Reconstruction of Simulated NR data

Atul Prajapati, E. Baracchini

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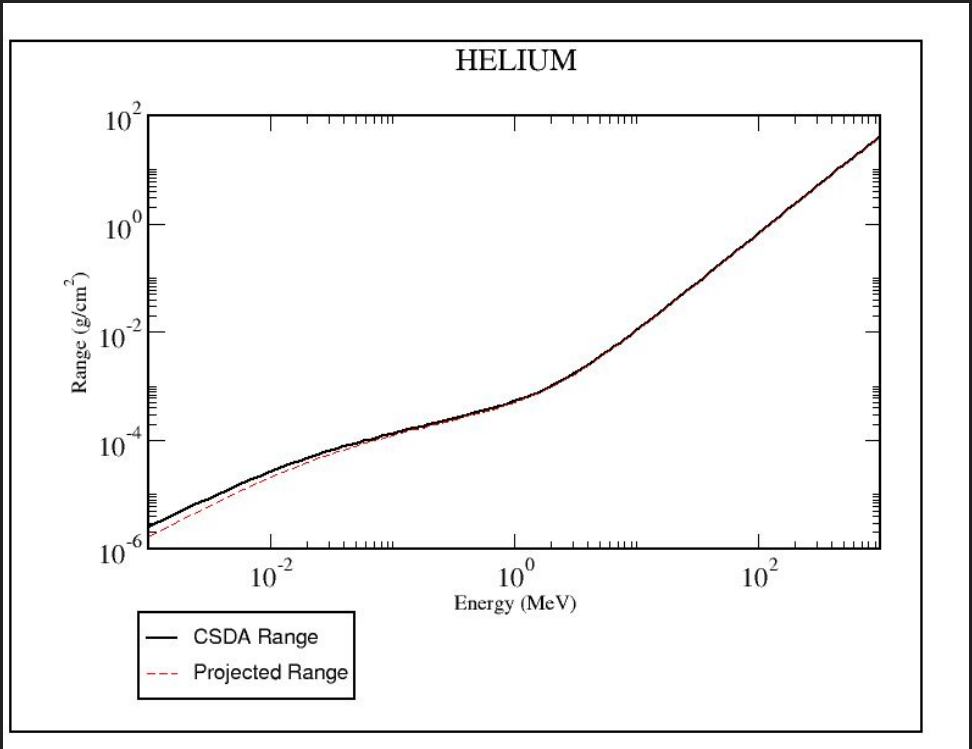
Configuration used for the Reconstruction

- Supercluster Algorithm : GAC
- Noise Run : 3944
- Slice Radius : 10/30 pixels
- Cimax : 2000 (earlier it was 300)
- Version of reconstruction code: latest code on github

He Recoil Range in He gas



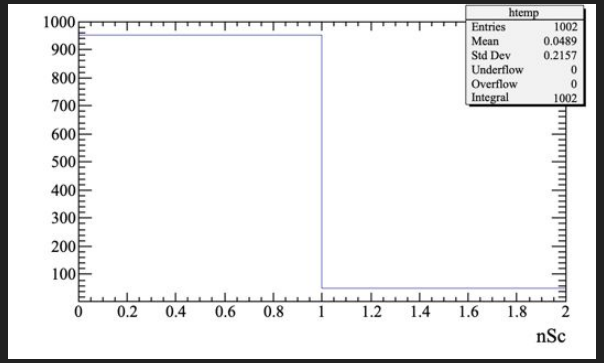
- For 10 keV NR

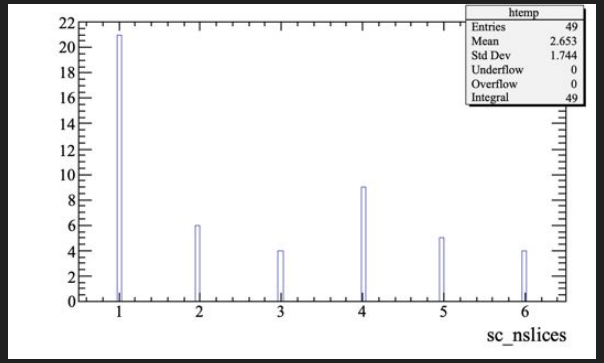
  Approx. Range ~ 0.133 mm
- For 300 keV NR

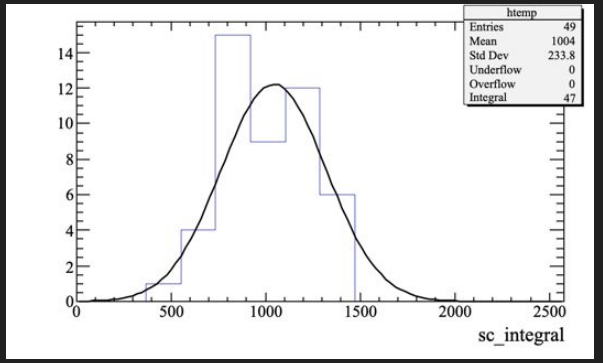
  Approx. Range ~ 1.4 mm

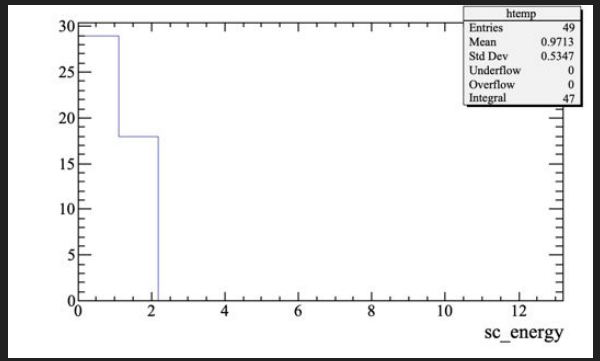
Source: https://physics.nist.gov/PhysRefData/Star/Text/ESTAR.html

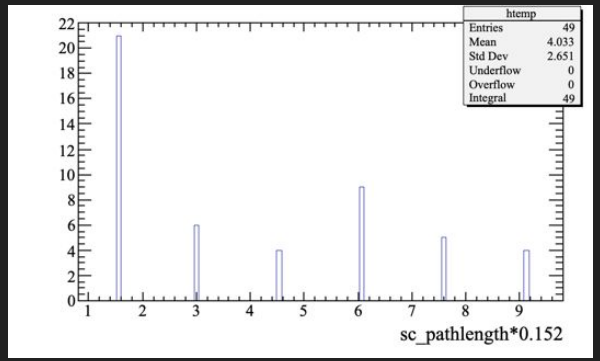
3 keV NR with Slice radius of 10 pixels





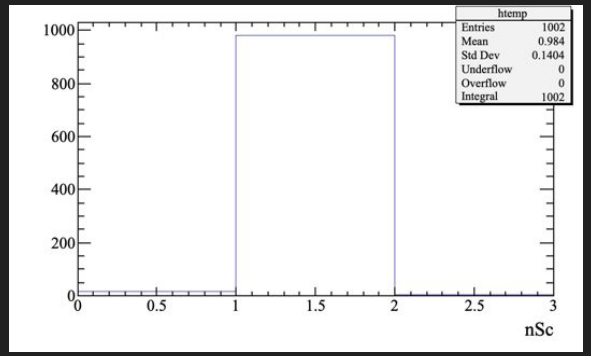


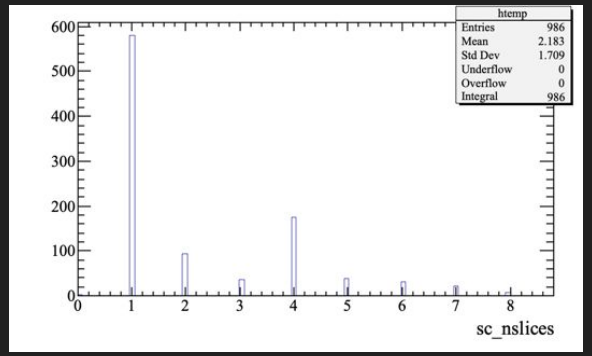


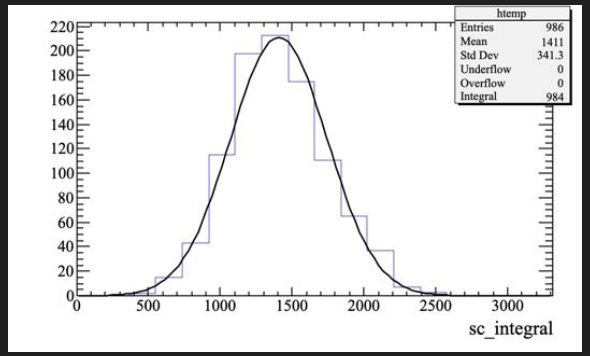


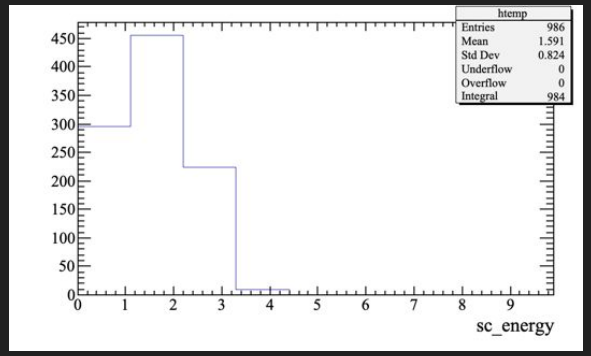
- Efficiency of reconstruction is less than 5%

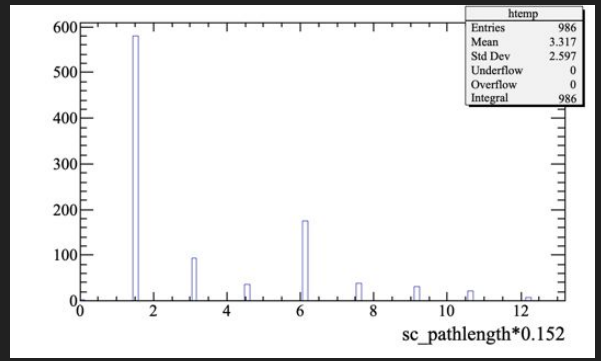
6 keV NR with Slice radius of 10 pixels





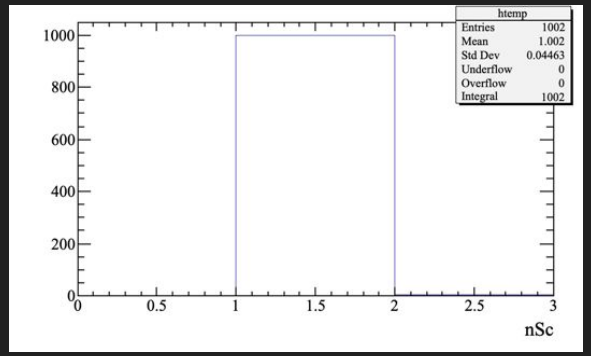


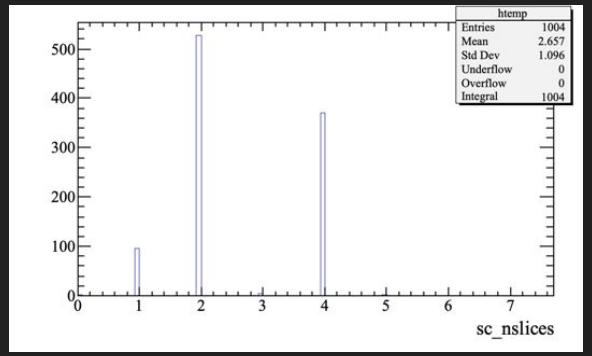


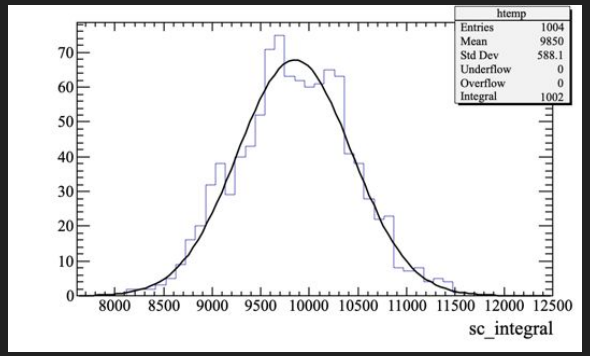


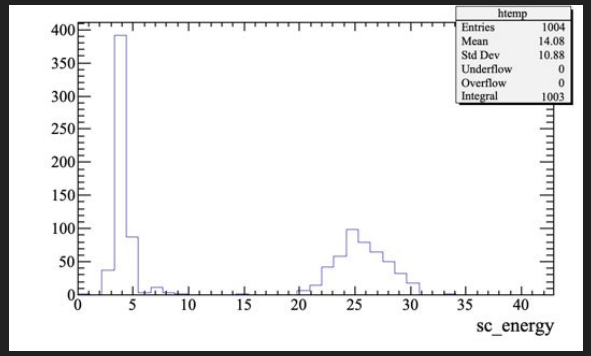
- Efficiency of reconstruction is almost 98%

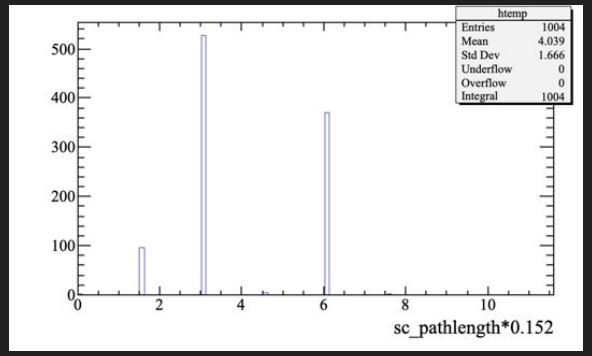
30 keV NR with Slice radius of 10 pixels





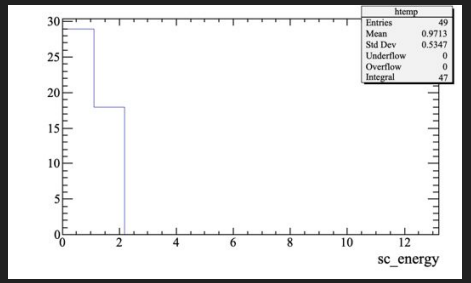


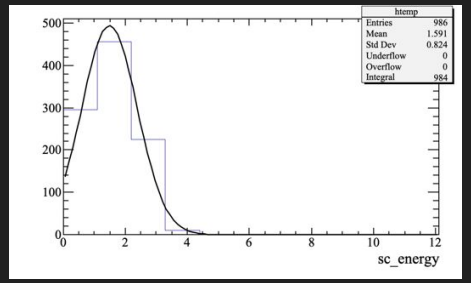


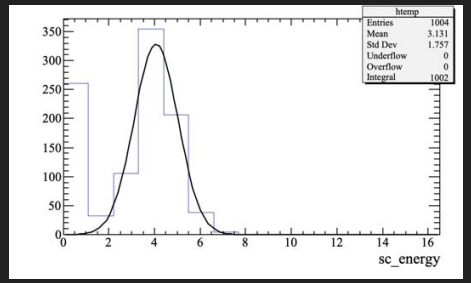


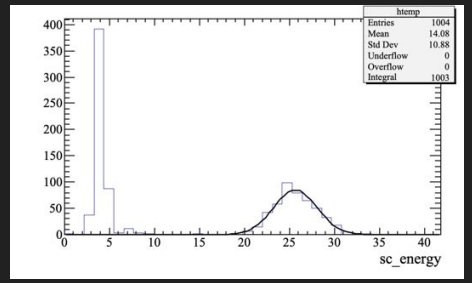
- Efficiency of reconstruction is almost 100%

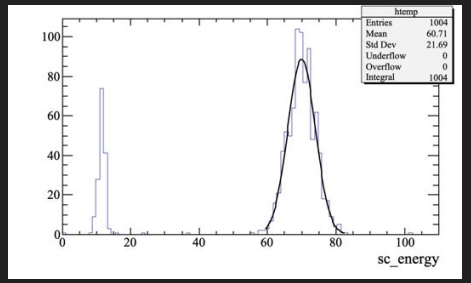
Reconstructed Energy with SR of 10 pixels

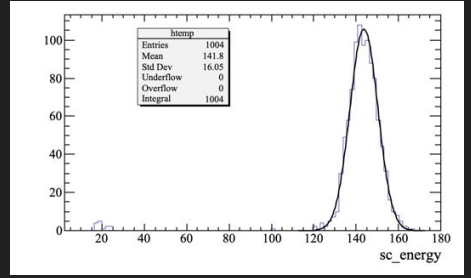


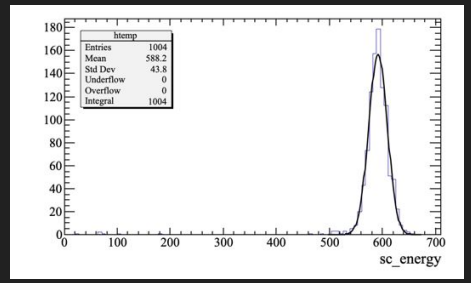




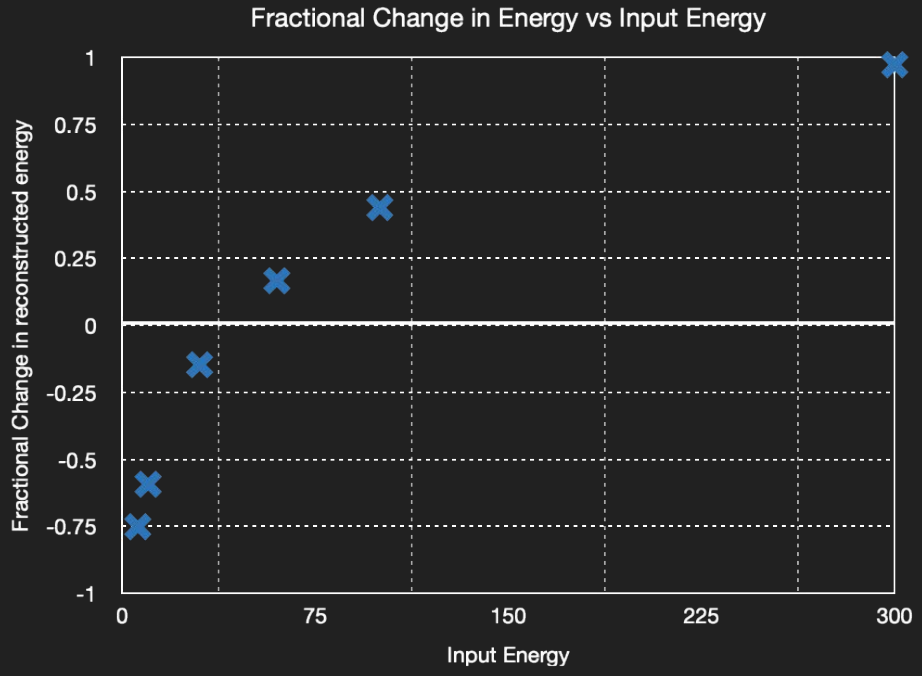


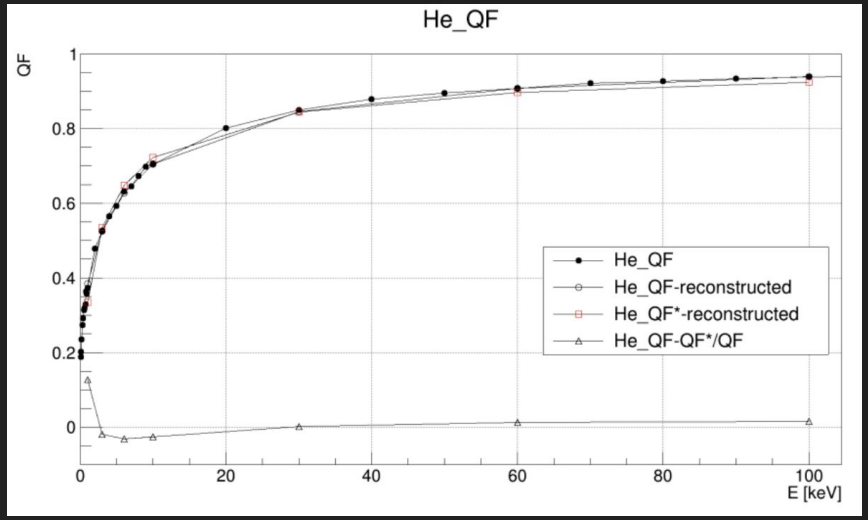


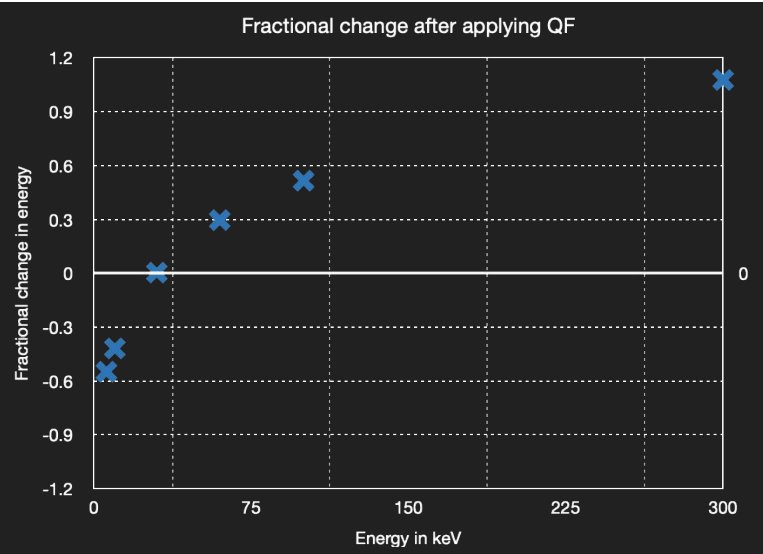




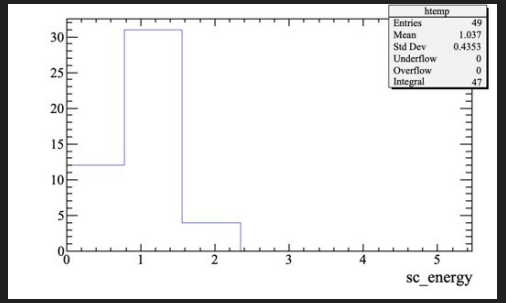
Plots corresponds to the reconstructed energy of 3, 6, 10, 30, 60, 100, 300 keV NR respectively (Starting from top left corner). Energy is underestimated for energies below 60 keV and over estimated for energies above 60 keV.

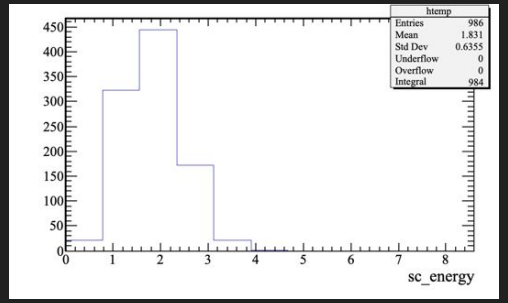

Fractional Change in Energy vs Input Energy
Fractional Change in reconstructed energy
1
0.75
0.5
0.25
0
-0.25
-0.5
-0.75
-1
0
75
150
225
300
Input Energy

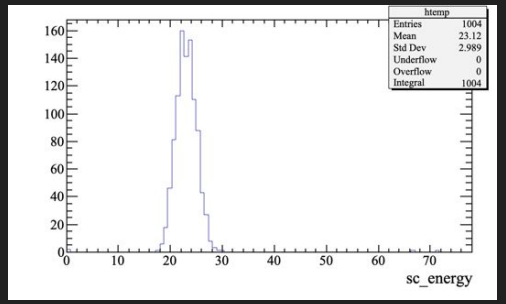

He_QF
QF
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
E [keV]
He_QF
He_QF-reconstructed
He_QF*-reconstructed
He_QF-QF*/QF

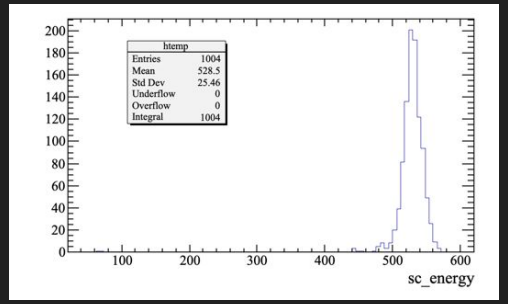

Fractional change after applying QF
Fractional change in energy
1.2
0.9
0.6
0.3
0
-0.3
-0.6
-0.9
-1.2
0
75
150
225
300
0
Energy in keV

Reconstructed Energy with SR of 30 pixels



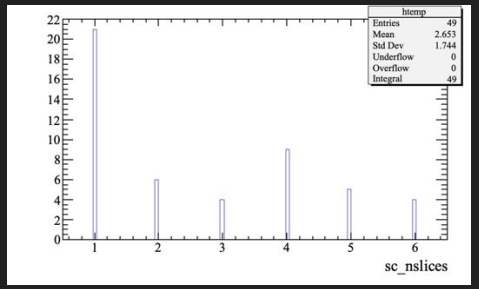


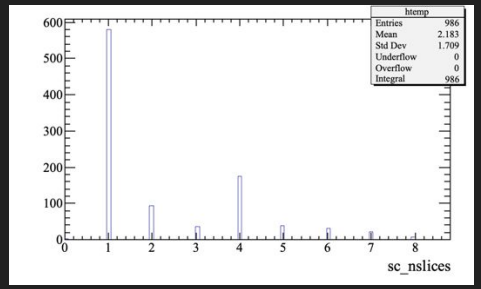


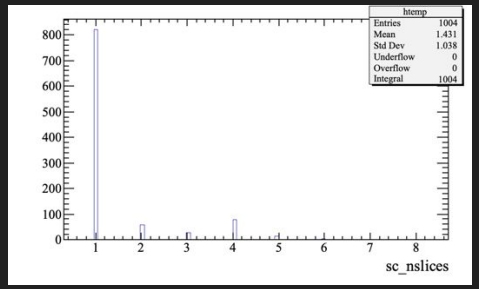


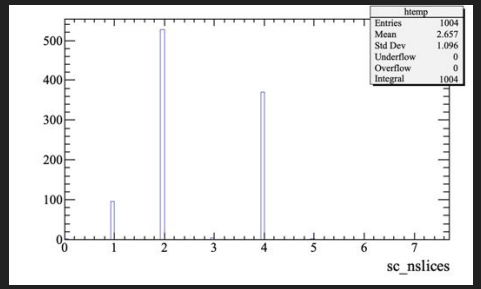
Plots corresponds to the reconstructed energy of 3, 6, 30, 300 keV NR respectively. (Starting from top left corner)

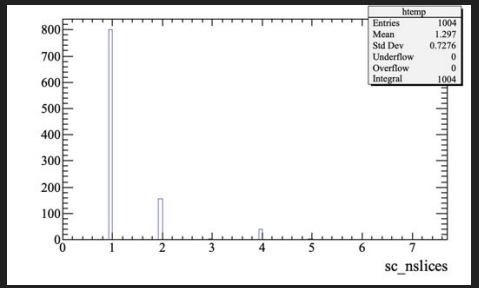
No. of slices with SR of 10 pixels

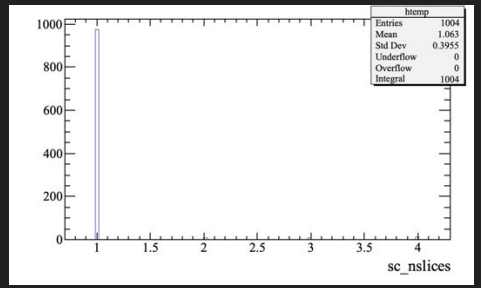


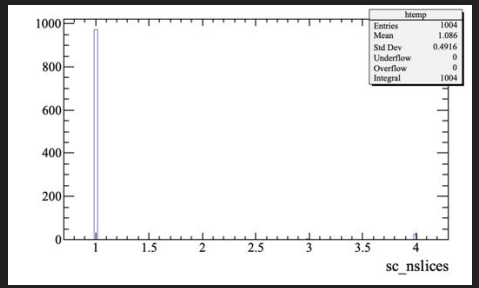






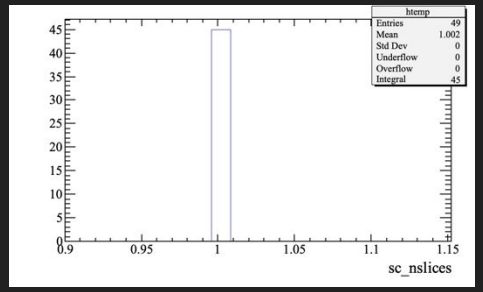


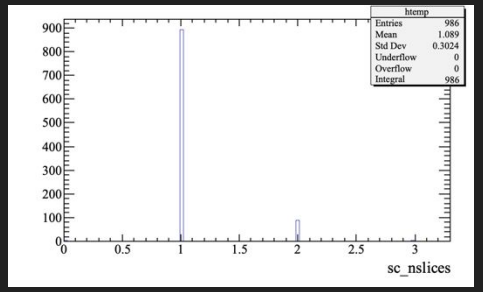


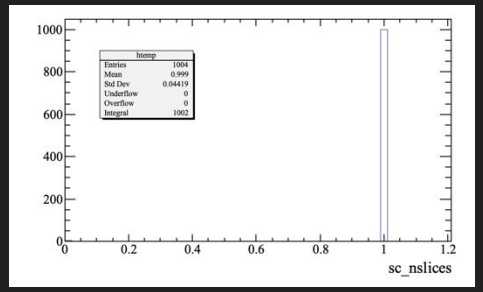


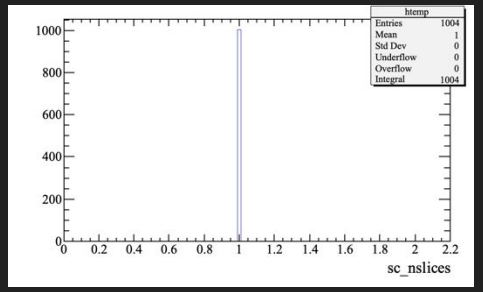
Plots correspond to the no. of slices of 3, 6, 10, 30, 60, 100, 300 keV NR respectively (Starting from top left corner). At low energies the SC is big because it contains a lot of noisy pixels around track (example is shown later).

No. of slices with SR of 30 pixels



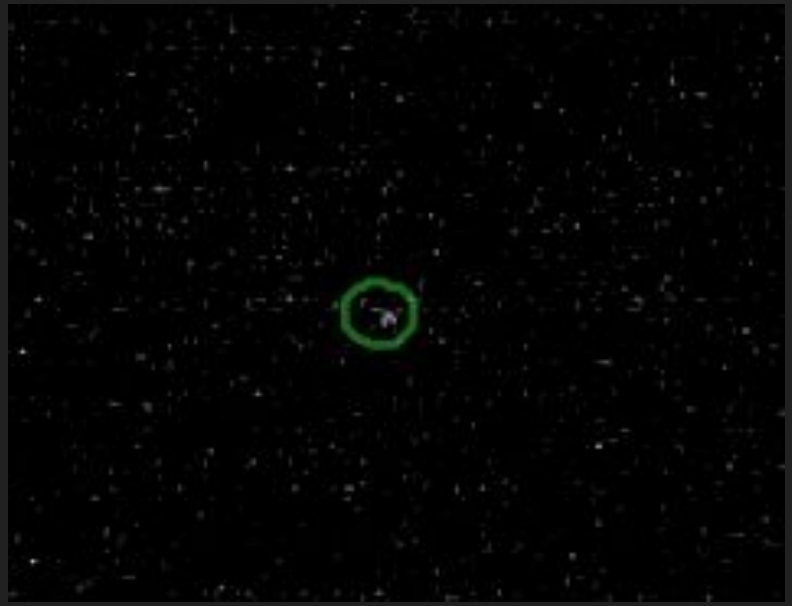






Plots correspond to the no. of slices of 3, 6, 30, 300 keV NR respectively (Starting from top left corner).

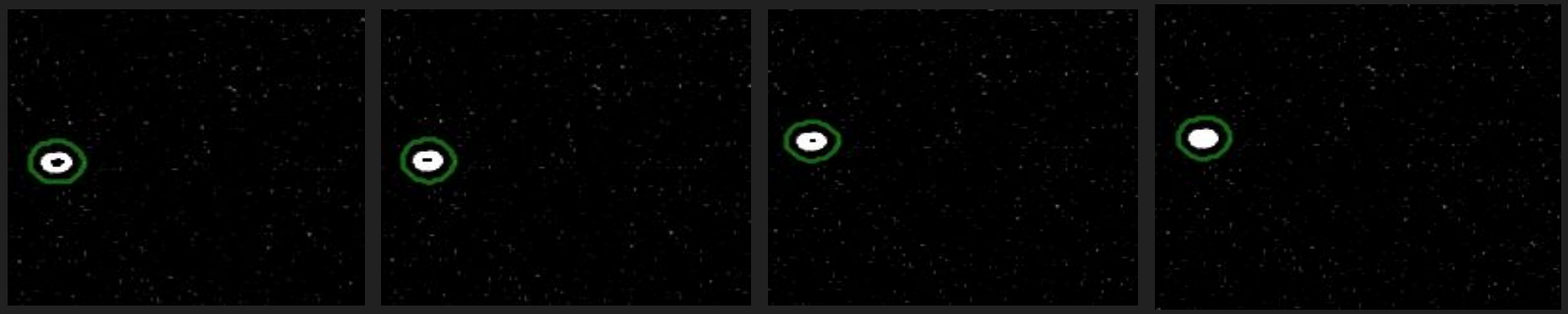
3 keV reconstructed event



- With slice radius of 10 pixels there are 5 slices in the reconstructed event and with sr of 30 pixels there is only 1 slice reconstructed.

Upper threshold for NR

1000 keV NR reconstruction with different upper threshold



300 500 1000 2000