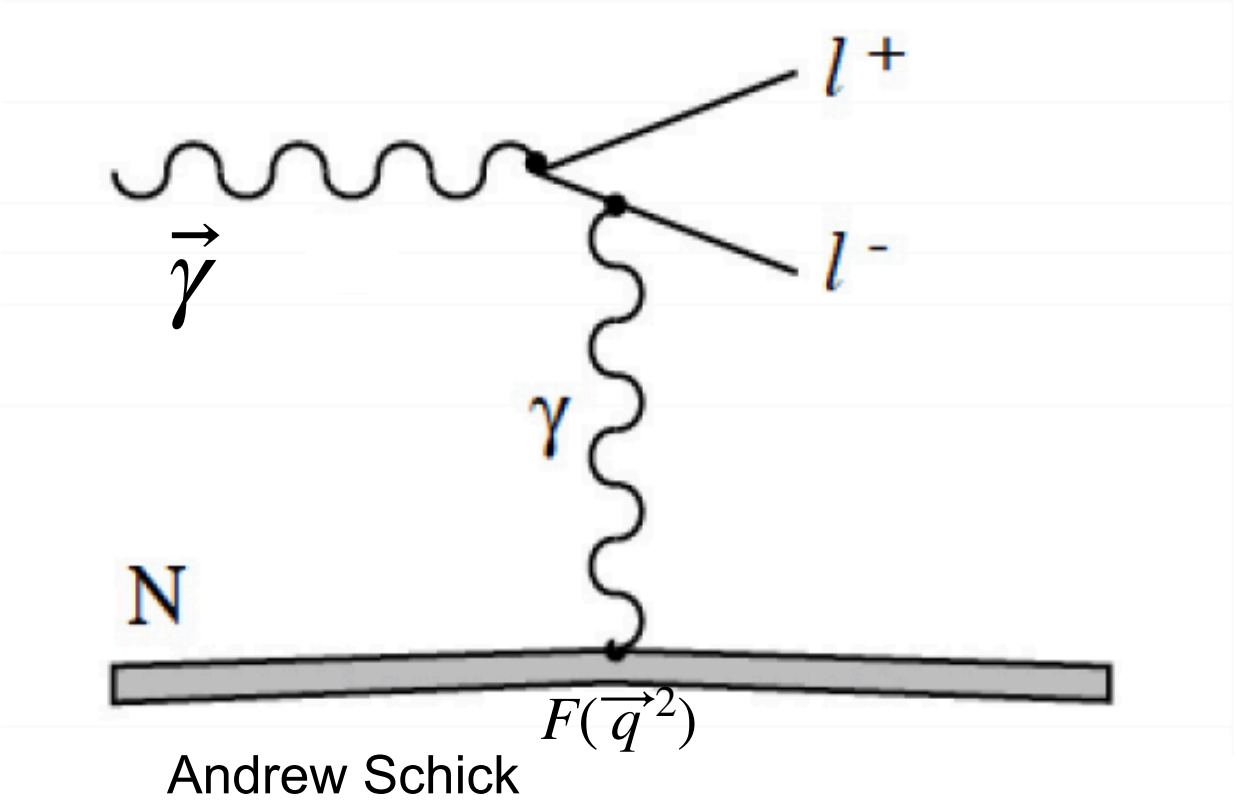
University of Massachusetts Amherst

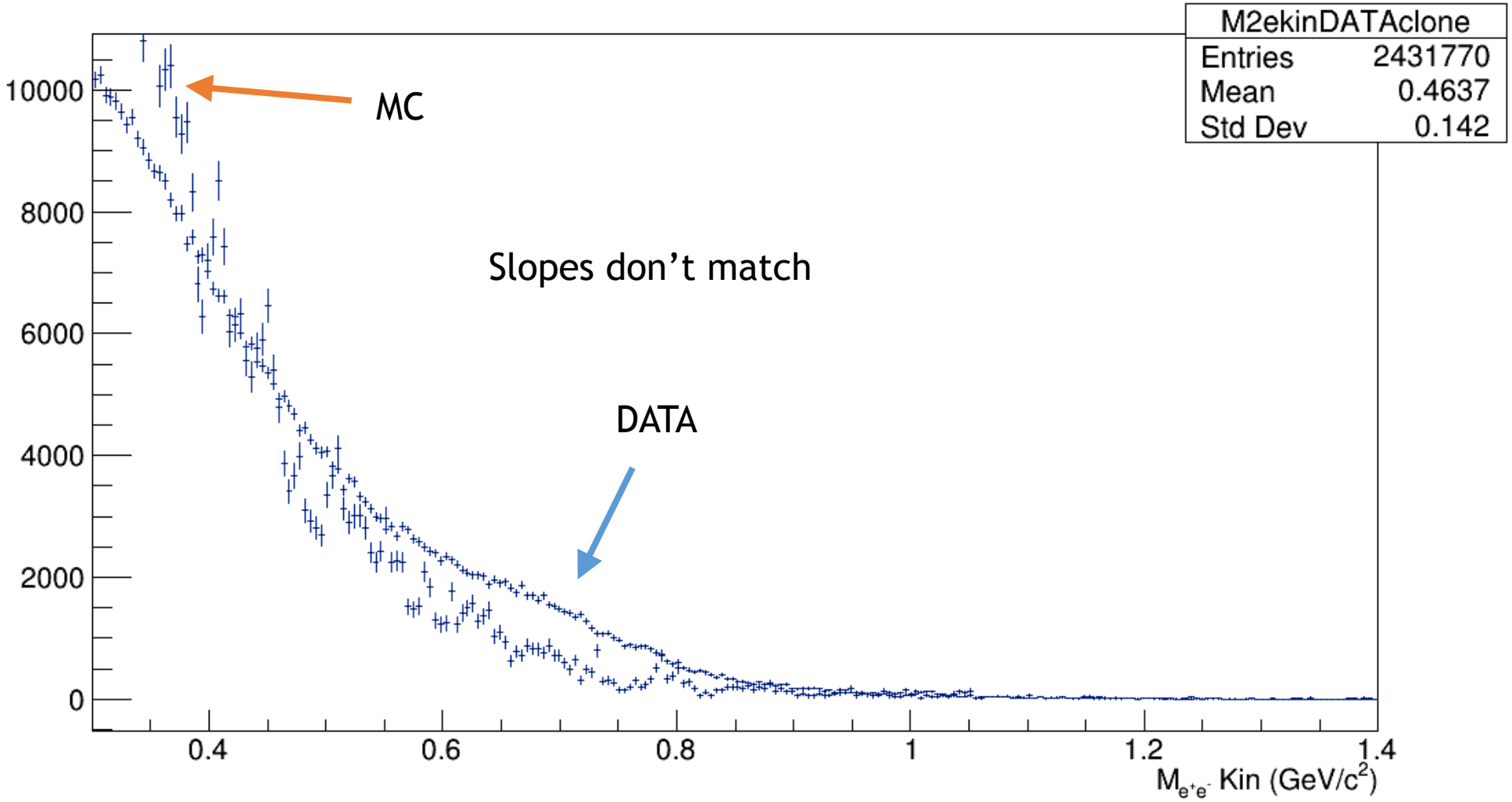
MENP

Characterizing Pion Contamination in Bethe-Heitler Study $\gamma p \rightarrow e^+e^-(p)$



Andrew Schick

Wednesday, November 6 2019

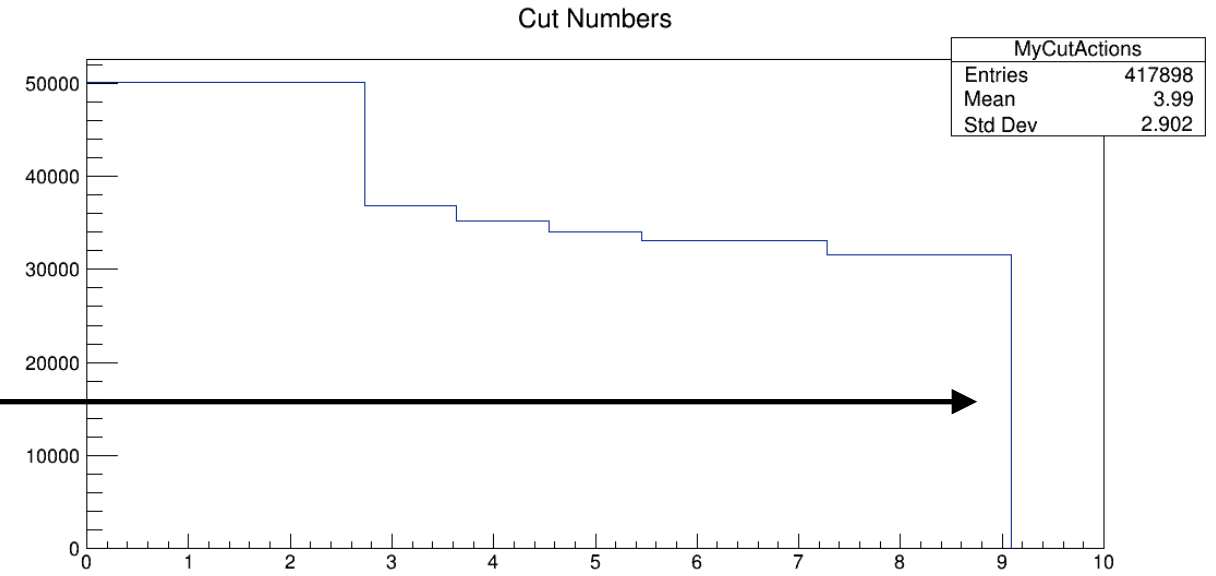

M2ekinDATAclone
Entries 2431770
Mean 0.4637
Std Dev 0.142
MC
Slopes don't match
DATA
10000
8000
6000
4000
2000
0
0.4
0.6
0.8
1
1.2
1.4
$M_{e^+e^-}$ Kin (GeV/c^2)

LAST TIME: Wanted to see if E9E25 was a better way to separate pions and electrons.

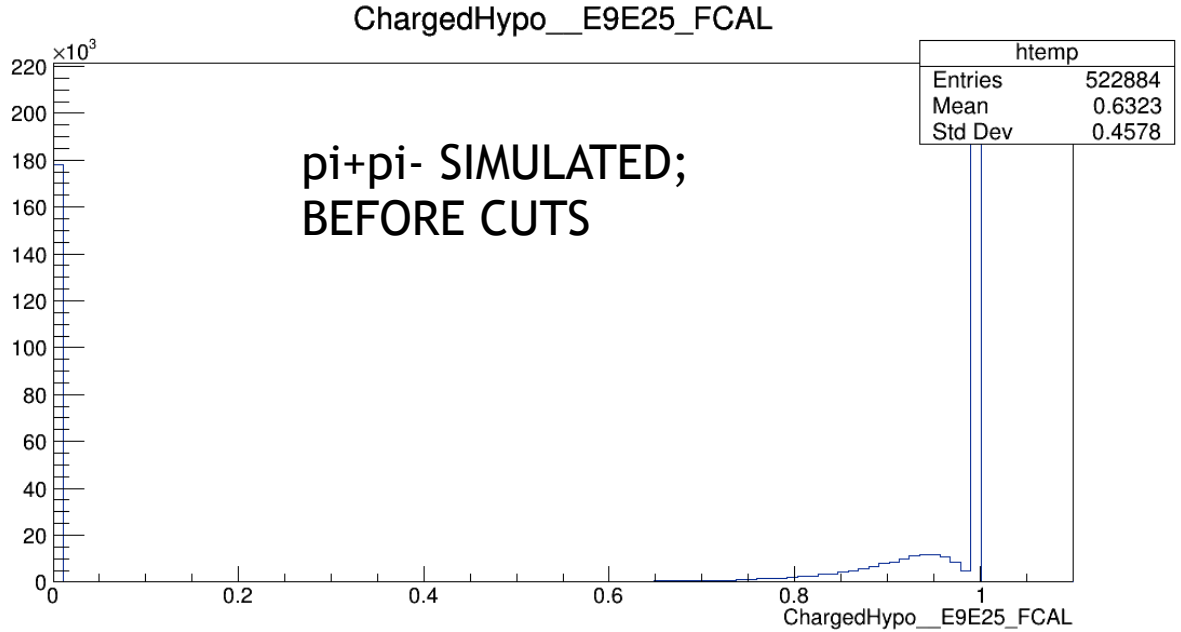
Idea: throw pions, but run $\gamma p \rightarrow e^+e^-(p)$ reaction filter. See how many pions reconstruct as e+/e-.

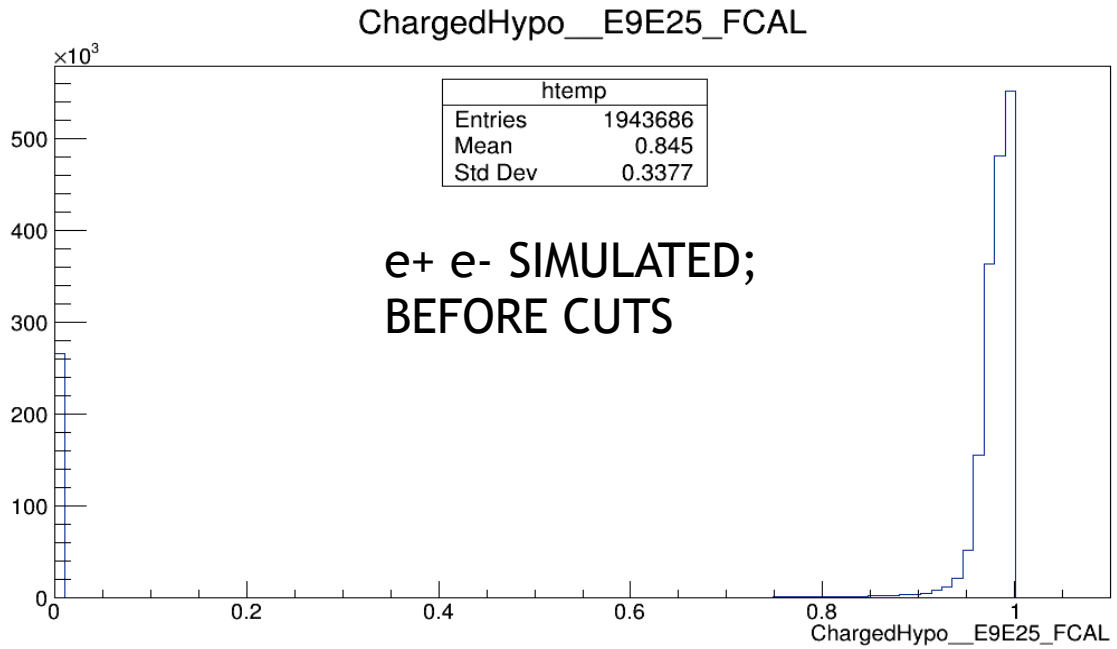
BUT….

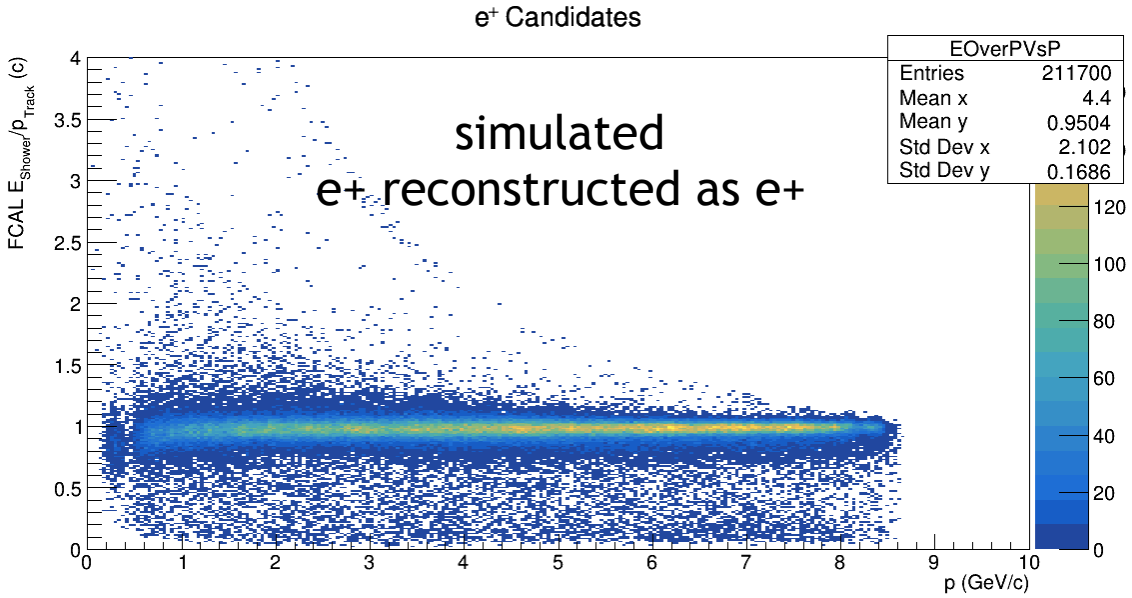
First E/p cut
Kills all pions

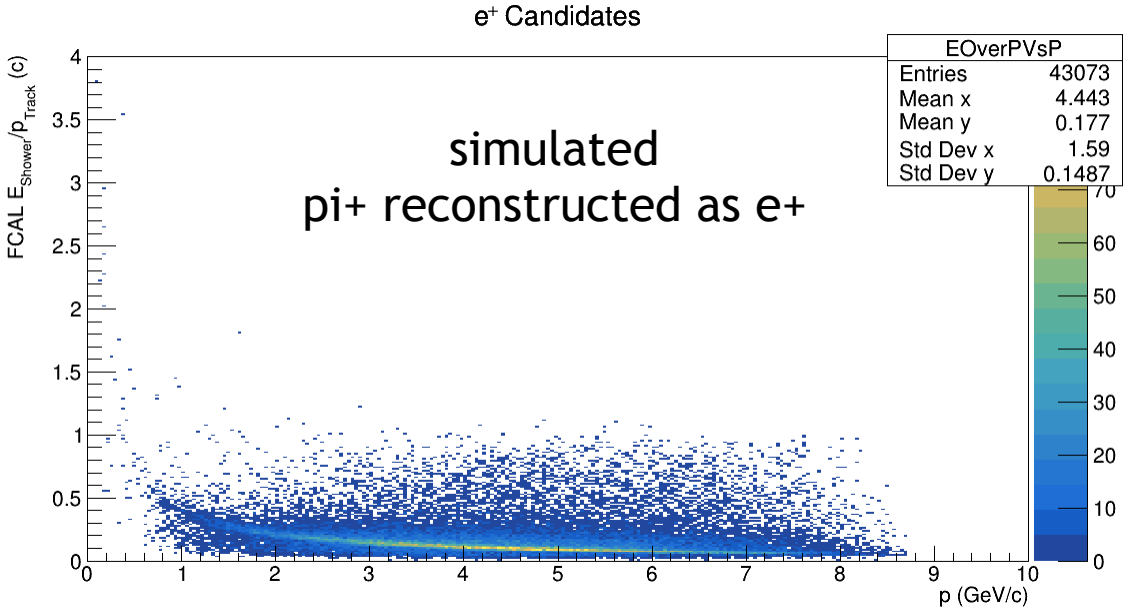


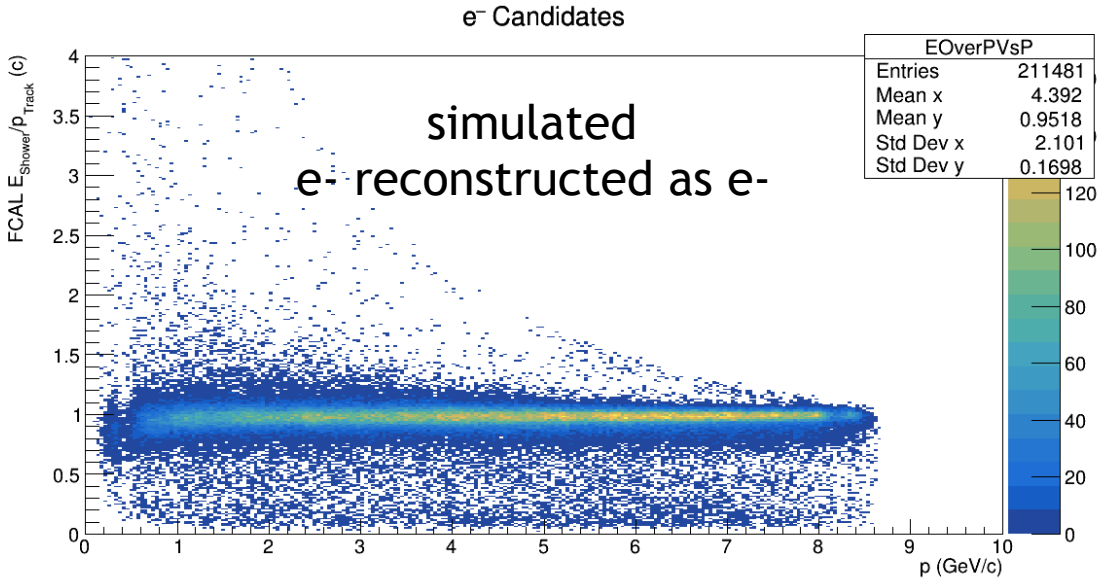
Can at least compare REST files though:

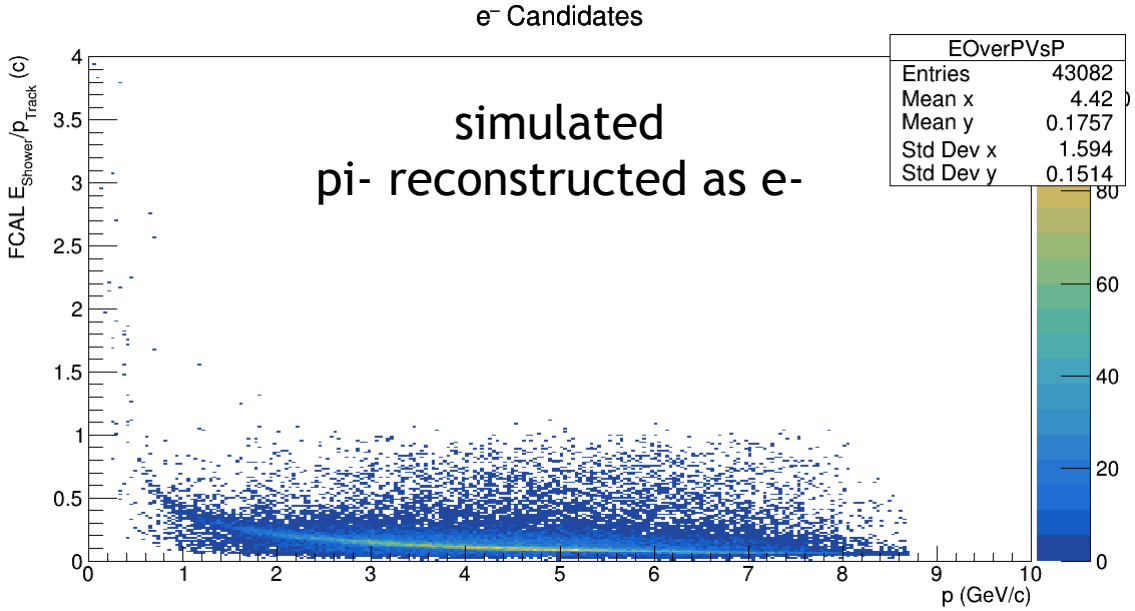





e⁺ Candidates
simulated
e+ reconstructed as e+
EOverPVsP
Entries 211700
Mean x 4.4
Mean y 0.9504
Std Dev x 2.102
Std Dev y 0.1686
FCAL E_Shower/p_Track (c)
p (GeV/c)


e⁺ Candidates
simulated
pi+ reconstructed as e+
EOverPVsP
Entries 43073
Mean x 4.443
Mean y 0.177
Std Dev x 1.59
Std Dev y 0.1487
FCAL E_Shower/p_Track (c)
p (GeV/c)


e⁻ Candidates
simulated
e- reconstructed as e-
EOverPVsP
Entries 211481
Mean x 4.392
Mean y 0.9518
Std Dev x 2.101
Std Dev y 0.1698
FCAL E_Shower/p_Track (c)
p (GeV/c)


e⁻ Candidates
simulated
pi- reconstructed as e-
EOverPVsP
Entries 43082
Mean x 4.42
Mean y 0.1757
Std Dev x 1.594
Std Dev y 0.1514
FCAL E_Shower/p_Track (c)
p (GeV/c)

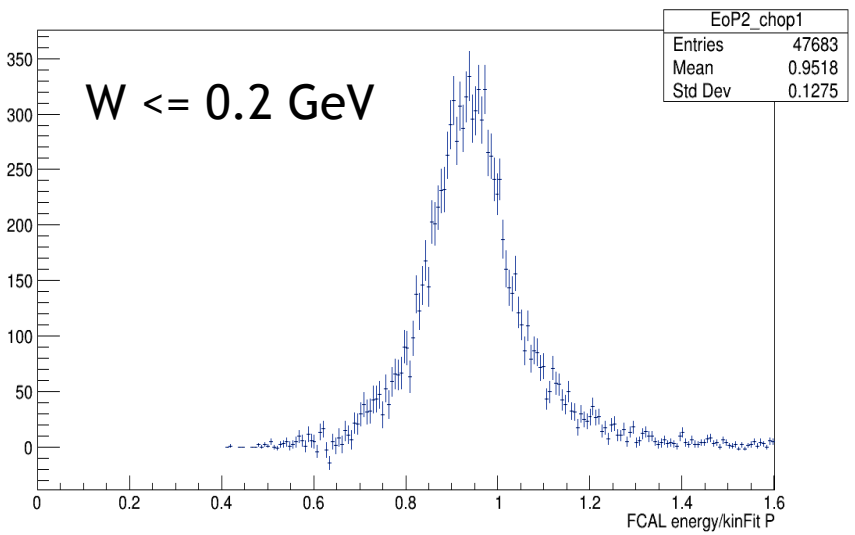
Cuts for $\gamma p \rightarrow e^+e^-(p)$

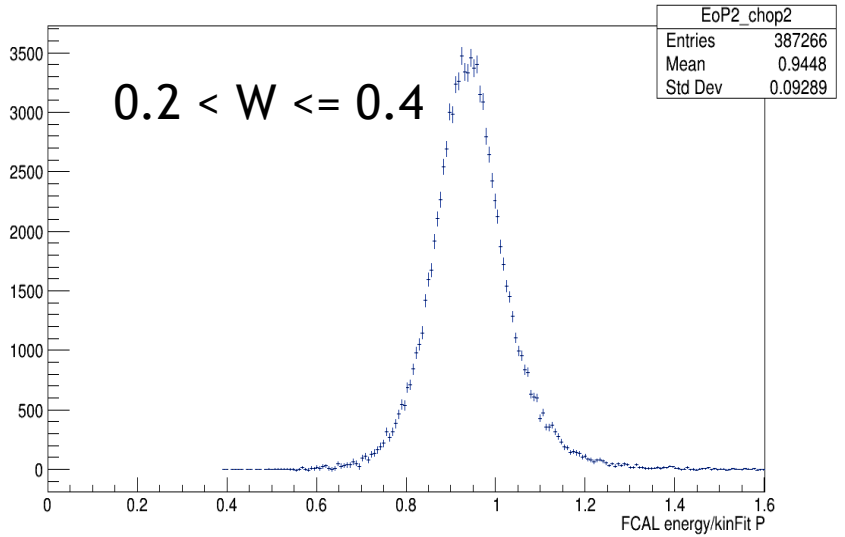
Preselection Cuts

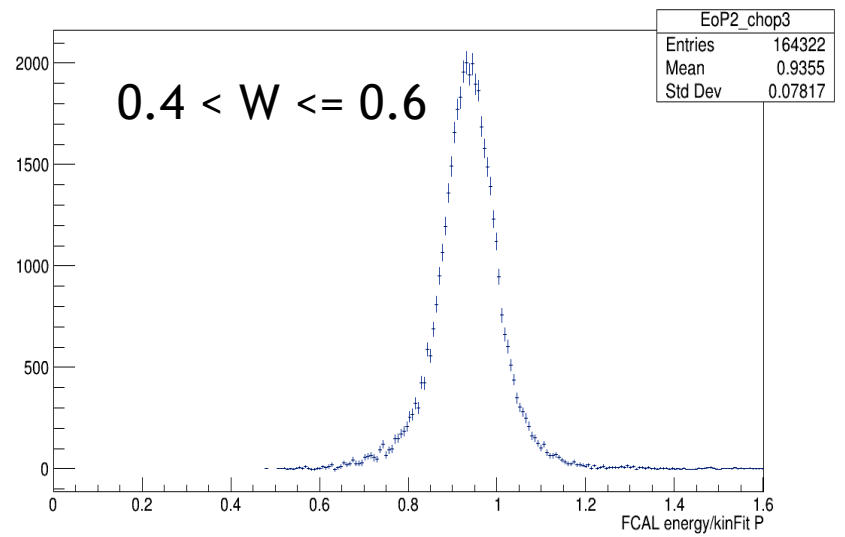
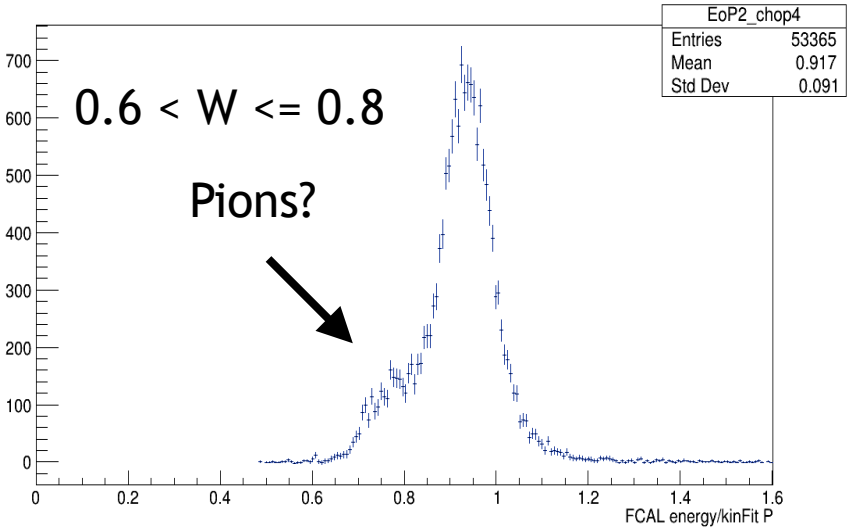
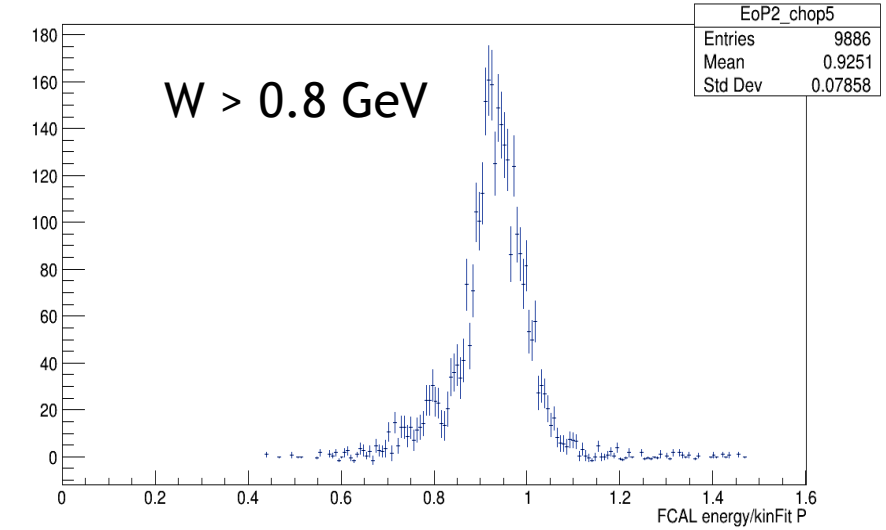
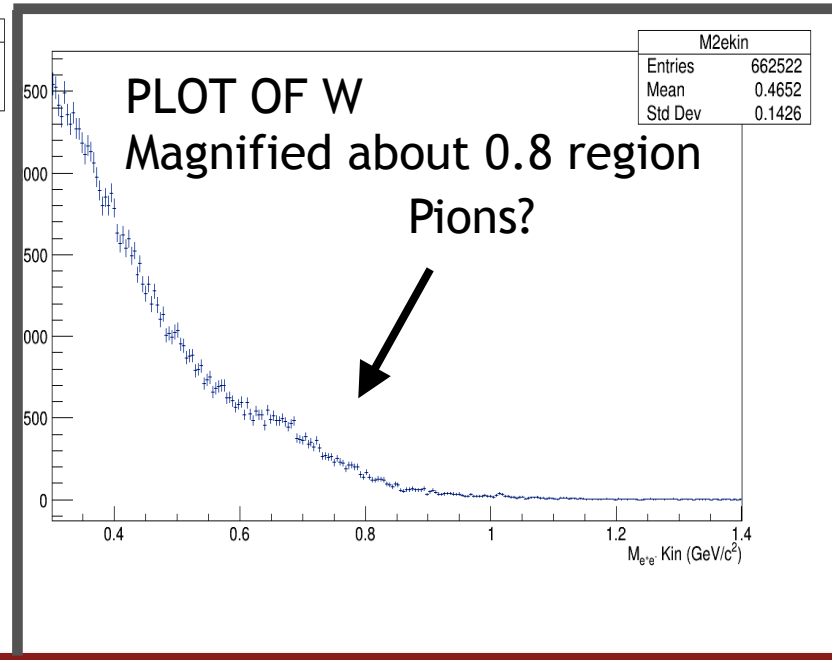
1. Default GlueX cuts: https://halldweb.jlab.org/wiki/index.php/Spring_2017_Analysis_Launch_Cuts
2. Require E/p > 0.7 for electron and positron tracks in FCAL and BCAL

DSelector Cuts

1. Cut on coherent peak: 8.12 < Eγ < 8.88
2. Require both electron and positron tracks have hit in FCAL
3. Require both electron and positron tracks have hit in TOF
4. Require dMinKinFitCL > 10E-6
5. Eliminate events with NumUnusedTracks ≥ 2, (Split up data into 1 unused and 0 unused.) Today we are only looking at **0 unused track events**.
6. Eliminate events with Energy_UnusedShowers > 0
7. TOF dE/dx cut for electron and positron tracks at 3σ
8. FCAL DOCA cut for e+ and e- tracks at 3σ
9. **Cut on** $\frac{E_1}{p_1}$ **and** $\frac{E_2}{P_2}$ **at** $\pm 3\sigma$ **.** *Plot* $\frac{E_2}{P_2}$ *in bins of invariant mass.*







Plots of electron FCAL energy/Electron kin fit p in bins of invariant mass