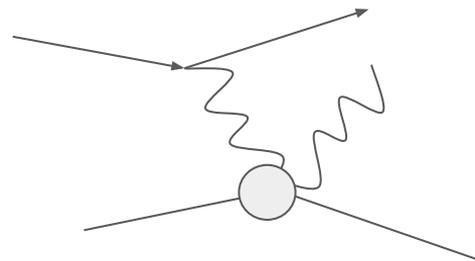




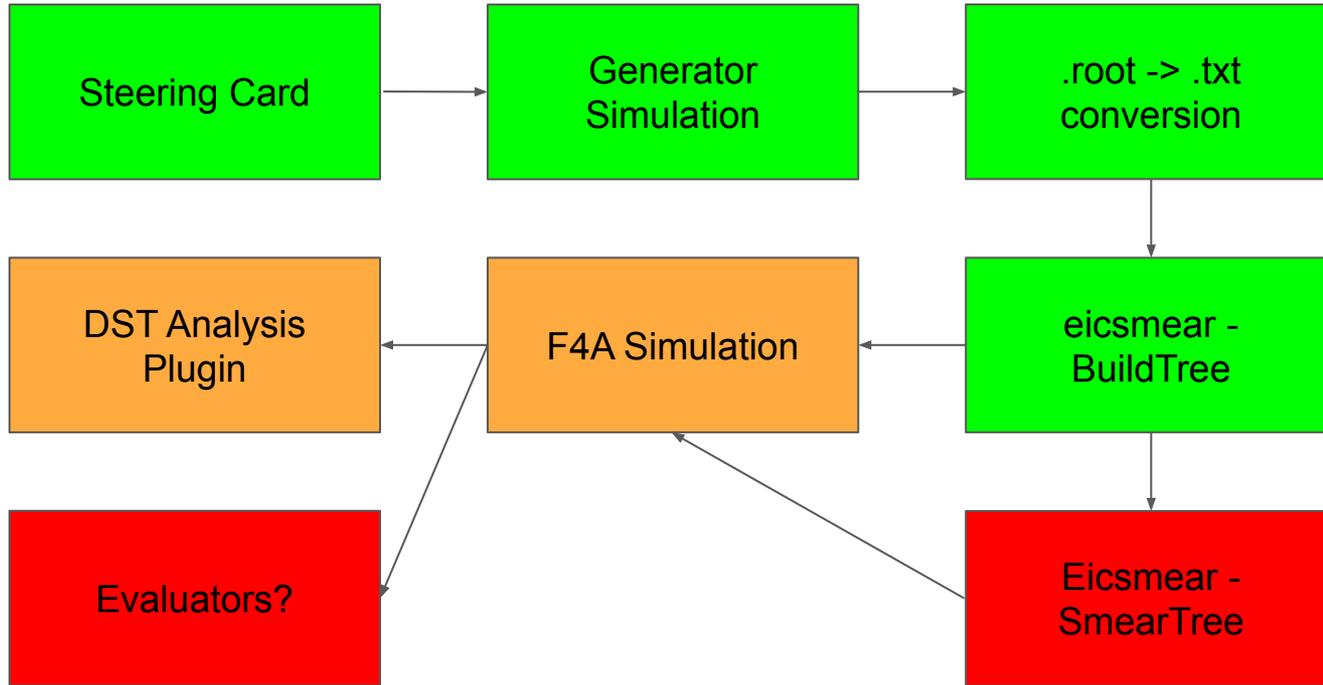
University
of Glasgow

Deeply Virtual Compton Scattering

$$eA \rightarrow e'A'\gamma$$



Status of Workflow



Generator: Topeg

The (DVCS) Orsay-Perugia Event
Generator : TOPEG

<https://gitlab.in2p3.fr/dupre/nopeg>

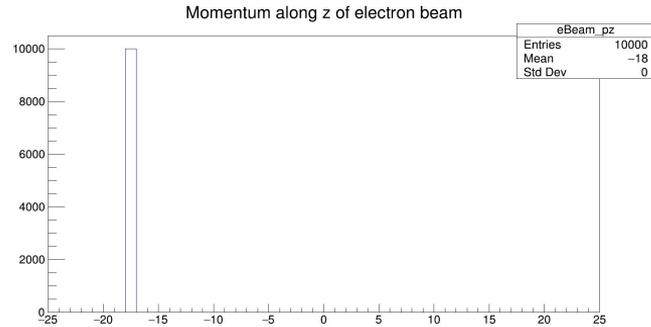
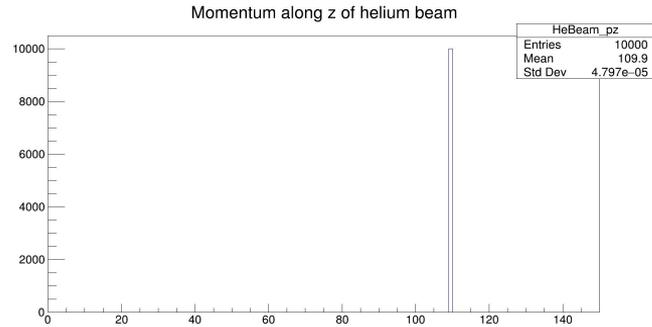
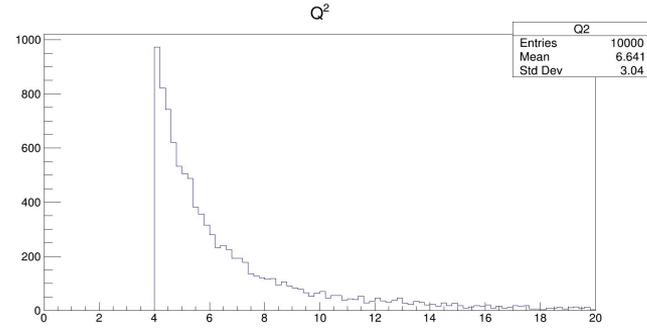
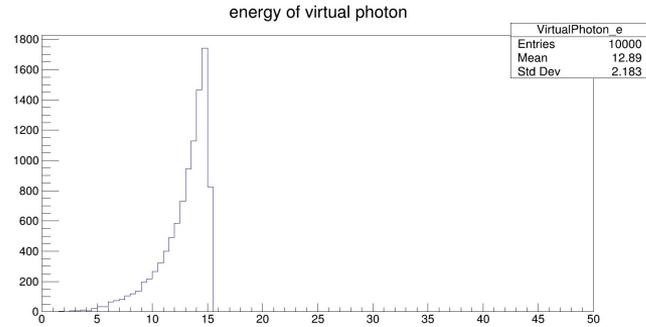
- Raphael Dupre, Sara Fucini

- Data from 18x110 with positive electron beam helicity
- Currently for 10K events.

```
output/Out-EIChigh-M3-Ph.root % Output file name
18.0 % Electron beam energy (GeV)
109.937 % Nuclear beam momentum (GeV)
2 % Z of nucleus
4 % A of nucleus
10000 % Nb of events to generate
10000 % Nb of TFOam cells
300 % Nb of samples per cell
1234 % Seed
0.05 % y min
0.85 % y Max
4.0 % Q2 min (GeV^2)
30.0 % Q2 Max (GeV^2)
16.0 % W2 min (GeV^2)
2.35 % theta Max electron (radians)
0.01 % t min (GeV^2)
0.5 % t Range (GeV^2)
3 % Model nb (1: Param (no helicity), 2: Fucini, 3: Fucini without real
spart)
1.0 % Electron beam helicity
0.0 % non used double
█

-:--- EIChigh-M3-Ph.txt All L21 Git-master (Text)
```

Topeg/eic Tree Plots (starting kinematics)



Lund Format Conversion



Conversion
Macro

SIMPLE Event FILE

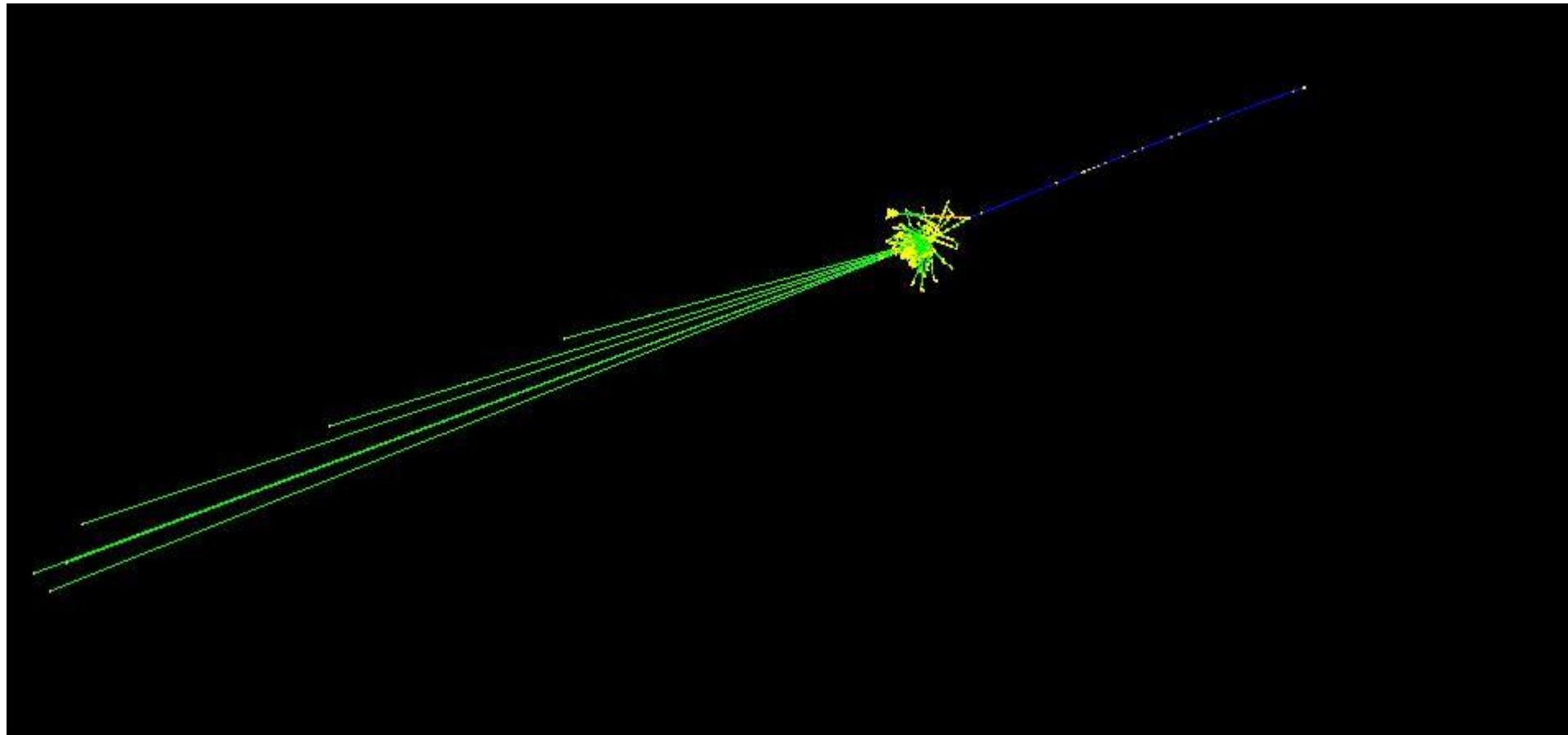
I, ievent, nParticles

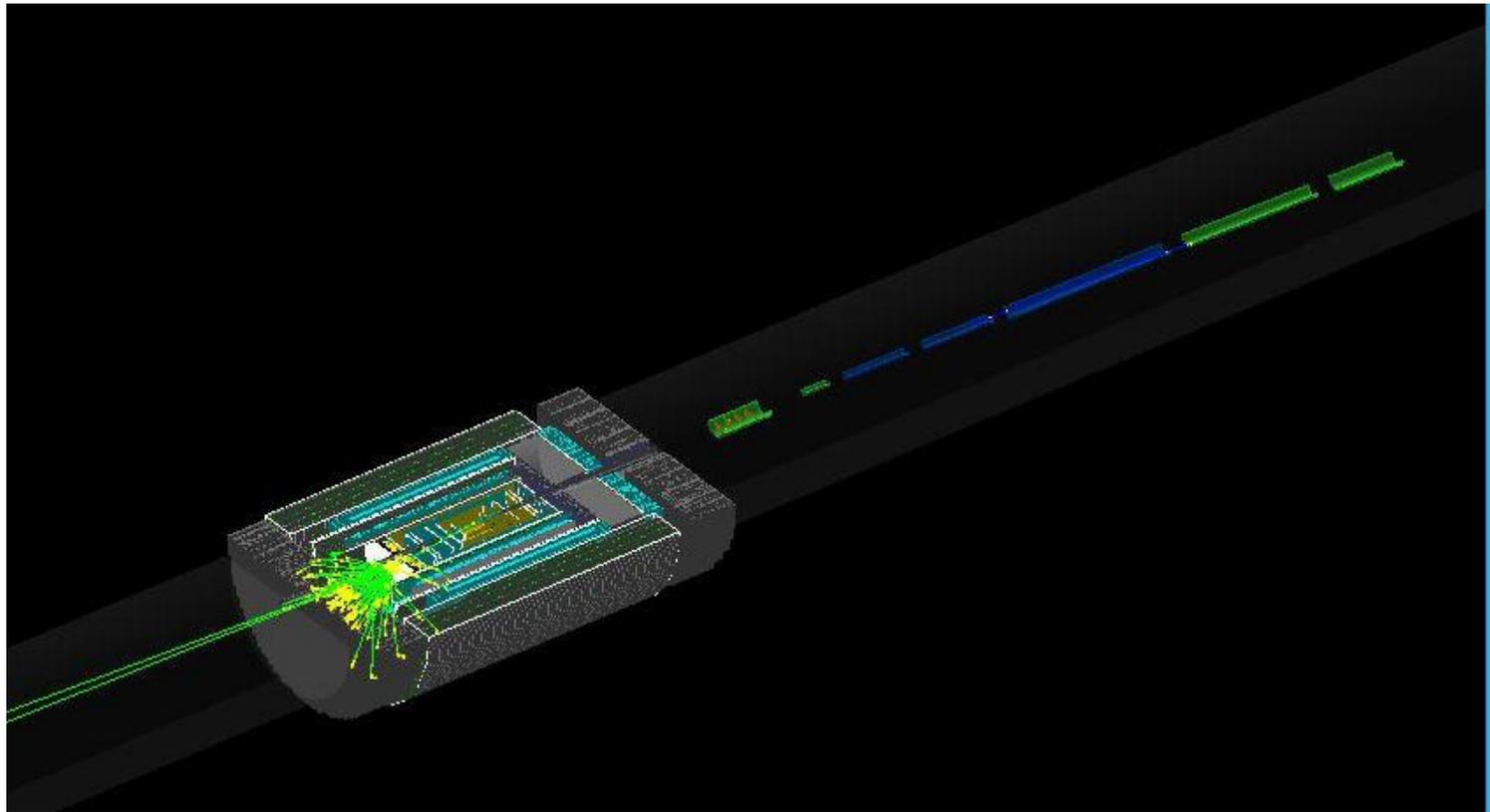
I K(I,1) K(I,2) K(I,3) K(I,4) K(I,5) P(I,1) P(I,2) P(I,3) P(I,4) P(I,5) V(I,1) V(I,2) V(I,3)

```
0      0      3
=====
1  21      11      0      3      4      0      0      -18      18      0.000511      0      0      0
2  21  1000020040      0      6      6      0      0      109.937      110      3.72743      0      0      0
3  21      22      1      0      0      -0.800566      -0.802341      -15.3117      15.0826      -2.8723      0      0      0
4  1      11      1      0      0      0.800566      0.802341      -2.68827      2.91744      0.000511      0      0      0
5  1      22      1      0      0      -0.815832      -1.07251      -15.1671      15.2268      0      0      0      0
6  1  1000020040      2      0      0      0.0152656      0.270171      109.792      109.856      3.72752      0      0      0
=====
```

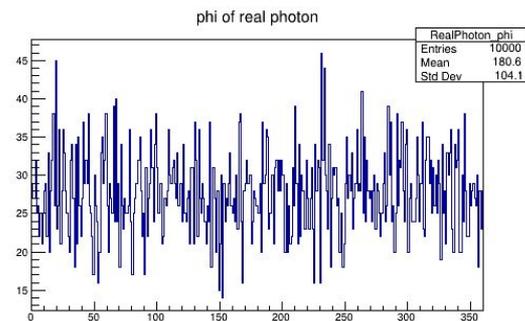
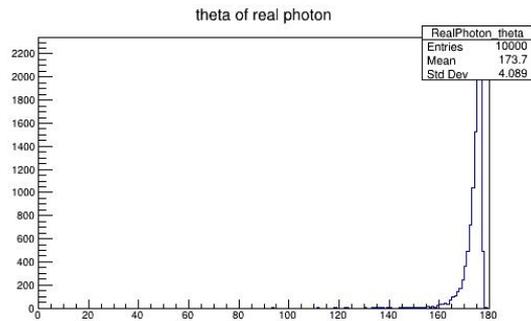
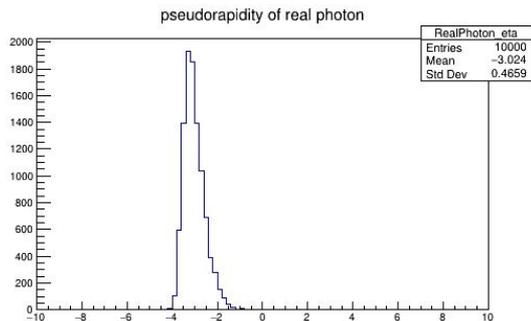
Event finished

Simulation: Fun4All



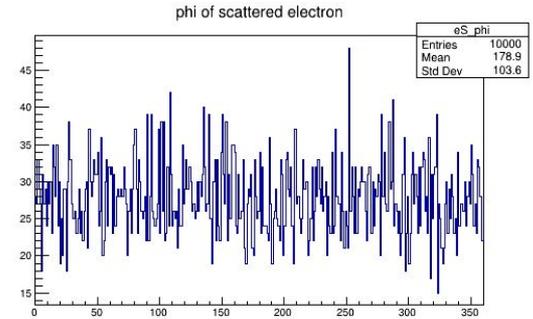
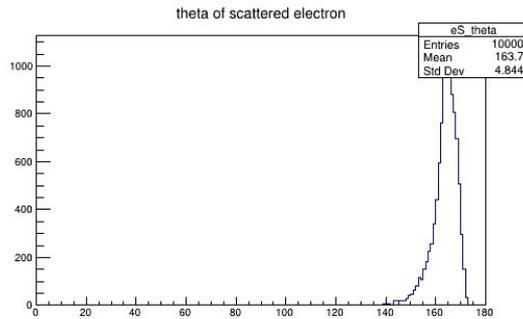
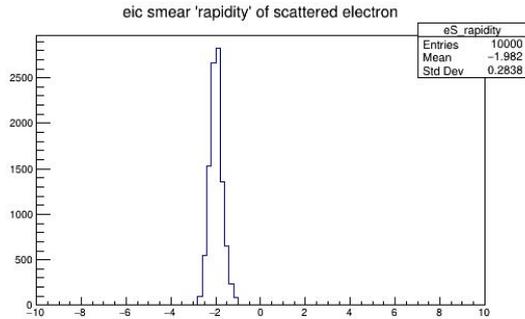


Generator final Kinematics



- $1 \leq |\eta| \leq 4$ - mean 3.024
- $150^\circ \leq \Theta \leq \sim 178^\circ$? - mean 173.7
- $0^\circ \leq \phi \leq 360^\circ$ - about homogenous

Generator final Kinematics

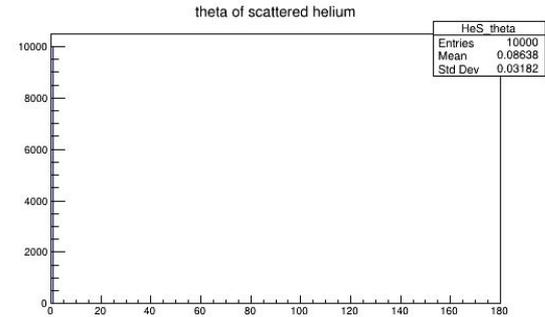
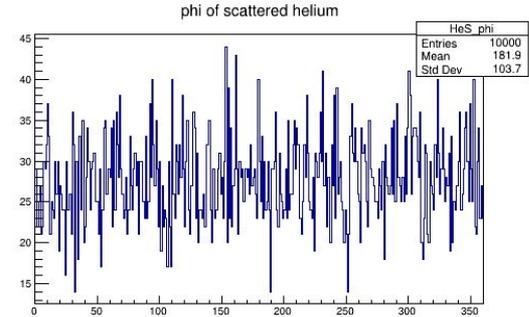
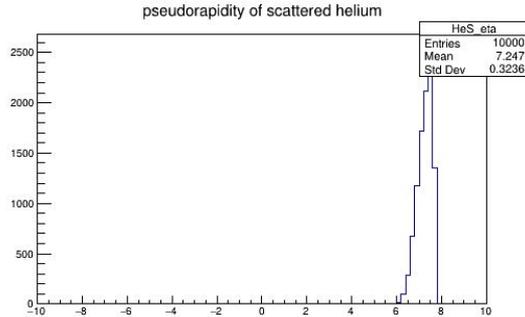
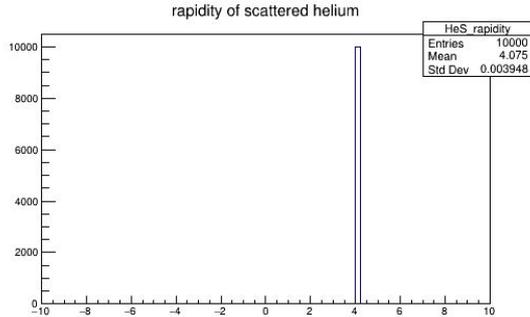


- $1 \leq |\eta| < \sim 3$ - mean 1.982
- $140^\circ \leq \theta \leq \sim 178^\circ$?
- $0^\circ \leq \phi \leq 360^\circ$ - also about homogenous, (good)
- Pseudorapidity (eta) and rapidity were identical (high momentum approx.)

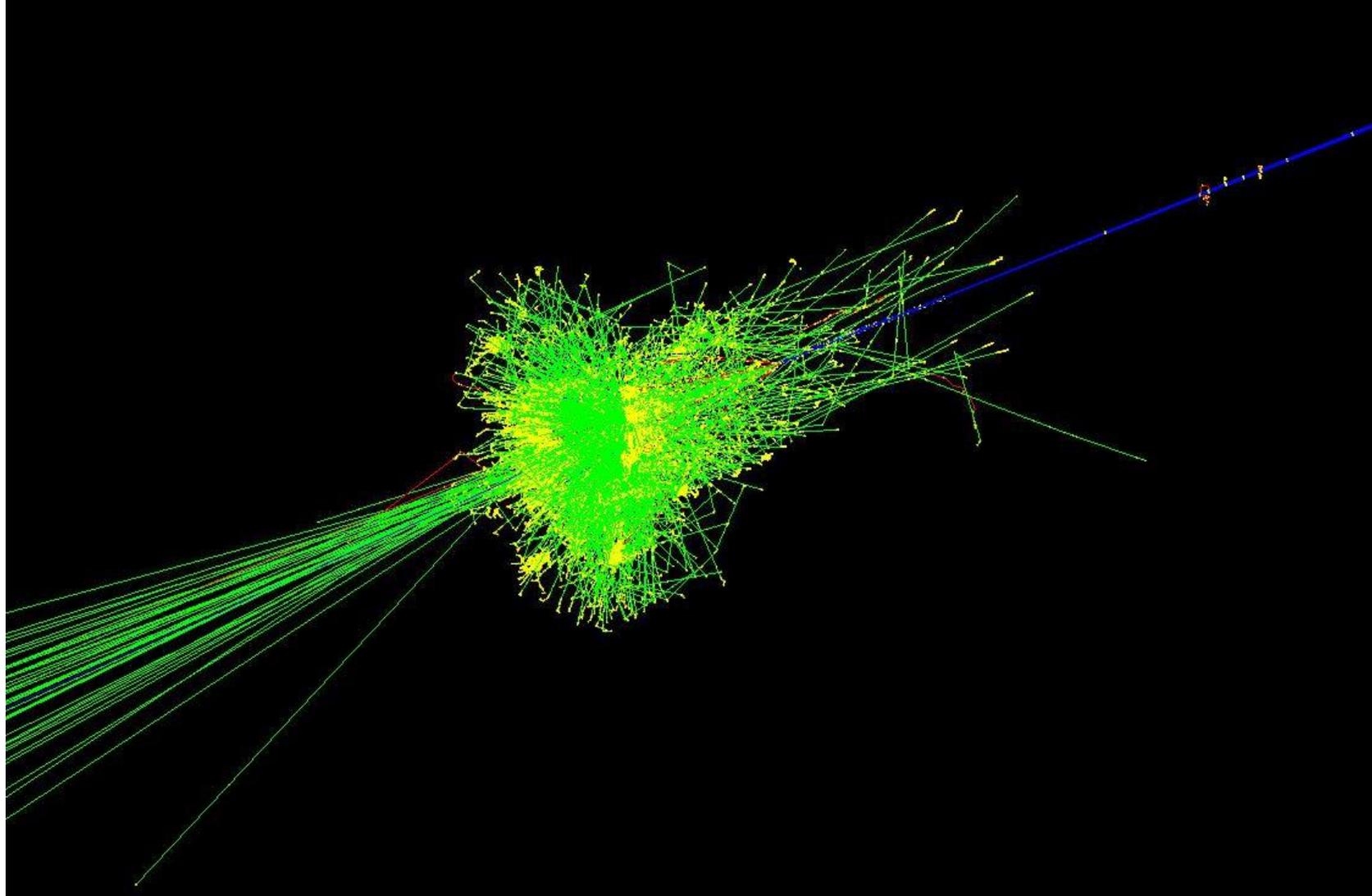
$$\eta = \frac{1}{2} \ln \left(\frac{|\mathbf{p}| + p_L}{|\mathbf{p}| - p_L} \right) = \operatorname{artanh} \left(\frac{p_L}{|\mathbf{p}|} \right),$$

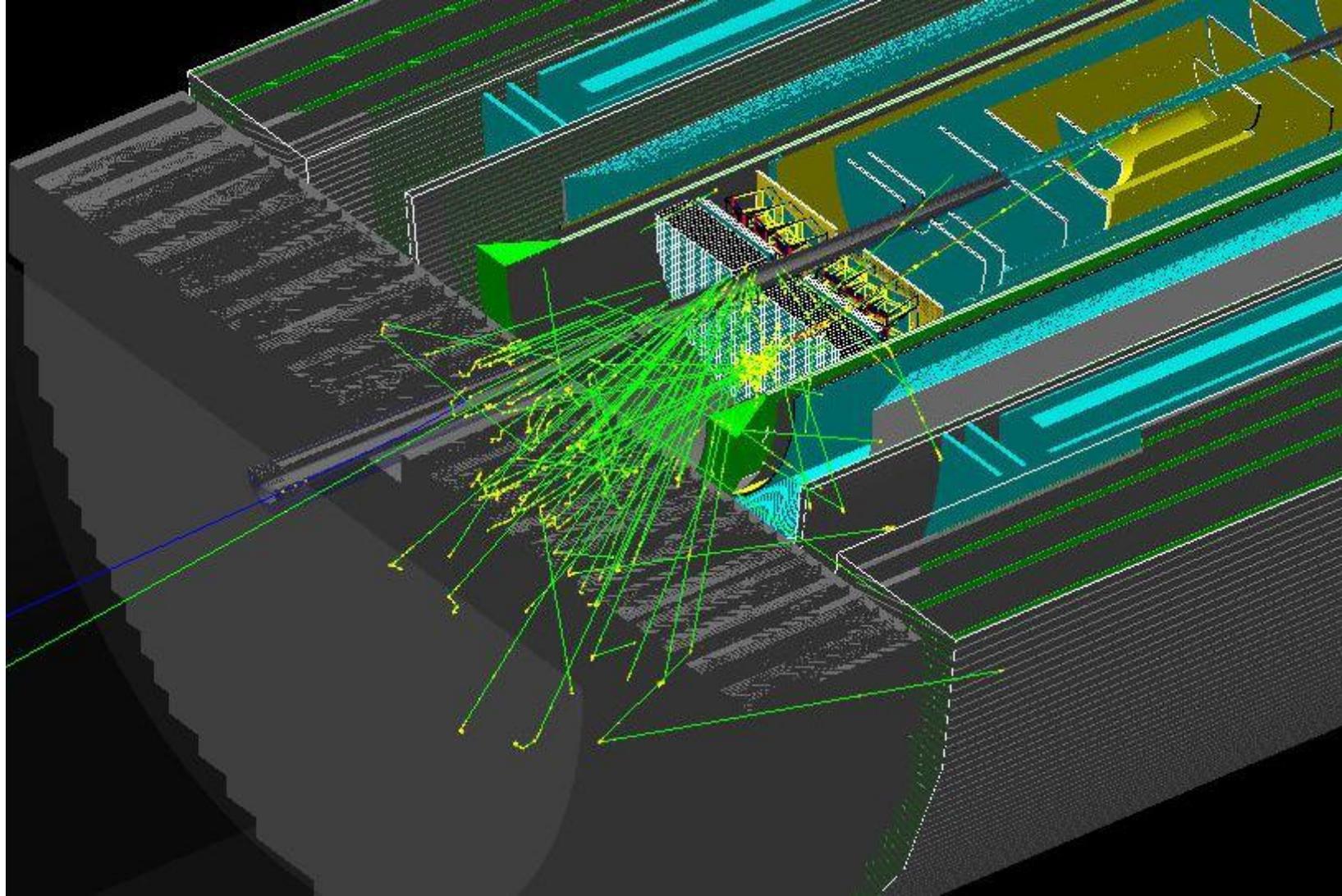
$$y \equiv \frac{1}{2} \ln \left(\frac{E + p_L}{E - p_L} \right)$$

Generator Kinematics - Helium

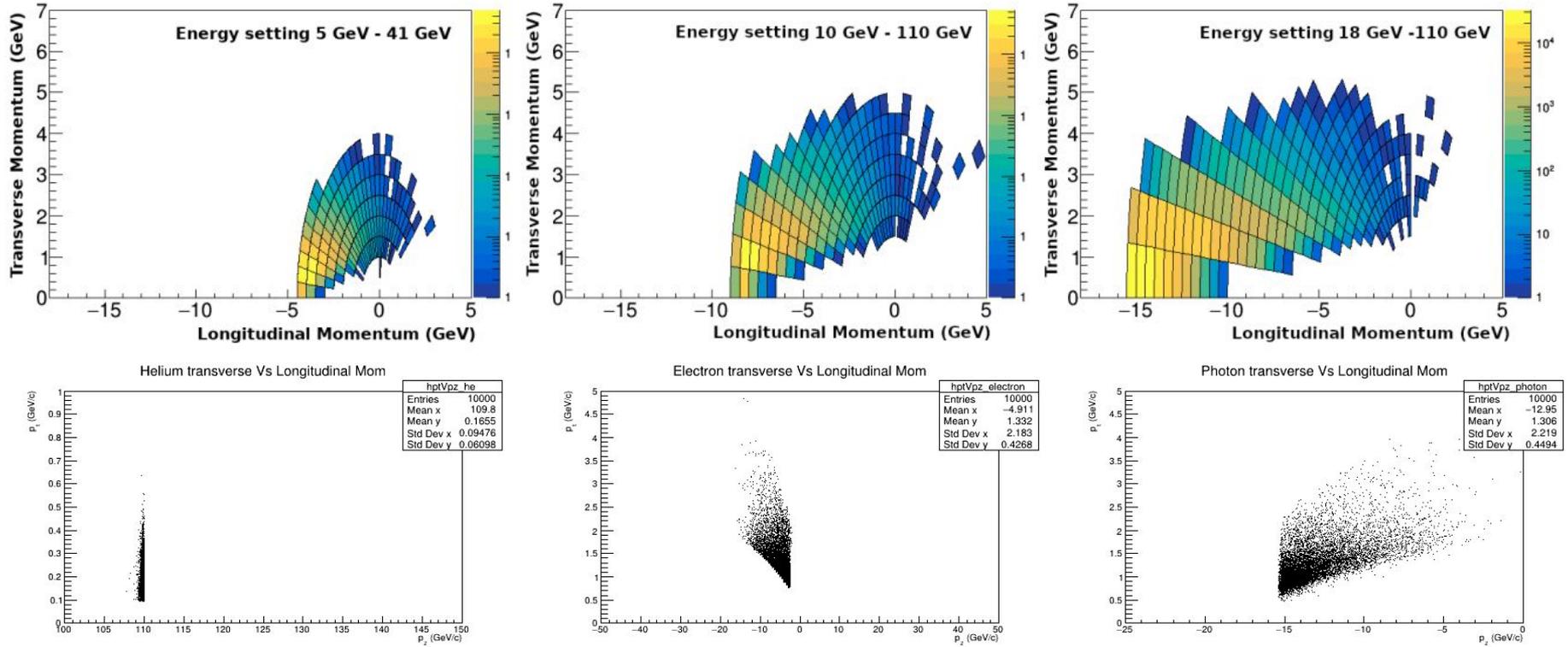


- $\leq |\eta| <$ - mean
- $\leq |y| \leq$ - mean
- $\Theta \approx 0$ (as expected)
- $0^\circ \leq \phi \leq 360^\circ$ - also about homogenous
- Pseudorapidity (eta) and rapidity were **not** the same due to helium mass





Recreating Yellow Report Plots



Kinematic distributions of photons from DVCS at 3 energy configuration (Top). Kinematic distributions of electron, helium and photon from DVCS at **highest** energy configuration (Bottom)

Next Steps

- Analysis of Fun4All DST output -> meat and potatoes of the physics
 - Fix Analysis plugin - currently returning int 0!
 - Comparison of 'truth' to reconstructed track data
 - Smearing aspect
 - Effect of passing input through eicsmear - SmearTree function before simulation
- Full / Larger Statistics simulation once output is understood.