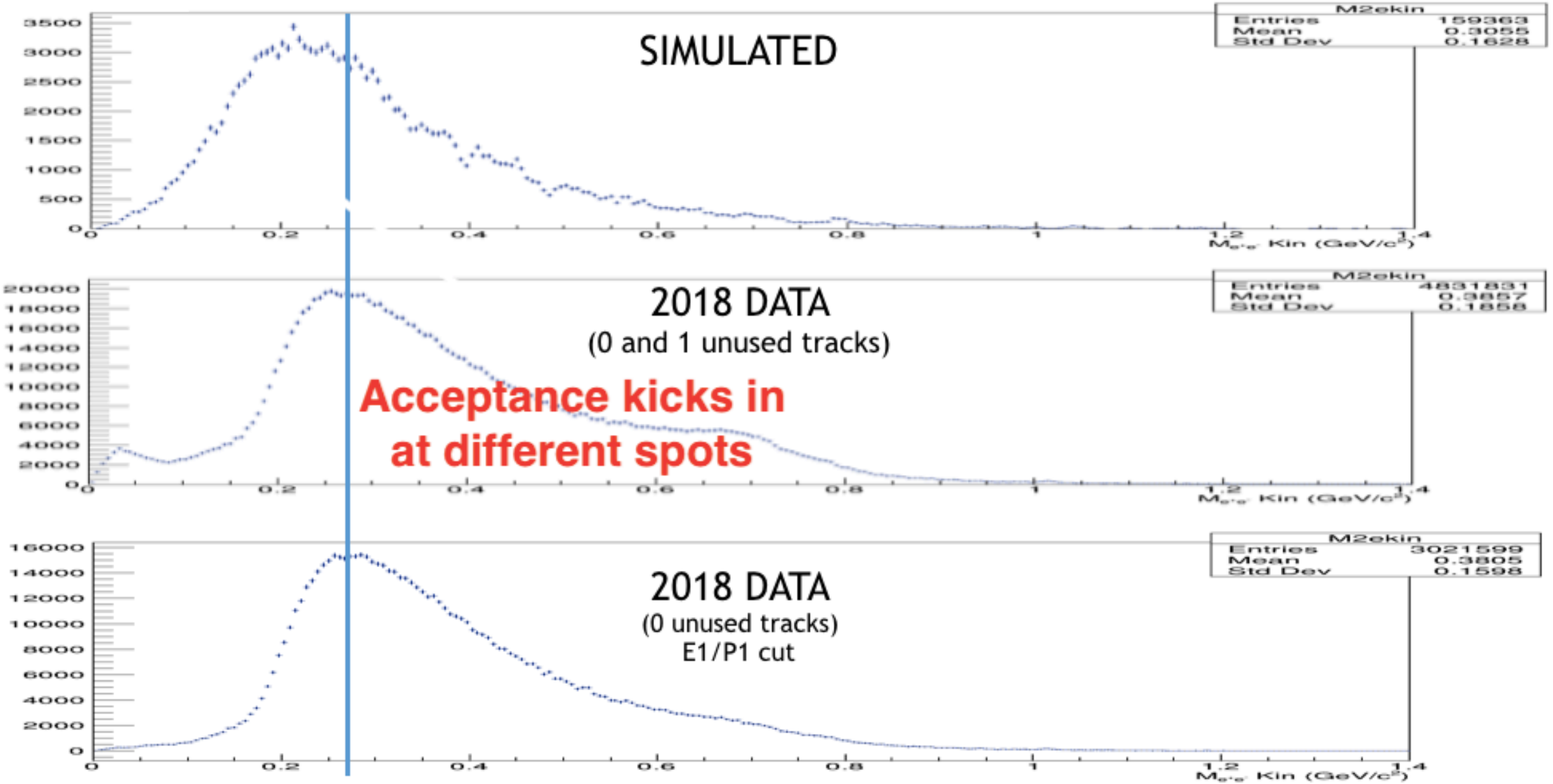
Questions

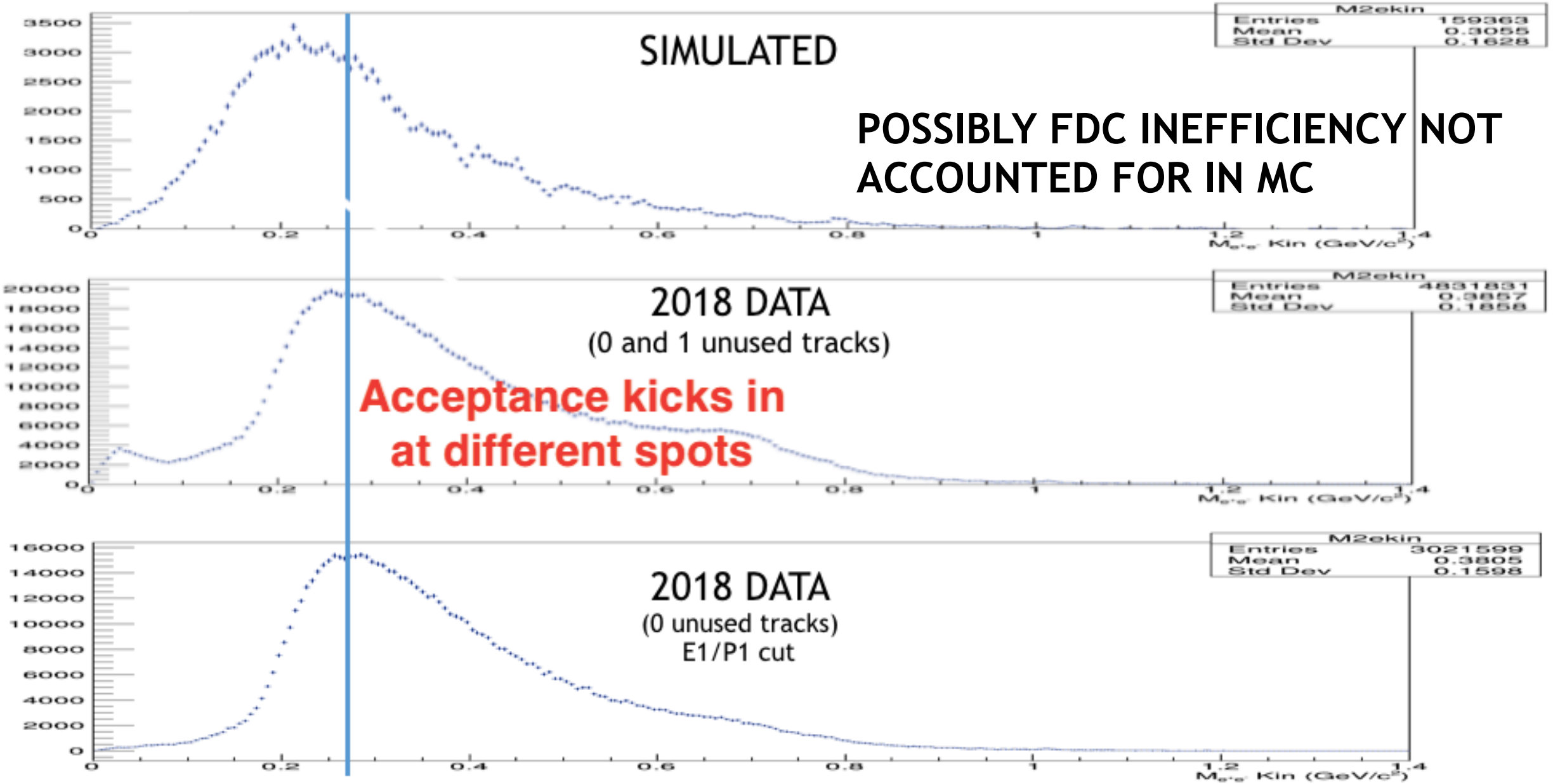
- Invariant mass acceptance cutoff kicks in in different spots between MC and data

- Kinematic fit t only goes down to ~10^-3, whereas measured goes down to ~10^-5. Is this something we can control?

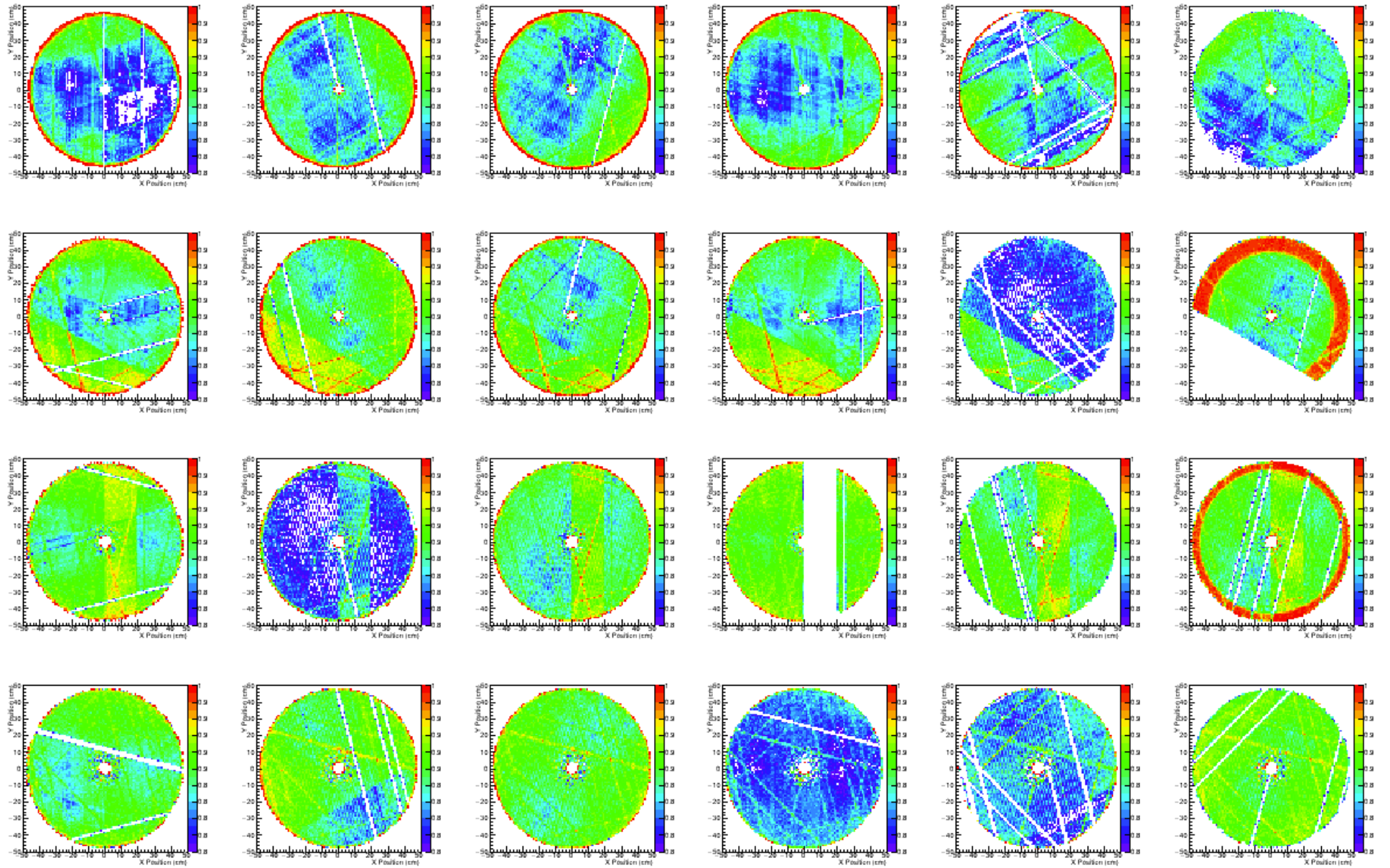
- Meaning of the various FDC efficiency plots

1. Invariant Mass Acceptance Cut-off

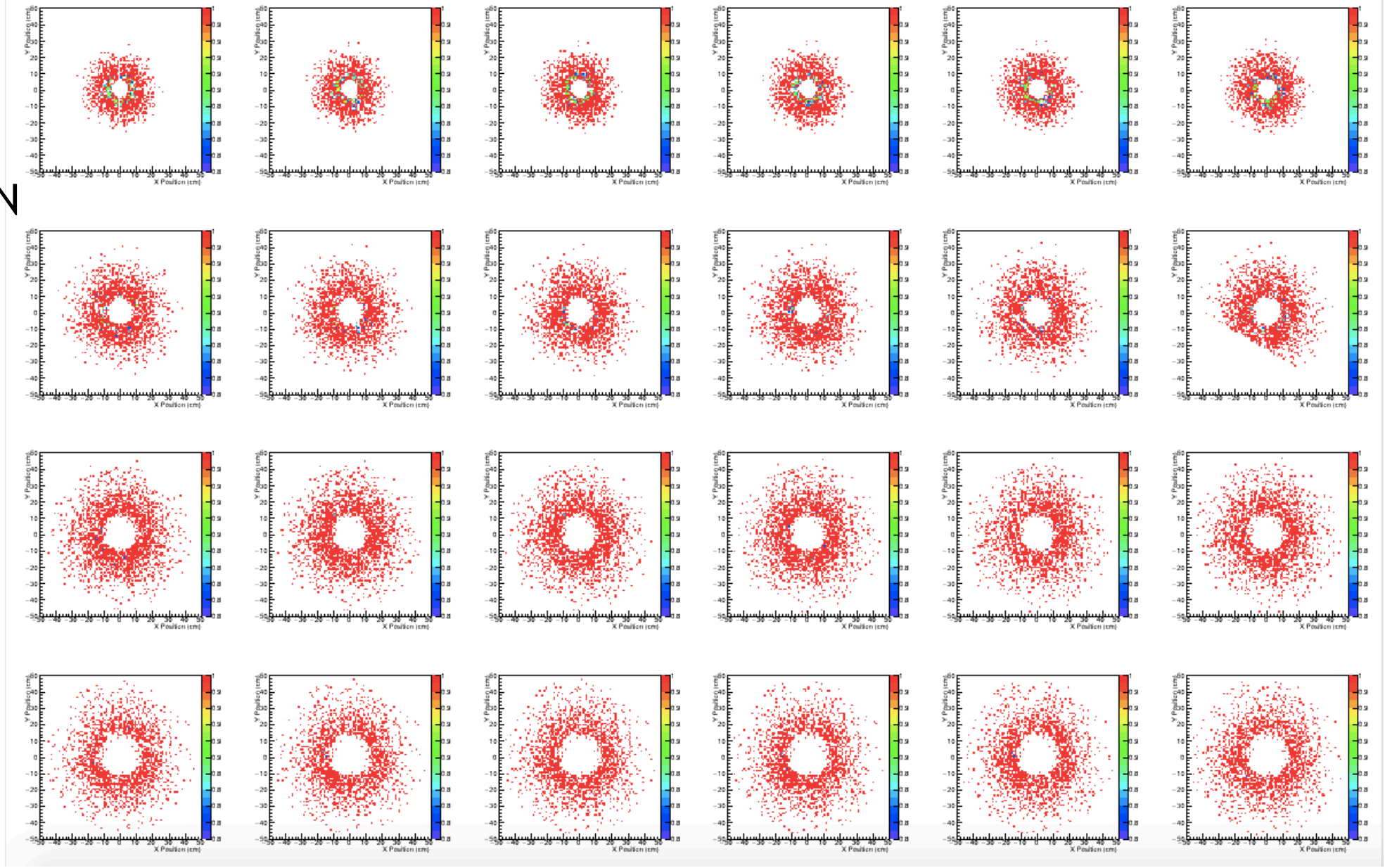

SIMULATED
M2ekin
Entries 159363
Mean 0.3055
Std Dev 0.1628
2018 DATA
(0 and 1 unused tracks)
M2ekin
Entries 4831831
Mean 0.3857
Std Dev 0.1858
Acceptance kicks in
at different spots
2018 DATA
(0 unused tracks)
E1/P1 cut
M2ekin
Entries 3021599
Mean 0.3805
Std Dev 0.1598
$M_{e^+e^-}$ Kin (GeV/c^2)


SIMULATED
M2ekin
Entries 159363
Mean 0.3055
Std Dev 0.1628
POSSIBLY FDC INEFFICIENCY NOT ACCOUNTED FOR IN MC
2018 DATA
(0 and 1 unused tracks)
M2ekin
Entries 4831831
Mean 0.3857
Std Dev 0.1858
Acceptance kicks in at different spots
2018 DATA
(0 unused tracks)
E1/P1 cut
M2ekin
Entries 3021599
Mean 0.3805
Std Dev 0.1598
M_e+e- Kin (GeV/c²)

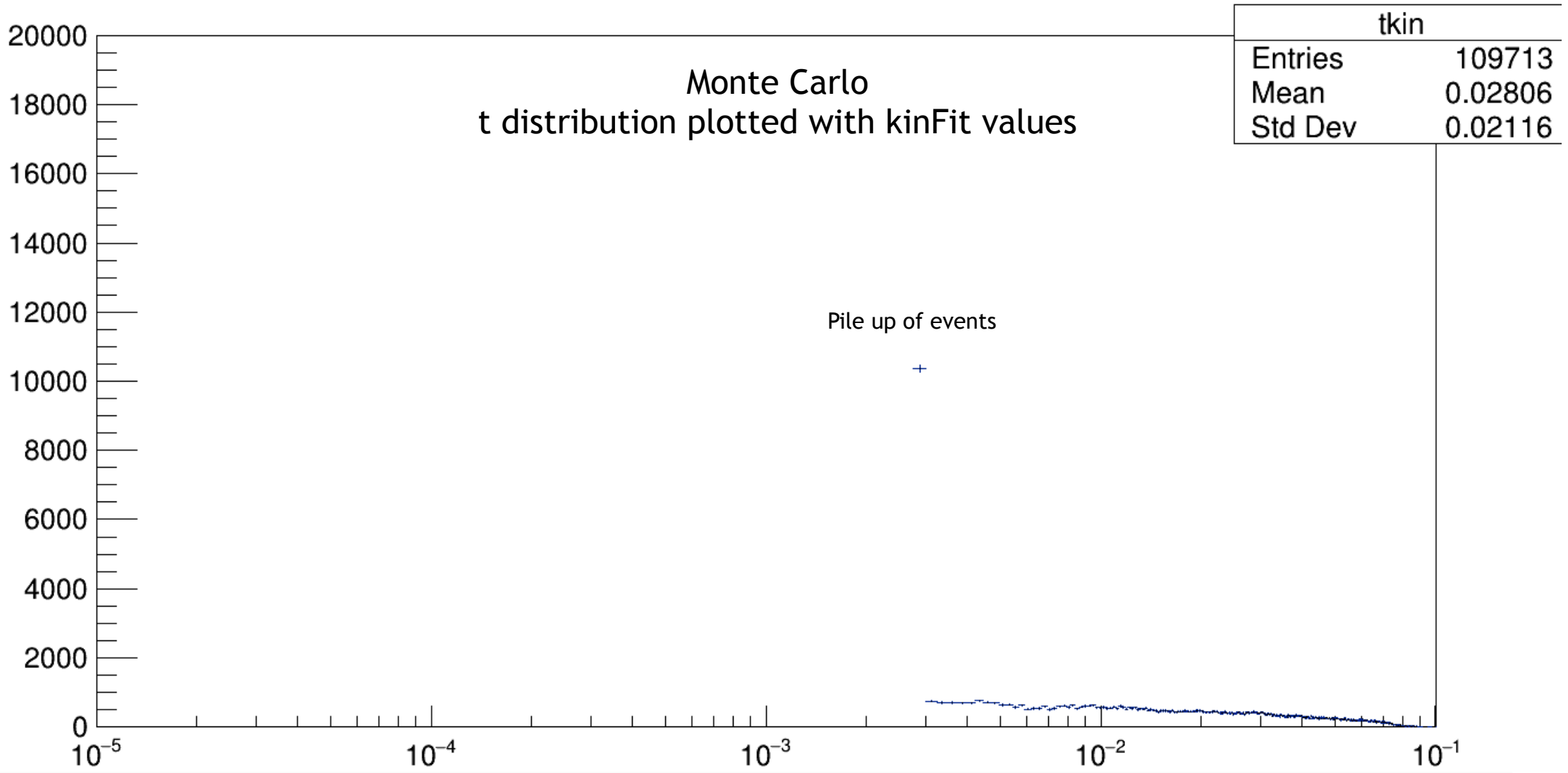
Pseudo Hit Efficiency For DATA

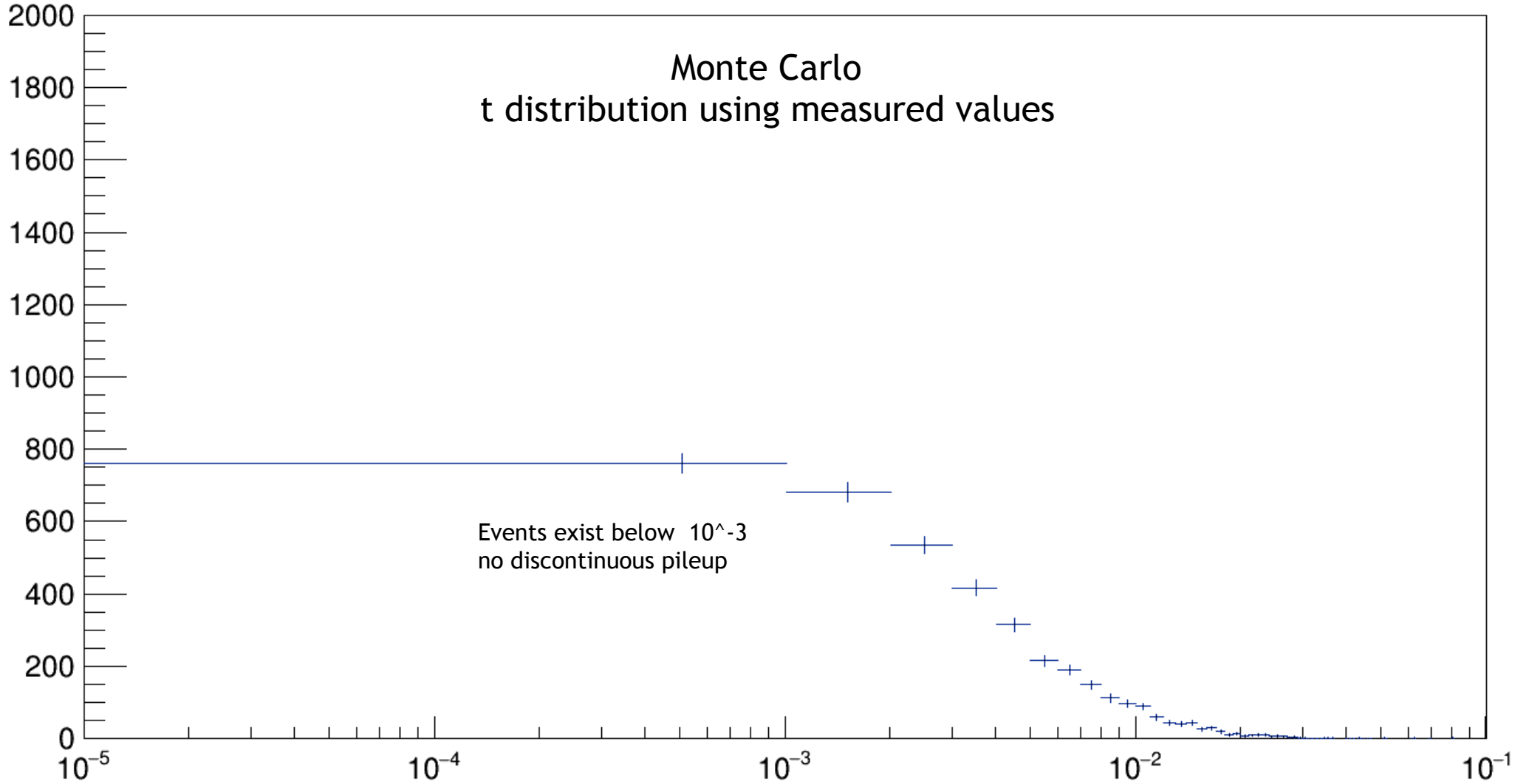


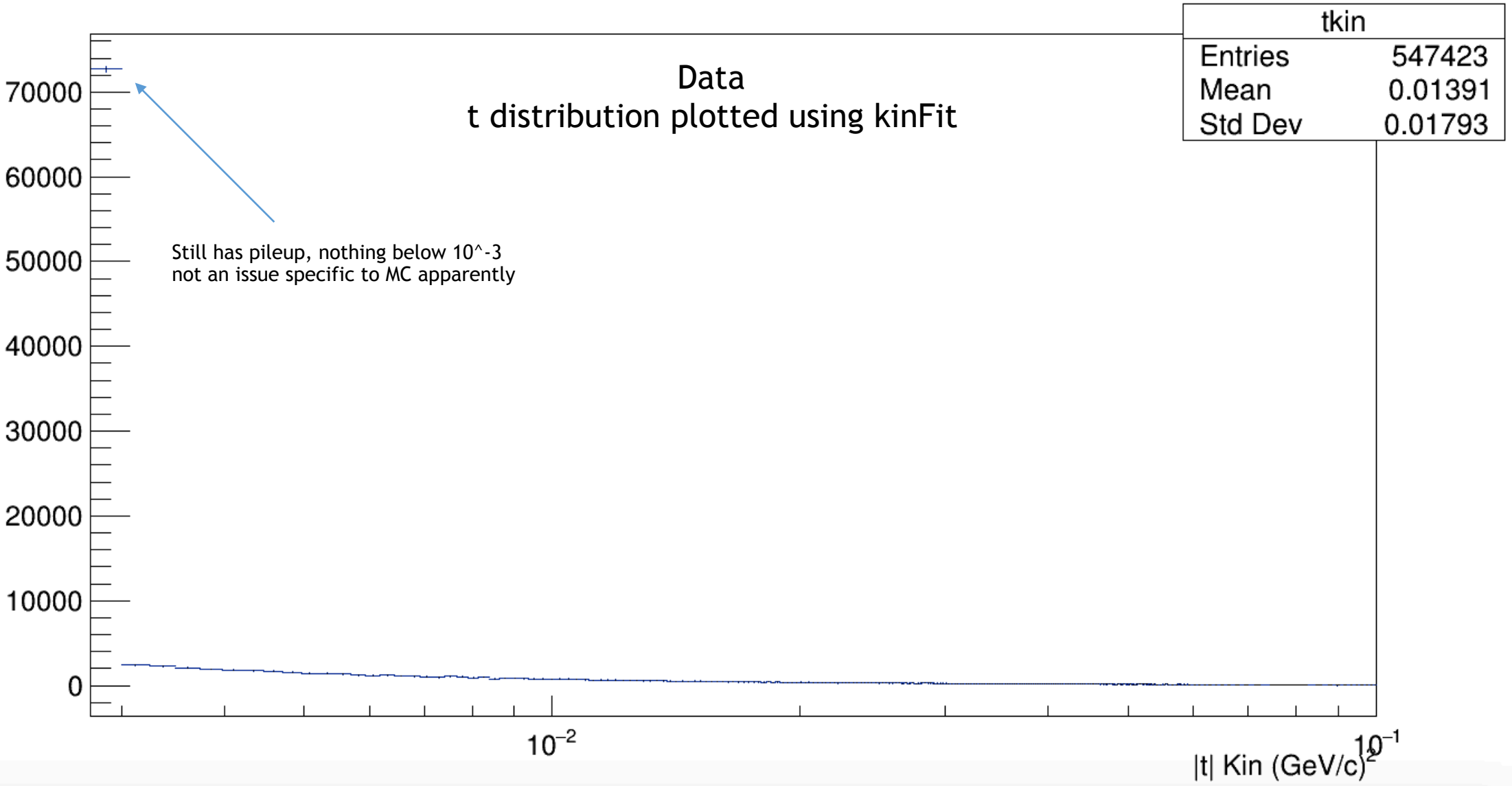
Pseudo Hit Efficiency For SIMULATION



2. KinFit t stops at 10^-3 whereas measured goes lower


Monte Carlo
t distribution plotted with kinFit values
tkin
Entries 109713
Mean 0.02806
Std Dev 0.02116
Pile up of events
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}


Monte Carlo
t distribution using measured values
Events exist below 10^-3
no discontinuous pileup
2000
1800
1600
1400
1200
1000
800
600
400
200
0
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}


Data
t distribution plotted using kinFit
tkin
Entries 547423
Mean 0.01391
Std Dev 0.01793
Still has pileup, nothing below 10^-3
not an issue specific to MC apparently
70000
60000
50000
40000
30000
20000
10000
0
10^{-2}
10^{-1}
|t| Kin (GeV/c)^2

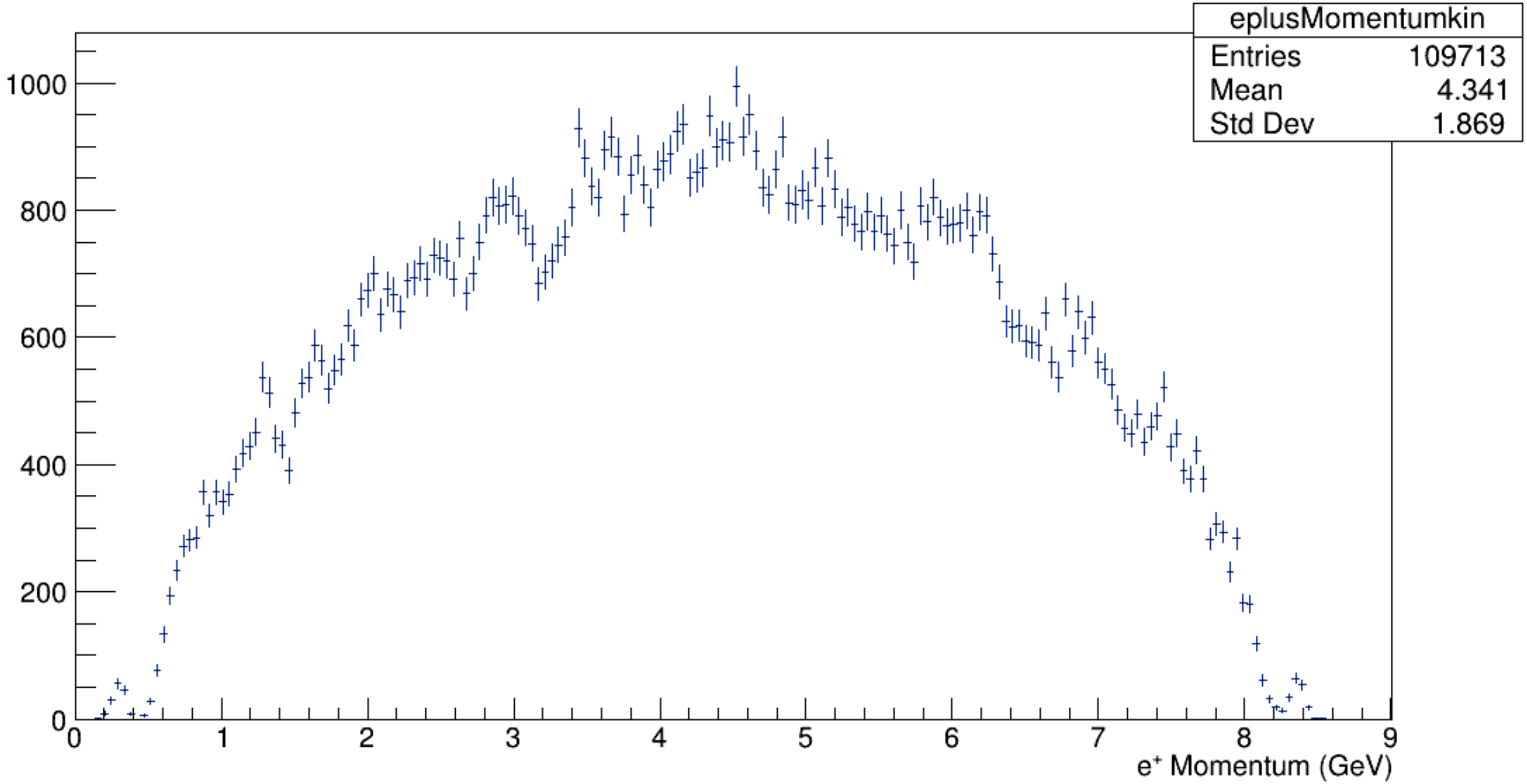
Cuts for $\gamma p \rightarrow e^+e^-(p)$

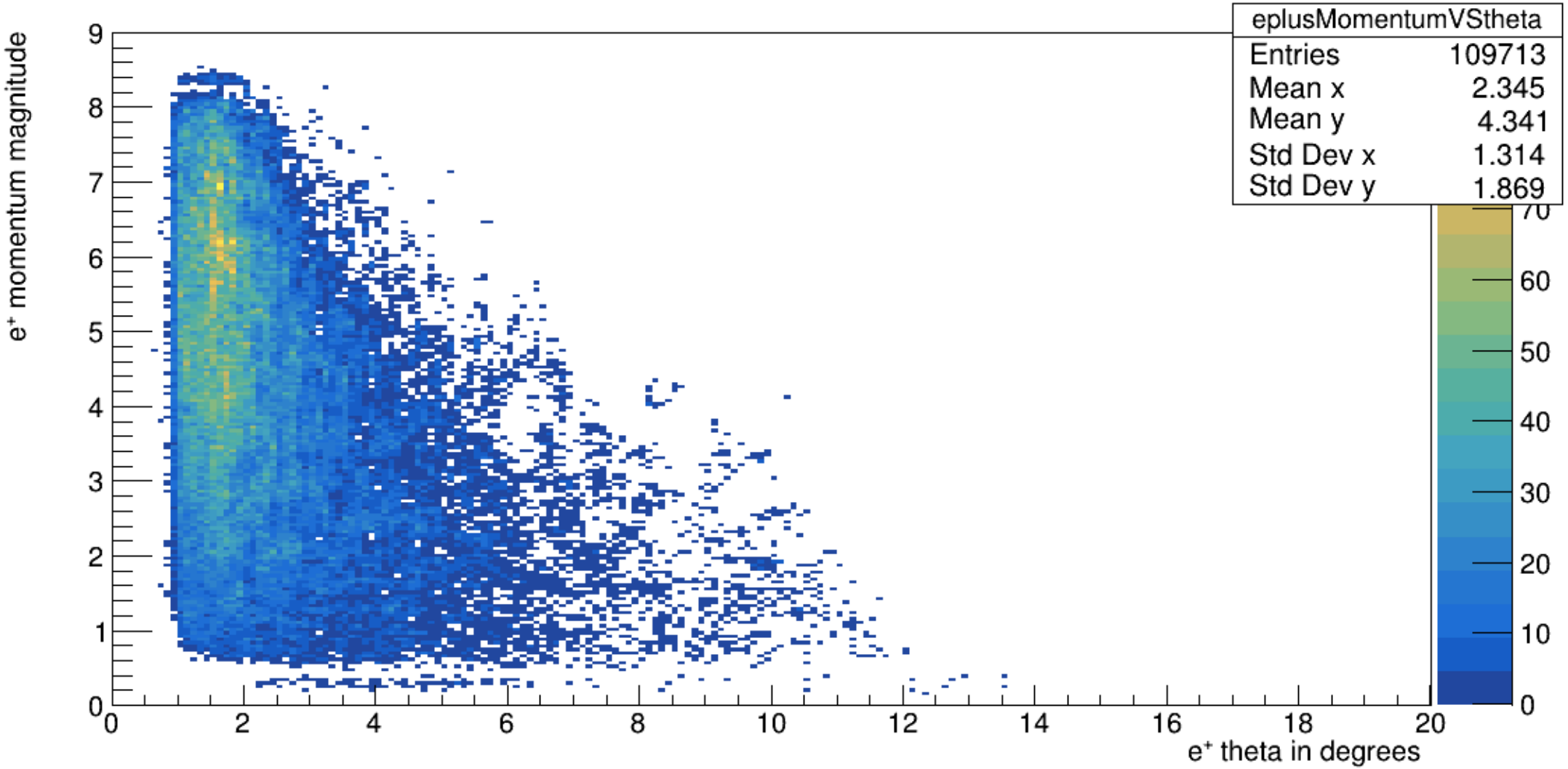
Preselection Cuts

1. Default GlueX cuts: https://halldweb.jlab.org/wiki/index.php/Spring_2017_Analysis_Launch_Cuts
2. Require E/p > 0.5 for electron and positron tracks in FCAL. Reject BCAL events.

DSelector Cuts

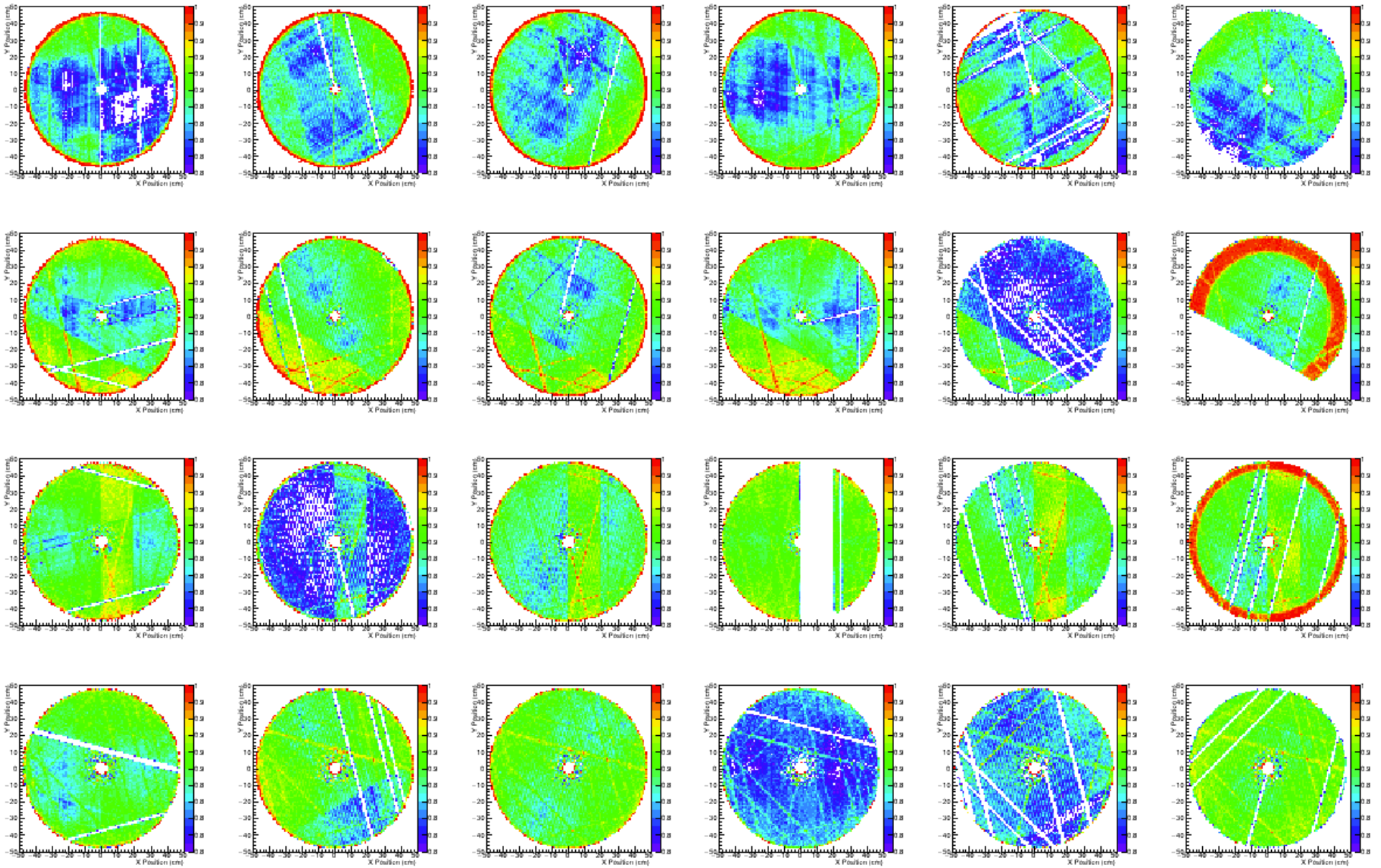
1. Cut on coherent peak: 8.12 < Eγ < 8.88
2. Require both electron and positron tracks have hit in FCAL
3. Require both electron and positron tracks have hit in TOF
4. Require dMinKinFitCL > 10E-6
5. Eliminate events with any unused tracks
6. Eliminate events with Energy_UnusedShowers > 0
7. TOF dE/dx cut for electron and positron tracks > 3σ
8. FCAL DOCA cut for e+ and e- tracks > 3σ
9. FCAL Elasticity $\pm 3\sigma$ cut
10. **Cut events with** $\frac{E_1}{p_1}$ **< 0.85.** *Plot* $\frac{E_2}{P_2}$ *in bins of invariant mass.*


eplusMomentumkin
Entries 109713
Mean 4.341
Std Dev 1.869
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
e⁺ Momentum (GeV)

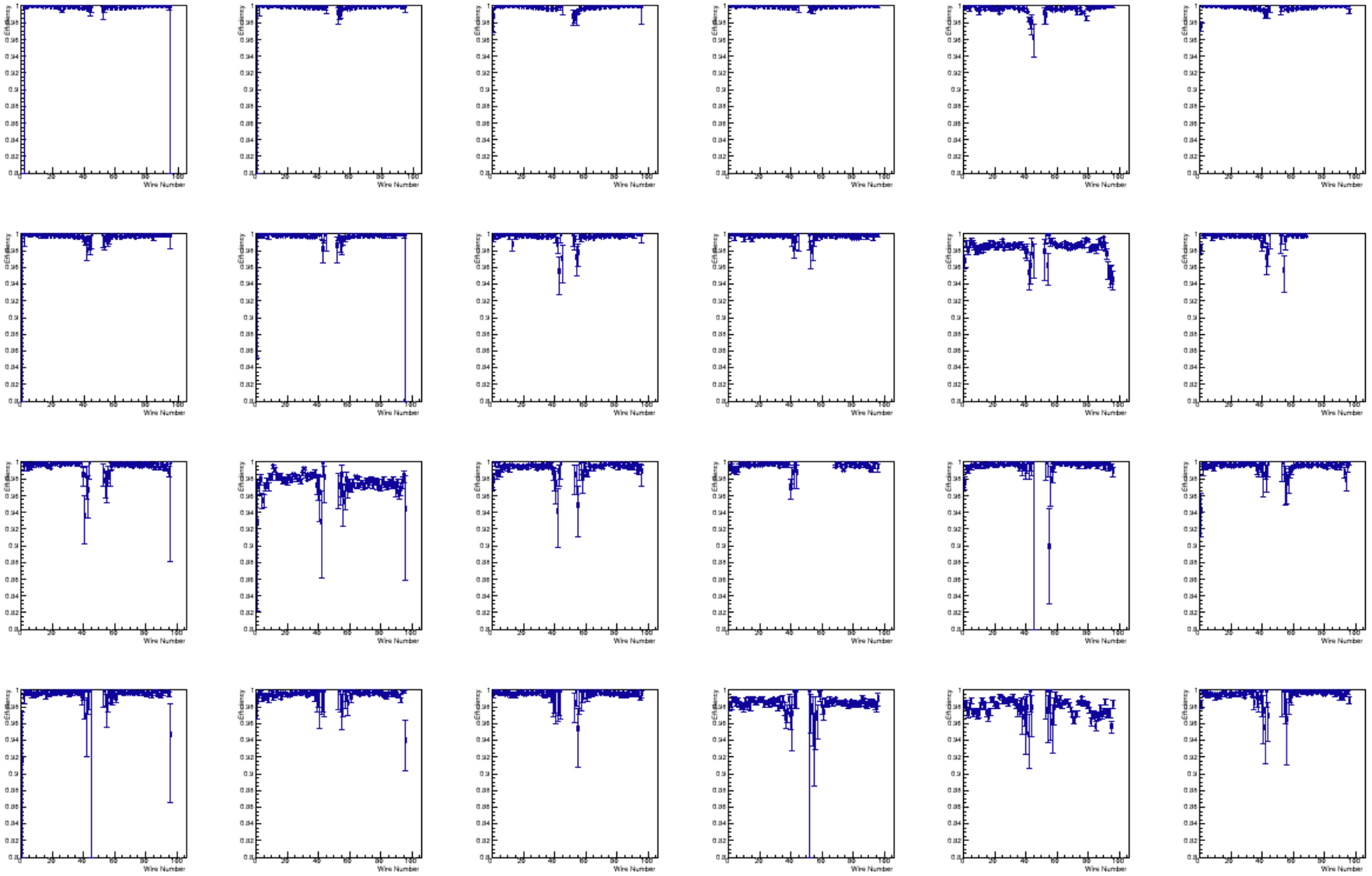

eplusMomentumVStheta
Entries 109713
Mean x 2.345
Mean y 4.341
Std Dev x 1.314
Std Dev y 1.869
e⁺ momentum magnitude
e⁺ theta in degrees
0
1
2
3
4
5
6
7
8
9
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60
70

3. All of the various FDC efficiency plots

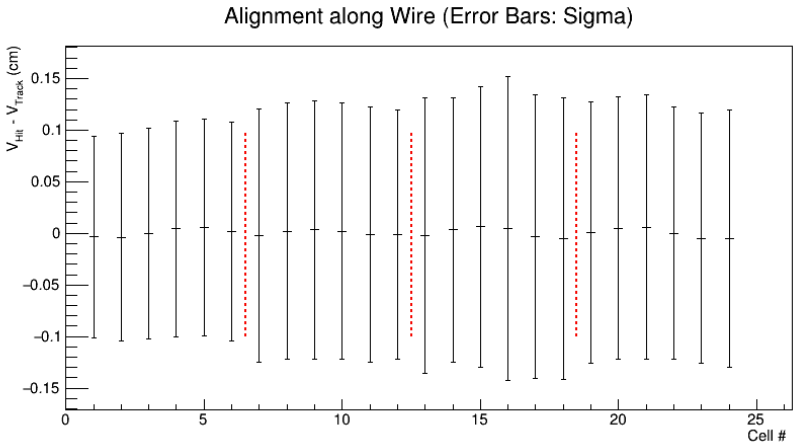
Pseudo Hit Efficiency

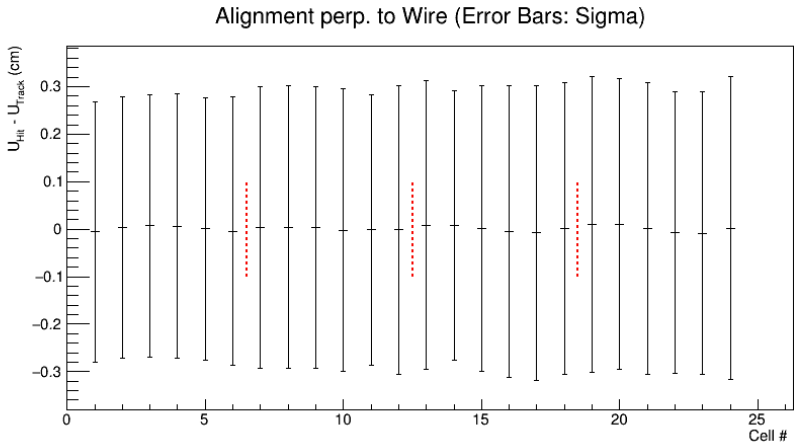


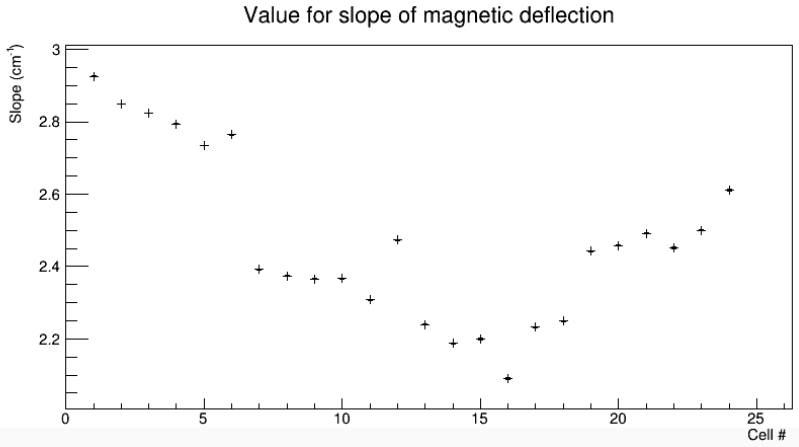
Wire Efficiency



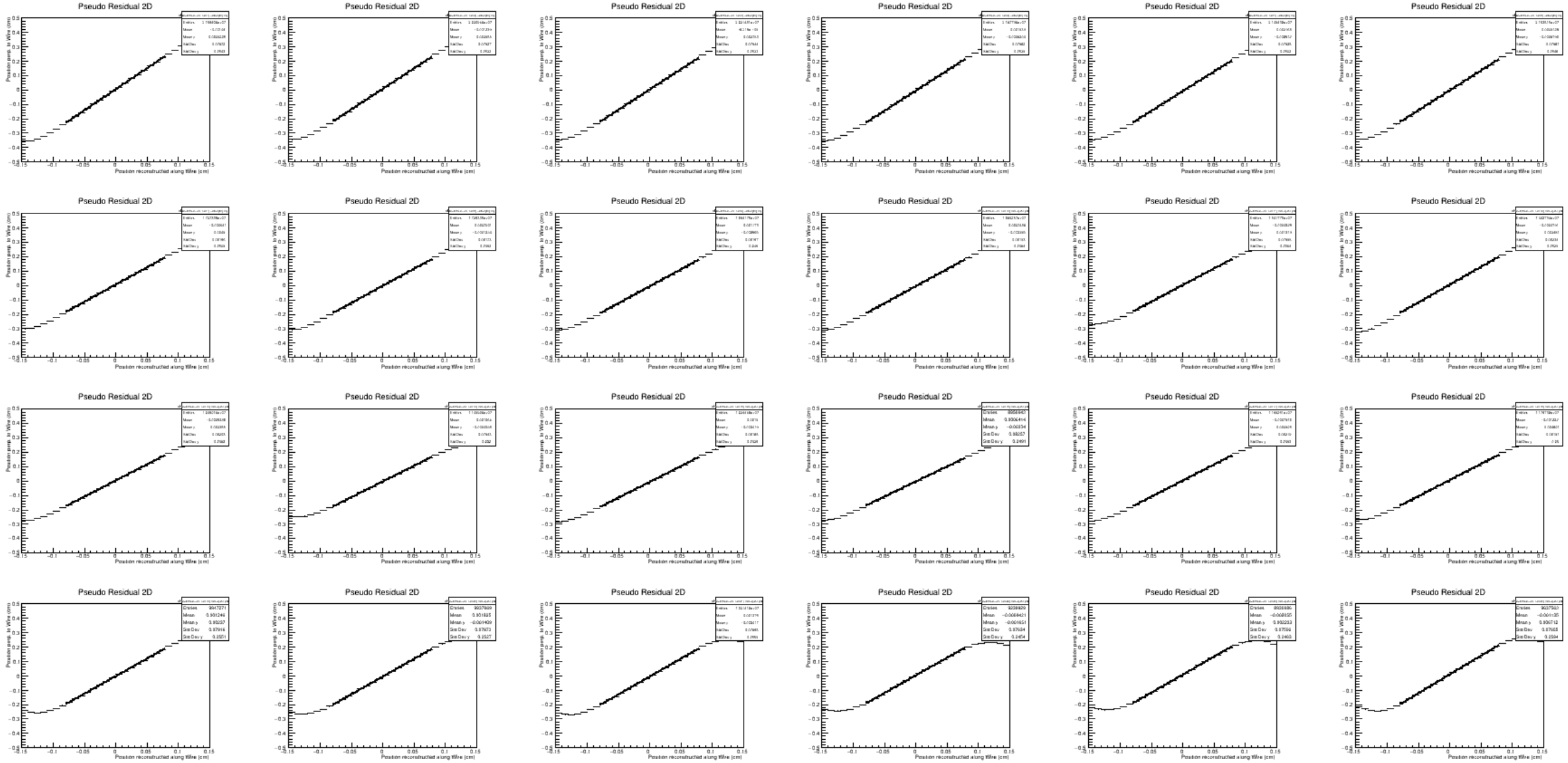
Alignment


Alignment along Wire (Error Bars: Sigma)
$V_{Hit} - V_{Track}$ (cm)
0.15
0.1
0.05
0
−0.05
−0.1
−0.15
0
5
10
15
20
25
Cell #

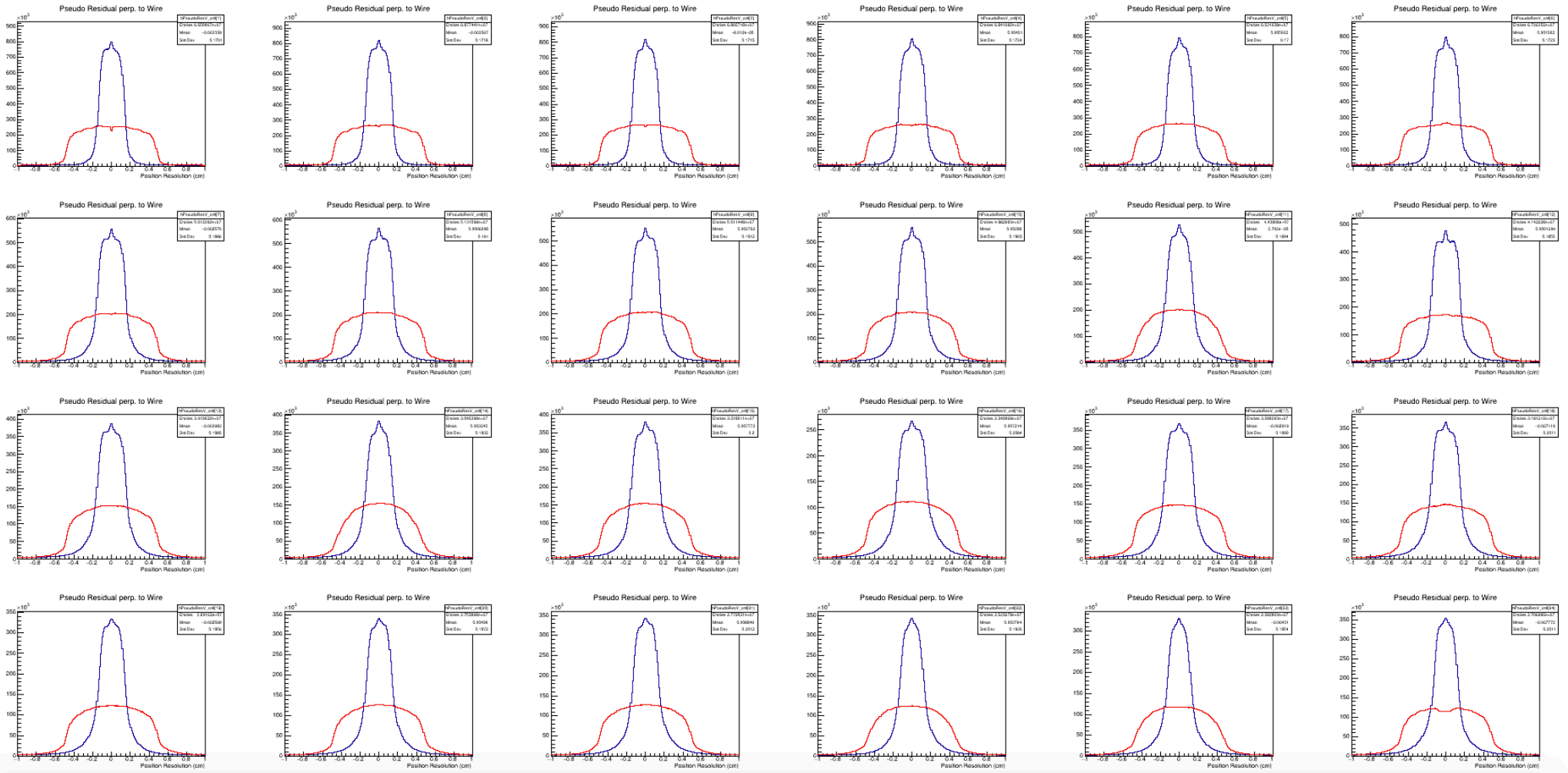

Alignment perp. to Wire (Error Bars: Sigma)
$U_{Hit} - U_{Track}$ (cm)
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
0
5
10
15
20
25
Cell #


Value for slope of magnetic deflection
Slope (cm^{-1})
3
2.8
2.6
2.4
2.2
0
5
10
15
20
25
Cell #

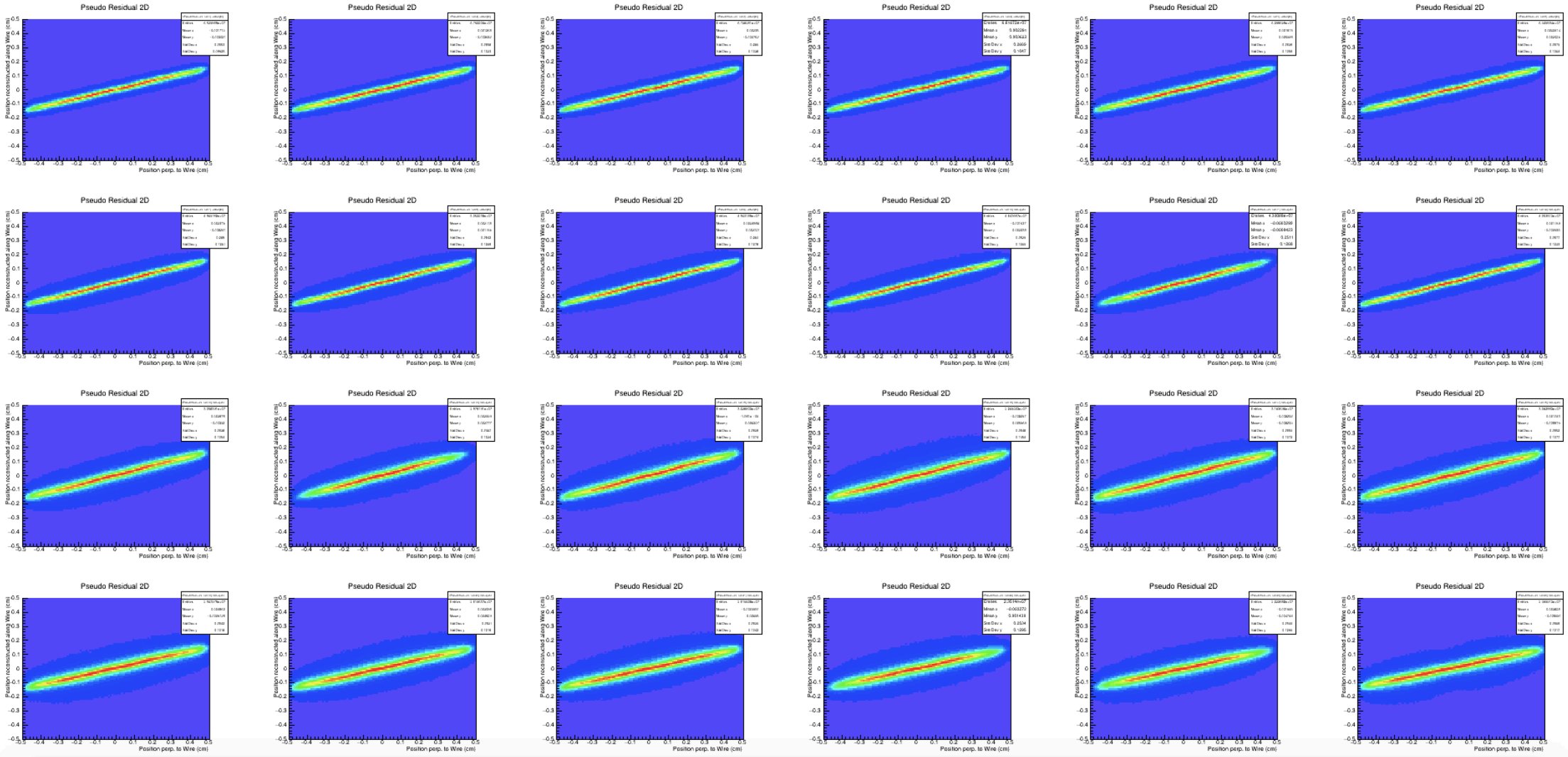
Pseudo Resolution Profile



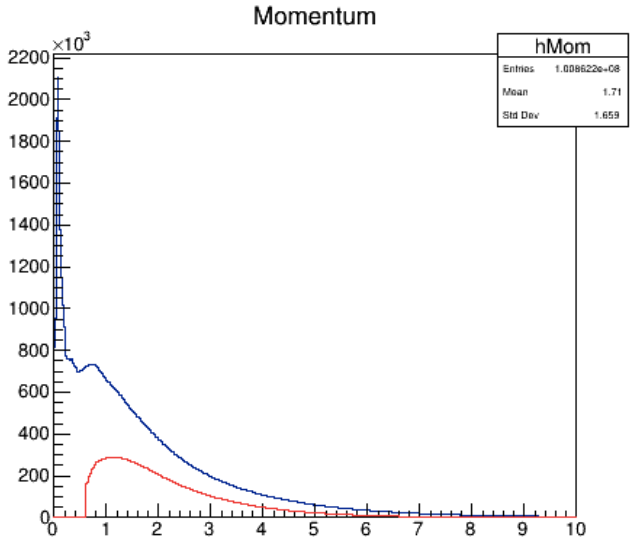
Pseudo Hit Resolution

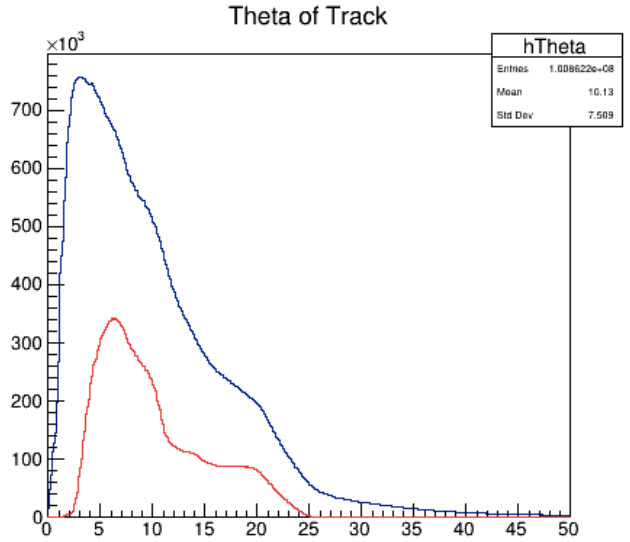


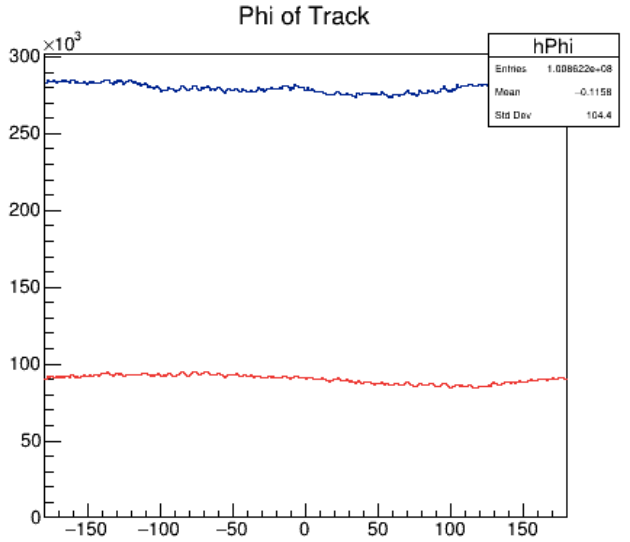
Pseudo Hit Resolution

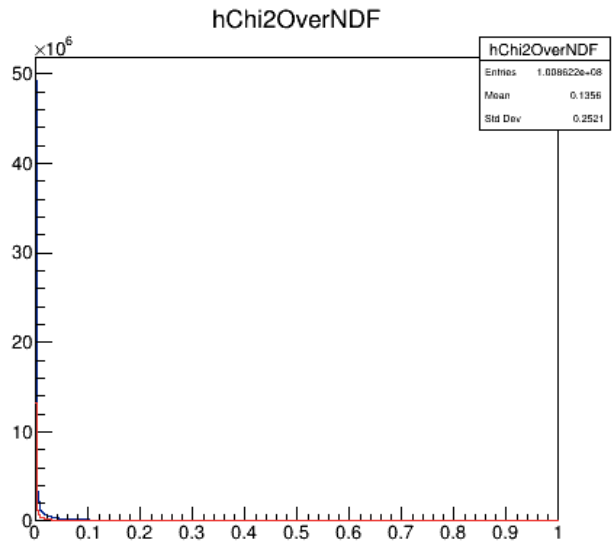


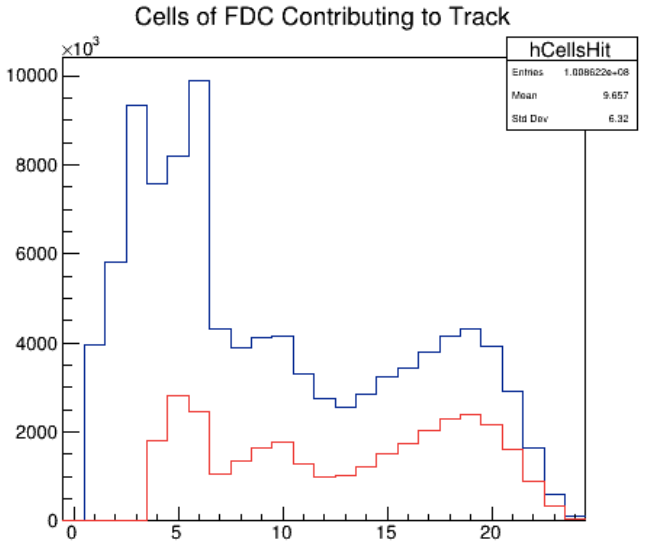
Track Quality Histograms

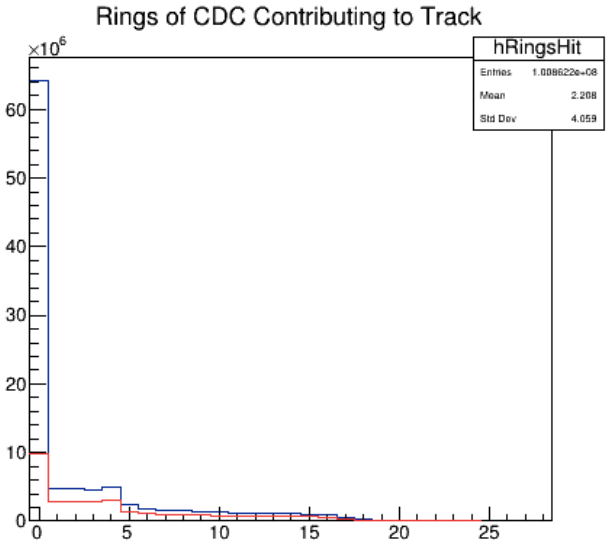


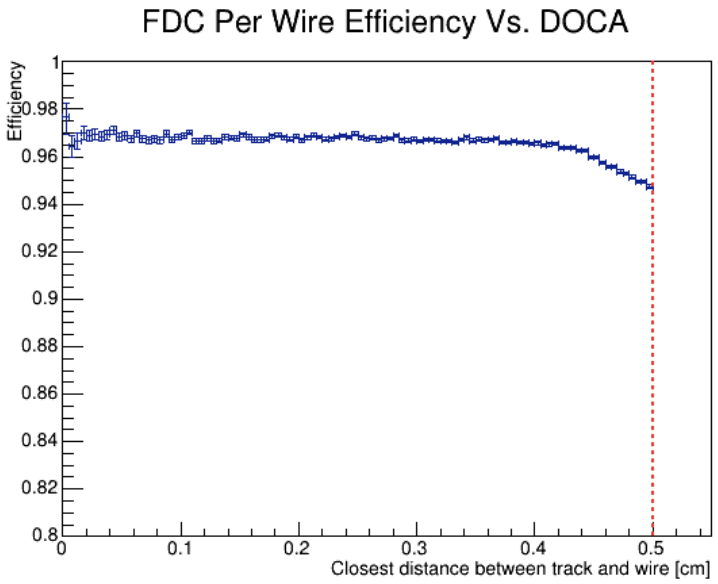


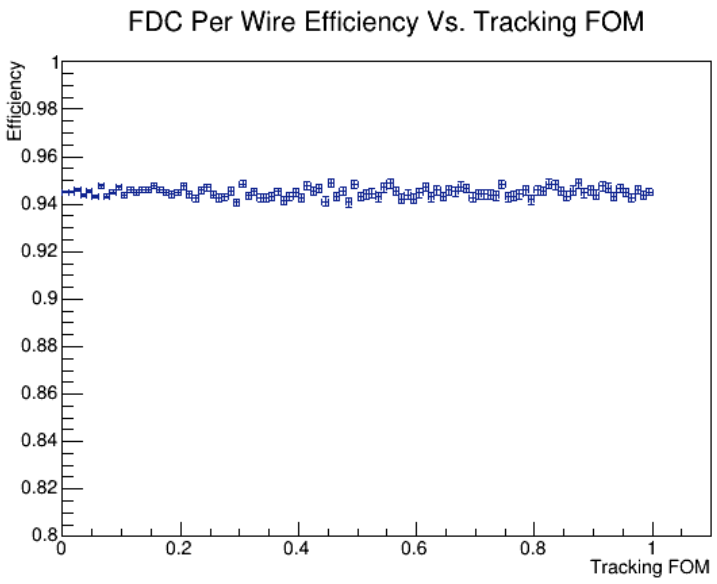


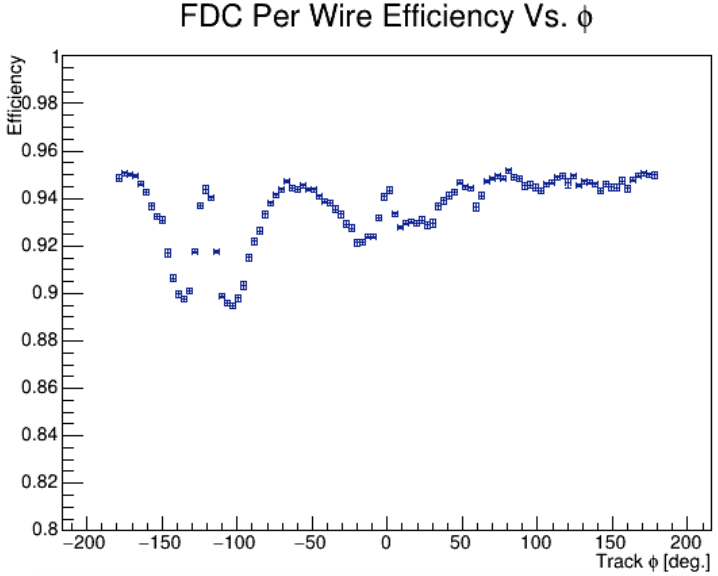


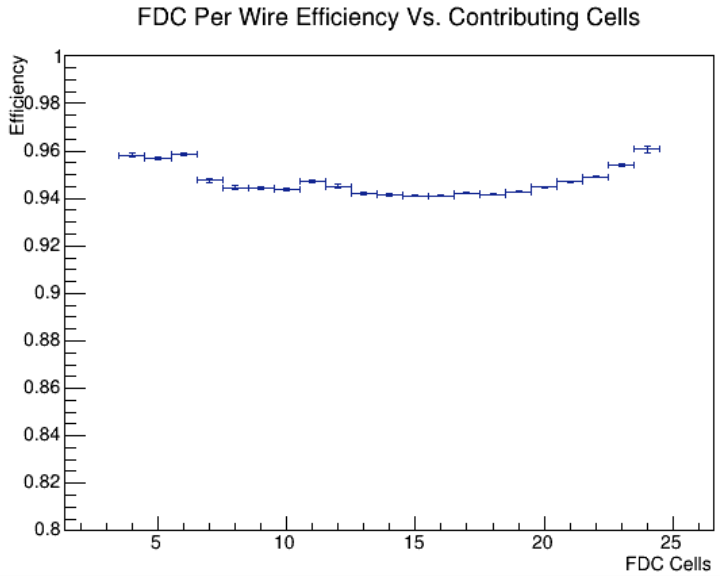





FDC Per Wire Efficiency Vs. DOCA
Efficiency
Closest distance between track and wire [cm]


FDC Per Wire Efficiency Vs. Tracking FOM
Efficiency
Tracking FOM


FDC Per Wire Efficiency Vs. ϕ
Efficiency
Track ϕ [deg.]


FDC Per Wire Efficiency Vs. Contributing Cells
Efficiency
FDC Cells