



# Progress Report

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2<sup>nd</sup> November, 2023

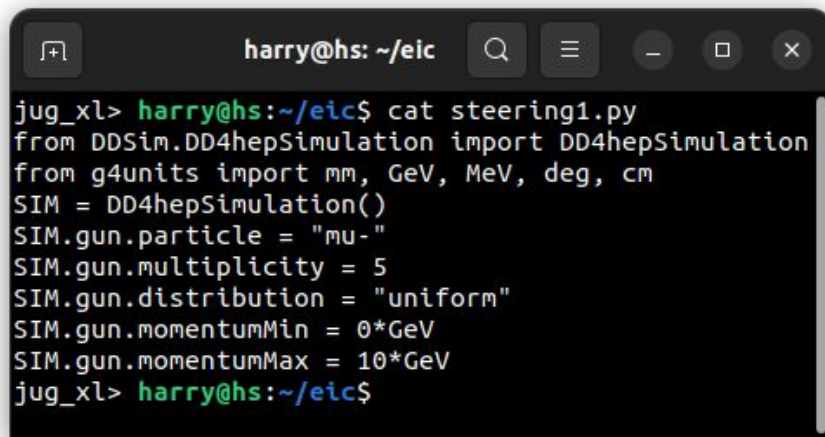
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# List of commands for first task:

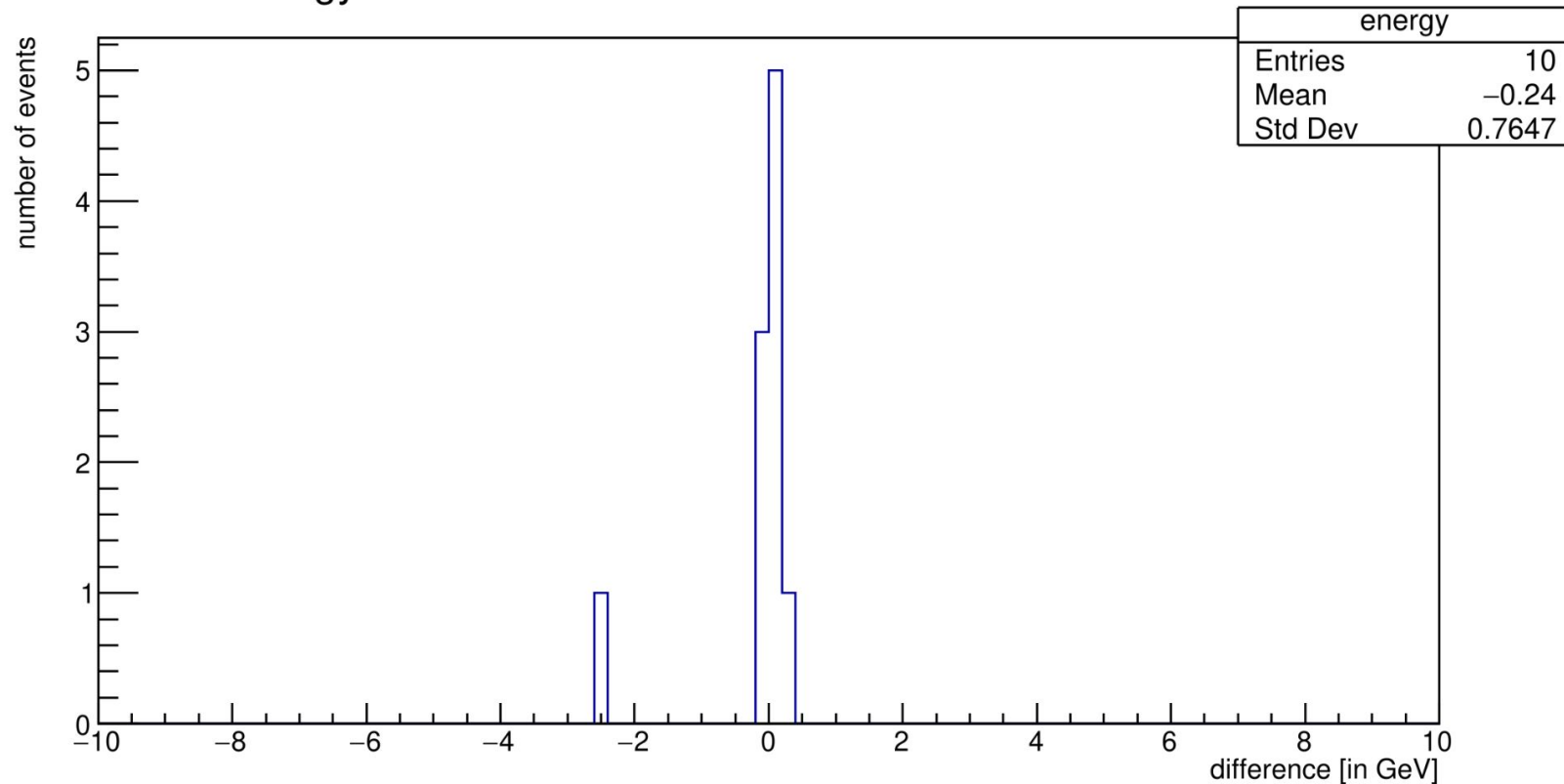
- `ddsim --steeringFile=steering1.py`  
`--compactFile=$DETECTOR_PATH/$DETECTOR_CONFIG.xml`  
`--outputFile=output1.edm4hep.root -G -N=10`
- `eicrecon -Ppodio:output_file=result1.root output1.edm4hep.root`
- `root -l analysis.C("result1.root", "analysis1-out.root")`
- `steering1.py`

A terminal window with a dark background and light text. The window title is 'harry@hs: ~/eic'. The prompt is 'jug\_xl>'. The user has entered 'harry@hs:~/eic\$ cat steering1.py'. The output shows the contents of the file: 'from DDSim.DD4hepSimulation import DD4hepSimulation', 'from g4units import mm, GeV, MeV, deg, cm', 'SIM = DD4hepSimulation()', 'SIM.gun.particle = "mu-"', 'SIM.gun.multiplicity = 5', 'SIM.gun.distribution = "uniform"', 'SIM.gun.momentumMin = 0\*GeV', 'SIM.gun.momentumMax = 10\*GeV'. The prompt is now 'jug\_xl> harry@hs:~/eic\$'.

```
jug_xl> harry@hs:~/eic$ cat steering1.py
from DDSim.DD4hepSimulation import DD4hepSimulation
from g4units import mm, GeV, MeV, deg, cm
SIM = DD4hepSimulation()
SIM.gun.particle = "mu-"
SIM.gun.multiplicity = 5
SIM.gun.distribution = "uniform"
SIM.gun.momentumMin = 0*GeV
SIM.gun.momentumMax = 10*GeV
jug_xl> harry@hs:~/eic$
```

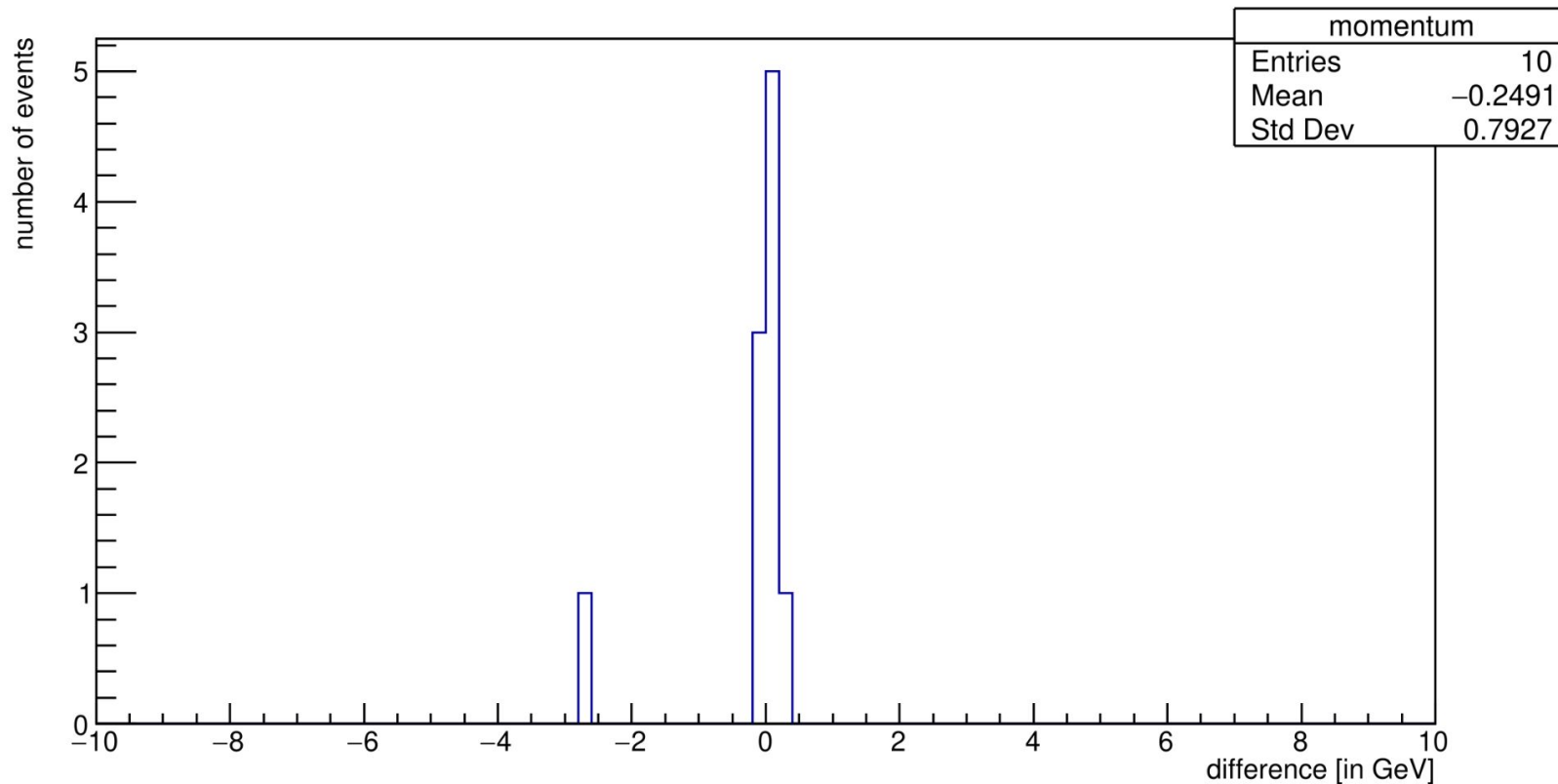
# Results

Energy Difference b/w MC Particles and Recons. Particles

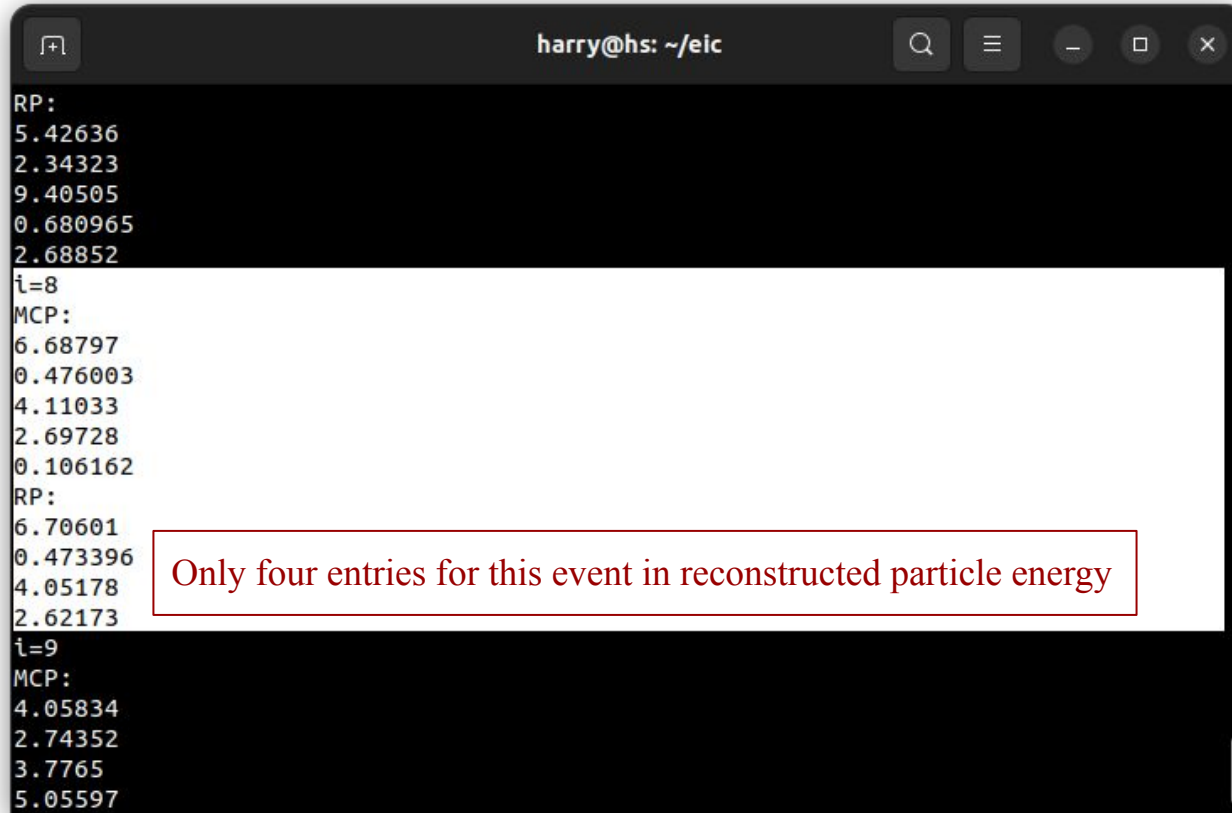


# Results

Momentum Difference b/w MC Particles and Recons. Particles



# Possible cause of this weirdly large deviation:

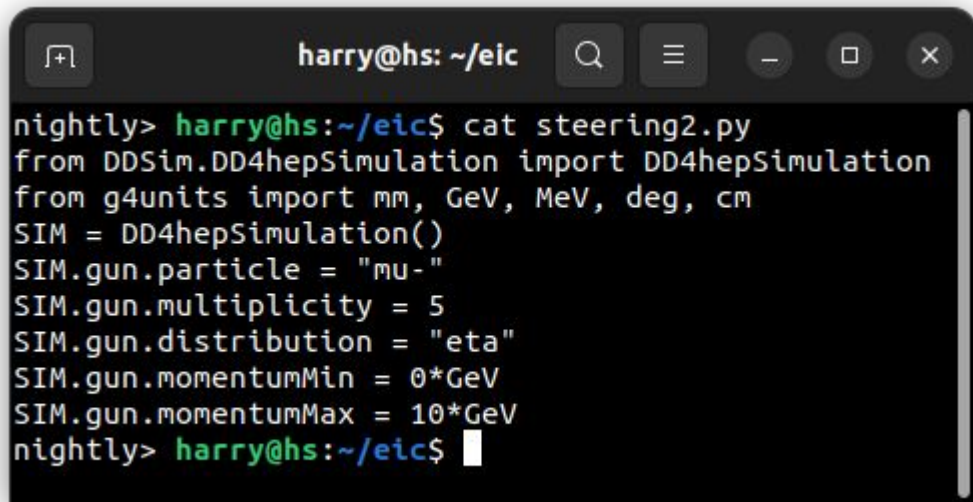


```
harry@hs: ~/eic
RP:
5.42636
2.34323
9.40505
0.680965
2.68852
i=8
MCP:
6.68797
0.476003
4.11033
2.69728
0.106162
RP:
6.70601
0.473396
4.05178
2.62173
i=9
MCP:
4.05834
2.74352
3.7765
5.05597
```

Only four entries for this event in reconstructed particle energy

## List of commands for second task:

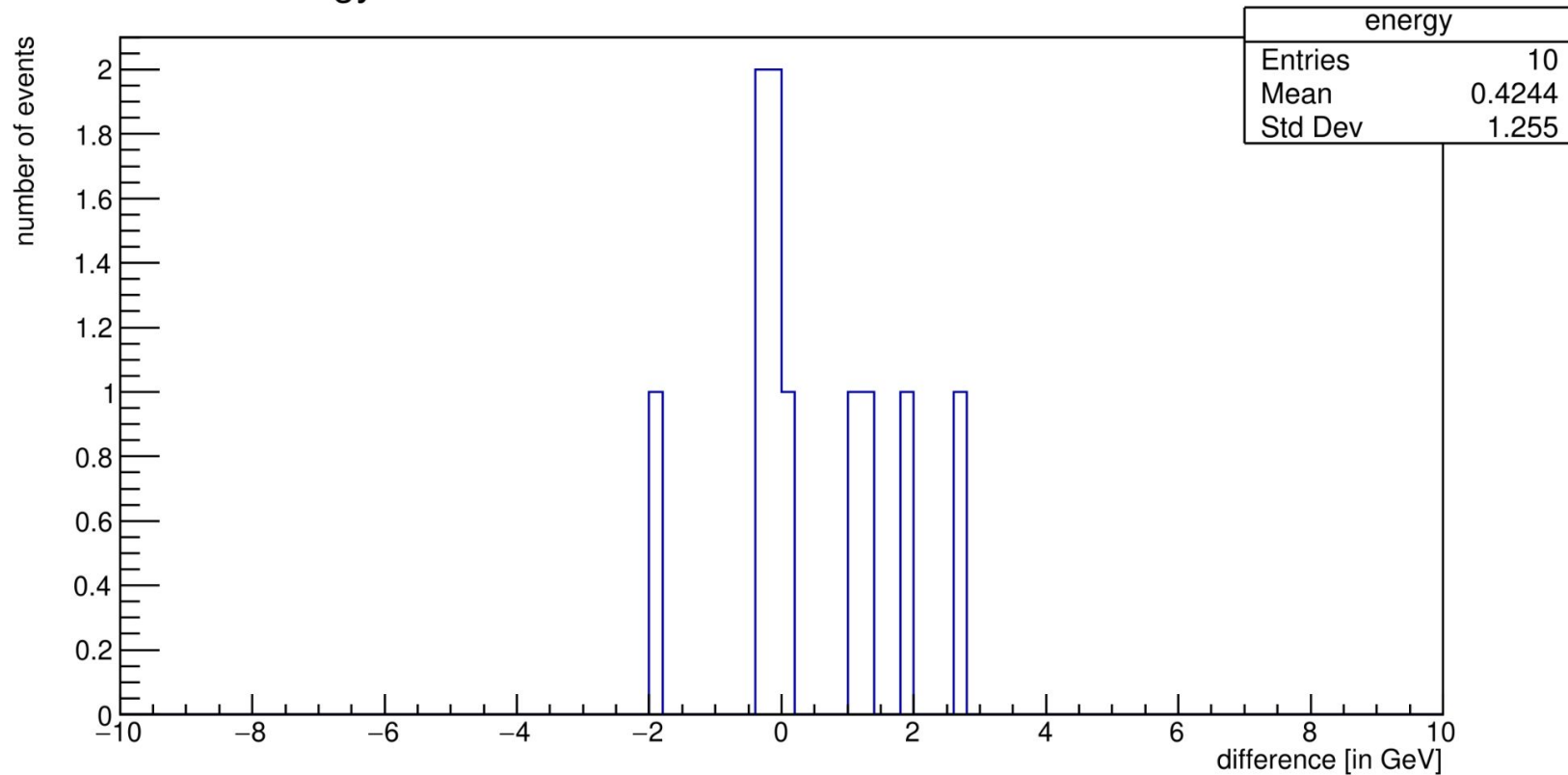
- `ddsim --steeringFile=steering2.py`  
`--compactFile=$DETECTOR_PATH/$DETECTOR_CONFIG.xml`  
`--outputFile=output2.edm4hep.root -G -N=10`
- `eicrecon -Ppodio:output_file=result2.root output2.edm4hep.root`
- `root -l analysis.C("result2.root", "analysis2-out.root")`
- `steering2.py`

A terminal window with a dark background and light text. The title bar shows 'harry@hs: ~/eic'. The prompt is 'nightly>'. The user has entered 'cat steering2.py' and the output is displayed line by line. The code defines a DD4hep simulation with a muon gun, 5 particles, eta distribution, and momentum range from 0 to 10 GeV.

```
nightly> harry@hs:~/eic$ cat steering2.py
from DDSim.DD4hepSimulation import DD4hepSimulation
from g4units import mm, GeV, MeV, deg, cm
SIM = DD4hepSimulation()
SIM.gun.particle = "mu-"
SIM.gun.multiplicity = 5
SIM.gun.distribution = "eta"
SIM.gun.momentumMin = 0*GeV
SIM.gun.momentumMax = 10*GeV
nightly> harry@hs:~/eic$
```

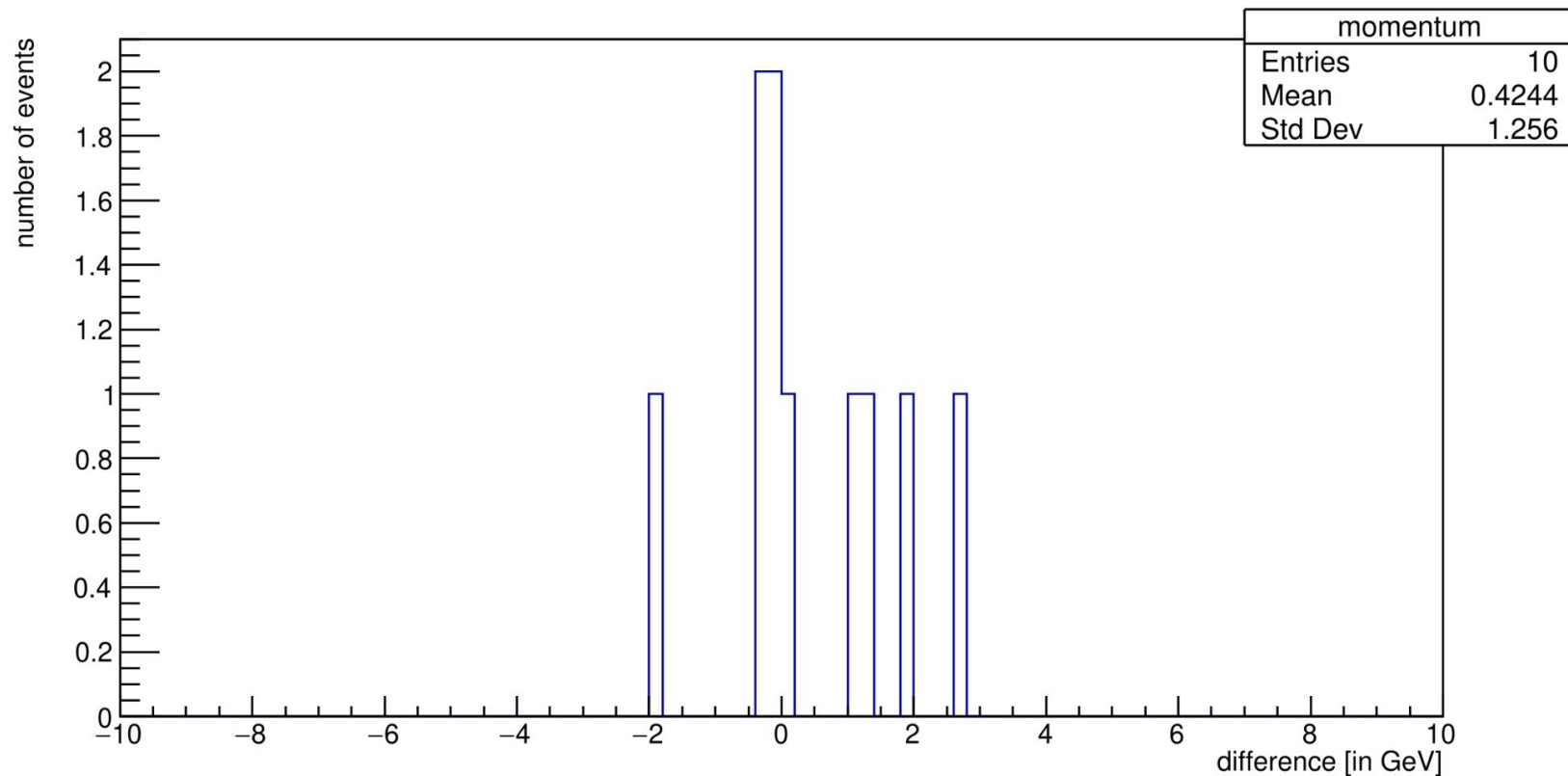
# Results

Energy Difference b/w MC Particles and Recons. Particles



# Results

Momentum Difference b/w MC Particles and Recons. Particles



# Possible cause of this weirdly large deviation:



A terminal window with a dark background and light gray text. The window title is 'harry@hs: ~/eic'. The terminal output consists of a list of numerical values, some followed by labels like 'RP:', 'i=8', 'MCP:', 'i=9', and 'MCP:'. A red rectangular box is drawn over the middle of the list, containing the text 'Less entries of reconstructed particle energy in each event' in red. The terminal output ends with 'root [1] .q'.

```
9.01589
8.3554
6.75362
9.25899
2.85089
RP:
i=8
MCP:
9.65726
5.13383
5.86727
8.48183
7.04121
RP:
9.7361
5.93338
i=9
MCP:
1.93853
0.650154
2.87518
9.85761
5.58962
RP:
root [1] .q
```

Less entries of reconstructed particle energy in each event