RICH-sPHENIX INTT Seed Tracking Development

RIKEN
Takuya Kumaoka

1. Refuctoring my code to take over anyone.

2. Include calorimeter clusters in the event generation root file.
($\rightarrow$ Only include it, I have not yet applied my tracking code.)

3. Check the magnetic field profile used in the sPHENIX simulation.

4. Check some events which do not work pT estimation.
($\rightarrow$ I have not yet clarified the reason.)

Document Location

https://indico.bnl.gov/event/7081/attachments/25527/38284/sphenix_tdr_20190513.pdf

Figure 12. Field Map of the sPHENIX Solenoid

ROOT file Location

/cvmfs/sphenix.sdcc.bnl.gov/calibrations/sphnxpro/cdb/
FIELDMAP_GAP/65/
a9/65a930ed6de9c0e049cd0f3ef226e6b4_sphenix3dbigmapxyz_gap_
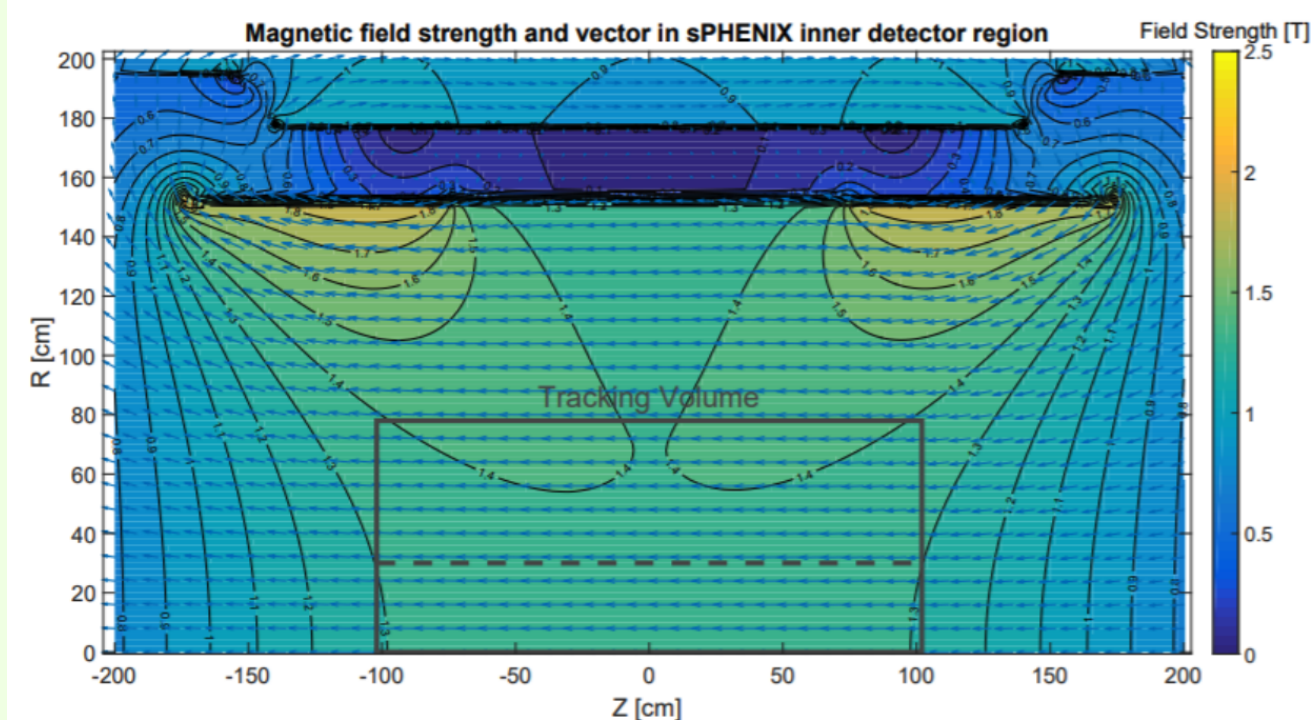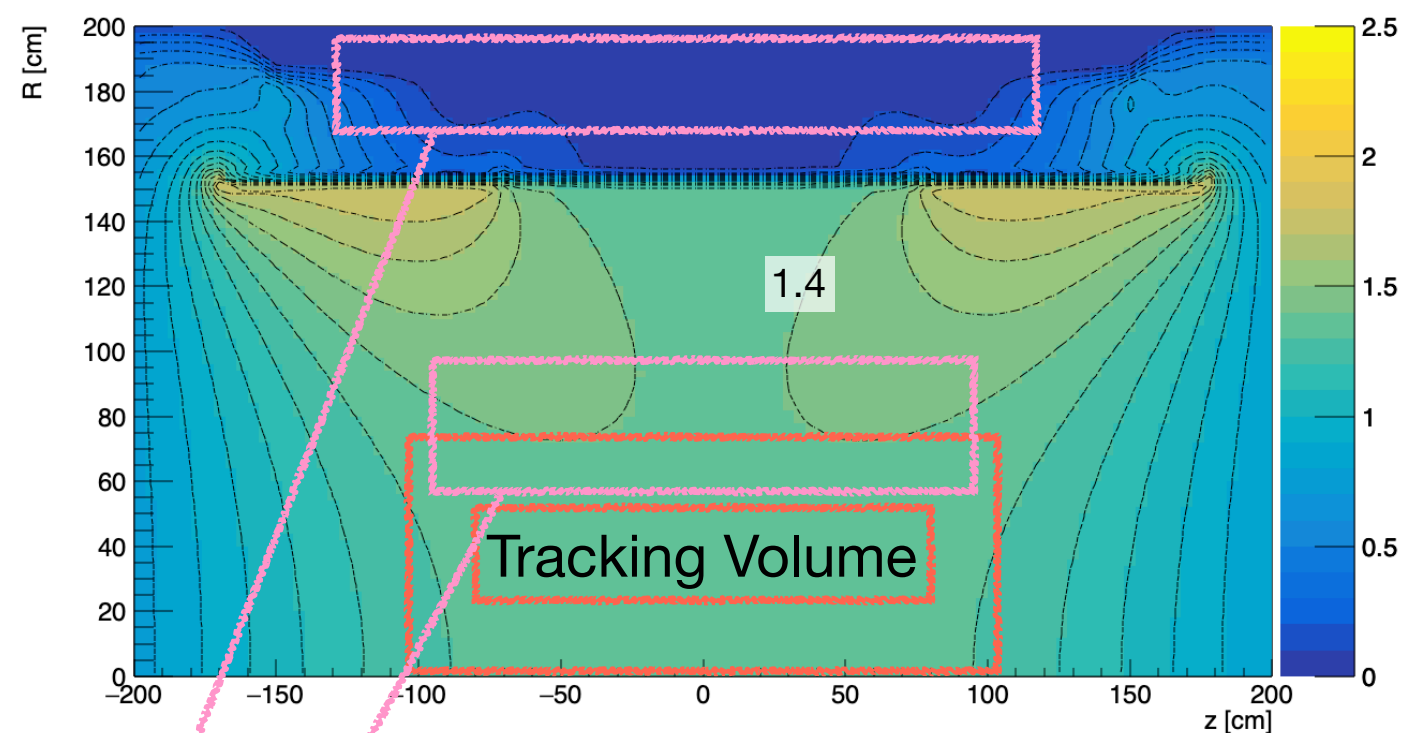rebuild_v2.root

Tracking Volume

1.4

Different behavior:
However, I do not know what is this magnetic field.

Calorimeter Clustering code

RawClusterContainer (← Now I am using):
https://sphenix-collaboration.github.io/doxygen/d6/d12/classRawClusterContainer.html
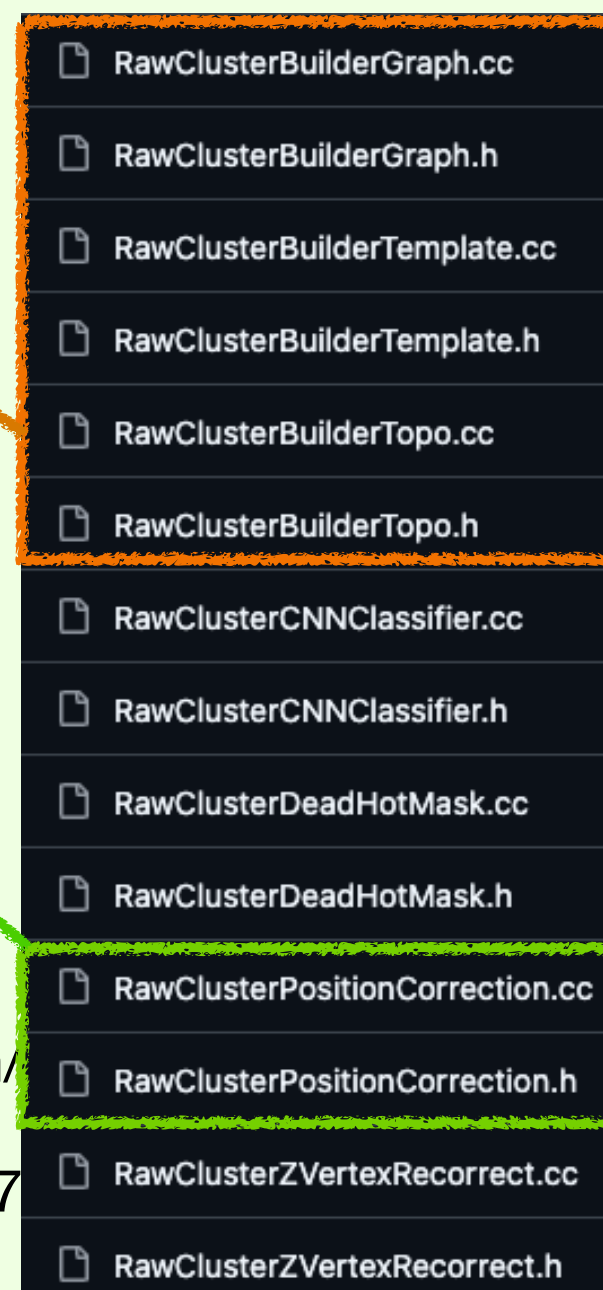
<u>RawCluster</u>:
https://sphenix-collaboration.github.io/doxygen/d2/d4e/classRawCluster.html

I think by reading the "ClusterBuilder" source codes.
However, there are three codes having the name
"ClusterBuilder"…

The RawClusterPositionCorrection seems important
for tracking…
However, I have not yet read it.

https://github.com/sPHENIX-Collaboration/
coresoftware/tree/
02804b5a691b92395e4aae83726ae2c0497
9c0e2/offline/packages/CaloReco

RawClusterBuilderGraph.cc
RawClusterBuilderGraph.h
RawClusterBuilderTemplate.cc
RawClusterBuilderTemplate.h
RawClusterBuilderTopo.cc
RawClusterBuilderTopo.h
RawClusterCNNClassifier.cc
RawClusterCNNClassifier.h
RawClusterDeadHotMask.cc
RawClusterDeadHotMask.h
RawClusterPositionCorrection.cc
RawClusterPositionCorrection.h
RawClusterZVertexRecorrect.cc
RawClusterZVertexRecorrect.h

Single electron generator simulation
  injection p_T: 0.5-1.5 [GeV/c]
$\eta = 0, |\phi| < \pi$
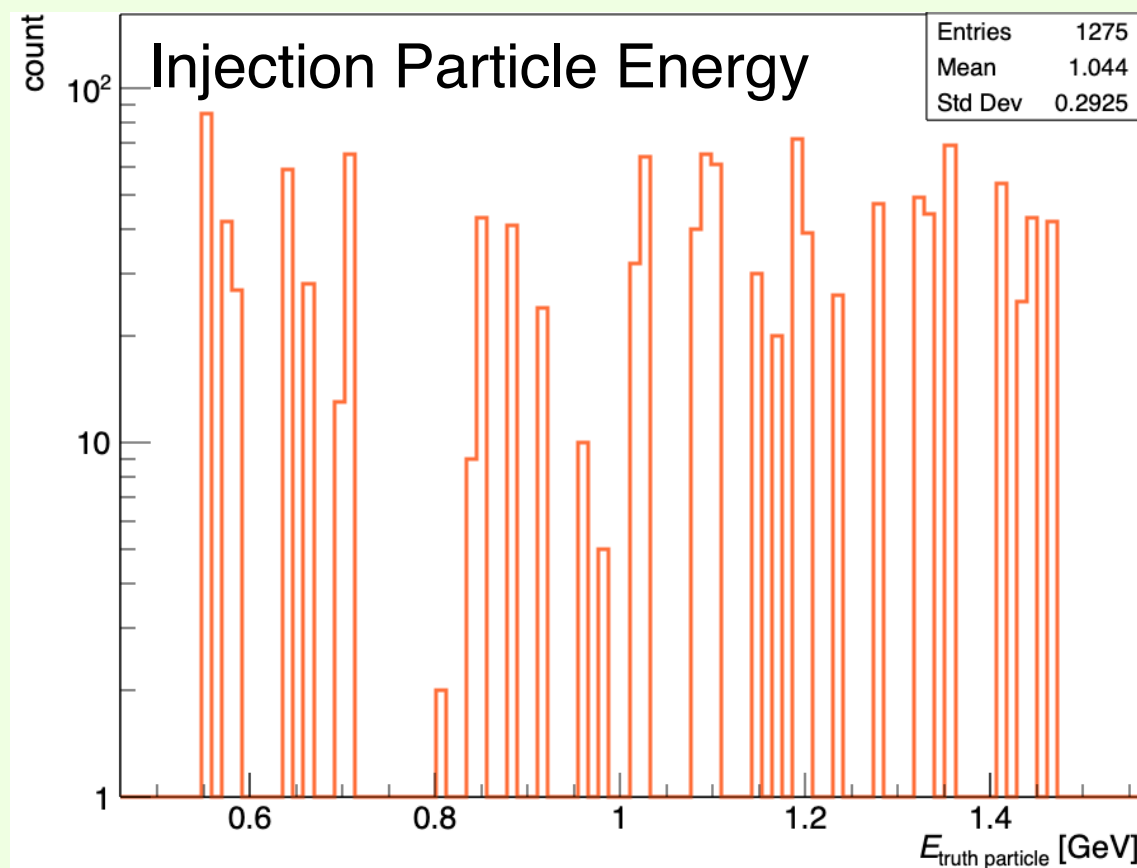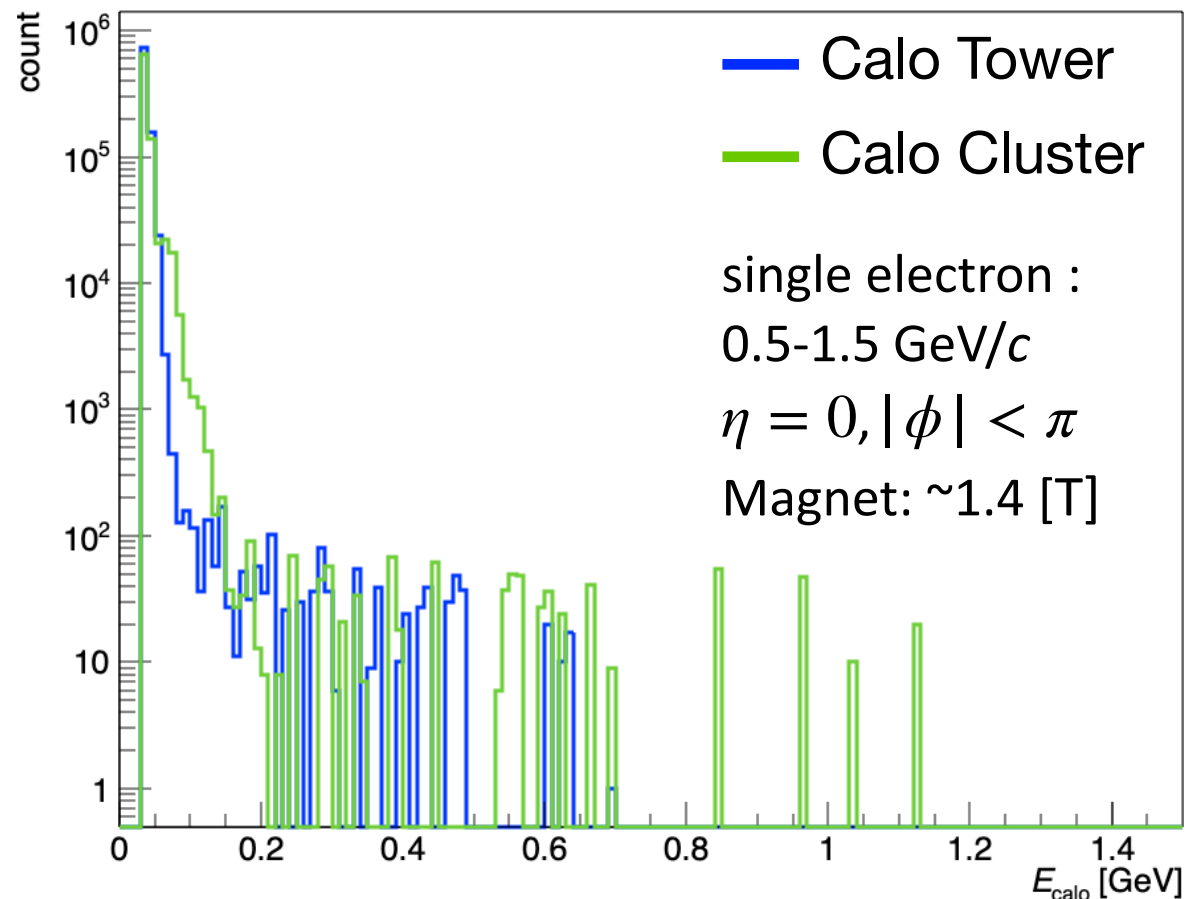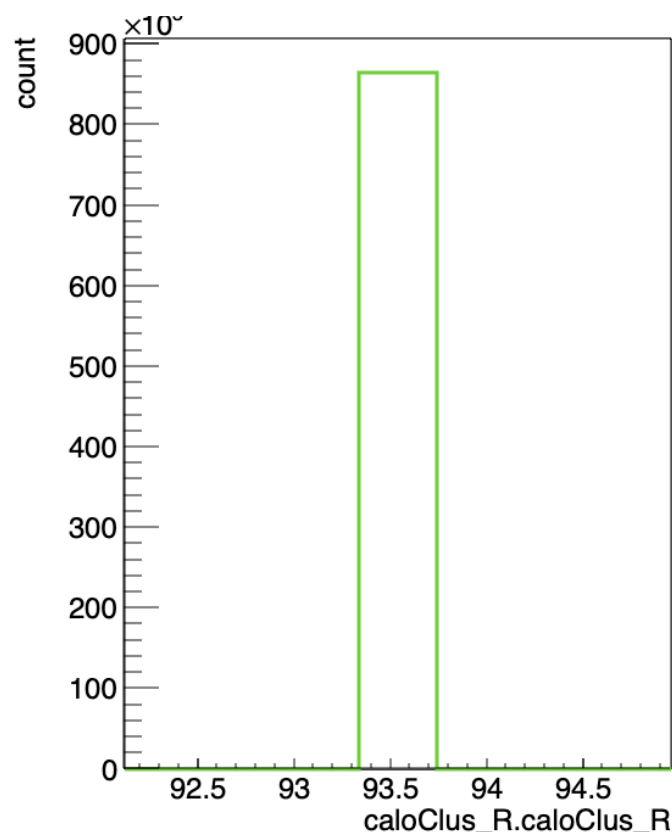
Calorimeter Tower
("TOWERINFO_CALIB_CEMC")
<TowerInfo>

Calorimeter Cluster ("CLUSTER_CEMC")
<RawCluster>

Injection Particle Energy

Entries	1275
Mean	1.044
Std Dev	0.2925

$E_{\text{truth particle}}$ [GeV]

Calorimeter Cluster R

caloClus_R.caloClus_R

— Calo Tower
— Calo Cluster

single electron :
0.5-1.5 GeV/c
$\eta = 0, |\phi| < \pi$
Magnet: ~1.4 [T]

E_{calo} [GeV]

Fitting does not work well

$$\frac{p_{\mathrm{T,reco}} - p_{\mathrm{T,truth}}}{p_{\mathrm{T,reco}}} = 5 \text{ GeV}/c$$
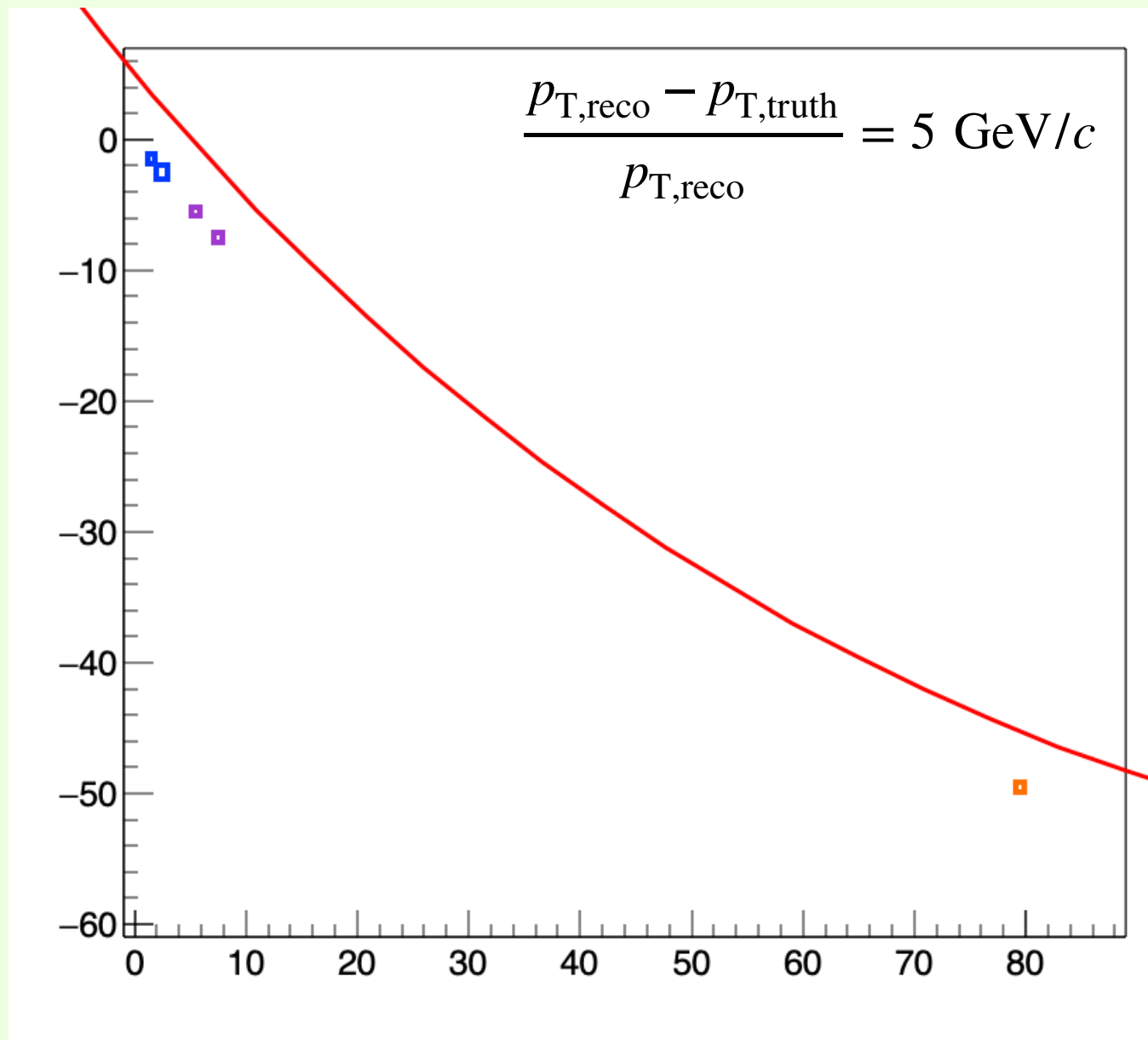
Fitting seems work well, but…

$$\frac{p_{\mathrm{T,reco}} - p_{\mathrm{T,truth}}}{p_{\mathrm{T,reco}}} = 12 \text{ GeV}/c$$
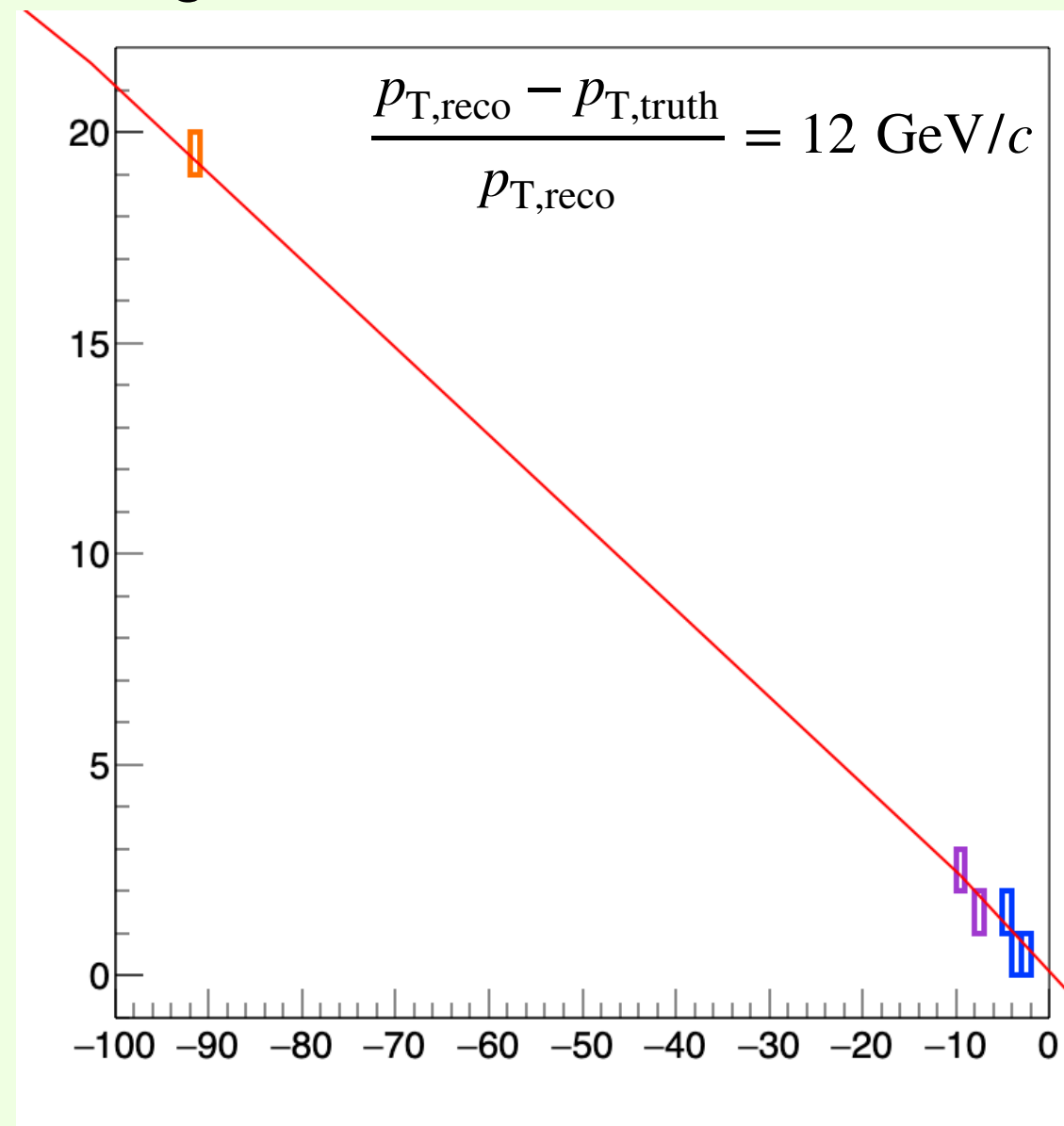
There some reasons that the p_{T} estimation does not work.

Remanings

1. Have to check some weird points of my results.

2. Increase p_T range of single electrons (p_T = 0.5, 1, 2, 5, 8, 10 GeV/c)

3. Check and summarize what does the calorimeter tower making and clustering do

4. Check that it work in PYTHIA simulation (tracking efficiency, p_T resolution)