Momentum loss study by SIMC

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Kinematics used:

Input file: **feb17_eep.inp**

File Location: **/w/halla-scshelf2102/triton/bishnu/HALLC_SIMC_Jan2022/simc_gfortran/infiles**

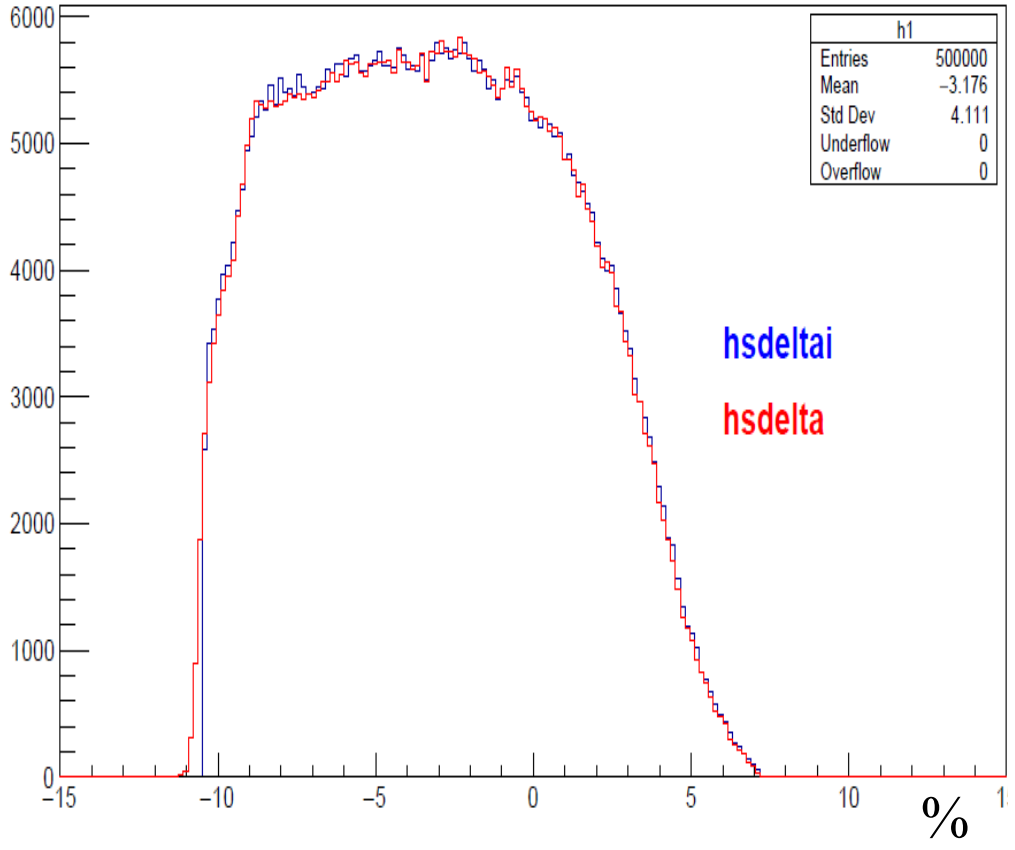
```
ngen = 500000
 EXPER%charge =  1.
 doing_phsp = 0
 doing_kaon = 1
 doing_pion = 0
 doing_decay = 0
 ctau = 780.4
 transparency = 0.36
```

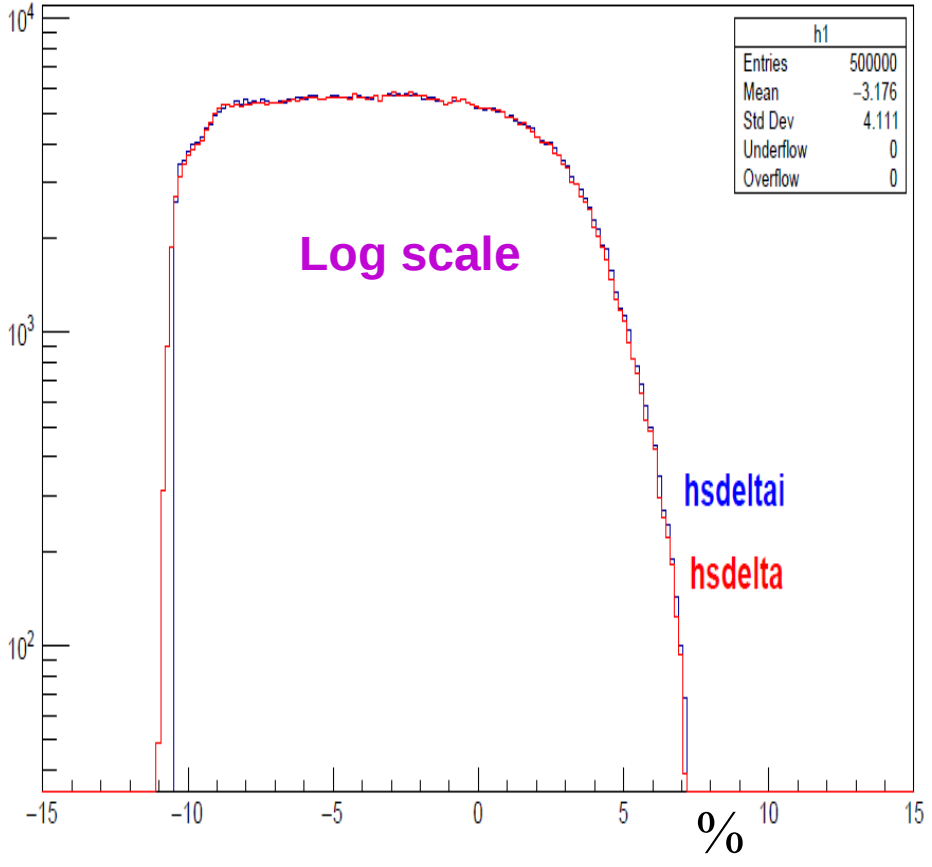
```
Ebeam = 4240.
 dEbeam = 0.05
 electron_arm = 1
 hadron_arm = 5
 spec%e%P = 2740.0
 spec%e%theta =6.50
 spec%p%P = 1200.0
 spec%p%theta =11.5.
```

```
begin parm target
  targ%A = 3.0
  targ%Z = 2.0
  targ%mass_amu = 3.015481
  targ%mrec_amu = 3.213675
  targ%rho = 0.07332
  targ%thick = 262.172
  targ%angle = 0.
  targ%abundancy = 100.
  targ%can = 2
end parm target
```

```
 hard_cuts = 0
using_rad = 1
 use_expon = 0
 one_tail = 0
 intcor_mode = 1         ;
 spect_mode = 0          ;
 cuts%Em%min = 0.
 cuts%Em%max = 200.
 using_Eloss = 1;
 correct_Eloss = 1
 correct_raster = 1
 mc_smear = 1
 deForest_flag = 0
 rad_flag = 0
 extrad_flag = 2
 lambda(1) = 0.0
 lambda(2) = 0.0
 lambda(3) = 0.0
 Nntu = 1
 using_Coulomb = 1
 dE_edge_test = 0.
 Egamma_gen_max = 0.
```

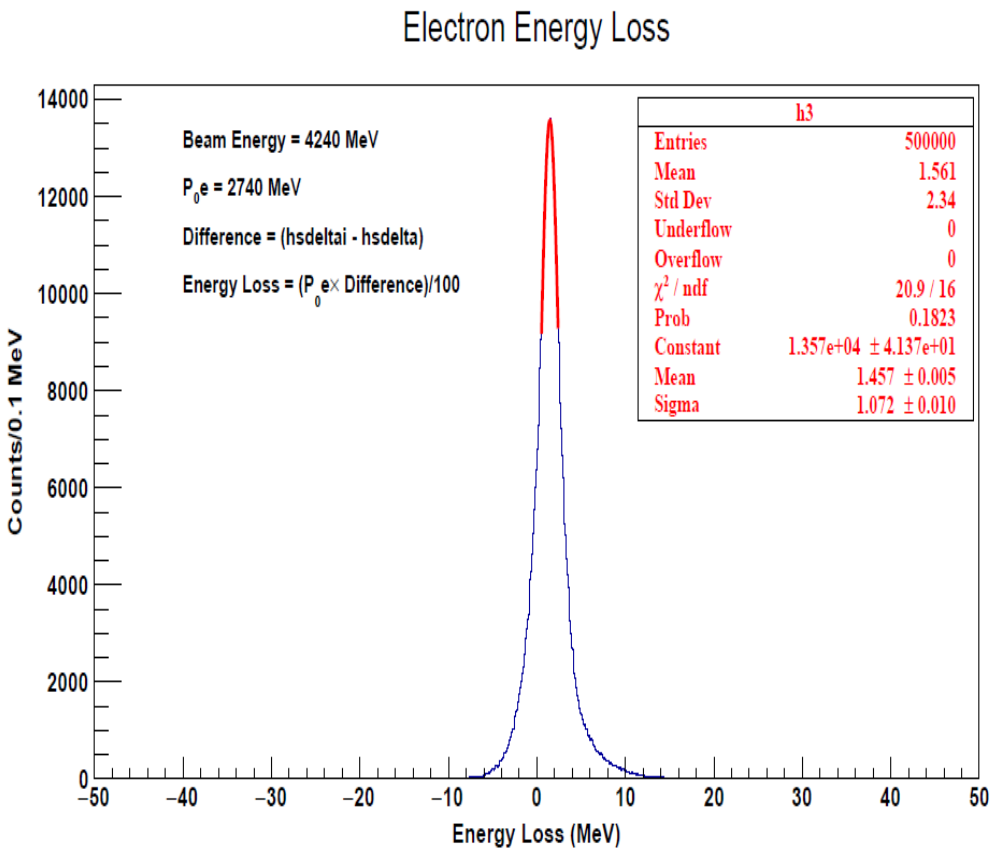
Comparison between generated and reconstructed delta (hsdelta and hsdeltai)



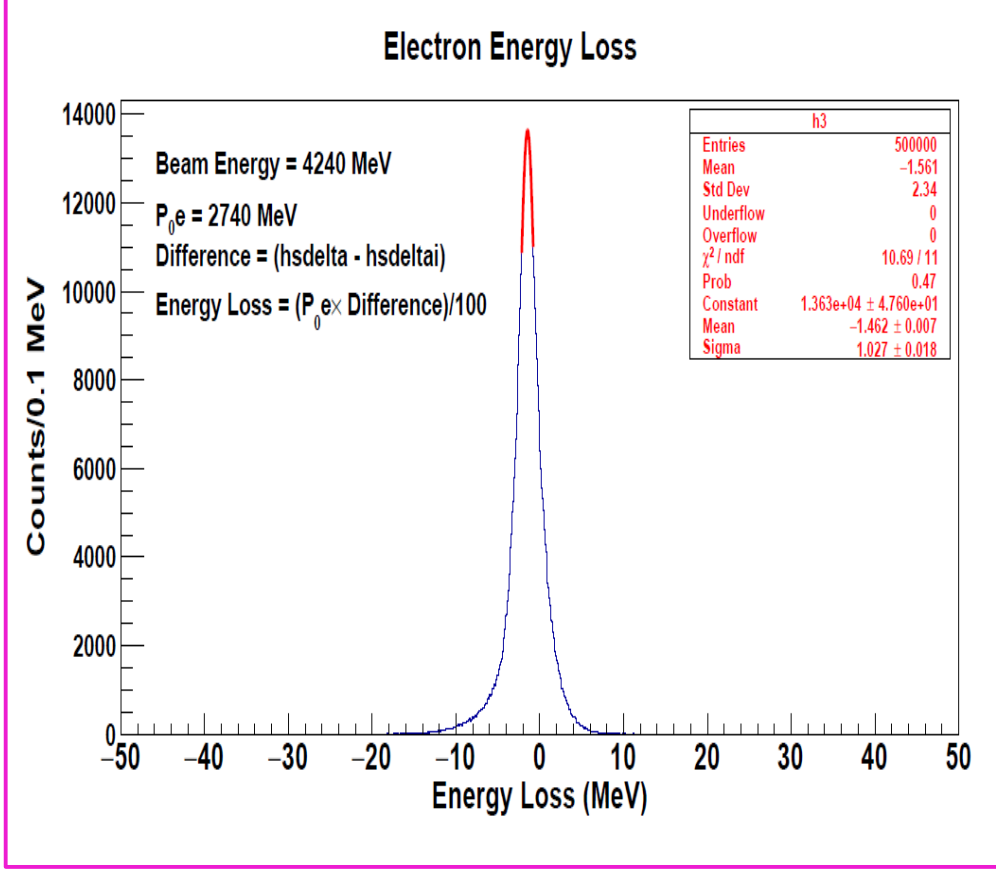


- It looks like the data is not symmetric around 0. The spectrum is more towards left side.
- Also on the left side, the reconstructed delta (hsdelta or the red line) is larger than the generated delta (hsdeltai or the blue line). That is in the negative region, hsdelta>hsdeltai.

Generated delta – Reconstructed delta

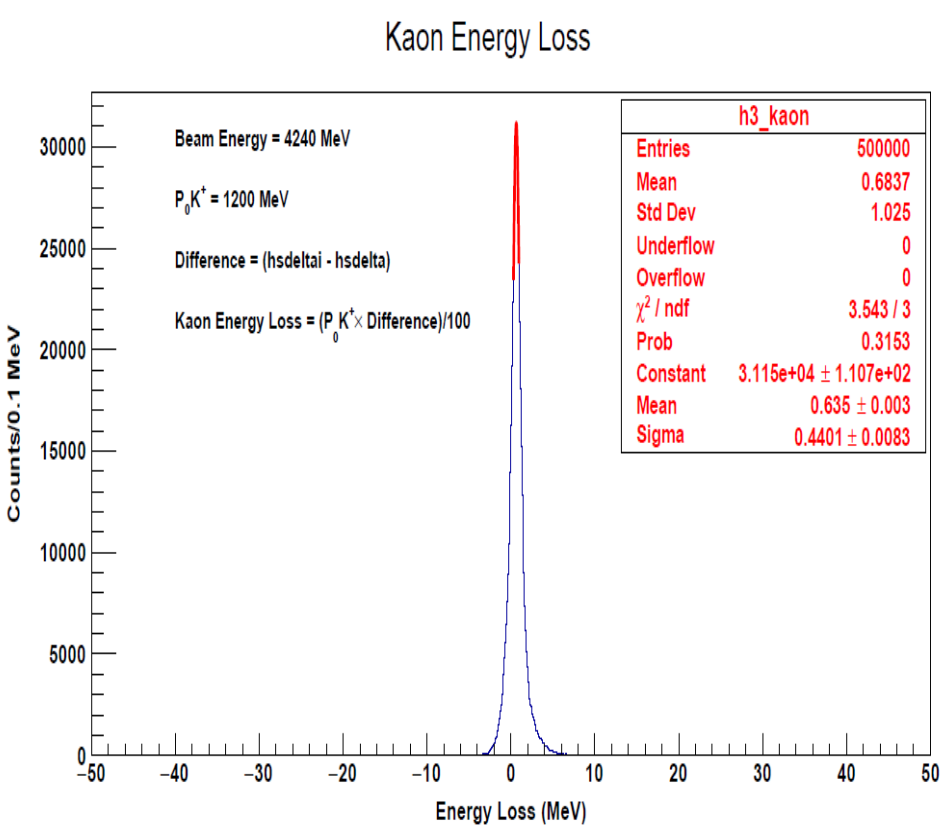


Reconstructed delta – Generated delta

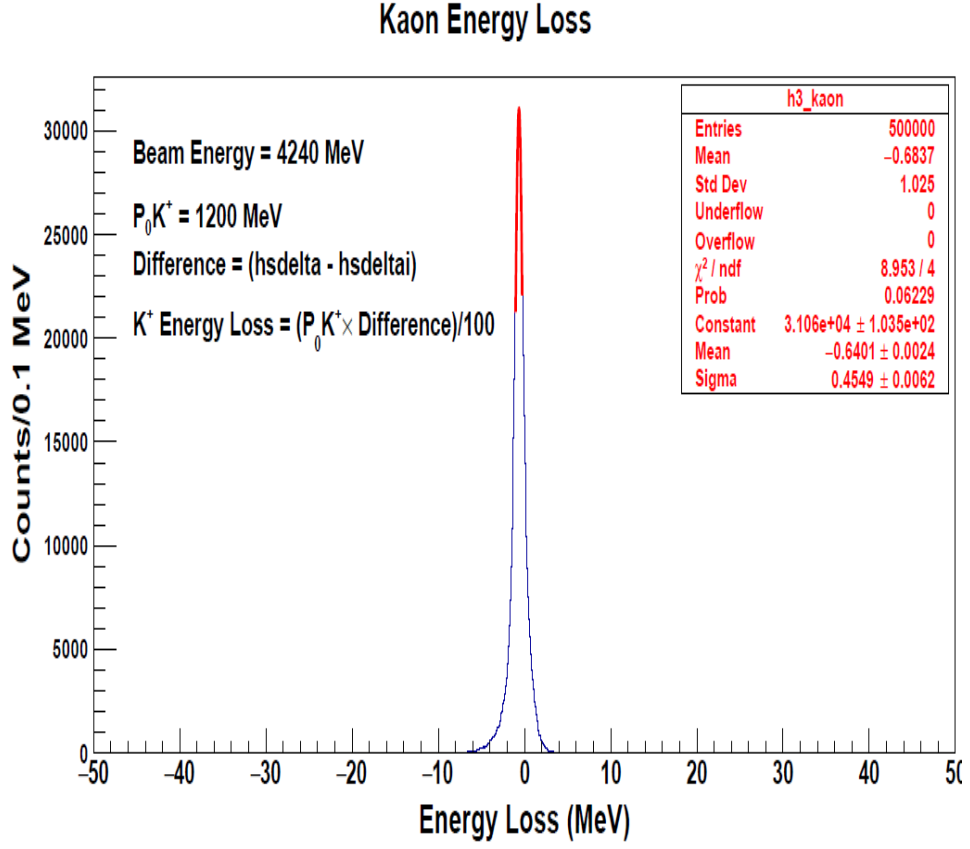


- In the 1st histogram, reconstructed delta is subtracted from the generated delta, however, there are still a lot of events in the negative region.
- I am not sure why the events are appeared in the negative region.

Generated delta – Reconstructed delta

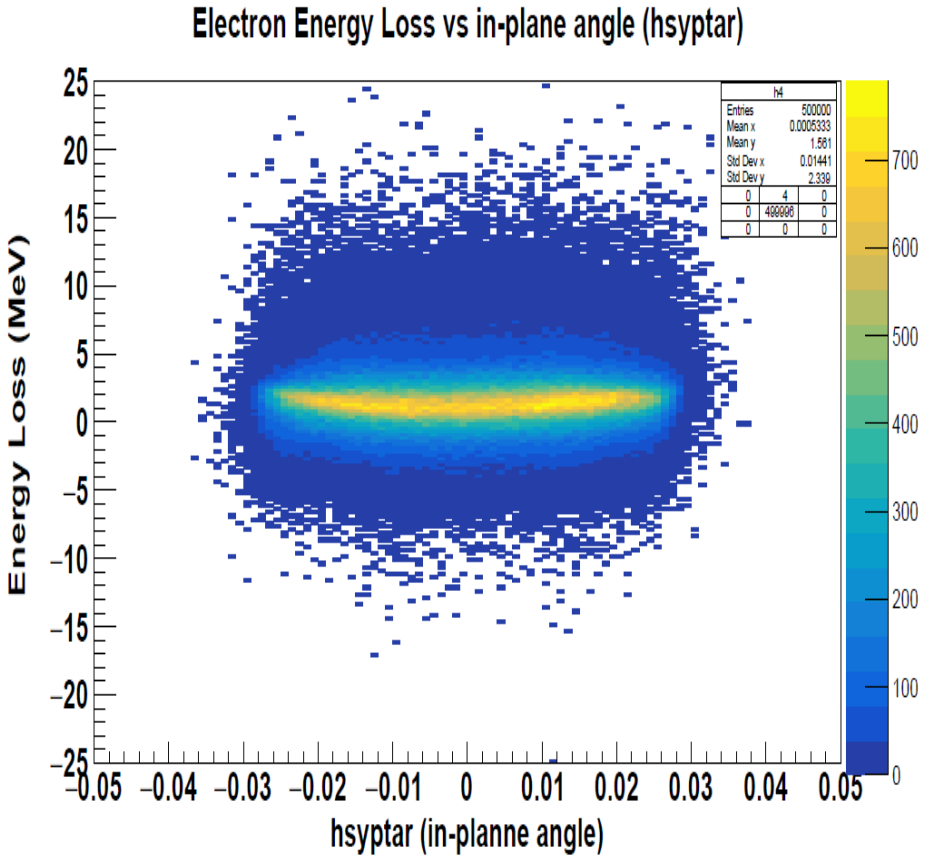


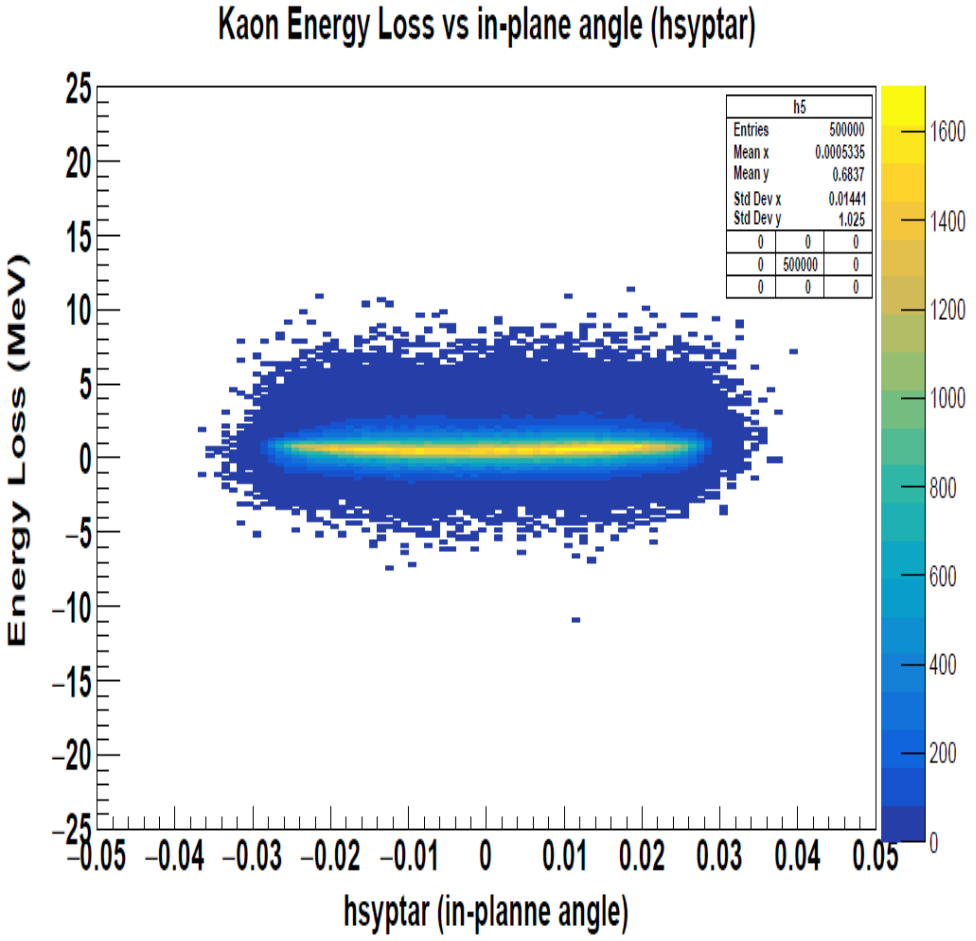
Reconstructed delta – Generated delta

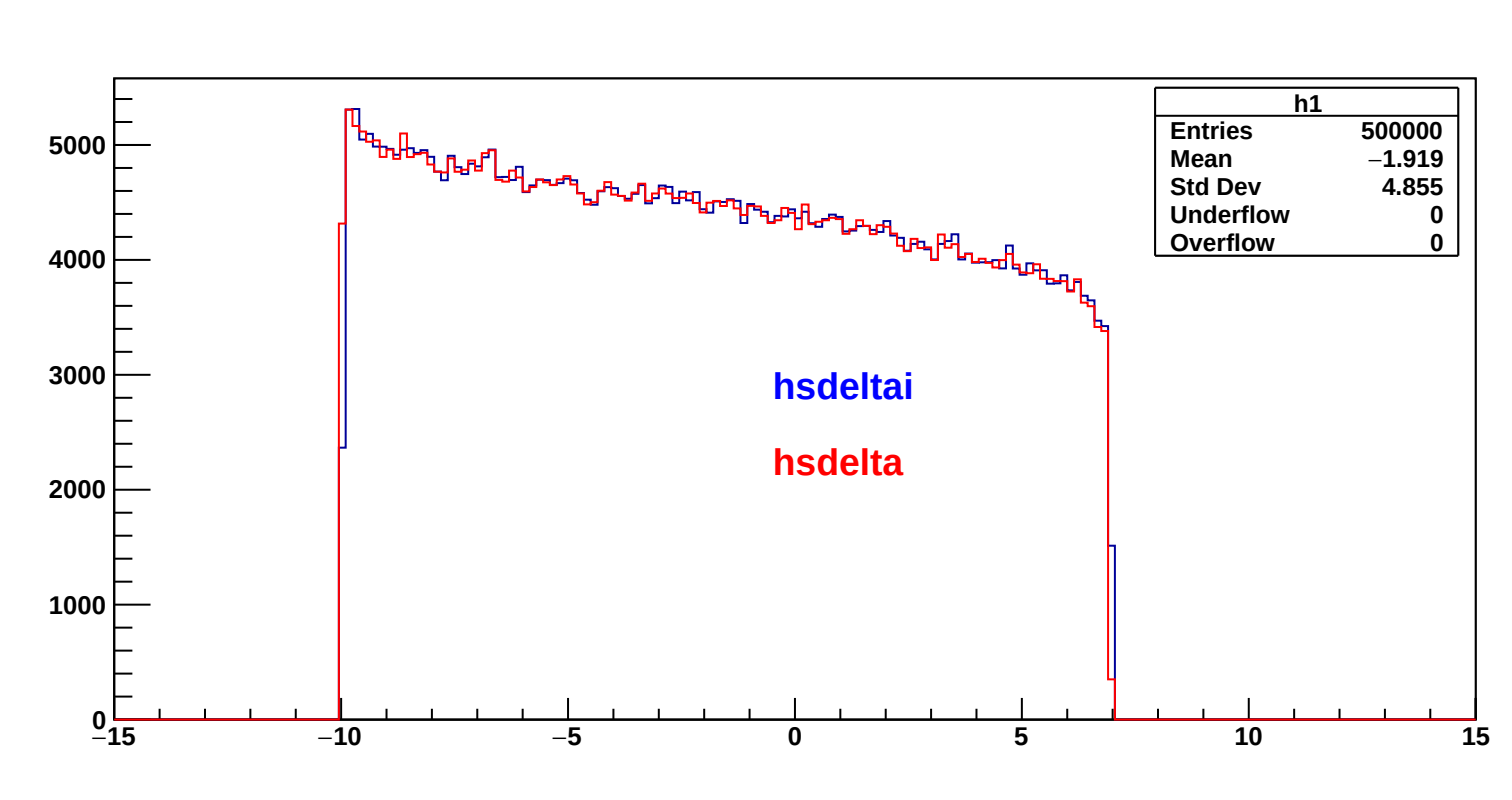


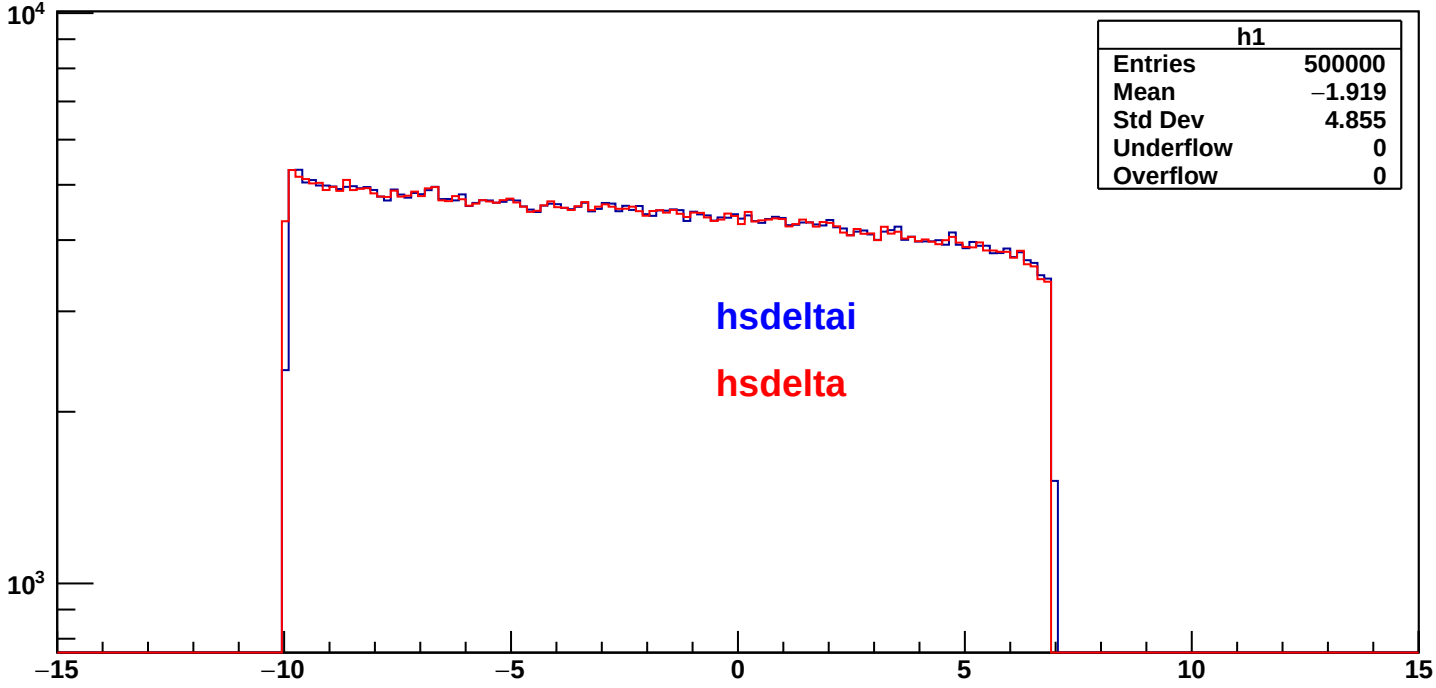
- In the 1st histogram, reconstructed delta is subtracted from the generated delta, however, there are still a lot of events in the negative region.
- I do not understand why the events are in the negative region.

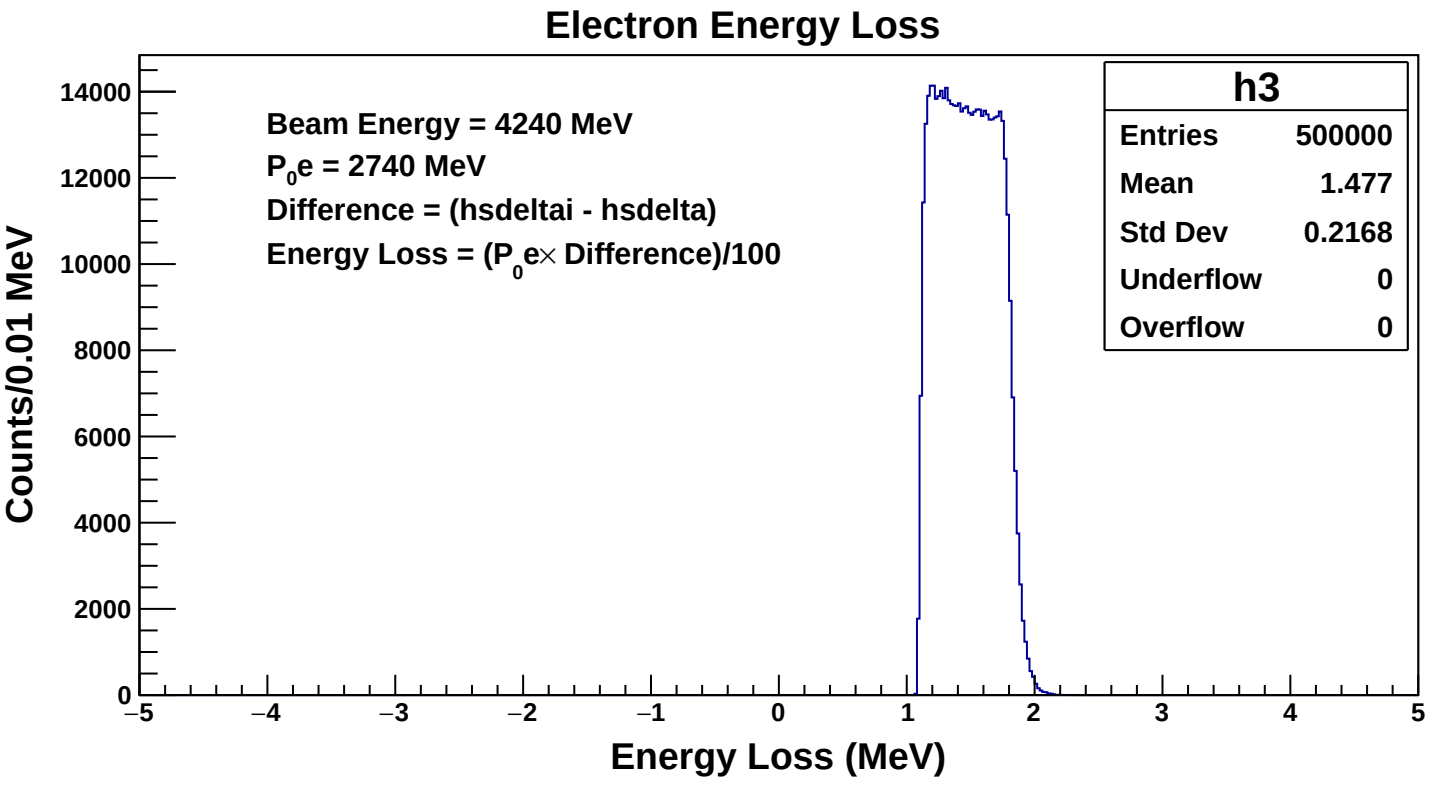
Momentum Loss vs in-plane angle

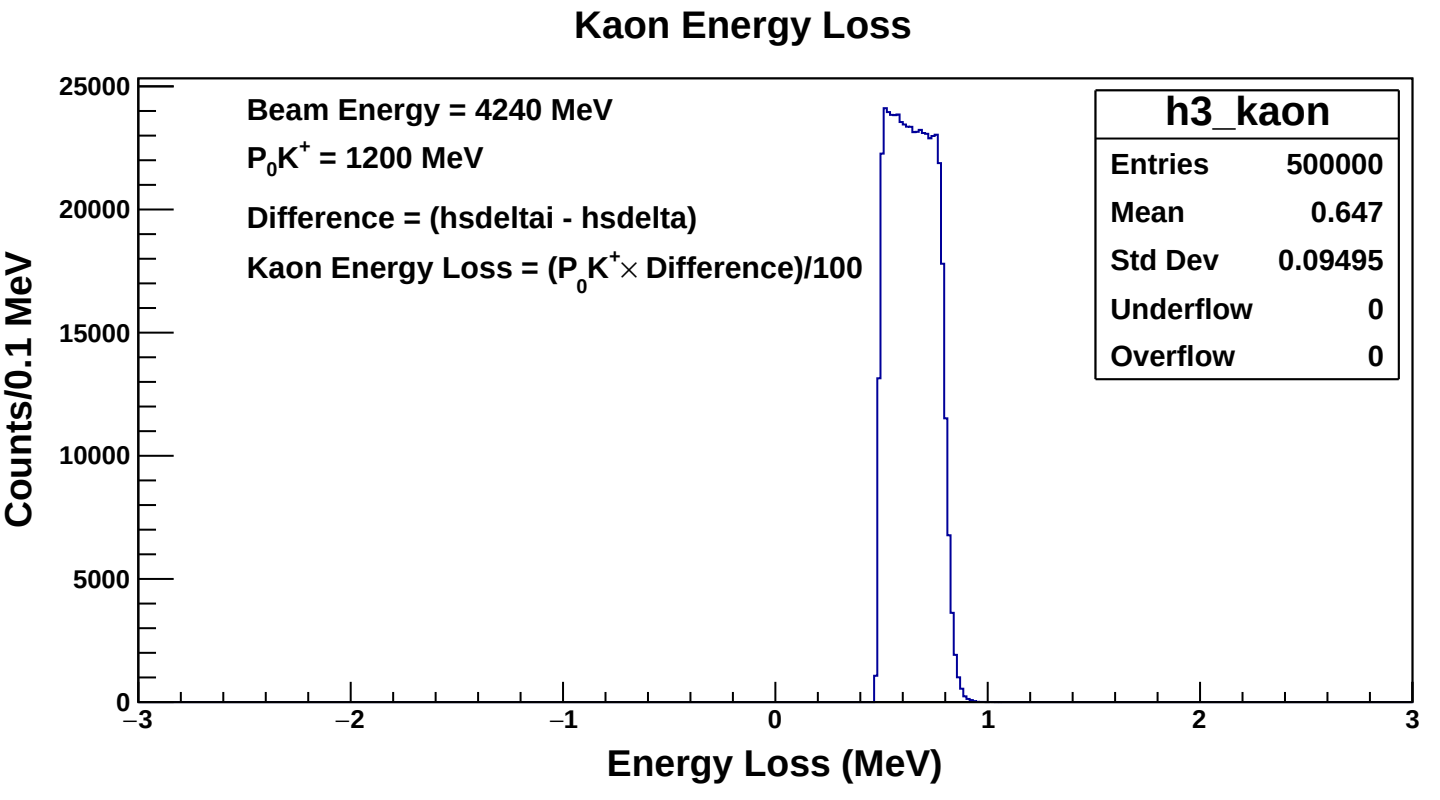


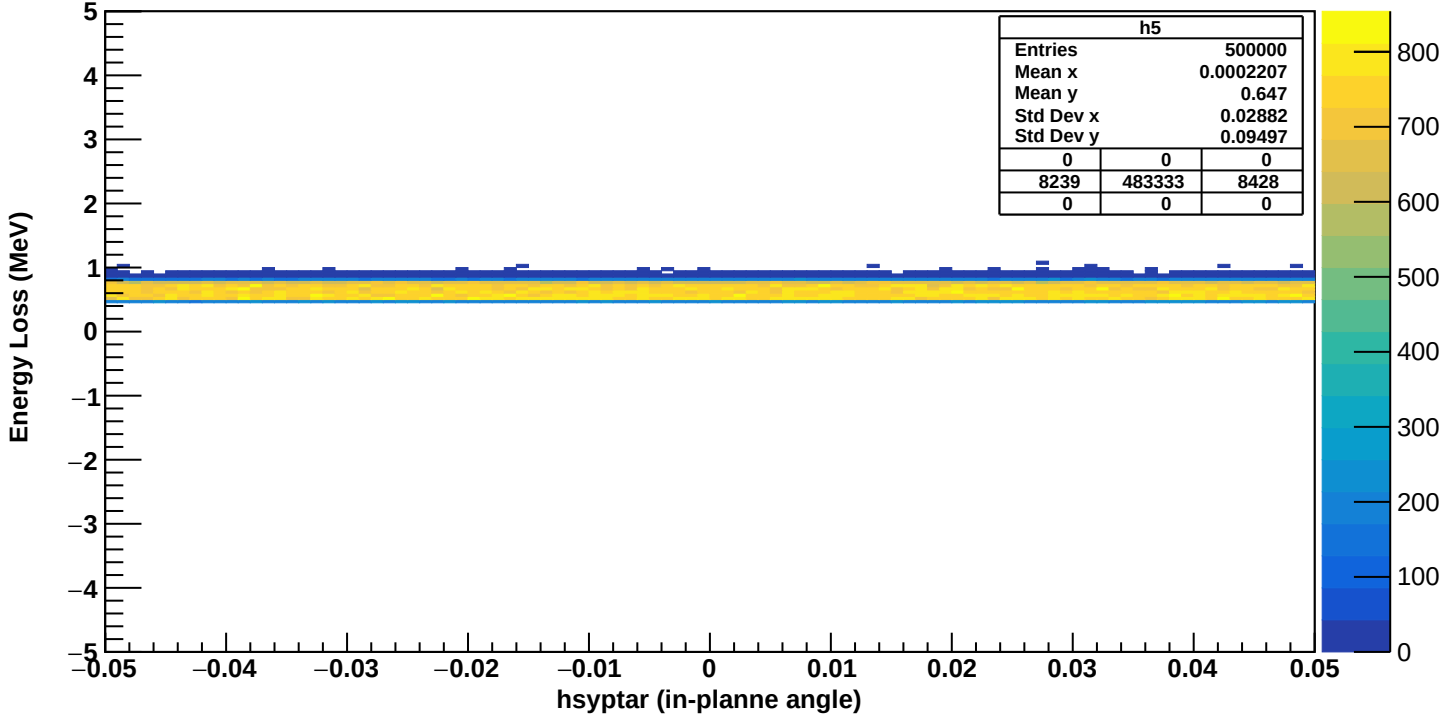


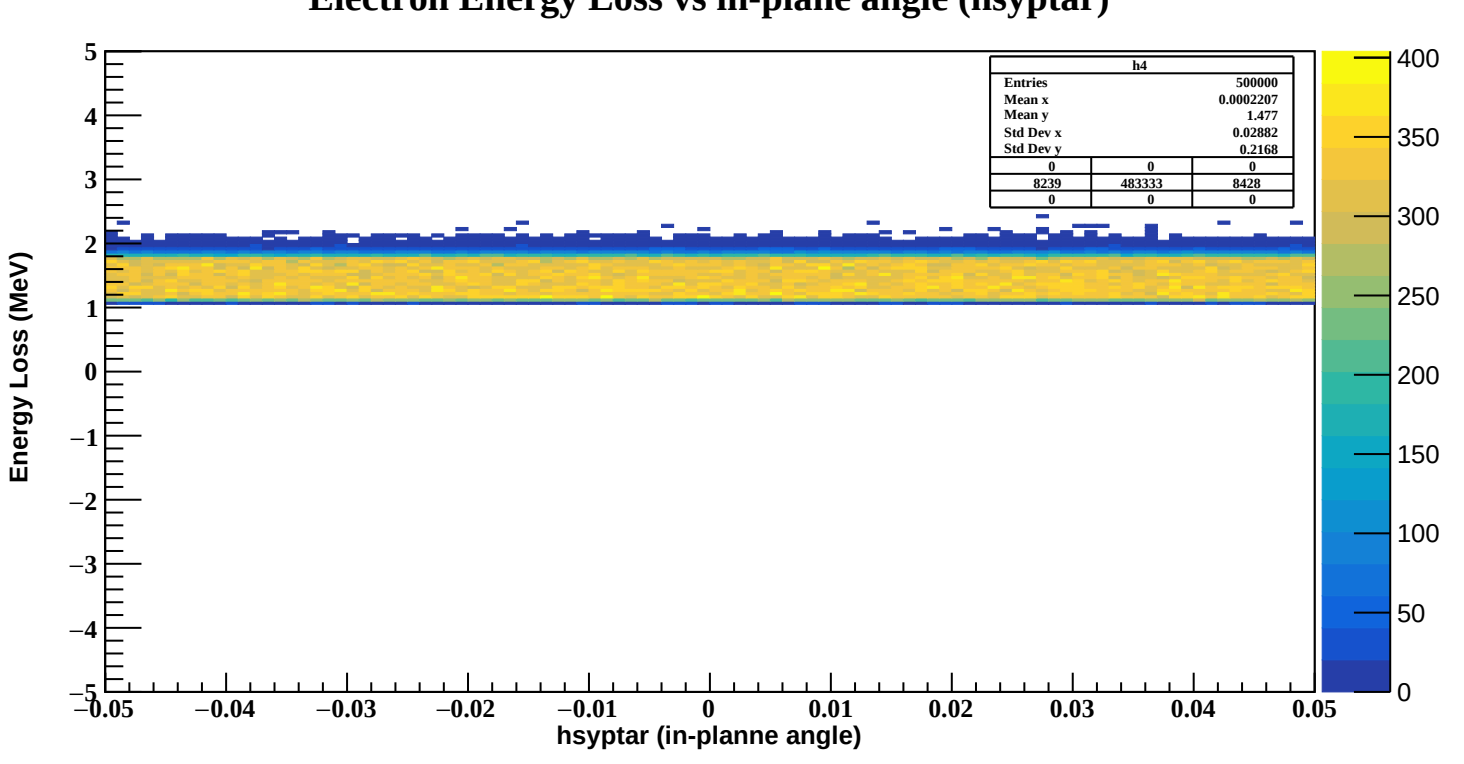

h1
Entries 500000
Mean −1.919
Std Dev 4.855
Underflow 0
Overflow 0
hsdeltai
hsdelta
5000
4000
3000
2000
1000
0
−15
−10
−5
0
5
10
15


h1
Entries 500000
Mean −1.919
Std Dev 4.855
Underflow 0
Overflow 0
hsdeltai
hsdelta
10^4
10^3
−15
−10
−5
0
5
10
15


Electron Energy Loss
Beam Energy = 4240 MeV
P0e = 2740 MeV
Difference = (hsdeltai - hsdelta)
Energy Loss = (P0e× Difference)/100
h3
Entries 500000
Mean 1.477
Std Dev 0.2168
Underflow 0
Overflow 0
Counts/0.01 MeV
Energy Loss (MeV)
0
2000
4000
6000
8000
10000
12000
14000
−5
−4
−3
−2
−1
0
1
2
3
4
5


Kaon Energy Loss
Beam Energy = 4240 MeV
P0K+ = 1200 MeV
Difference = (hsdeltai - hsdelta)
Kaon Energy Loss = (P0K+× Difference)/100
h3_kaon
Entries 500000
Mean 0.647
Std Dev 0.09495
Underflow 0
Overflow 0
Counts/0.1 MeV
Energy Loss (MeV)
25000
20000
15000
10000
5000
0
−3
−2
−1
0
1
2
3


Kaon Energy Loss vs in-plane angle (hsyptar)
h5
Entries 500000
Mean x 0.0002207
Mean y 0.647
Std Dev x 0.02882
Std Dev y 0.09497
0 0 0
8239 483333 8428
0 0 0
Energy Loss (MeV)
hsyptar (in-planne angle)
5
4
3
2
1
0
−1
−2
−3
−4
−5
−0.05
−0.04
−0.03
−0.02
−0.01
0
0.01
0.02
0.03
0.04
0.05
800
700
600
500
400
300
200
100
0


Electron Energy Loss vs in-plane angle (hsyptar)
h4
Entries 500000
Mean x 0.0002207
Mean y 1.477
Std Dev x 0.02882
Std Dev y 0.2168
0 0 0
8239 483333 8428
0 0 0
Energy Loss (MeV)
hsyptar (in-planne angle)
5
4
3
2
1
0
−1
−2
−3
−4
−5
−0.05
−0.04
−0.03
−0.02
−0.01
0
0.01
0.02
0.03
0.04
0.05
400
350
300
250
200
150
100
50
0