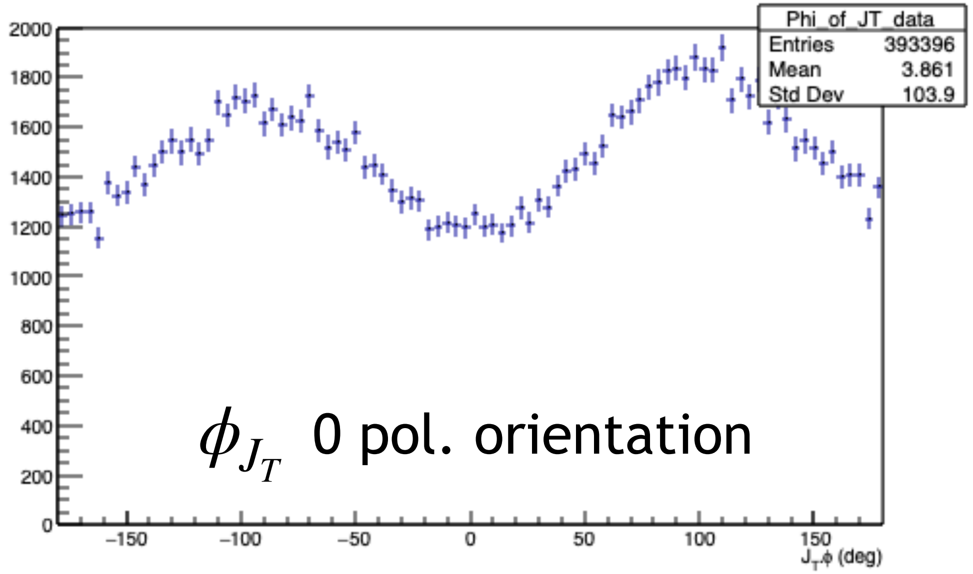
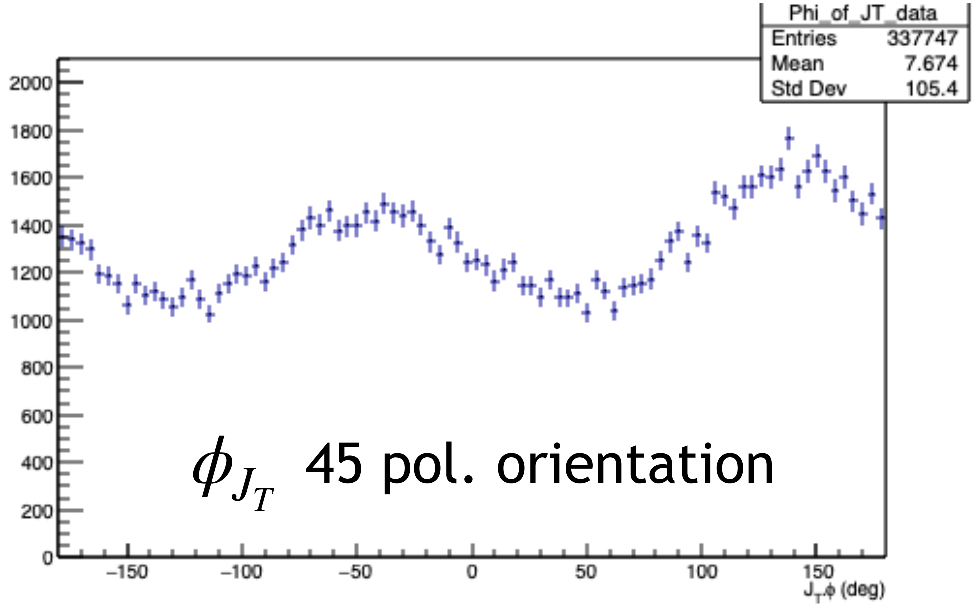
Work Overview

- $\gamma p \rightarrow e^{+}e^{-}(p)$ Polarization Study
  - MC of para and perp finished. Need to fit distribution.
  - Need to explain offset in the yield asymmetry for data.

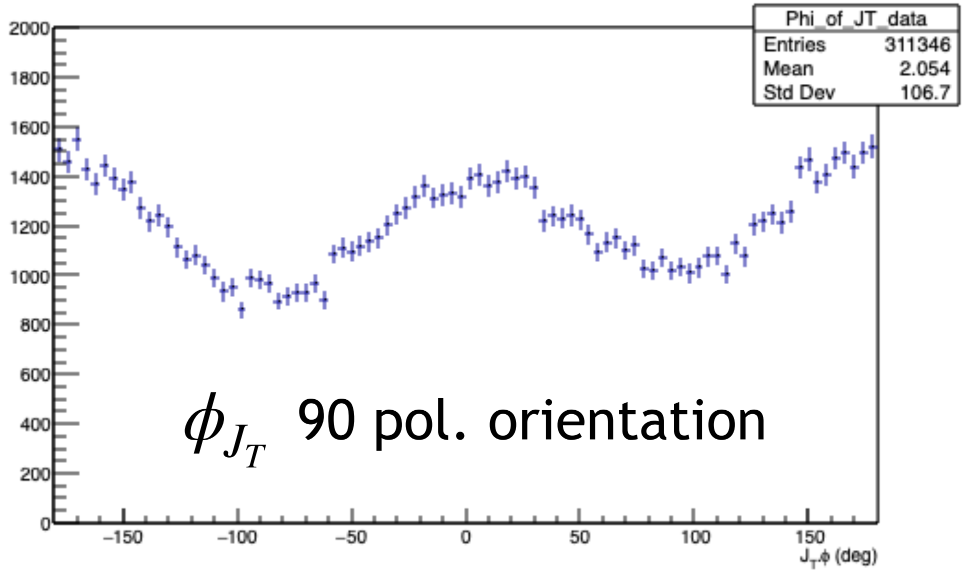
$\gamma p \rightarrow e^+e^-(p)$ 2018-01 GlueX data, w/ fiducial+N.N. cuts



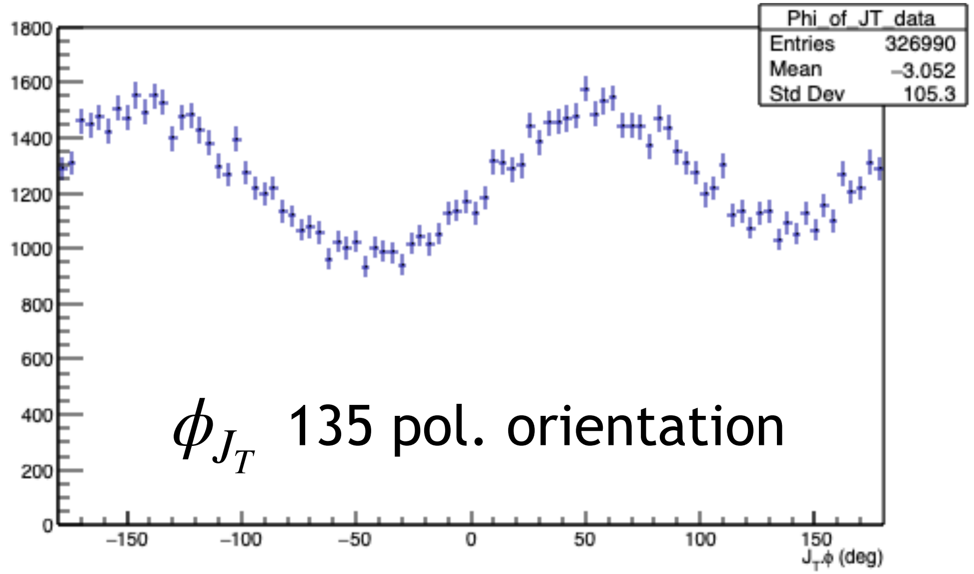
ϕ_{J_T} 0 pol. orientation



ϕ_{J_T} 45 pol. orientation



ϕ_{J_T} 90 pol. orientation



ϕ_{J_T} 135 pol. orientation

$$\frac{Y_\perp(\phi) - \frac{N_\perp}{N_\parallel} Y_\parallel(\phi)}{Y_\perp + \frac{N_\perp}{N_\parallel} Y_\parallel(\phi)} = \frac{\Sigma \cos 2\phi (P_\perp + P_\parallel)}{2 + \Sigma \cos 2\phi (P_\perp - P_\parallel)}$$

Pol = 0 and 90 runs

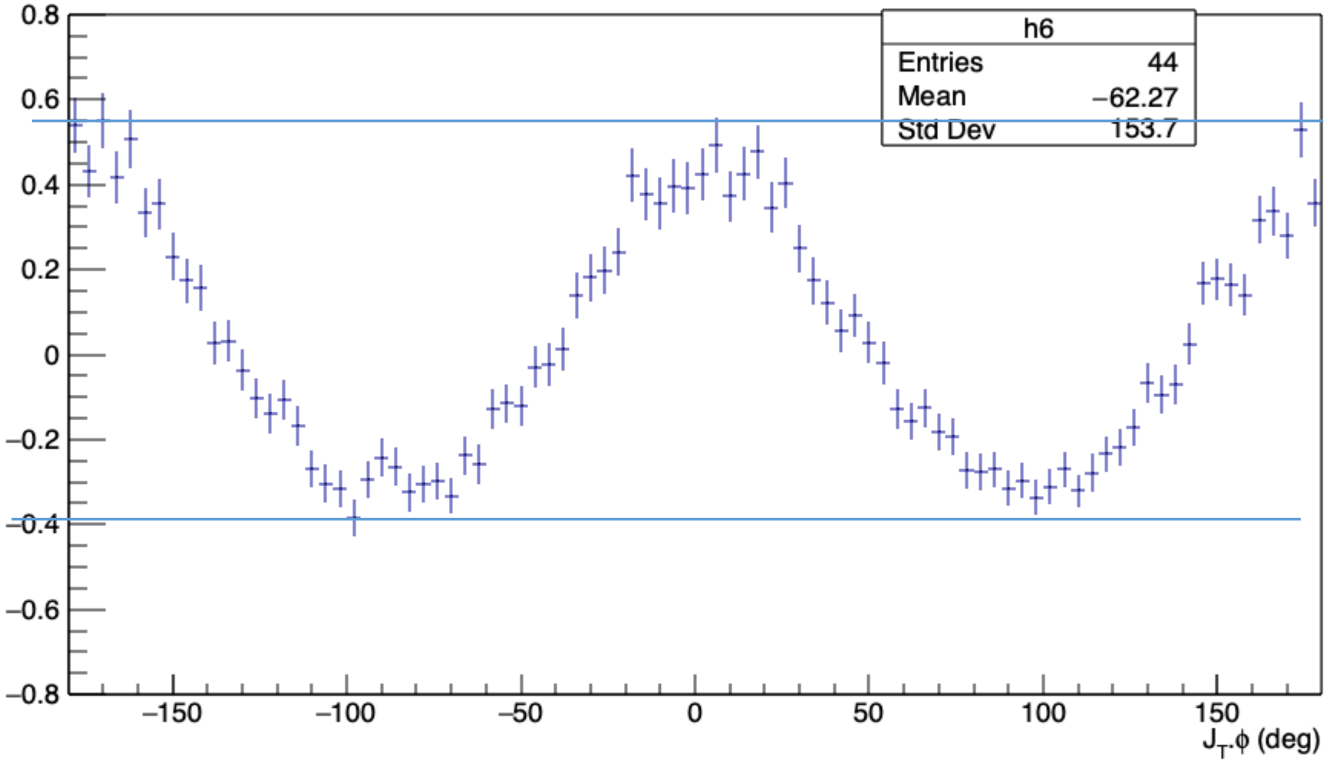
$$N_\perp = 311346$$

$$N_\parallel = 325538$$

$$\frac{N_\perp}{N_\parallel} = 0.9564$$

Asymmetry effect in data goes away when given the standard GlueX treatment, combining para and perp runs.

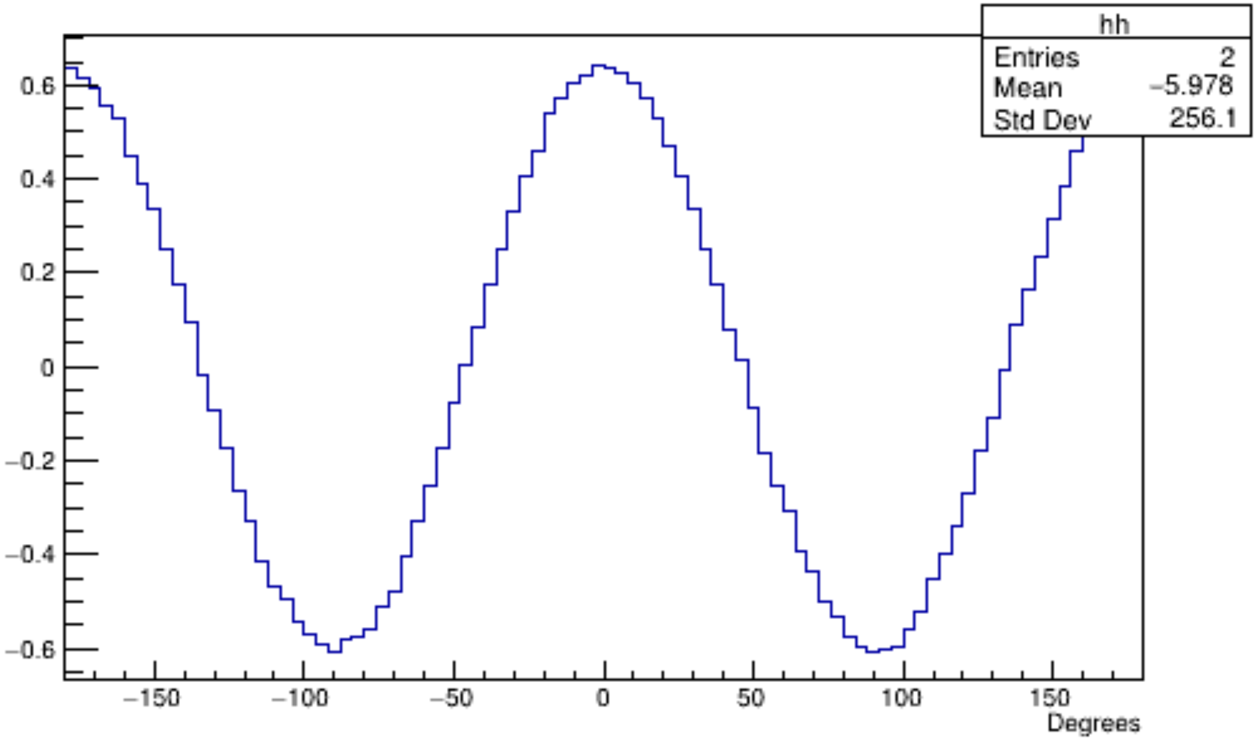
Yield Asymmetry



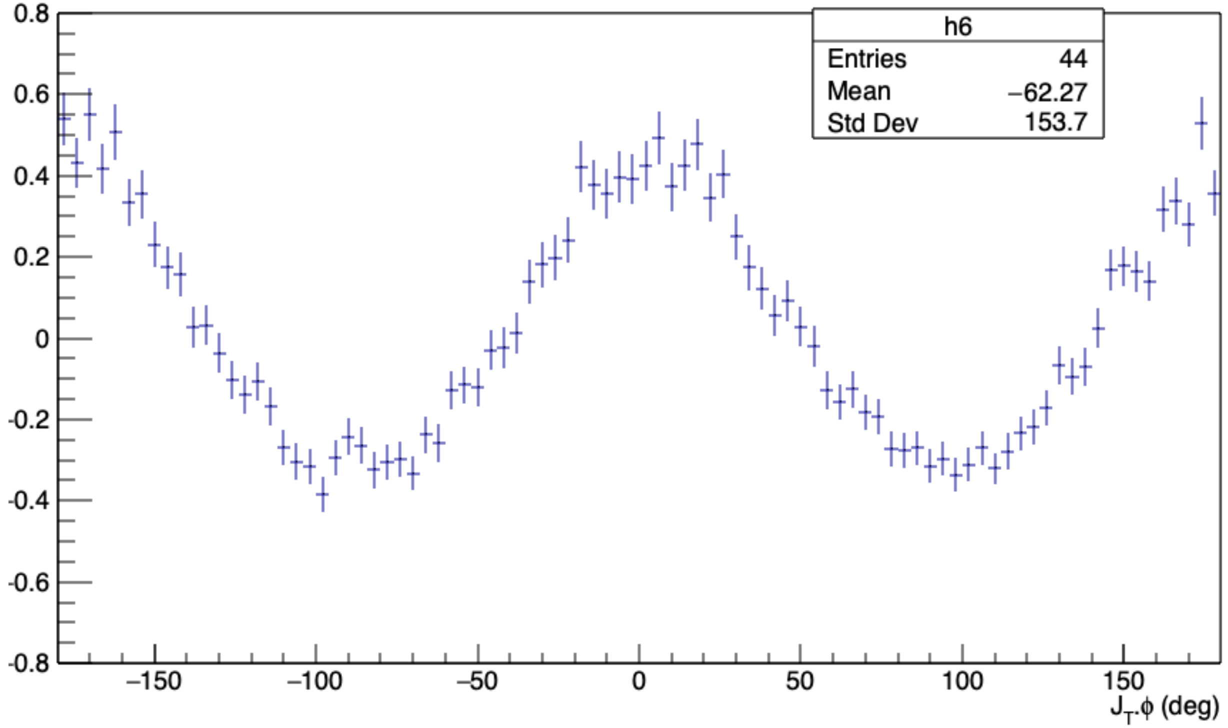
$$\frac{Y_\perp(\phi) - Y_\parallel(\phi)}{Y_\perp + Y_\parallel(\phi)} = \Sigma \cos 2\phi$$

$$\frac{Y_\perp(\phi) - \frac{N_\perp}{N_\parallel} Y_\parallel(\phi)}{Y_\perp + \frac{N_\perp}{N_\parallel} Y_\parallel(\phi)} = \frac{\Sigma \cos 2\phi (P_\perp + P_\parallel)}{2 + \Sigma \cos 2\phi (P_\perp - P_\parallel)}$$

Yield Asymmetry Simulation



2018-01 Pol = 0 and 90 runs
Yield Asymmetry data



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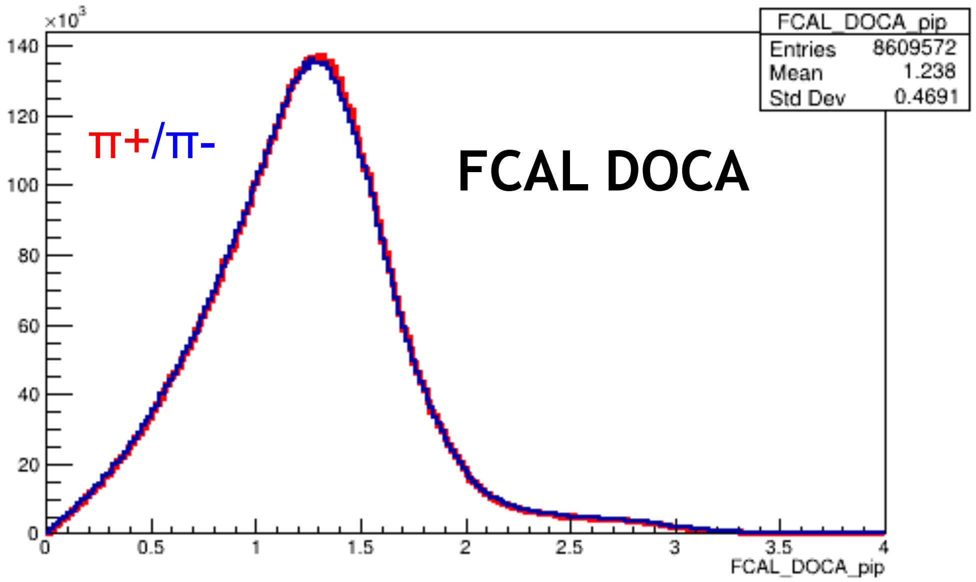
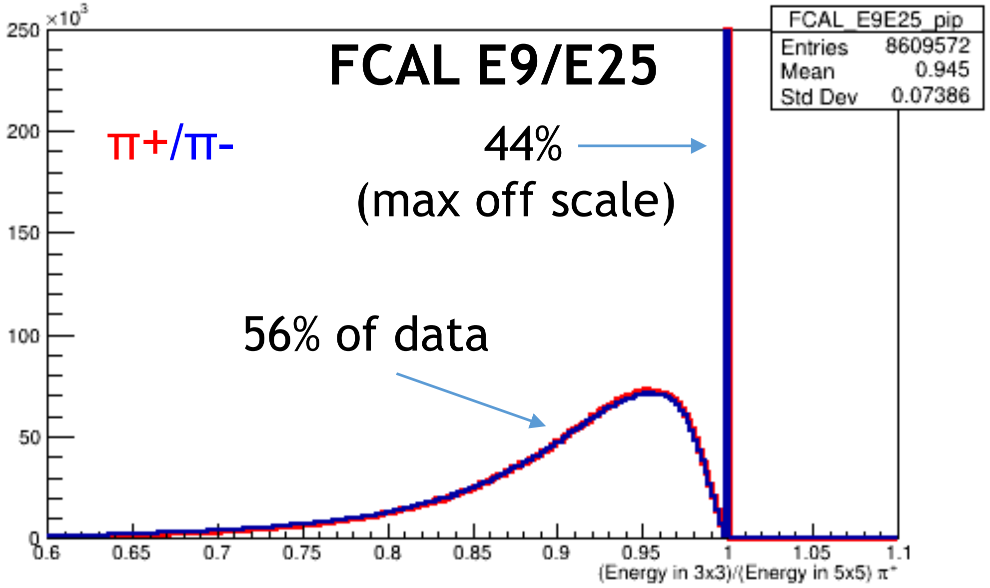
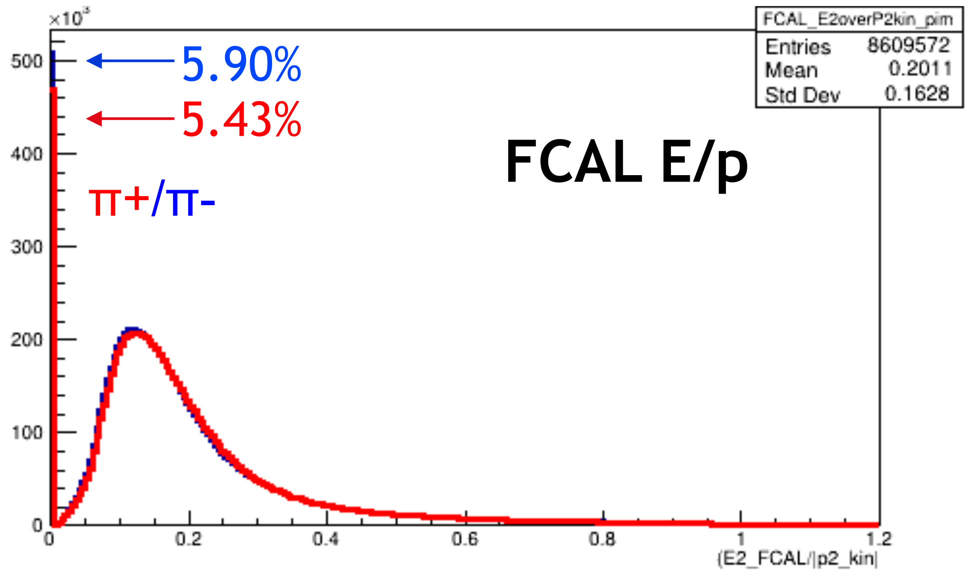
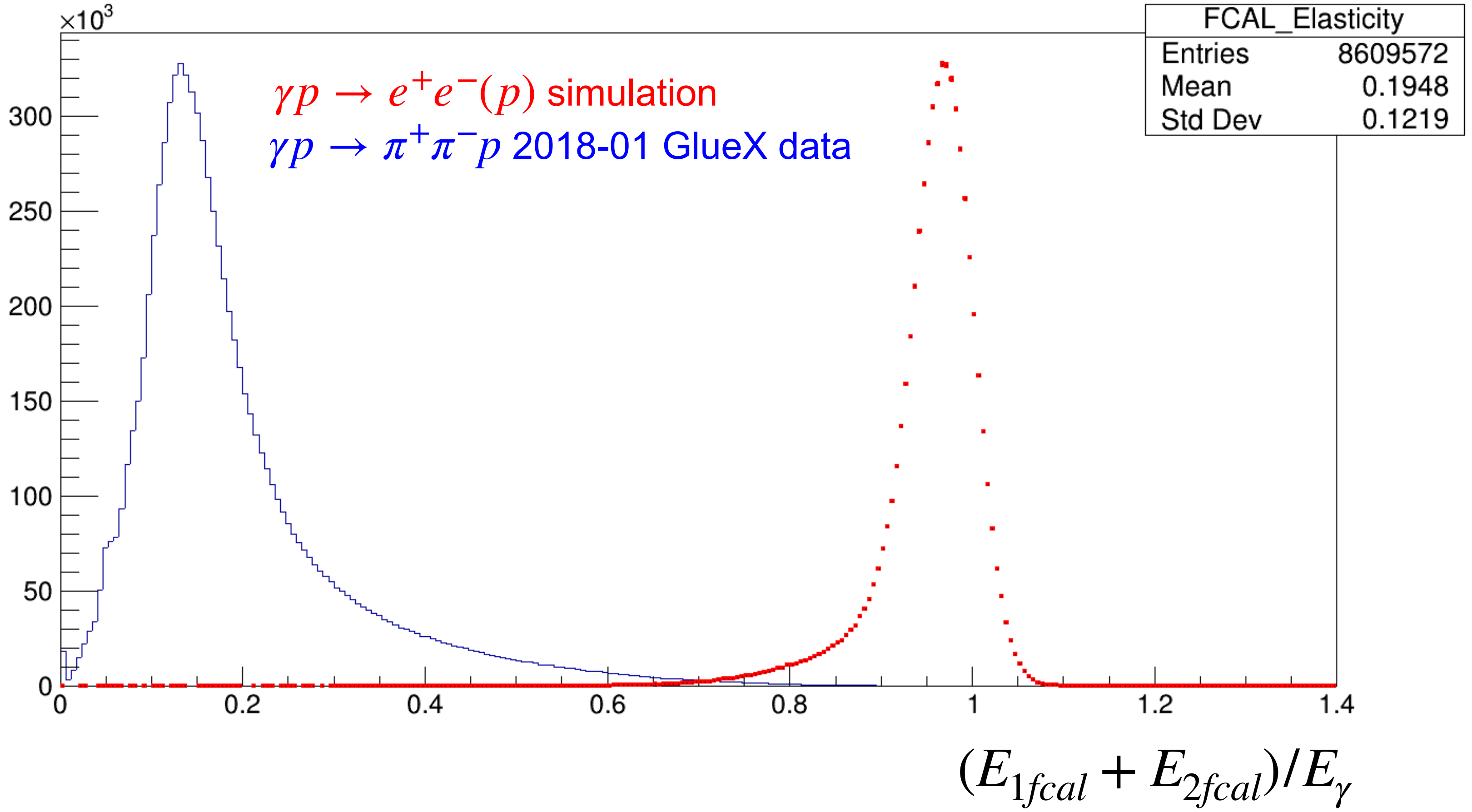
$\gamma p \rightarrow \pi^+\pi^- p$ 2018-01 GlueX data, *e/π MVA training variables*



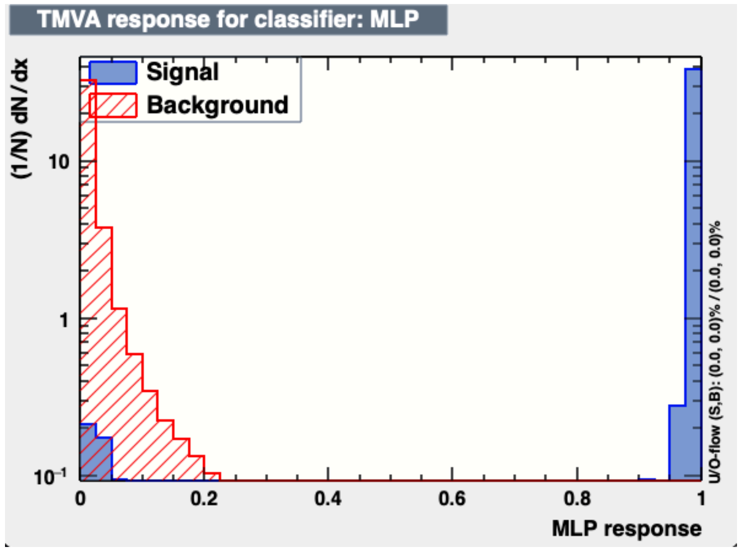


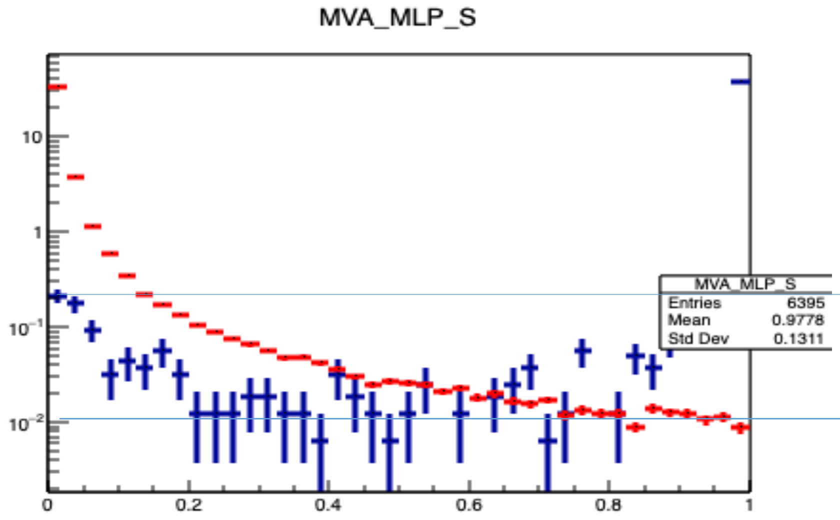


FCAL Elasticity

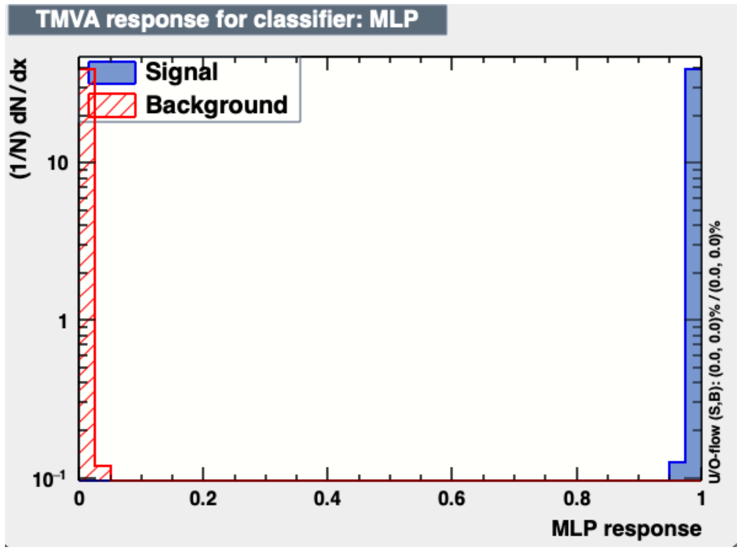


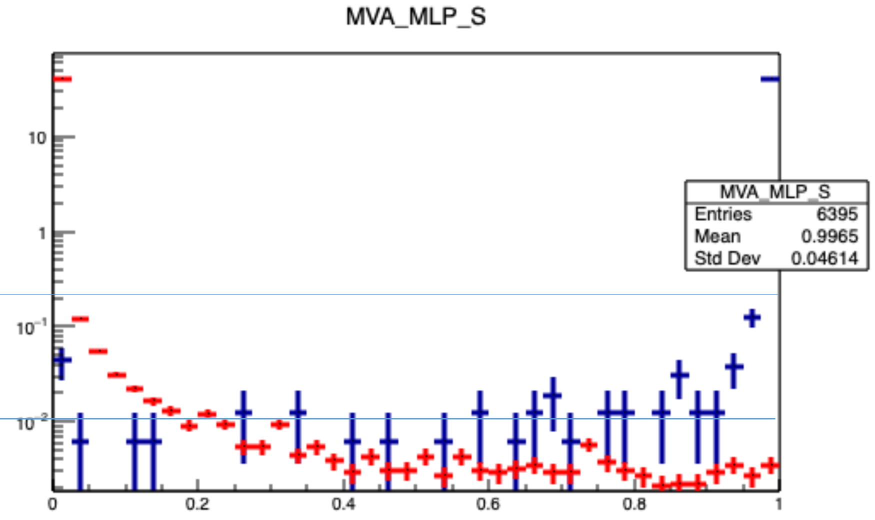
Single Track (old)



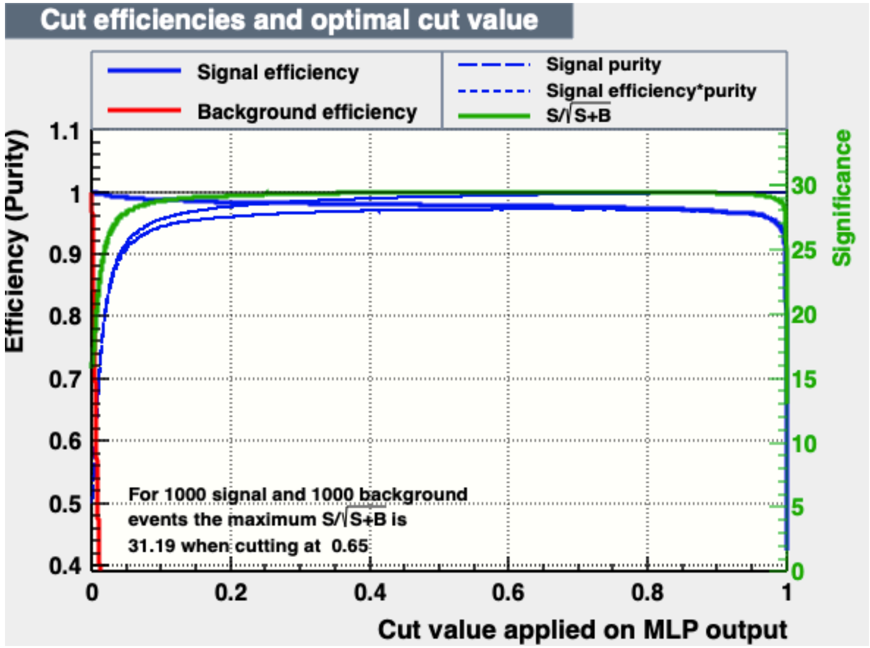


Two Track (new)

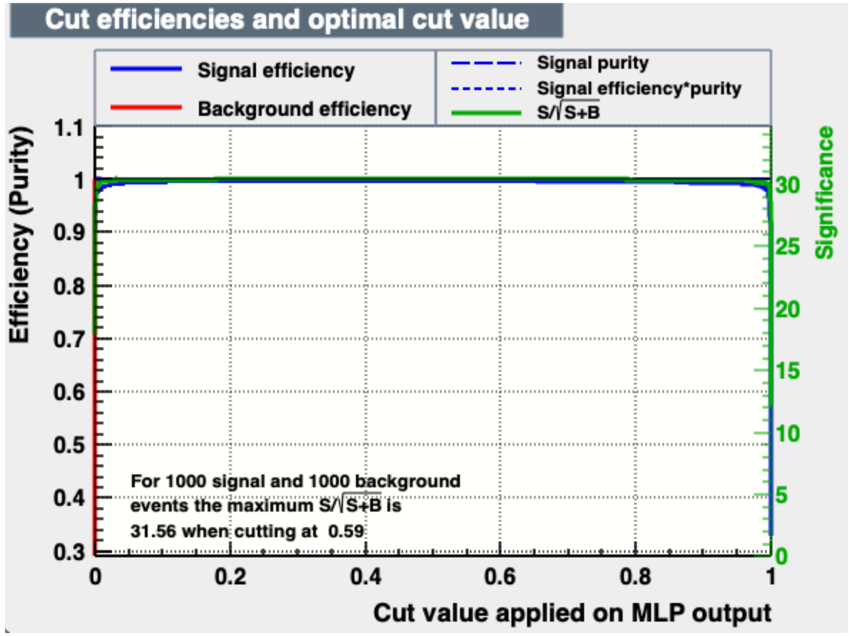




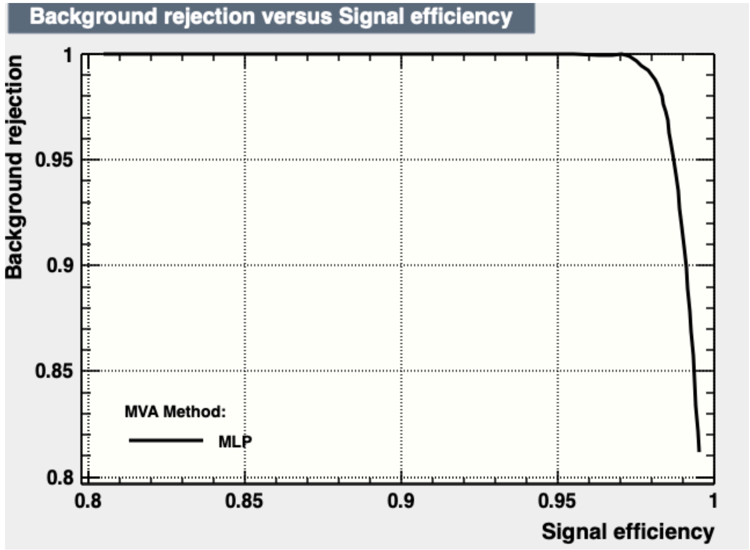
Single Track
(old)



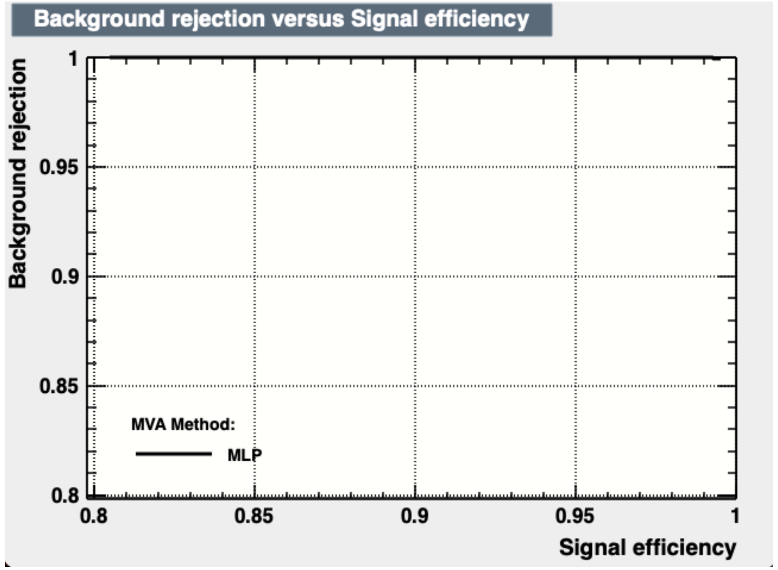
Two Track
(new)



Single Track
(old)

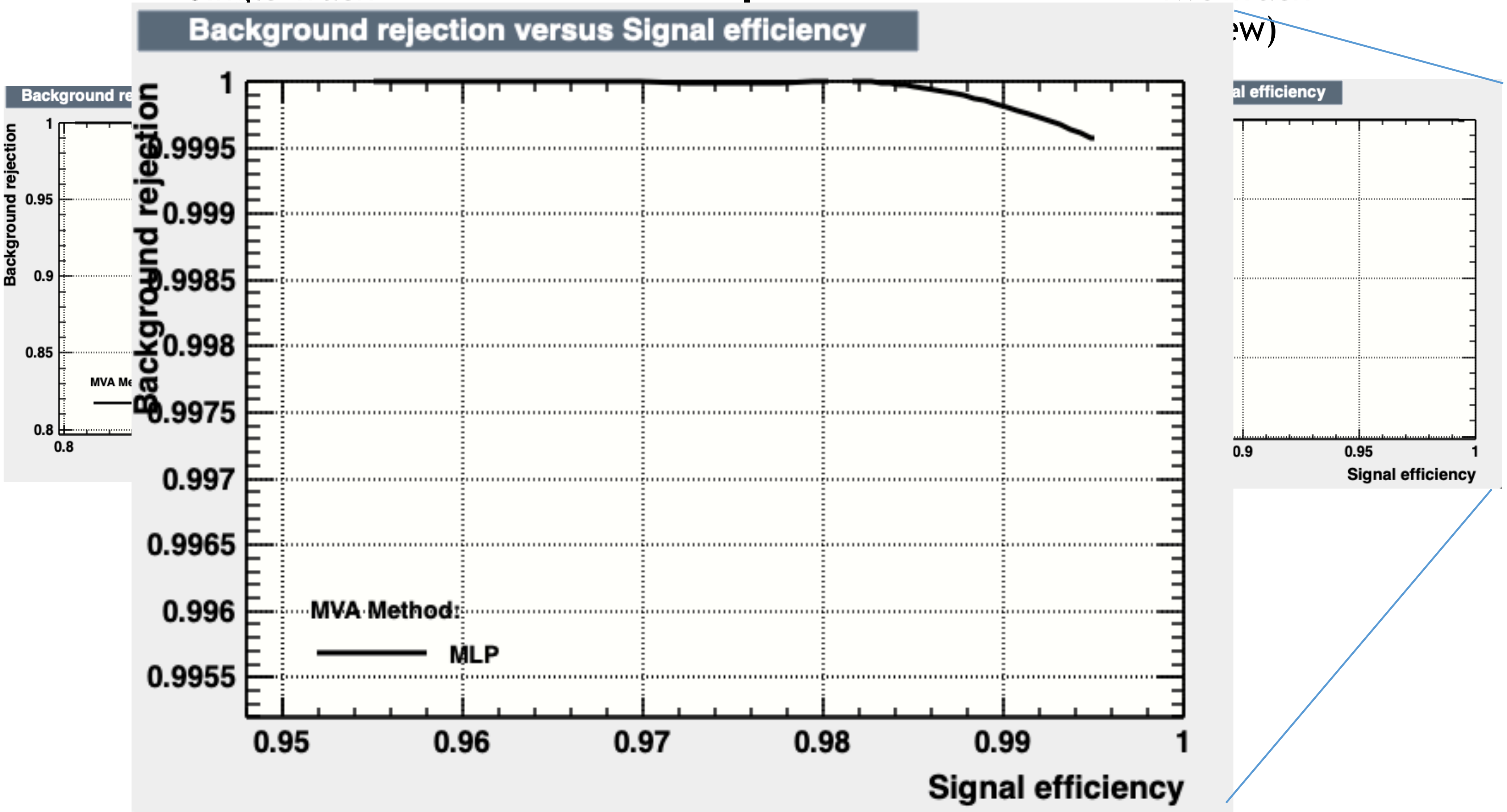


Two Track
(new)

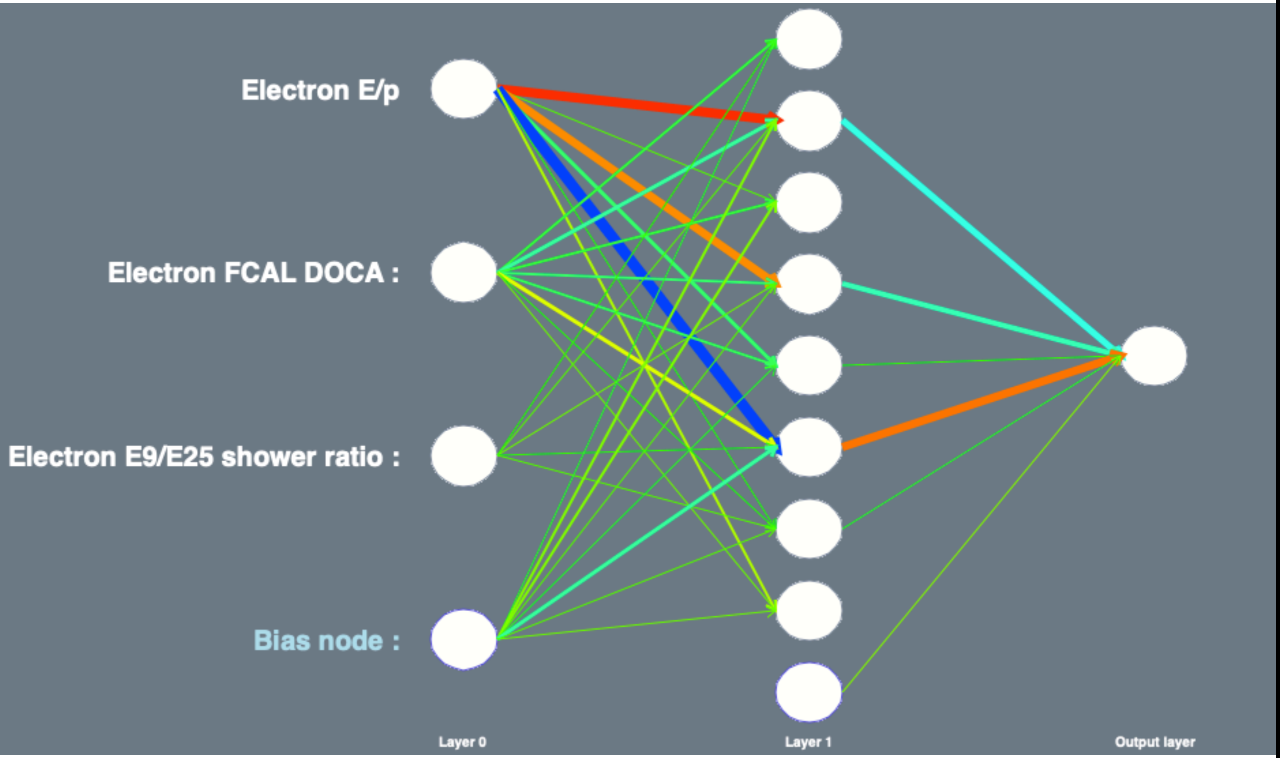


Single Track

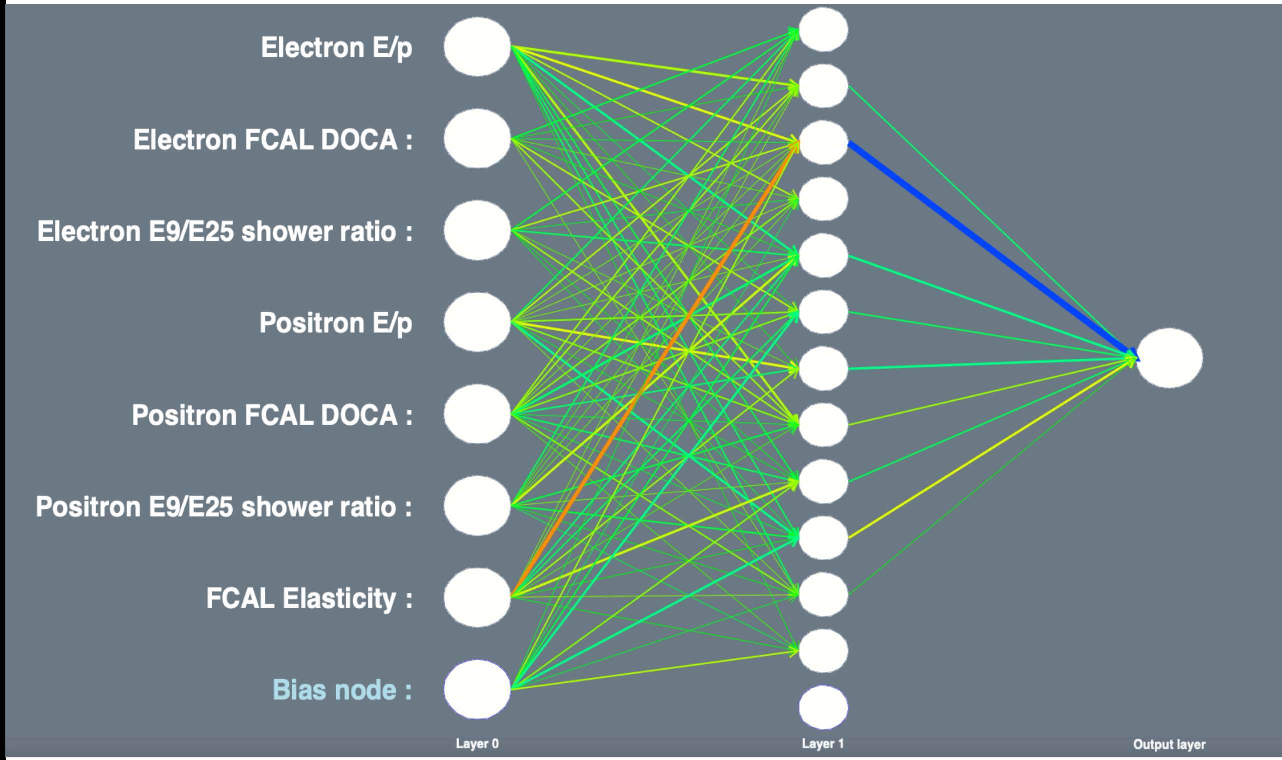
Two Track



Single Track (old)

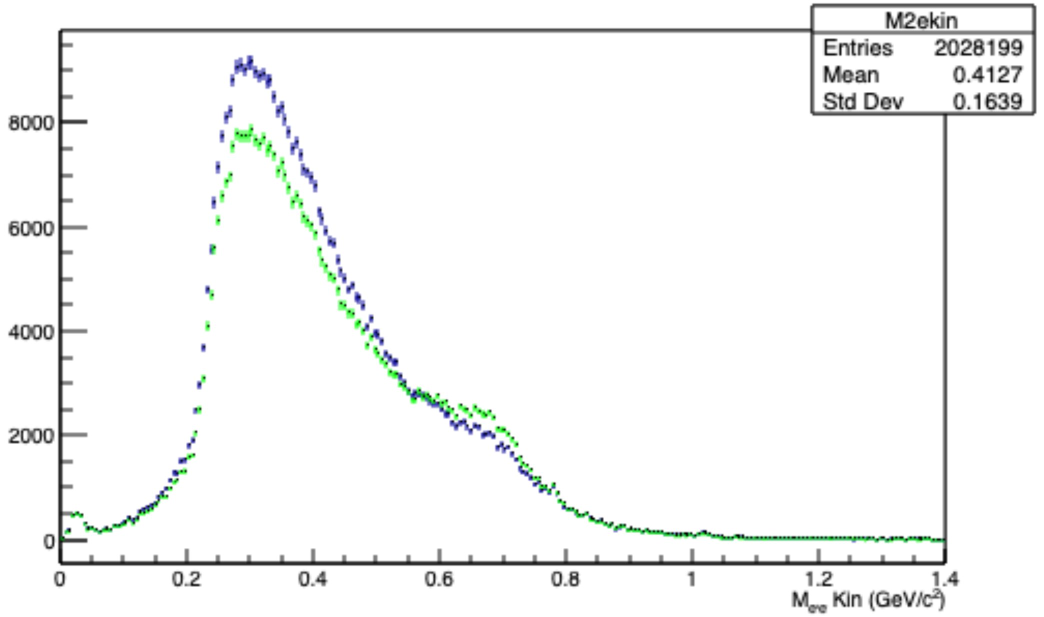


Two Track (new)

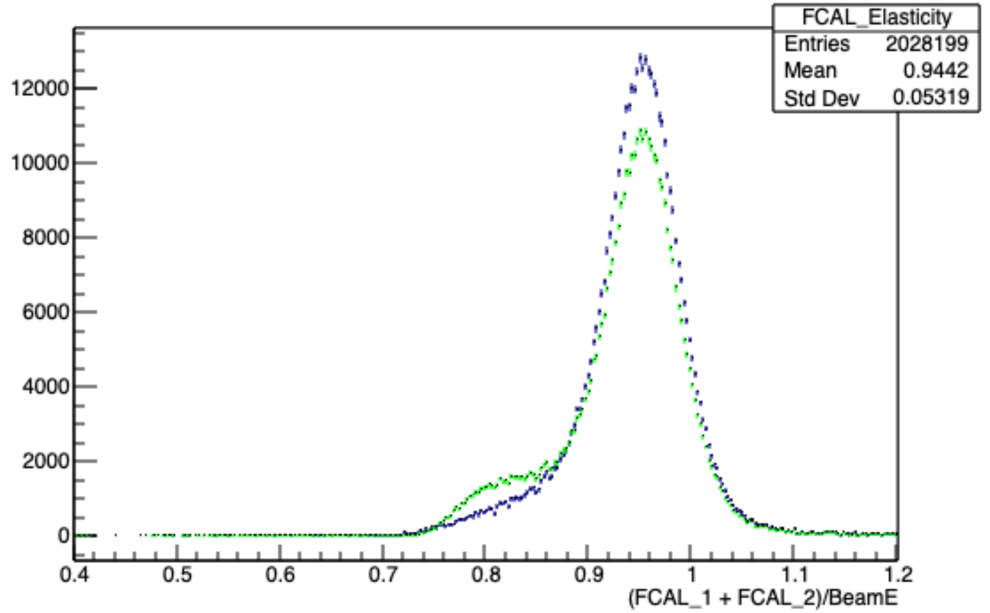


Blue is old single track NN, cut on each individual track
Green is new 2-track NN

2e Invariant Mass



FCAL Elasticity



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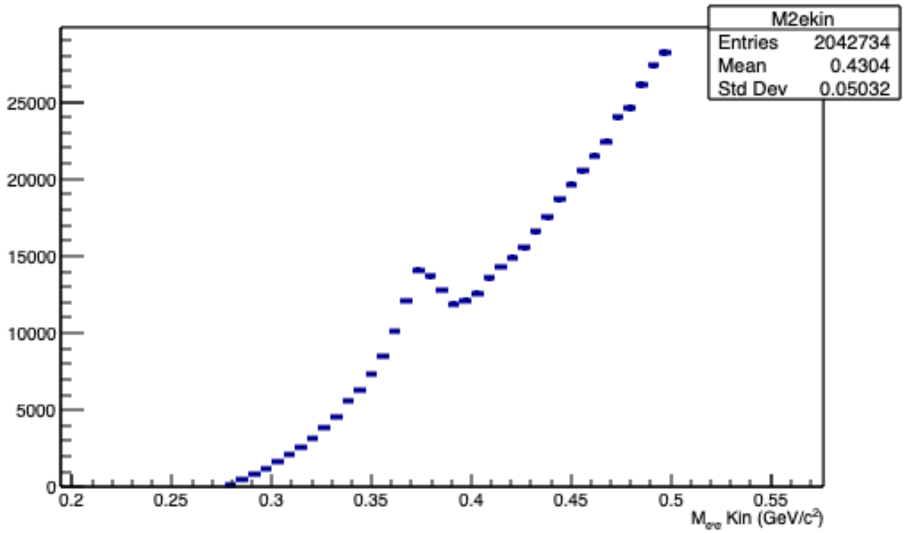
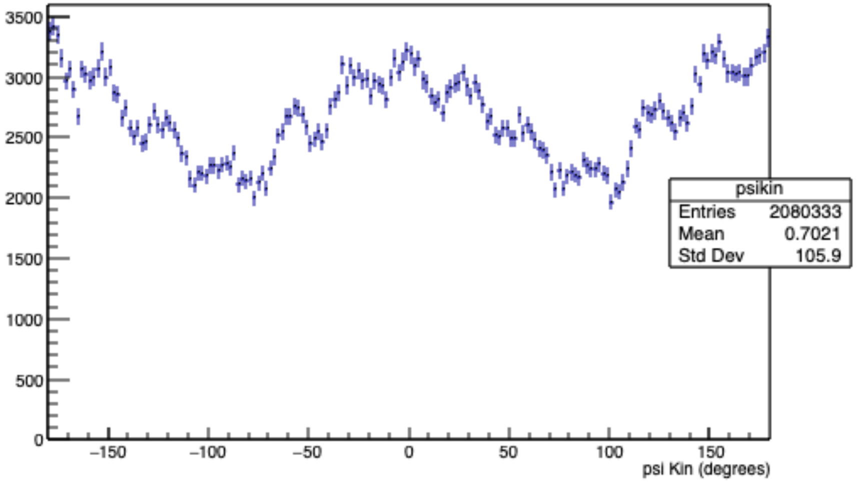
- $\gamma p \rightarrow \pi^+\pi^-(p)$
  - Analyze in the $m_{\pi\pi} < 0.5$ GeV, and low t region. Plot t, ϕ_{π^+}, and $\psi_{\pi\pi}$
  - Compare with simulation: Primakoff, $f_0(500)$, ρ^0—AmpTools Tutorial Mar 25, 9AM

2018-08 $\gamma p \rightarrow \pi^+\pi^-(p)$ GlueX data

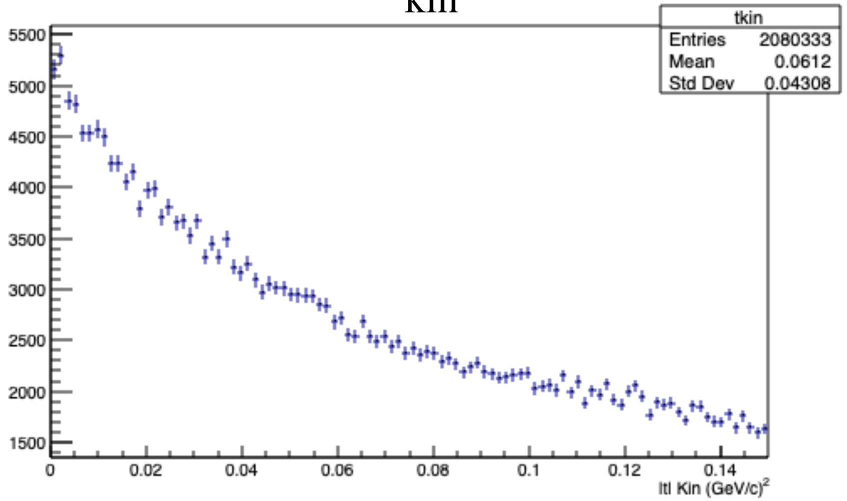
2π Invariant Mass < 0.5 GeV, **Elasticity < 0.4**



ψ



$-t_{\text{kin}}$



Neural Net Classification Cuts (NN1,2> 0.9)

$8.2\,\text{GeV} < E_\gamma < 8.8\,\text{GeV}$

$W_{\pi\pi} < 0.5\,\text{GeV}$

Both pions have hits in the TOF

$\theta_1, \theta_2 > 1.5\,\text{deg}$

Elasticity < 0.4

Vertex cut (Window free): 52 < z < 78 cm