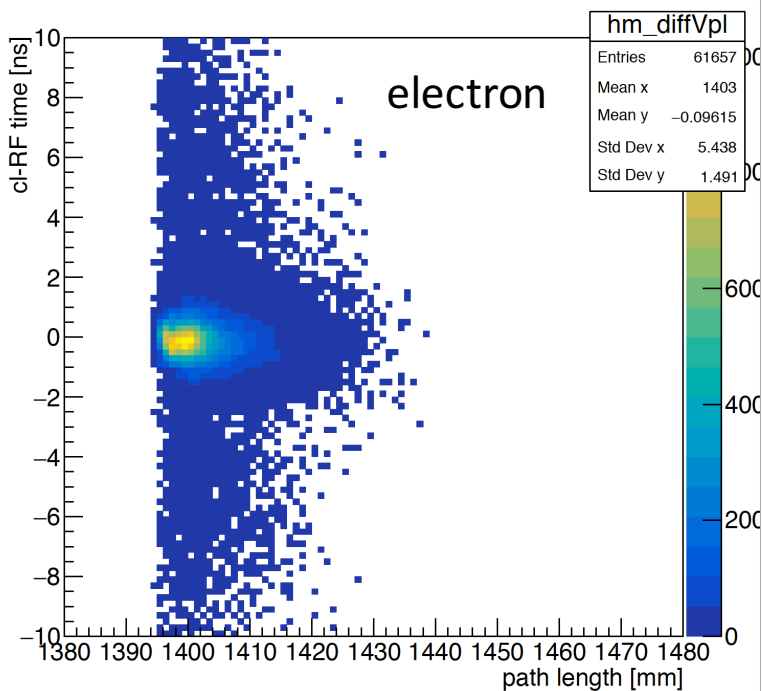
- Instead of (t1-t2), plot (t-eventTime)







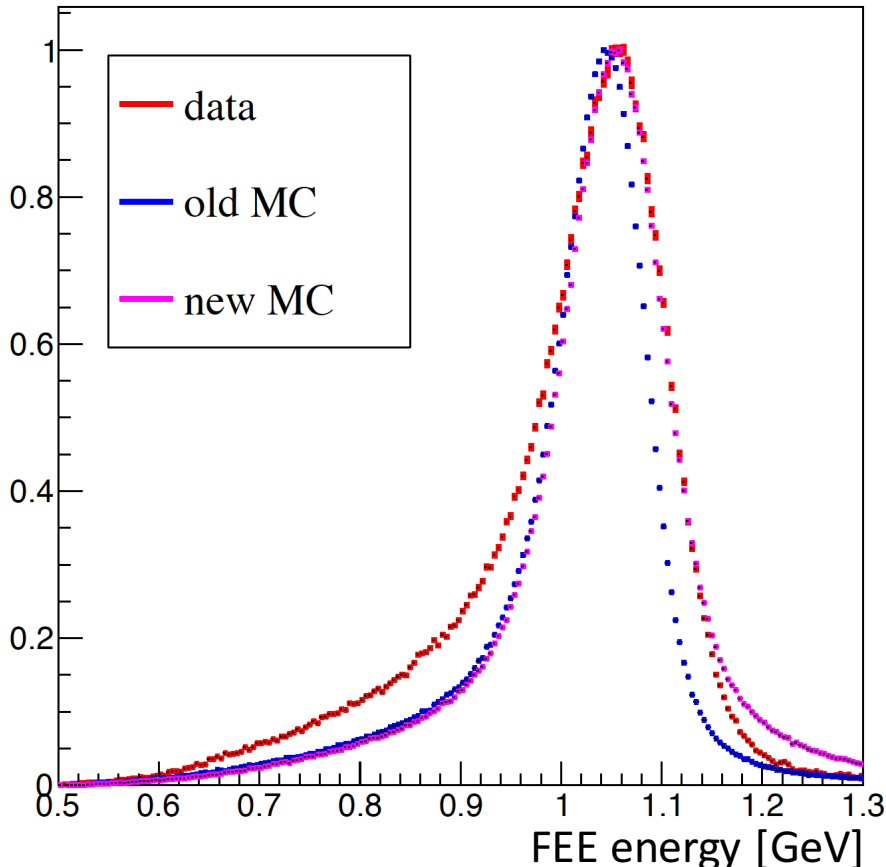




# Change made to ecal cluster resolution in MC

New software:

- In the recon steering, there is a new flag at HpsReconParticleDriver
- `<isMC>true</isMC>` must be set here so that Cluster energy corrections in ReconParticle Driver can be done for MC and additional resolution smear factor
- By default, this is set to false so that nothing will break



$$\frac{\sigma_E}{E} (\%) = \frac{1.62}{E} \oplus \frac{2.87}{\sqrt{E}} \oplus 2.5 \quad (10)$$

Equation (10) can be compared to the energy resolution as derived from Monte Carlo [2] in Equation (11):

$$\frac{\sigma_E}{E} (\%) = \frac{1.65}{E} \oplus \frac{2.62}{\sqrt{E}} \oplus 1.8 \quad (11)$$

- Old MC peak lower (shifted here by 10 MeV to line up with data and new MC)
- New MC resolution close to correct
- Energy loss tail different between MC and data



Still to do :

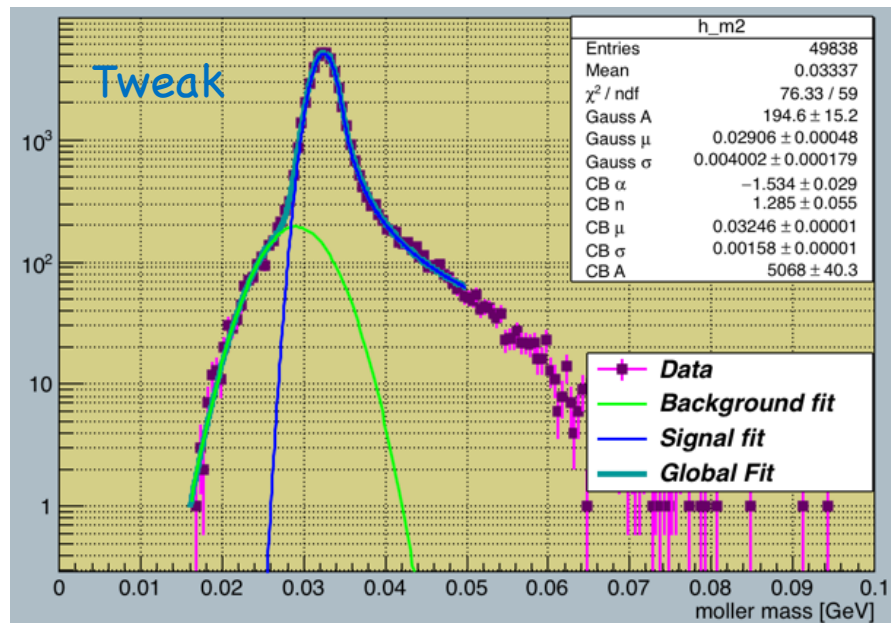
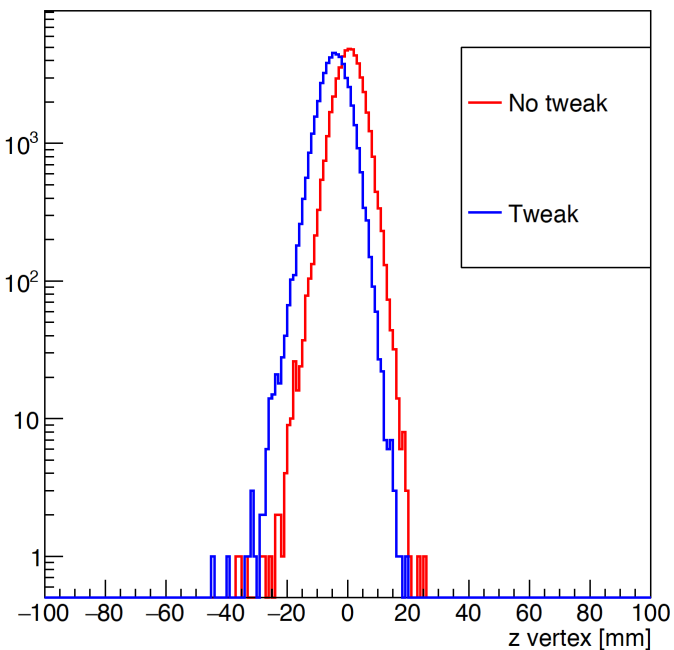
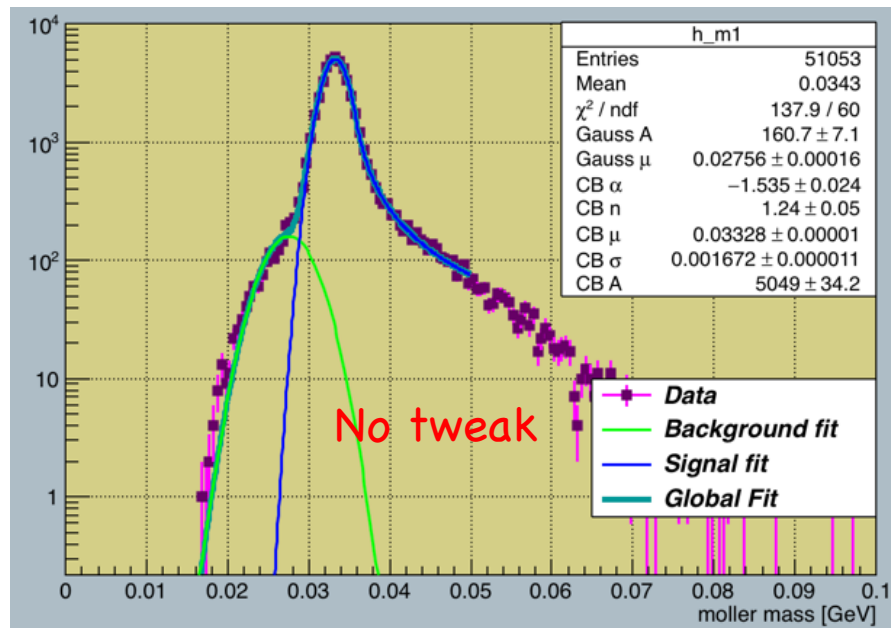
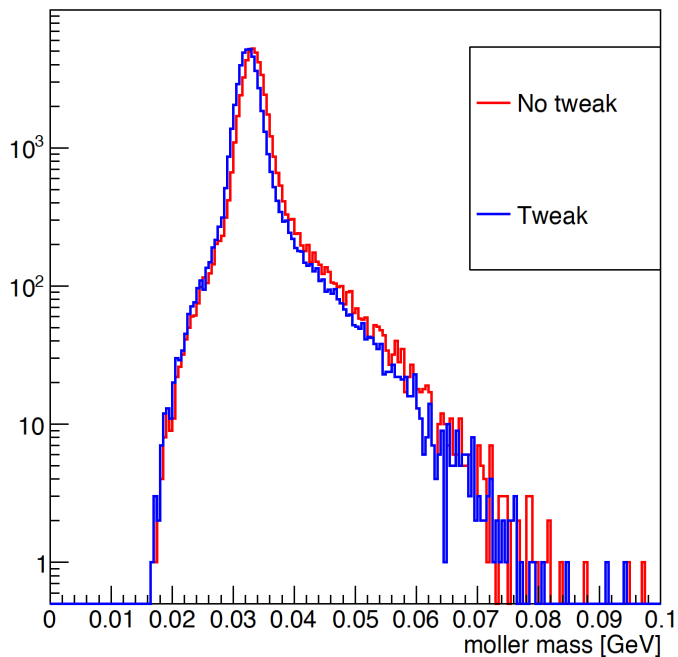
Smear cluster hit timing resolution in MC as:

$$\text{Time resolution (ns)} = \frac{0.188}{E \text{ (GeV)}} \oplus 0.152.$$

Plan to make a separate method that can be called in EcalRawConverter.  
This will add a new flag to EcalRawConverter called <isMC>

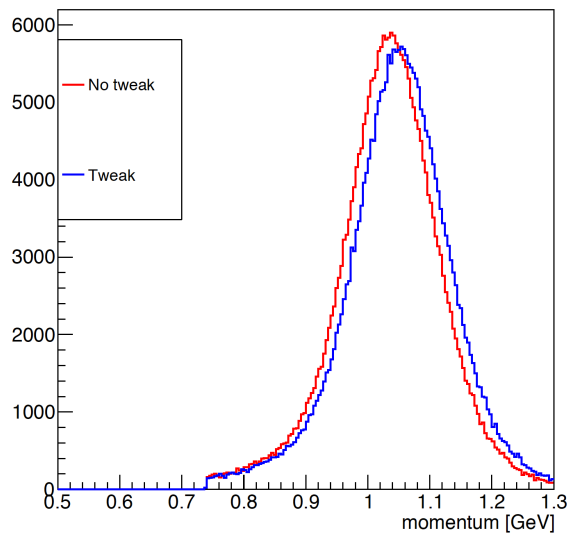
# Tweak vertex effects:

## -Mollers

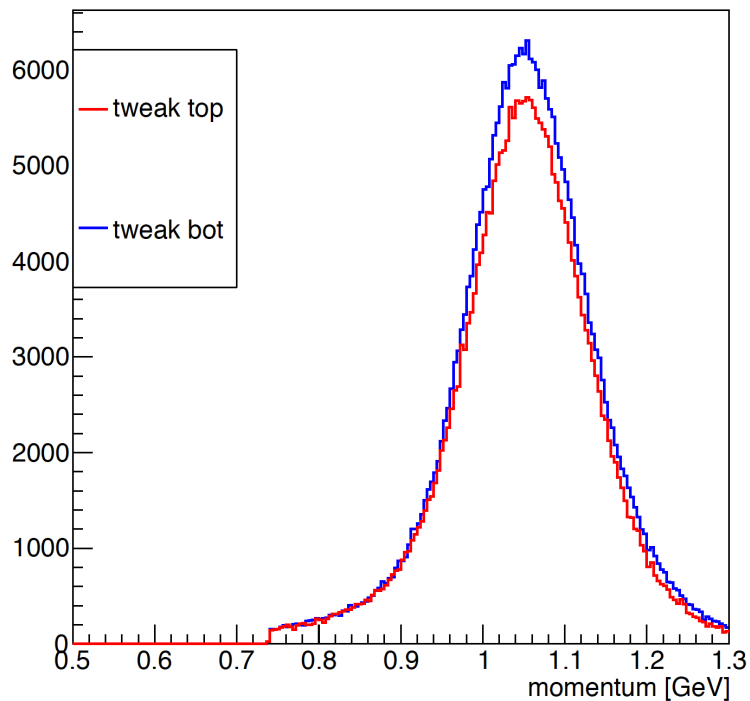
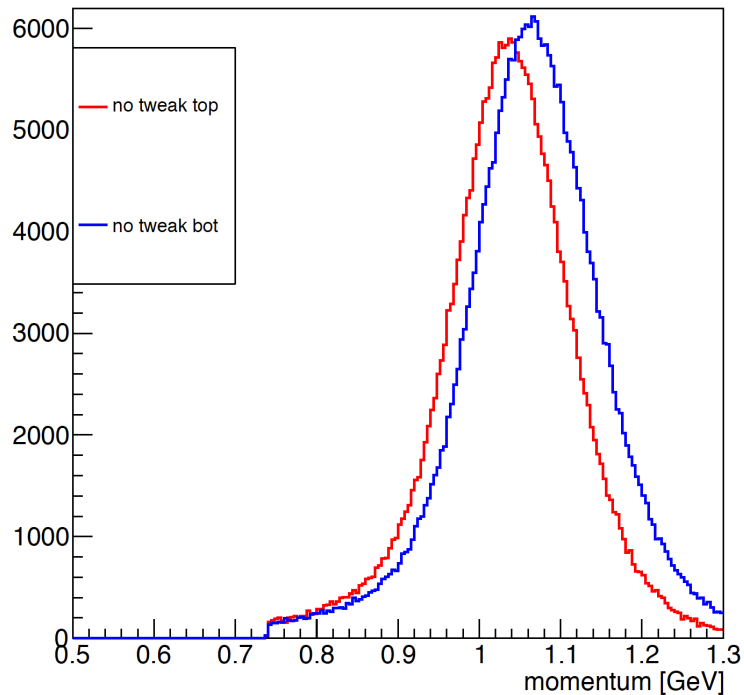
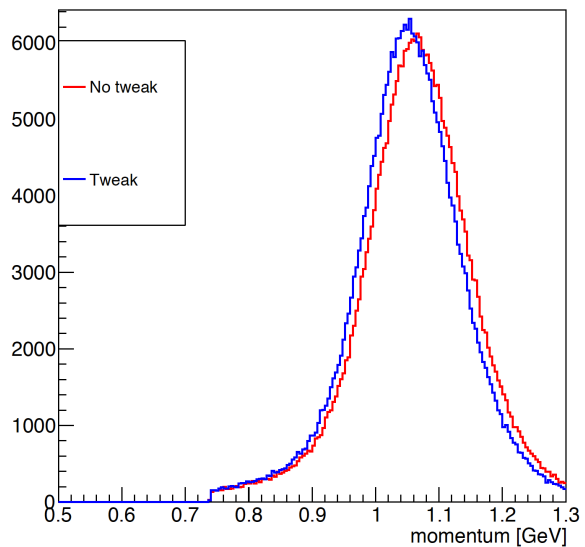


# Tweak vertex effects: -FEE

top P



bottom P



## Summary:

- RF timing still needs some study in order to improve the event timing correction and analysis cuts (priority)
- Tweak corrections have small effect on mass, but do correct the momentum of tracks
- Will smear MC timing today and test before merging
- Ecal smear looks good (generally). We should understand why the energy loss tail looks different.