FEE Rate Analysis

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Introduction

- Pass1, V1 Detector, Singles1 Trigger, no GBL
- FEE cuts - 10 ns timing window, 0.6-1.2 GeV energy cut, greater than 2 cluster size cut. All rates are matched
- FEE rates in different spherical (ϕ and θ) regions of detector. Comparison of data and MC.
- Data - 5772; MC - 3.4.0
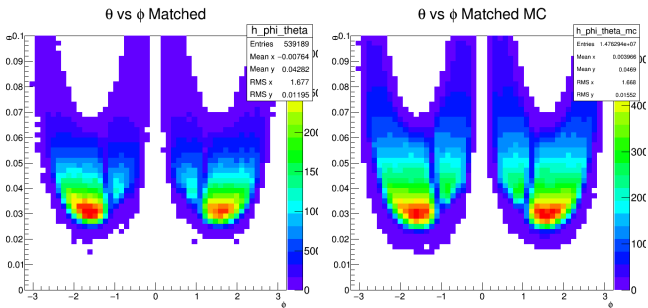- Updated matching, checked energy distributions at high θ, and included efficiency plots

Parameter Space

- θ vs ϕ for Data (left) and MC (right) for all tracks in Singles1 events. Positive ϕ is top and negative ϕ is bottom
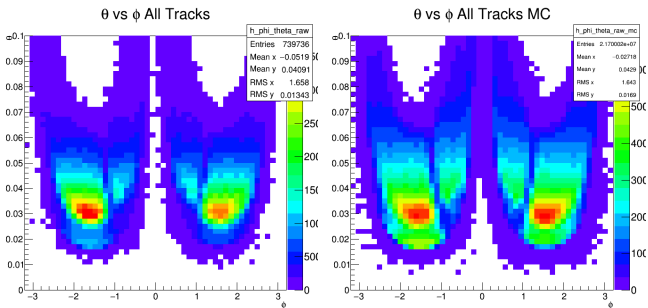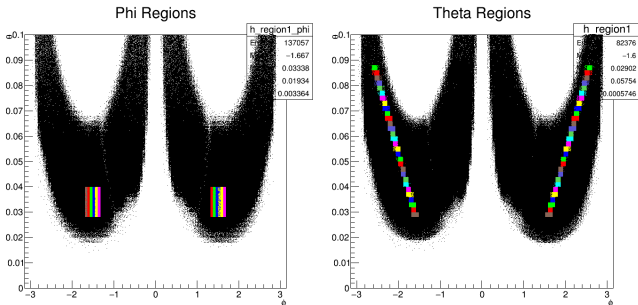
Parameter Space Matched

- θ vs ϕ for Data (left) and MC (right) for FEE matched tracks. Positive ϕ is top and negative ϕ is bottom
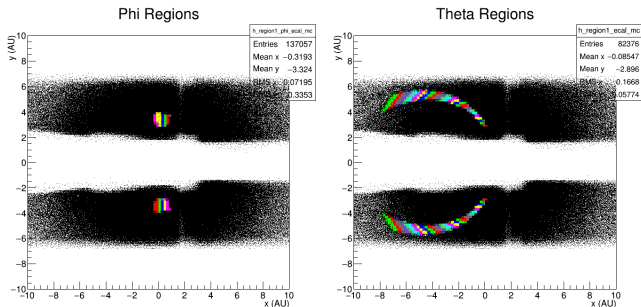
Region Definitions

- Definition of regions shown in the different colors. Black is not a part of any region
- ϕ regions (left): $\Delta\phi = 0.0666$, $0.028 < \theta < 0.040$
- θ regions (right): $\Delta\phi = 0.2$, $\Delta\theta = 0.02$

Region Definitions (Cont.)

- Definition of regions shown from previous slide in x-y coordinates
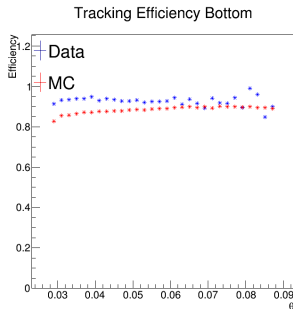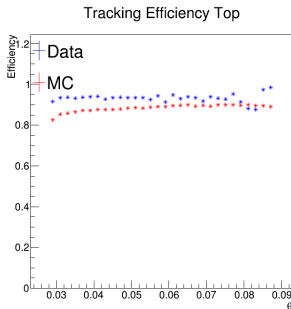- ϕ regions (left) and θ regions (right)

Distributions in θ Regions

- ▶ Distributions of energy, momentum, E/P, and cluster size plotted and checked (but not shown)
- ▶ In general, distributions appear to be fine and can't account for the discrepancy between data/MC
- ▶ Energy, E/P, and cluster size shows a slight increase in data for increasing θ but not in MC
  - ▶ This does not appear to happen for momentum
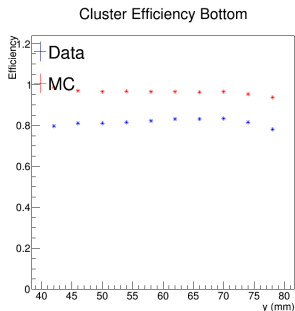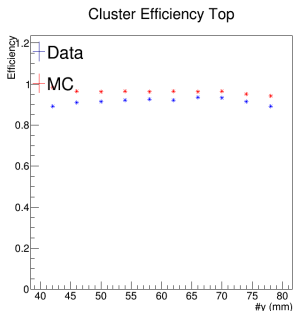
Tracking Efficiency in θ Regions

▶ Ratio of number of matched tracks to the total number of tracks in each region

▶ Top (left) and bottom (right)

Cluster Efficiency in Different Regions

- ▶ Region definitions changed in terms of Ecal coordinates
- ▶ Ratio of number of matched clusters to the total number of FEE clusters in each region
- ▶ Top (left) and bottom (right)

Normalization and Total Rates

- Data normalized based on time (7200 s), current (50 nA), blind (0.1), and deadtime (0.85)
- MC normalized based on time (calculated from file size), current (50 nA), and prescale (2^{11})
- Below rates are consistent with slide 3 figure and figures that follow

Region	Data (counts/s)	MC (counts/s)
All	866.6	1135.28
Phi Regions	146.9	125.8
Theta Top Regions	65.8	66.8
Theta Bottom Regions	66.8	65.6

FEE Rate of ϕ Regions

- ▶ Data has a higher rate in these regions
- ▶ Possible misalignment effects present
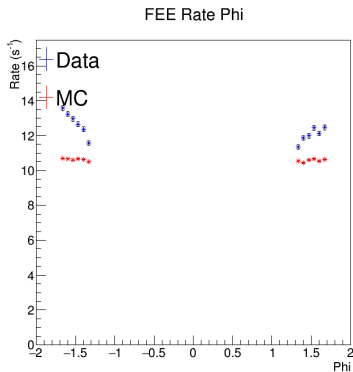
FEE Rate of θ Regions

- ► For low θ, data rate is higher. Consistent with ϕ regions.
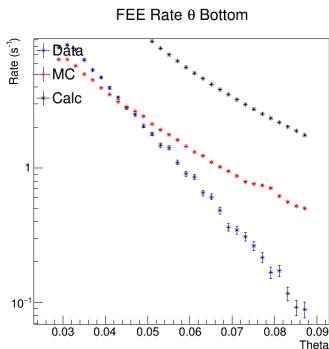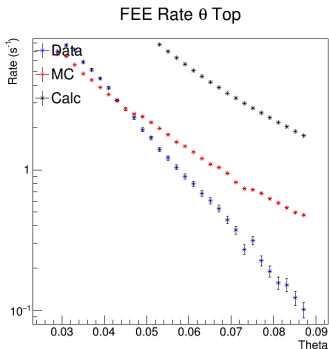- ► For high θ, MC rate is higher. Consistent with slide 3 figures.
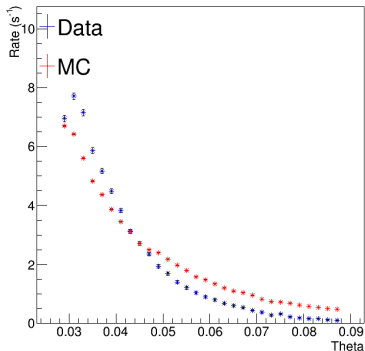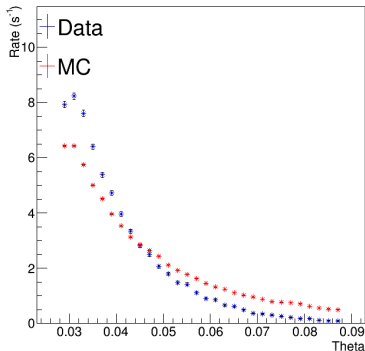
FEE Rates of Calculation Compared to Data or MC in θ

- ▶ Comparison of Calculation (Mott Scattering) Rates to Data and MC log scale
- ▶ MC and calcs have the same slope. Data is different
- ▶ Note: Calculation are off by an arbitrary factor

FEE Ratio of Calculation to Data or MC in θ

▶ Comparison of the ratios of Calculation (Mott Scattering) to Data and MC

▶ Approximately constant ratio for MC. Ratio for data increases drastically with θ

▶ Note: Calculation are off by an arbitrary factor
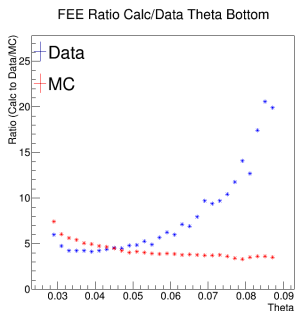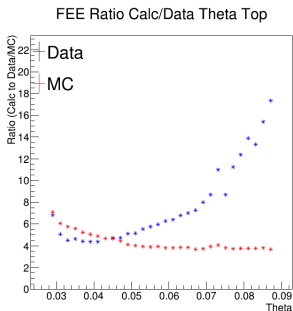
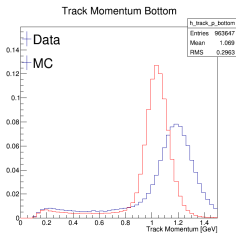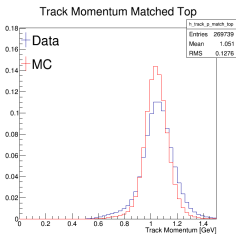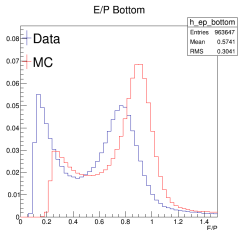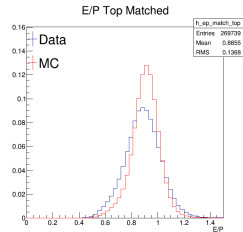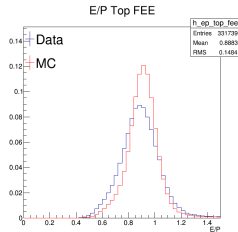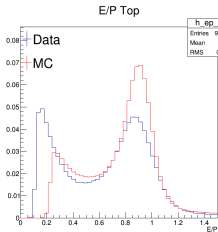▶ This appears to be constistent with Luca's previous results
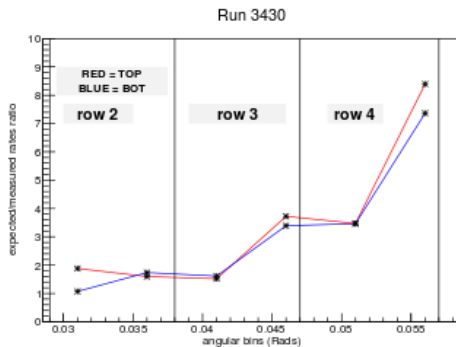
Conclusions

- Still unexplained effects - MC and Data have different behaviors as a function of θ
- Discrepancy between data and MC at large θ cannot be explained by matching efficiency
- Still waiting for V2 detector and Pass2...

Track Momentum

E/P

Energy