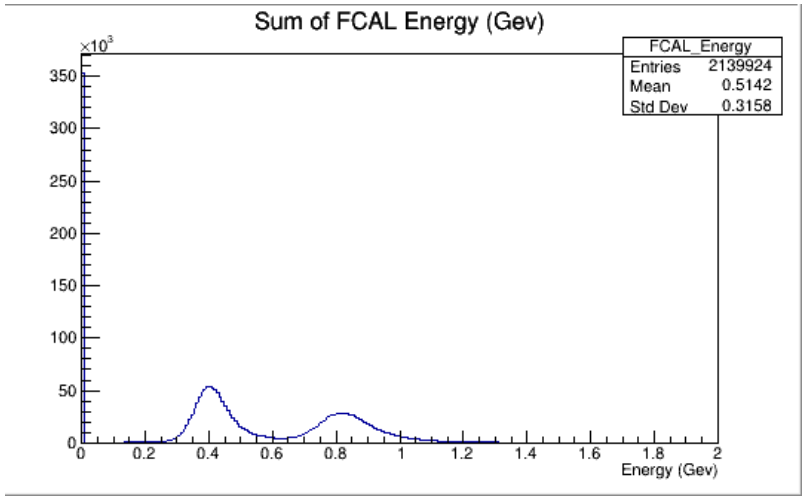
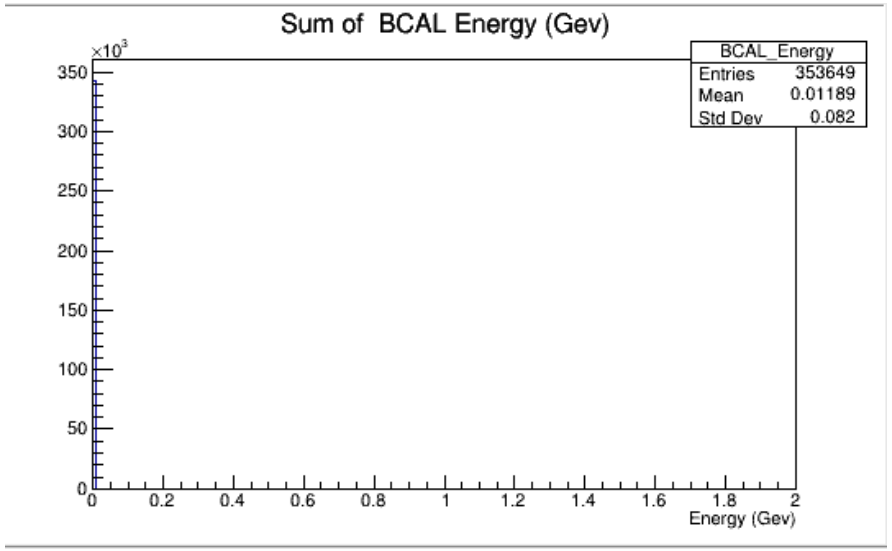
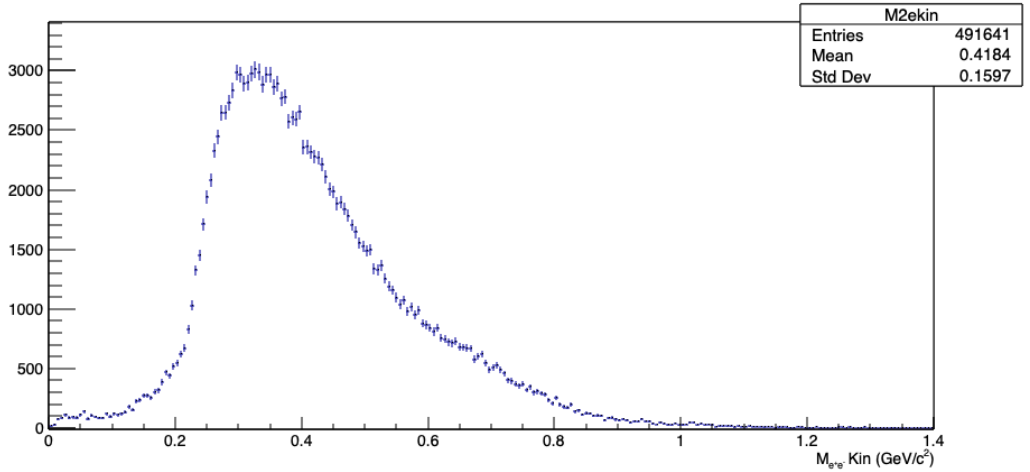
Work Overview

- 2019 CPP Test run—*muons*, *pions*, *electrons*
    - Status of muon FCAL shower determination?

$\gamma p \rightarrow \mu^+\mu^-(p)$ Monte Carlo simulation







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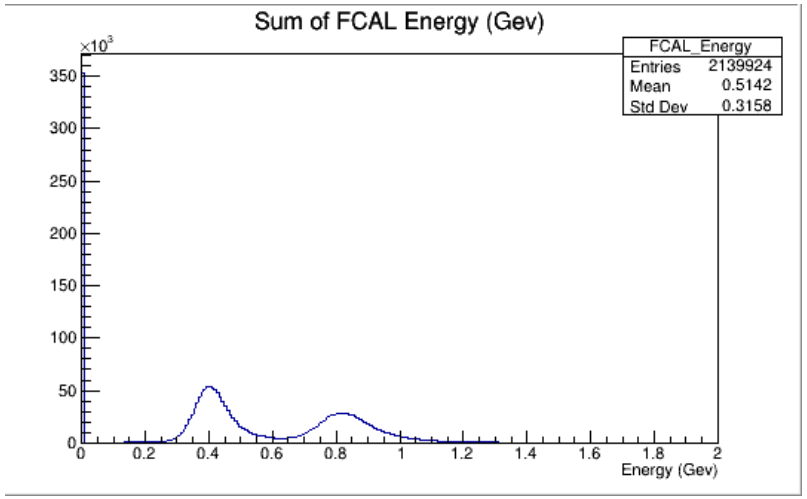

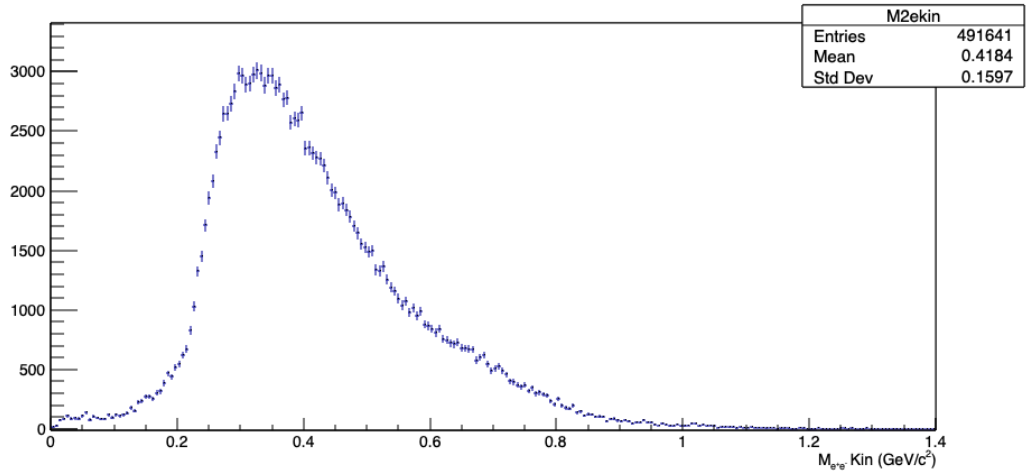

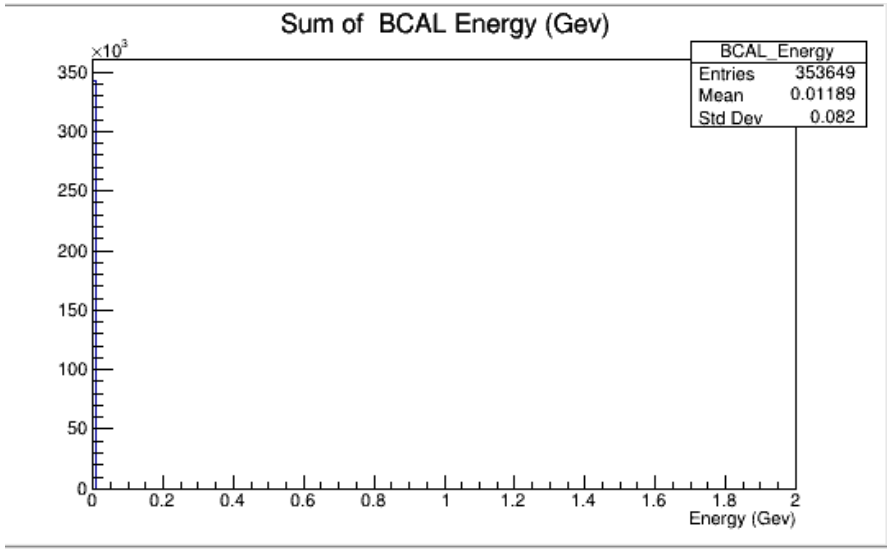

Set number of blocks required for shower = 1 and the pileup at 0 goes away.

Need a solution for this before looking at CPP test run.

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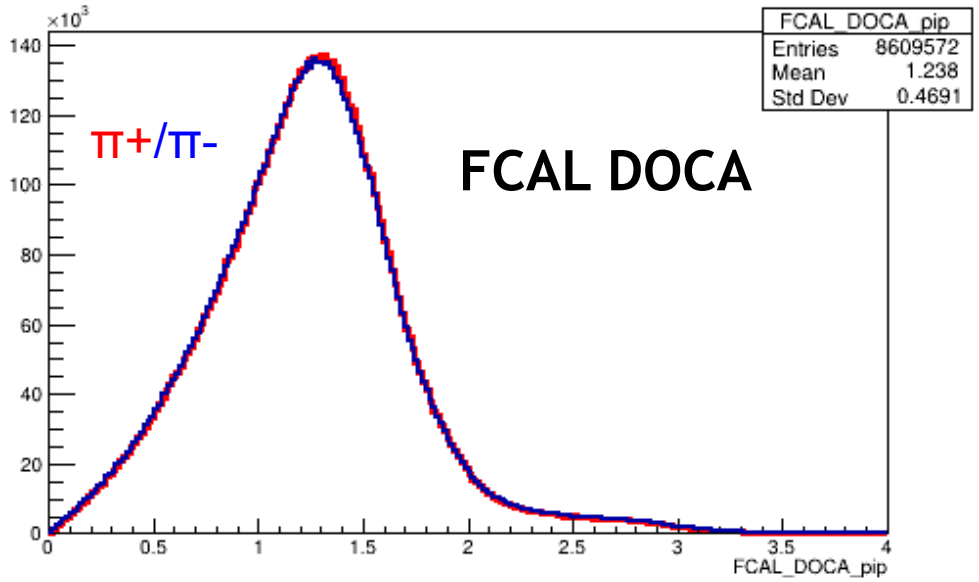
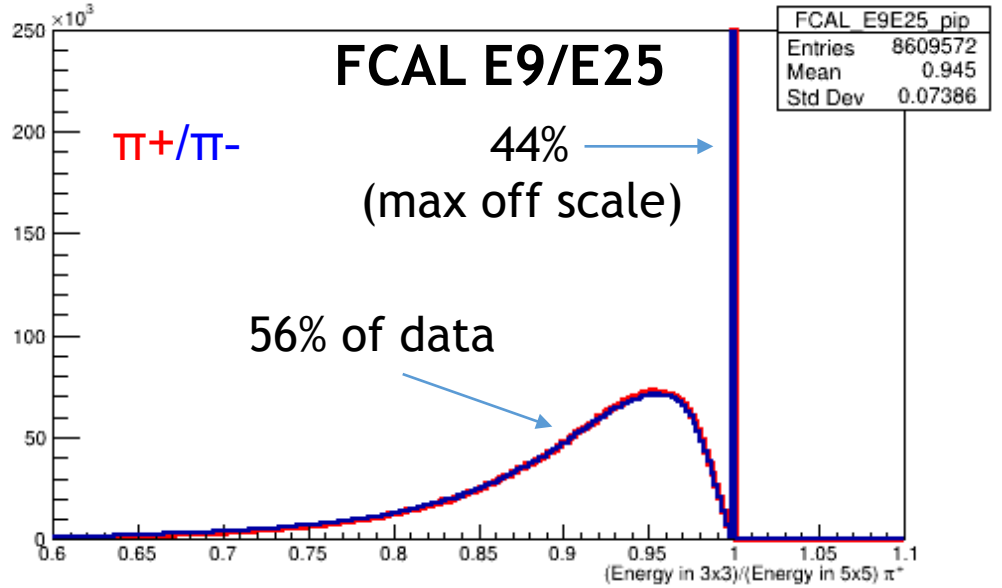
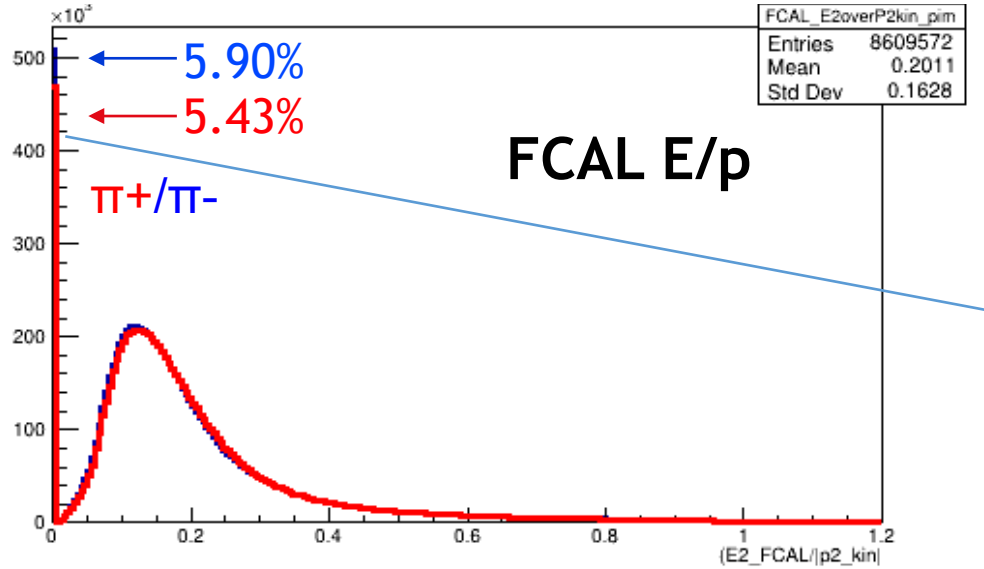
$\gamma p \to \pi^+\pi^- p$ 2018-01 GlueX data, *e/π MVA training variables*





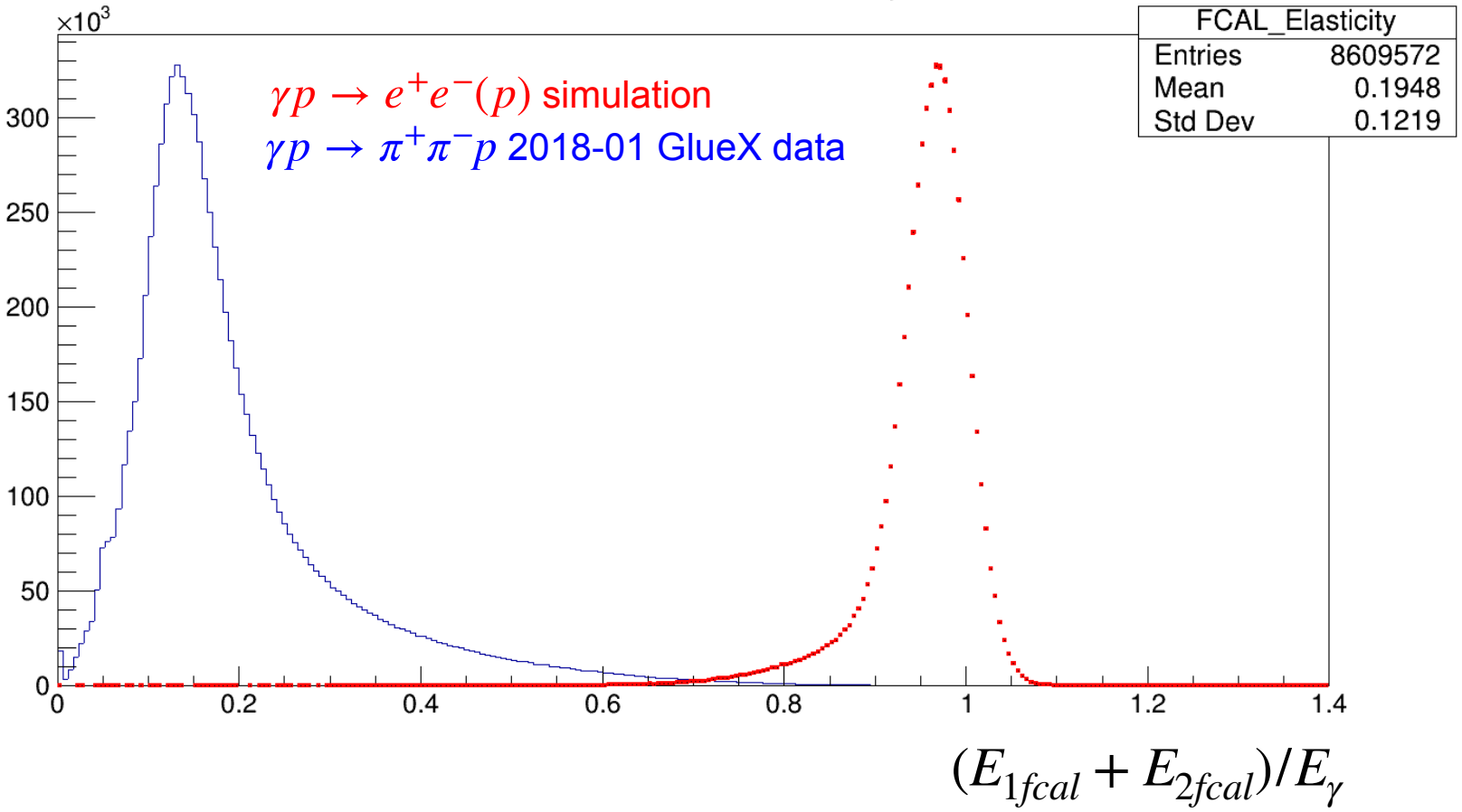


$$\int_0^1 H(E_+/p_+)\mathrm{d}b = 467874, \qquad 467874 + \sigma = 468558$$

Difference not merely due to statistics

$$\int_0^1 H(E_-/p_-)\mathrm{d}b = 508636, \qquad 508636.0 - \sigma = 507923$$

FCAL Elasticity



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- $\gamma p \rightarrow \pi^{+}\pi^{-}(p)$
  - Eleven 2018-01 0pol runs sent for analysis launch (~3% of total 2018 spring run data)
  - Analyze in the $m_{\pi\pi} < 0.5$ GeV, and low t region. Plot t, $\phi_{\pi^{+}}$, and $\psi_{\pi\pi}$
  - Compare with simulation: Primakoff, $f_0(500)$, ρ^0—*Tutorial for Elton's generator?*

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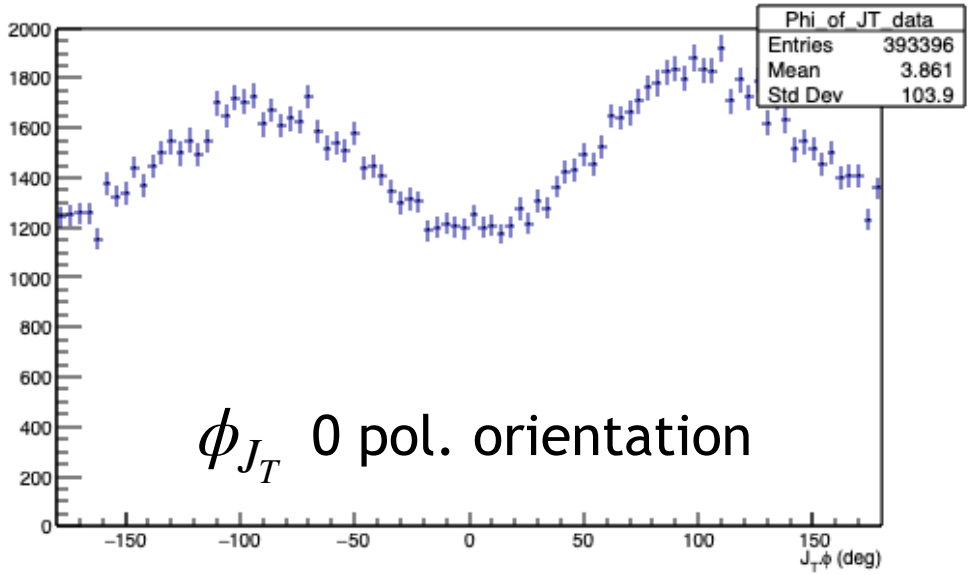
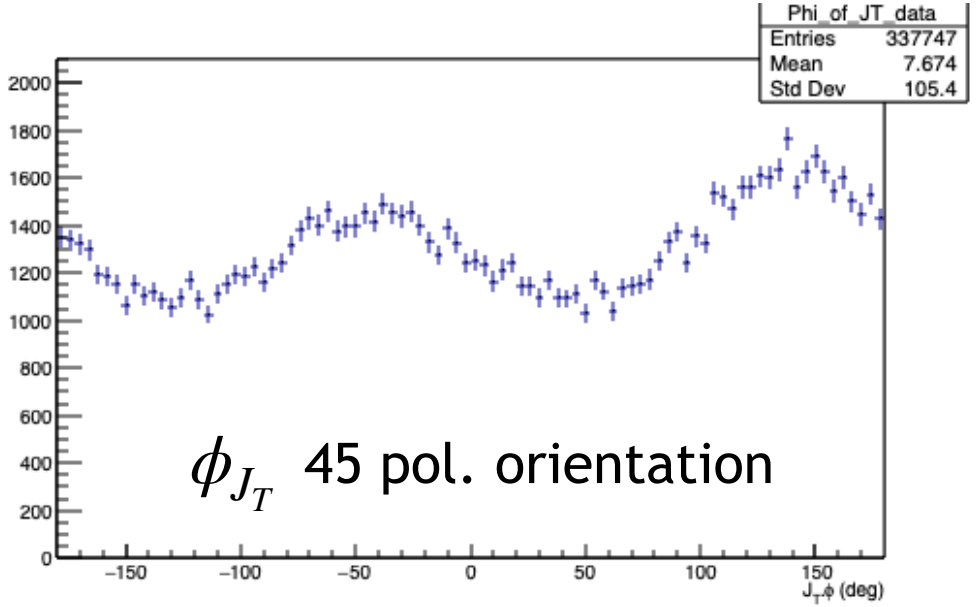
- $\gamma p \rightarrow e^{+}e^{-}(p)$ Polarization Study

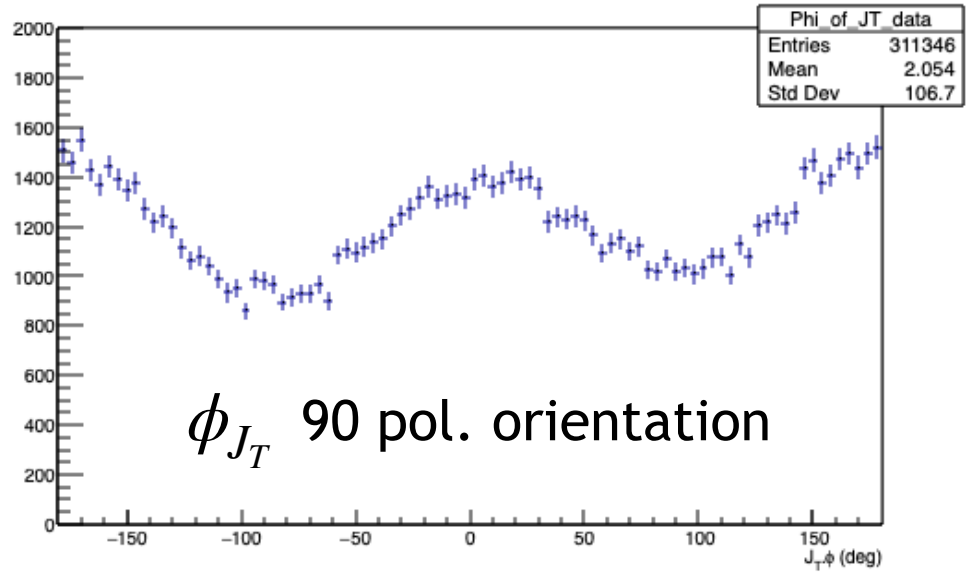
$\gamma p \rightarrow e^+e^-(p)$ 2018-01 GlueX data, w/ fiducial+N.N. cuts



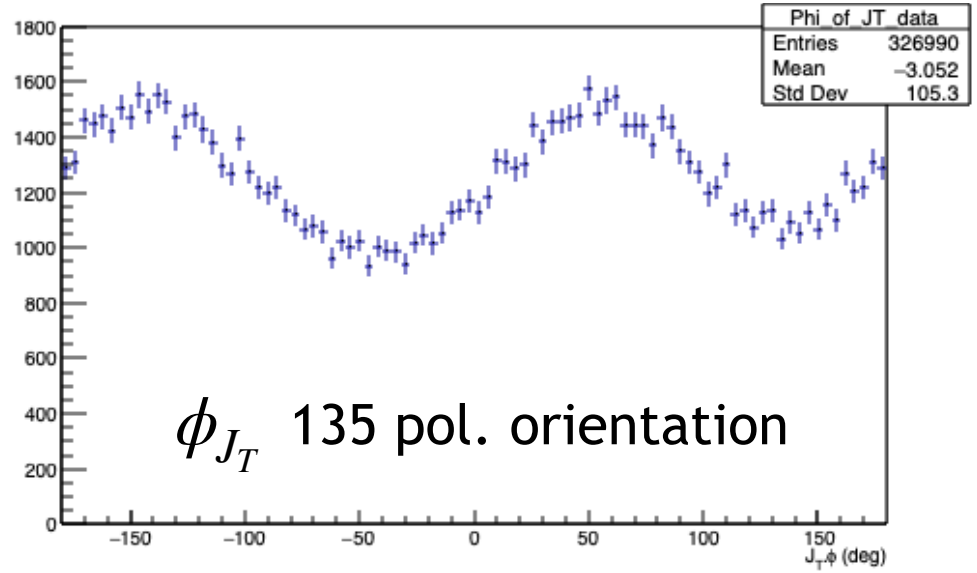
ϕ_{J_T} 0 pol. orientation



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

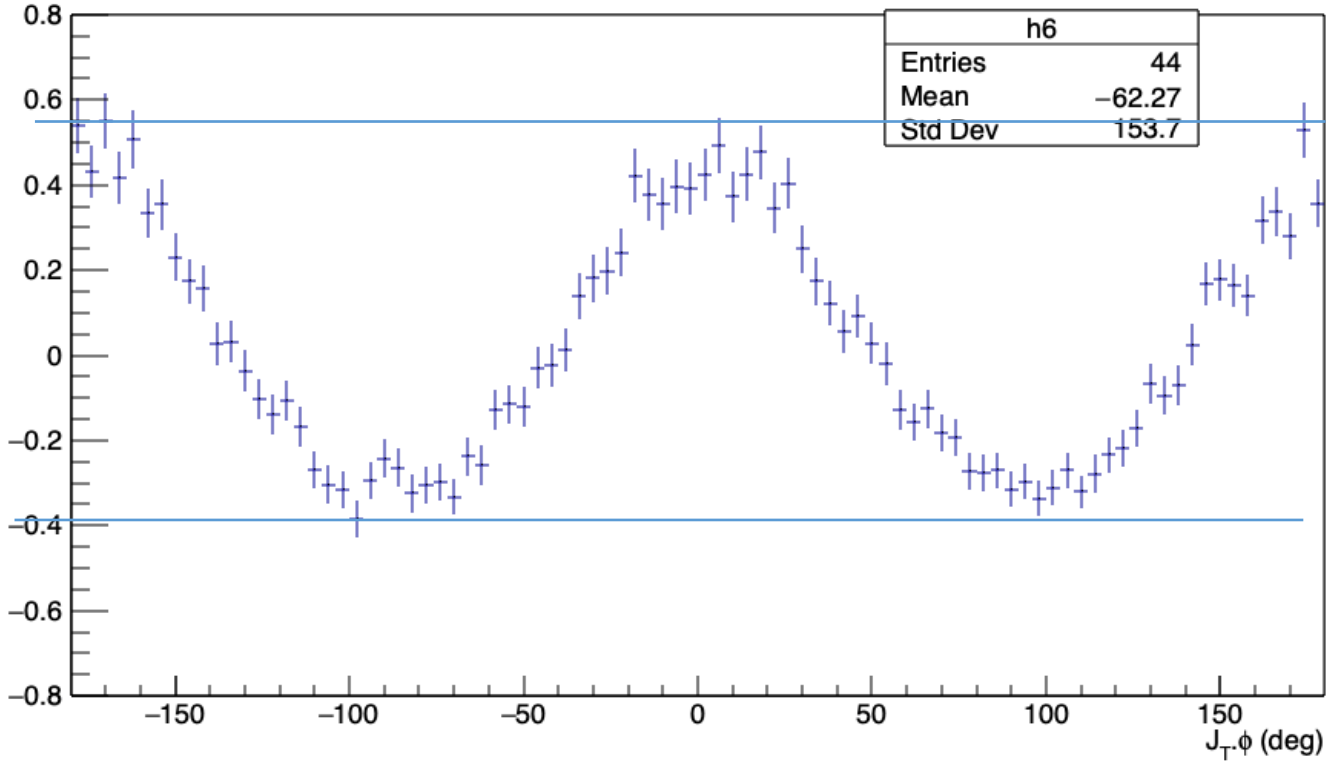
$$N_\perp = 311346$$

$$N_\parallel = 325538$$

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

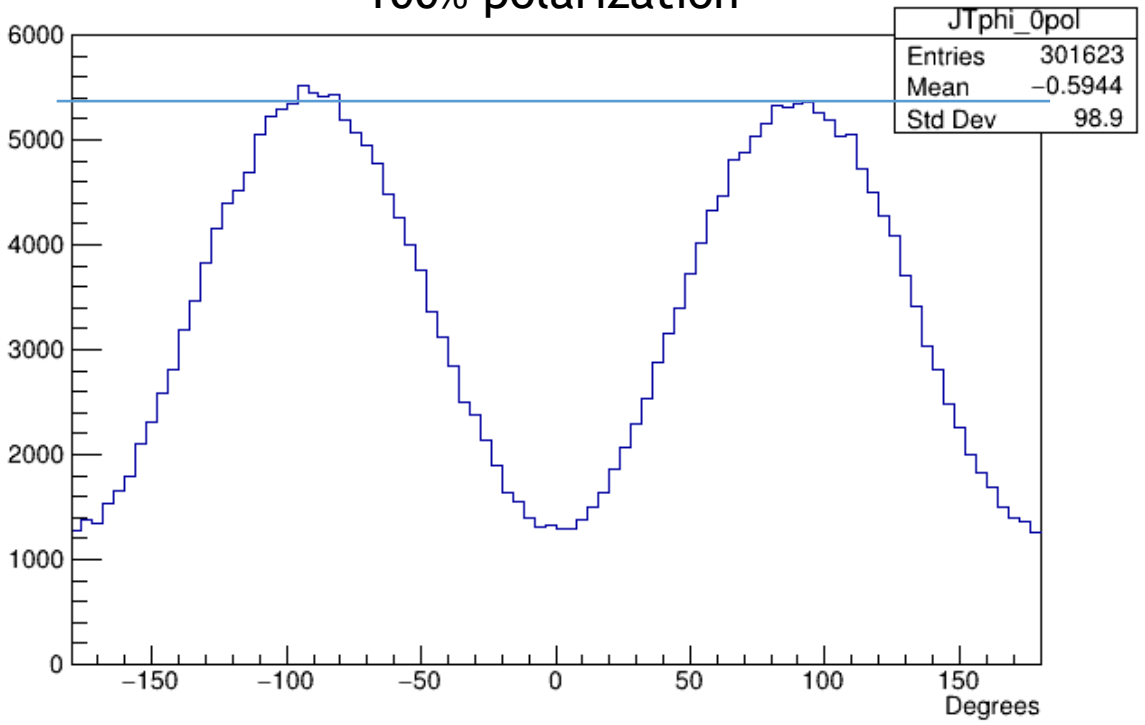
Asymmetry effect in data goes away when given the standard GlueX treatment, combining para and perp runs.

Yield Asymmetry

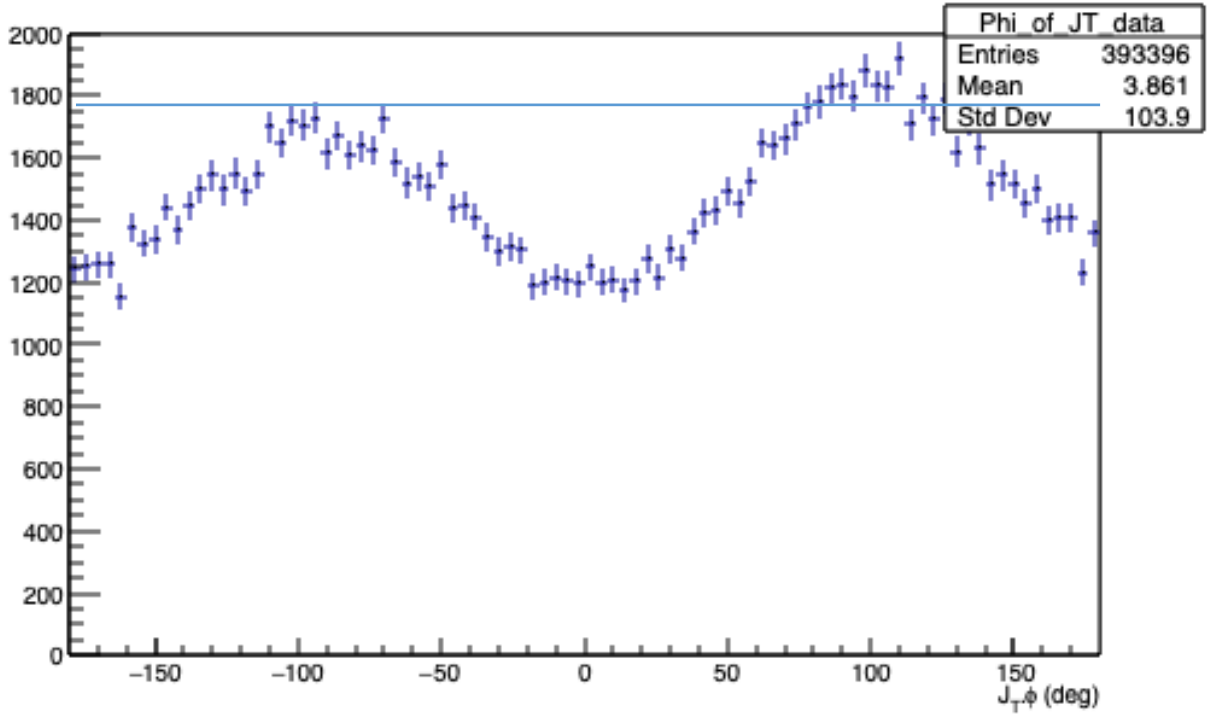


$\gamma p \rightarrow e^+e^-(p)$ reaction filter.

SIMULATION WITH ELECTRON BEAM OFFSET
ON COLLIMATOR 1mm along 45 deg
100% polarization



2018-01 DATA
0 deg orientation runs

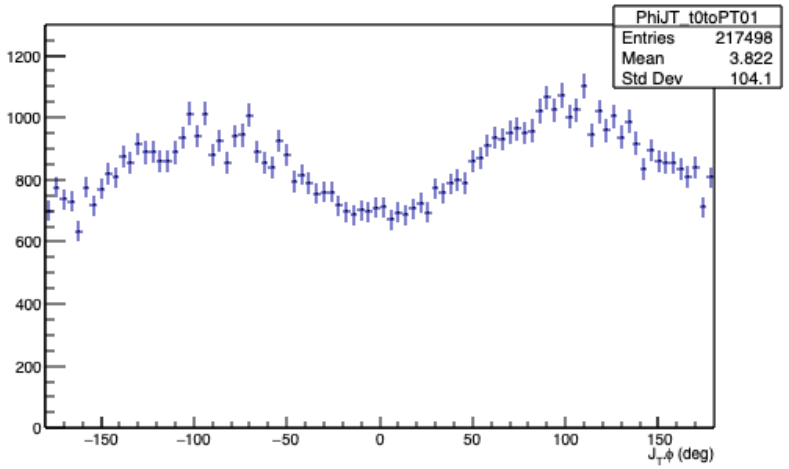


Offset from collimator is probably along 135 deg (or maybe 225?), not 45 deg.
The ebeam collimator offset is likely larger than 1mm!

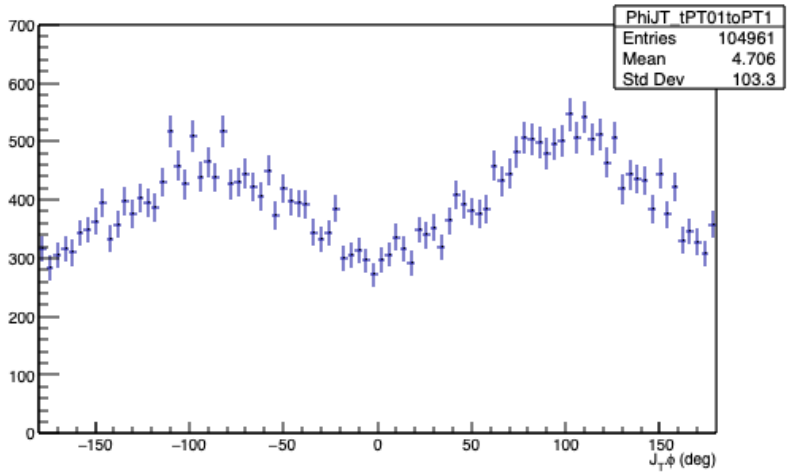
Phi of JT in bins of -t

2018-01 Data, Neural Net + Fiducial Cuts
0 pol orientation runs

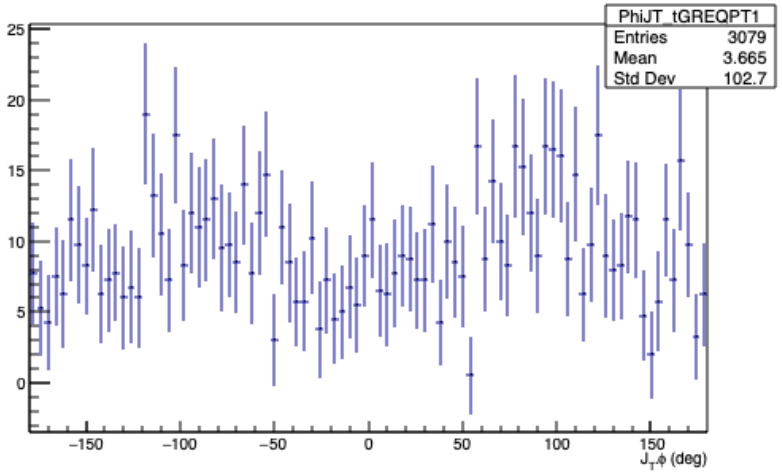
-t < 0.01



0.01 < -t < 0.1

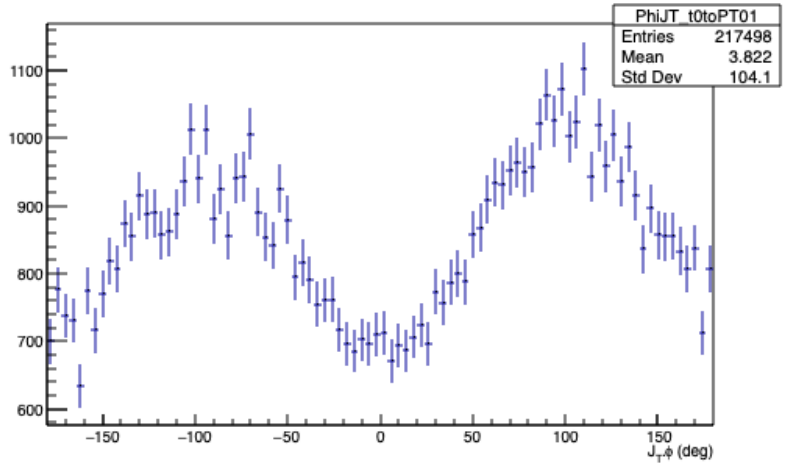


0.1 < -t

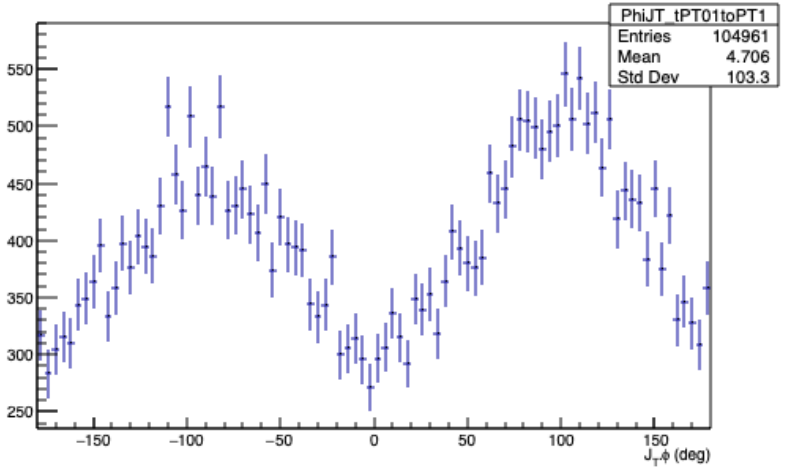


Very few events in this region of -t

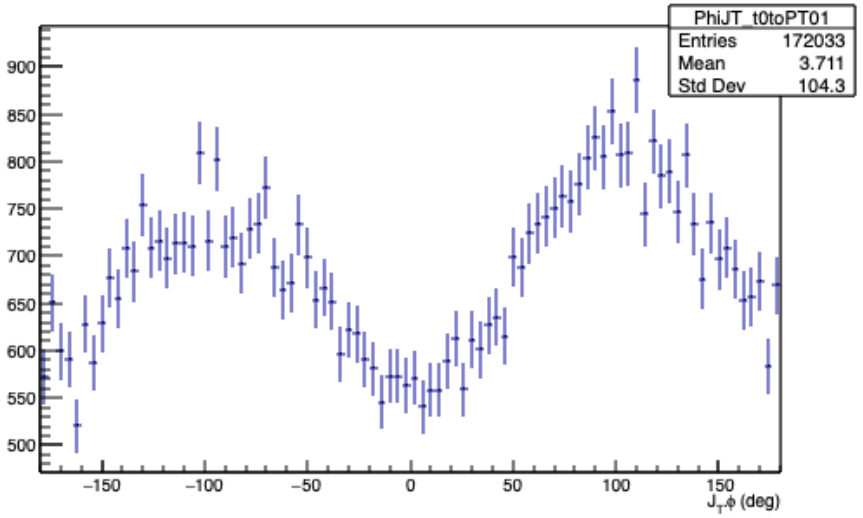
Same as above, zoomed



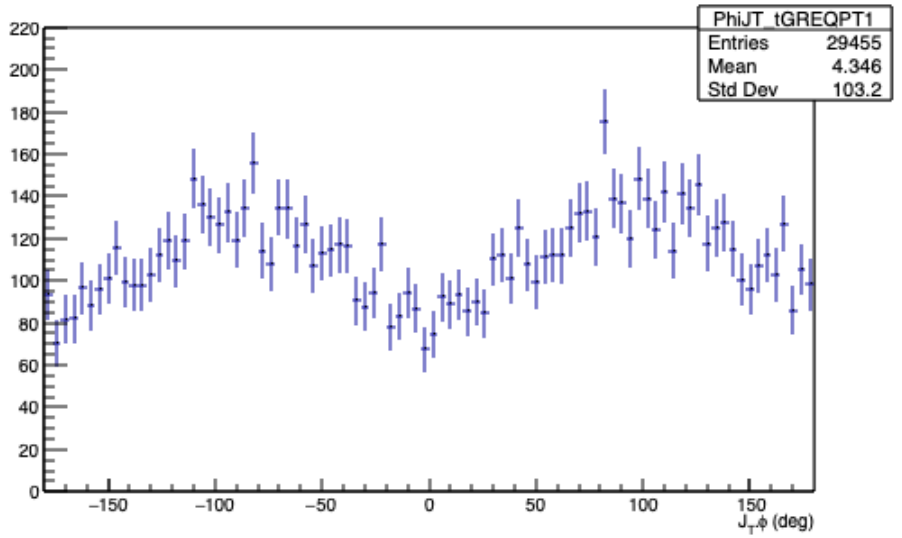
Same as above, zoomed

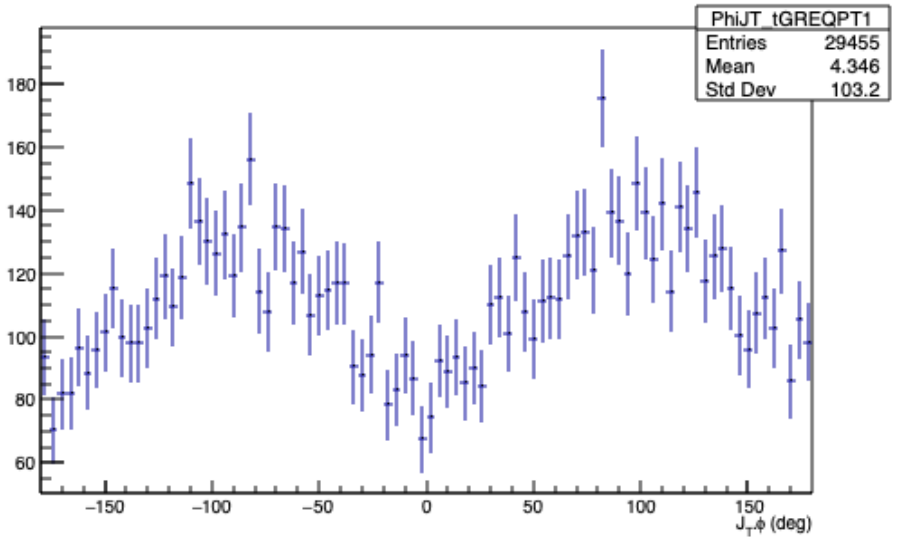


-t < 0.005


PhiJT_t0toPT01
Entries 172033
Mean 3.711
Std Dev 104.3
$J_T\phi$ (deg)

0.06 < -t


PhiJT_tGREQPT1
Entries 29455
Mean 4.346
Std Dev 103.2
$J_T\phi$ (deg)


PhiJT_tGREQPT1
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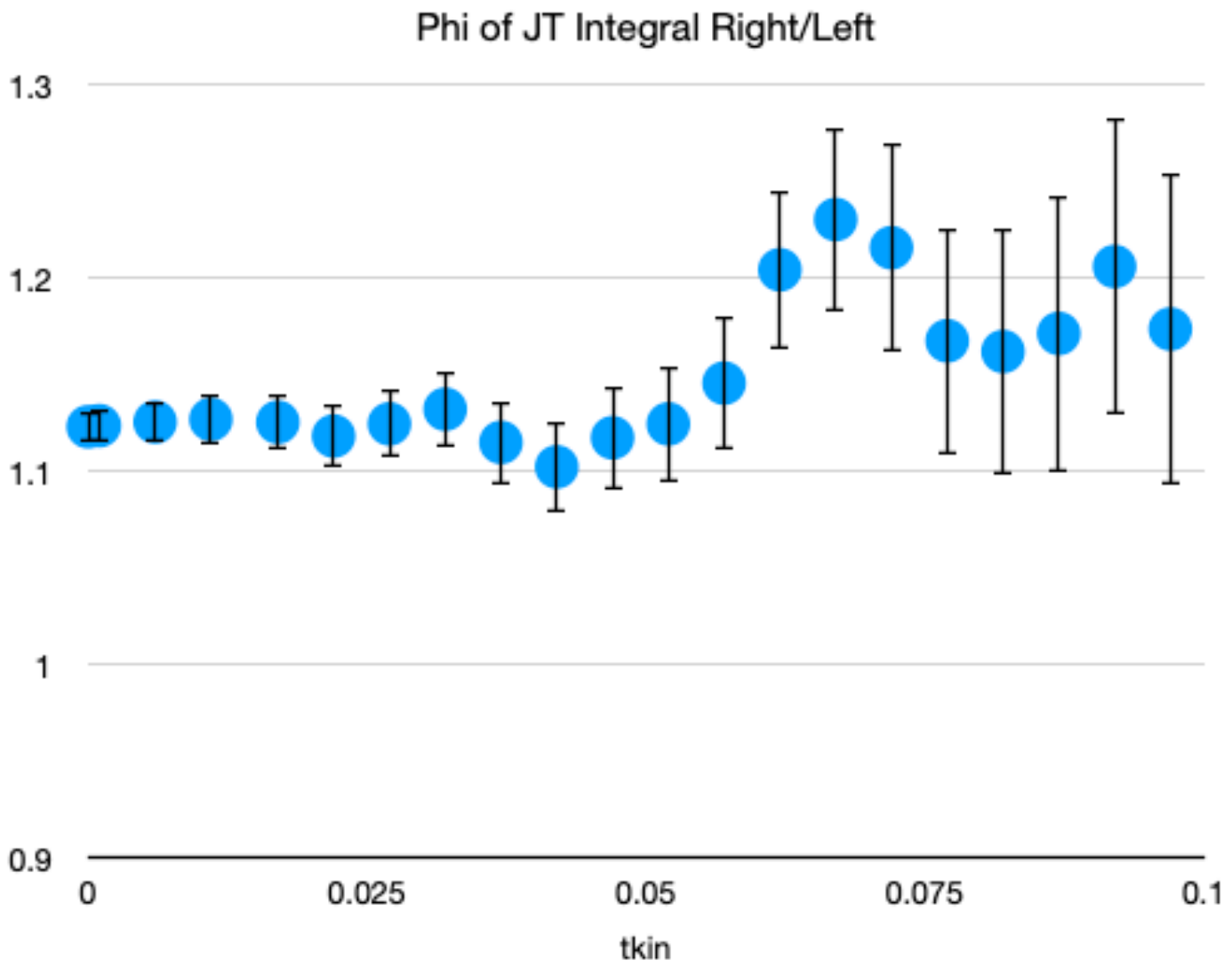
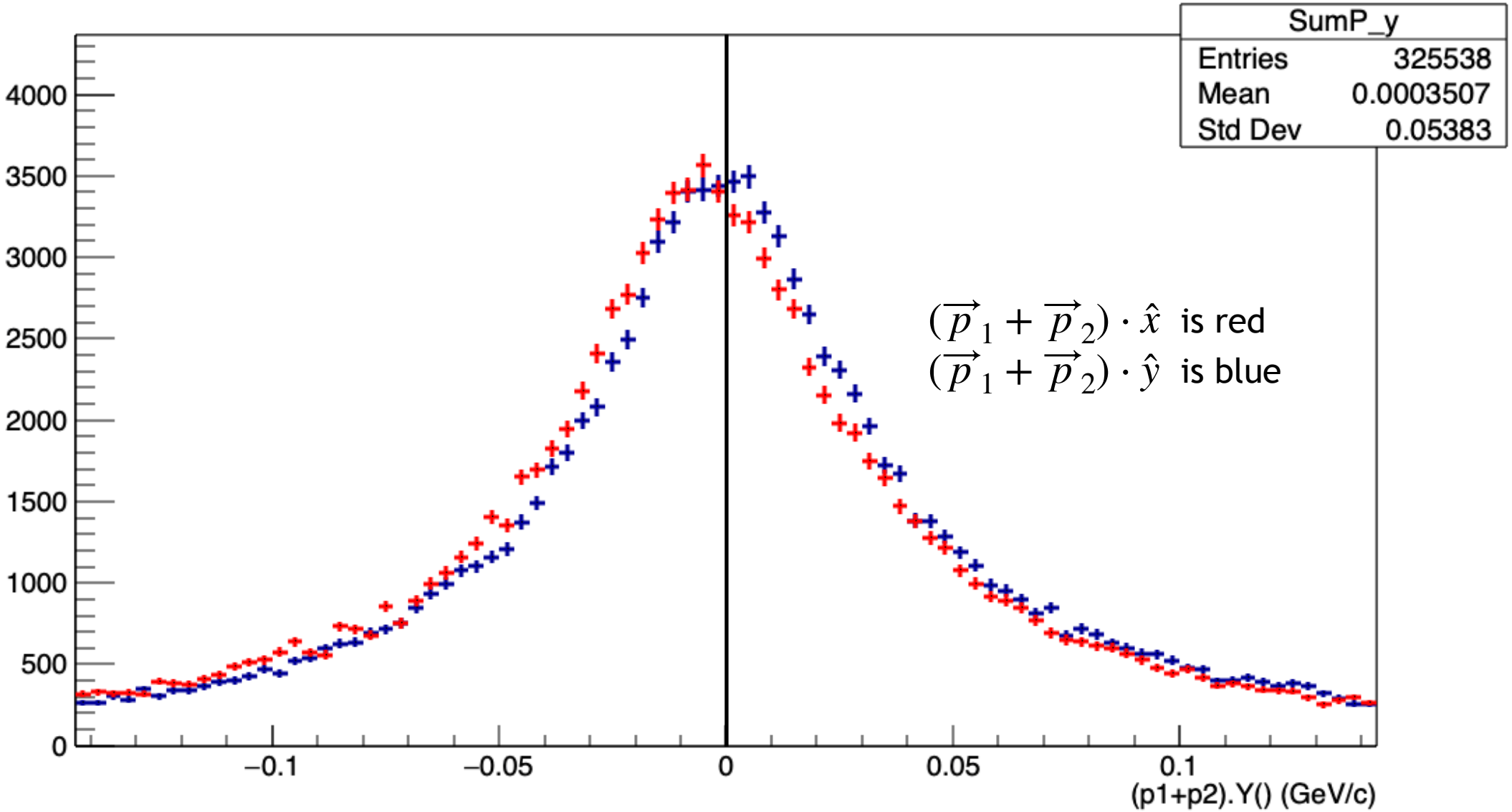
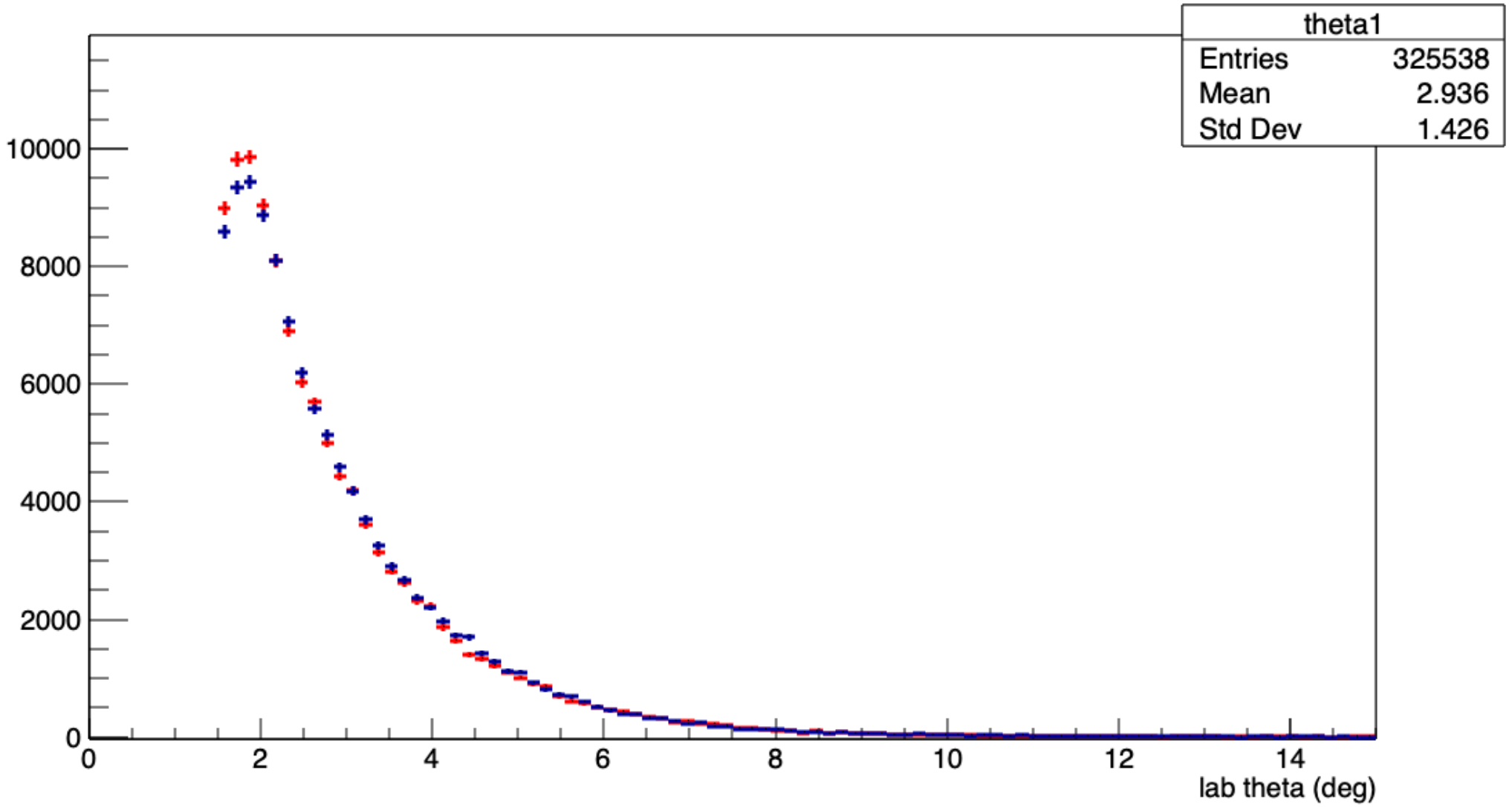
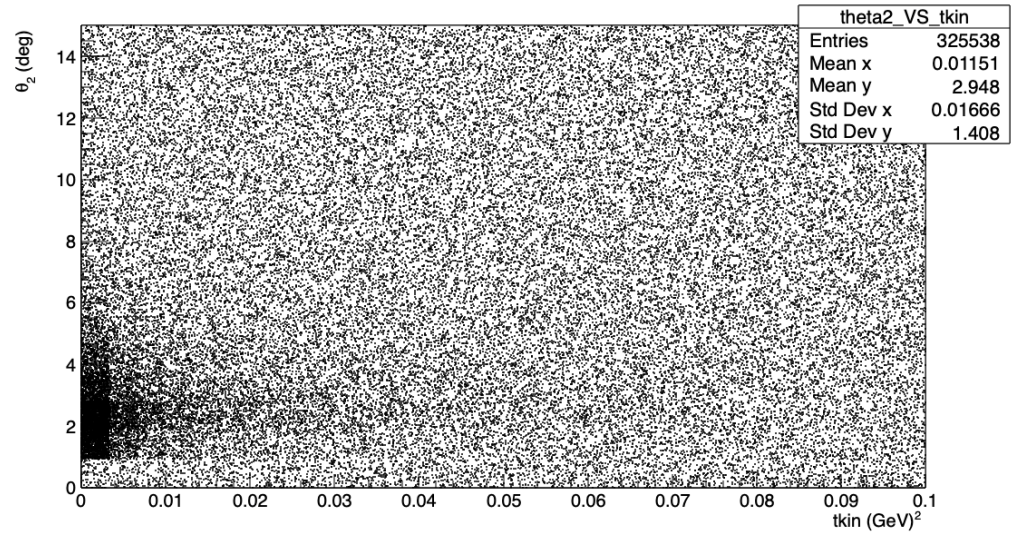
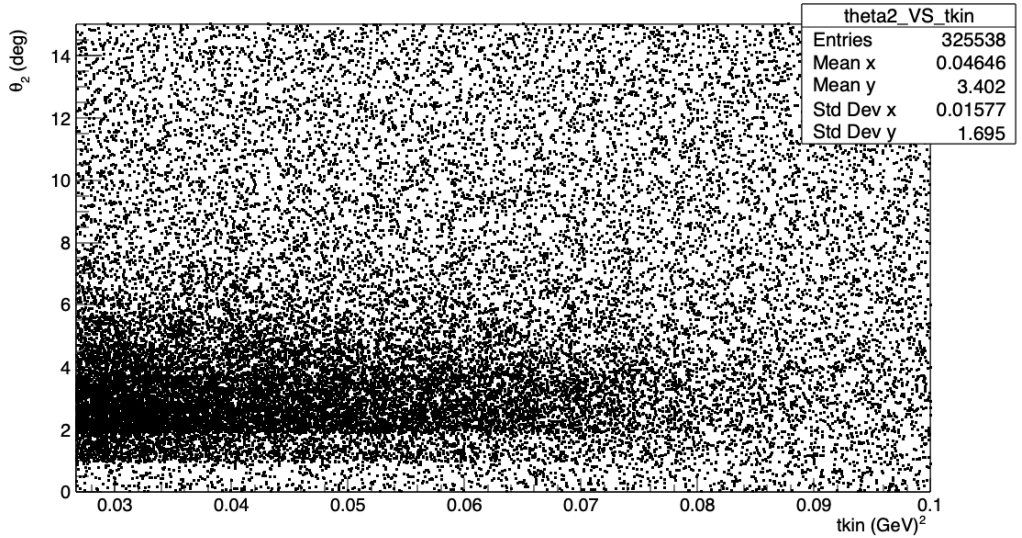
Mean 4.346
Std Dev 103.2
$J_T\phi$ (deg)


Phi of JT Integral Right/Left
1.3
1.2
1.1
1
0.9
0
0.025
0.05
0.075
0.1
tkin


SumP_y
Entries 325538
Mean 0.0003507
Std Dev 0.05383
$(\overrightarrow{p}_1 + \overrightarrow{p}_2) \cdot \hat{x}$ is red
$(\overrightarrow{p}_1 + \overrightarrow{p}_2) \cdot \hat{y}$ is blue
4000
3500
3000
2500
2000
1500
1000
500
0
−0.1
−0.05
0
0.05
0.1
(p1+p2).Y() (GeV/c)


theta1
Entries 325538
Mean 2.936
Std Dev 1.426
10000
8000
6000
4000
2000
0
0
2
4
6
8
10
12
14
lab theta (deg)





Need ϕ vs θ