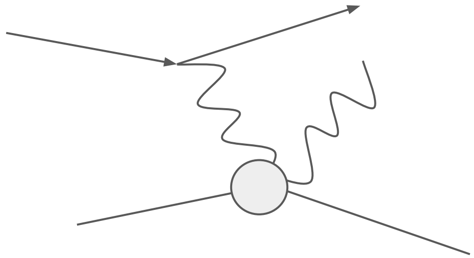
DVCS eA Status

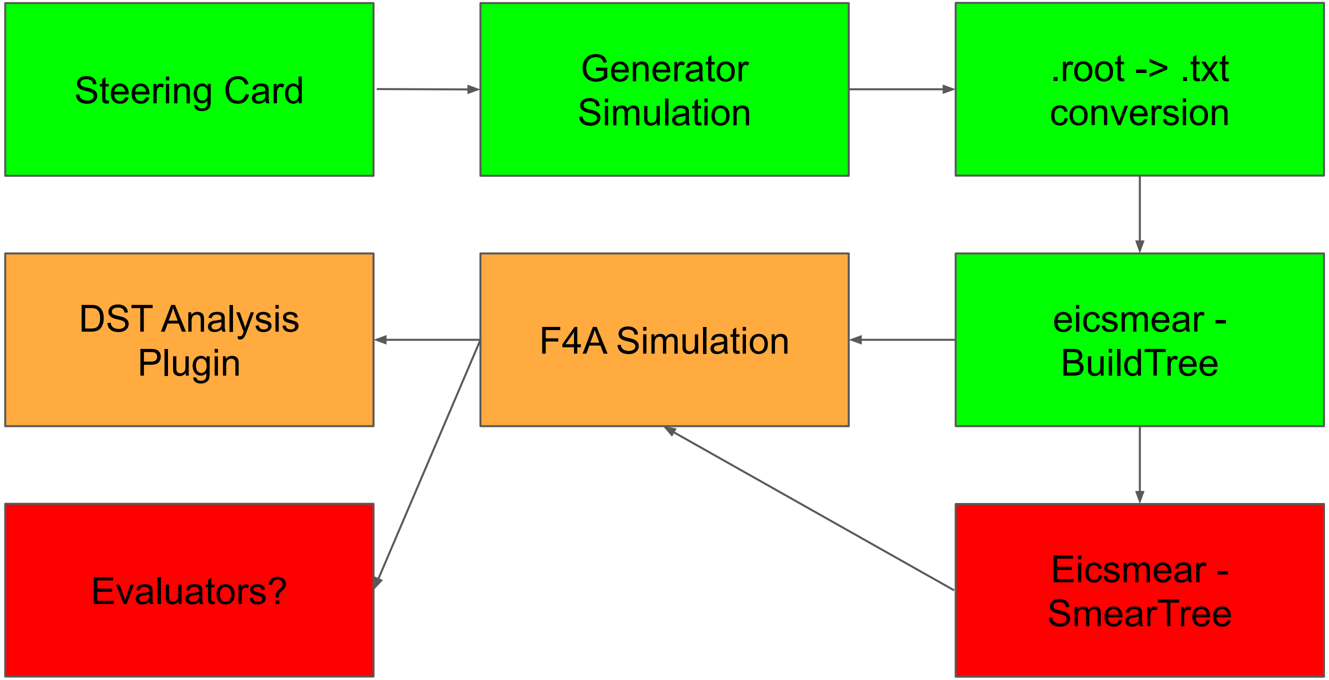
G. Penman, R. Montgomery
10/09/21

eA->e'A'γ

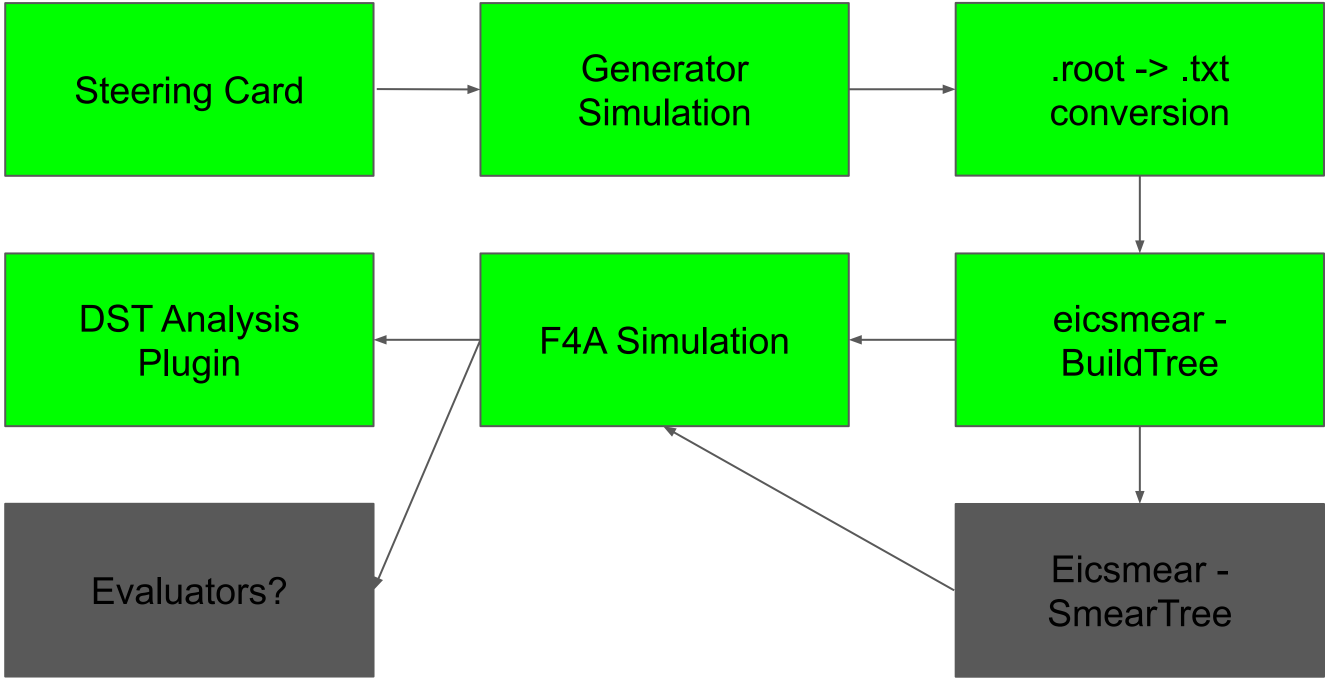


1. Overview
    a. Status
    b. Kinematic Settings Changes
2. Finalised Generator Plots
3. Up to Date FFA Analysis Plots
    a. Finalised Plots / Cuts
    b. In Process Plots
    c. Potential Plots (Tuesday Discussion)
4. PID / Calorimeter Clustering

Status of Workflow (last time)



Status of Workflow



The (DVCS) Orsay-Perugia Event Generator : TOPEG - https://gitlab.in2p3.fr/dupre/nopeg

DVCS-eA events generated using Fucini helicity model :
https://arxiv.org/pdf/2008.11437.pdf

Beam Setups:

Electron Helicity	Beam Energy [GeV]	Beam Energy [GeV]	Beam Energy [GeV]
Positive	5x41	10x110	18x110
Negative	5x41	10x110	18x110

1M Events generated for each configuration and ready for Simulation.

Nominal Beam Energies

Electron: 5, 10, 18 GeV. Proton: 41, 100, 275 GeV

For eP scattering, 18x275 for example makes sense.

For eA scattering, nominal energy given to each proton, total energy distributed amongst all nucleons, resulting in ionic energy of

$$E_{ion} = \frac{Z}{A} E$$

5x41	5x20.5
10x110	10x50
18x110	137.5

Nominal Beam Energies	41	100	275
5	5x 20.5	5x50	5x137.5
10	10x20.5	10x50	10x137.5
18	18x20.5	18x50	18x137.5

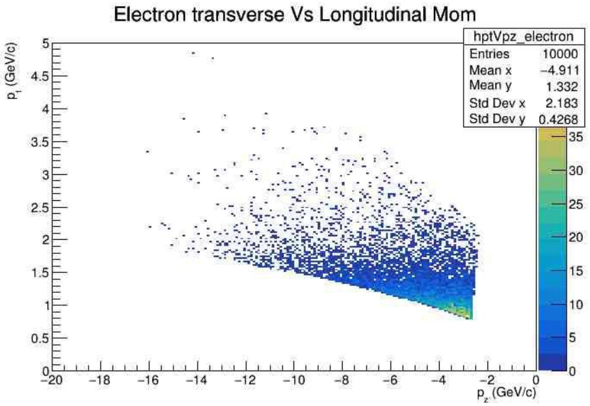
Generator config files (steering cards) written for 9 configurations above (not simulated).

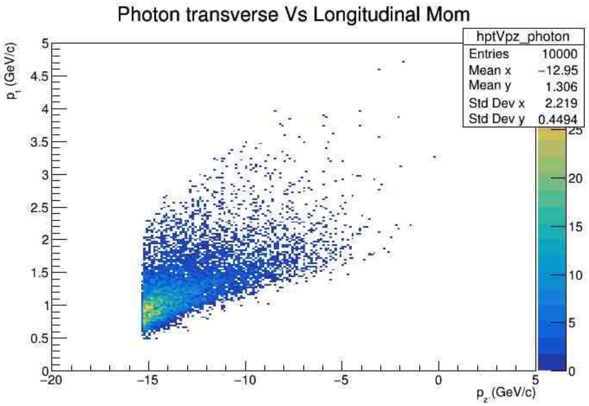
Currently re-generating grids for green configurations as tests.

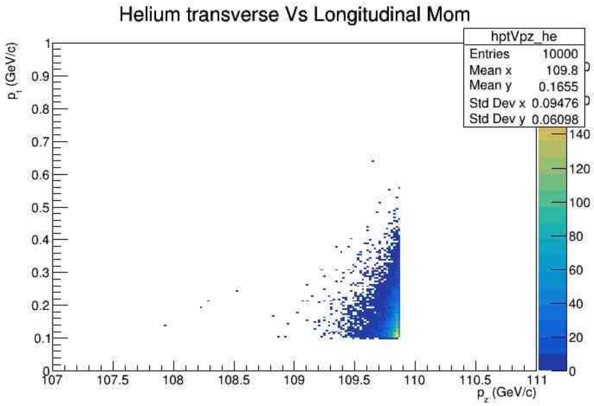
Main Focus for Now: 18x275 (18x137.5)

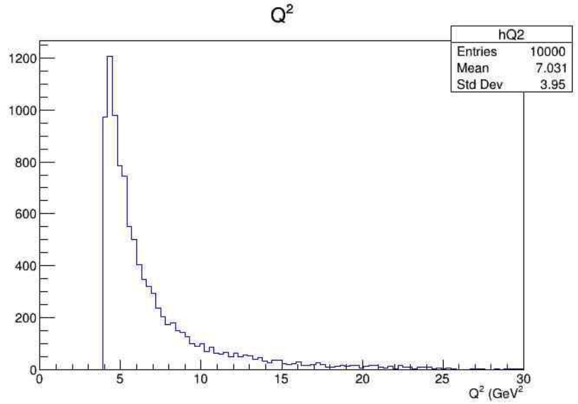
275 GeV available for IP8 -> Comparison with IP6 possible (per Carlos' email)*

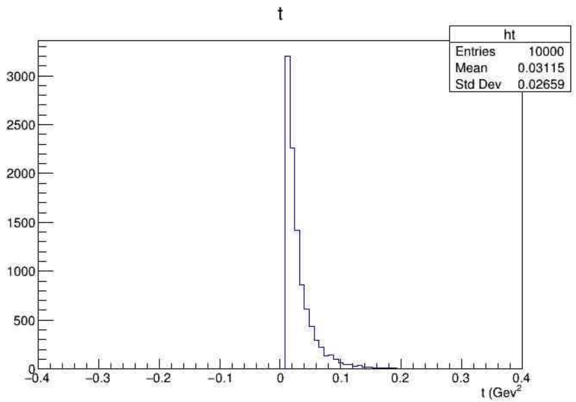
Generator Output: 18x110



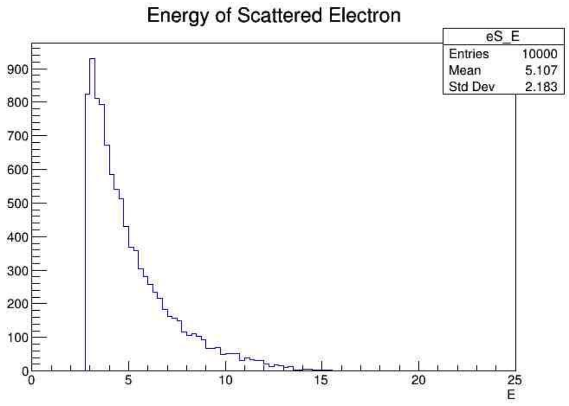


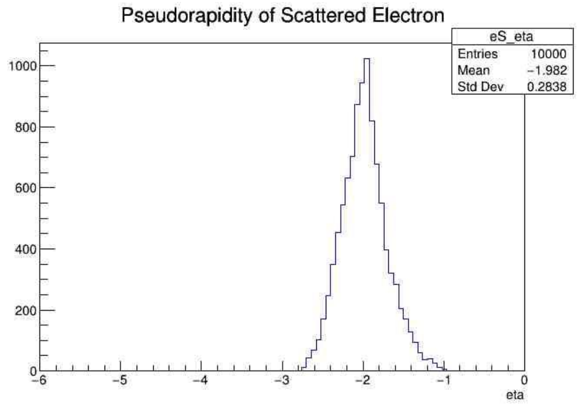


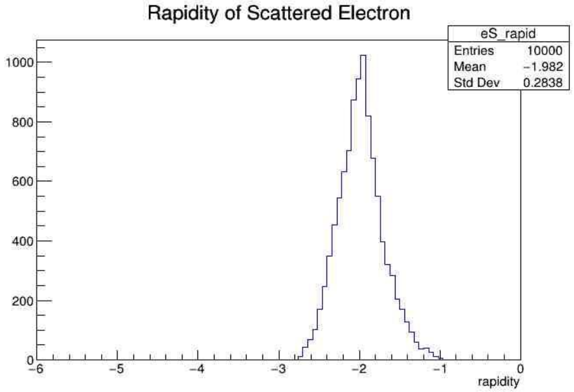


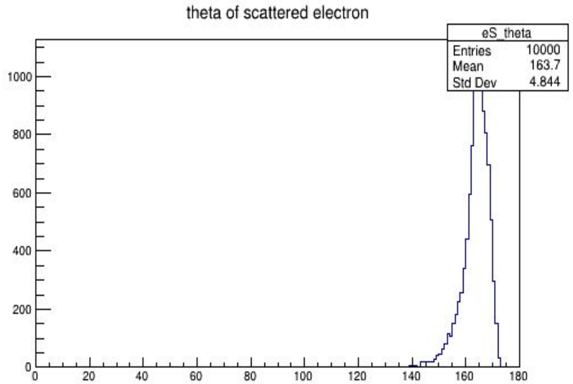


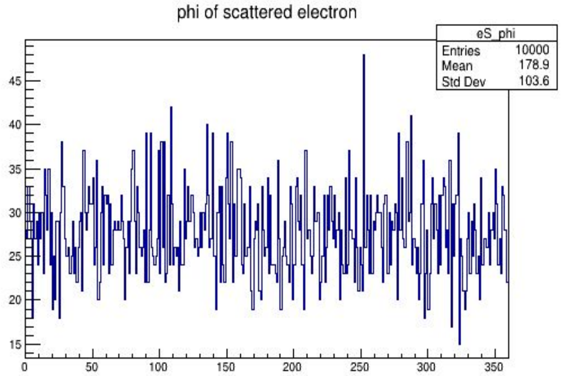
Generator Output: 18x110 Electron



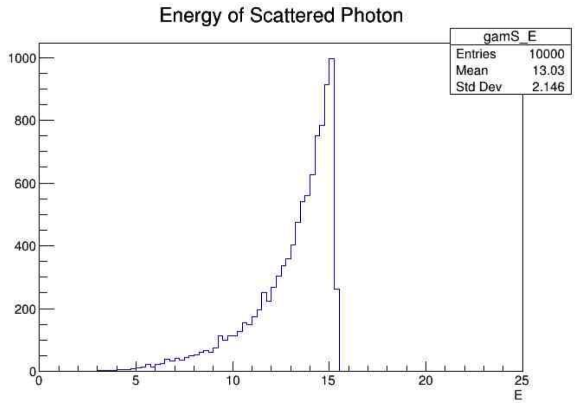


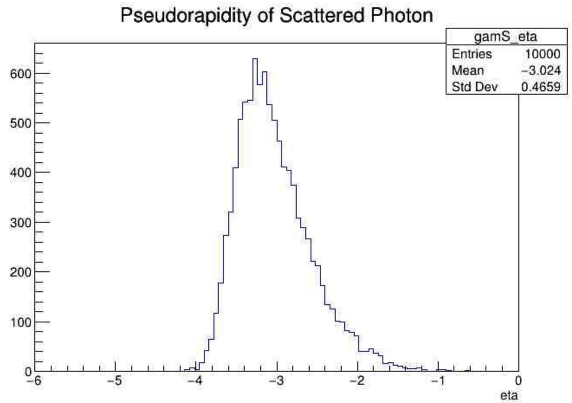


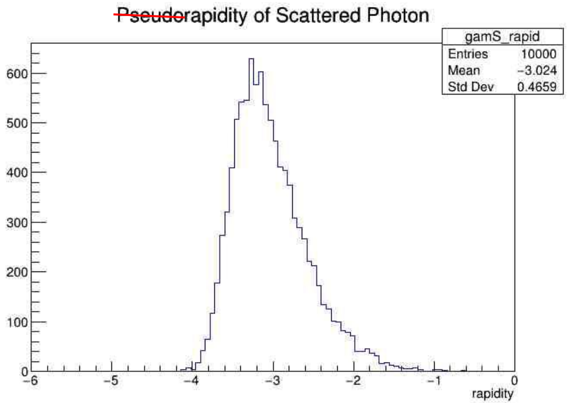


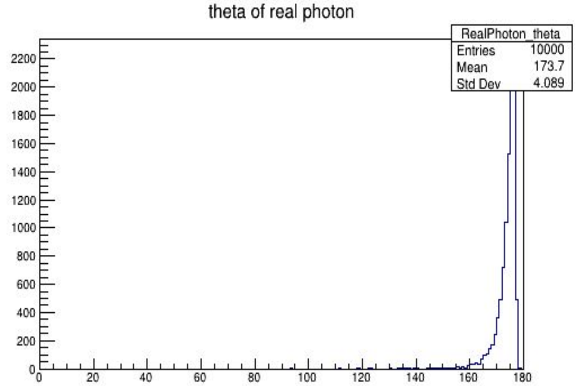


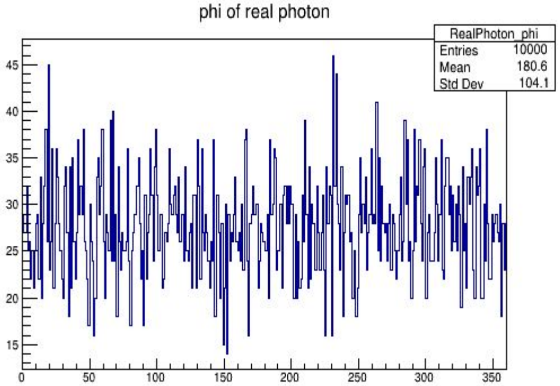
Generator Output: 18x110 Photon



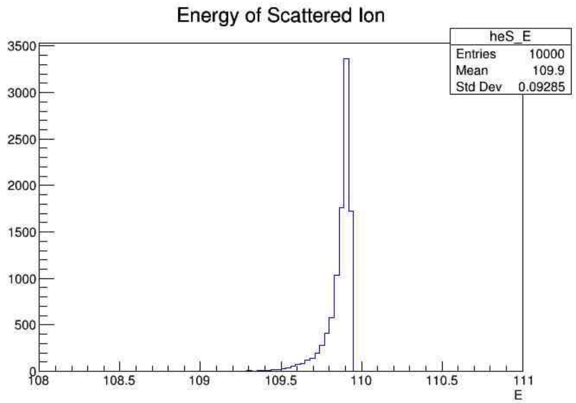


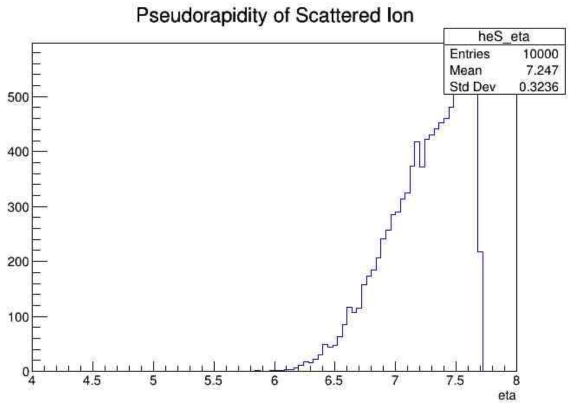


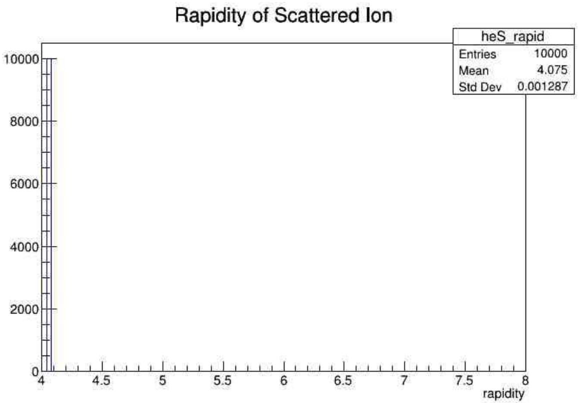


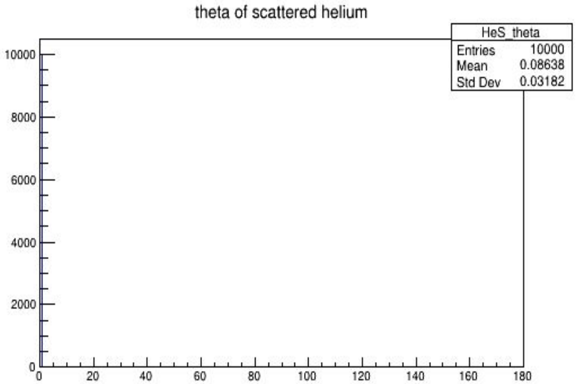


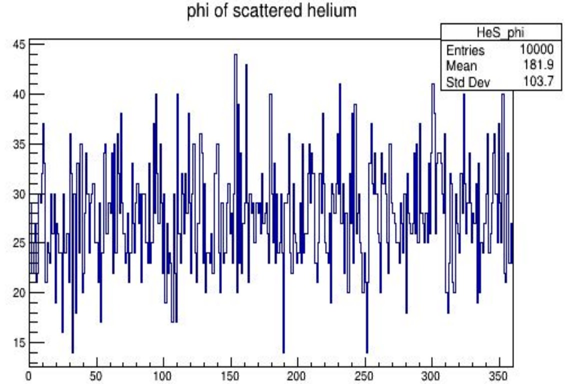
Generator Output: 18x110 Helium

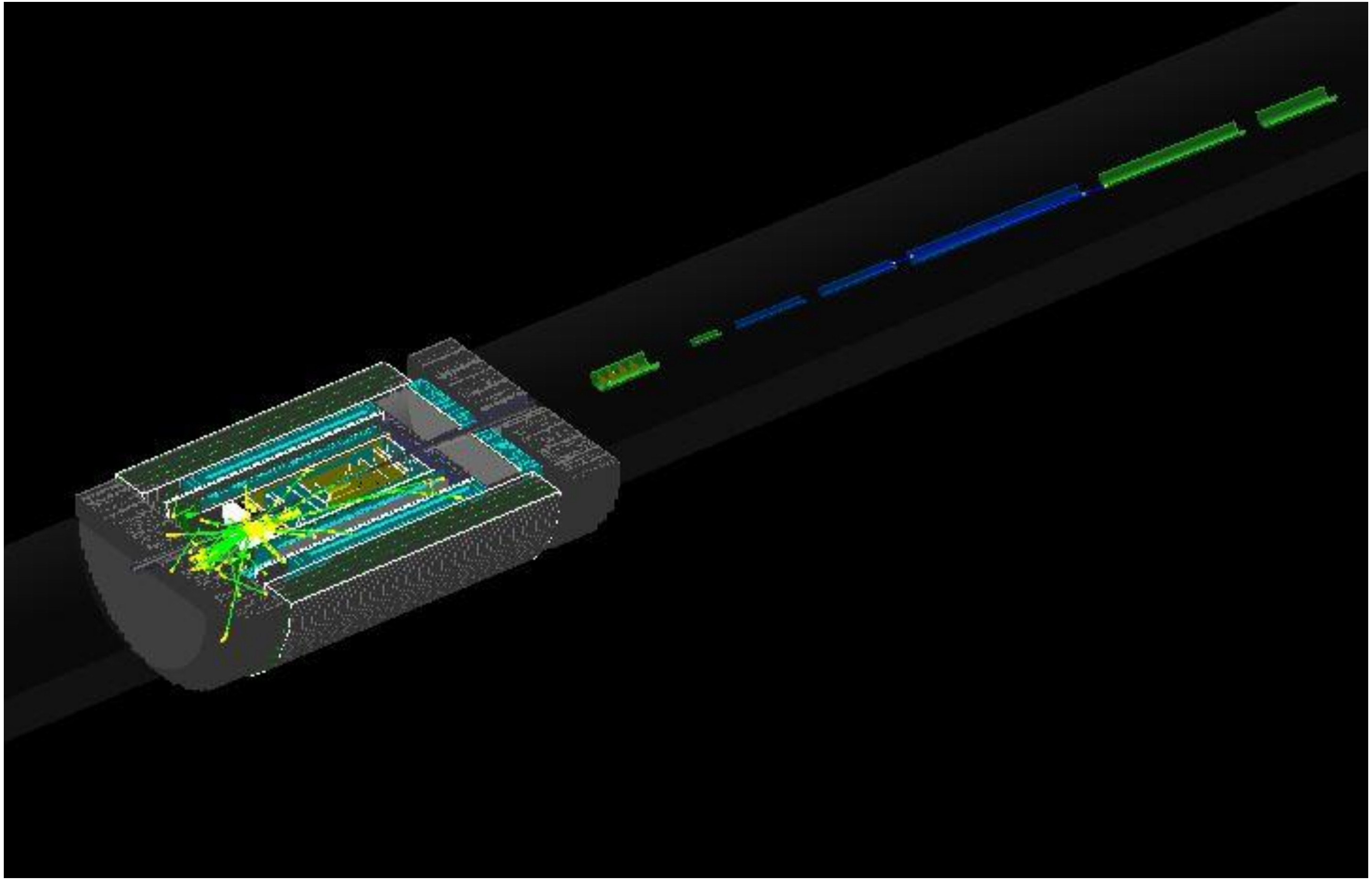


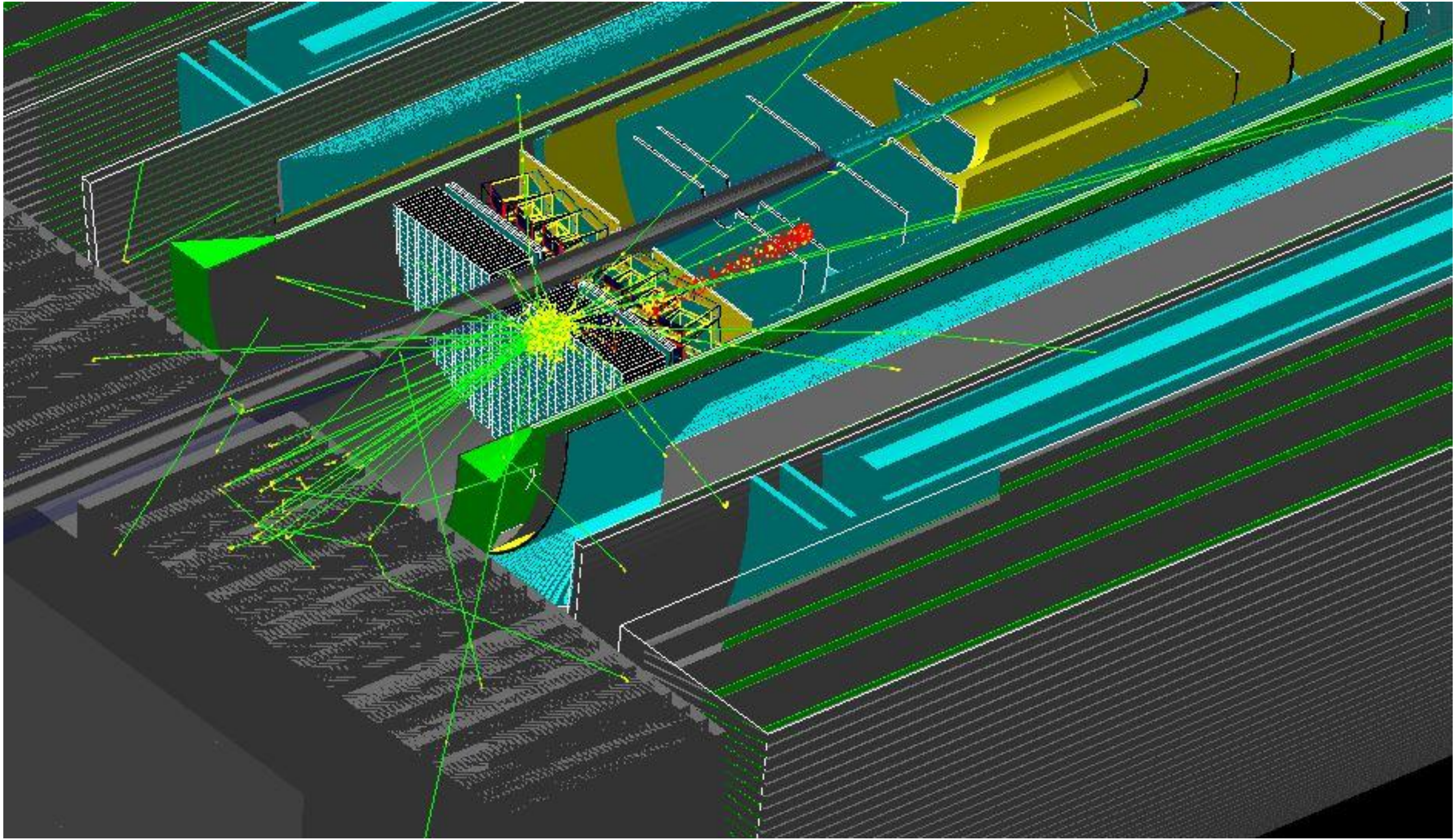




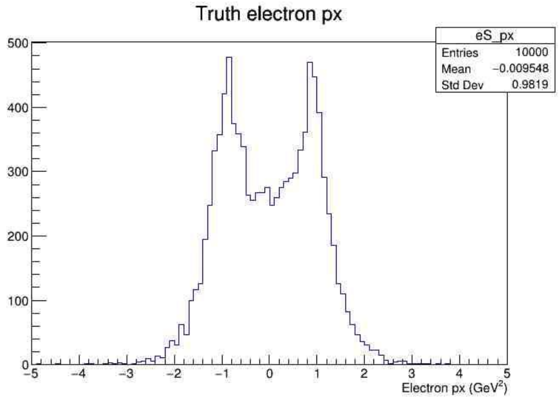


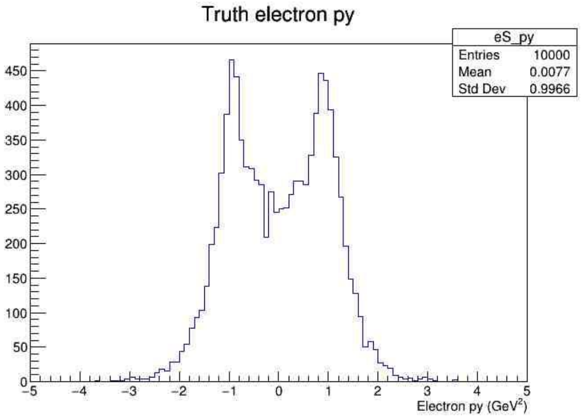


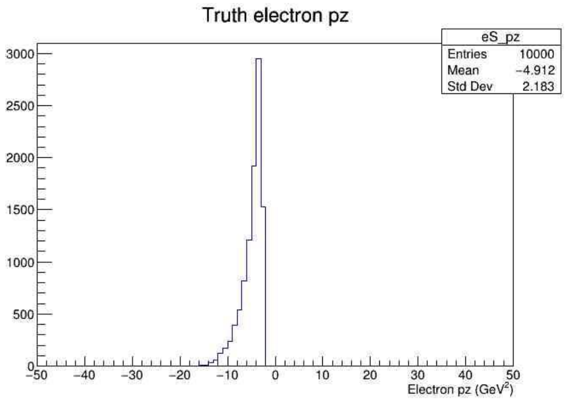


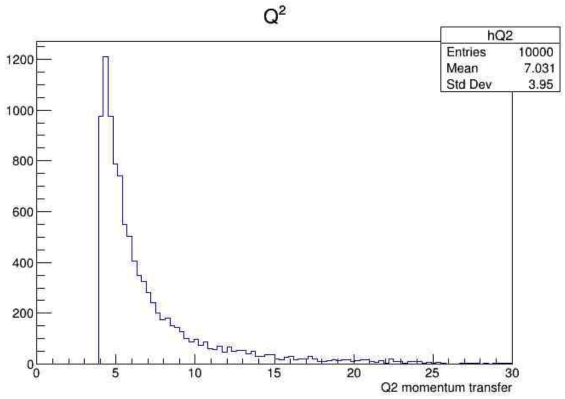


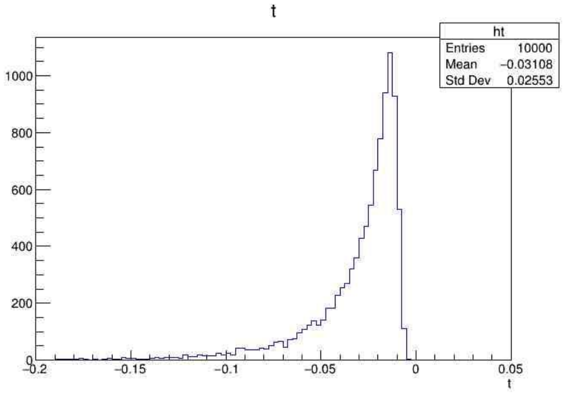
FFA Truth Info: 18x110 Electron



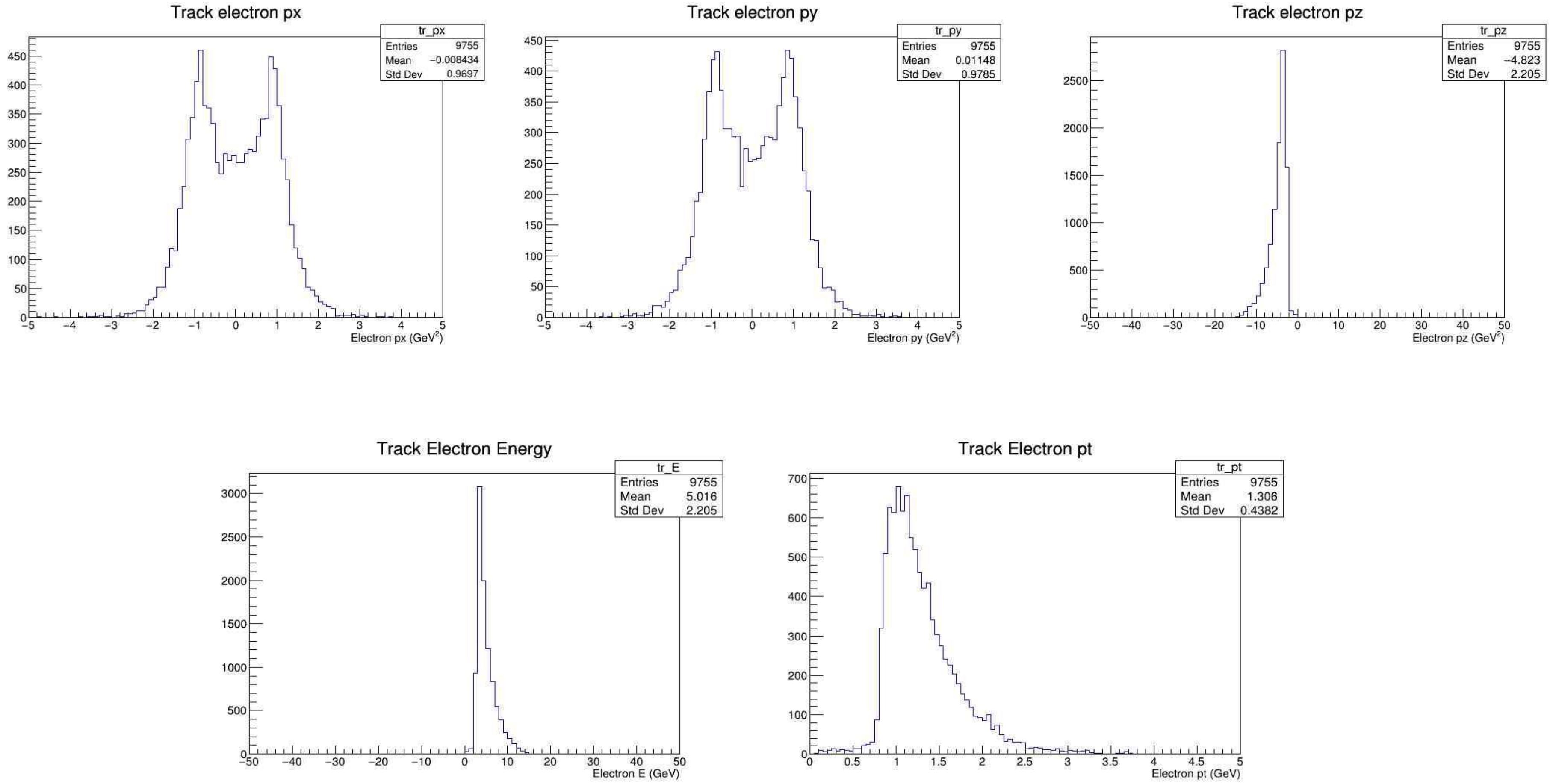




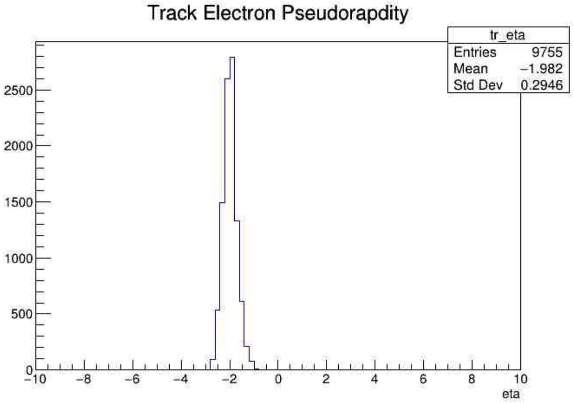


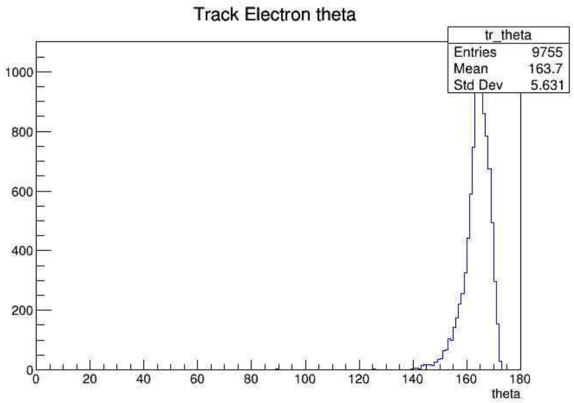


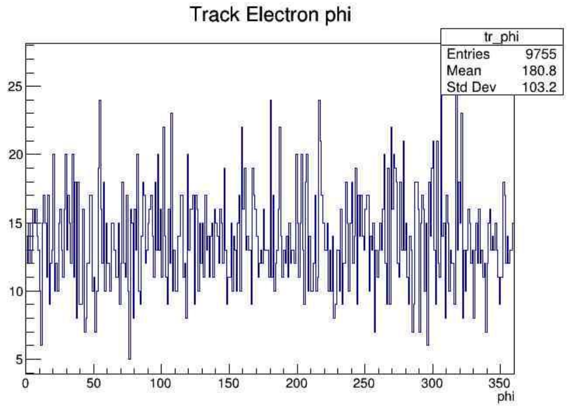
FFA Track Info: 18x110 Electron Energy & Momenta Plots

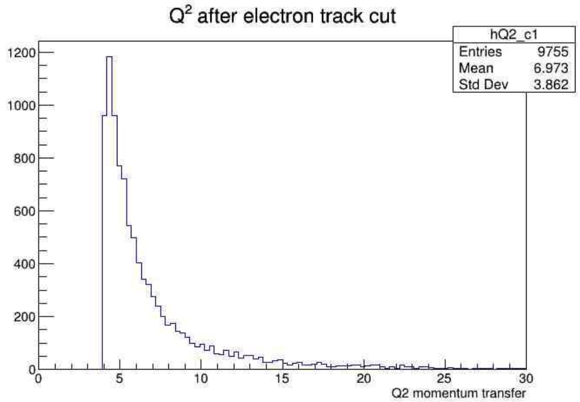


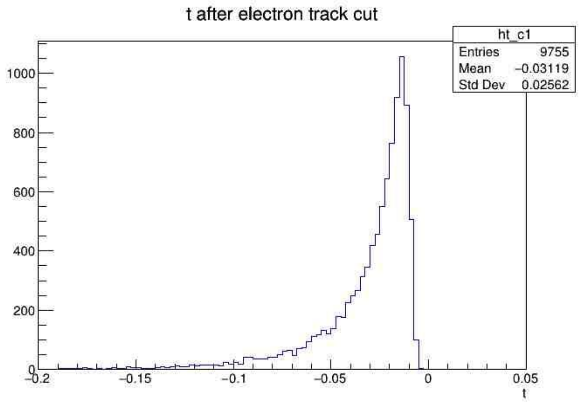
FFA Track Info: 18x110 Electron Kinematics and Angular Plots



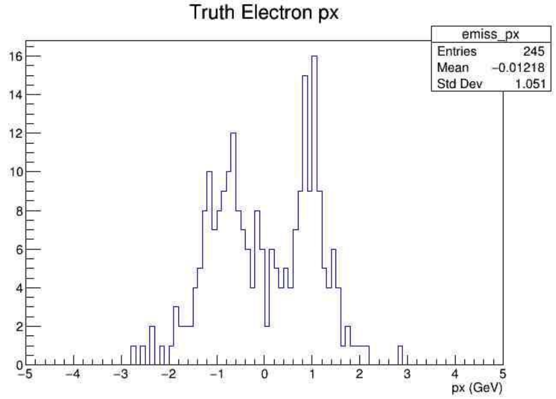


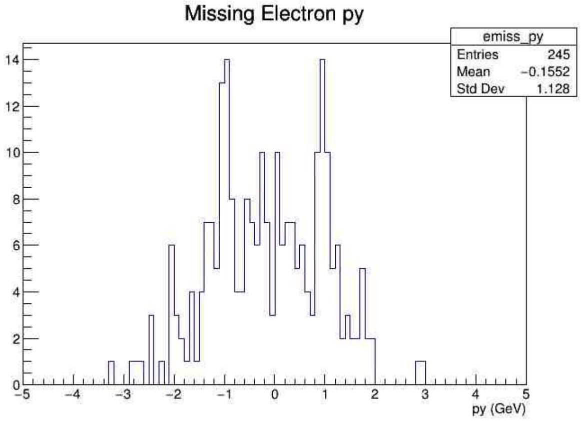


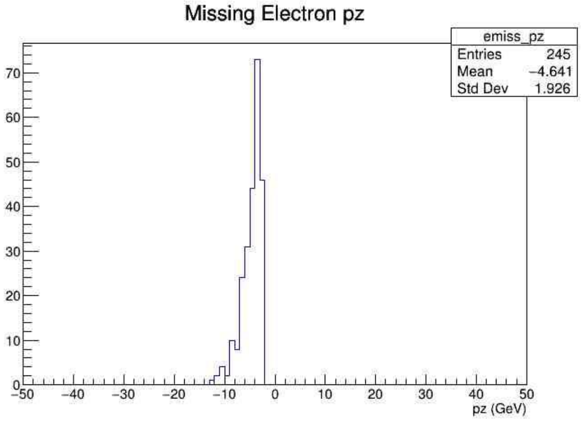


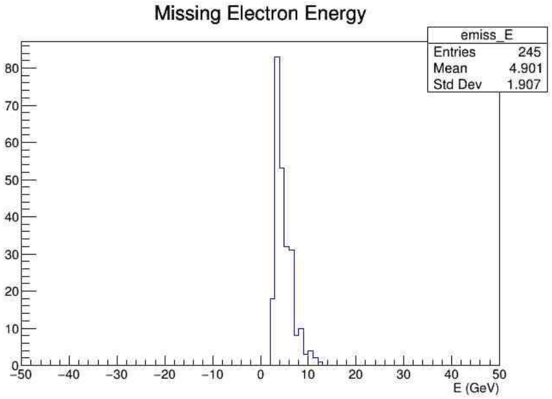


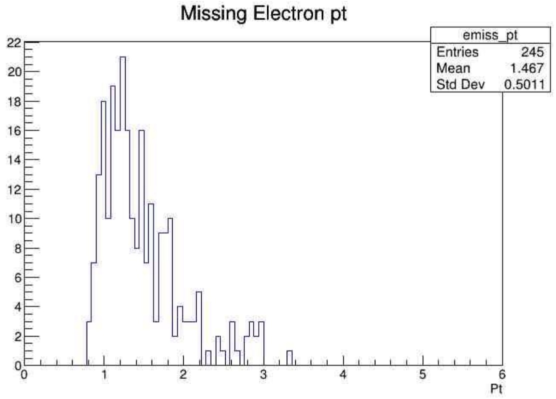
FFA Track Info: 18x110 Missing Electron Energy and Momenta Plots



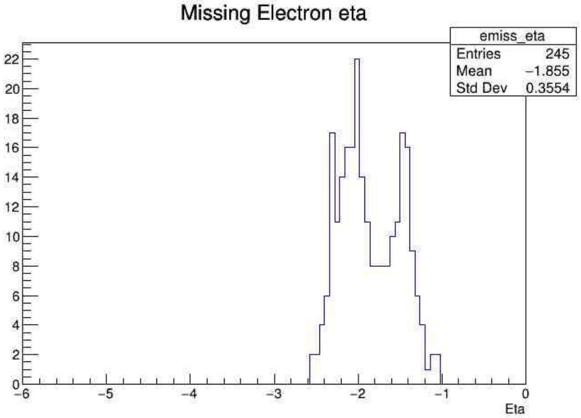


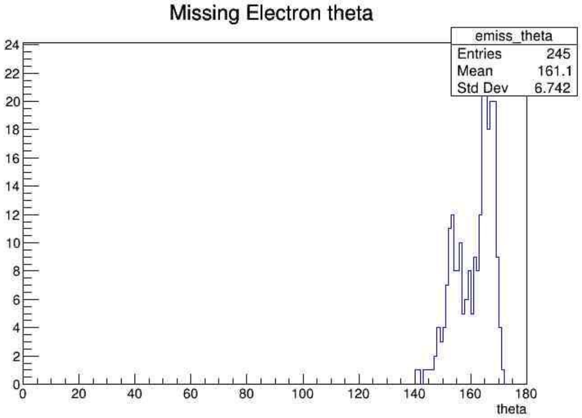


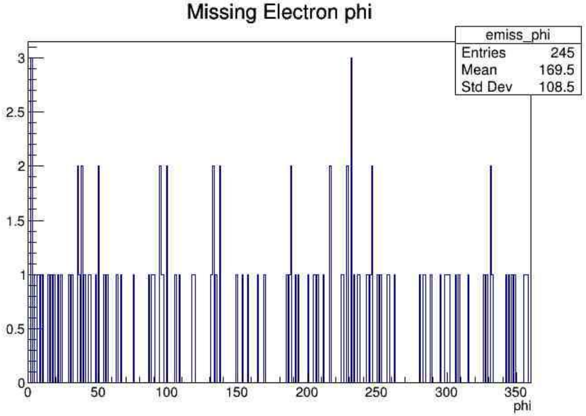




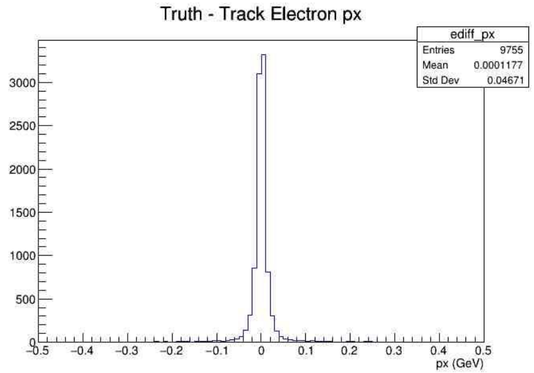
FFA Track Info: 18x110 Missing Electron Angular Plots

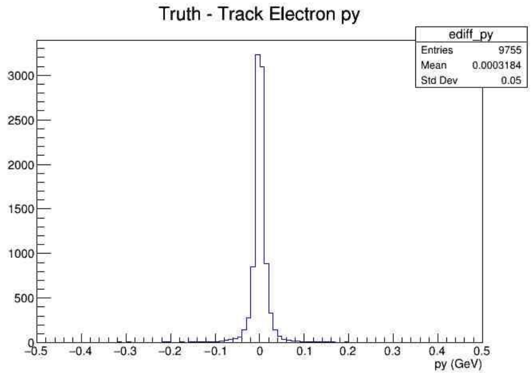


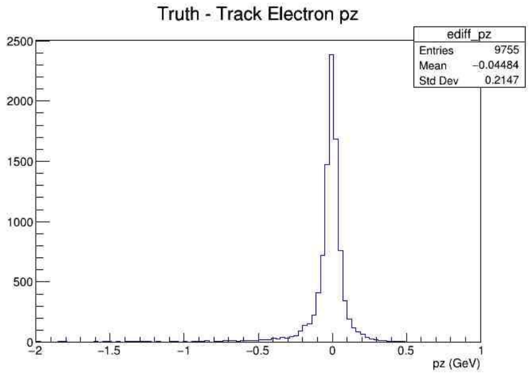


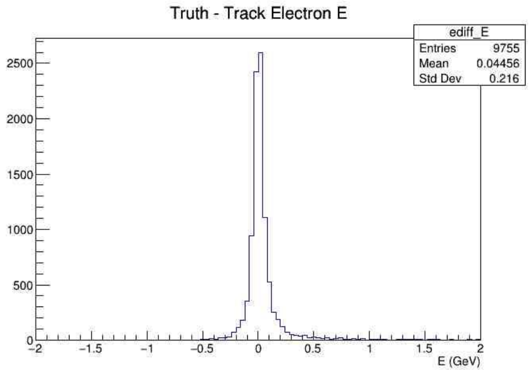


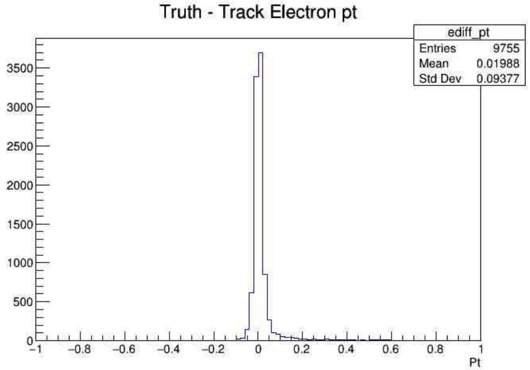
FFA Track Info: 18x110 Truth - Track Plots (Measure of Smearing)











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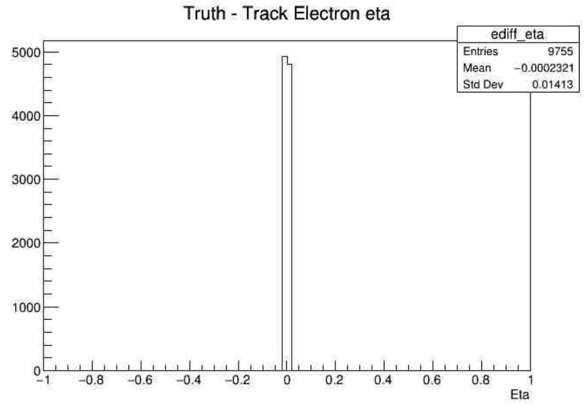
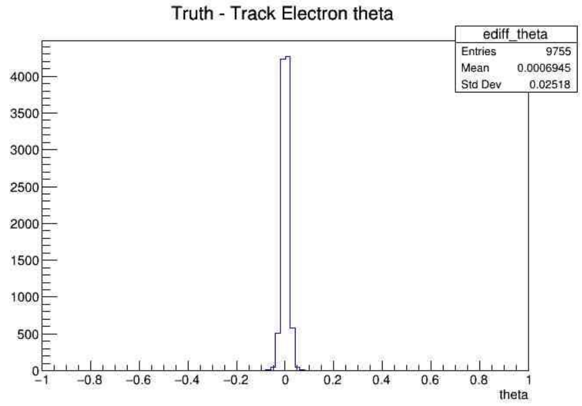
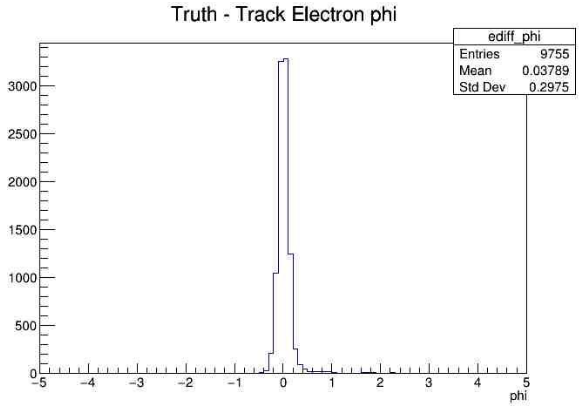




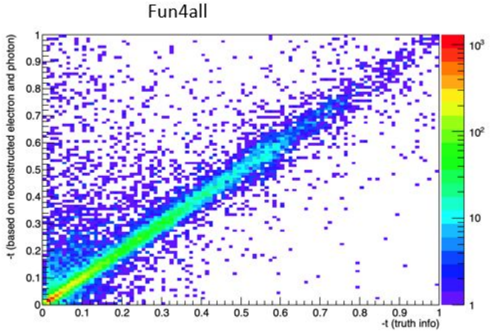


FFA Track Info: 18x110 Photon (second cut using calo info) [calo cluster afterburner?]

FFA Track Info: 18x110 Helium (third cut using Roman Pot / B0 Silicon Detector info) [hadron ID]

Future Plots (next few days)

- Q2, t & Nev vs -t after each cut.
- t reconstructed vs t truth TH2F, Q2 reconstructed vs Q2 truth TH2F,



(Igor's Presentation 20/08/21*)

- eta vs p TH2F
- Photon eta plots using calorimeter loops
- Helium RP eta plots - need RP track reconstruction.

backup

$$t = (p - p')^2 = (\gamma + e' - e)^2$$

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

$$t = -\frac{MQ^2 + 2M\nu\left(\nu - \sqrt{\nu^2 + Q^2}\cos\theta_{\gamma^*\gamma}\right)}{M + \nu - \sqrt{\nu^2 + Q^2}\cos\theta_{\gamma^*\gamma}}$$

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

https://github.com/FriederikeBock/AnalysisSoftwareEIC

https://indico.bnl.gov/event/12409/contributions/51842/attachments/36847/60635/PhysicsAug31.pdf

https://github.com/FriederikeBock/AnalysisSoftwareEIC/blob/master/treeAnalysis/treeProcessing.C

https://github.com/ECCE-EIC/ecce-detectors/tree/master/FastPID/dRICH

https://github.com/ECCE-EIC/ecce-detectors/tree/master/FastPID