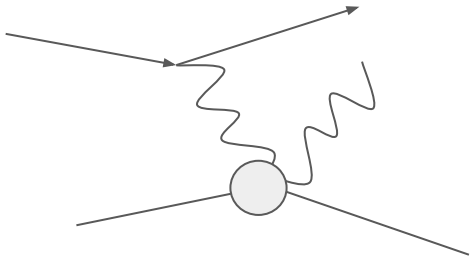
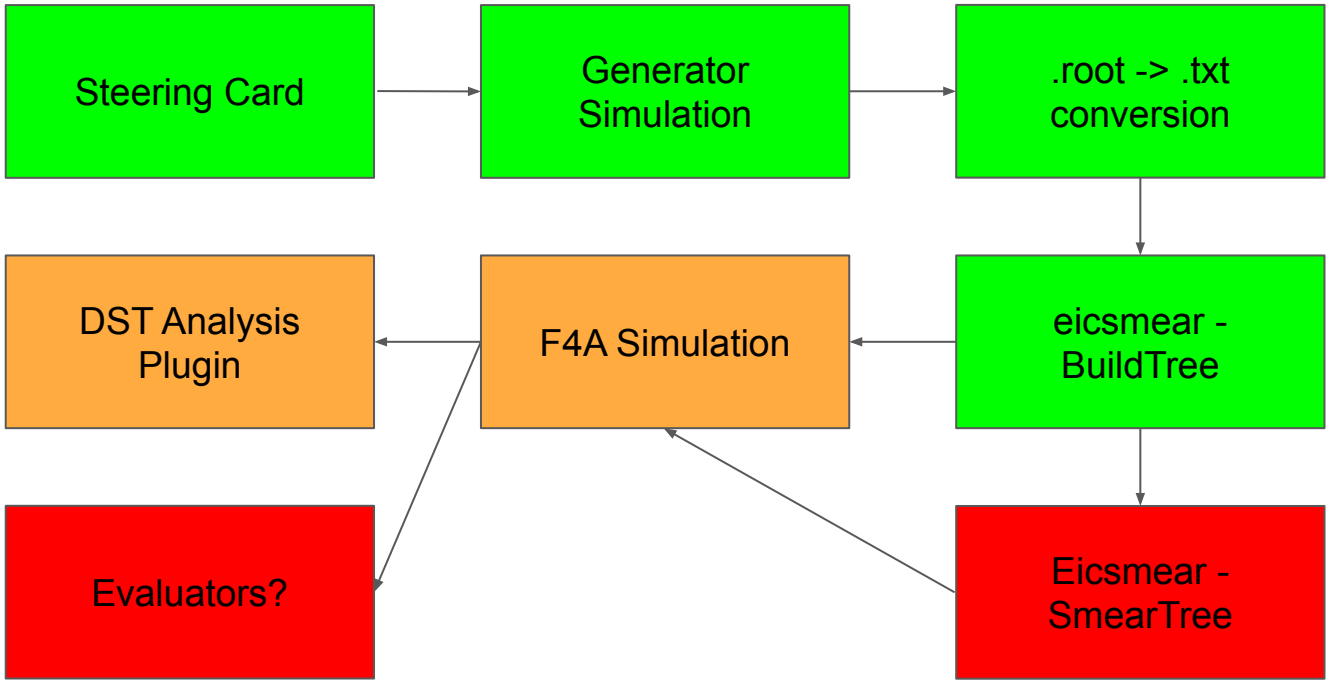
University of Glasgow

Deeply Virtual Compton Scattering

eA->e'A'γ



Status of Workflow



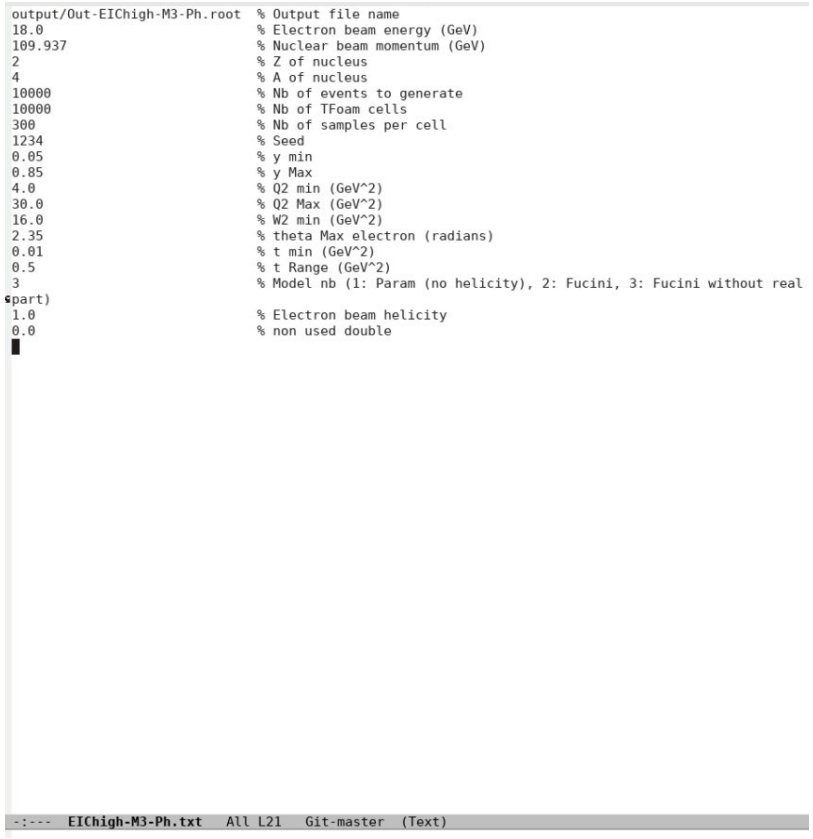
Generator: Topeg

The (DVCS) Orsay-Perugia Event Generator : TOPEG

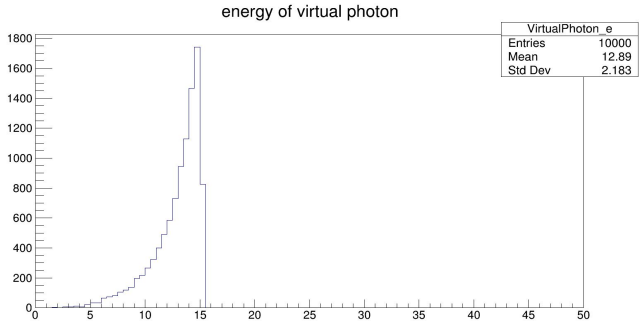
https://gitlab.in2p3.fr/dupre/nopeg

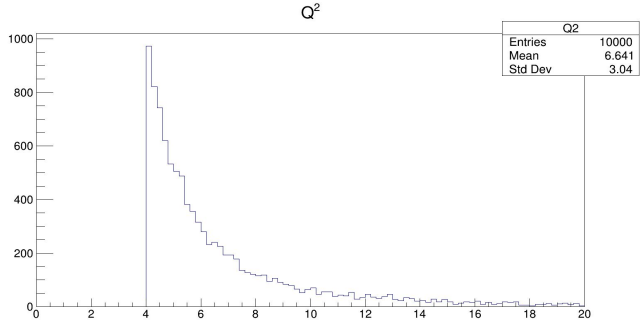
- Raphael Dupre, Sara Fucini

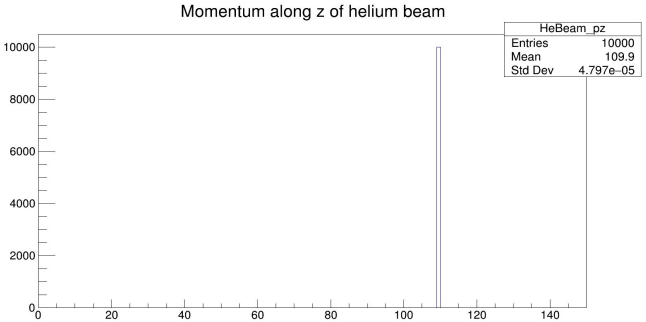
- Data from 18x110 with positive electron beam helicity
- Currently for 10K events.

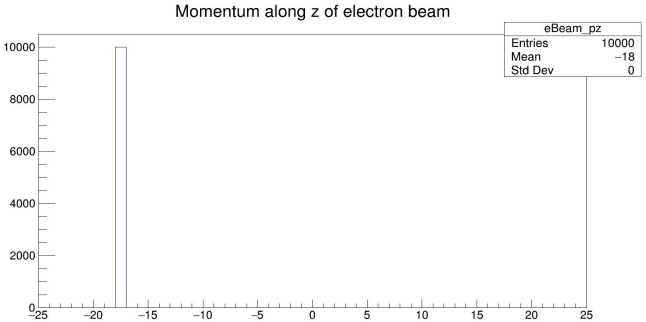


Topeg/eic Tree Plots (starting kinematics)

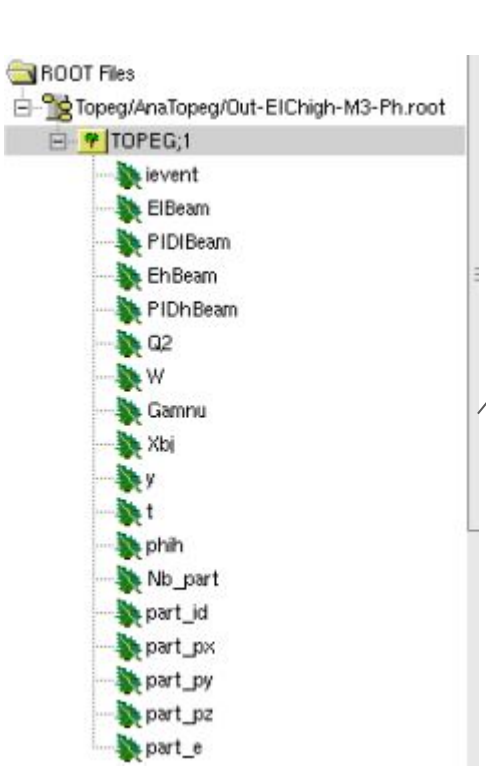


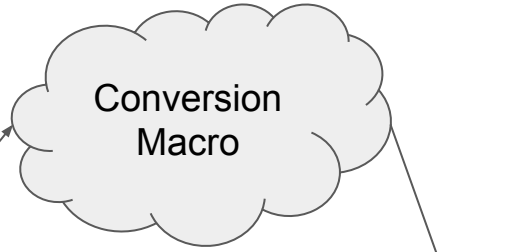






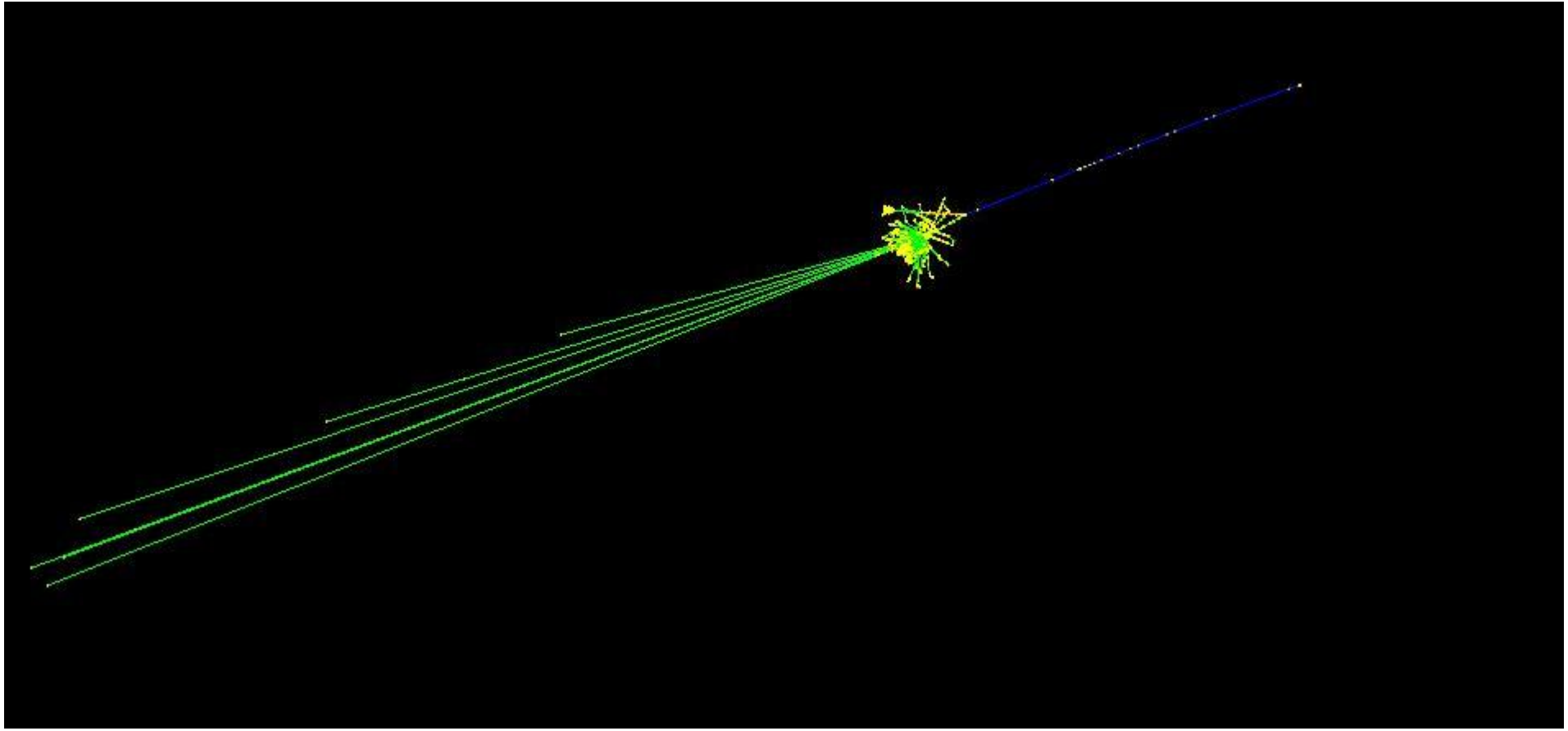
Lund Format Conversion

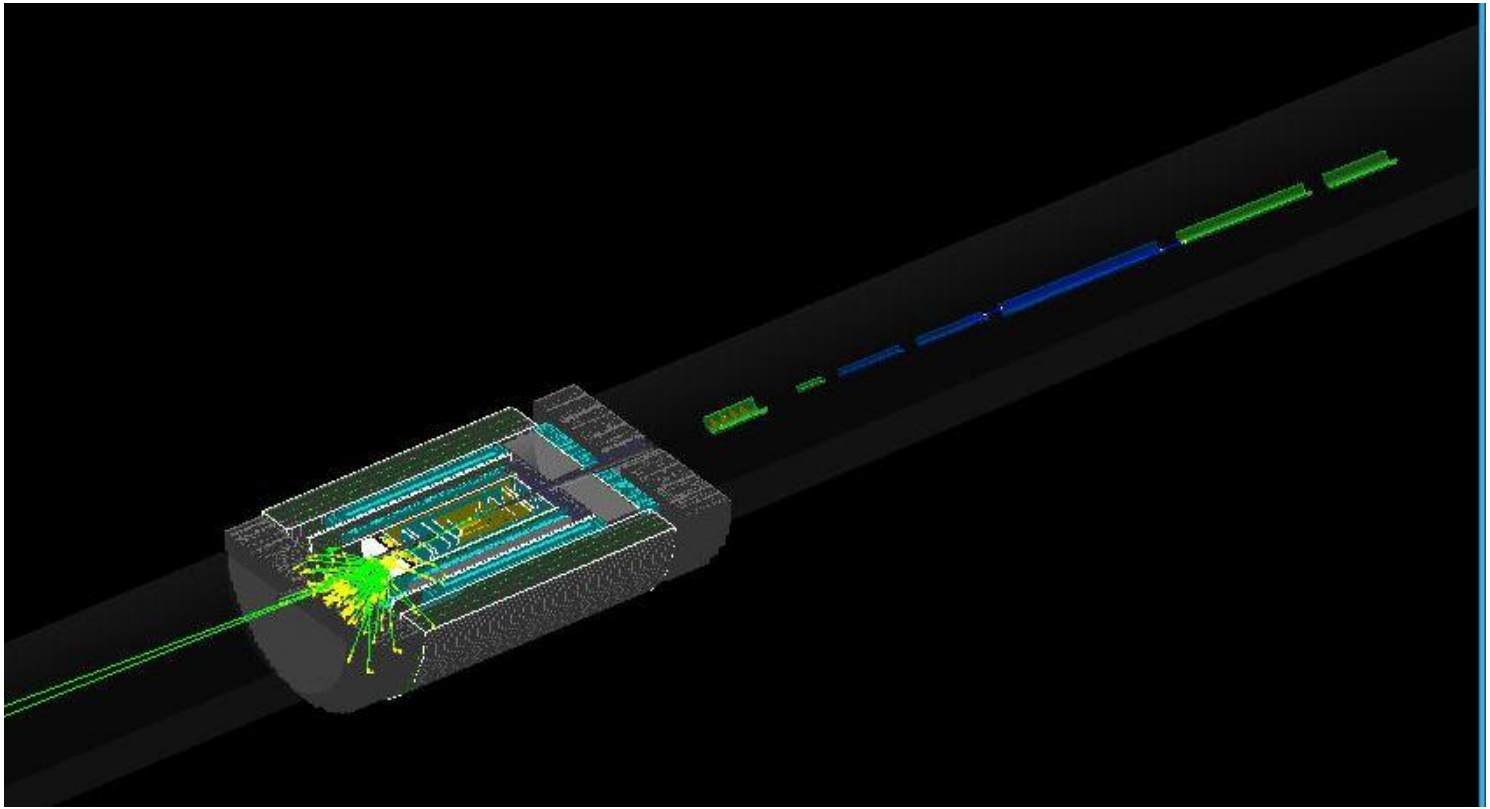




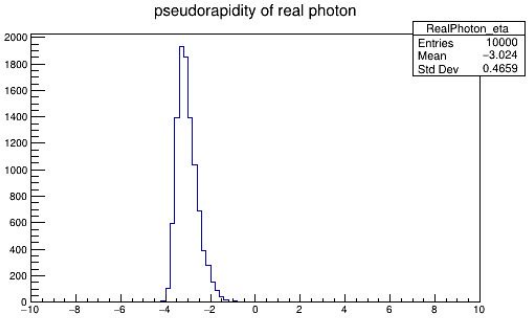

```
SIMPLE Event FILE
=========================================
I, ievent, nParticles
=========================================
I  K(I,1)  K(I,2)  K(I,3)  K(I,4)  K(I,5)  P(I,1)  P(I,2)  P(I,3)  P(I,4)  P(I,5)  V(I,1)  V(I,2)  V(I,3)
=========================================
0       0       3
=========================================
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 ==============
```

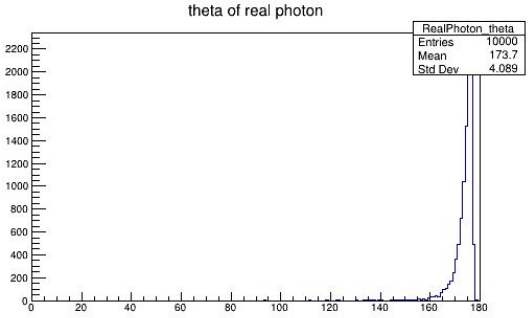
Simulation: Fun4All

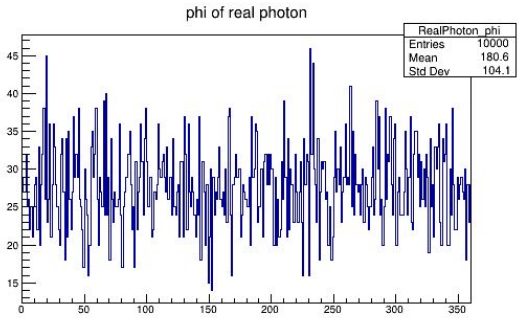




Generator final Kinematics

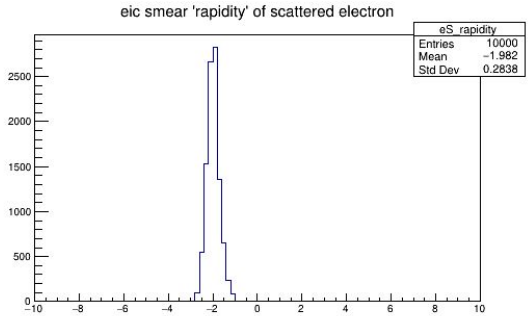


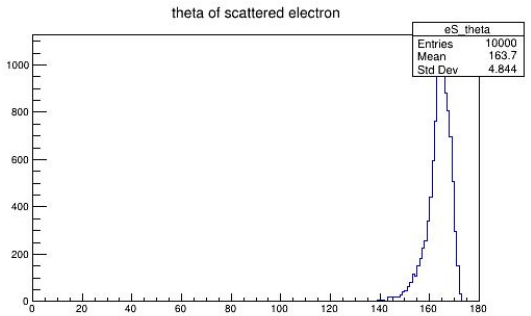


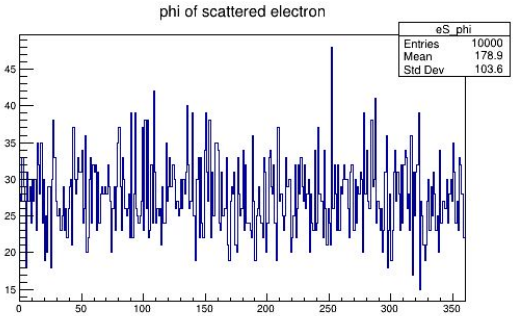


- $1 \leq |\eta| \leq 4$ - mean 3.024
- $150° \leq \theta \leq\sim 178°$? - mean 173.7
- $0° \leq \phi \leq 360°$ - about homogenous

Generator final Kinematics





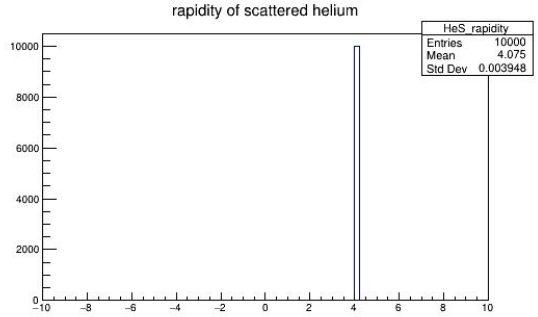


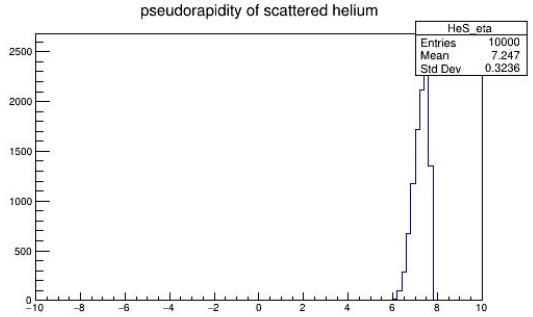
- $1 \leq |\,\boldsymbol{\eta}\,| \lesssim 3$ - mean 1.982
- $140° \leq \boldsymbol{\theta} \lesssim 178°$?
- $0° \leq \phi \leq 360°$ - also about homogenous, (good)
- Pseudorapidity (eta) and rapidity were identical (high momentum approx.)

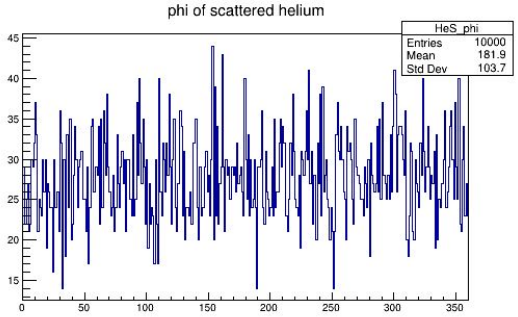
$$\eta = \frac{1}{2}\ln\left(\frac{|\mathbf{p}| + p_{\mathrm{L}}}{|\mathbf{p}| - p_{\mathrm{L}}}\right) = \operatorname{artanh}\left(\frac{p_{\mathrm{L}}}{|\mathbf{p}|}\right),$$

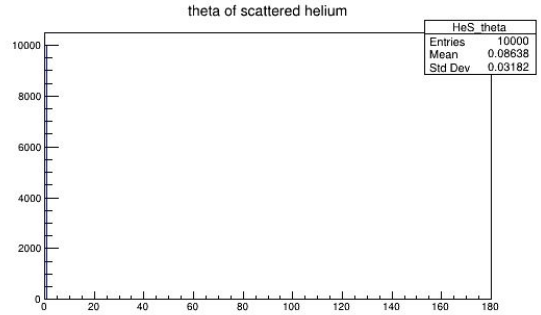
$$y \equiv \frac{1}{2}\ln\left(\frac{E + p_{\mathrm{L}}}{E - p_{\mathrm{L}}}\right)$$

Generator Kinematics - Helium

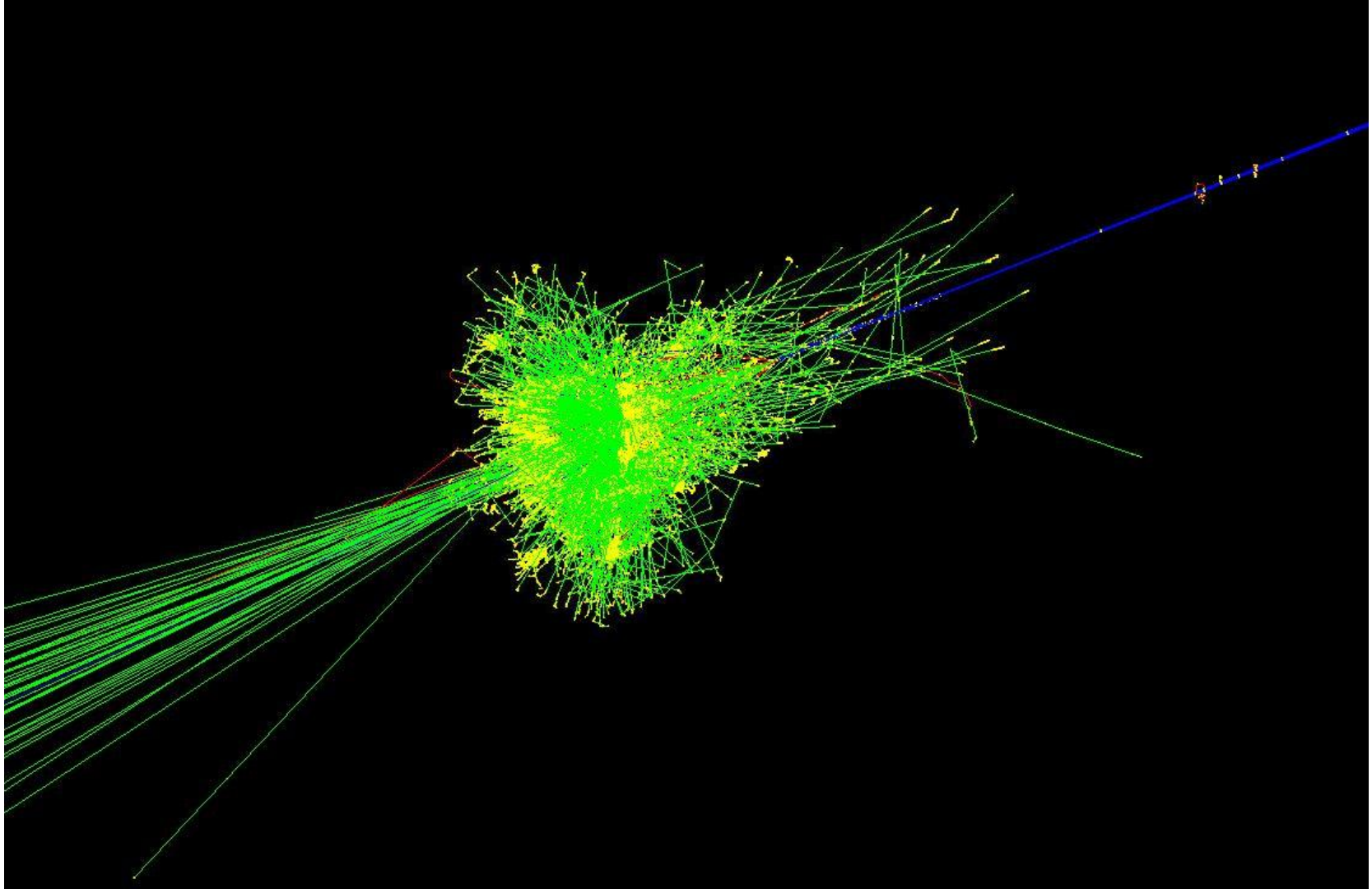


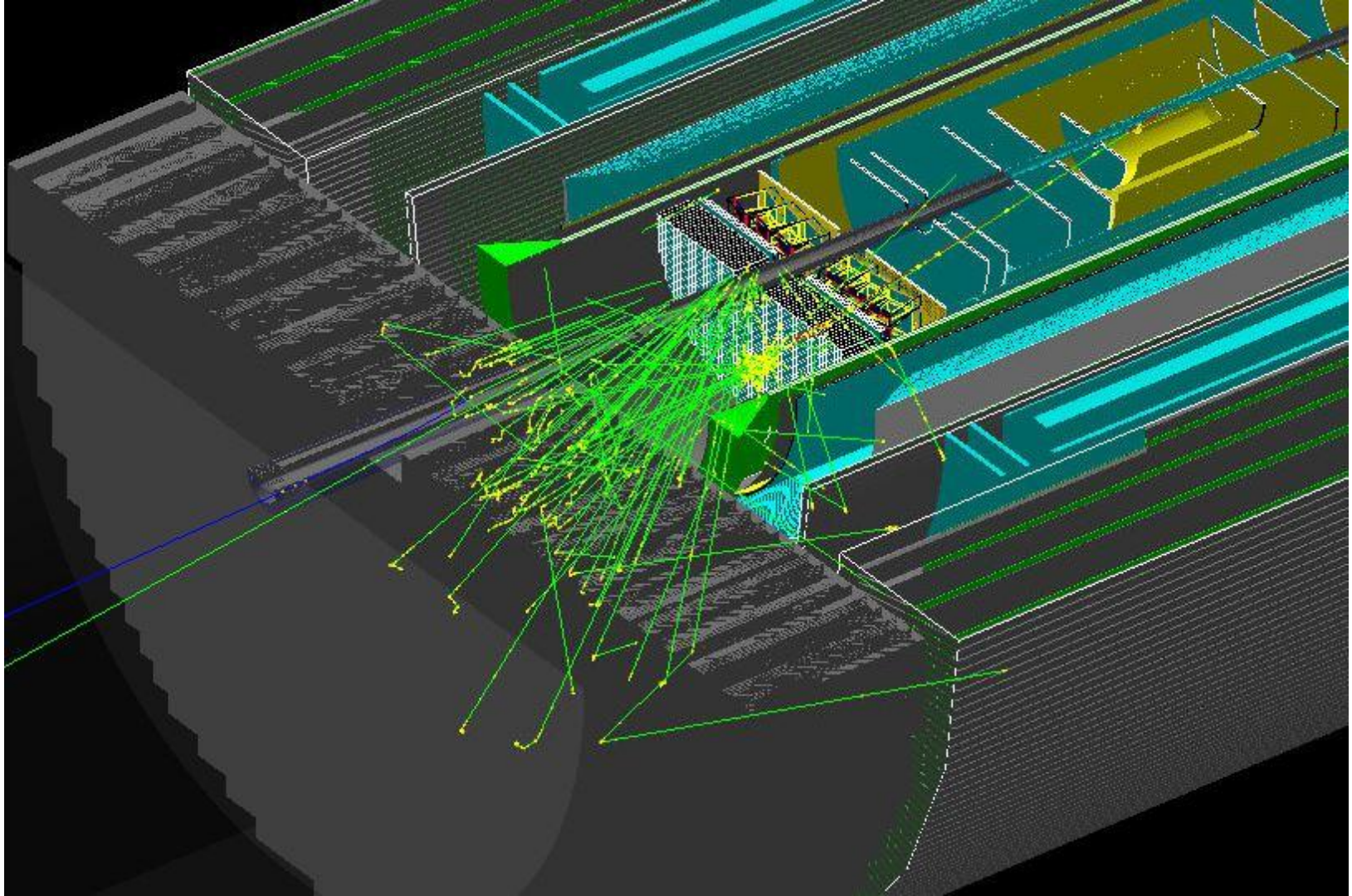




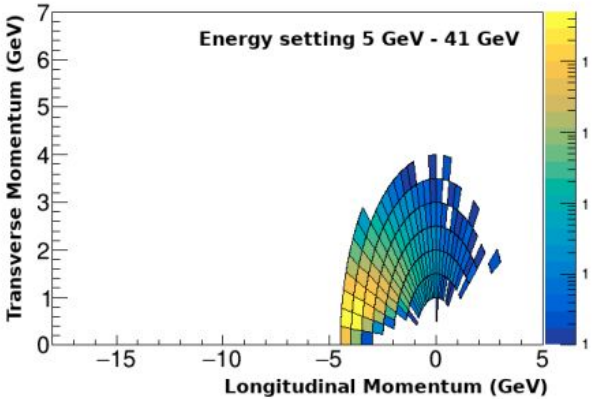


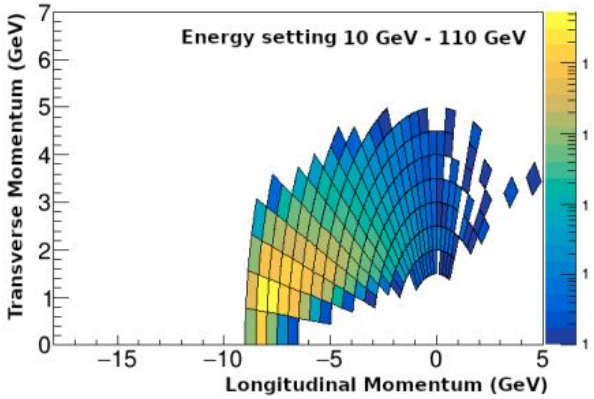
- ≤ | η | < - mean
- ≤ | y | ≤ - mean
- θ =~ 0 (as expected)
- 0° ≤ ϕ ≤ 360° - also about homogenous
- Pseudorapidity (eta) and rapidity were **not** the same due to helium mass

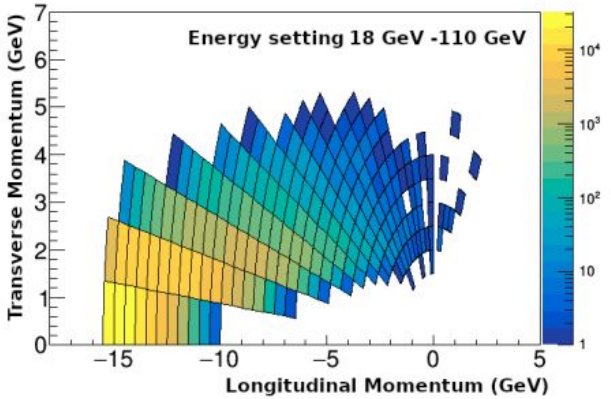


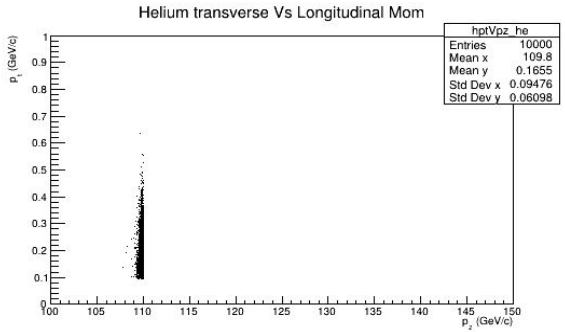


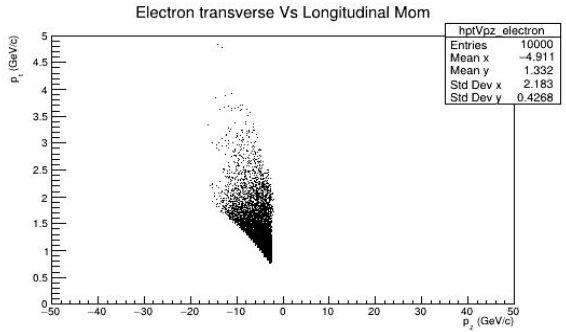
Recreating Yellow Report Plots

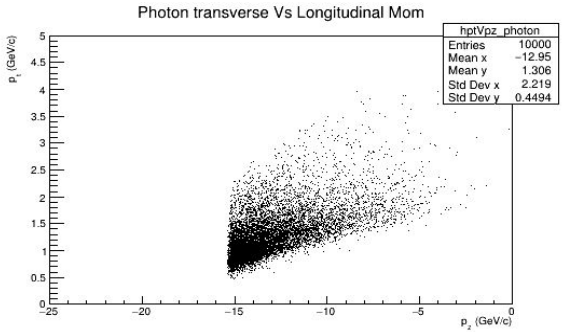












Kinematic distributions of photons from DVCS at 3 energy configuration (Top). Kinematic distributions of electron, helium and photon from DVCS at **highest** energy configuration (Bottom)

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.