Target Energy Loss Study with SIMC

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In this study the same target and kinematics is used as used in the E12-17-003 Experiment

Target Parameters Used:

Target wall thickness = 400 μm
Target Length = 25 cm
Target diameter = 12.7 mm
Target thickness = 84.8 mg/cm^2

Kinematics Used:

Beam energy = 4326.0 MeV
Electron arm central momentum= 2218.0 MeV/c
Electron arm angle =13.2^0
Hadron arm central momentum = 1823.0 MeV/c
Hadron arm angle =13.2^0

Electron arm = HMS
Hadron arm = SHMS

Energy Loss for the Beam Electron:

SIMC doesn't have any leaf variable to calculate the energy loss for the beam electron when it passes through the Al window (target cell entrance window), so it can not be printed in a histogram. However, it can print the average energy loss as a number.

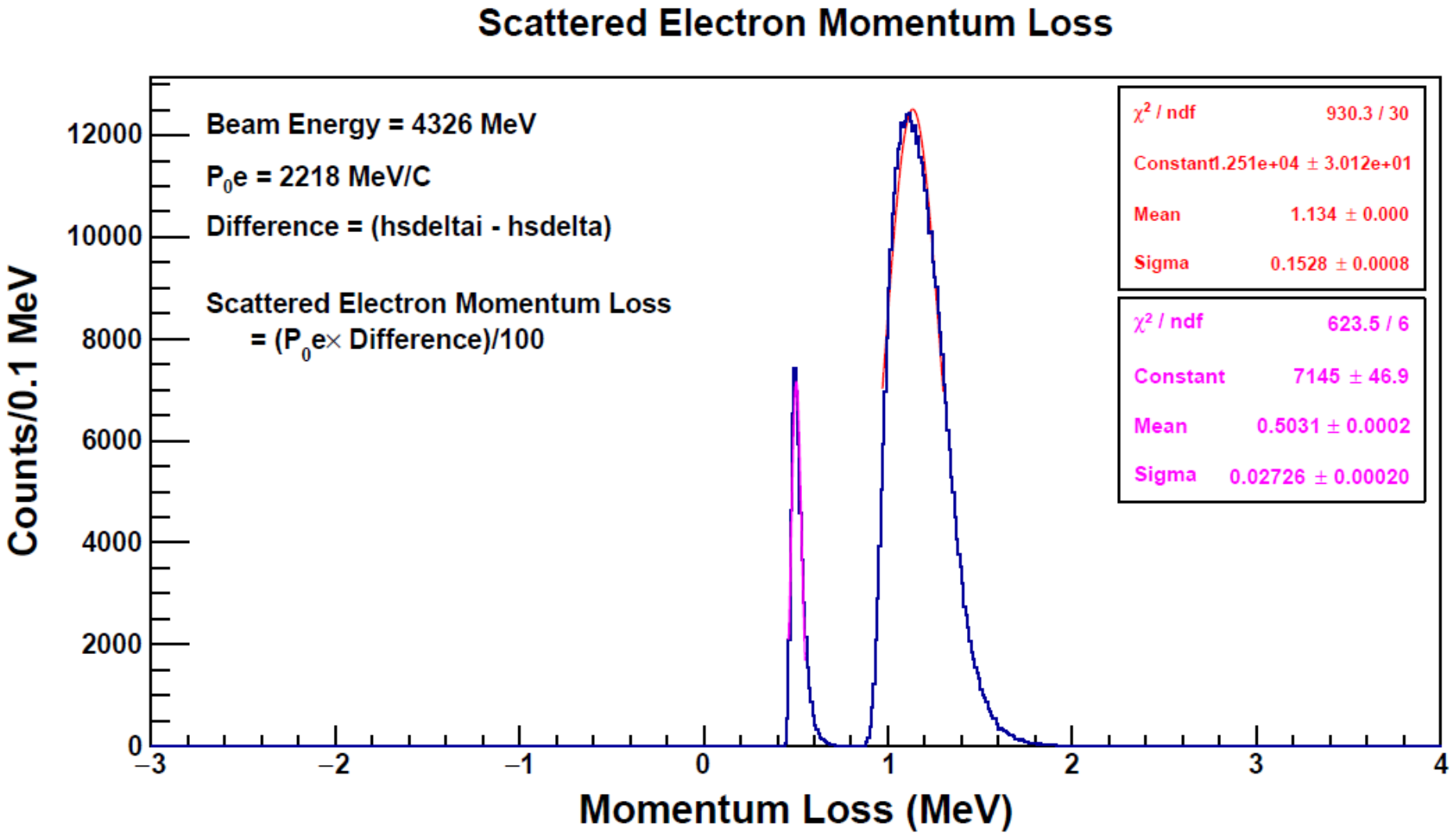
In this study, I ran 500 K events. The average energy loss when the electrons passes through the Al entrance window is as follows:

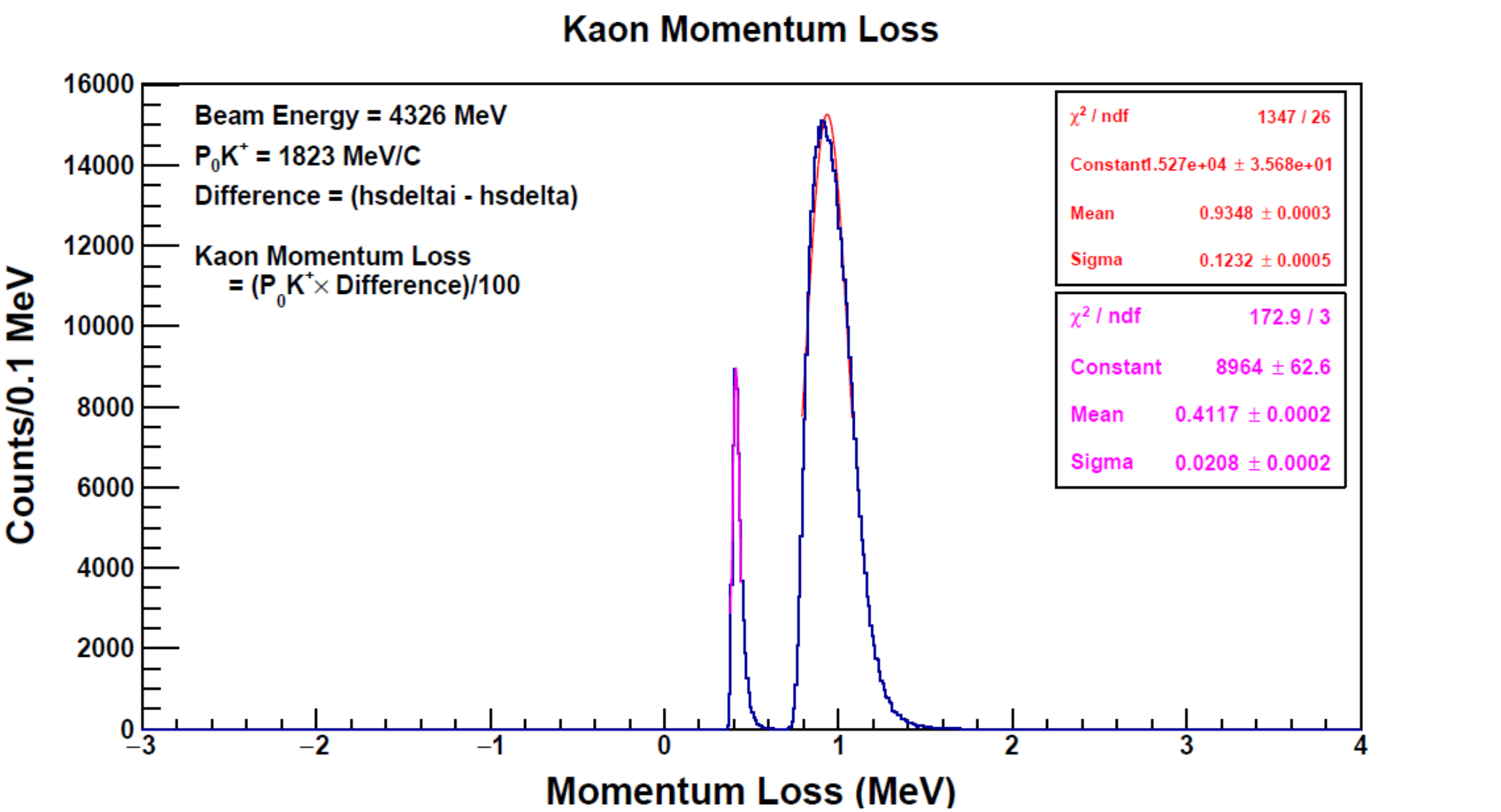
Lowest value = 0.15960 MeV

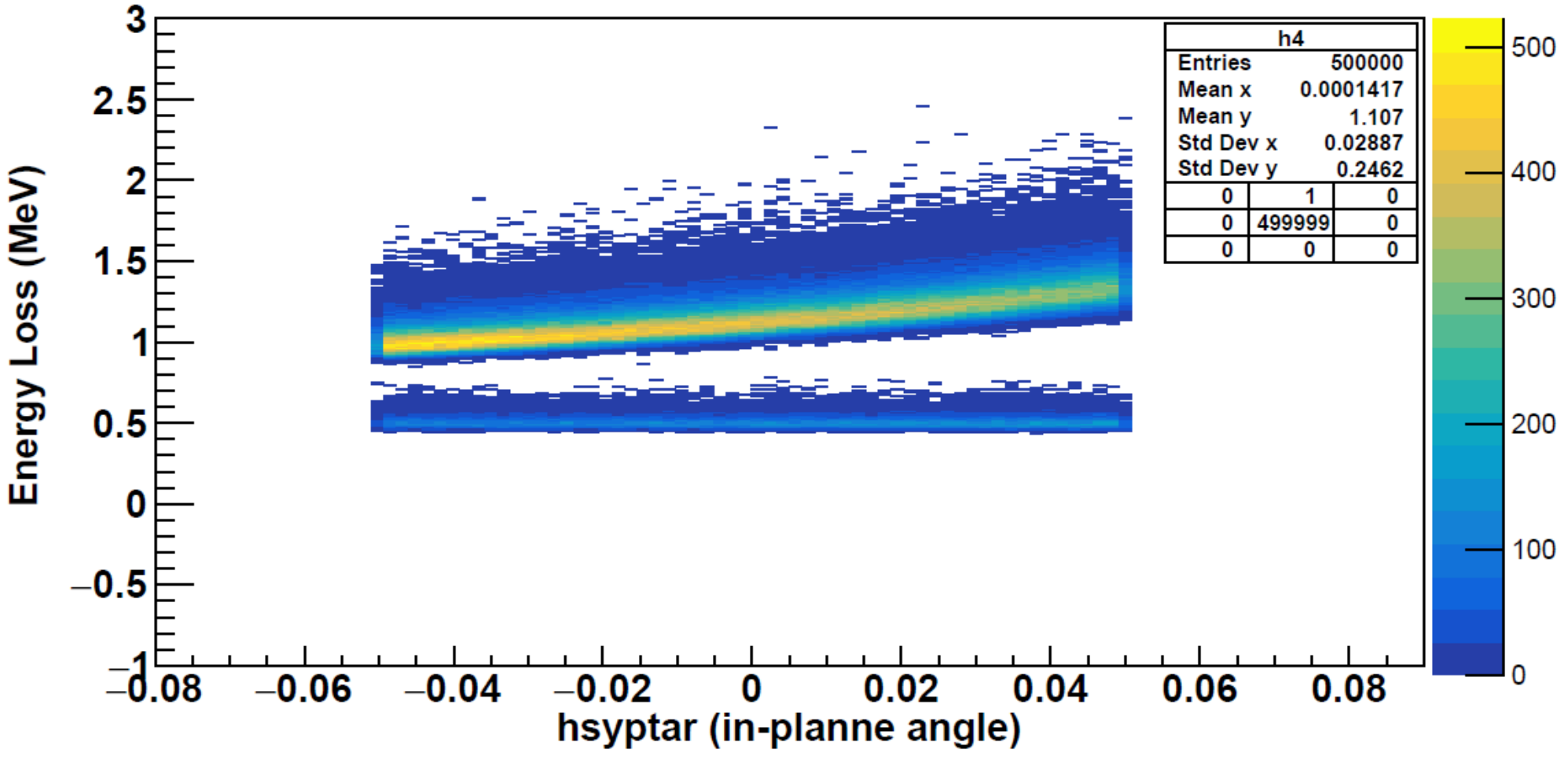
Highest value = 0.41815 MeV

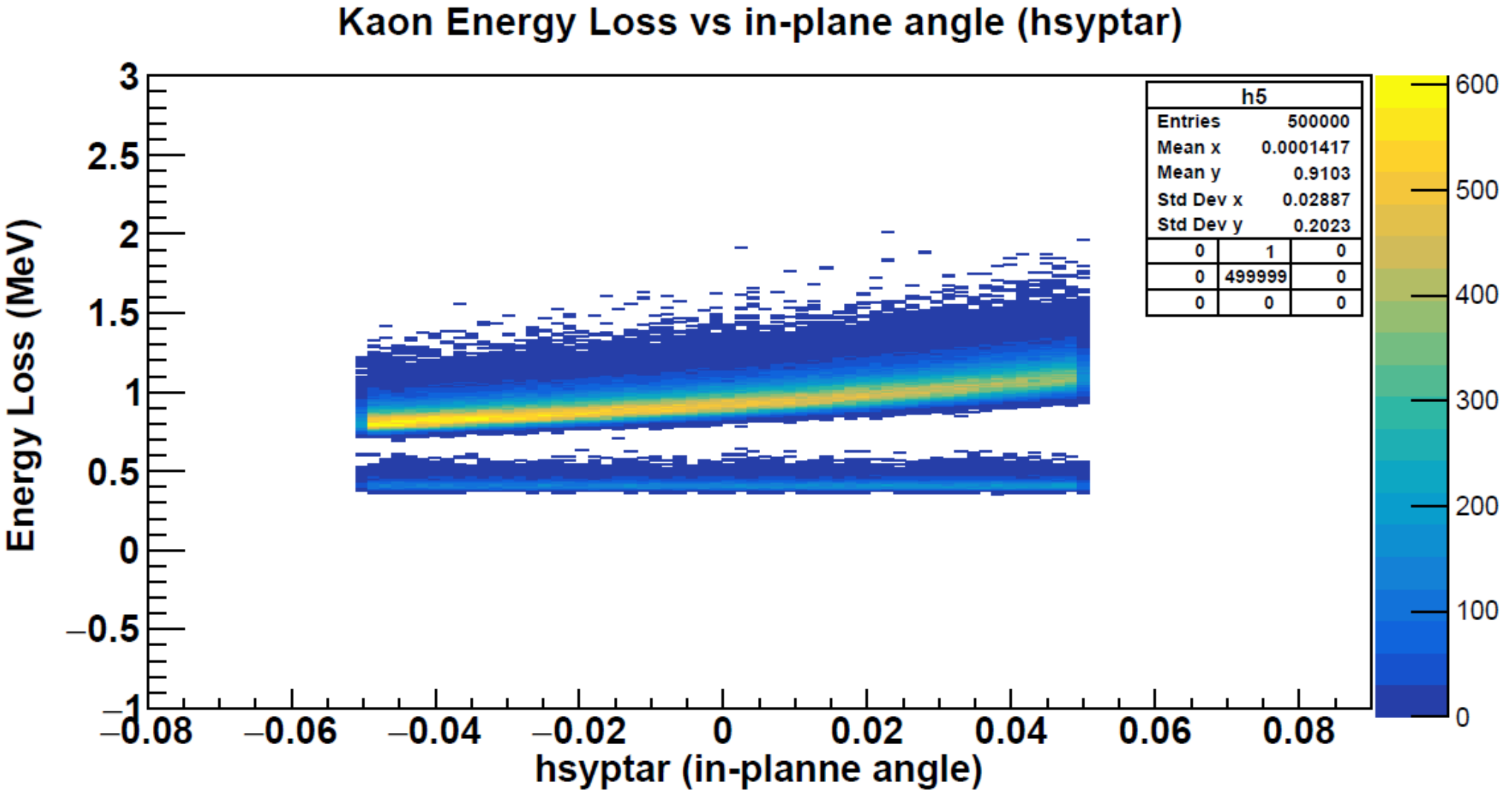
Average energy loss = 0.23443 MeV

Note: The average energy loss may be different if we run different number of events. For 500 K the average loss ~ 0.23 MeV.


Scattered Electron Momentum Loss
Beam Energy = 4326 MeV
P0e = 2218 MeV/C
Difference = (hsdeltai - hsdelta)
Scattered Electron Momentum Loss
= (P0e× Difference)/100
χ2 / ndf 930.3 / 30
Constant 1.251e+04 ± 3.012e+01
Mean 1.134 ± 0.000
Sigma 0.1528 ± 0.0008
χ2 / ndf 623.5 / 6
Constant 7145 ± 46.9
Mean 0.5031 ± 0.0002
Sigma 0.02726 ± 0.00020
Counts/0.1 MeV
Momentum Loss (MeV)
0
2000
4000
6000
8000
10000
12000
−3
−2
−1
0
1
2
3
4


Kaon Momentum Loss
Beam Energy = 4326 MeV
P0K+ = 1823 MeV/C
Difference = (hsdeltai - hsdelta)
Kaon Momentum Loss
= (P0K+ × Difference)/100
χ2 / ndf 1347 / 26
Constant 1.527e+04 ± 3.568e+01
Mean 0.9348 ± 0.0003
Sigma 0.1232 ± 0.0005
χ2 / ndf 172.9 / 3
Constant 8964 ± 62.6
Mean 0.4117 ± 0.0002
Sigma 0.0208 ± 0.0002
Counts/0.1 MeV
Momentum Loss (MeV)
16000
14000
12000
10000
8000
6000
4000
2000
0
−3
−2
−1
0
1
2
3
4


Electron Energy Loss vs in-plane angle (hsyptar)
h4
Entries 500000
Mean x 0.0001417
Mean y 1.107
Std Dev x 0.02887
Std Dev y 0.2462
0 1 0
0 499999 0
0 0 0
Energy Loss (MeV)
hsyptar (in-planne angle)
3
2.5
2
1.5
1
0.5
0
−0.5
−1
−0.08
−0.06
−0.04
−0.02
0
0.02
0.04
0.06
0.08
500
400
300
200
100
0


Kaon Energy Loss vs in-plane angle (hsyptar)
h5
Entries 500000
Mean x 0.0001417
Mean y 0.9103
Std Dev x 0.02887
Std Dev y 0.2023
0 1 0
0 499999 0
0 0 0
Energy Loss (MeV)
3
2.5
2
1.5
1
0.5
0
−0.5
−1
−0.08
−0.06
−0.04
−0.02
0
0.02
0.04
0.06
0.08
hsyptar (in-planne angle)
600
500
400
300
200
100
0