

LHRS Calibrations for d_2^n

Progress Report

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Outline

- 1 E/p
 - Fine-tuning
- 2 Contamination in the PR
 - Cut Placement
 - Contamination
- 3 Geant4 Simulation
- 4 Summary



Fine-tuning (1)

- Going back to check positions of e, π peaks in ADC spectra
 - Want each block to have same response, regardless of p
 - First, align π peaks to 100 channels in ADC
- Choose mid-range momentum value: $p = 1.20$ GeV
 - Good amount of e, π



Fine-tuning (2)

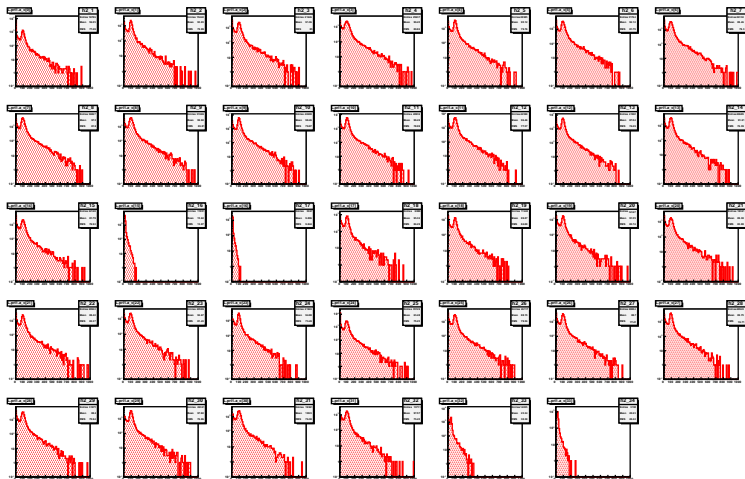


Figure: Layer 1. Pions are shown here.

Fine-tuning (3)

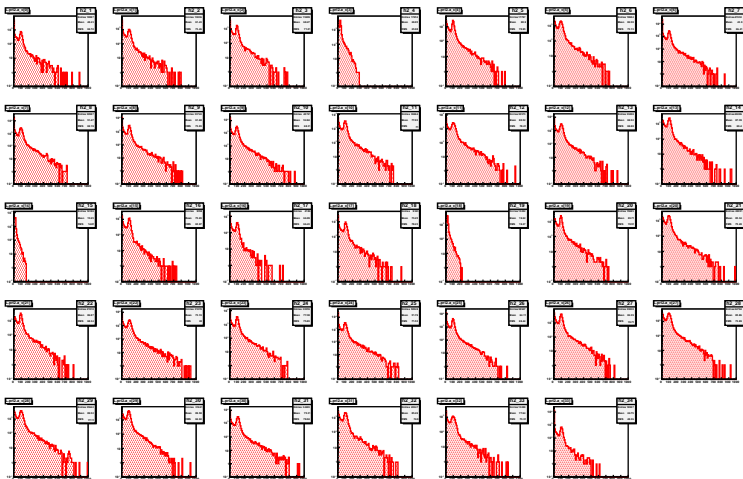


Figure: Layer 2. Pions are shown here.

Fine-tuning (4)

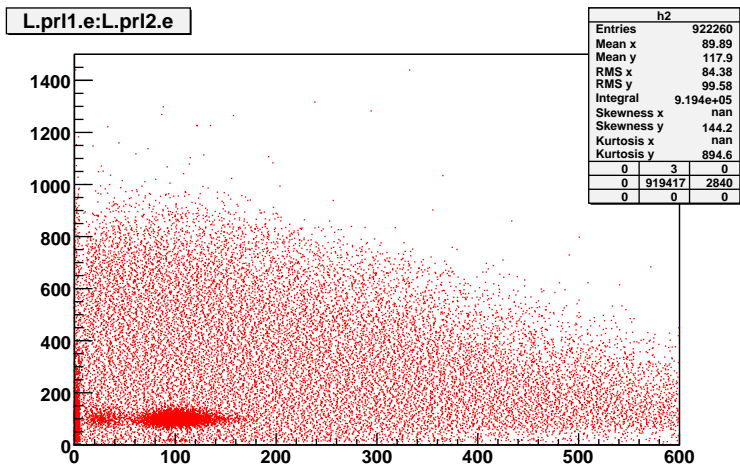
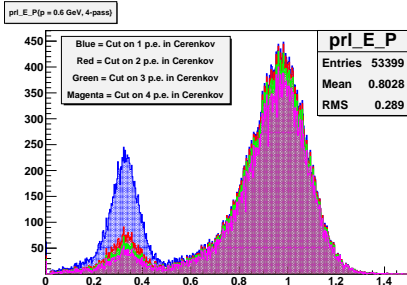
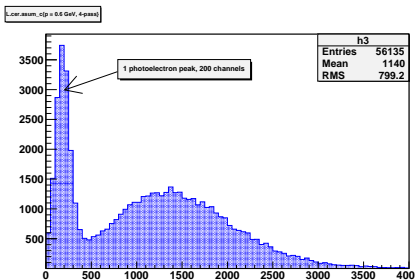


Figure: Pion energy deposition in shower for $p = 1.20$ GeV after gain-matching.



Placement of cut in Cerenkov

- In order to understand the π -contamination in the shower, we need to first determine the proper position to place the cut in the Cerenkov to select electrons



- Best to place cut at: 3 p.e. in Cerenkov for $p = 0.6$ GeV
 - Keeps good statistics of main electron peak, while greatly reducing pions that make the cut



π -contamination (1)

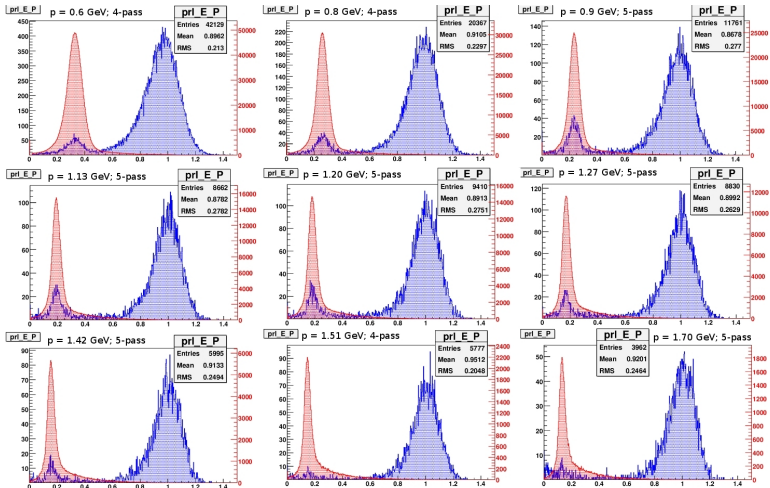


Figure: Electrons in blue, pions in red.



π -contamination (2)

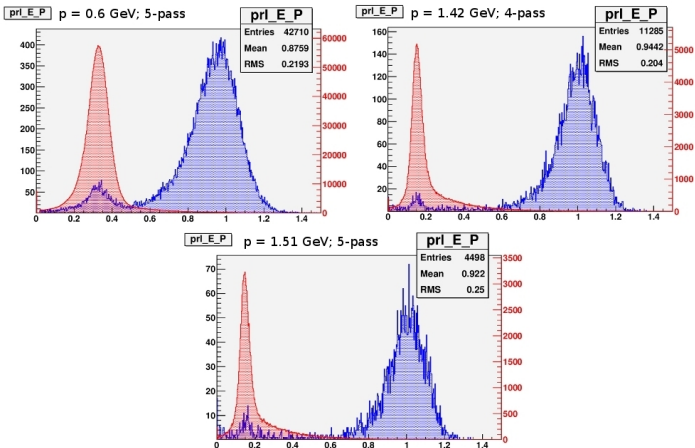


Figure: Electrons in blue, pions in red.



Geant4 Simulation

- Coding of simulation in progress
 - Development of simple geometry to start (1 block) is done
 - Calculation and accumulation of energy deposition of electrons has been implemented through the EventAction class (this may need some adjustments – in particular, PMT effects on energy calculations)
 - Still needs implementation of ROOT to plot data
 - After this looks good, then move to more complete geometry of PR
 - At some point, implement tracking?

- Allows calculation of:

$$\frac{1}{E_0} \frac{dE}{dt}$$

→ t = depth in units of X_0

→ $E_0 = p$ = initial energy



Summary

- E/p is getting there
- Best position of cut in Cerenkov ~ 3 p.e. for $p = 0.6$ GeV
 - For determination of π -contamination as seen in E/p plot
 - π -contamination seems manageable (smaller blue peak)



What's Next?

- Continue check of gain-matching in shower ADCs
 - Determine issue with block # 15, 16, 32, 33 in layer 1, and # 3, 14, 18 in layer 2
- Continue work on efficiencies
 - PR (efficiency/contamination, pion rejection factor)
 - Cerenkov
- Continue coding of simulation

