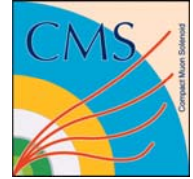




International Conference on Particle Physics
In Memoriam Engin Arık and Her Colleagues
Boğaziçi University, İstanbul, Turkey
October 27-31, 2008

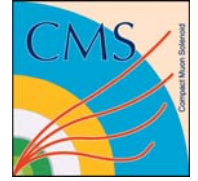


A Study Of Anomalous Events In CMS-HF PMTs

A. Halu, E. Gülmez, M. Deliömeroğlu
Physics Department
Boğaziçi University



Time Slices

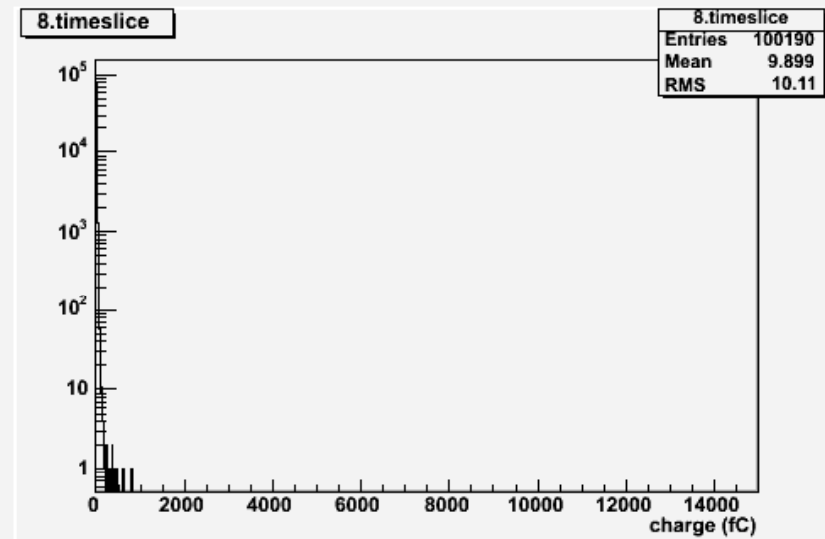
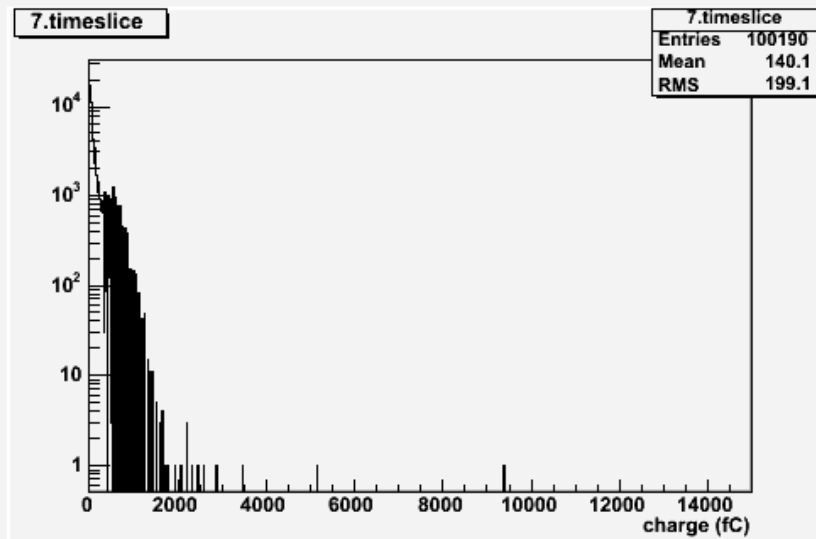
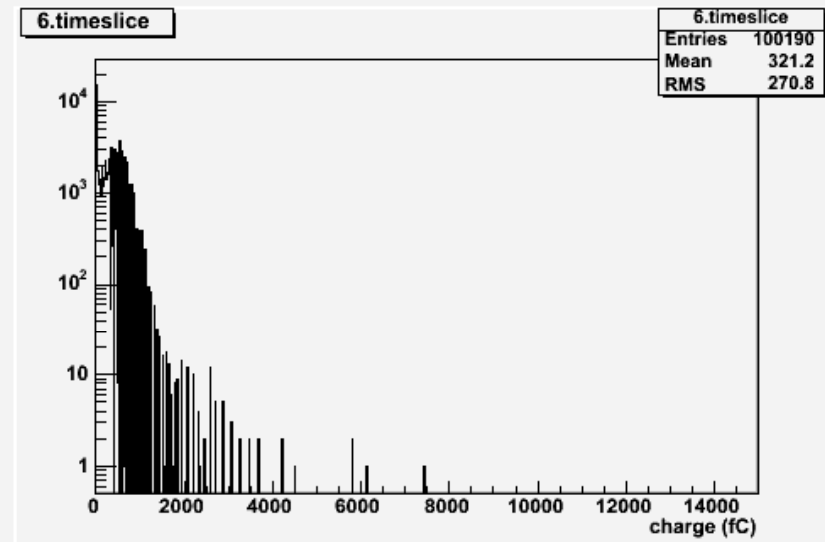
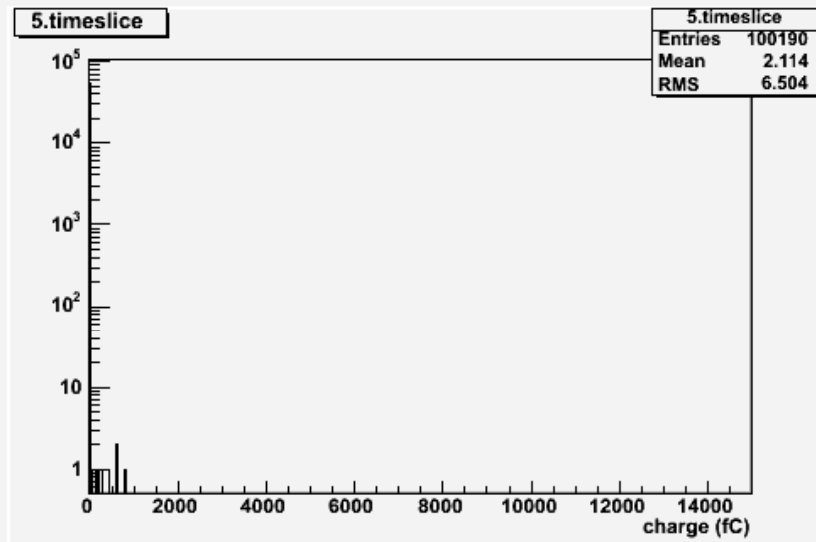


- Do the anomalous events appear in time intervals other than the interval that the beam is incident on?

➤ Check time slices...

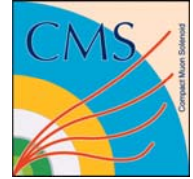


100 GeV pion run, incident tower(tower 2) time slices 5 through 8





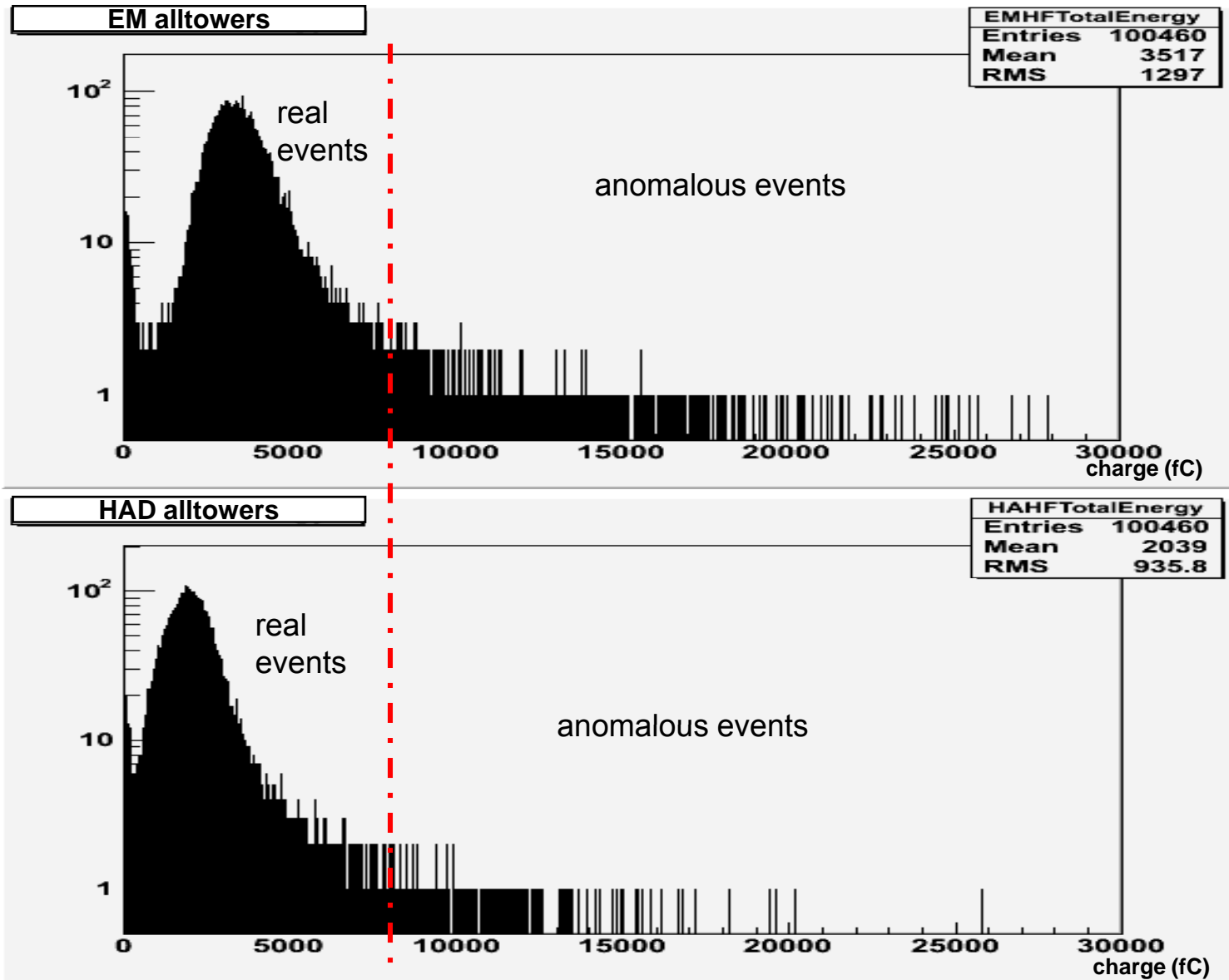
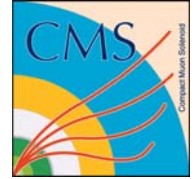
EM vs HAD channels



- How do the EM and HAD channels compare in terms of the number of anomalous events?
- histograms for the sum of all towers...

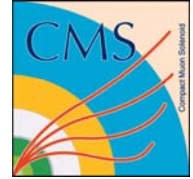


300 GeV pion beam, all towers EM and HAD channels





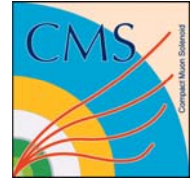
TS6 vs TS7



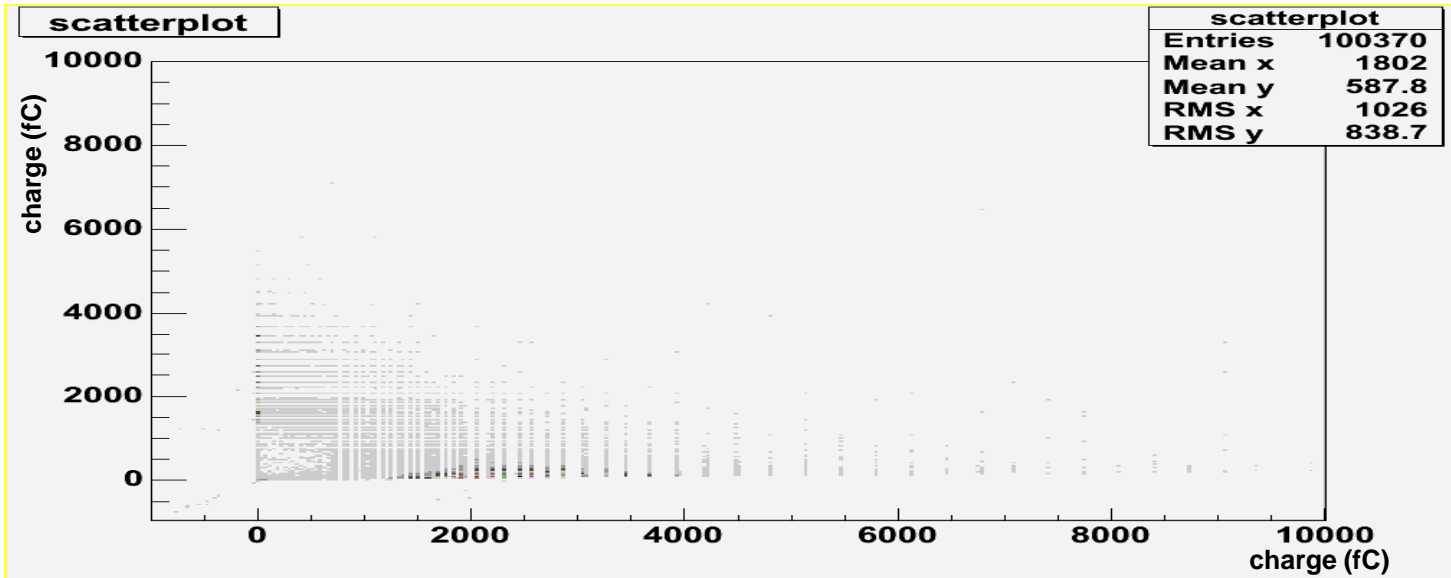
- Concentrate on the time interval that the beam is incident in, namely the 6th and 7th time slices. How are they related?
- scatter diagrams for incident tower and all other towers...



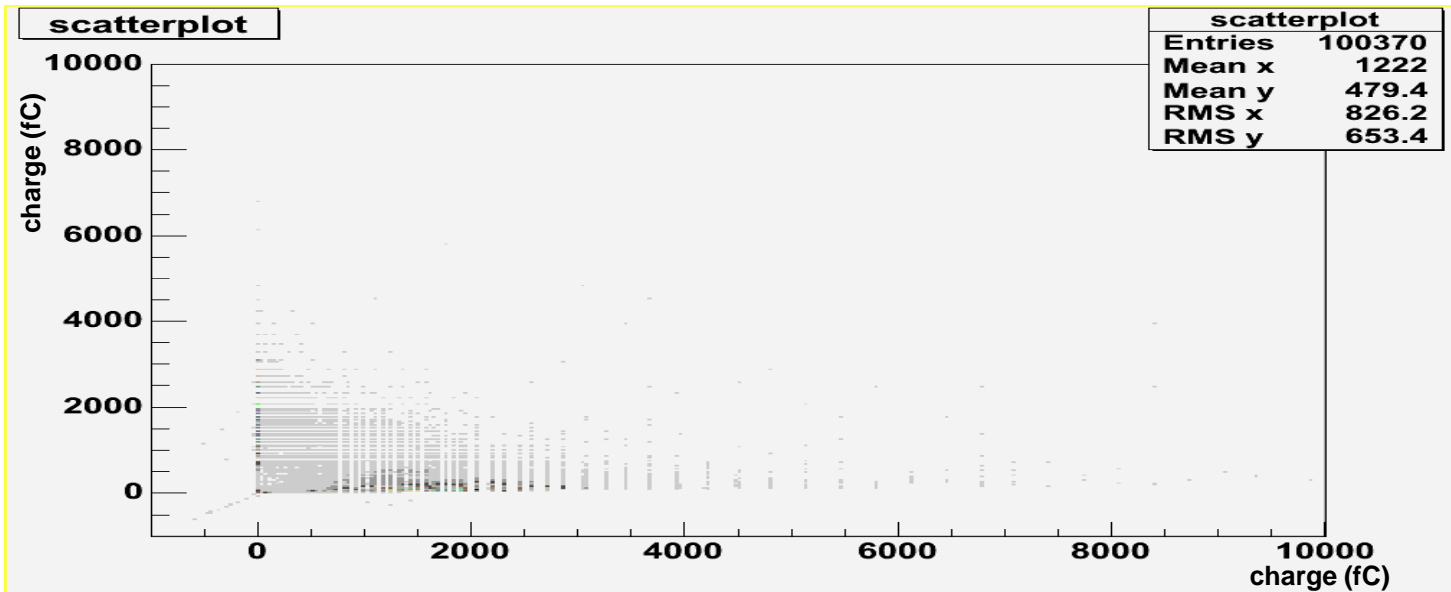
300 GeV pions, TS6 vs TS7 incident tower (tower 2)



EM
channel



HAD
channel

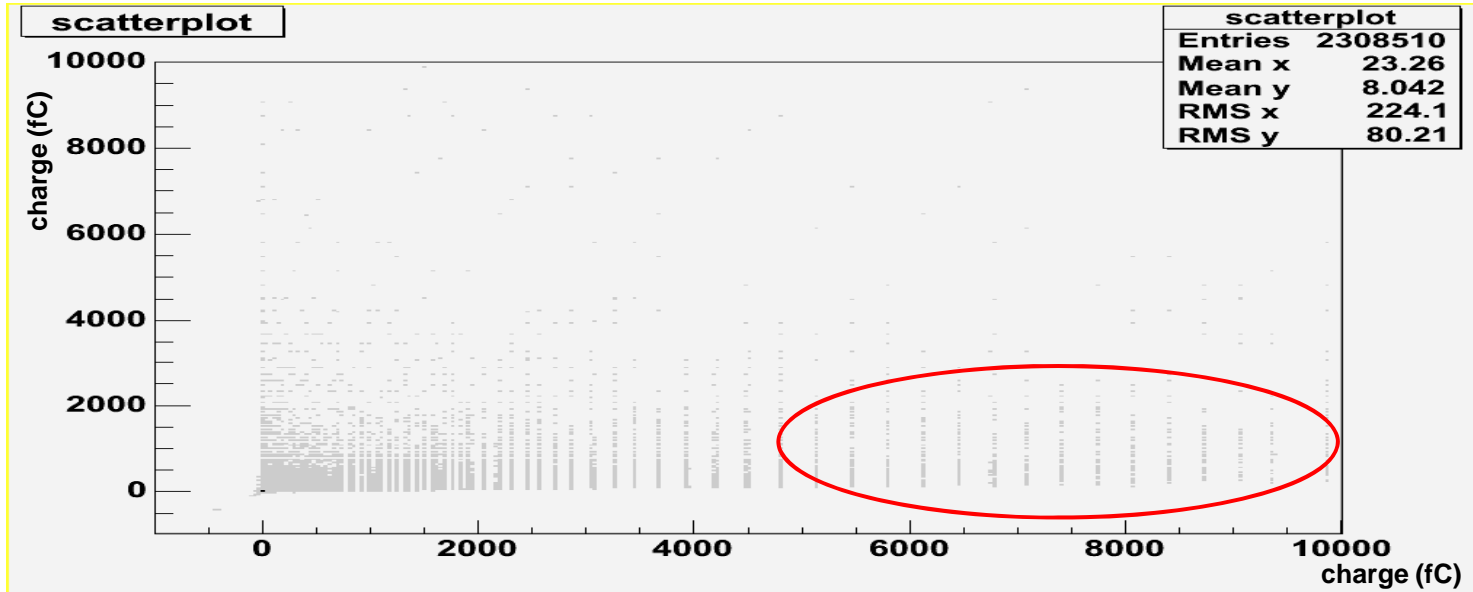




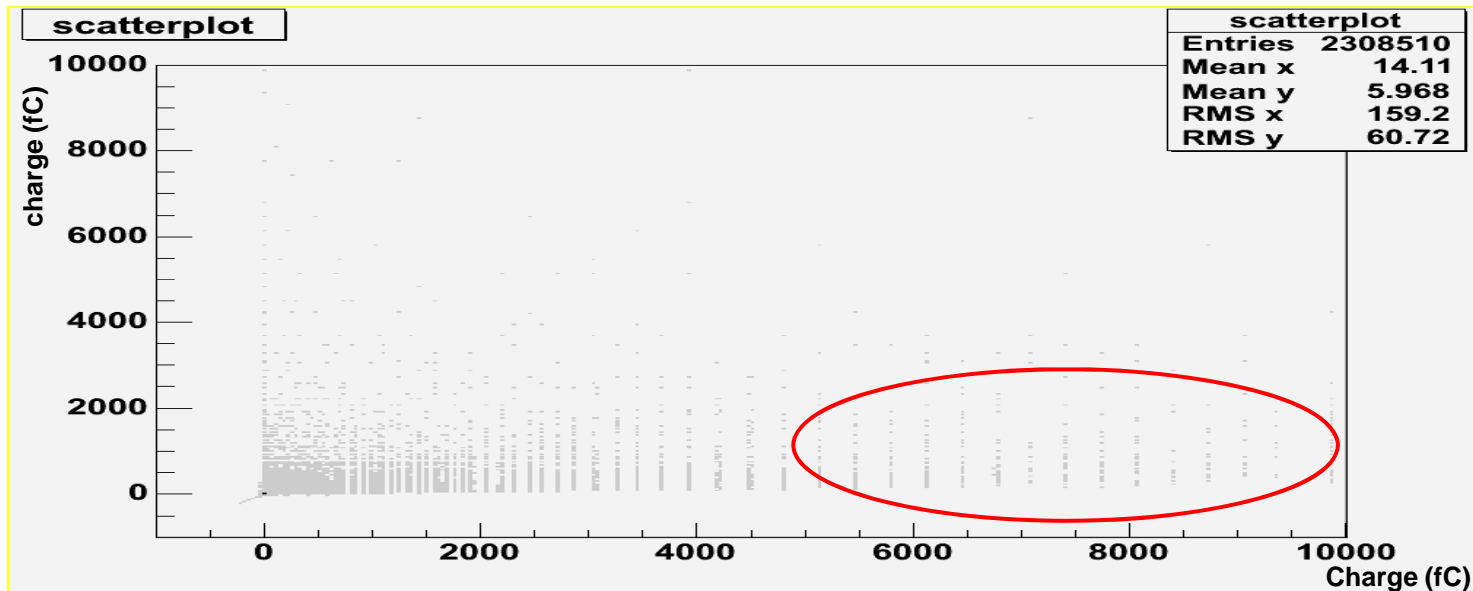
300 GeV pions, TS6 vs TS7 sum of all other towers



EM
channel

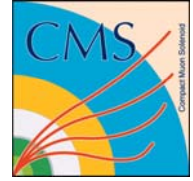


HAD
channel





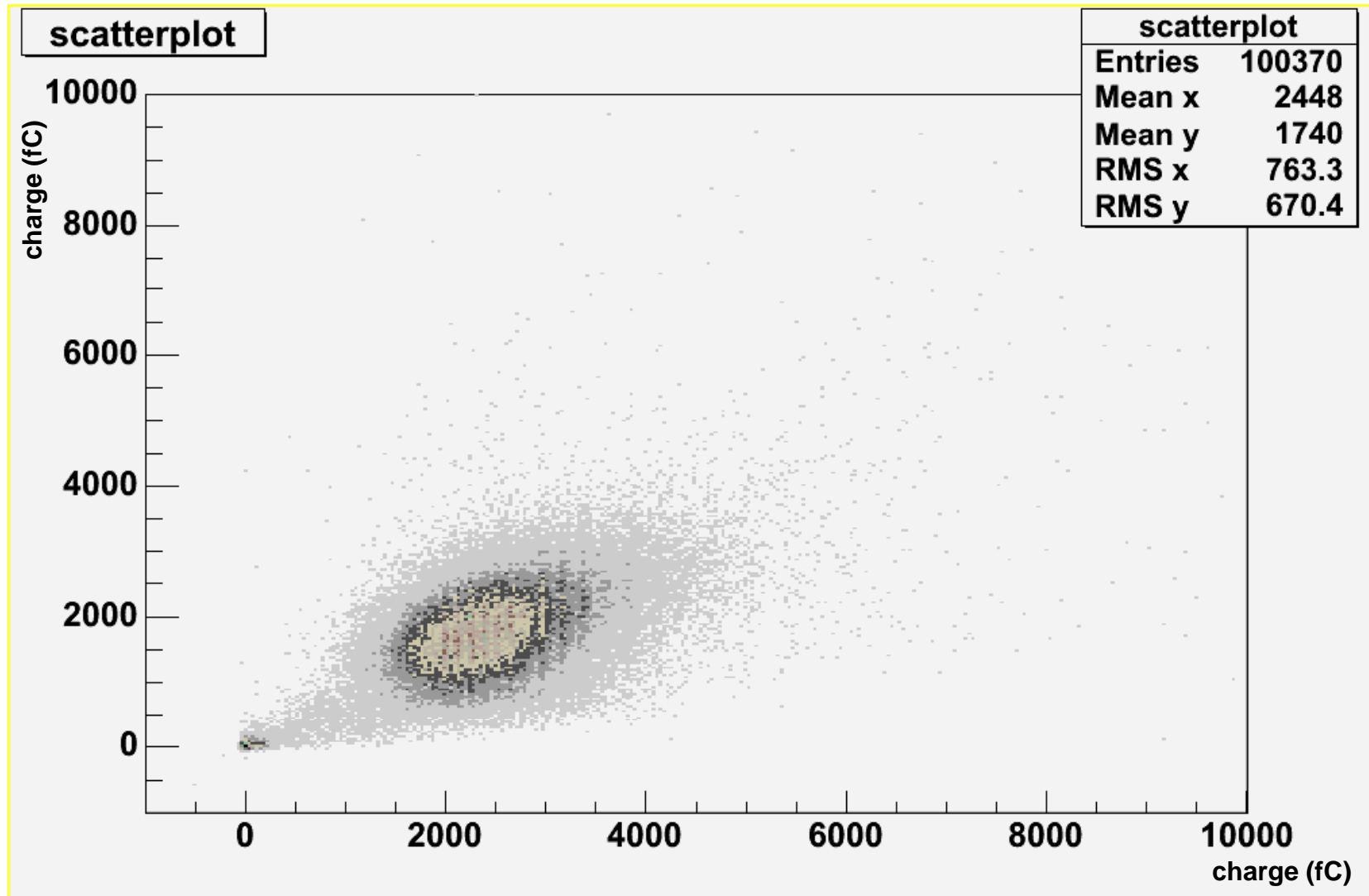
EM vs HAD channels



- How are the EM and HAD channels of an anomalous event related?
- scatter diagrams for EM vs HAD channels, both for incident tower and all other towers.

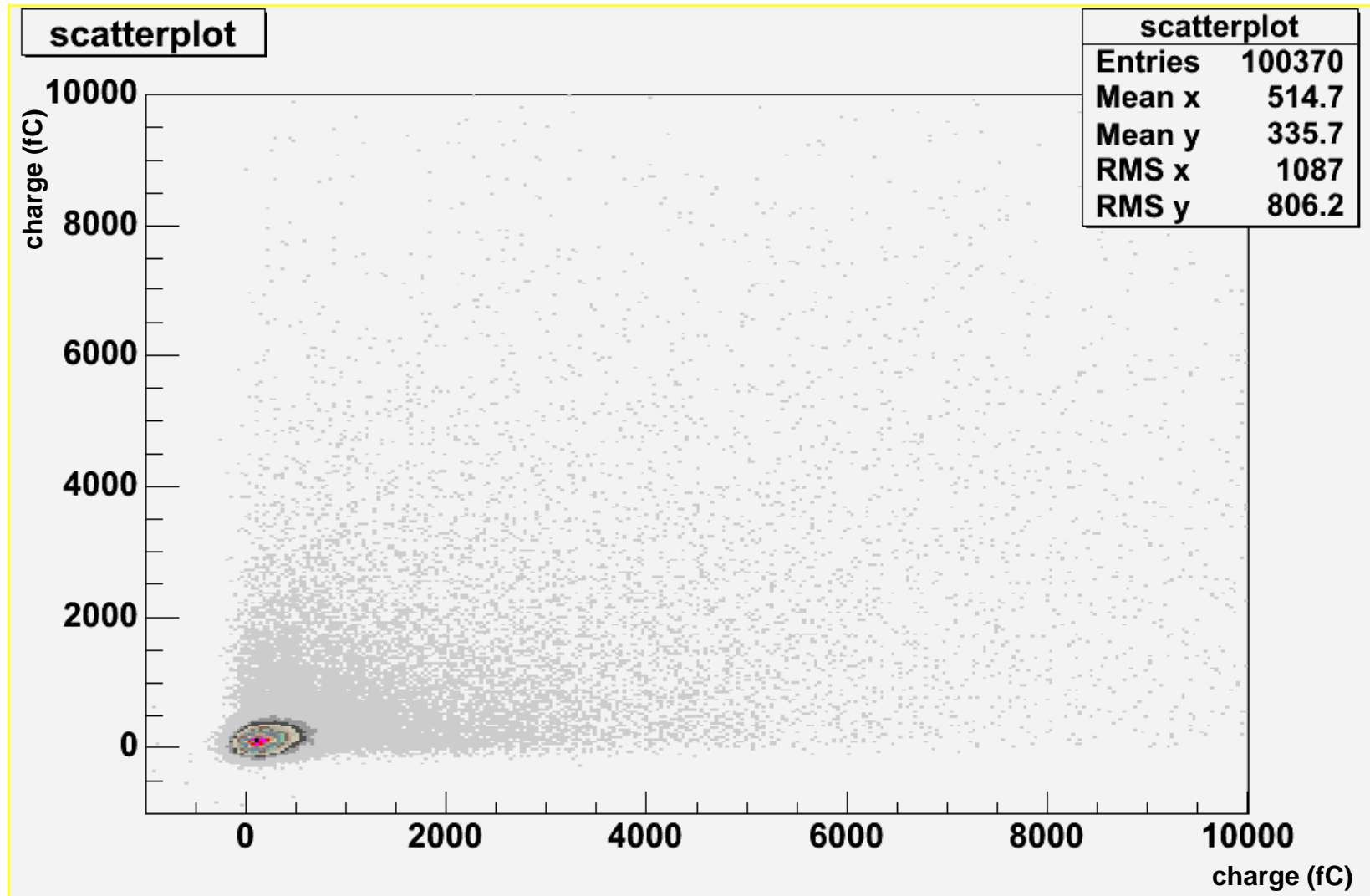


300 GeV pion beam, EM vs HAD incident tower (tower 2)



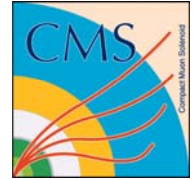


300 GeV pion beam, EM vs HAD all other towers





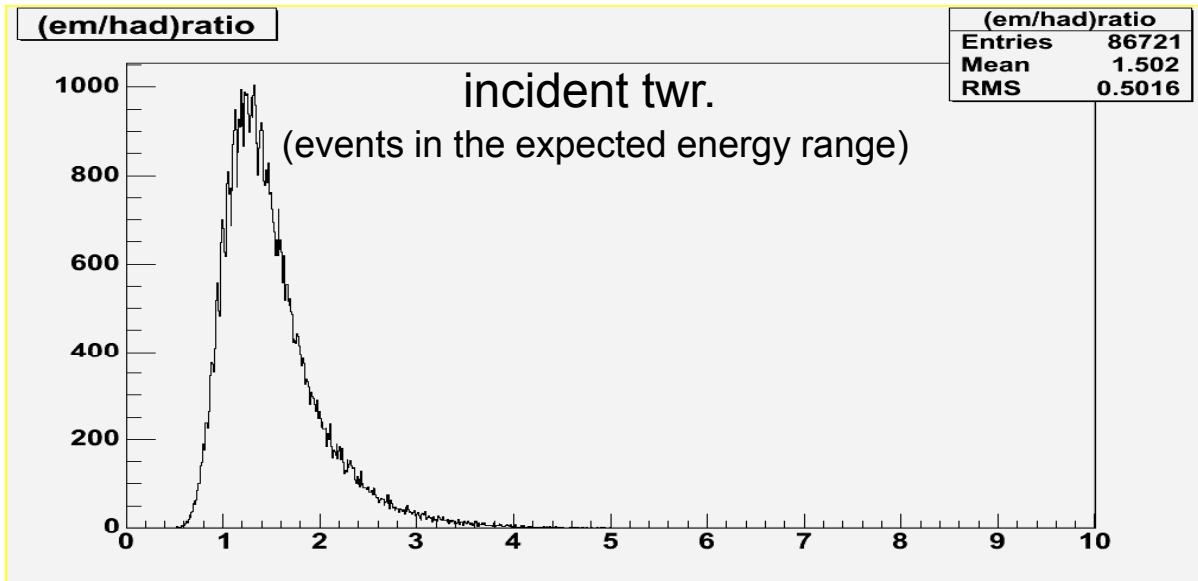
EM/HAD energy ratios



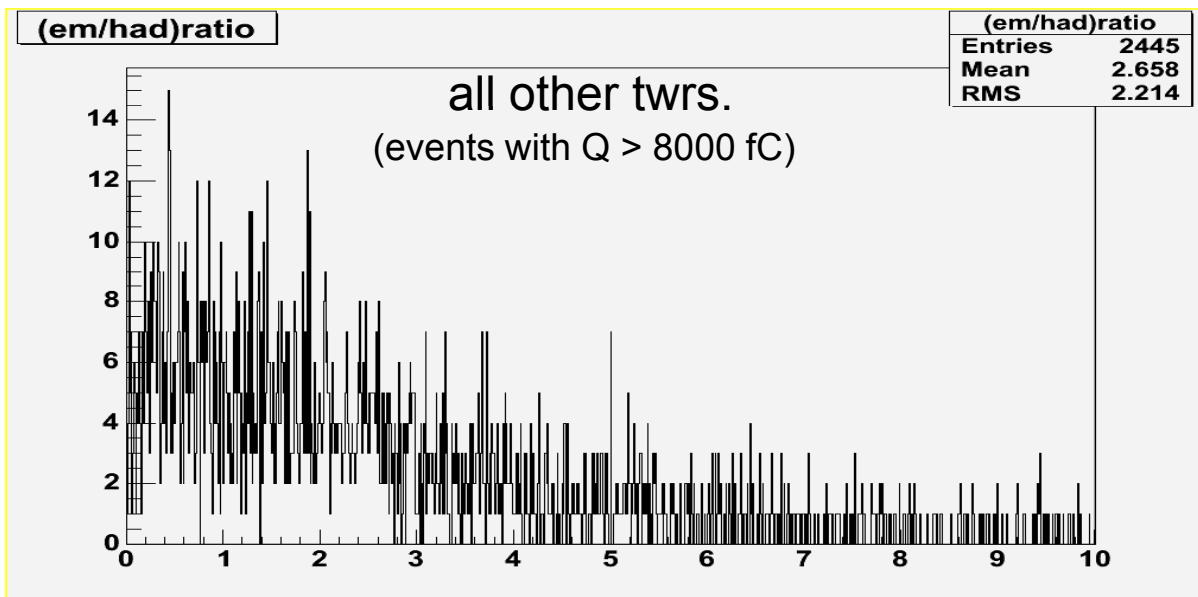
- Do anomalous events generate comparable signals in both EM and HAD channels, as normal events do?
- Investigate the behavior of EM/HAD and HAD/EM energy ratios...



300 GeV pions, EM/HAD ratio



Incident channel EM/HAD histogram displays a clear peak, justifying the existence of a correlation between the two channels for real events.



Events with abnormally high signals in the EM channel do not have signals of comparable magnitude in the HAD channel.



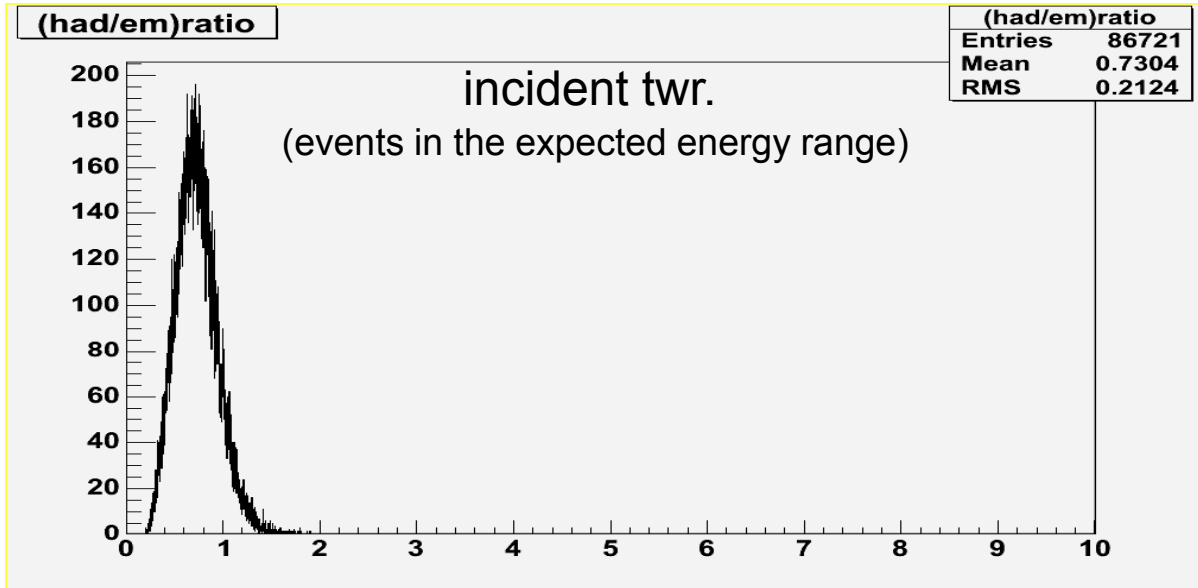
Conclusions



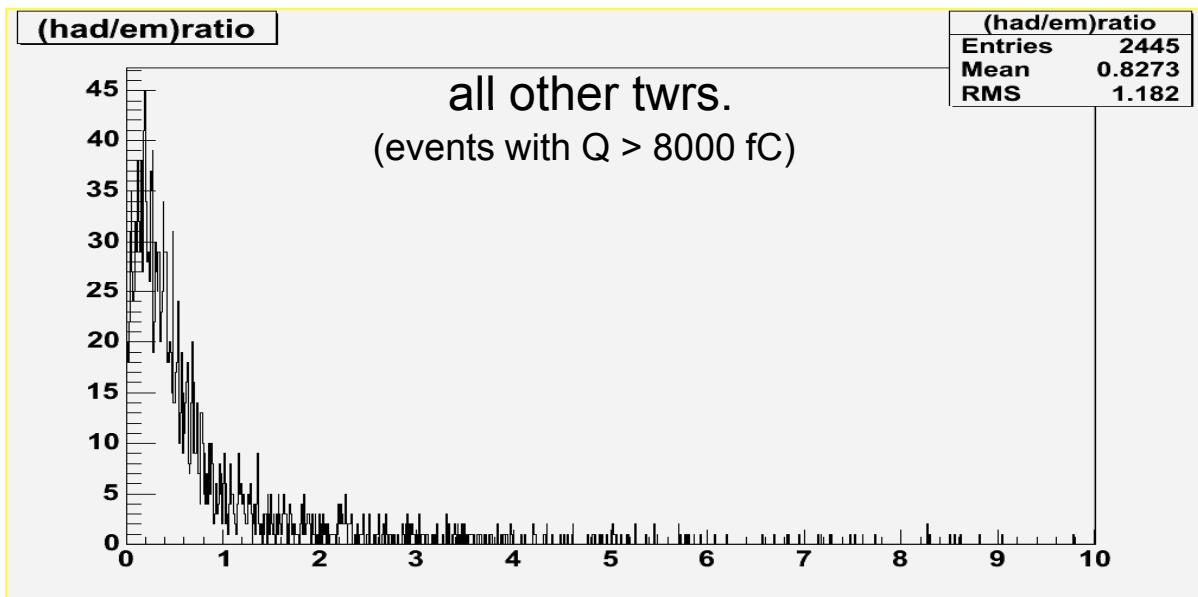
- Real events have comparable energies in both the EM and HAD channels whereas anomalous events lack such a correlation.
- This implies that the anomalous events were not collected the way they should have been.
- The effect seems to be amplified in towers behind which the readout boxes reside. Particles directly hitting the PMTs are most probably the cause of anomalous signals.



(Backup Slide) 300 GeV pions, HAD/EM ratio



The peak emerges again for the inverse ratio.



Similarly, events with abnormally high signals in the HAD channel do not have signals of comparable magnitude in the EM channel.