DEEP UNDERGROUND NEUTRINO EXPERIMENT

The University Of Sheffield.

A quick comparison of showering reconstruction for blurred and merged reconstruction in the workspace

Karl Warburton with guidance from Tingjun Yang

09/11/2015

What am I doing / using?

- Tingjun asked me to reconstruct the MCC4 files for;
  - prod_gamma_0.1-2.0GeV_isotropic_dune10kt_workspace
  - prod_eminus_0.1-5.0GeV_isotropic_dune10kt_workspace
- Using blurred (Mike) and merged (Dorota) reconstruction.
- Subsequently used the FD analysis tree in dunetpc.
- This is a quick (and dirty) study comparing various easily accessible shower quantities.

What am I comparing?

- Shower starting position (X,Y,Z)
- Shower initial direction (as a unit vector in X,Y,Z)
- Distance of Reco starting to Monte Carlo starting
- dEdx of initial track for shower (only blurred)
- Reconstructed energy (only blurred)
- Energy efficiency (only blurred)
  - No fTotalEnergy in merge shower, so can't make the last three plots.

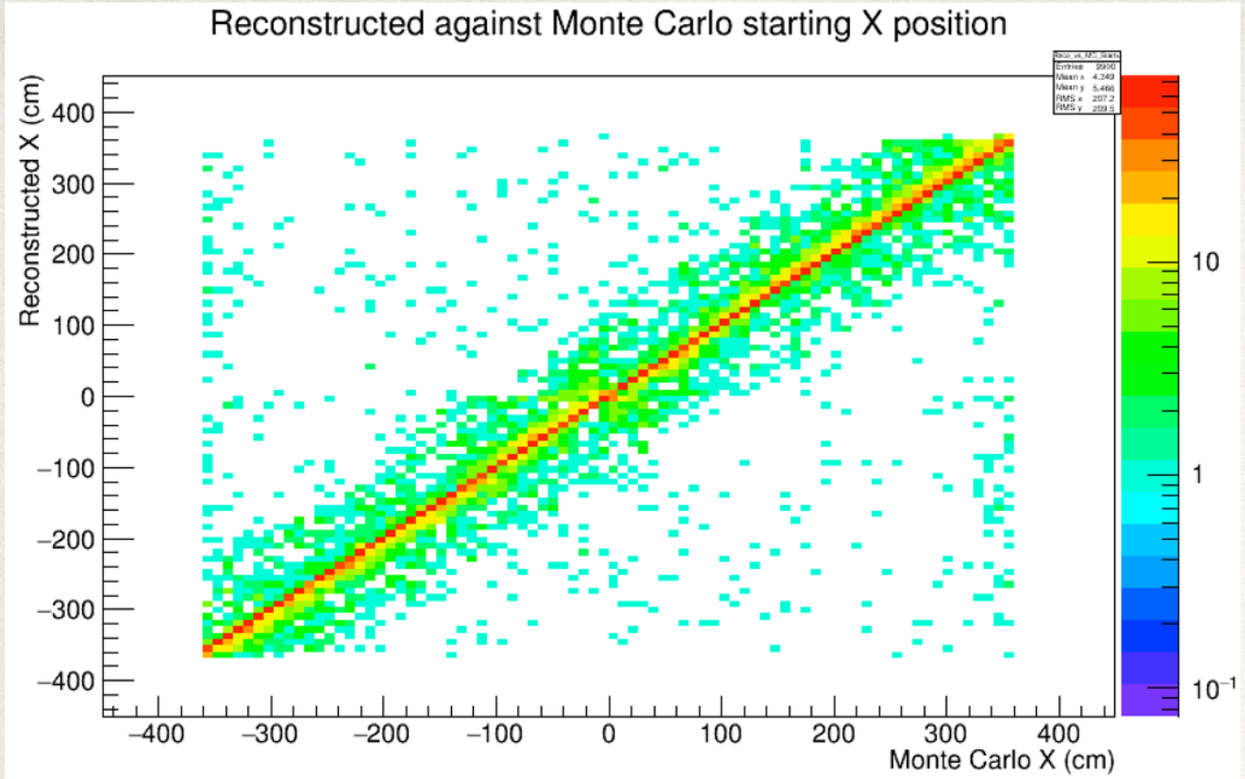
How I’m going to lay out the subsequent slides

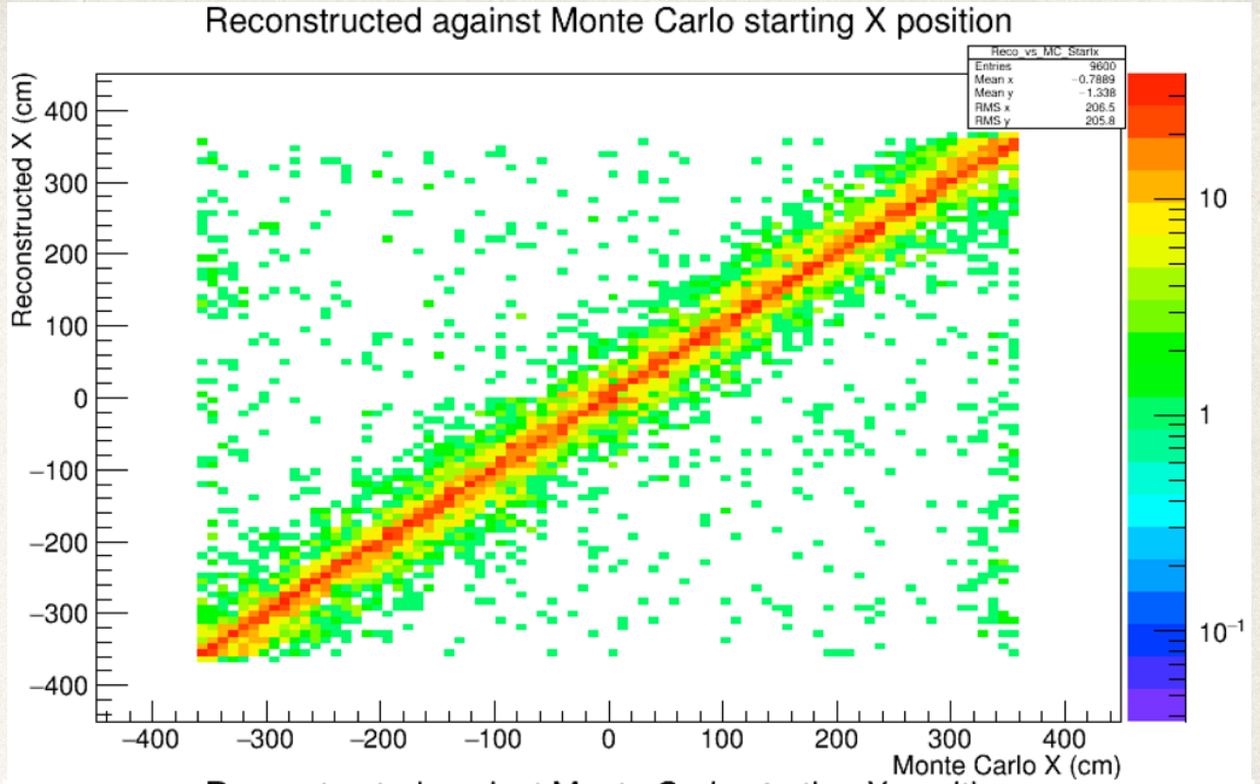
Blurred - Electrons

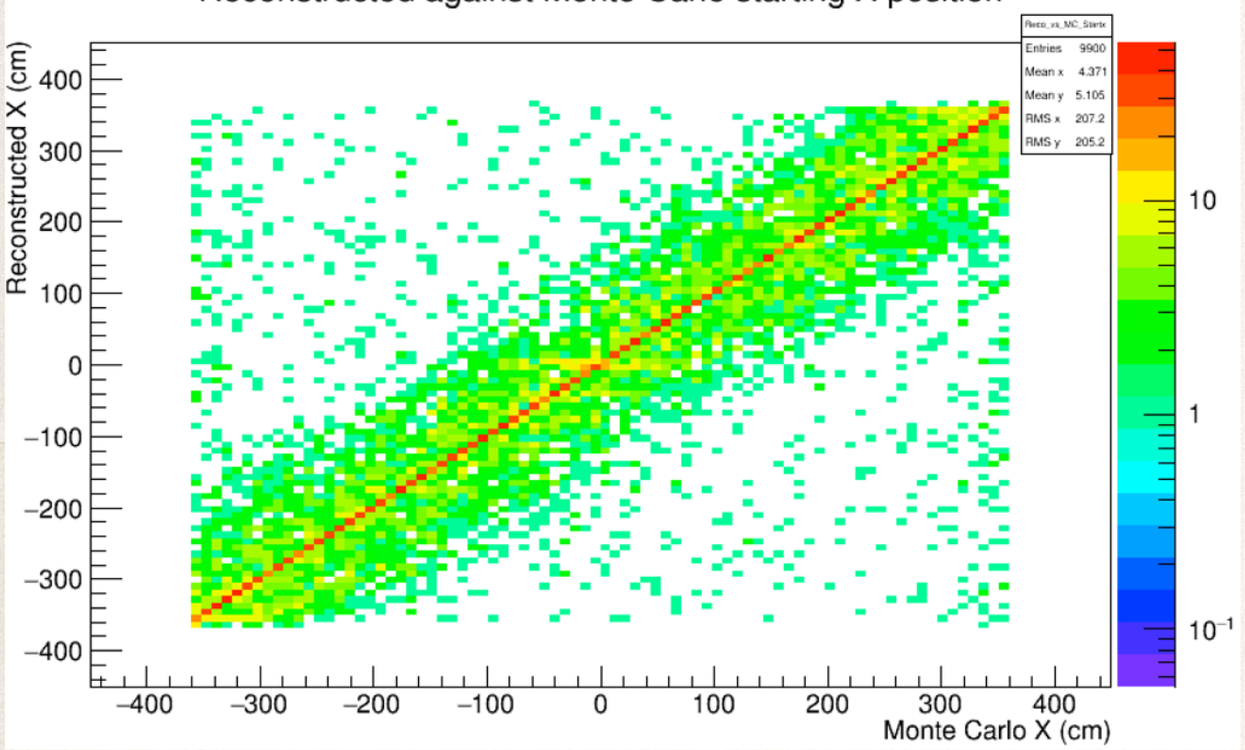
Blurred - Photons

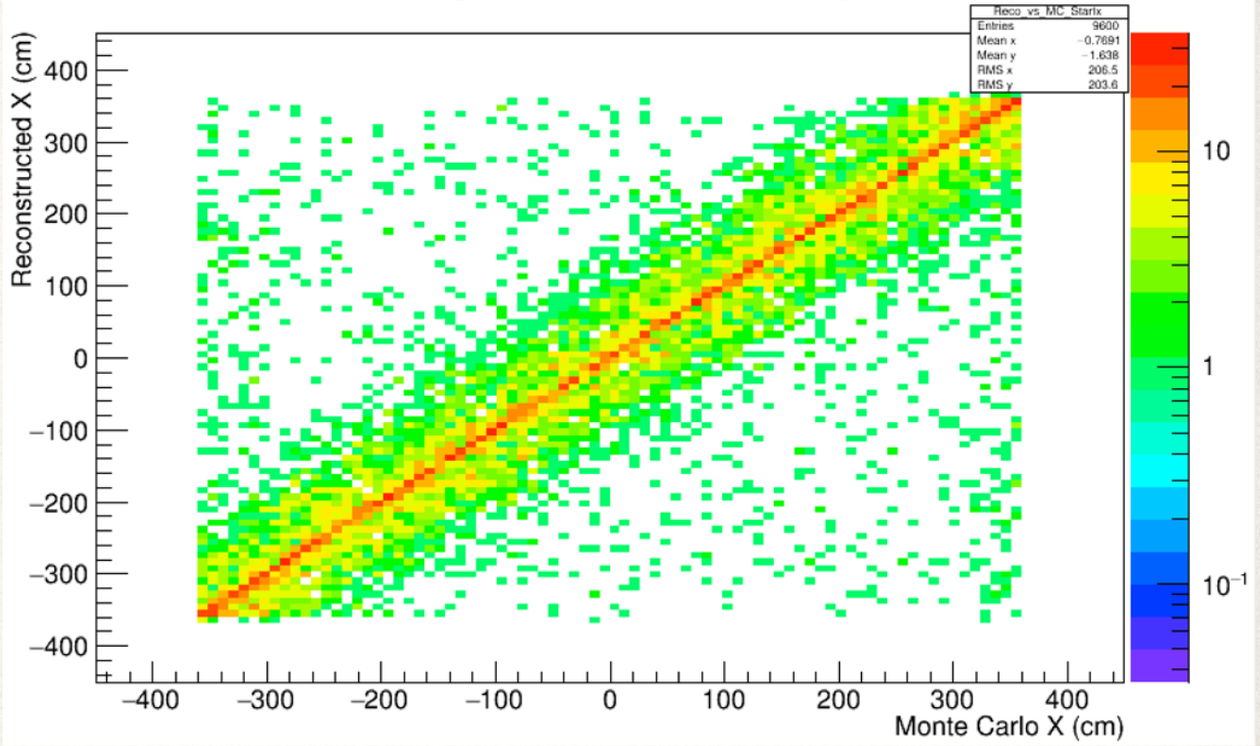
Merged - Electrons

Merged - Photons

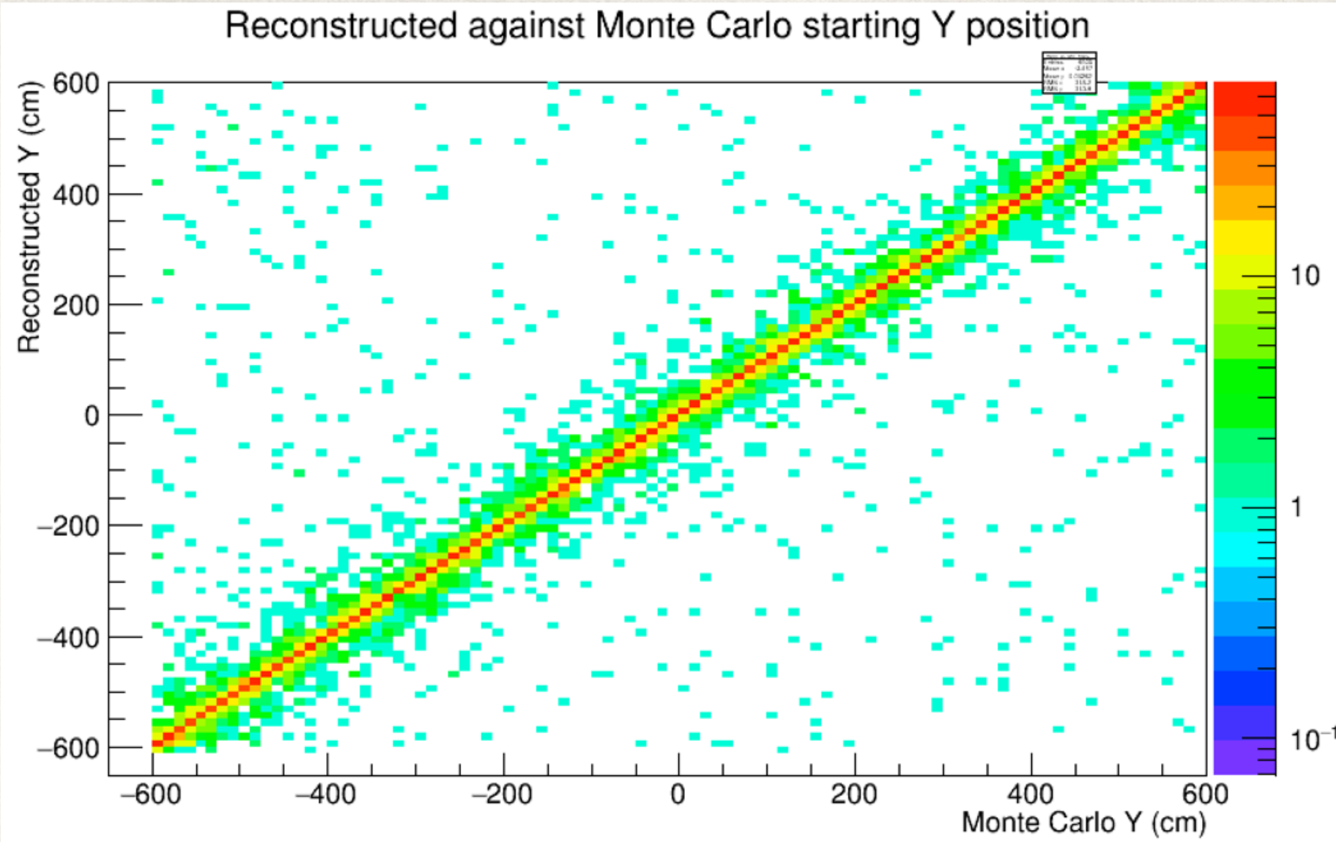


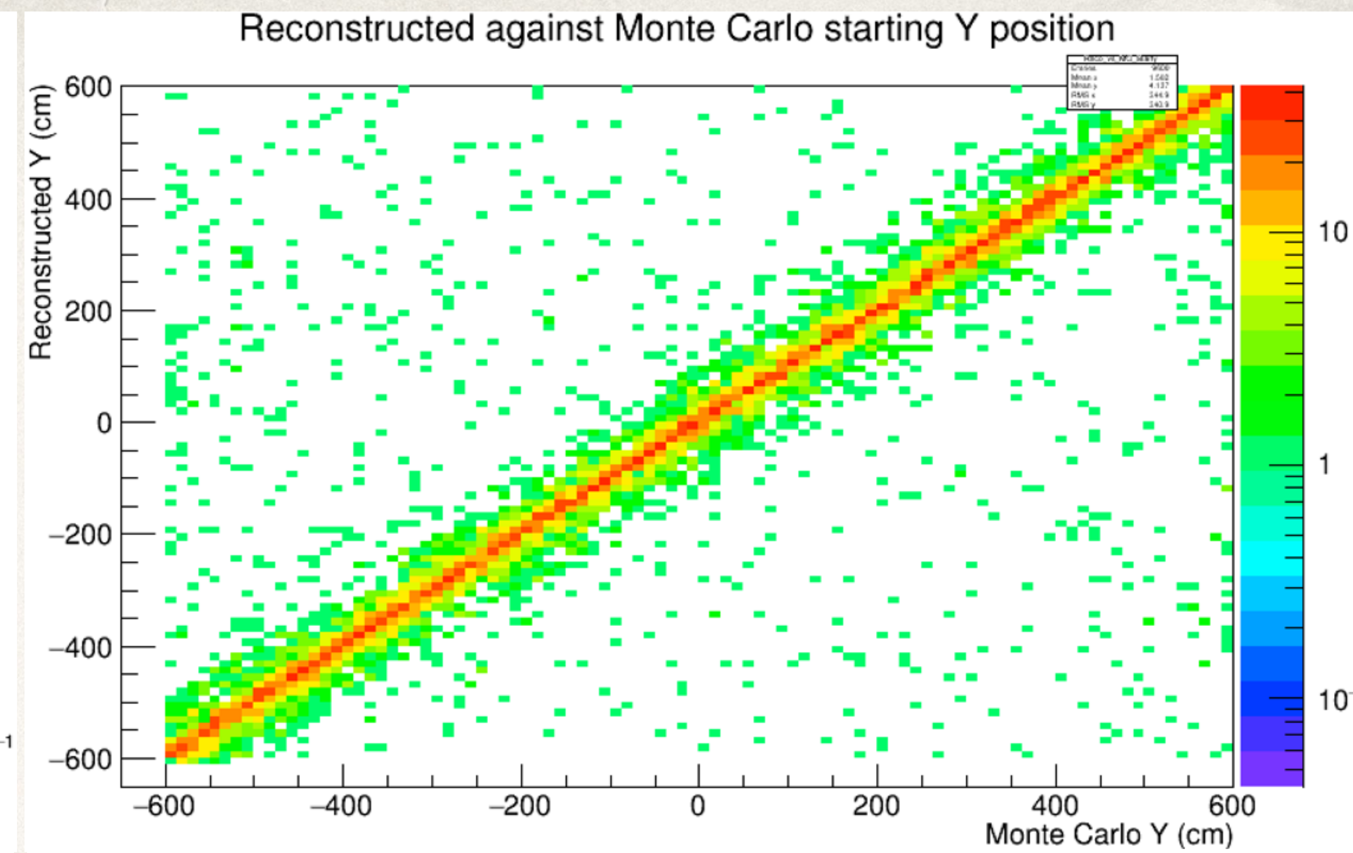


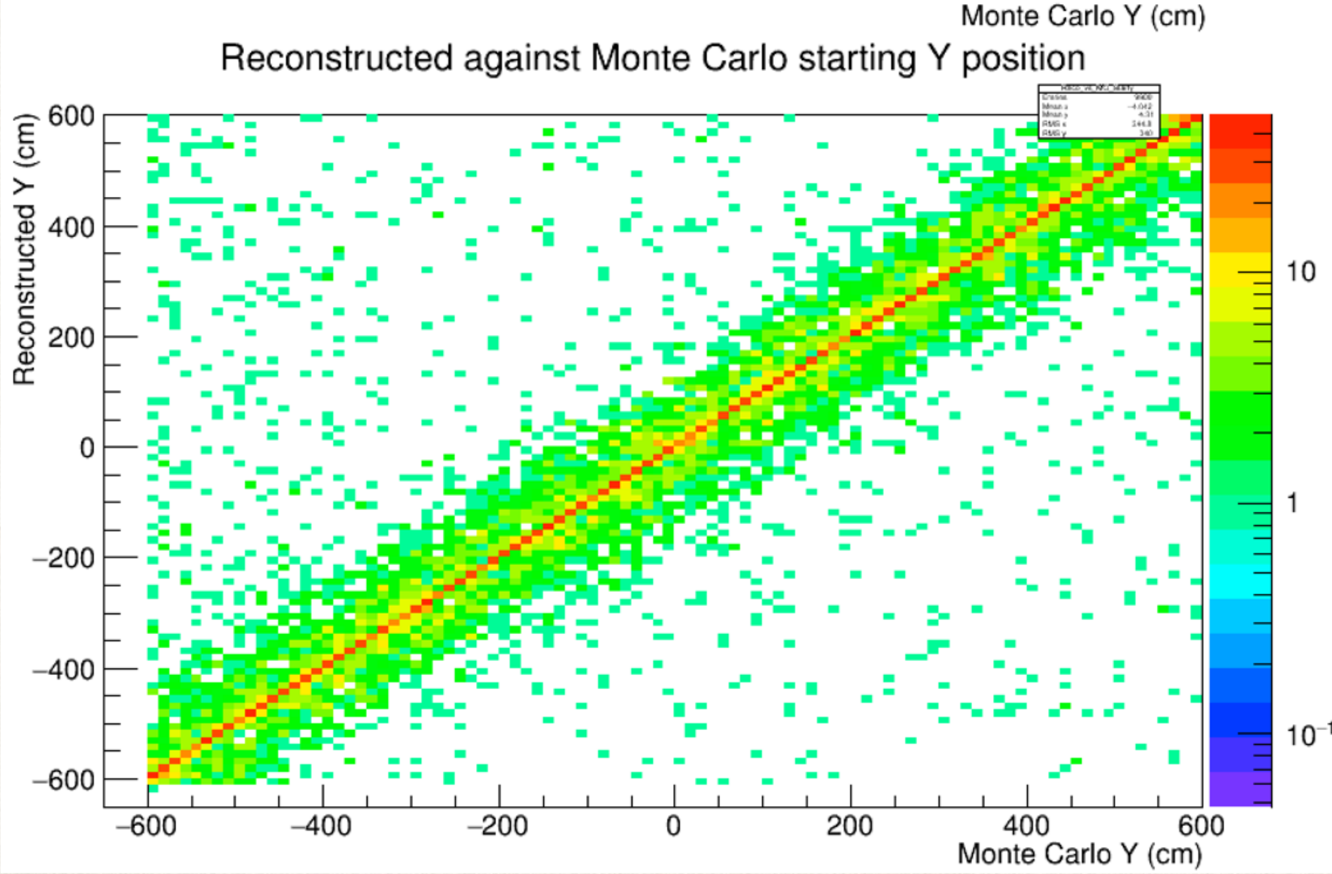


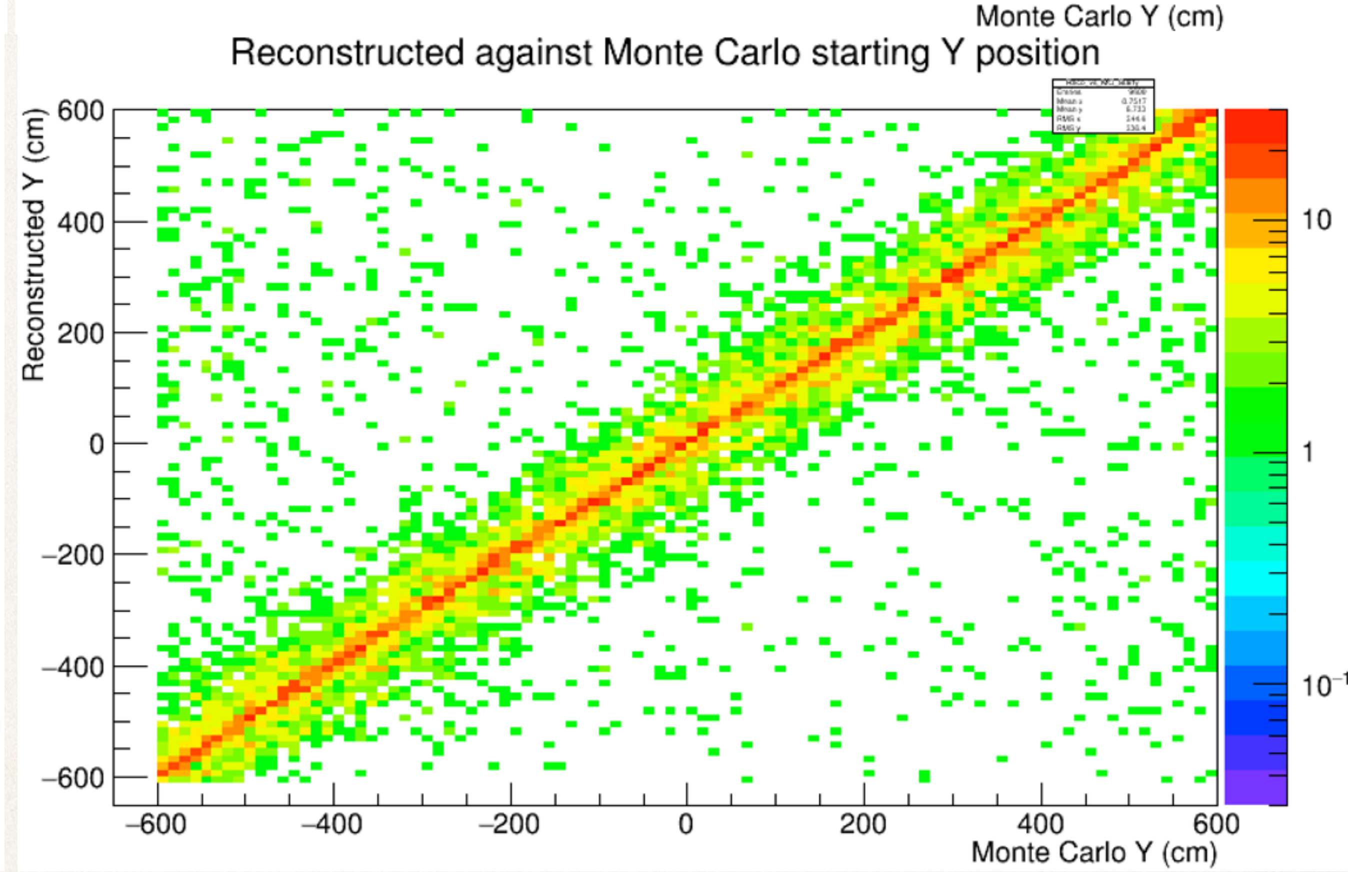


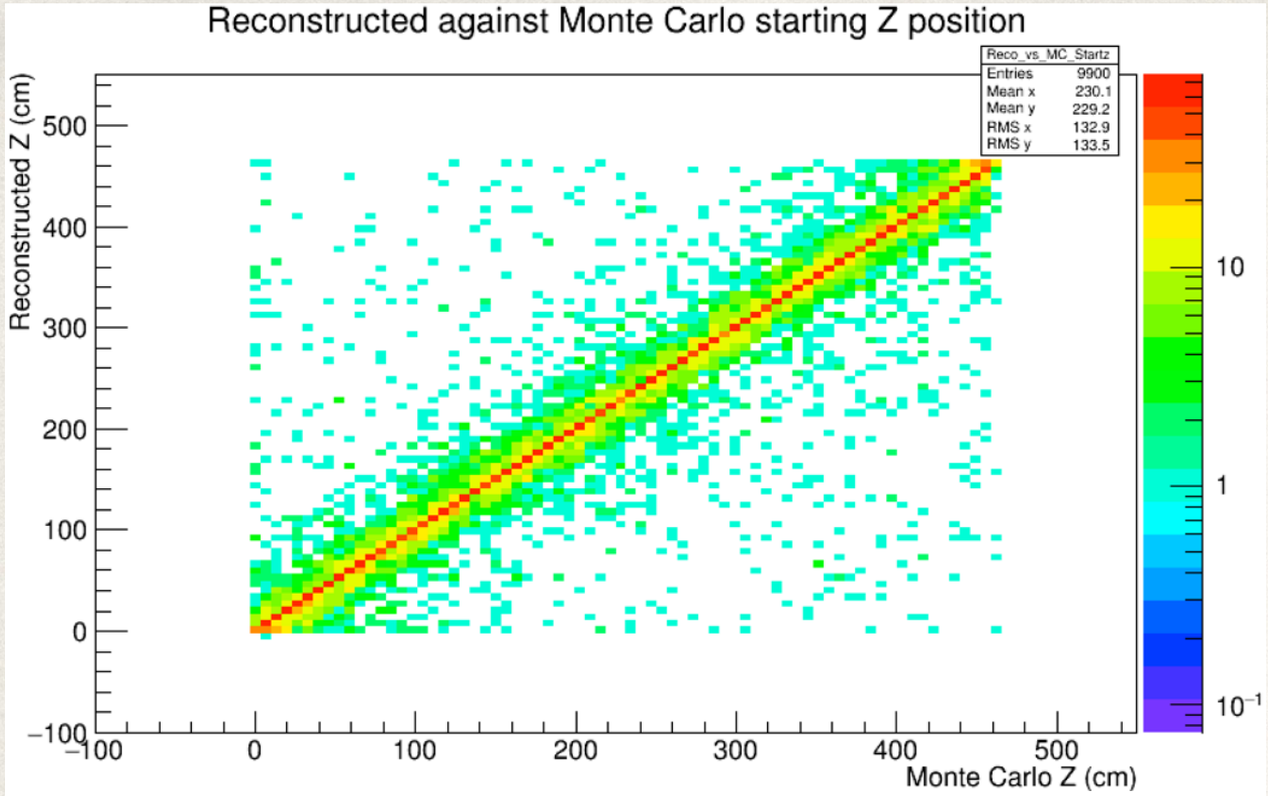
All starting positions are well reconstructed, so the plots for Y and Z basically look the same.

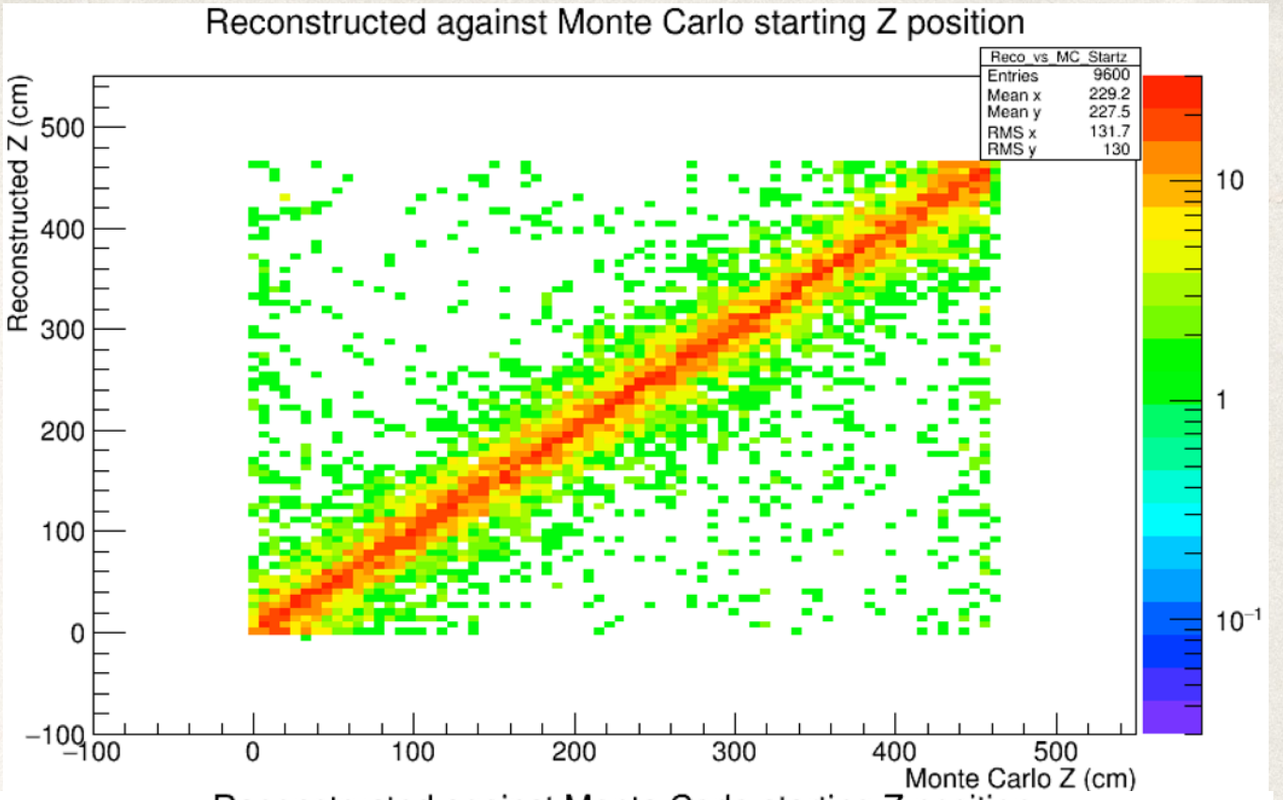

Reconstructed against Monte Carlo starting Y position
Reconstructed Y (cm)
Monte Carlo Y (cm)
600
400
200
0
−200
−400
−600
10
1
10^{-1}

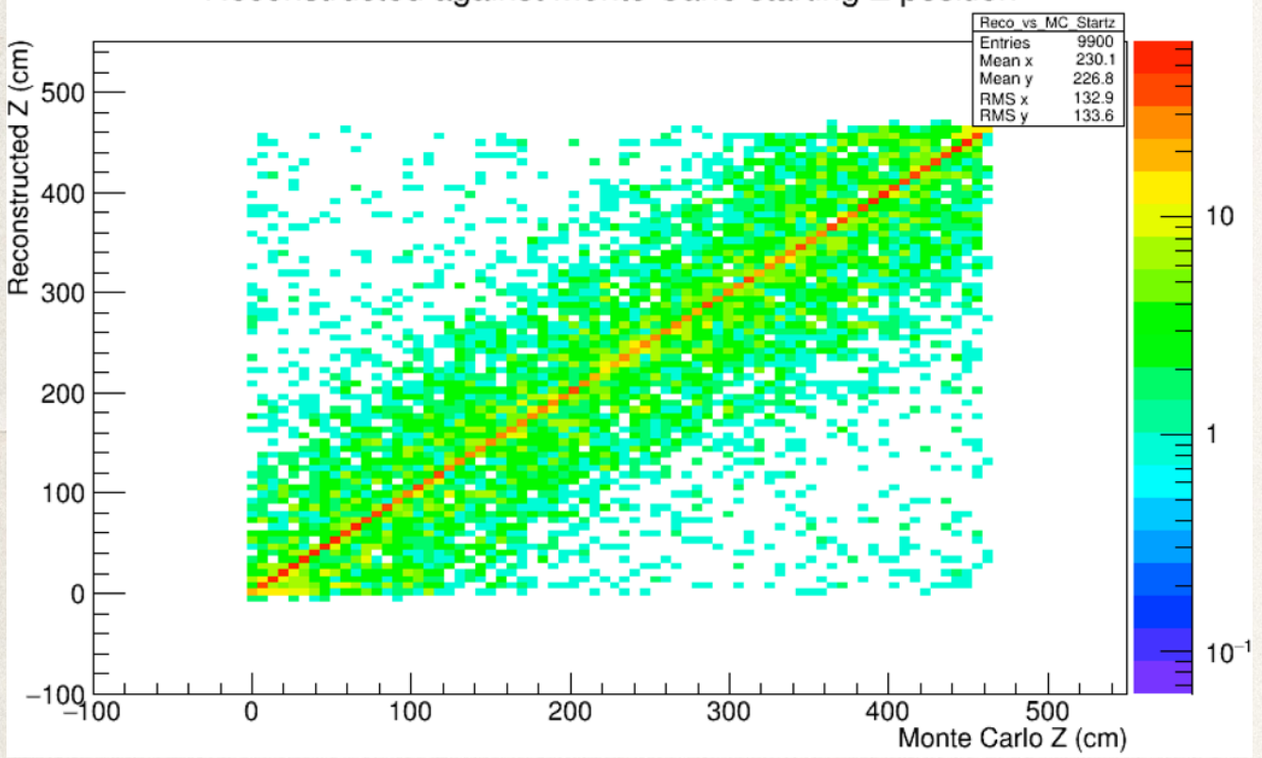

Reconstructed against Monte Carlo starting Y position
Reconstructed Y (cm)
Monte Carlo Y (cm)
600
400
200
0
−200
−400
−600
10
1
10^{-1}


Reconstructed against Monte Carlo starting Y position
Reconstructed Y (cm)
Monte Carlo Y (cm)
600
400
200
0
−200
−400
−600
10
1
10^{-1}


Reconstructed against Monte Carlo starting Y position
Reconstructed Y (cm)
Monte Carlo Y (cm)
600
400
200
0
−200
−400
−600
10
1
10^{-1}


Reconstructed against Monte Carlo starting Z position
Reco_vs_MC_Startz
Entries 9900
Mean x 230.1
Mean y 229.2
RMS x 132.9
RMS y 133.5
Reconstructed Z (cm)
Monte Carlo Z (cm)


Reconstructed against Monte Carlo starting Z position
Reco_vs_MC_Startz
Entries 9600
Mean x 229.2
Mean y 227.5
RMS x 131.7
RMS y 130
Reconstructed Z (cm)
Monte Carlo Z (cm)


Reconstructed against Monte Carlo starting Z position
Reco_vs_MC_Startz
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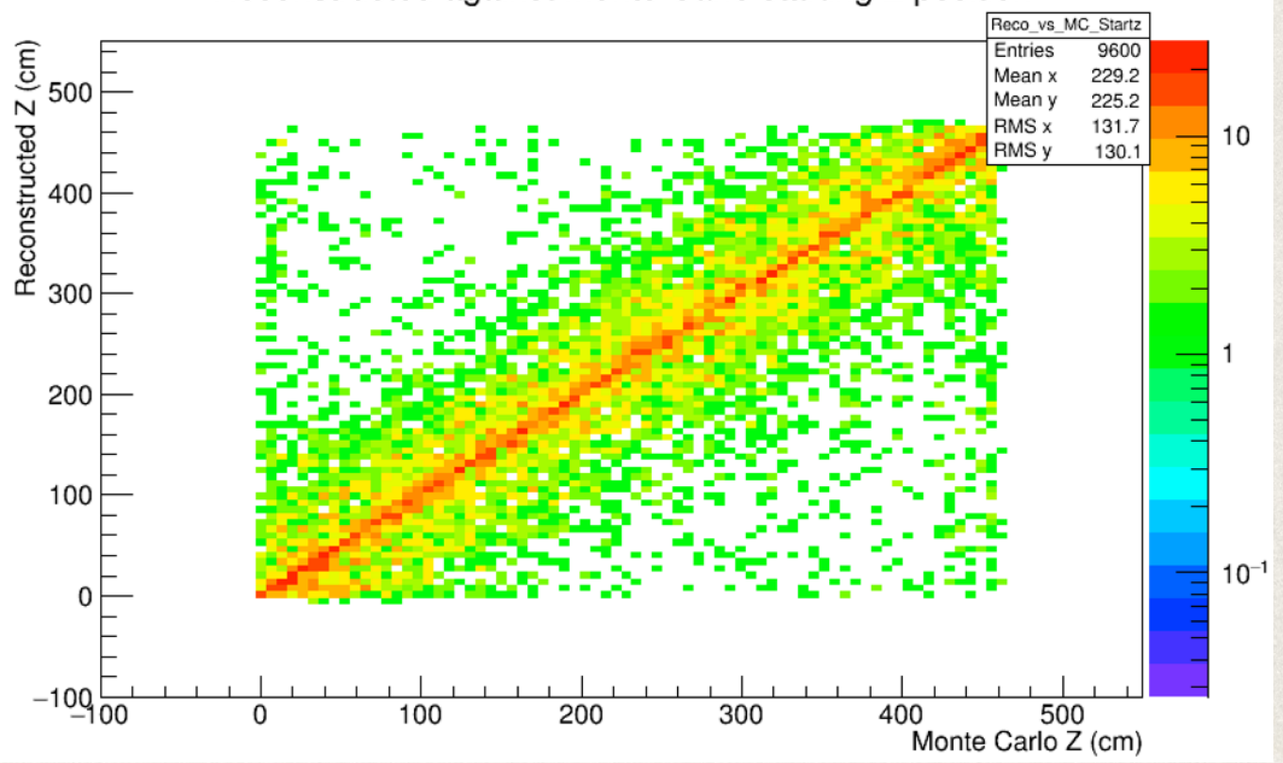
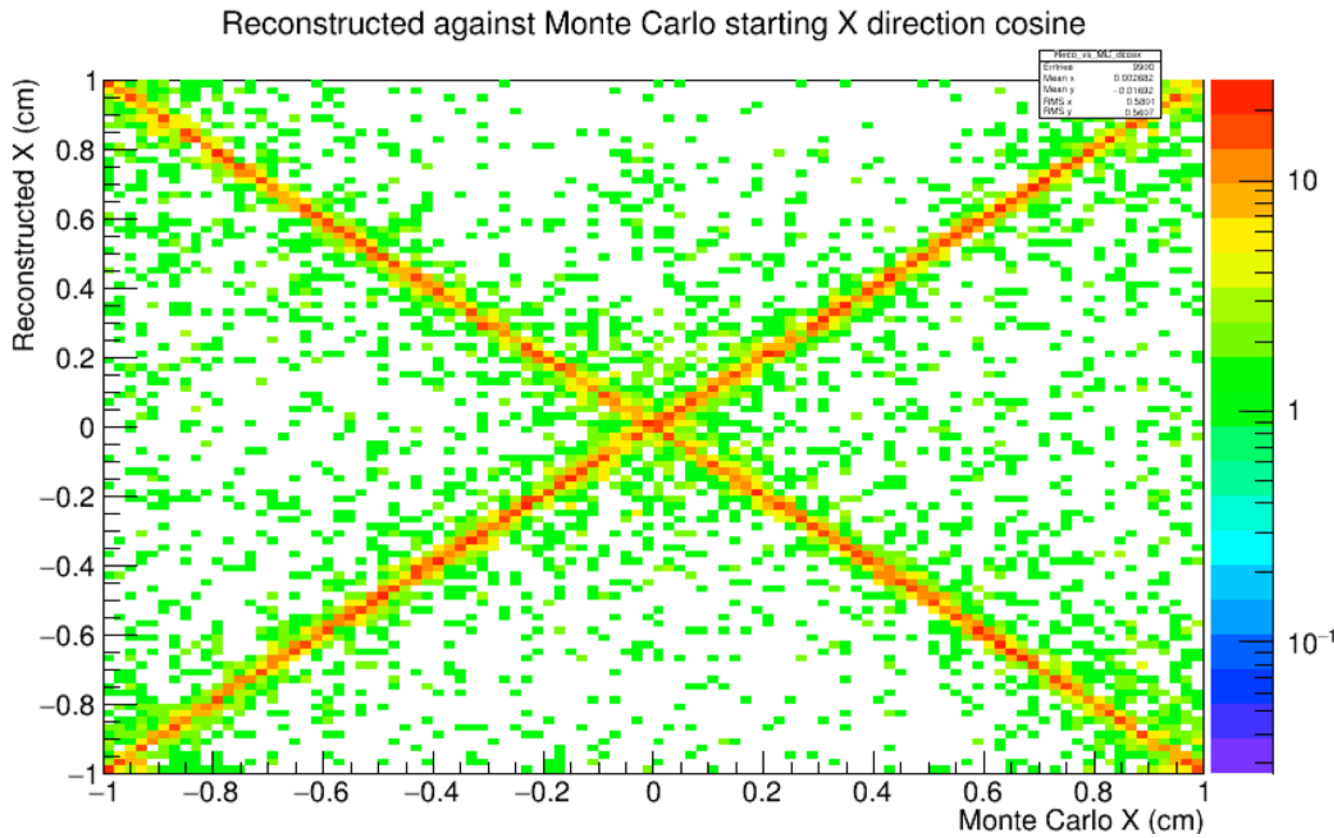
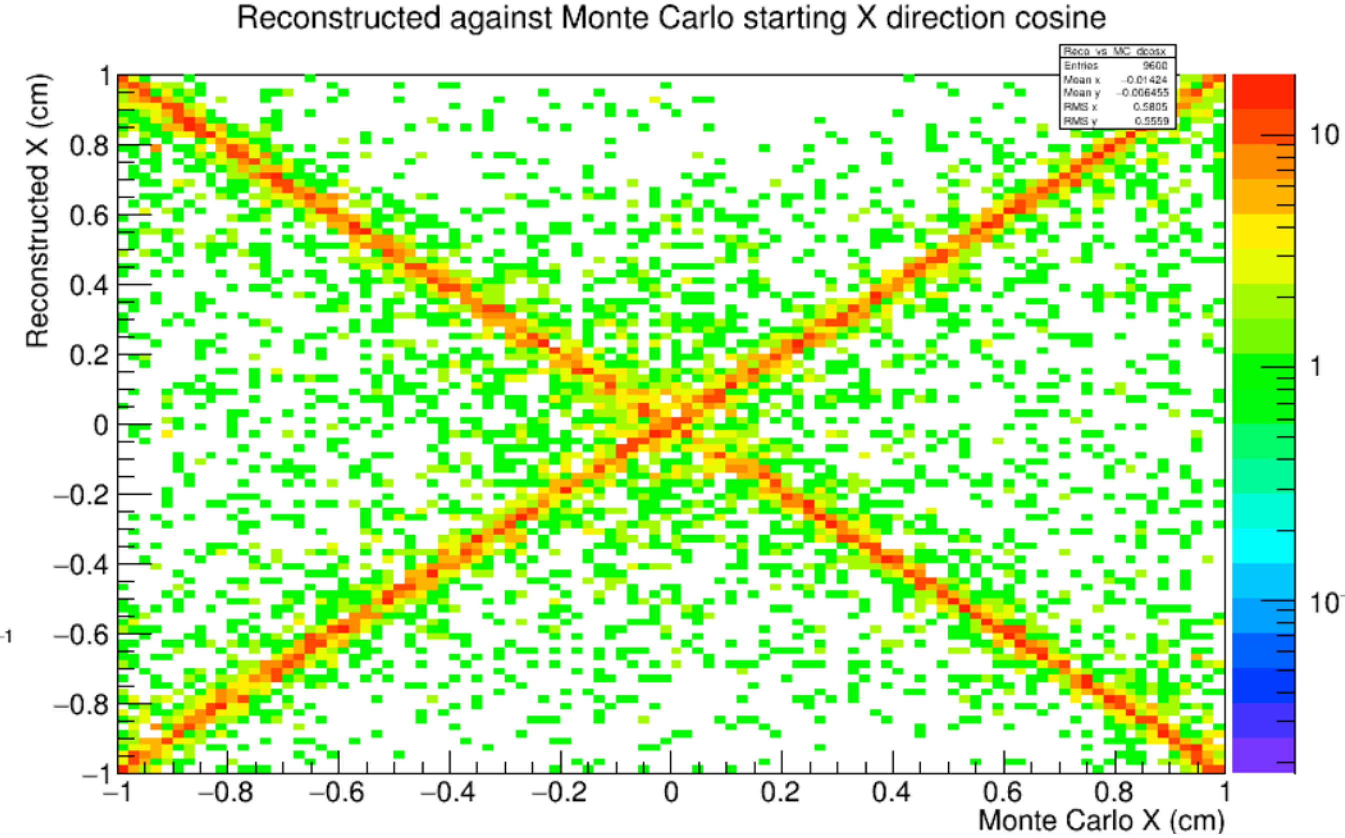
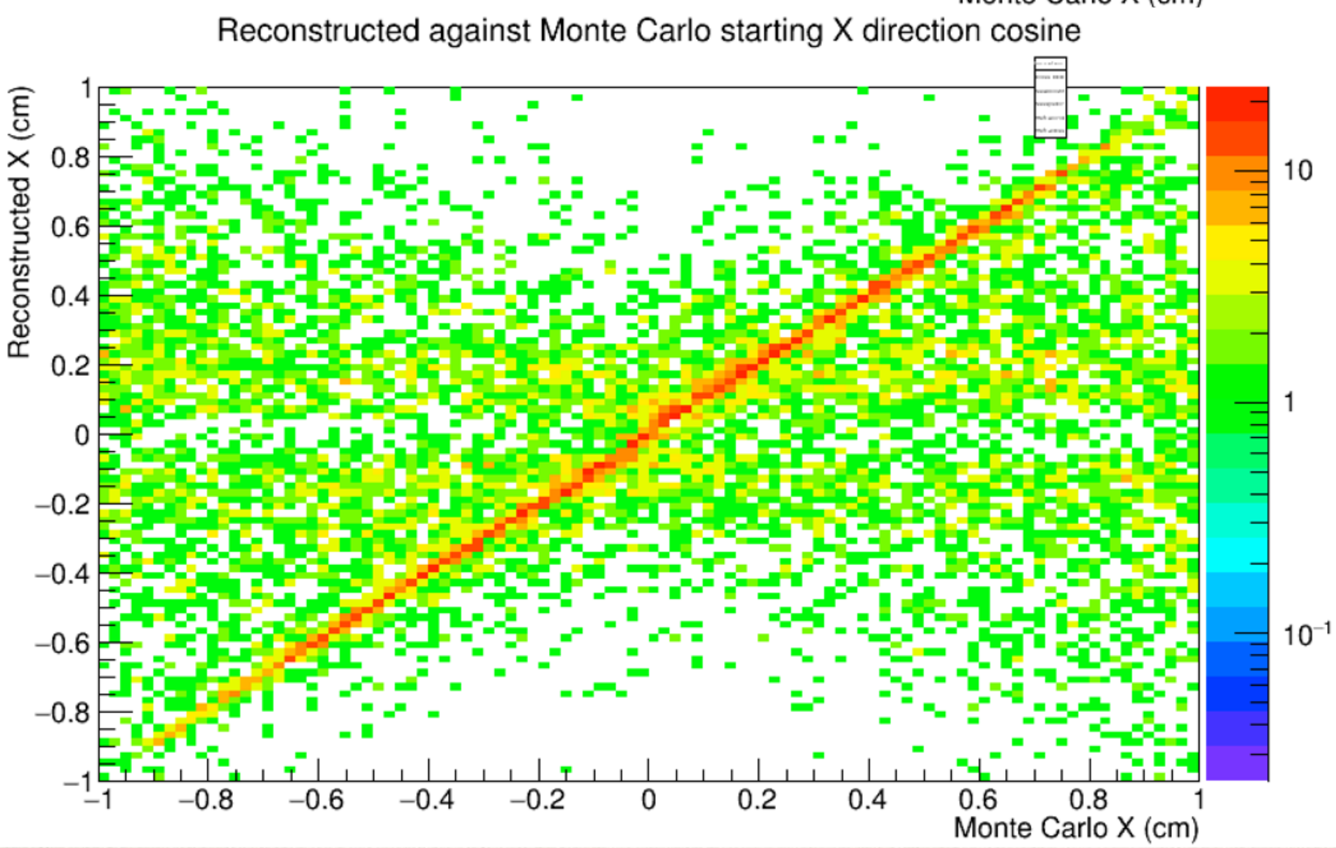
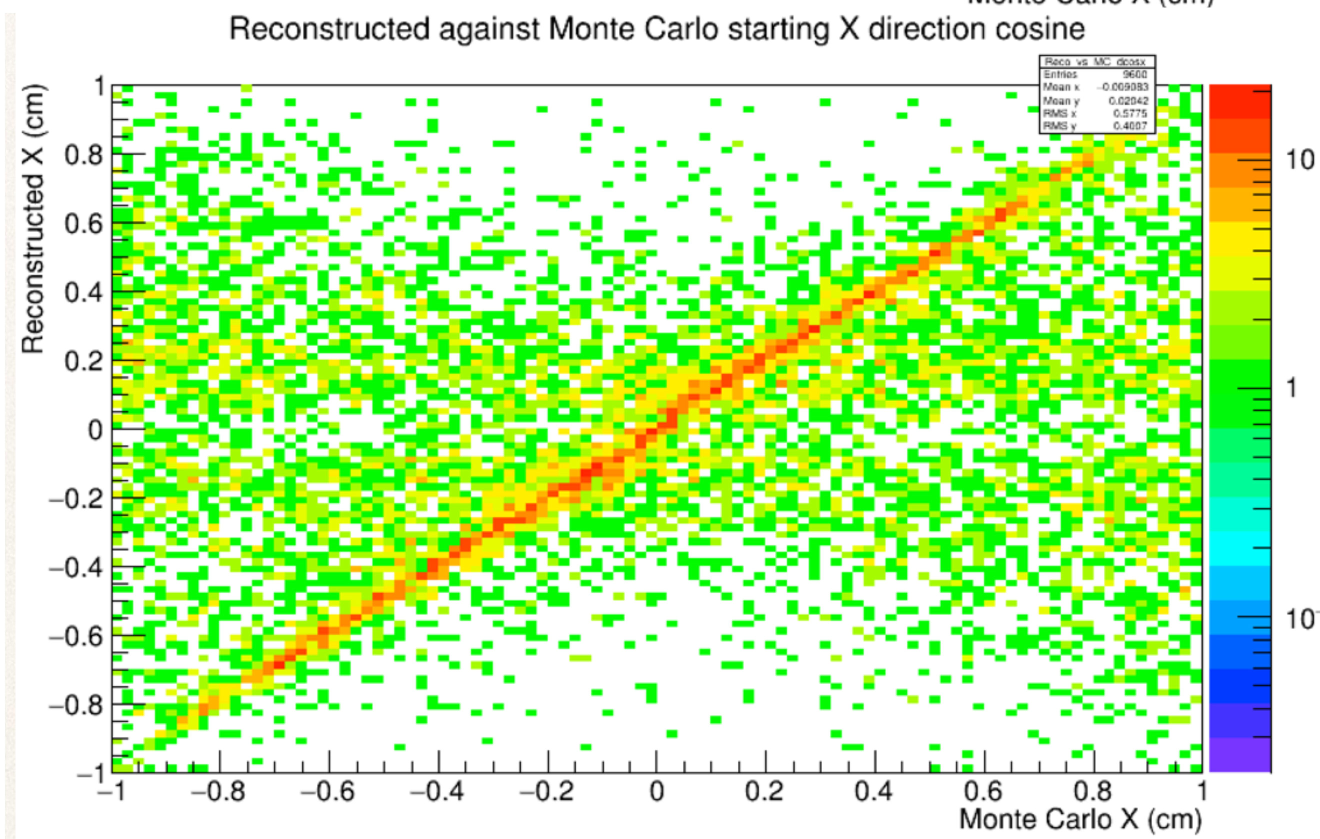
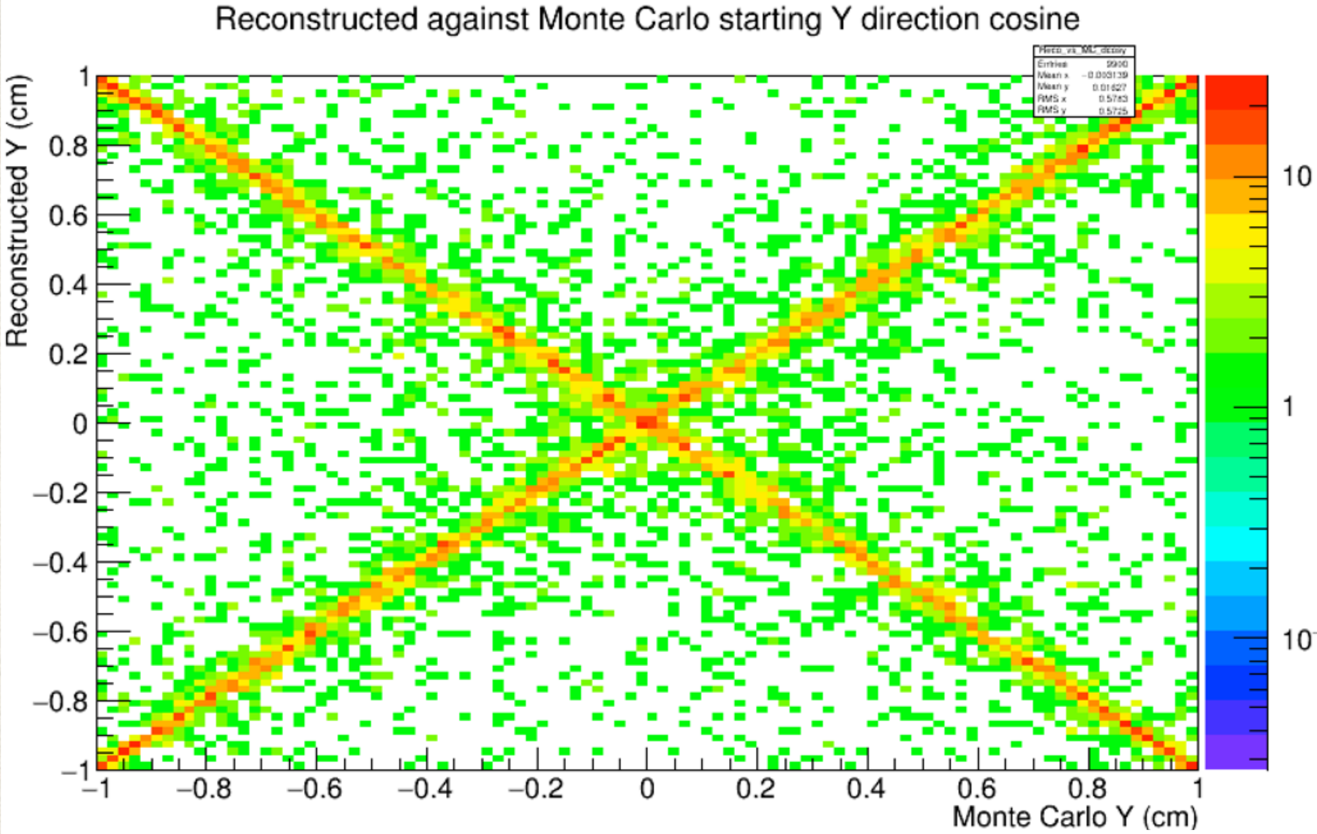
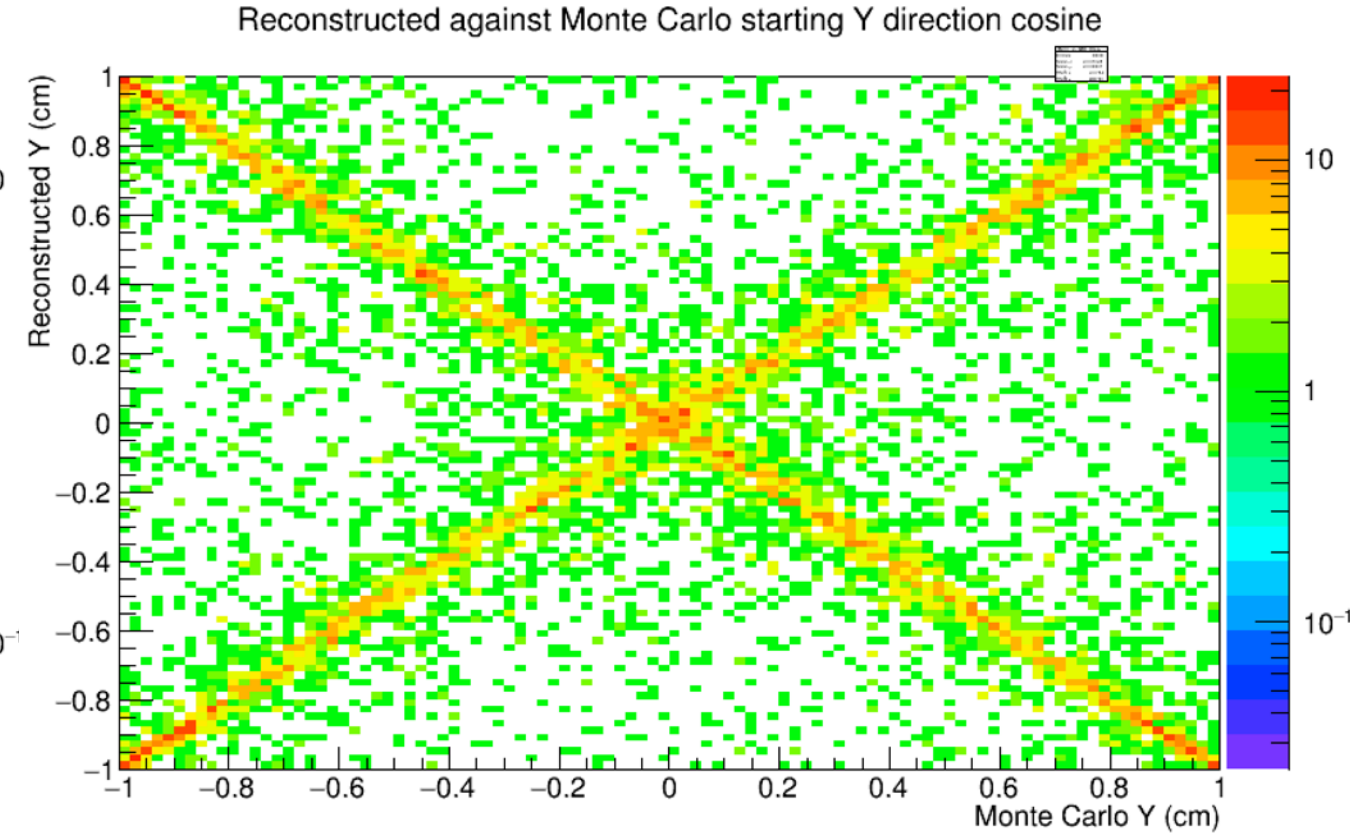
Mean x 230.1
Mean y 226.8
RMS x 132.9
RMS y 133.6
Reconstructed Z (cm)
Monte Carlo Z (cm)


Reconstructed against Monte Carlo starting Z position
Reco_vs_MC_Startz
Entries 9600
Mean x 229.2
Mean y 225.2
RMS x 131.7
RMS y 130.1
Reconstructed Z (cm)
Monte Carlo Z (cm)

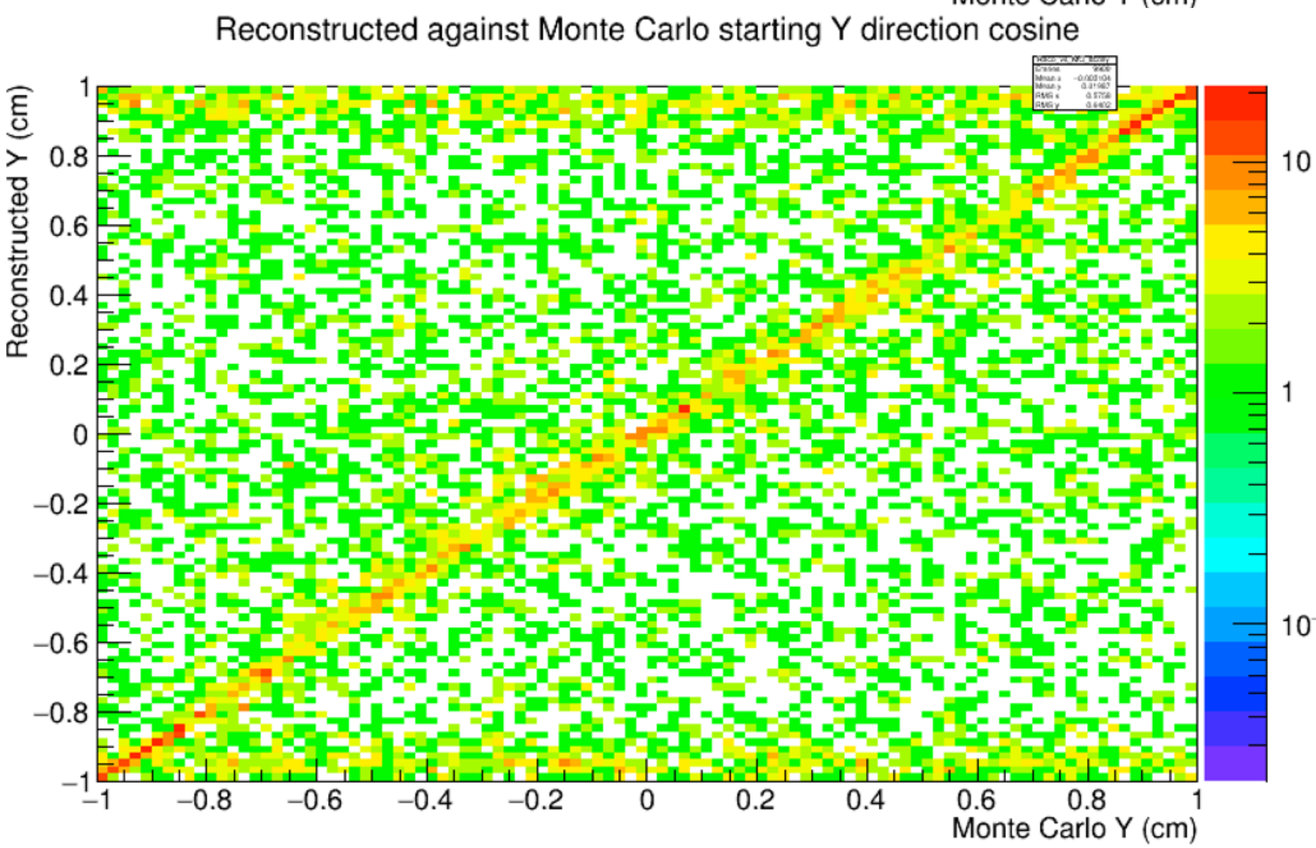

Reconstructed against Monte Carlo starting X direction cosine
Reconstructed X (cm)
Monte Carlo X (cm)

Reconstructed against Monte Carlo starting X direction cosine
Reconstructed X (cm)
Monte Carlo X (cm)

Reconstructed against Monte Carlo starting X direction cosine
Reconstructed X (cm)
Monte Carlo X (cm)

Reconstructed against Monte Carlo starting X direction cosine
Reconstructed X (cm)
Monte Carlo X (cm)



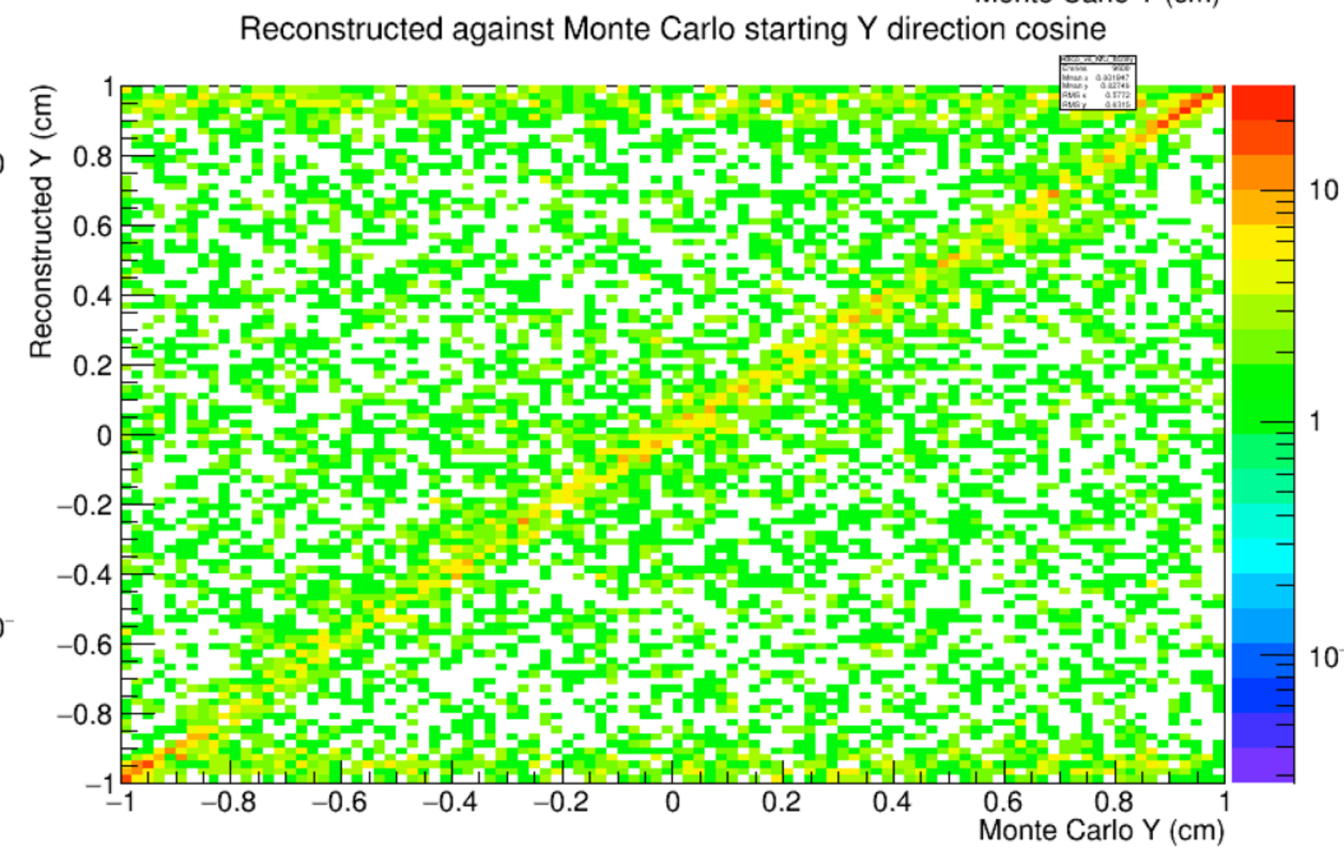
Reconstructed against Monte Carlo starting Y direction cosine
Reconstructed Y (cm)
Monte Carlo Y (cm)
10
1
10^{-1}



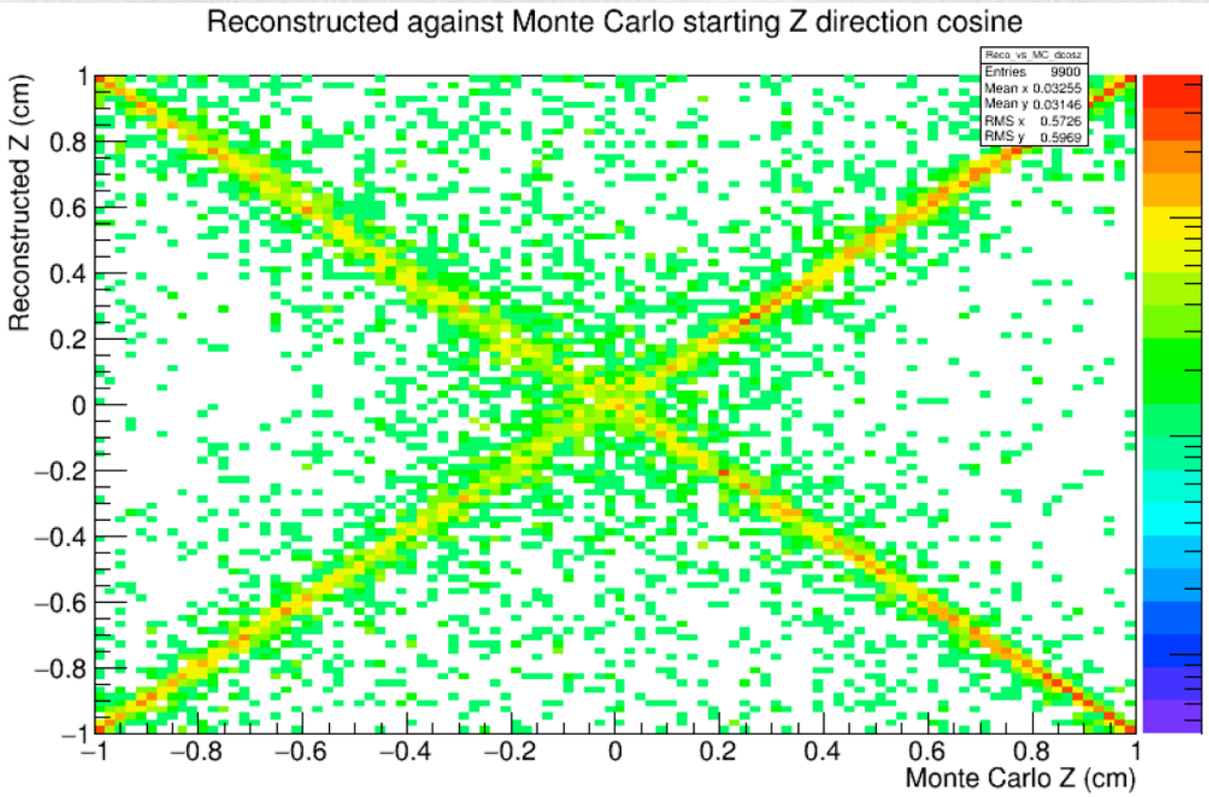
Reconstructed against Monte Carlo starting Y direction cosine
Reconstructed Y (cm)
Monte Carlo Y (cm)
10
1
10^{-1}

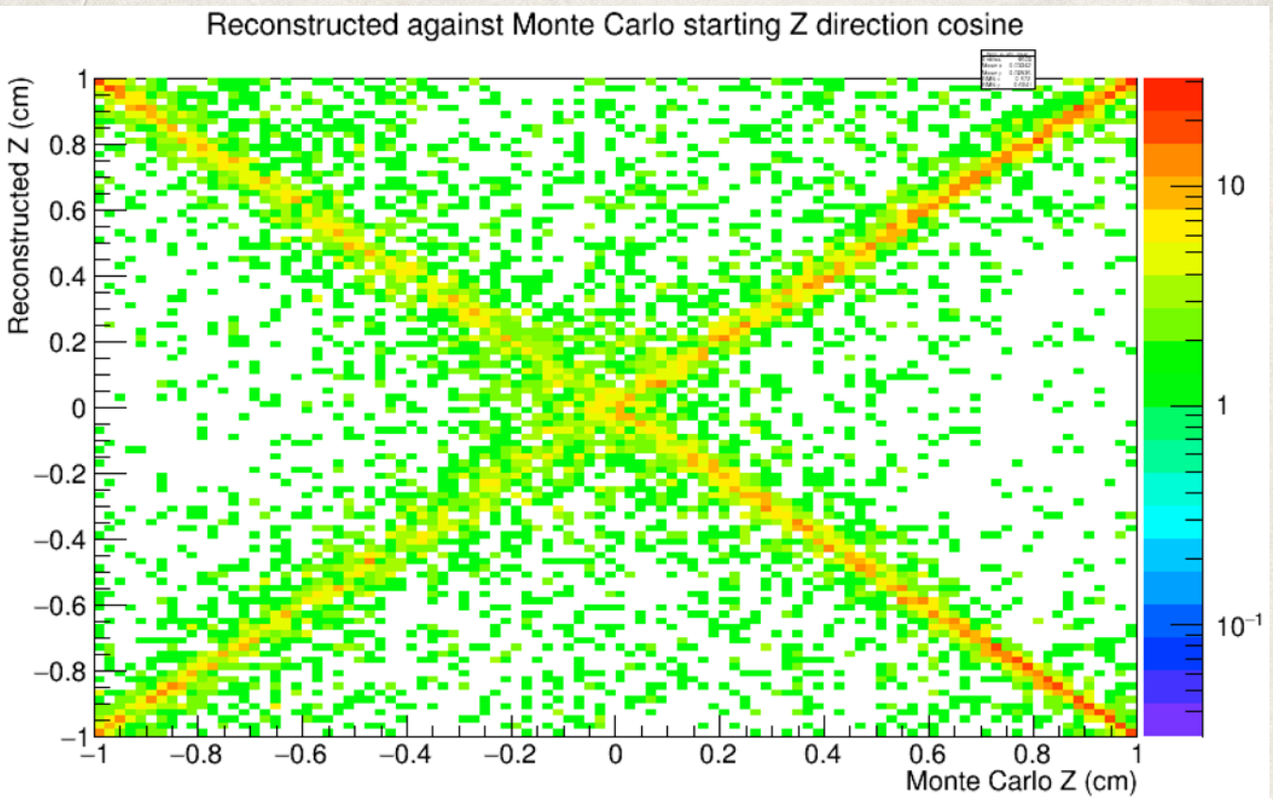


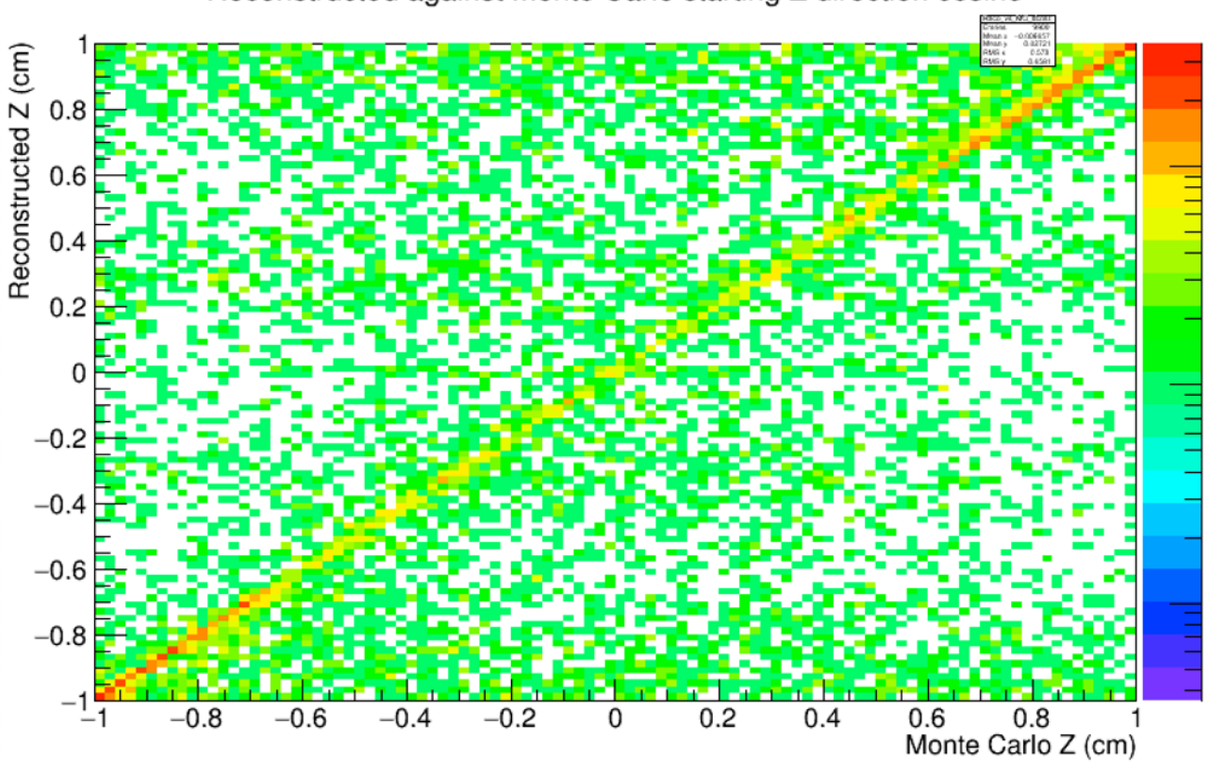
Reconstructed against Monte Carlo starting Y direction cosine
Reconstructed Y (cm)
Monte Carlo Y (cm)
10
1

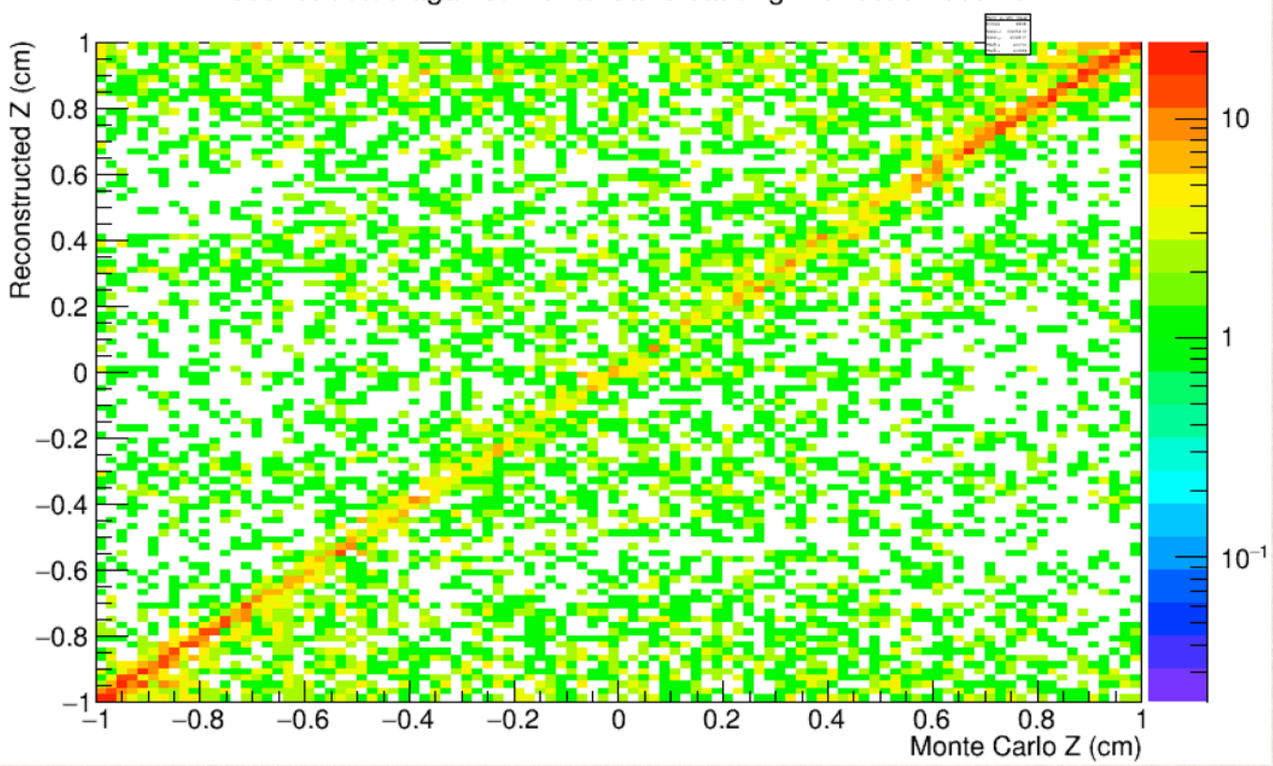


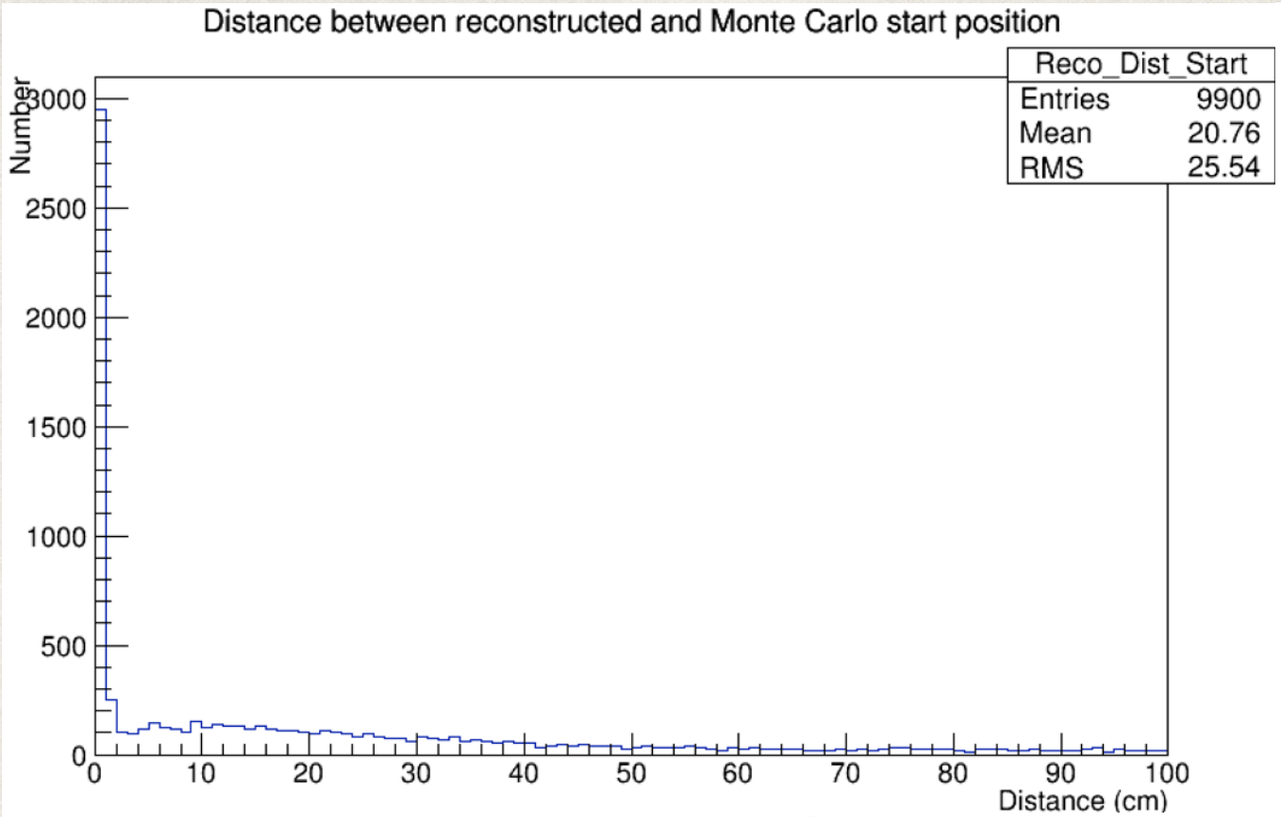
Reconstructed against Monte Carlo starting Y direction cosine
Reconstructed Y (cm)
Monte Carlo Y (cm)
10
1
10^{-1}

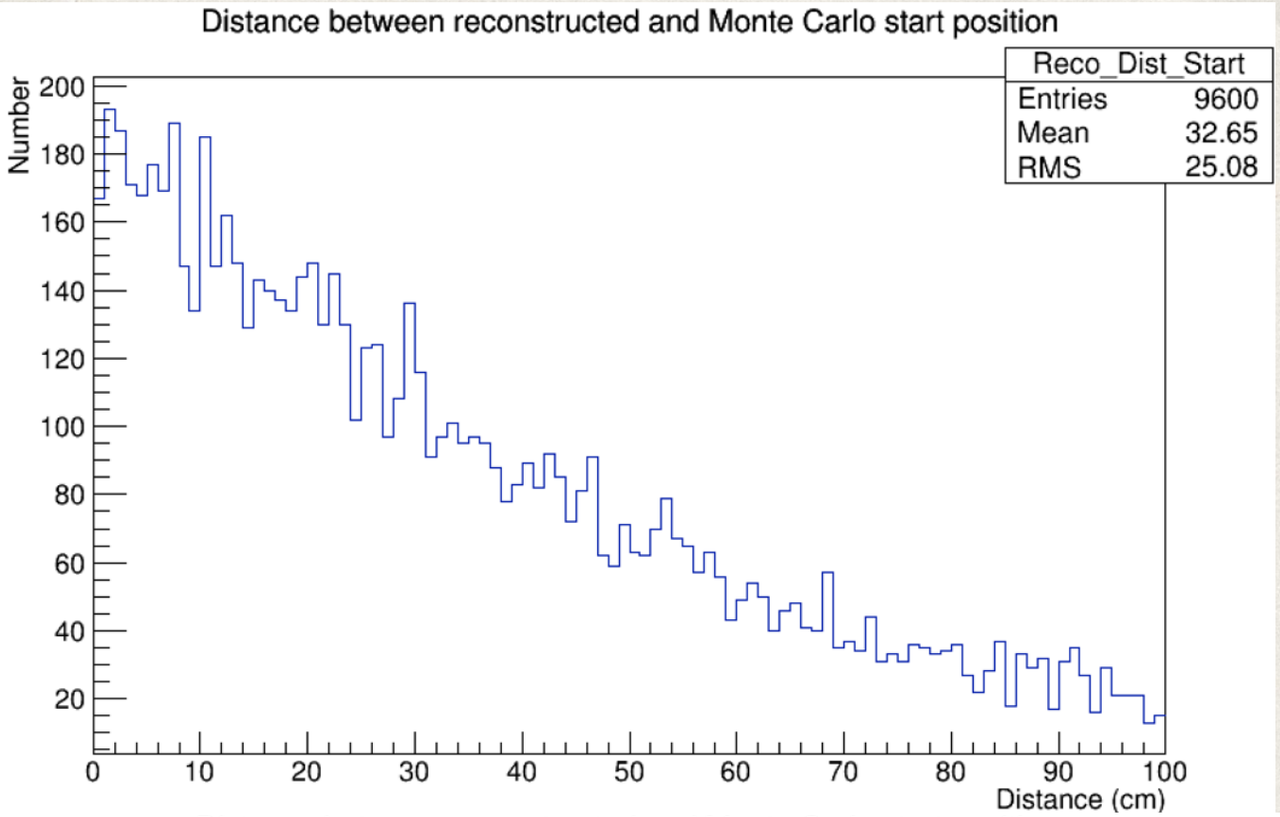

Reconstructed against Monte Carlo starting Z direction cosine
Reco_vs_MC_dcosz
Entries 9900
Mean x 0.03255
Mean y 0.03146
RMS x 0.5726
RMS y 0.5969
Reconstructed Z (cm)
Monte Carlo Z (cm)

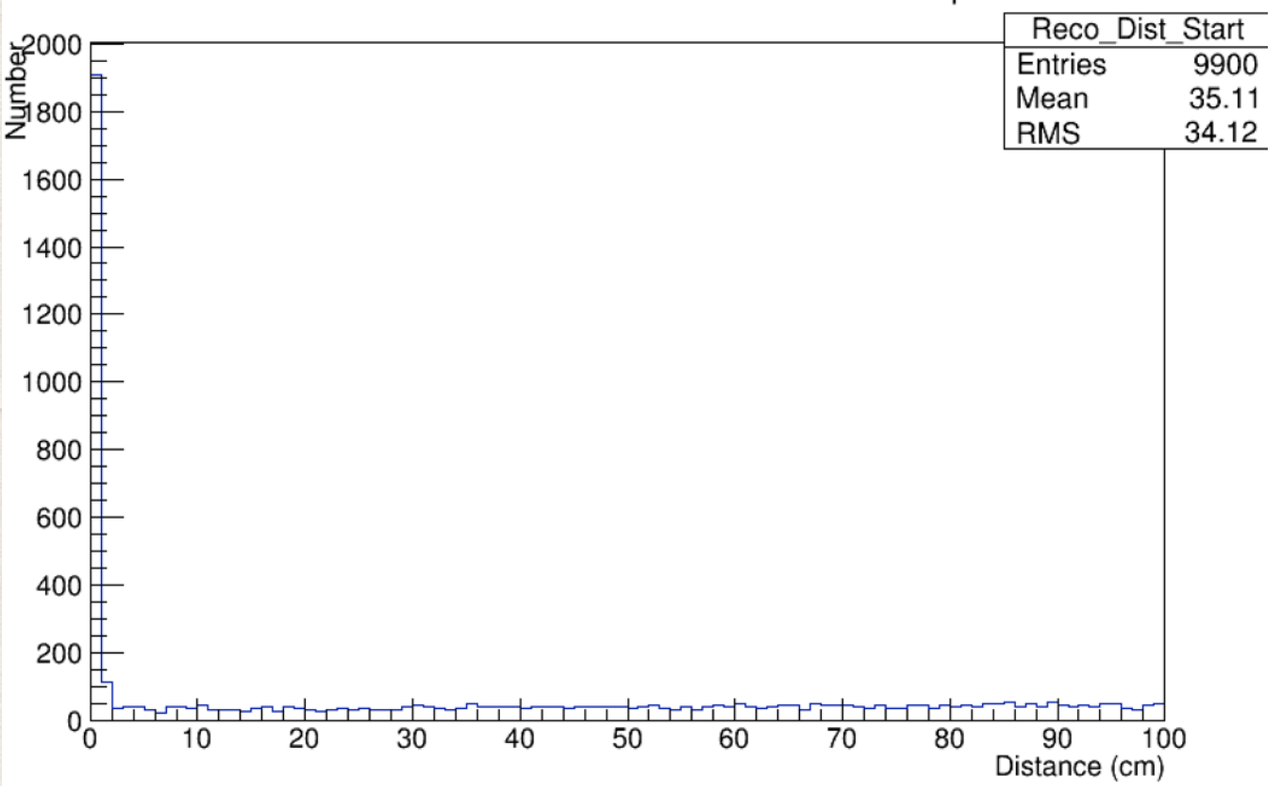

Reconstructed against Monte Carlo starting Z direction cosine
Reconstructed Z (cm)
Monte Carlo Z (cm)

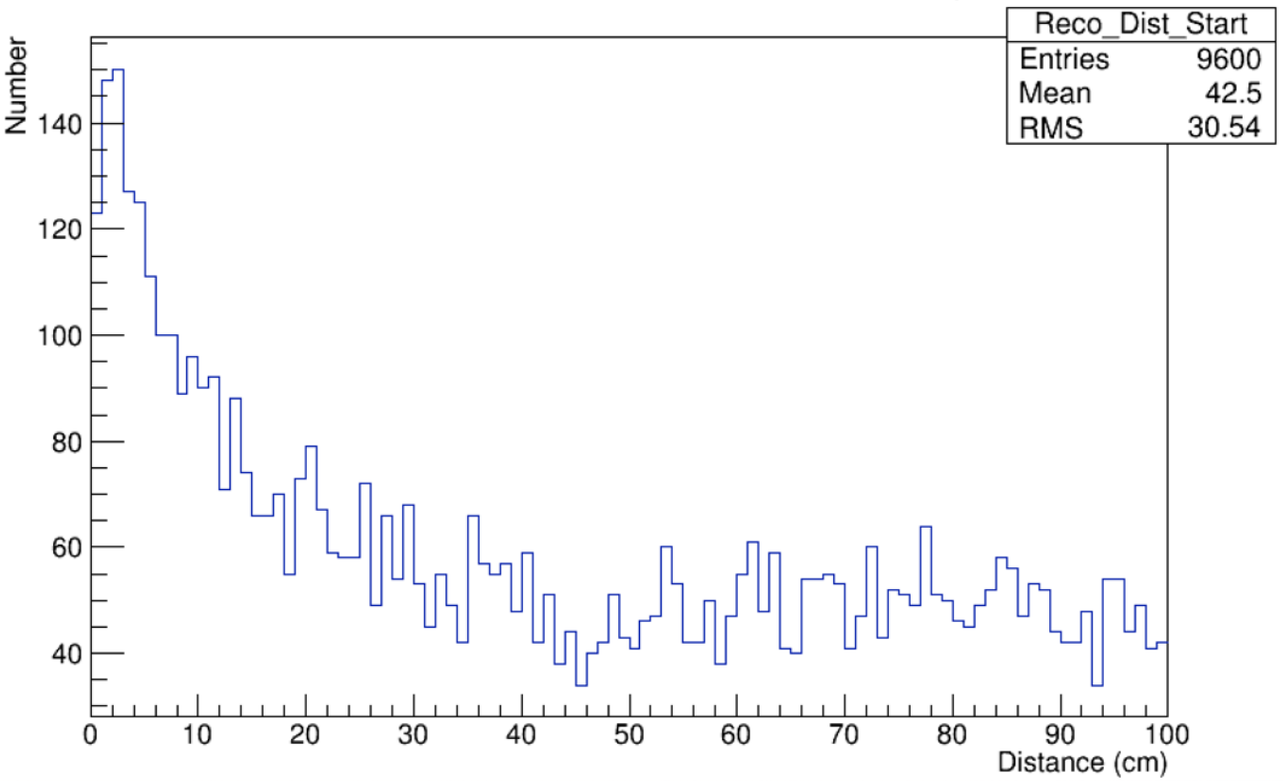

Reconstructed against Monte Carlo starting Z direction cosine
Reconstructed Z (cm)
Monte Carlo Z (cm)


Reconstructed against Monte Carlo starting Z direction cosine
Reconstructed Z (cm)
Monte Carlo Z (cm)

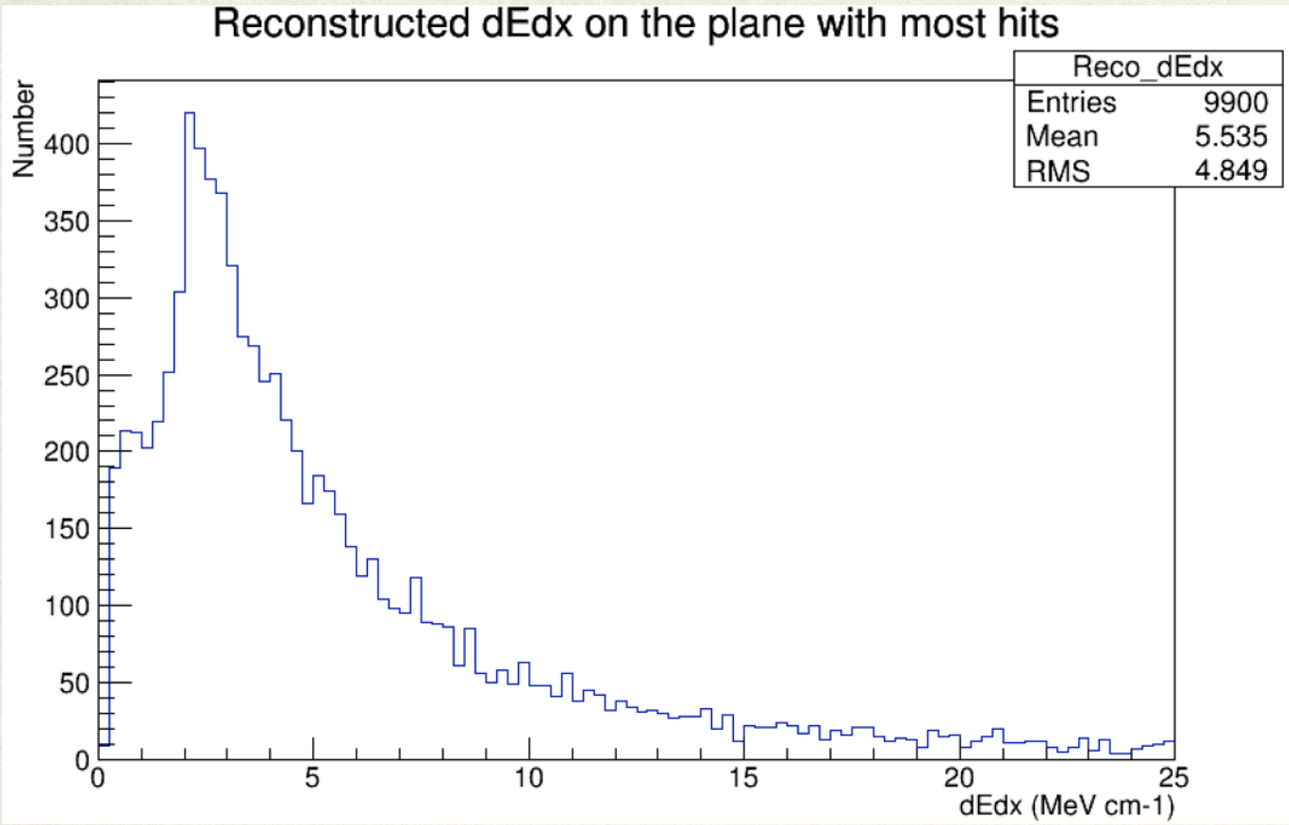

Distance between reconstructed and Monte Carlo start position
Reco_Dist_Start
Entries 9900
Mean 20.76
RMS 25.54
Number
Distance (cm)

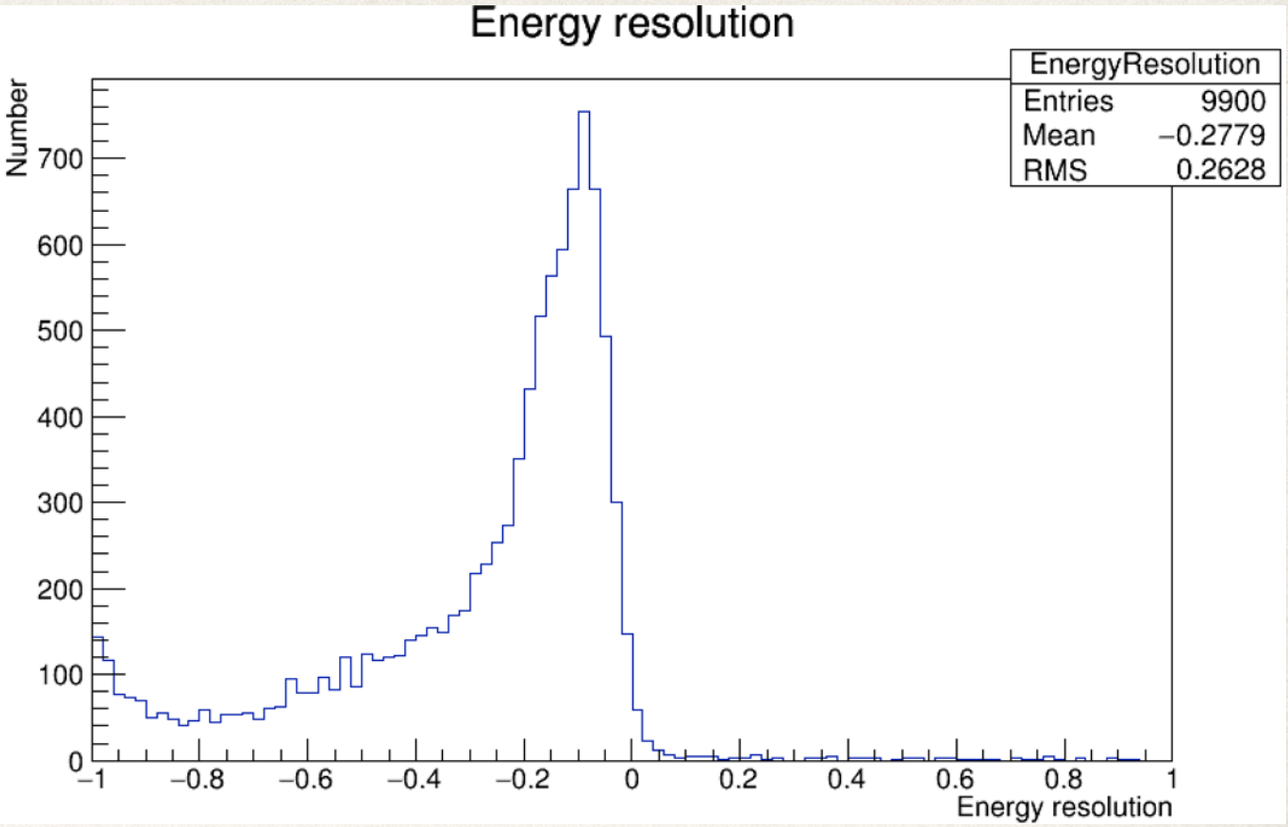

Distance between reconstructed and Monte Carlo start position
Reco_Dist_Start
Entries 9600
Mean 32.65
RMS 25.08
Number
Distance (cm)


Distance between reconstructed and Monte Carlo start position
Reco_Dist_Start
Entries 9900
Mean 35.11
RMS 34.12
Number
Distance (cm)

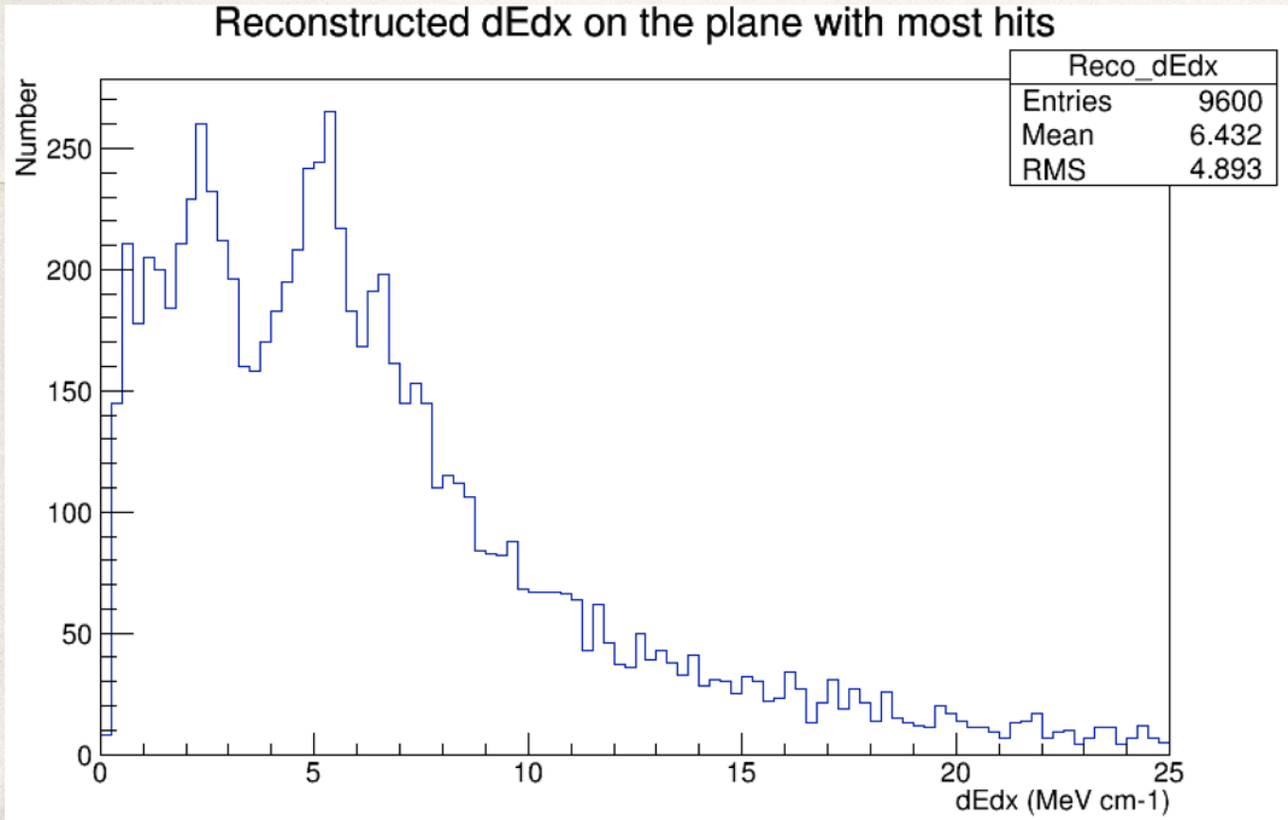

Distance between reconstructed and Monte Carlo start position
Reco_Dist_Start
Entries 9600
Mean 42.5
RMS 30.54
Number
Distance (cm)

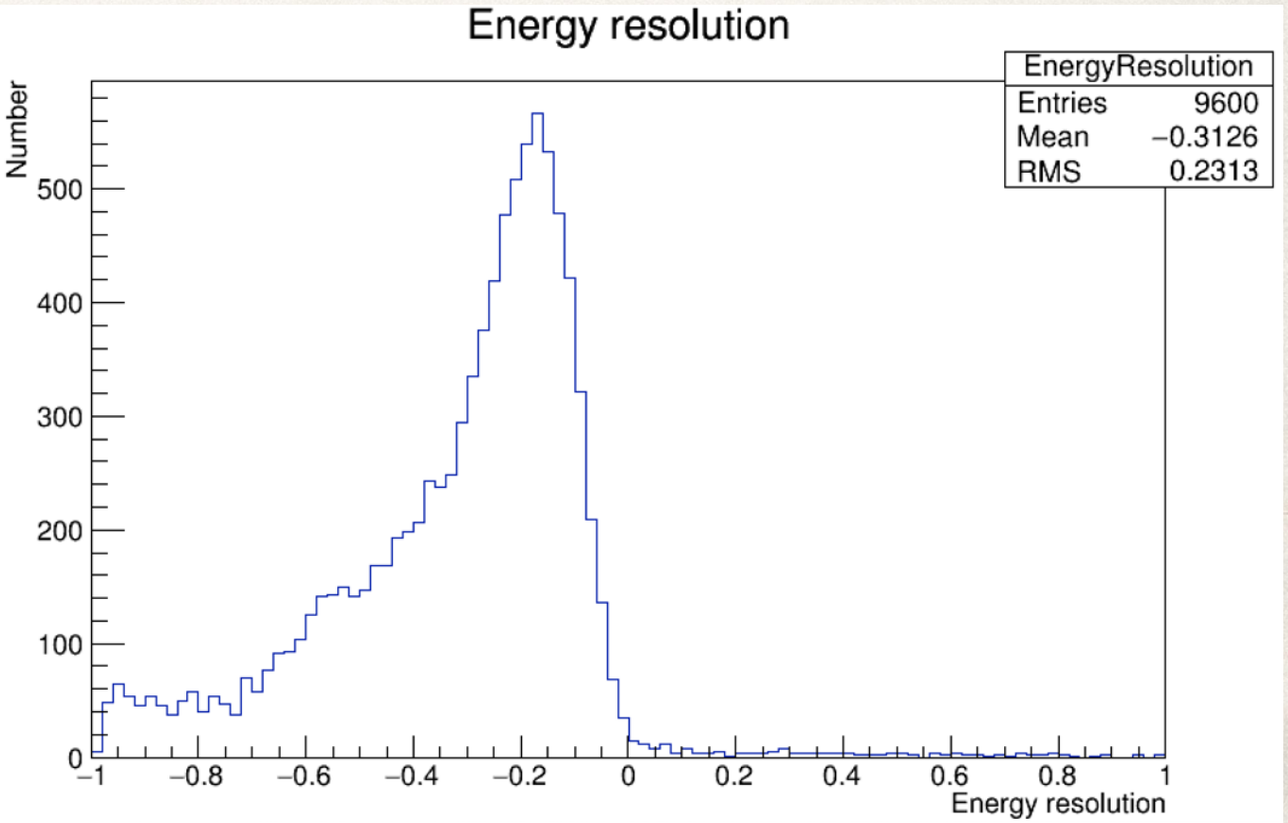
Electrons





Photons





Summary

- Both look great!
  - Especially in X, Y, Z positions, as shown by position and distance images!
- Blurred sometimes gets the direction going in the wrong way, but other than that it's 'bang on.'
- Merged gets a lot of the direction perfect, but also a spread.
- Energy resolution of blurred is excellent. Double peak for gammas is strange though.