Examination of Corrupted Data in the Tile Calorimeter

Stephanie Hamilton
Michigan State University
The ATLAS Experiment
Supervisor: Irene Vichou (U of IL, Urbana-Champaign)

My Project (review)

- Tile Calorimeter in ATLAS detector
  - Negative energy, generally abnormal data
    - This constitutes about 1% of all data with significant cell energies taken by TileCal
- Examine several different variables for TileCal corrupted data
  - Test in standard data integrity filters and new tests for cell energy, time reconstruction
    - How many “bad” events are from known reasons?
    - How many are from reasons we don’t quite understand yet and escape detection?
      - Source is largely front end or data transmission issues

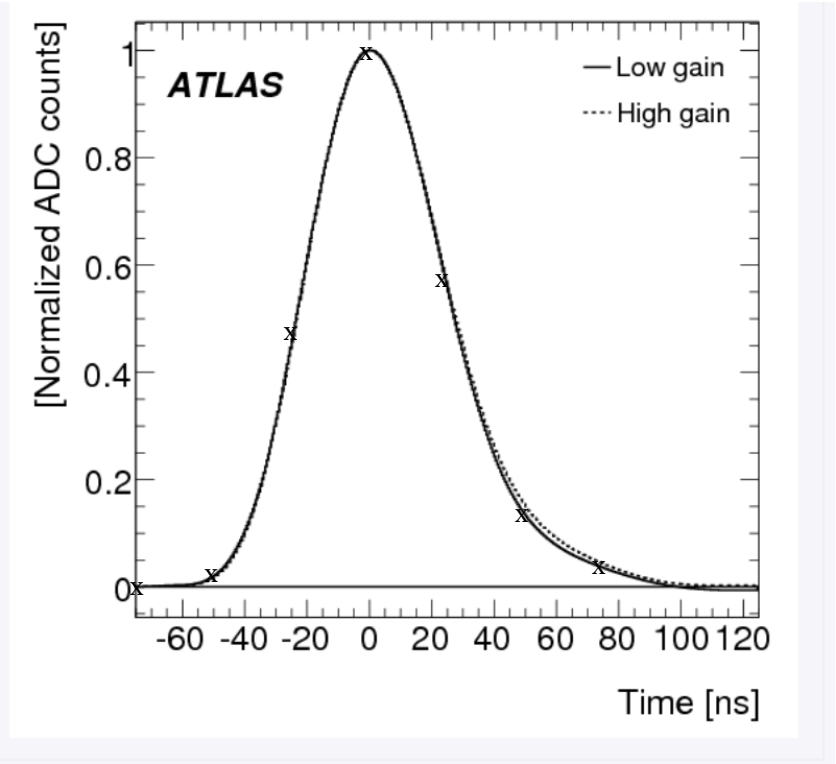
Status as of June 29

- Learning to use ROOT and C++
- Learning my way around the framework
- Getting familiar with the way detector performance is analyzed in TileCal
- In the first steps of developing macros to plot variables I was interested in

Status as of July 19

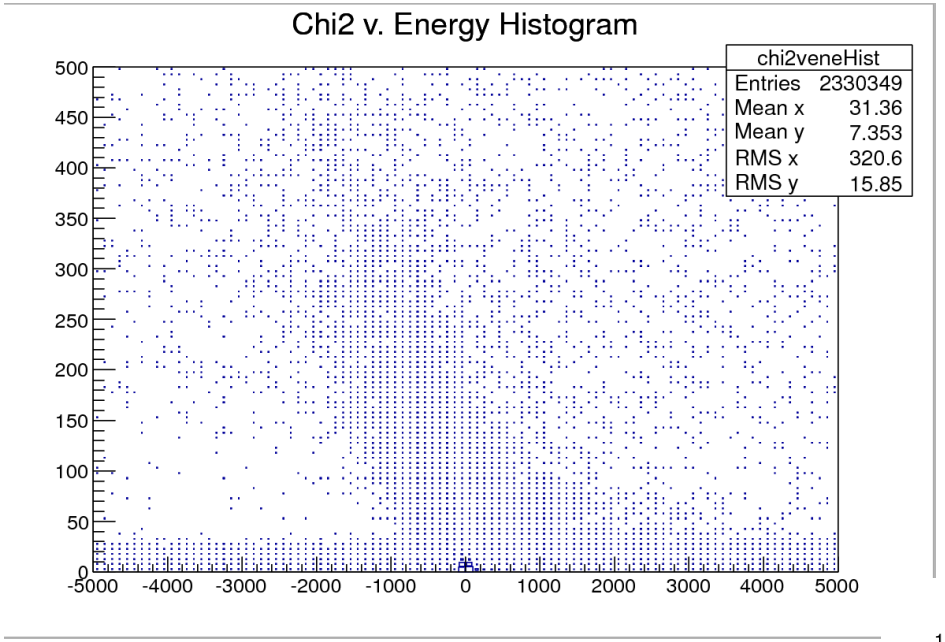
- Fully developed macro for plotting
  - Through trial and error, determined interesting variables
- Several plots of variables while implementing different cuts
- Searching for cases in which the pulse signal from the readout channel is anomalous and variables to detect these cases

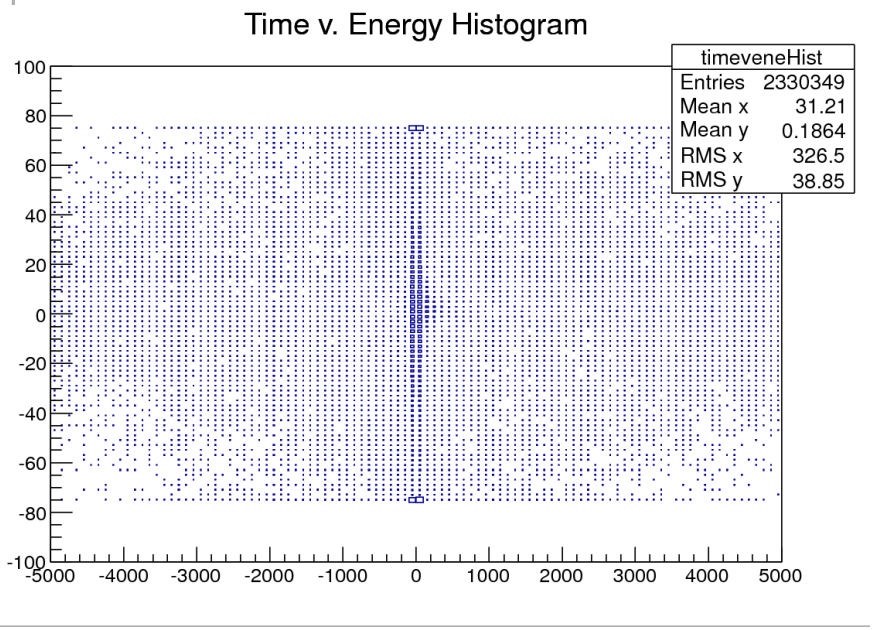
Searching for anomalous pulse signals

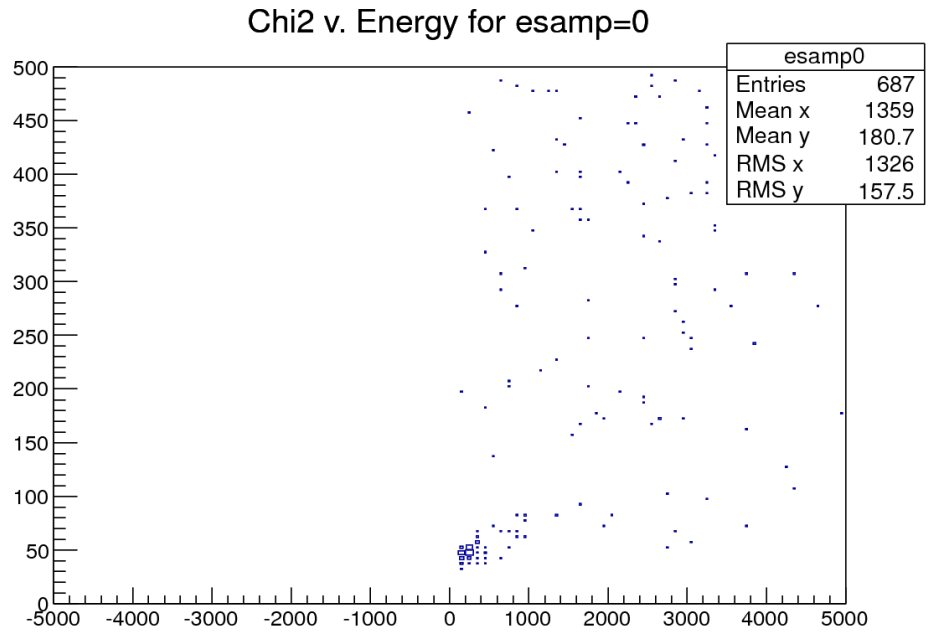


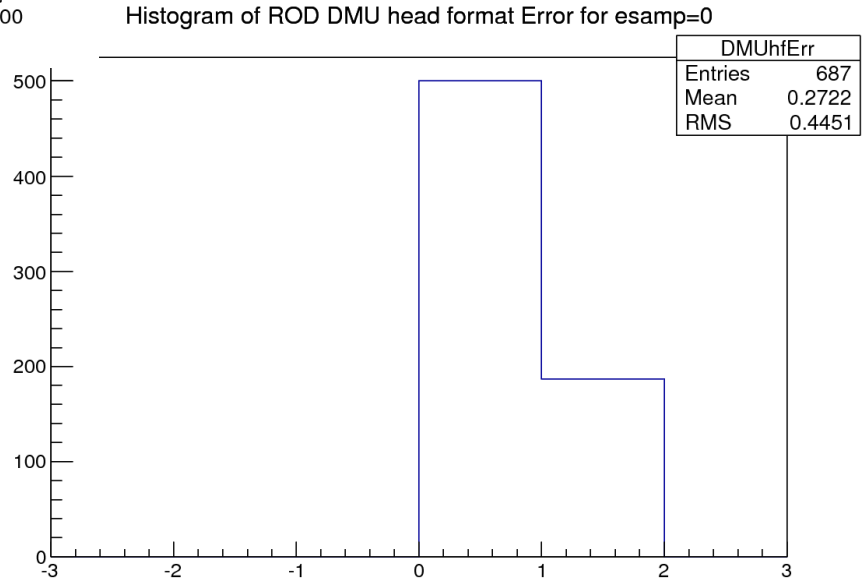
To the right is an example of a "normal" pulse signal

Since it is normalized, the "0" in this case is normal. I am looking for cases in which there is a zero for any "x" on the graph before normalization and before the background has been subtracted. This would NOT be normal!


Chi2 v. Energy Histogram
chi2veneHist
Entries 2330349
Mean x 31.36
Mean y 7.353
RMS x 320.6
RMS y 15.85
500
450
400
350
300
250
200
150
100
50
0
-5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000 5000


Time v. Energy Histogram
timeveneHist
Entries 2330349
Mean x 31.21
Mean y 0.1864
RMS x 326.5
RMS y 38.85
100
80
60
40
20
0
-20
-40
-60
-80
-100
-5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000 5000





Also checking data integrity variables

Why is my project important?

- Increase knowledge of the reasons behind TileCal corrupted data
- Validate criteria that would prevent “bad” event leaks into good quality data
- Create less headaches for the physicists using this data

What's Next?

- Have been using a small "test" data ntuple (1109 events) to develop my code
  - Move to full data ntuples
- Examine variables within full ntuples
  - How many bad samples are due to known errors?
    - These will be taken care of
  - How many involve abnormal times recorded?
  - How many involve abnormal energies?
  - How many involve abnormal values for χ^2?

Adventures

- Hiking in the Jura, Zermatt, Bern, Geneva, Barcelona…
  - Favorite either Zermatt or Barcelona
- Rome this weekend (!!!), Paris next weekend
- Still would like to explore Geneva some more