Update on Flame TB Analysis

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Reminder: Timeplane Selection

Signal sellection to be done

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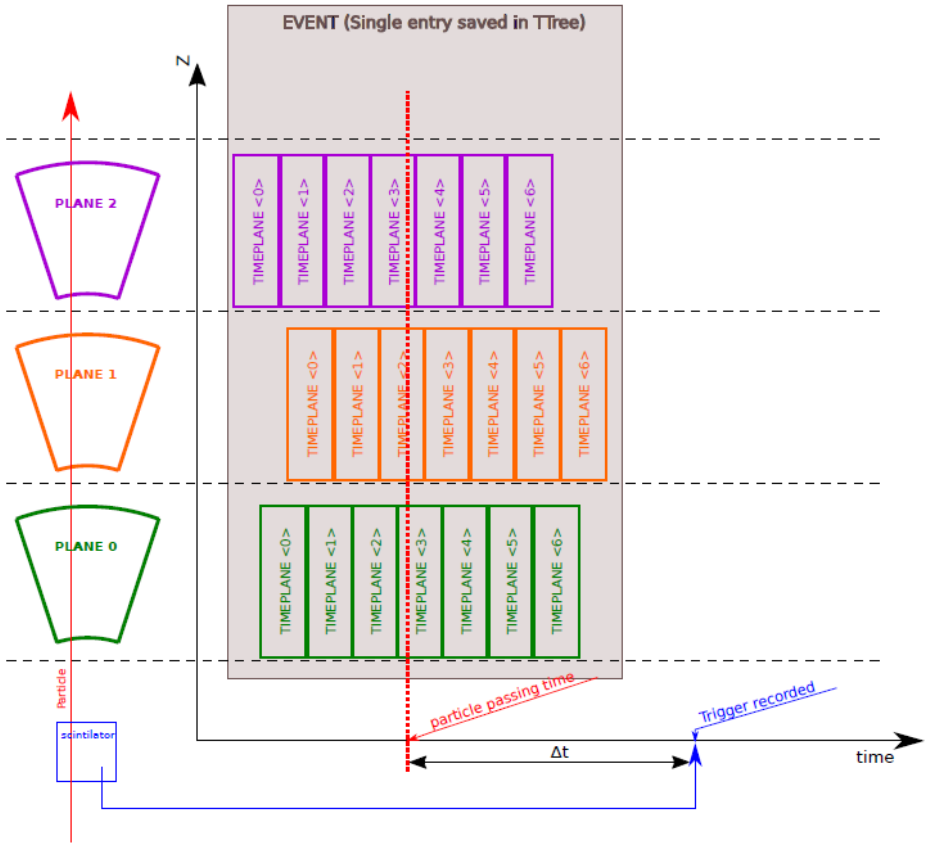
Current algorithm:

- Only timeplanes 2,3,4 considered
(0, 1 and 5,6 should not contain physical data)
- Events with signal on the same pad in any two frames rejected
- Timeplanes 2, 3, 4 merged together into a single frame

Stored data structure



- There is a delay (Δt) between the time when the particle is passing through the setup and time when trigger information is recorded by readout
- It needs to be taken to account and proper offset has to be applied during data-taking to save valuable frames (timeplanes)
- To have save margin for each trigger received, 7 consecutive frames (timeplanes) are stored (expected == timeplane[3] +/- 3)
- Moreover in the current setup each plane was running with independent FPGA clk → thus the asynchronizations between planes may occure
- theoretically we expected each hit to be in timeplane = 3, but it might happen that signal will be in other timeplane
- thus 3 frames back and front in reference to the trigger are saved in the event

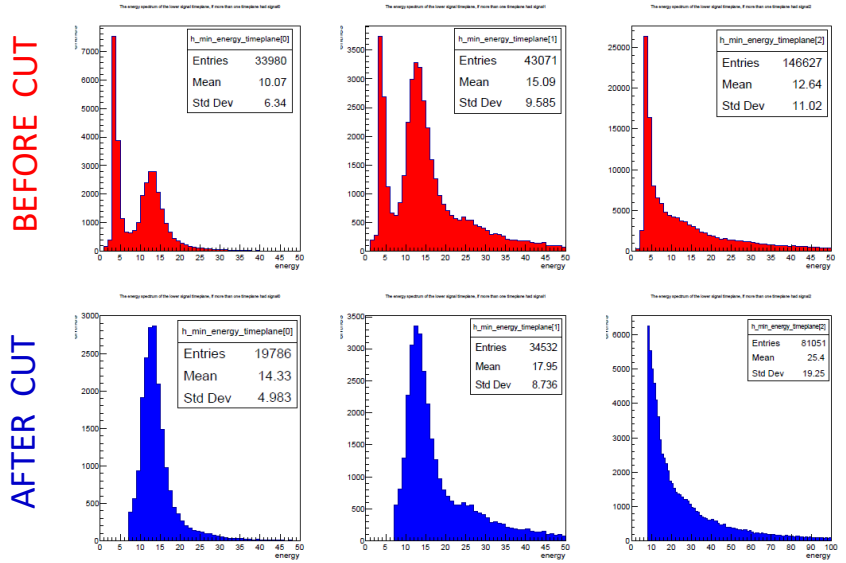
Reminder : Noise Cuts

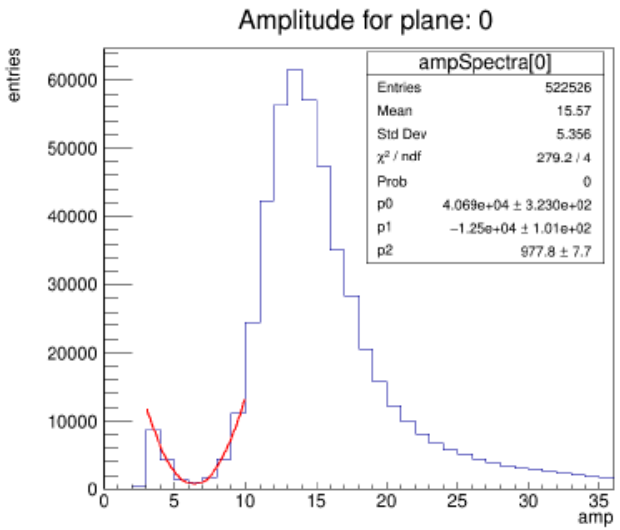
Online FLAME threshold not sufficient for TB conditions

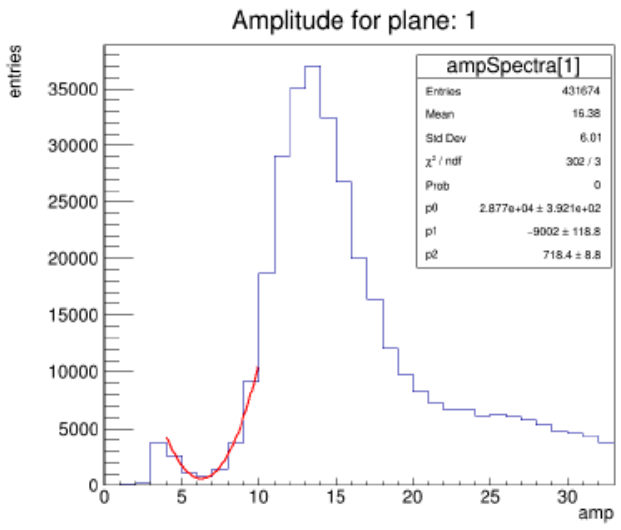
- There is a build-in signal threshold on the FPGA level
- Normally noise entries should not pass the data processing
- TB conditions were so noisy that some of them have still passed

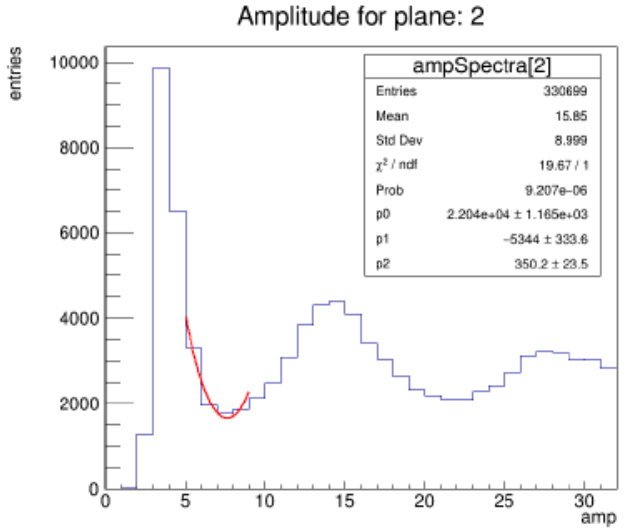
Further cuts on signal amplitude applied

- Noise level dependent on the plane position
- No easy way to measure the noise (noise entries highly suppressed)
- For each plane searching for the minima between noise leftovers and signal







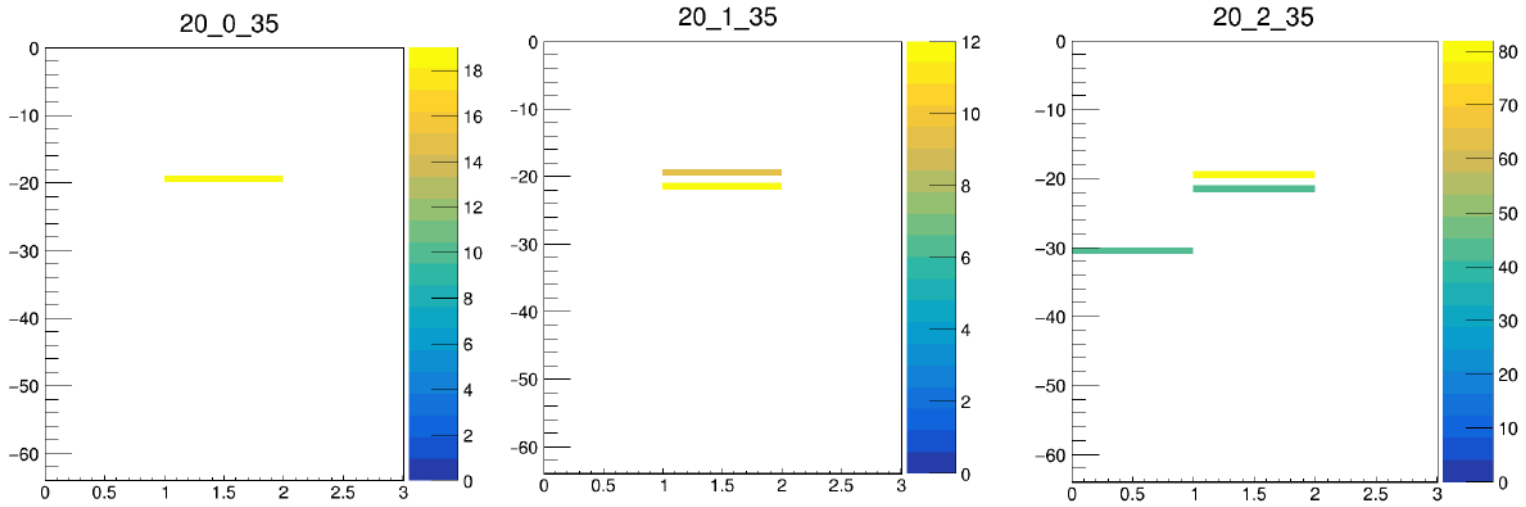


Reminder : Clusterization

Implemented clusterization:

- For now simple integration of the whole frame
- No towers -> independent clusterization per each plane
- Majority of the events are single particle (can be deduced from plane 0)
- There is a plan to use telescope data to reject multiple particles events to have a fully clear sample
- More advanced algorithm can be implemented at some point, but for now the goal is to have a firts look into the data

Exemplary event – run 864, event: 20, TLU number: 35

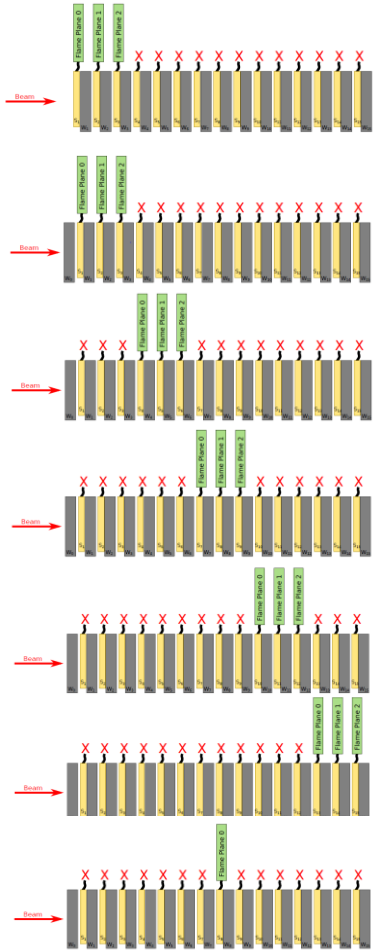


- timeplane = 3
- initial procedure implemented → algorithm searches for pad with the highest signal and adds all pads with signal in X distance from the seed
- question: what X should be? or maybe we have to integrate over whole frame?

RUNS ANALYSED

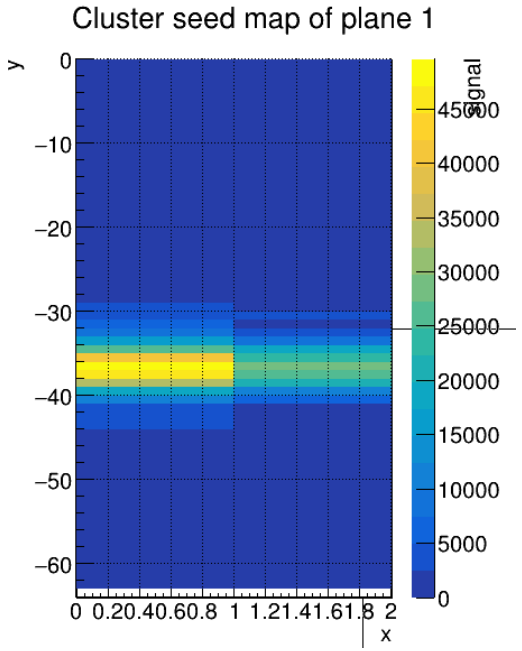
➢ Runs used:

- plane 0 : 777 – 780
- plane 1, 2, 3 : 678 – 683
- plane 4, 5, 6 : 696 – 701
- plane 7, 8, 9 : 746 – 755
- plane 10, 11, 12 : 758 – 762
- plane 13, 14, 15 : 869 – 873
- plane 8 : 877 – 881



➢ 5 GeV electrons

➢ ~ center of the sensor



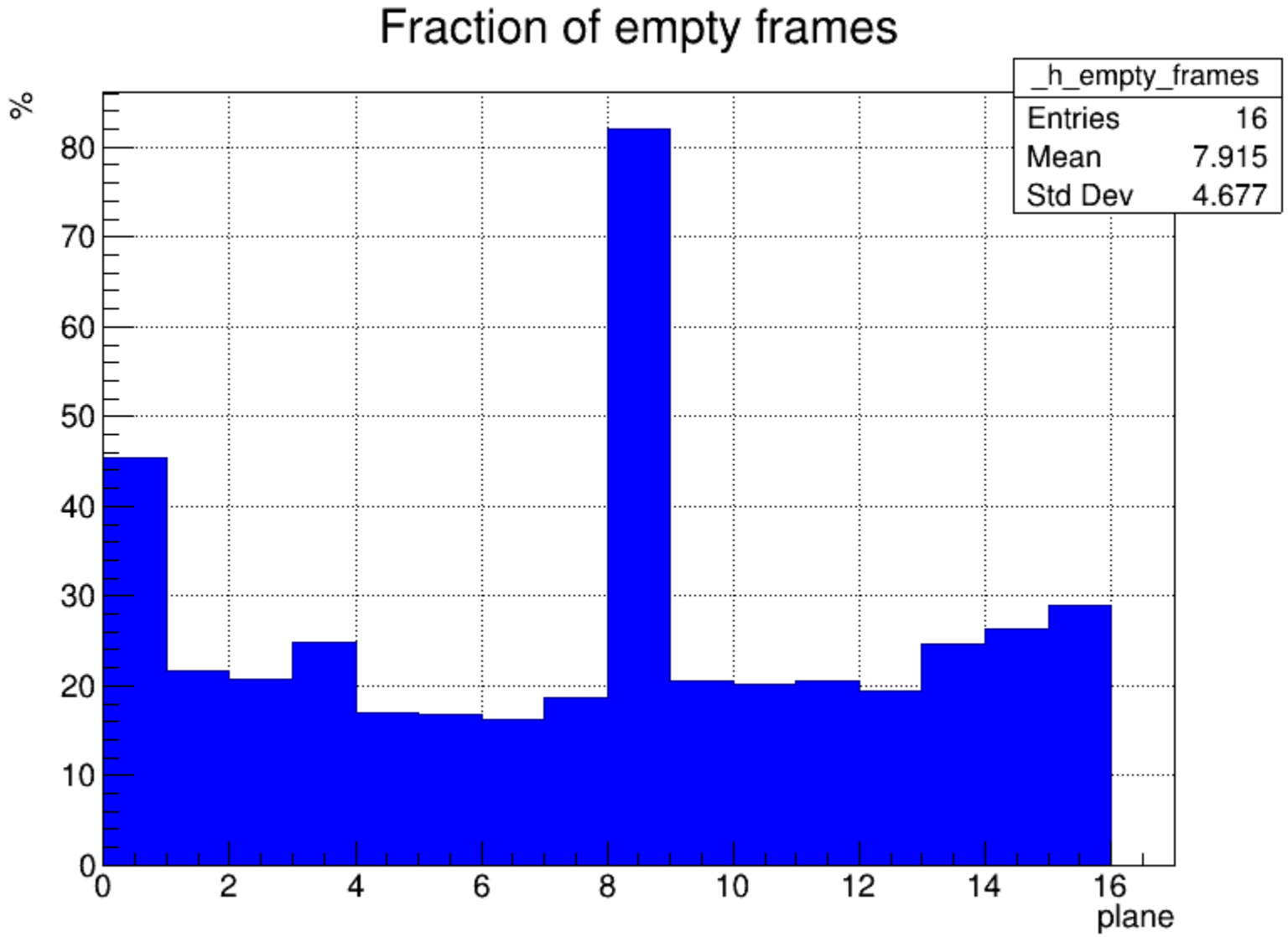
Run	First run in configuration C (see FLAME measurement plan). Some problem with plane 8. It shows only the noise. Noise is lower than in the neighbor planes. We continue runs with this problem open	746

TO BE IMPLEMENTED

EMPTY FRAMES ISSUE

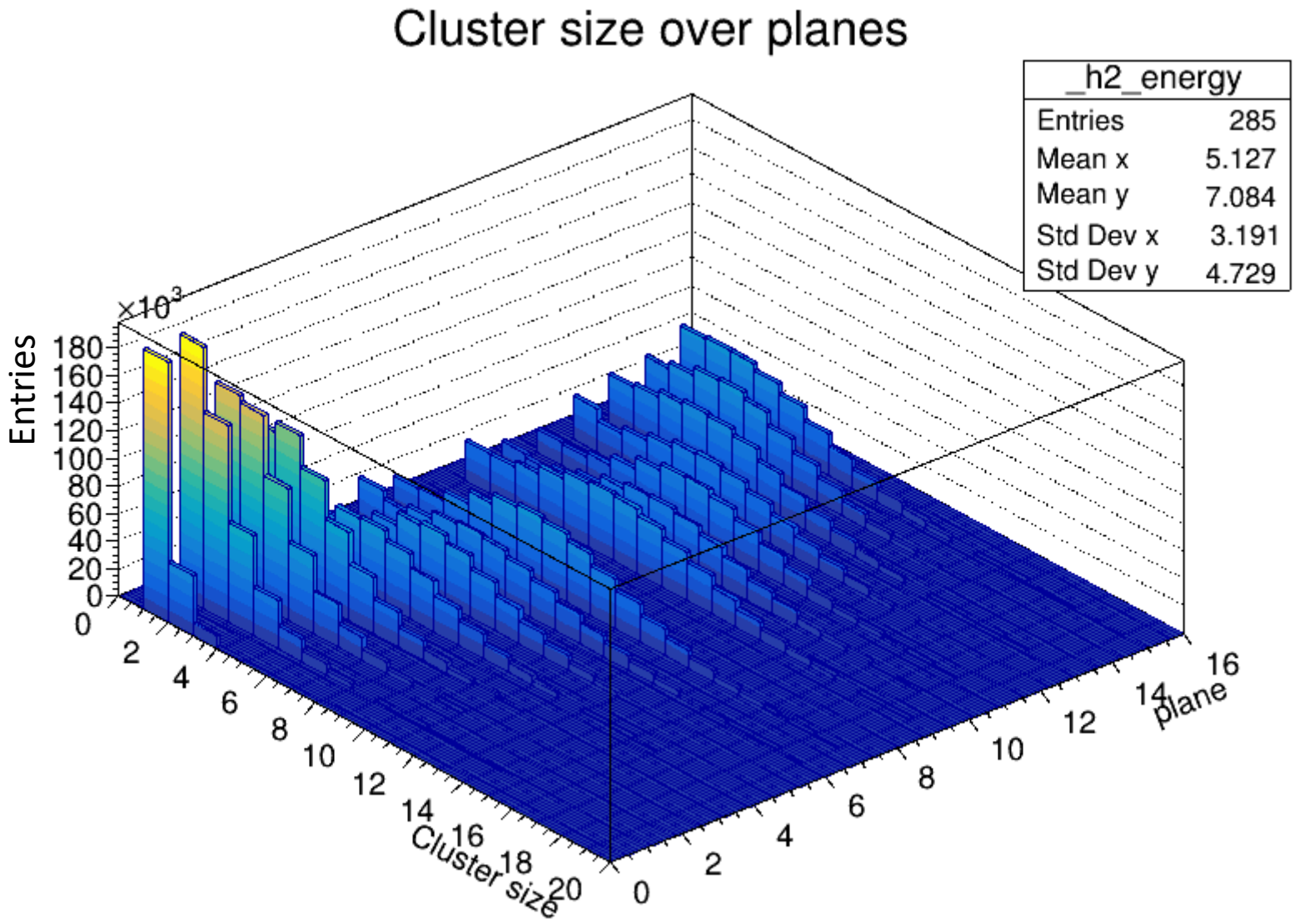
- **There is a significant fraction of empty frames**

- **Source unknown:**
  - triggers on particles out of lumical acceptance?
  - trigger synchronisation failure?
  - fraction of empty events to be checked

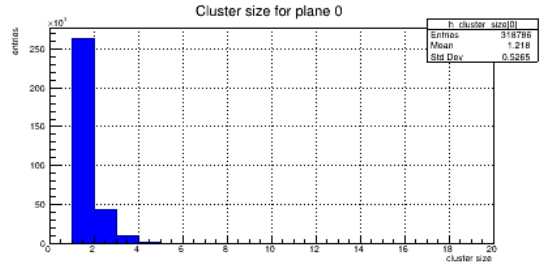


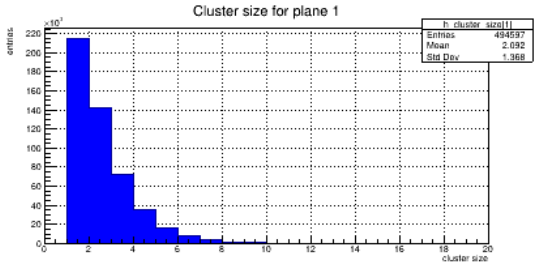
Cluster Size Analysis

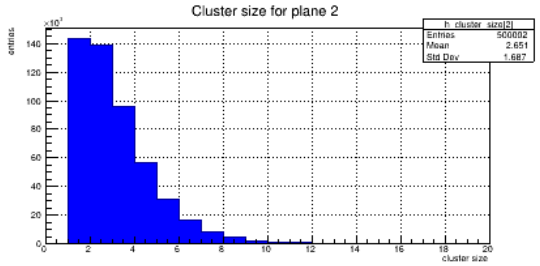
- The plot shows the cluster size (shower) development when going deeper into the calorimeter
- Behaviour as expected

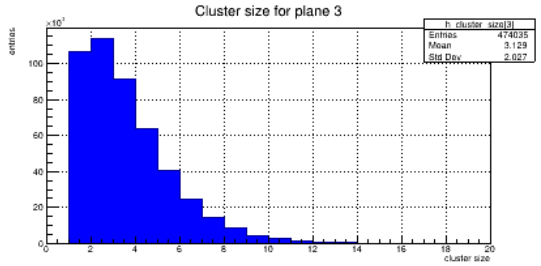


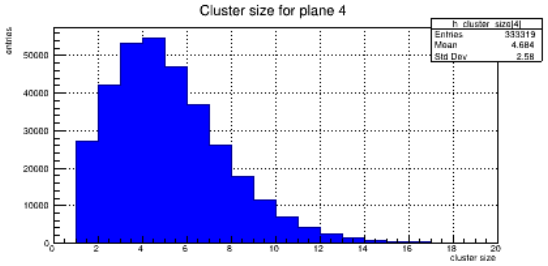
Cluster Size Analysis

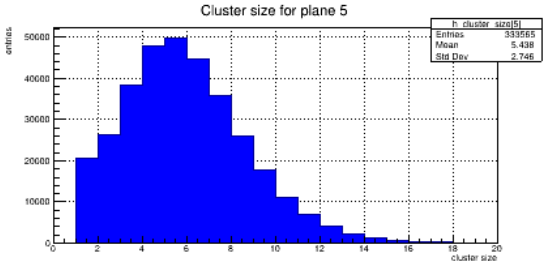


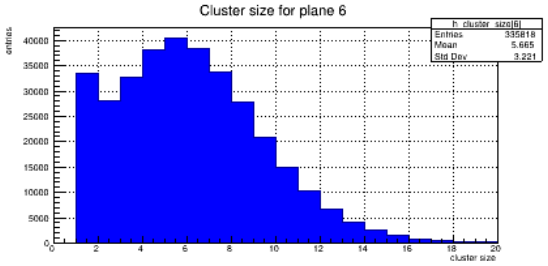


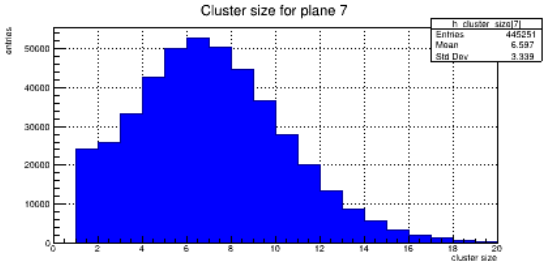


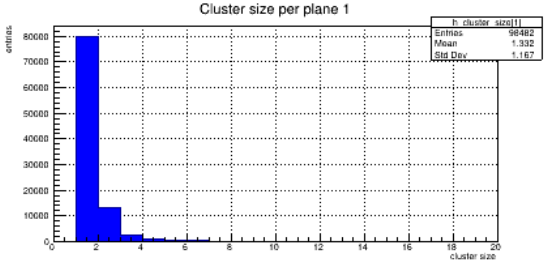


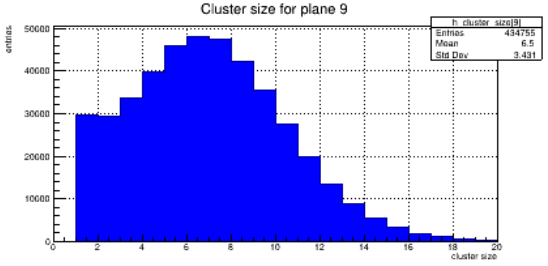


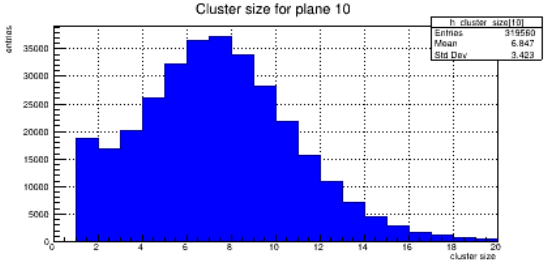


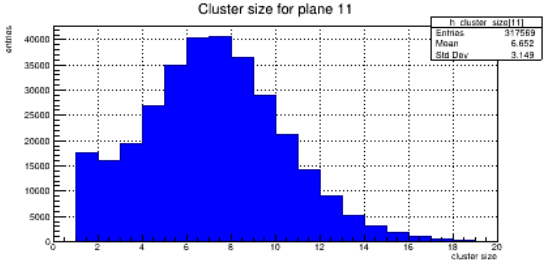


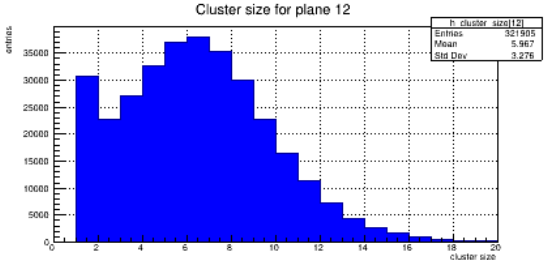


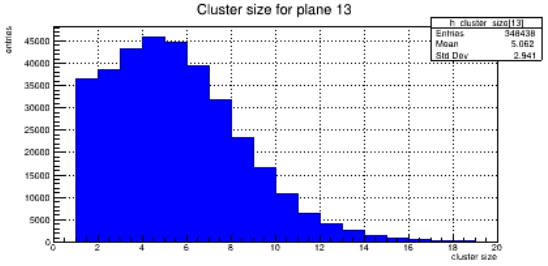


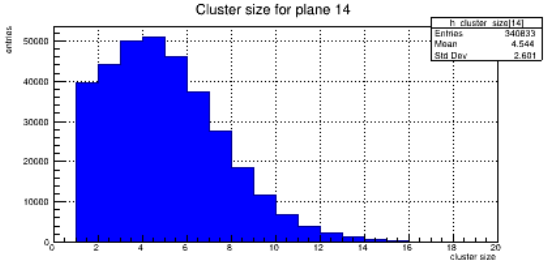


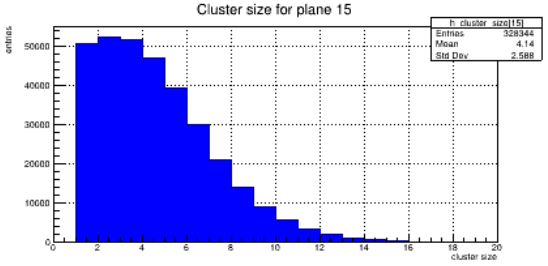






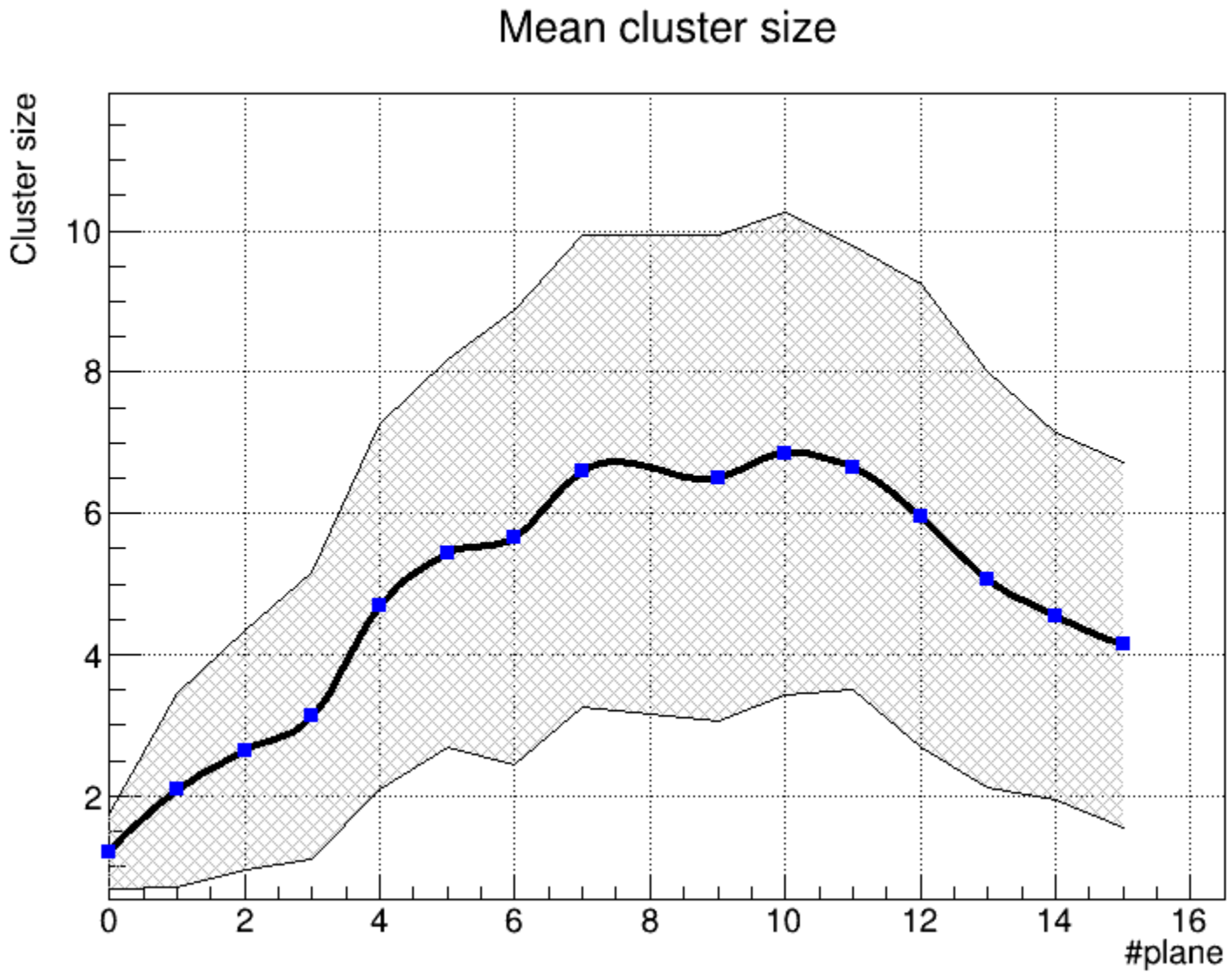






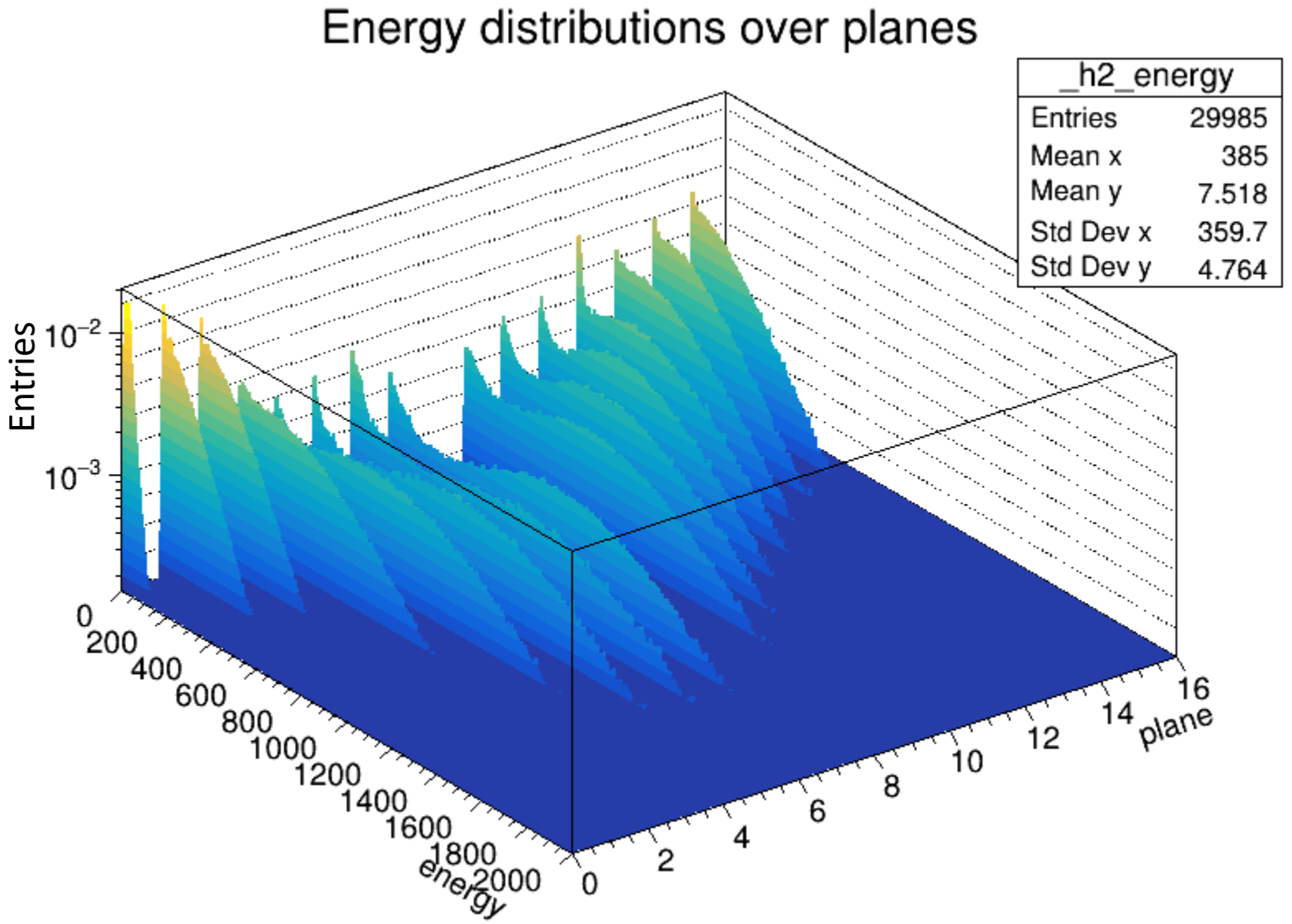
Cluster Size Analysis

- Based on the previos plots mean cluster size and its RMS are extracted for each plane
- Plot showe the mean value together with +/- RMS band
- The maximum for 5 GeV electrons at around 9 X_0

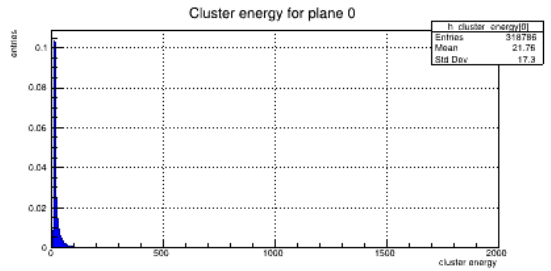


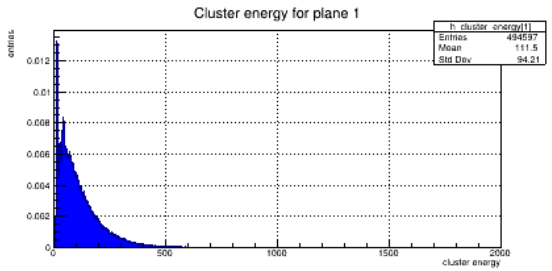
Cluster Energy Analysis

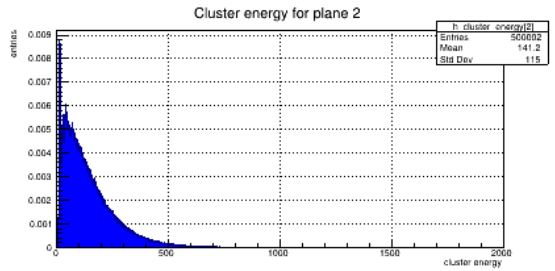
- The plot shows the cluster energy development when going deeper into the calorimeter
- Log Scale on Z-axxis

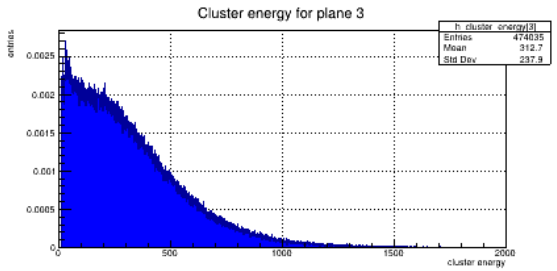


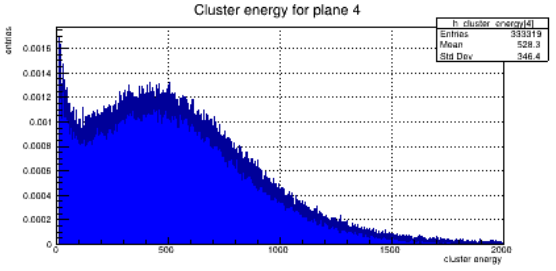
Cluster Energy Analysis

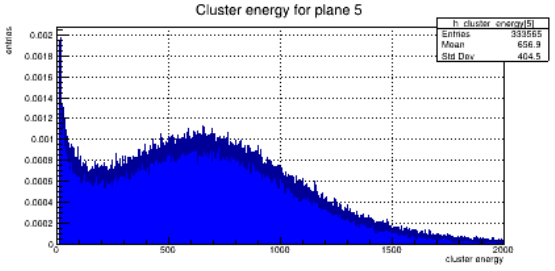


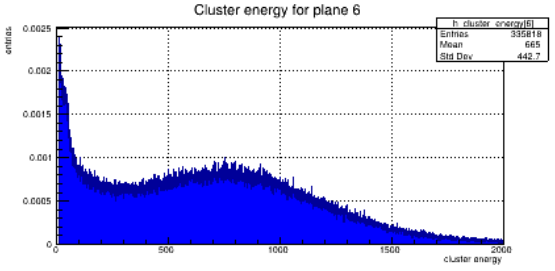


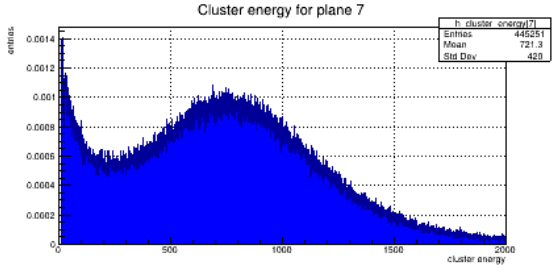


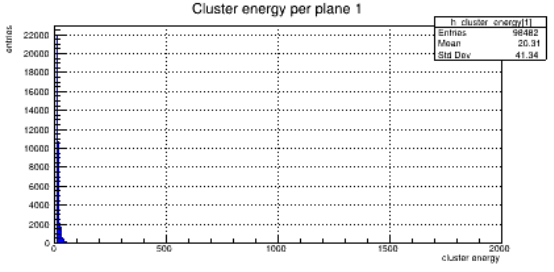


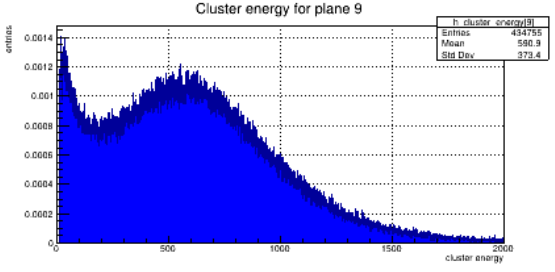


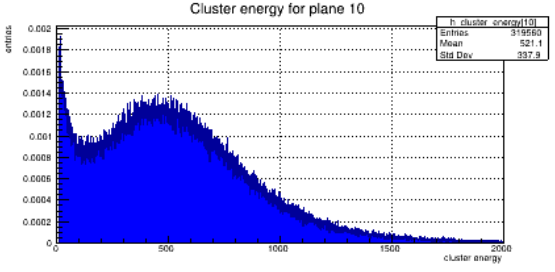


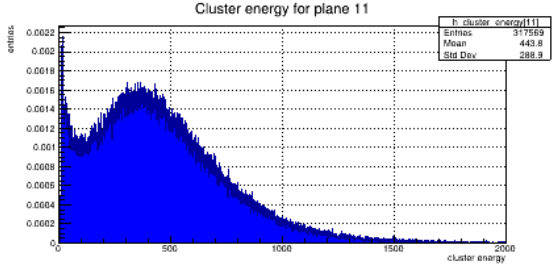


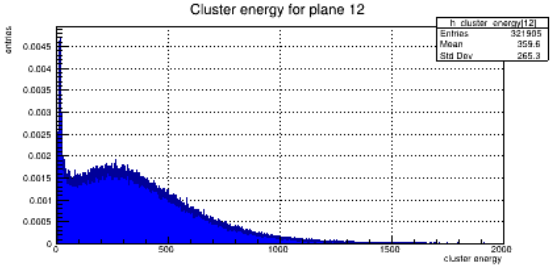


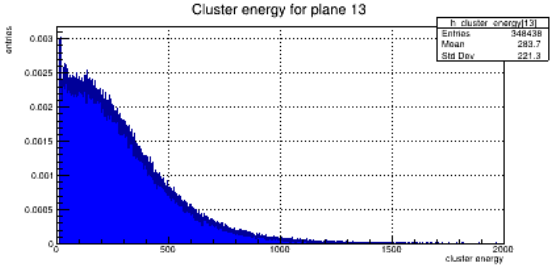


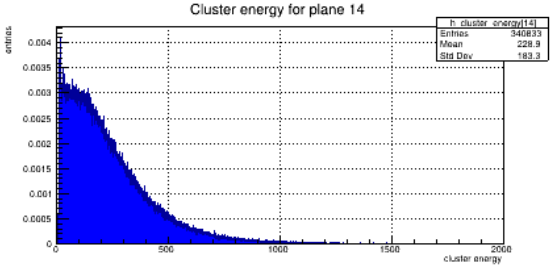


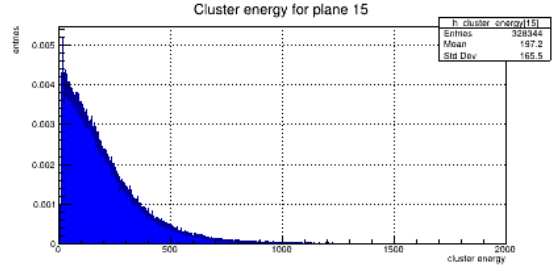




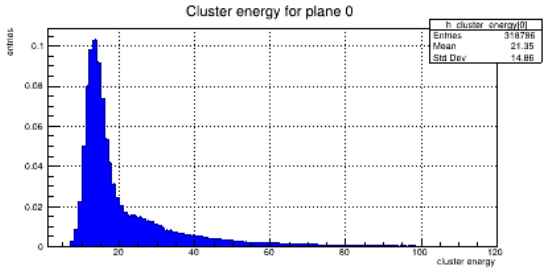


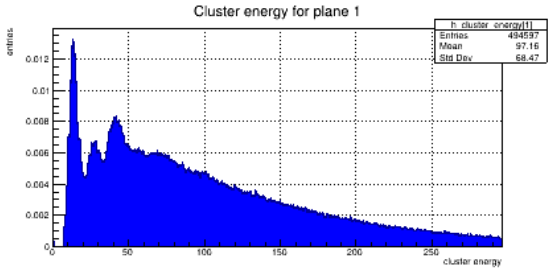


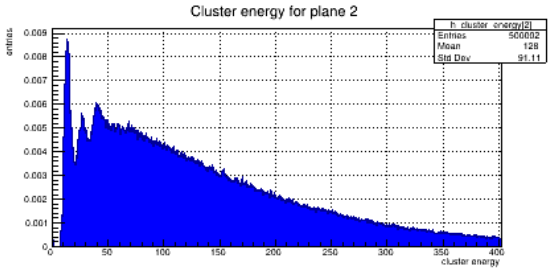


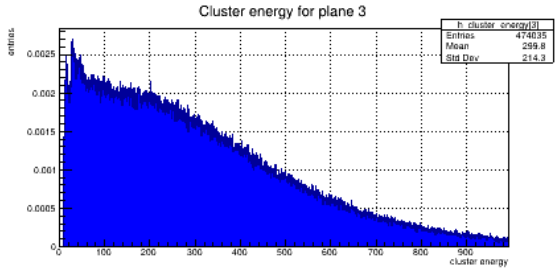


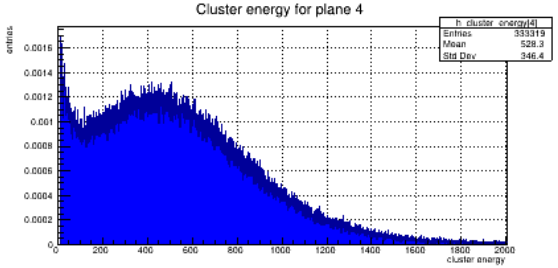
Cluster Energy Analysis

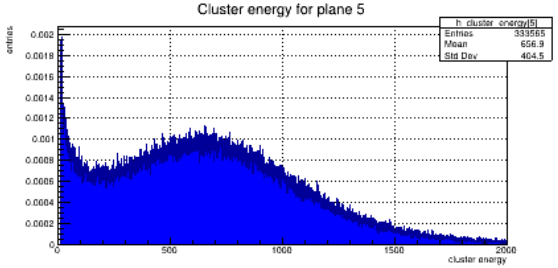


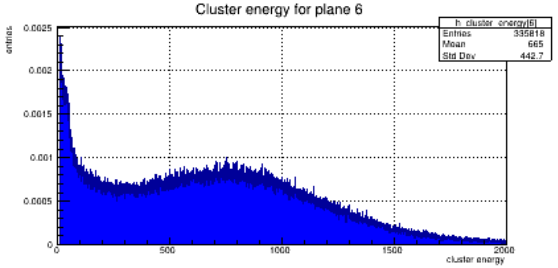


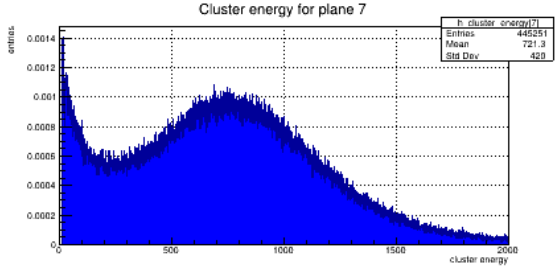


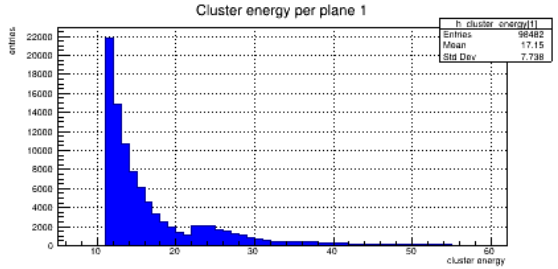


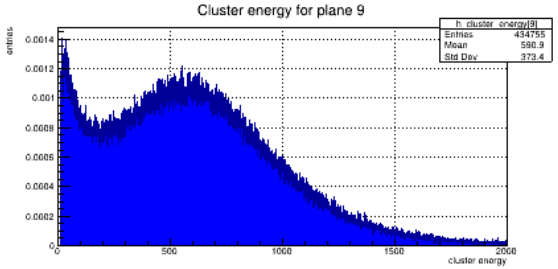


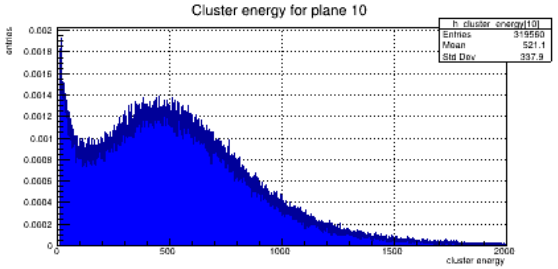


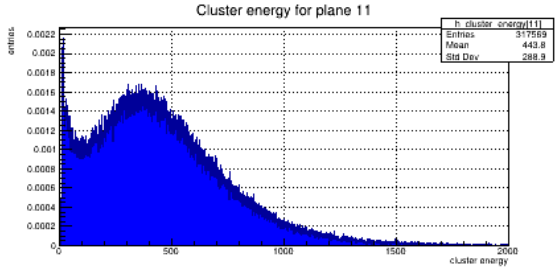


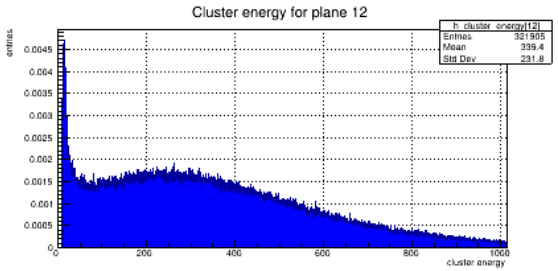


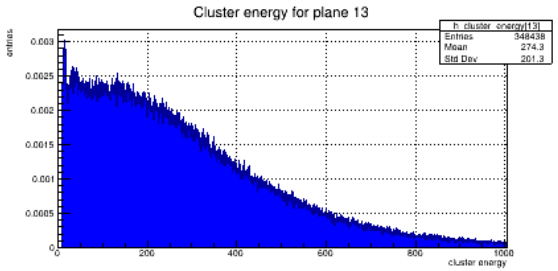


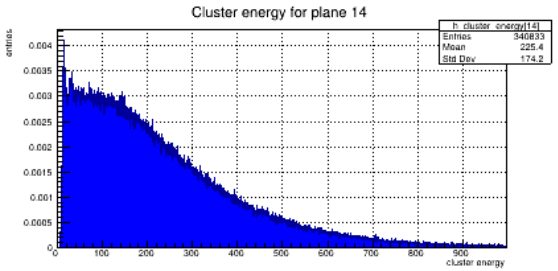


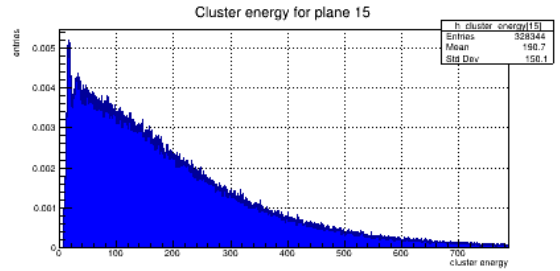




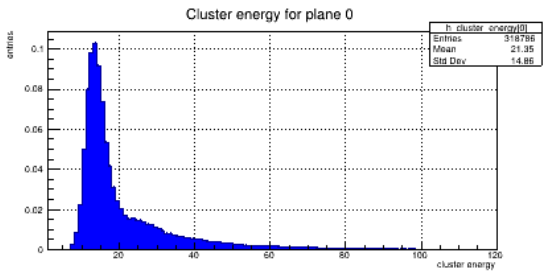


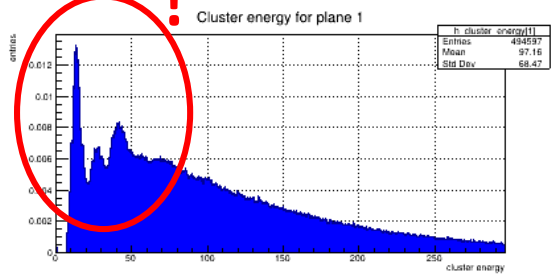


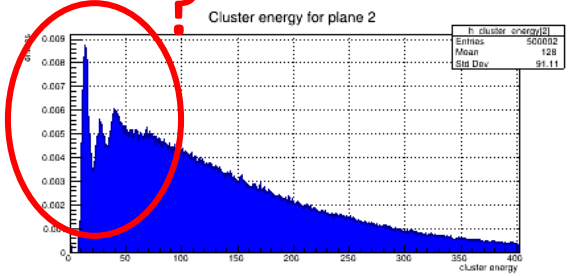


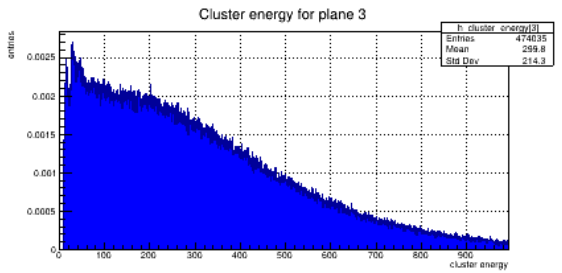


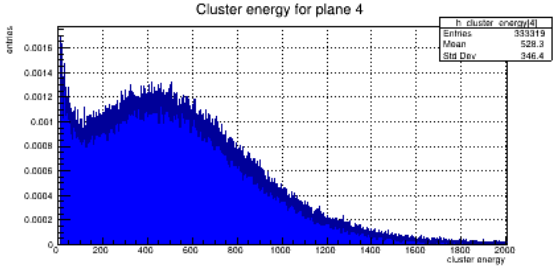
Cluster Energy Analysis

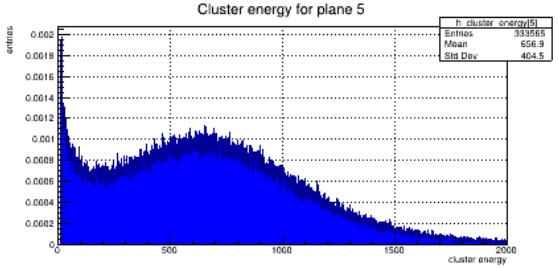


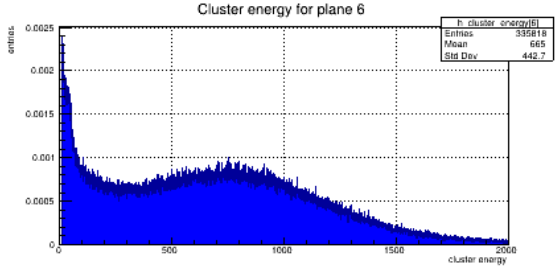


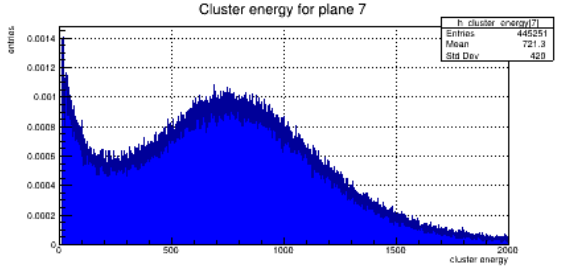


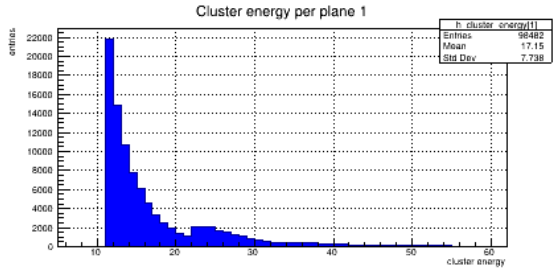


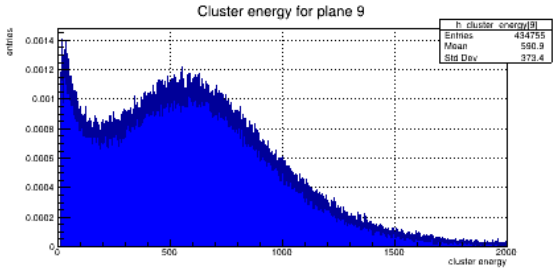


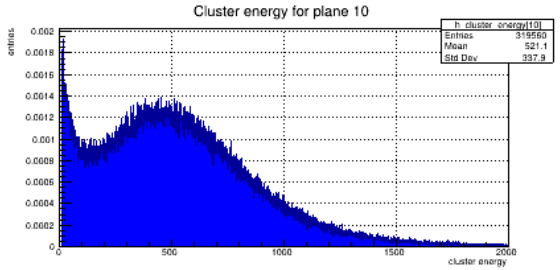


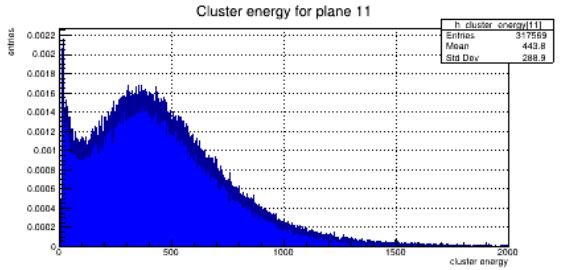


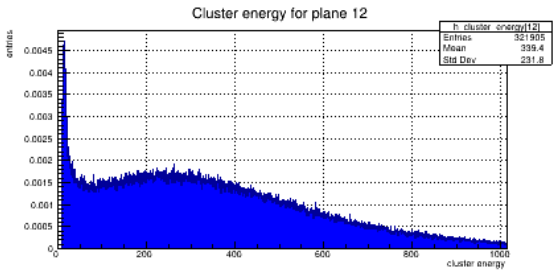


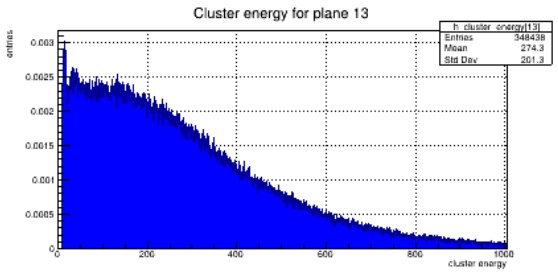


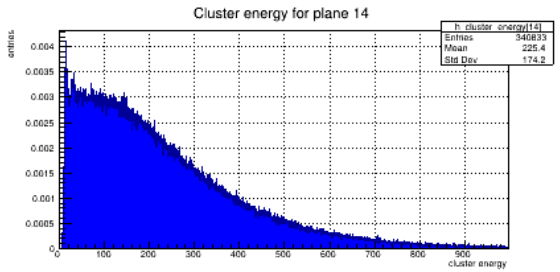


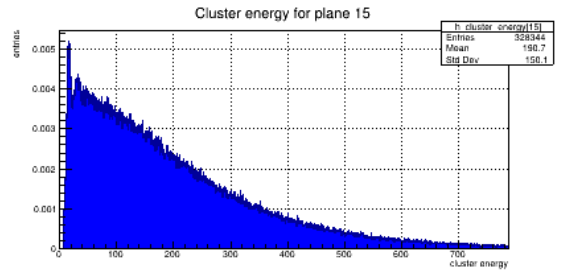






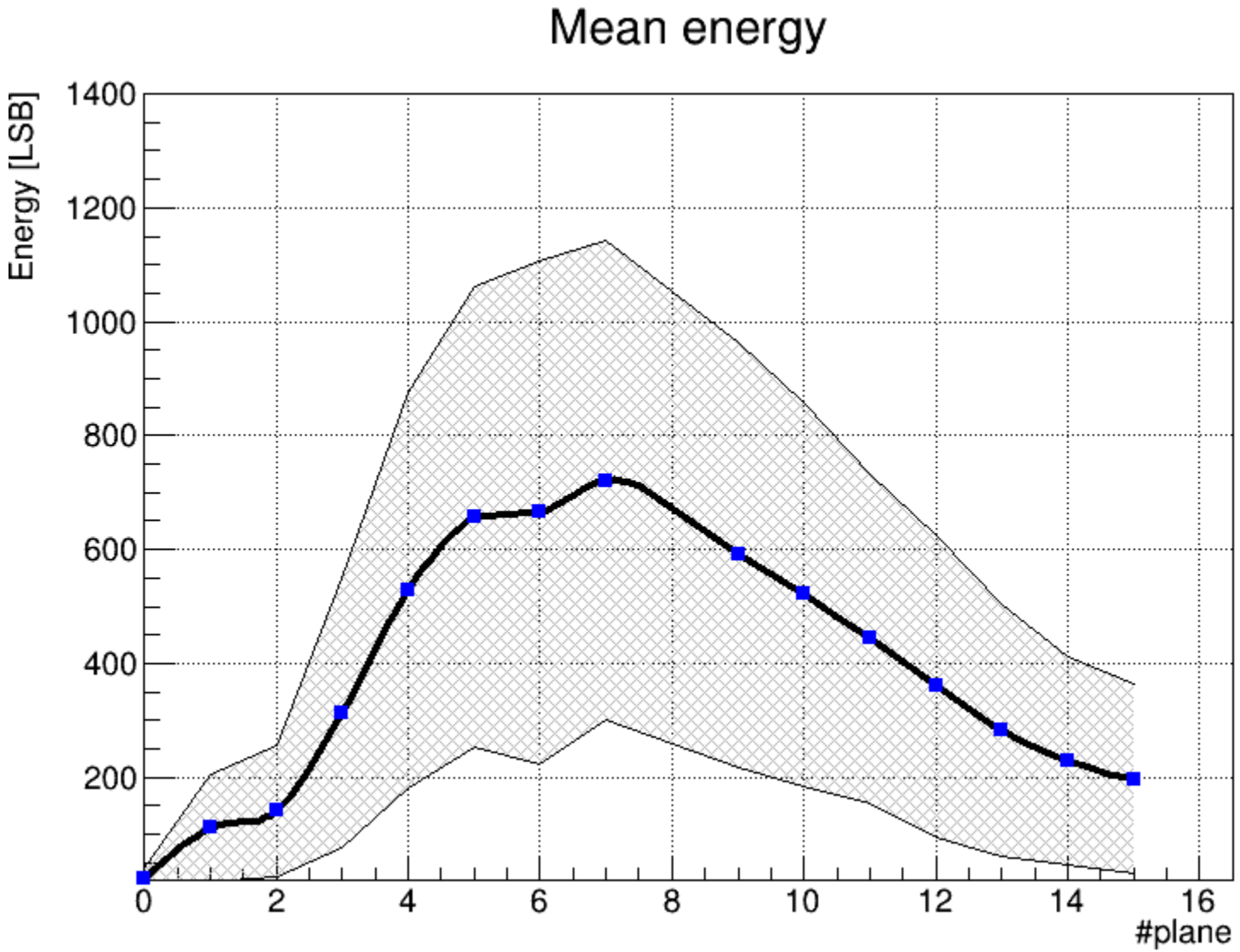






Cluster Energy Analysis

- Based on the previos plots mean cluster energy and its RMS are extracted for each plane
- Plot showe the mean value together with +/- RMS band
- The maximum energy deposition for 5 GeV electrons at around $7X_0$



THANK YOU FOR ATTENTION