Offline study of occillation data

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Some plots are made with the data taken on Dec 19 on module 1012.

Three sets of Data were taken with the respective conditions:
1) Without either offsets and ACMC
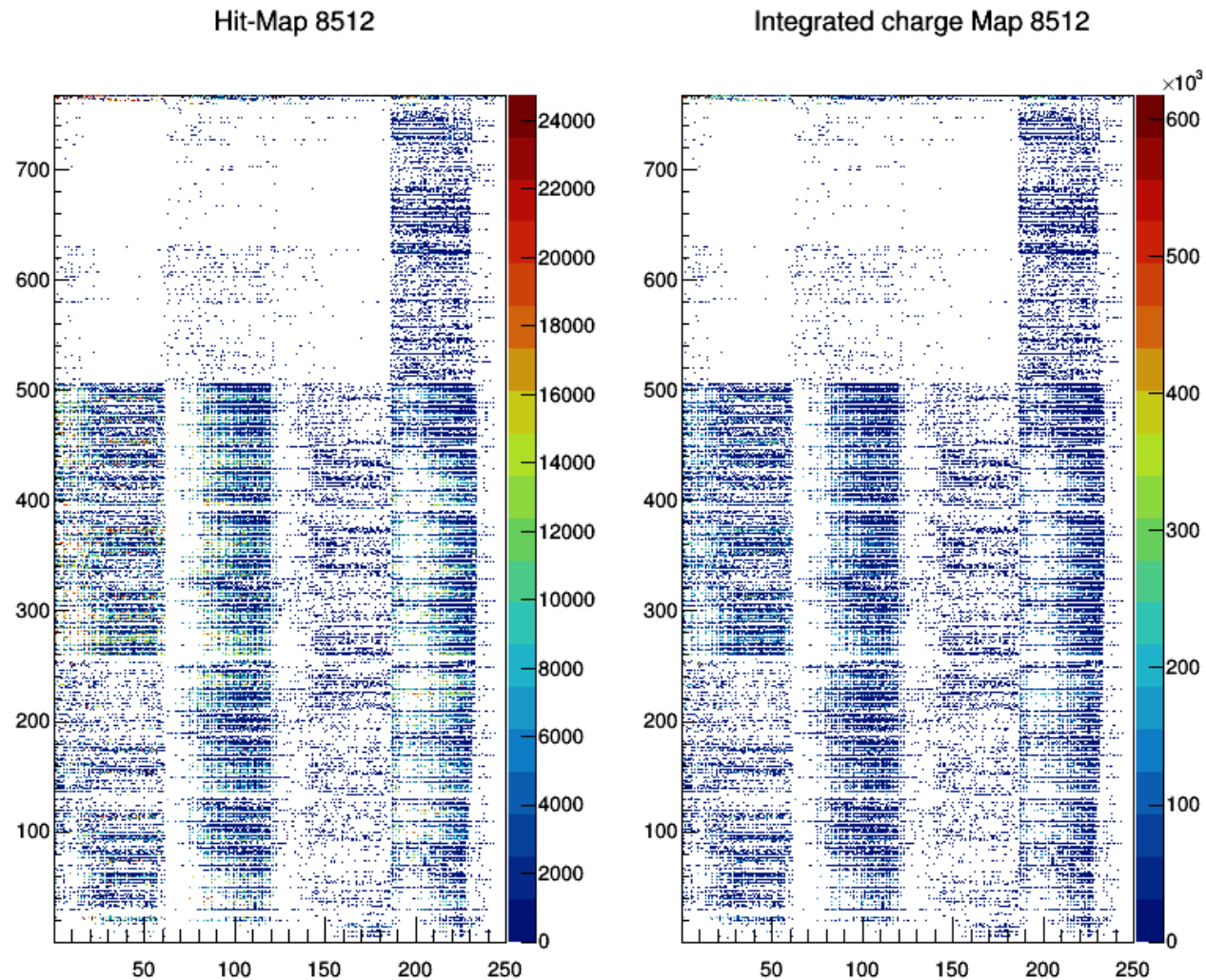2) With only ACMC on
3) With both offset and ACMC on

We look at some of the features of the oscillations.

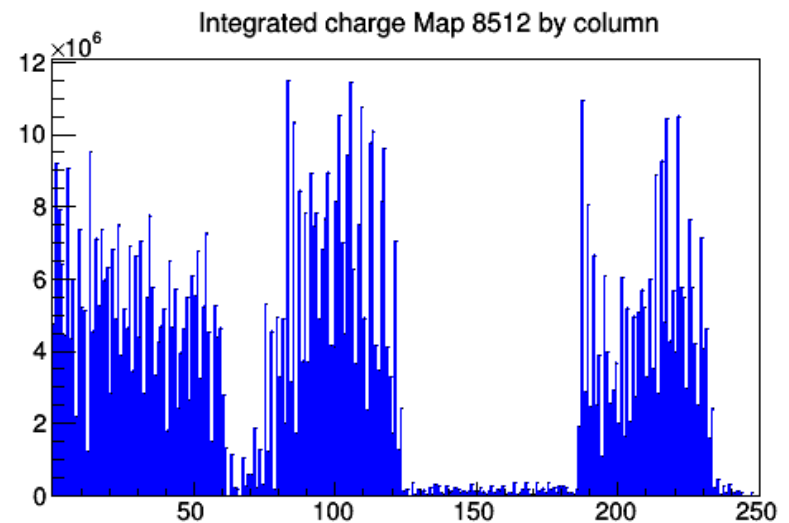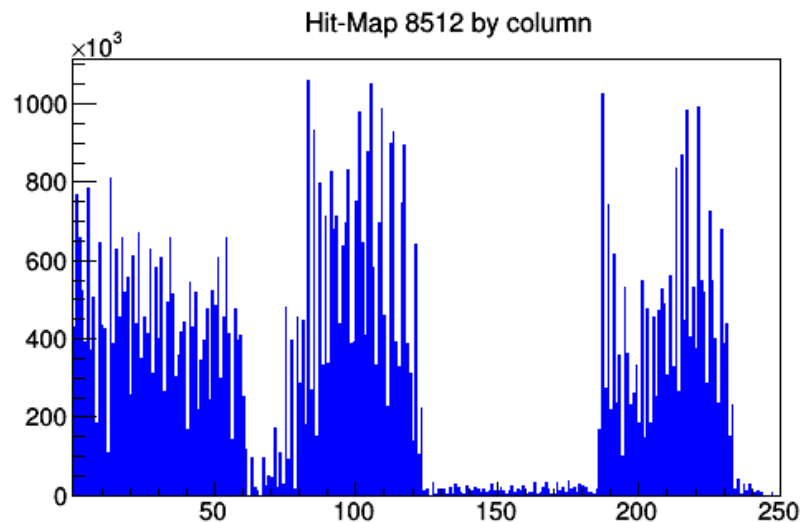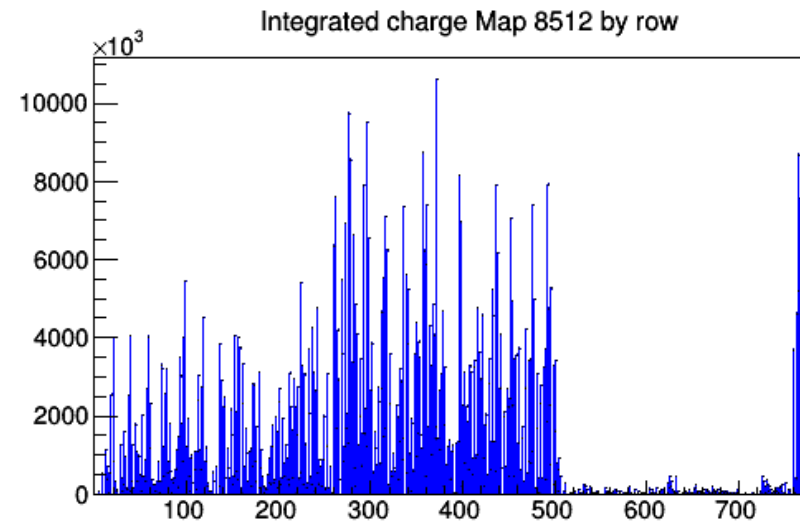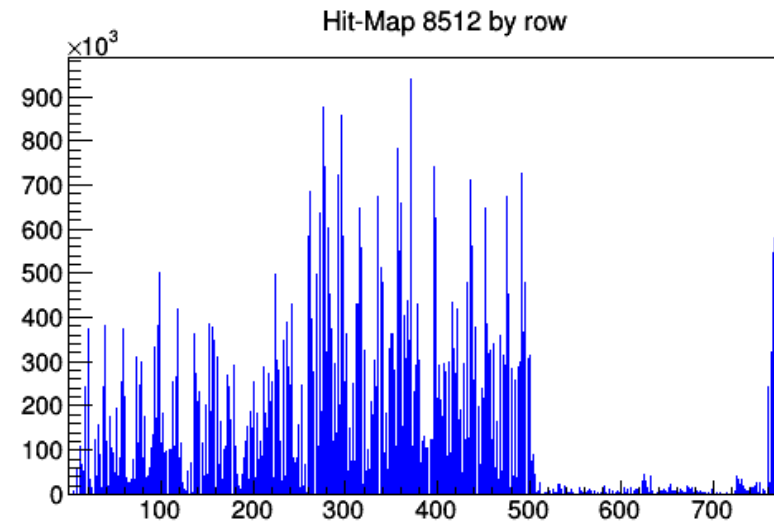Data taken with:
i) Offset : off
ii) ACMC : off

Integrated hit and charge maps:

- For DCD 1, 2 and 3, there seems to be a less noisy patch from row ~ 500 - 760

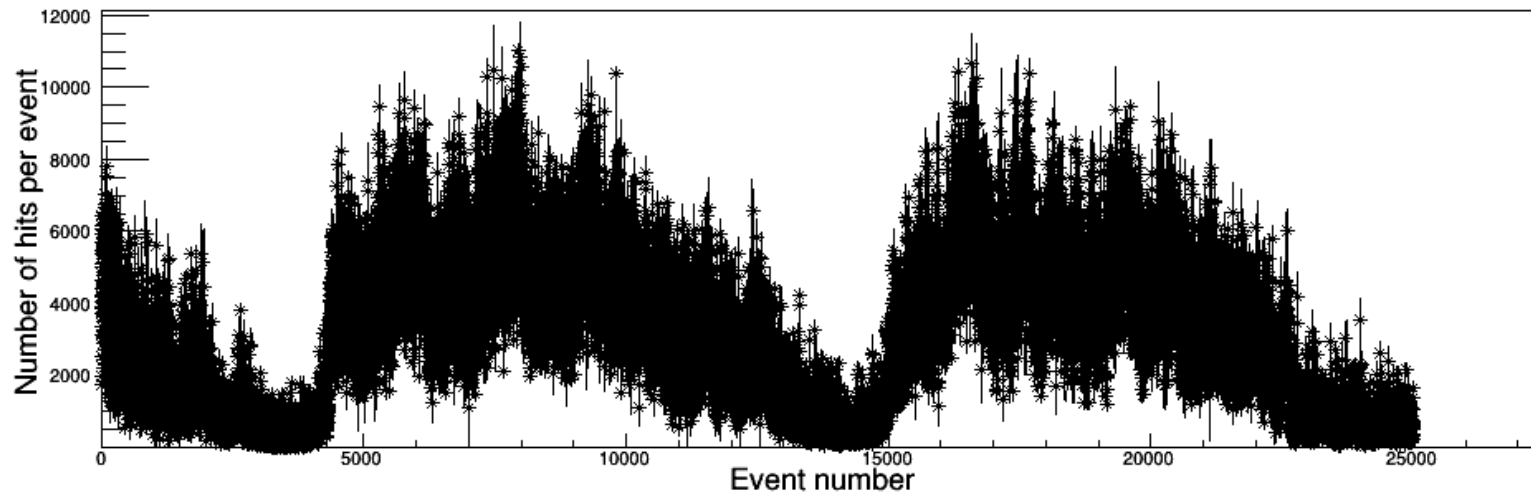# Integrated hit and charge maps: row and column projections
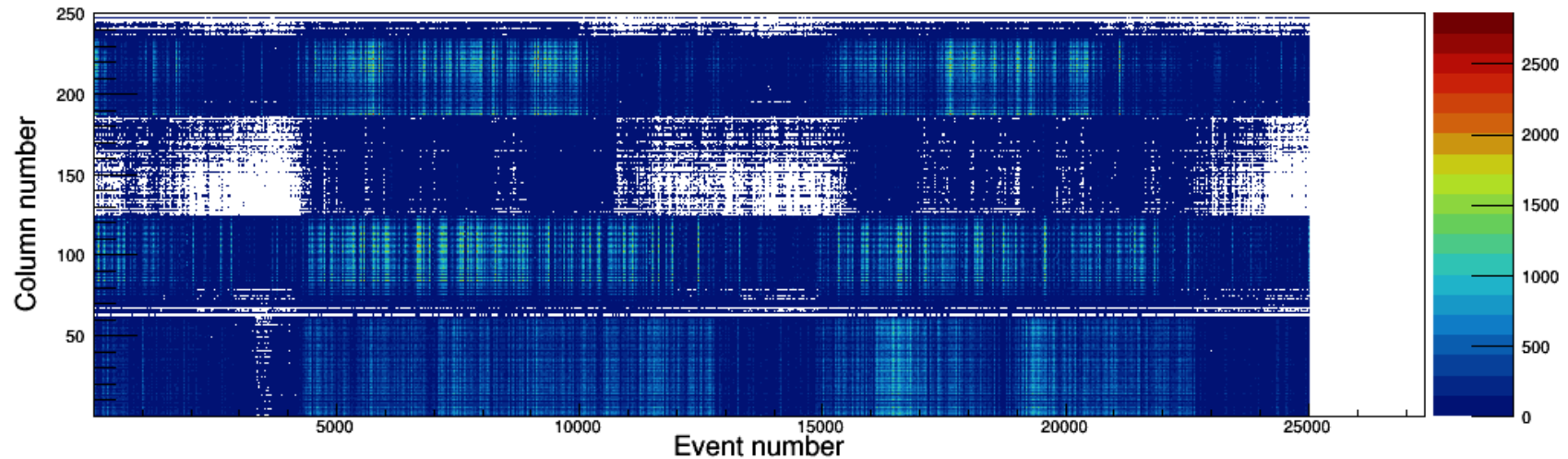
- DCD-3 is less noisy compared to 1, 2 and 4

Time evolution: Occupancy and Column charge

- Large oscillations in occupancy, upto 10^4 fired pixels per event with period ~2 minutes (~10000 events)
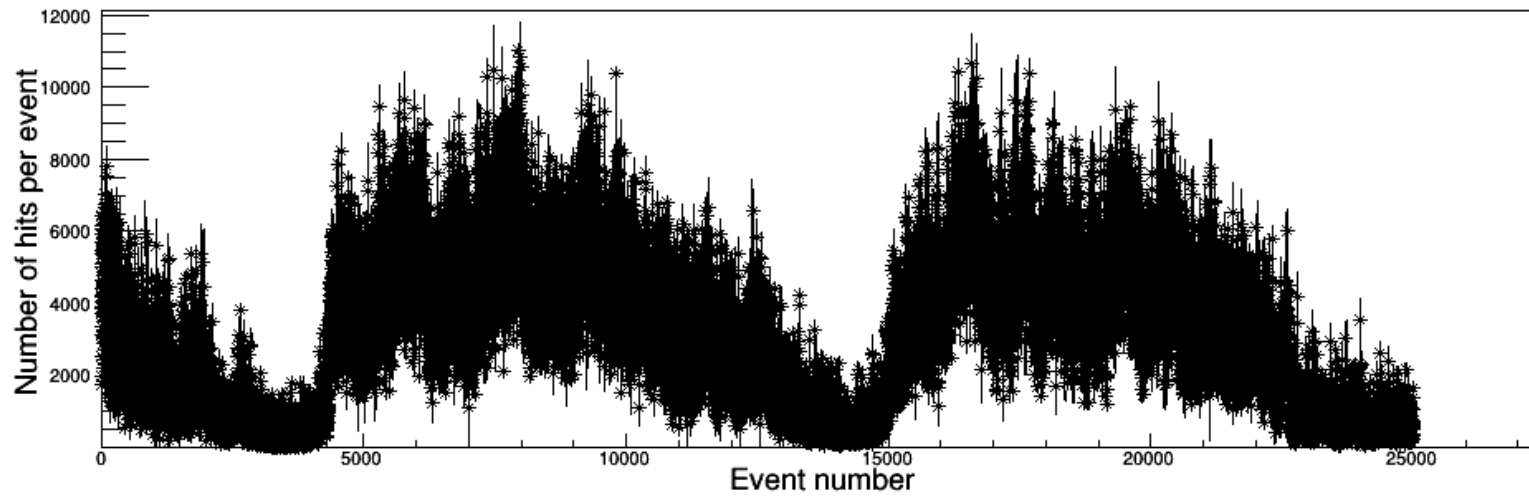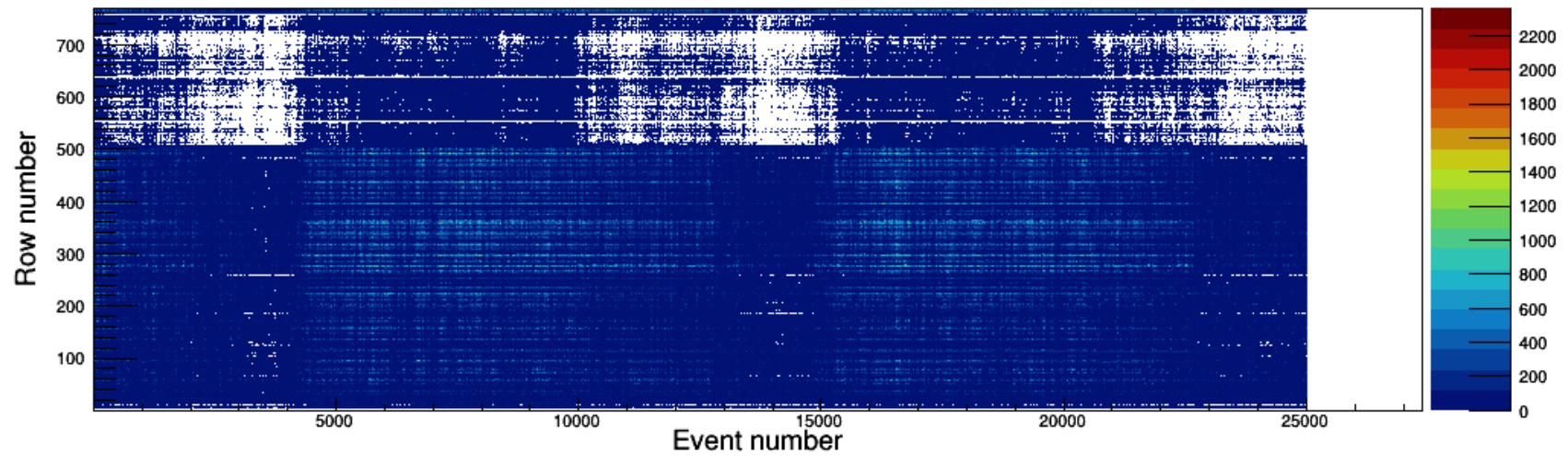

Graph
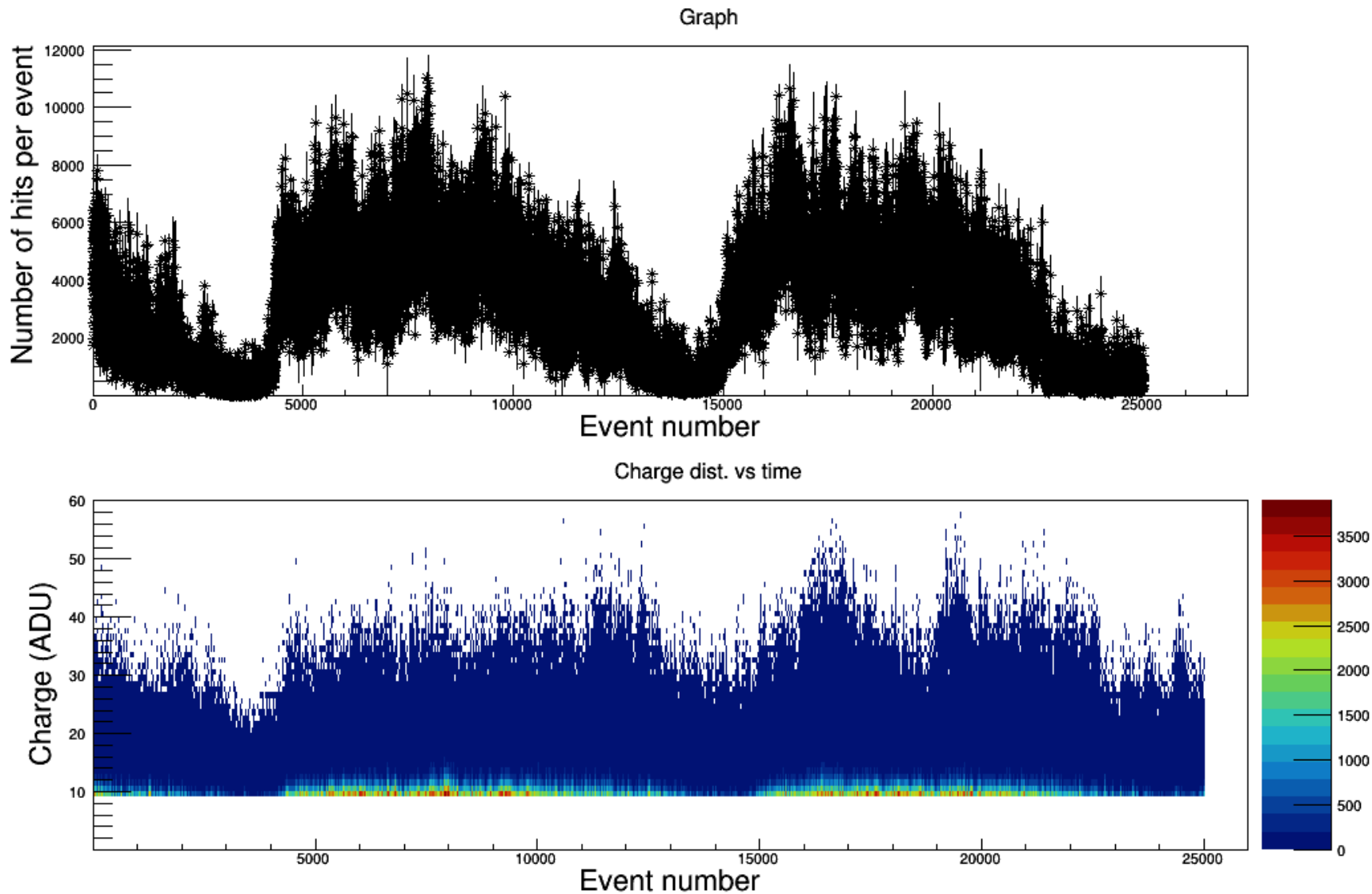

Column-charge vs time

Time evolution: Row charge

Time evolution: Charge distribution

- Large noise upto 50 ADU
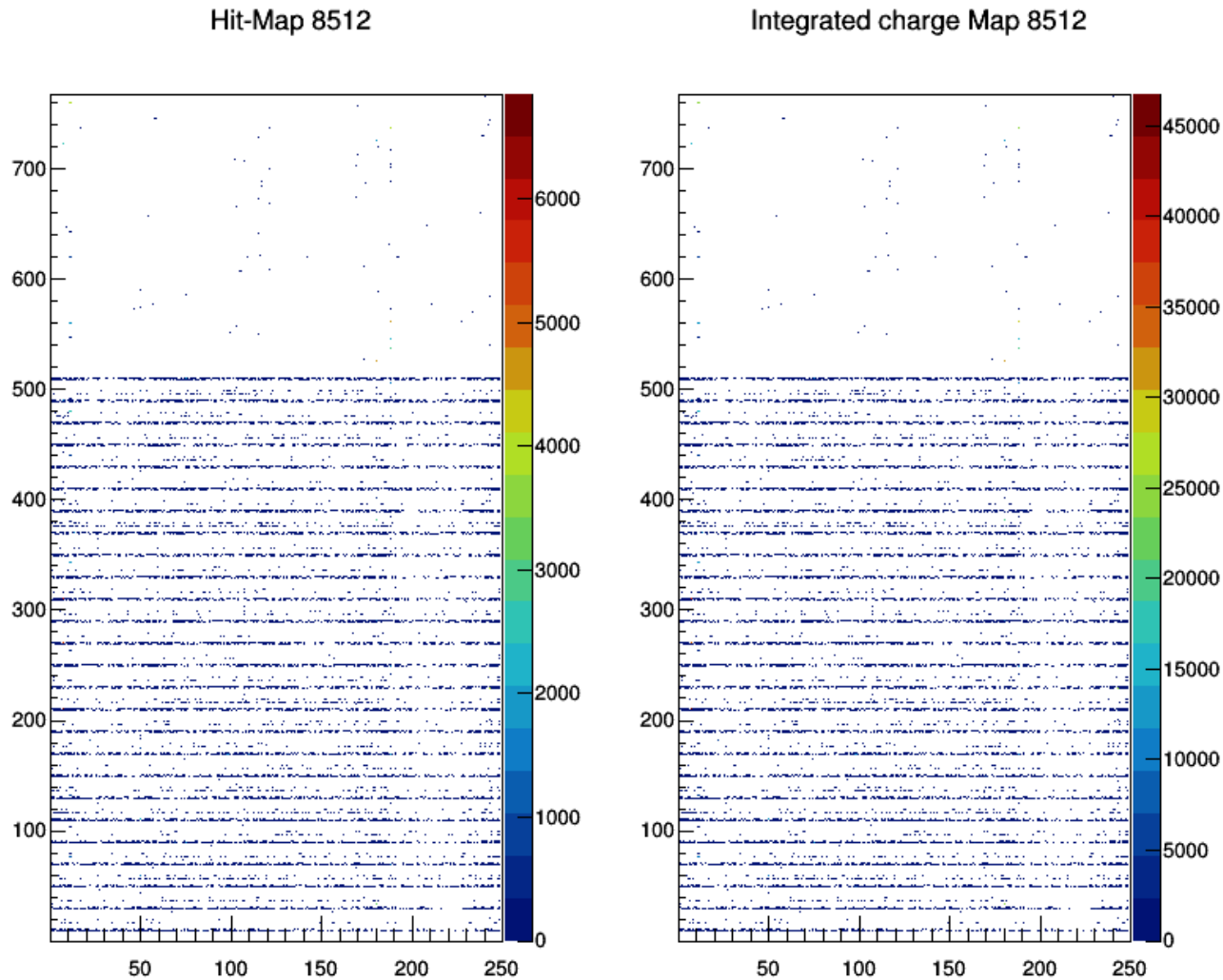
Data taken with:
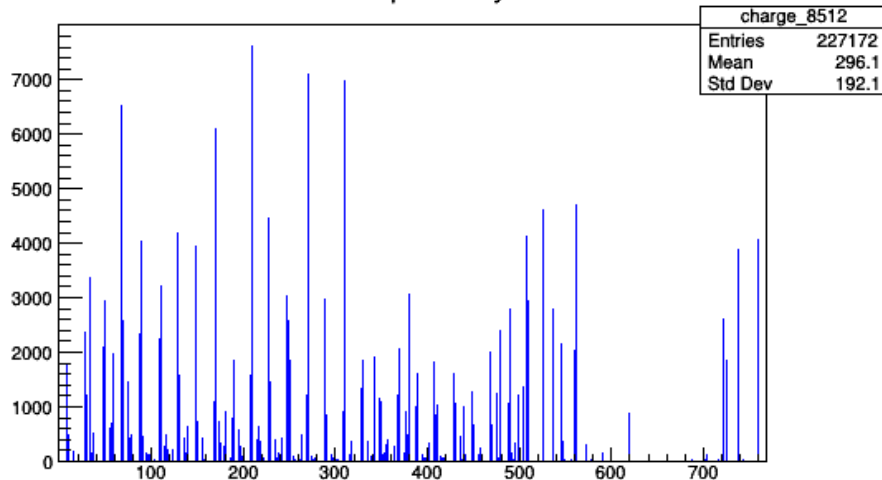i) Offset : off
ii) ACMC : on

Integrated hit and charge maps:

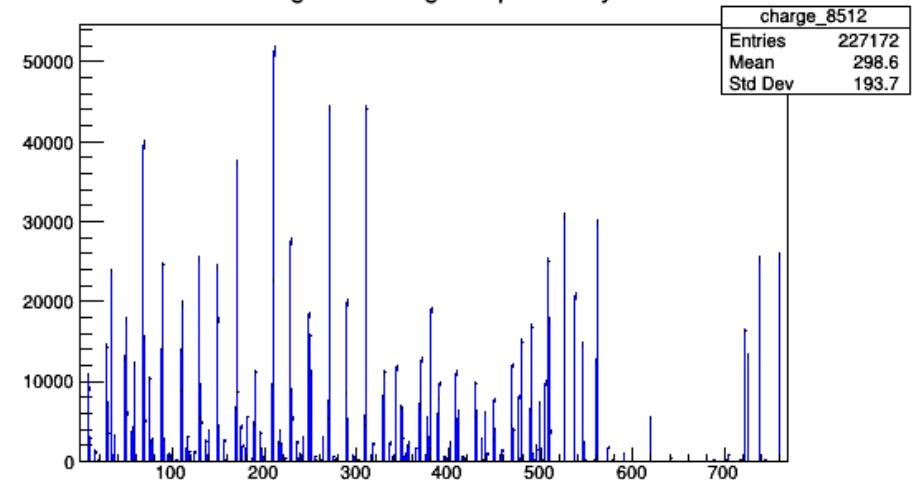- Less noisy patch from row > 500
- 'Horizontal noise lines' ?

Hit-Map 8512

Integrated charge Map 8512

Integrated hit and charge maps: row and column projections

- Appears to be a row-wise pattern with a periodicity of ~20 rows

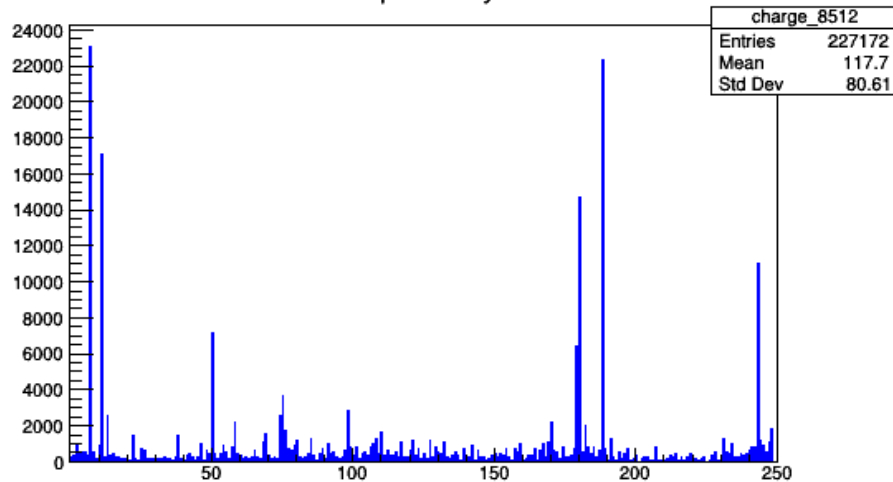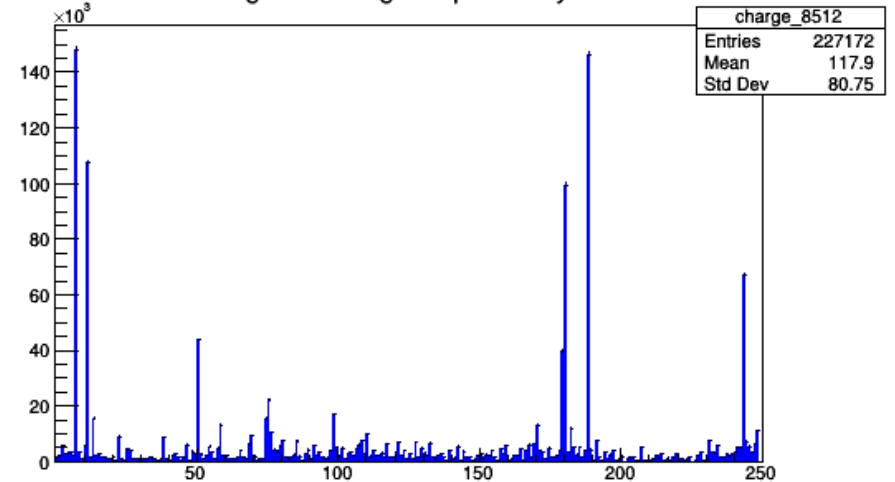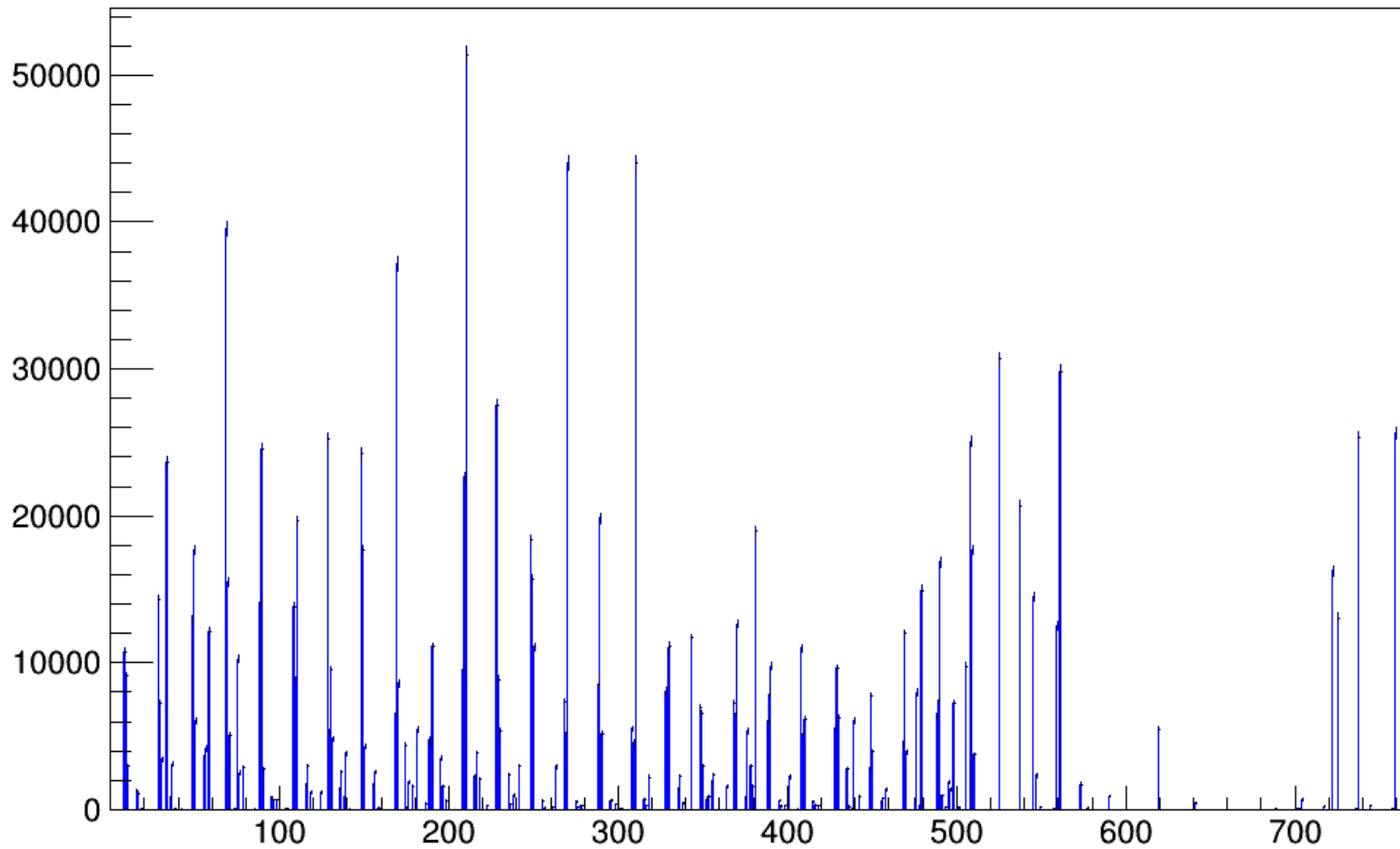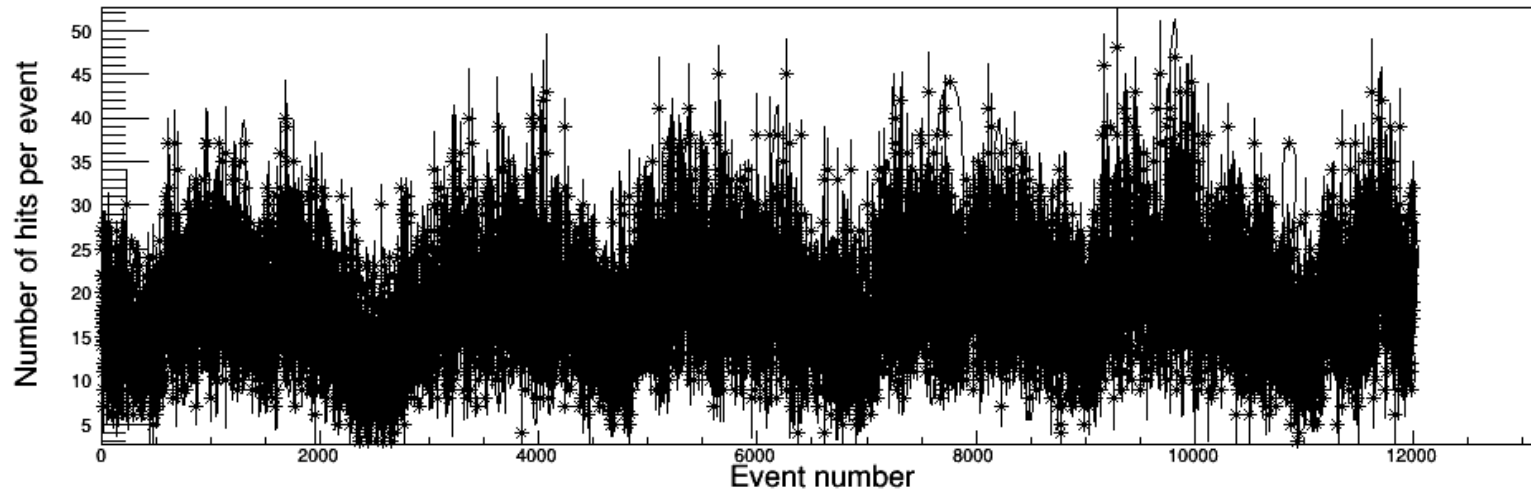# Integrated row-charge map: zoomed in

Integrated charge Map 8512 by row

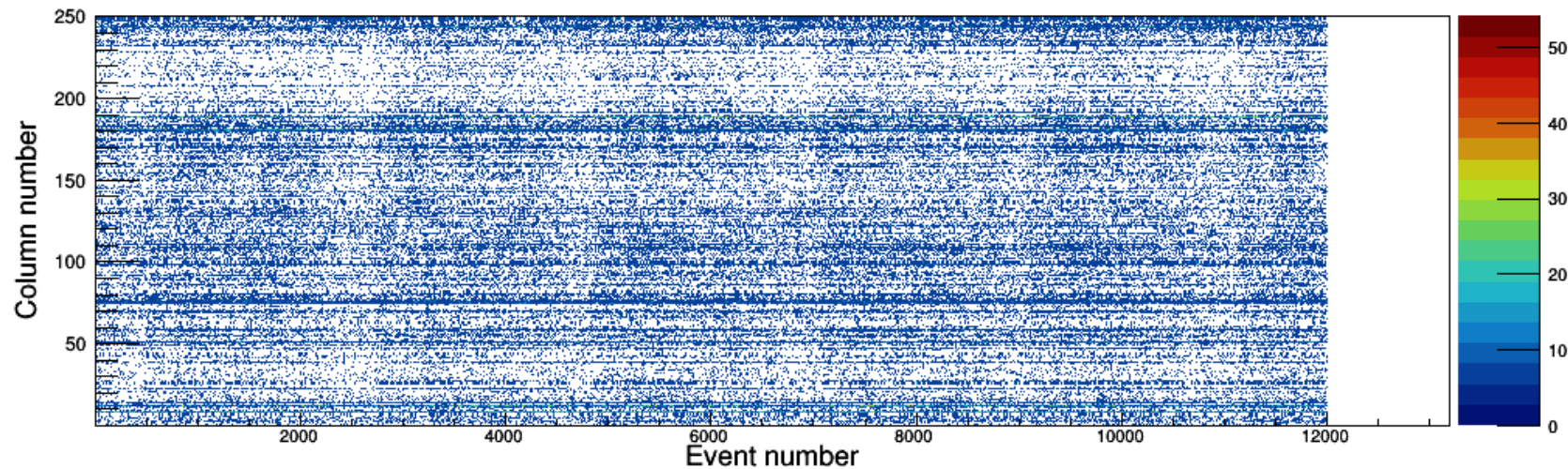# Time evolution: Occupancy and Column charge

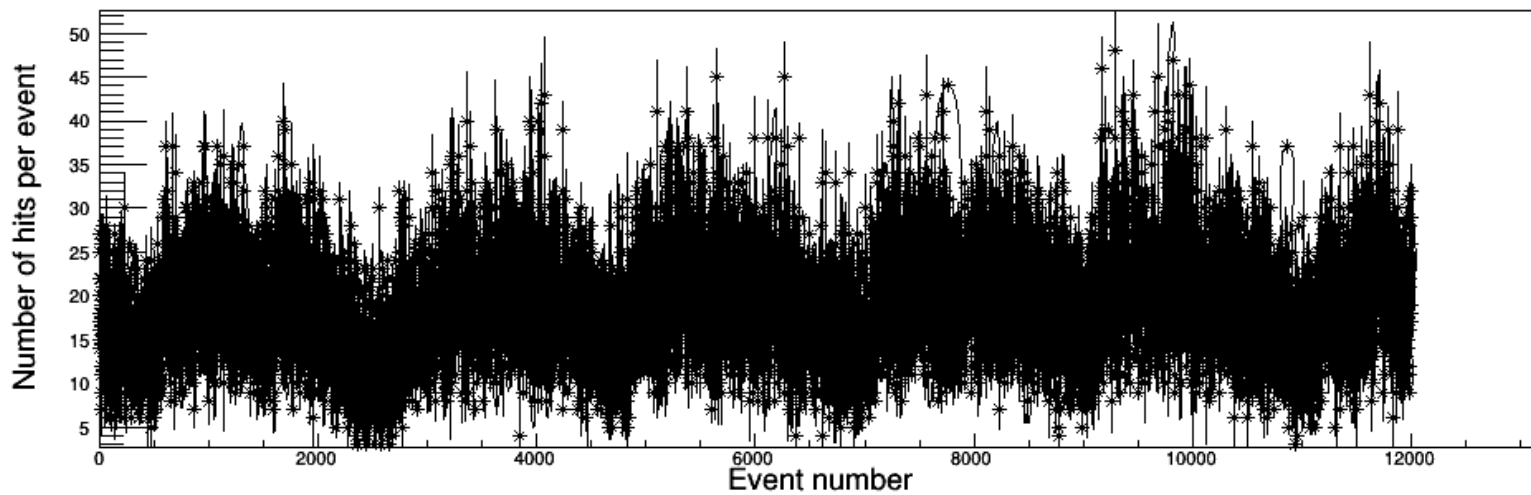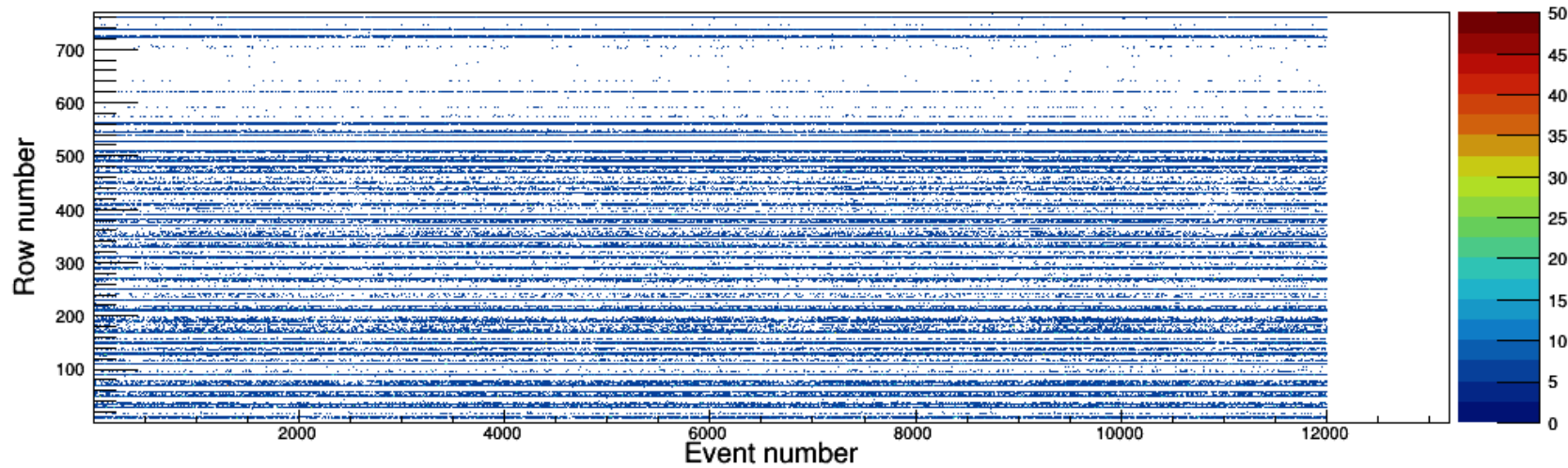- Small oscillations in occupancy, upto ~40 fired pixels per event with period ~2000 events
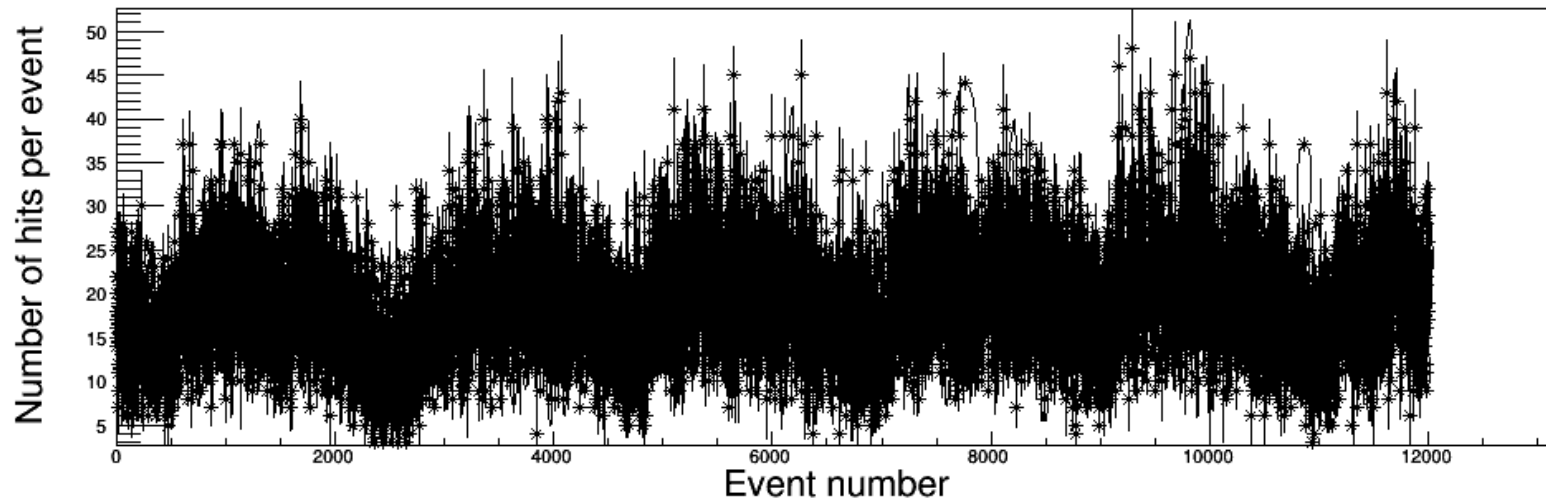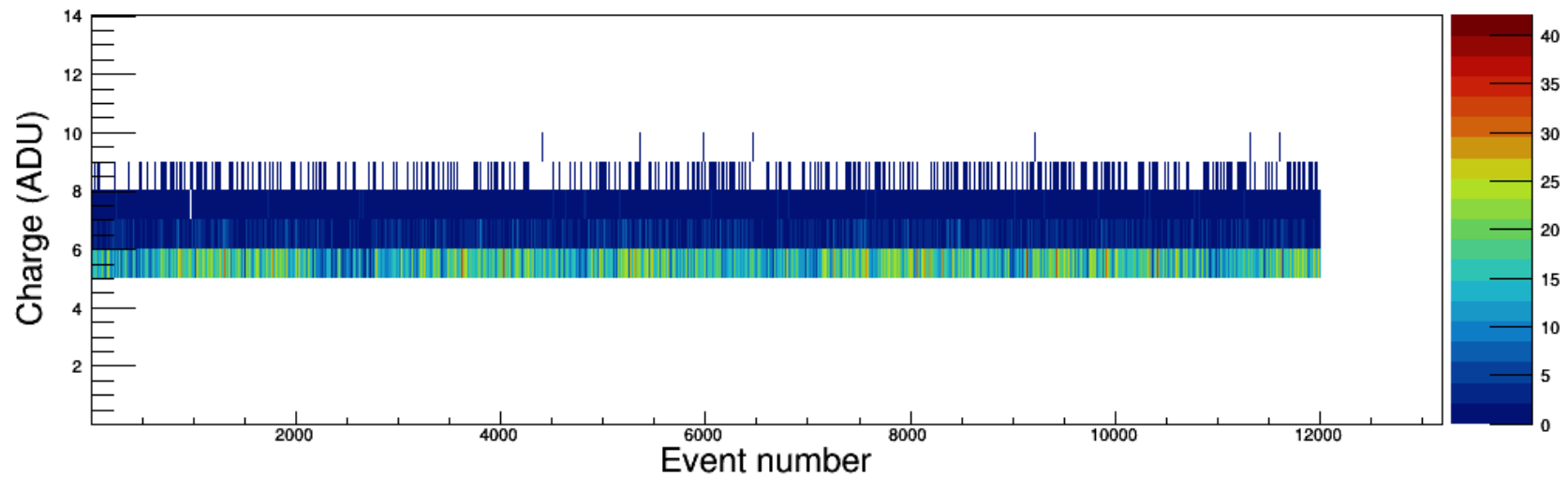
Time evolution: Row charge

Time evolution: Charge distribution

- Noise below 10 ADU

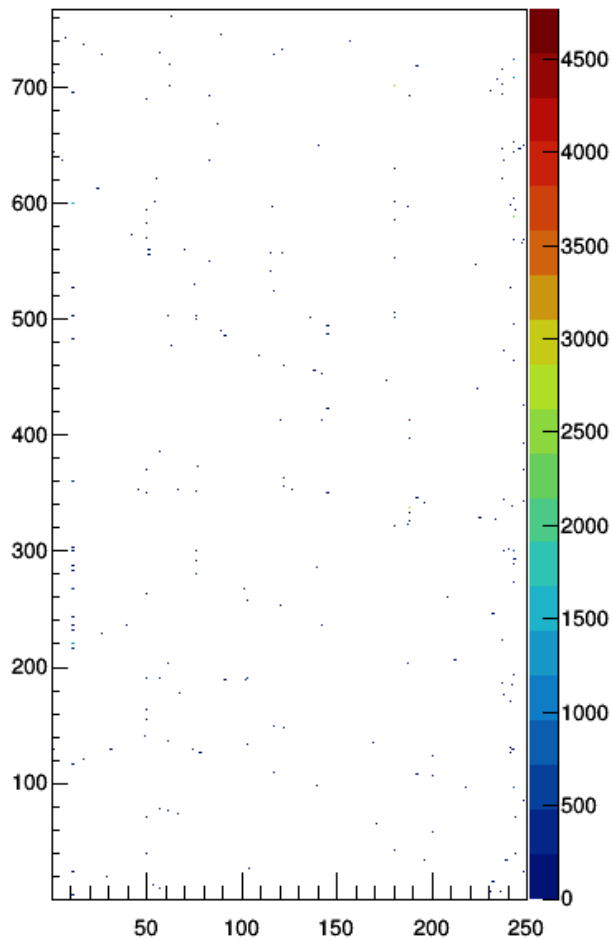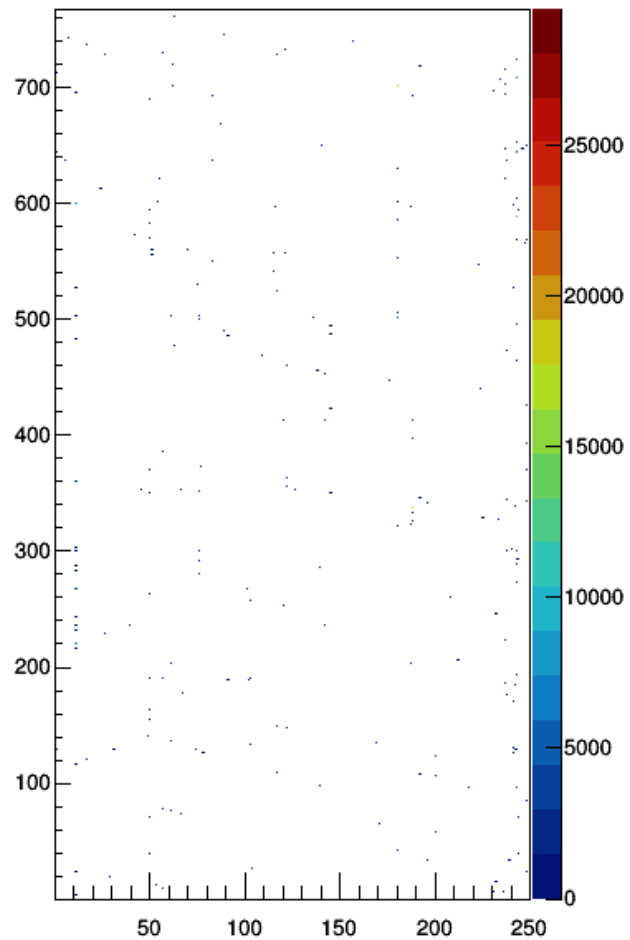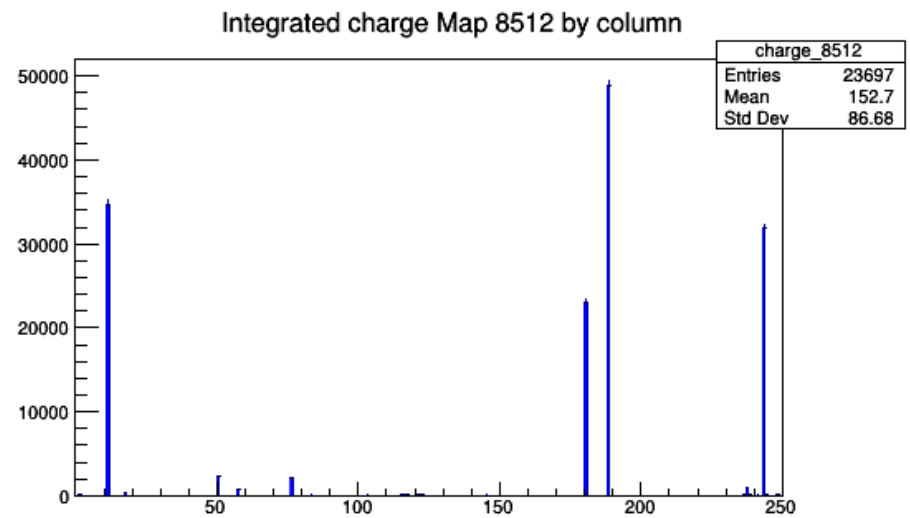Data taken with:
i) Offset : on
ii) ACMC : on

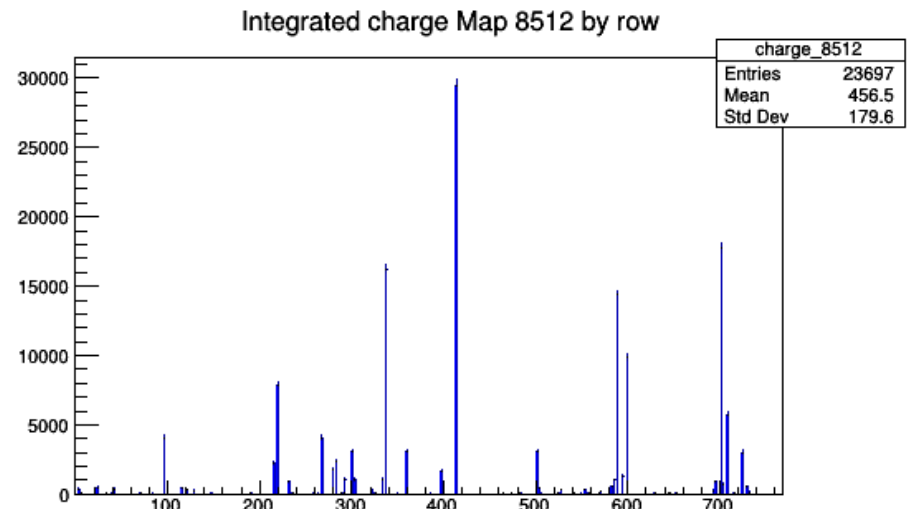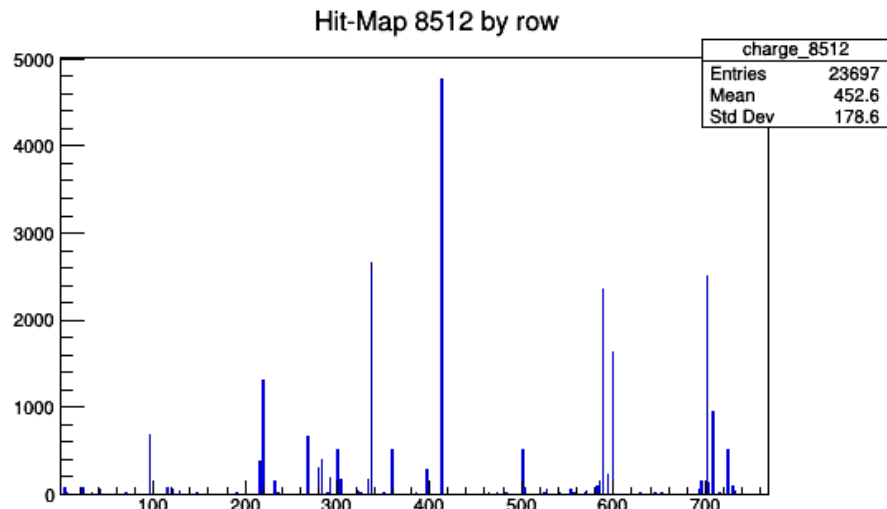# Integrated hit and charge maps:
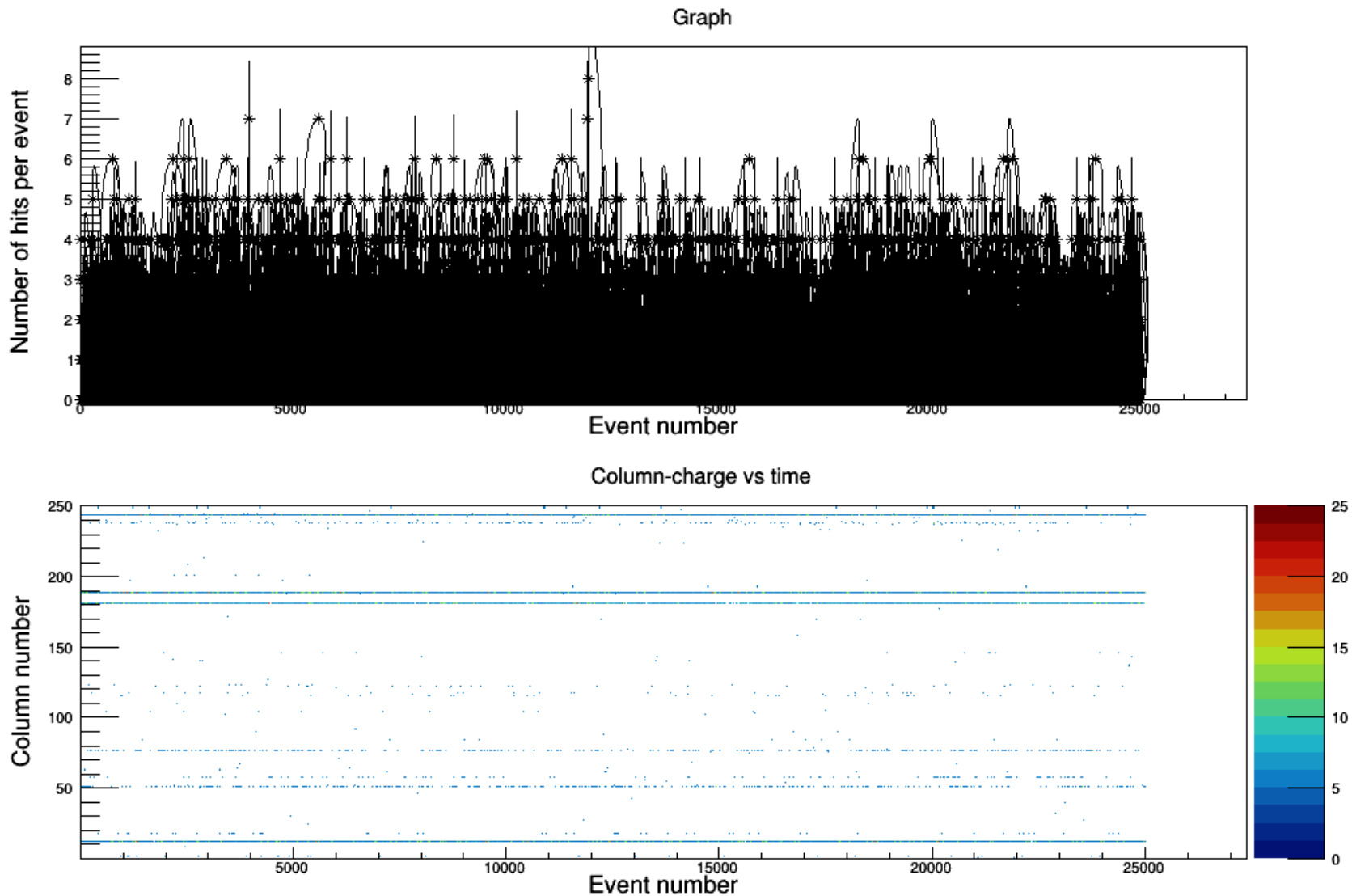
- Relatively clean noise map

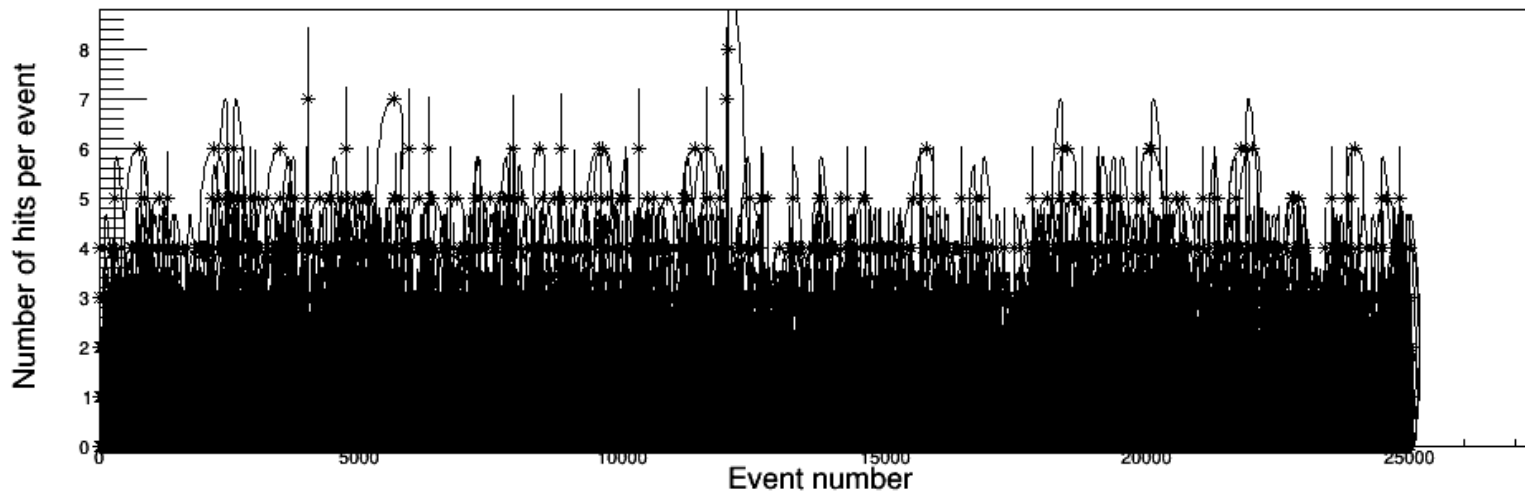# Integrated hit and charge maps: row and column projections

Time evolution: Occupancy and Column charge

- No systematic oscillations in occupancy apart from statistical fluctuations
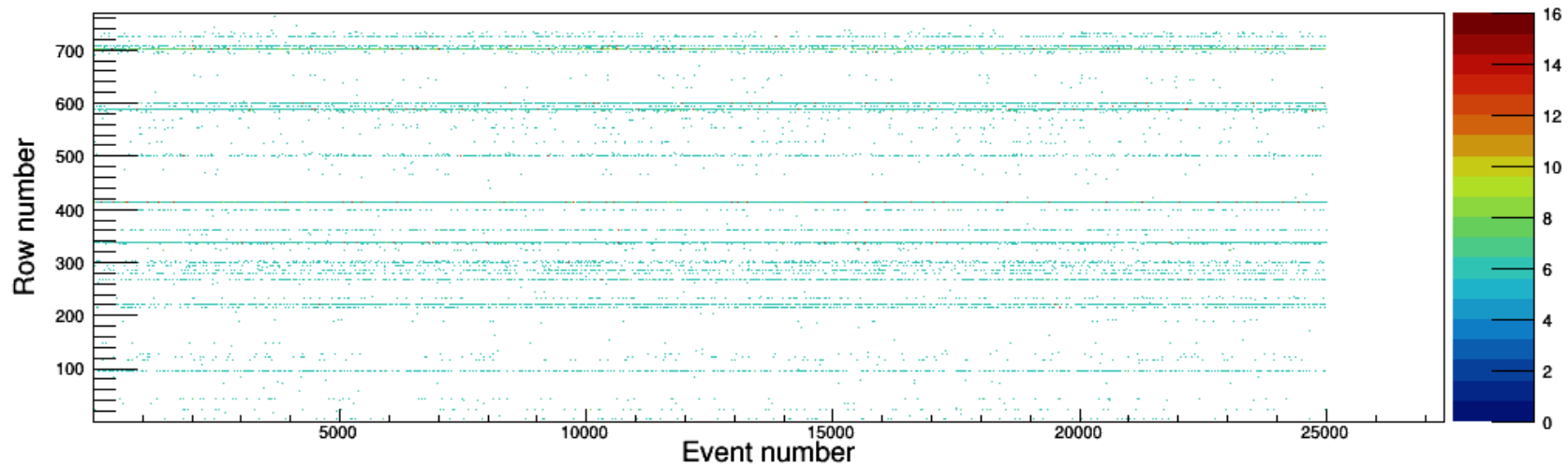- Below 10 fired pixels per event
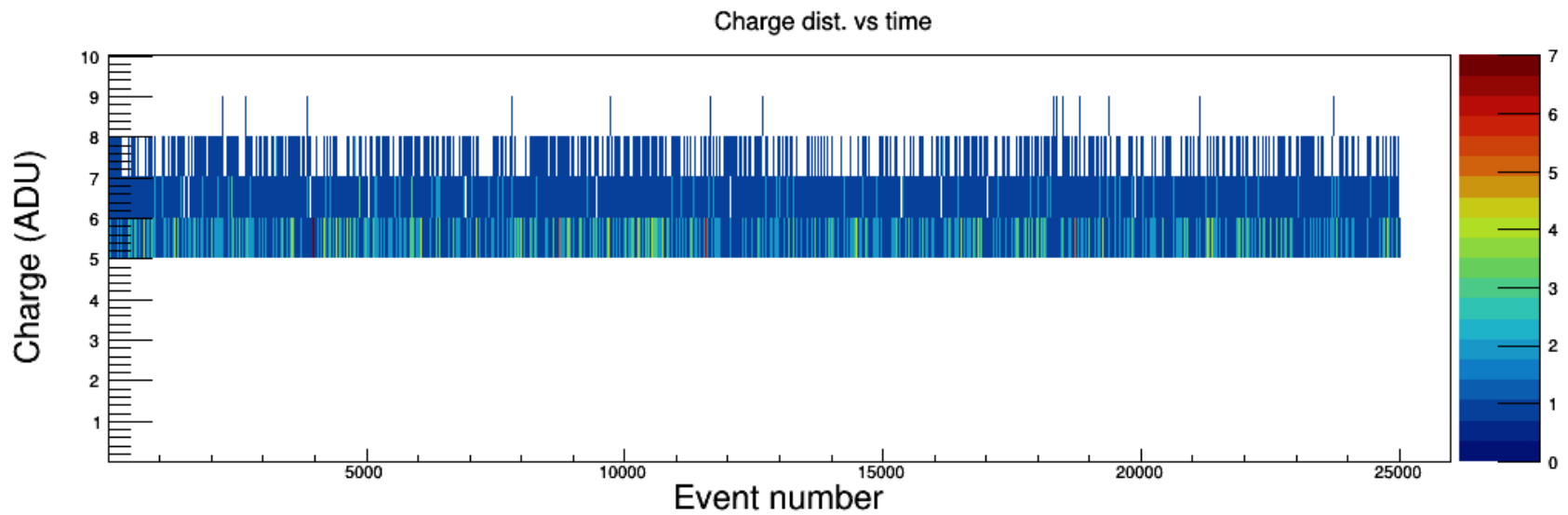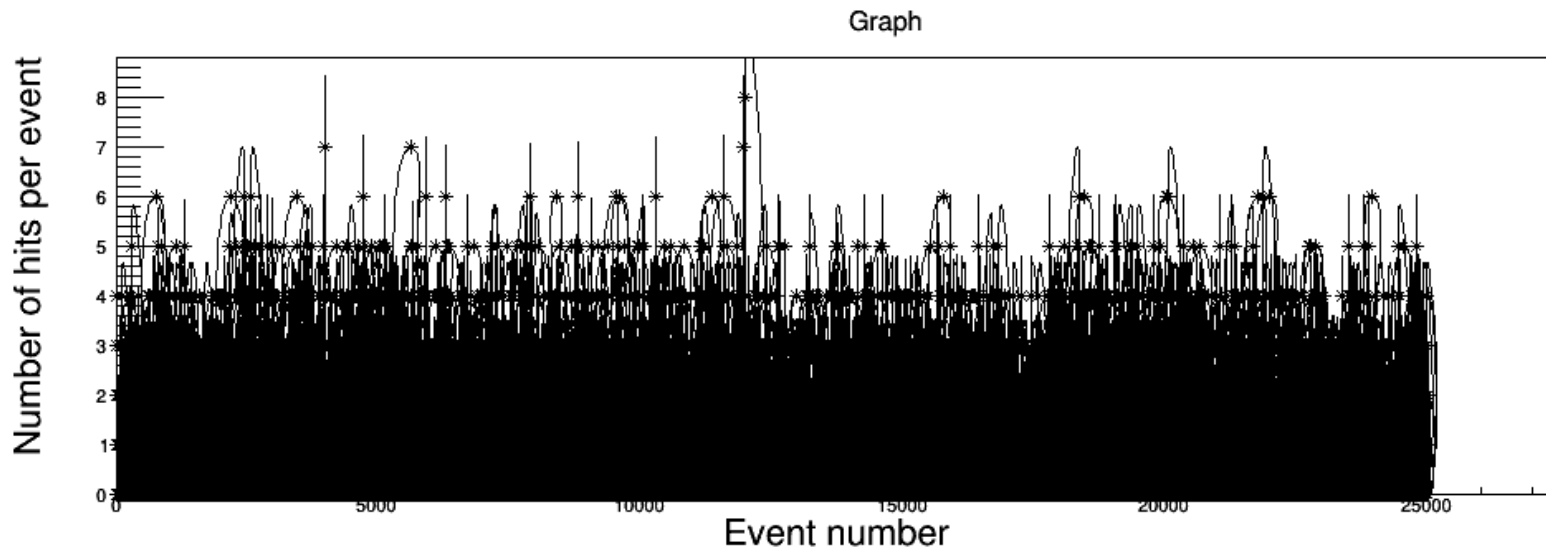

Graph

Column-charge vs time

Time evolution: Row charge

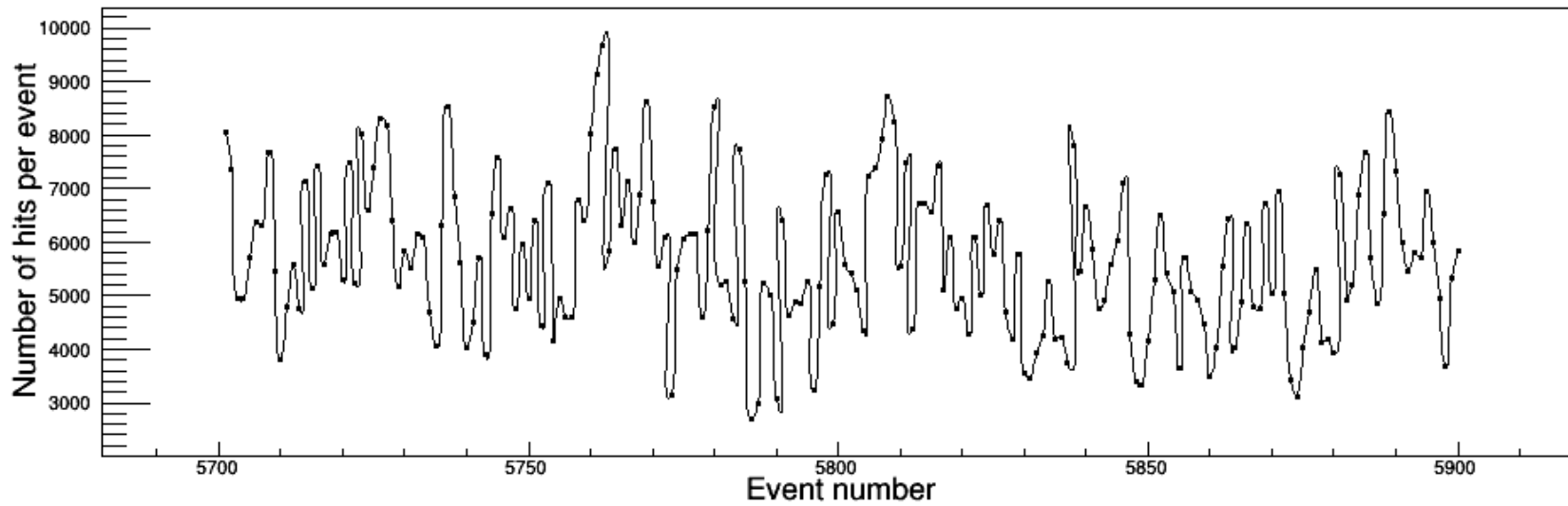# Time evolution: Charge distribution

- Noise below 9 ADU

Inferences

1) Oscillations in data rate seem to have two components, large oscillations with period ~8.3 mins and smaller oscillations with period 1/5 of that. This needs to be verified by looking at the Fourier components

2) The large oscillation are removed by switching on ACMC and switching on offsets in addition removes the smaller oscillations.

3) Operating without offsets (ACMC on) produces horizontal noise patterns on the sensor. **(?)**

4) The noise charge can reach upto 50 ADU if ACMC is not switched on, but if it is on, the noise charge doesnt exceed 10 ADU.
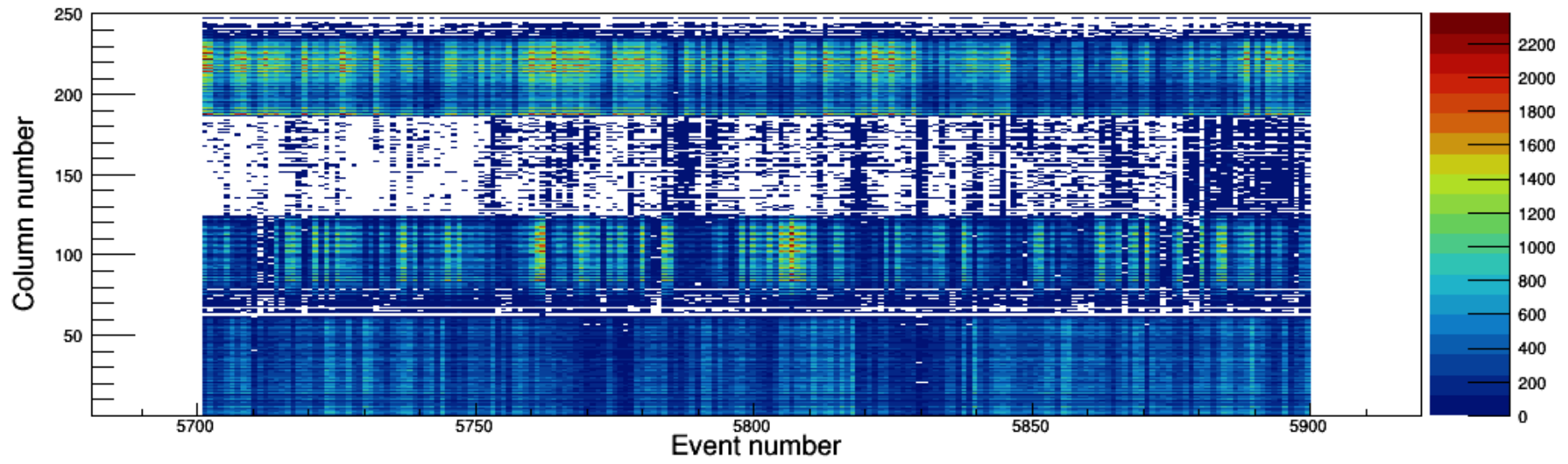
'Going back to the case where both ACMC and offsets are off and zooming into the peak region'

Time evolution: Column charge

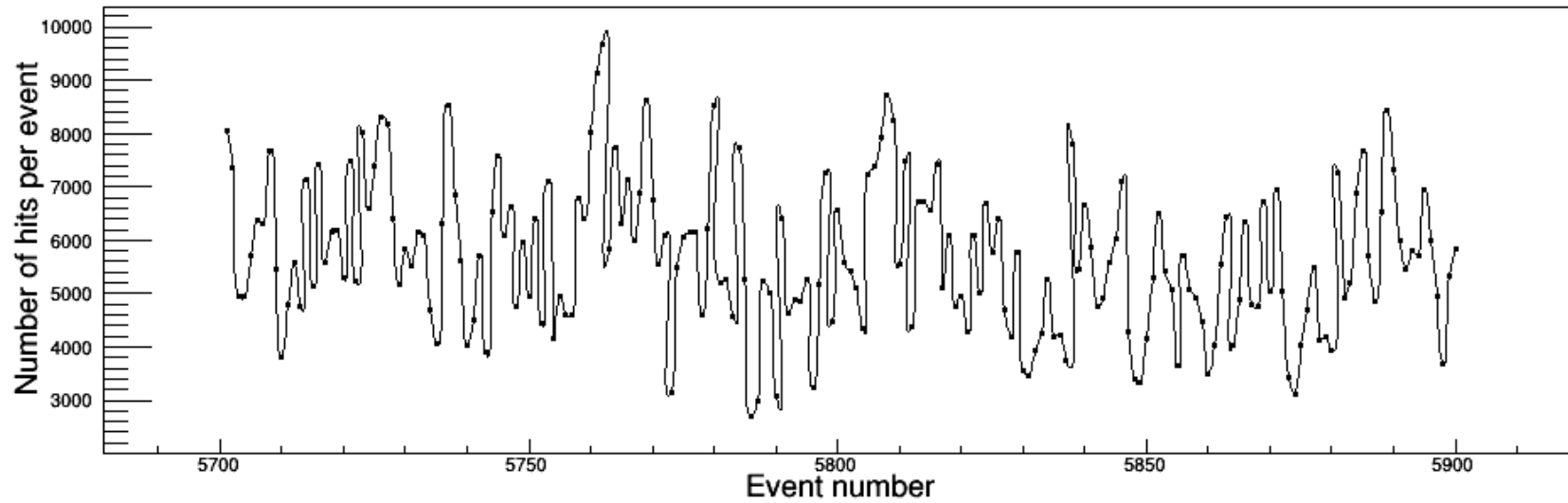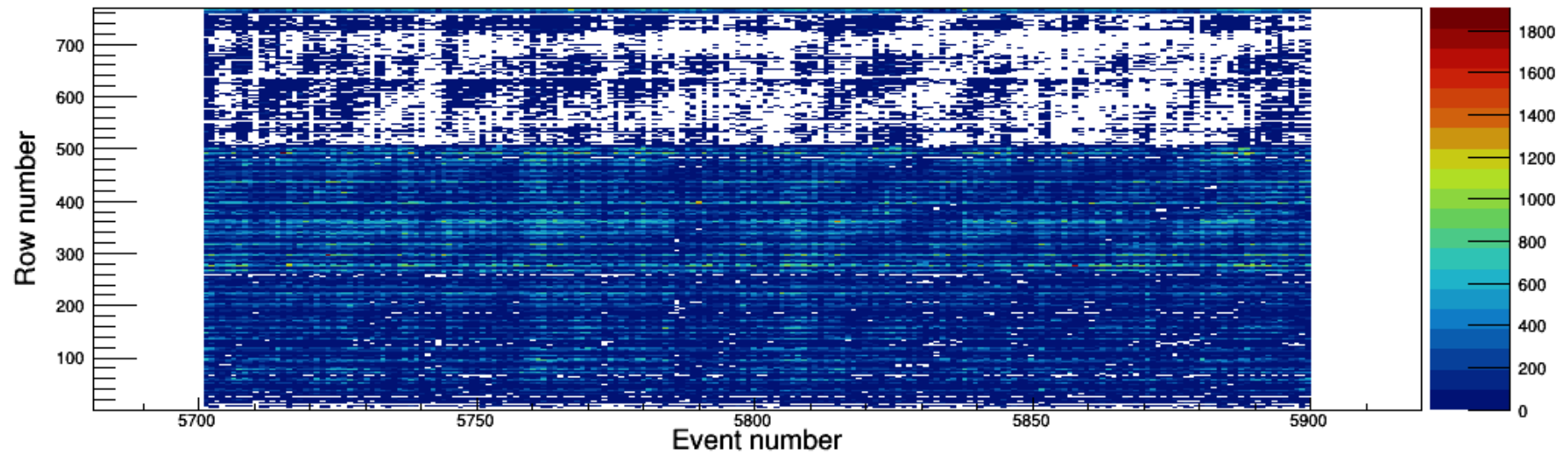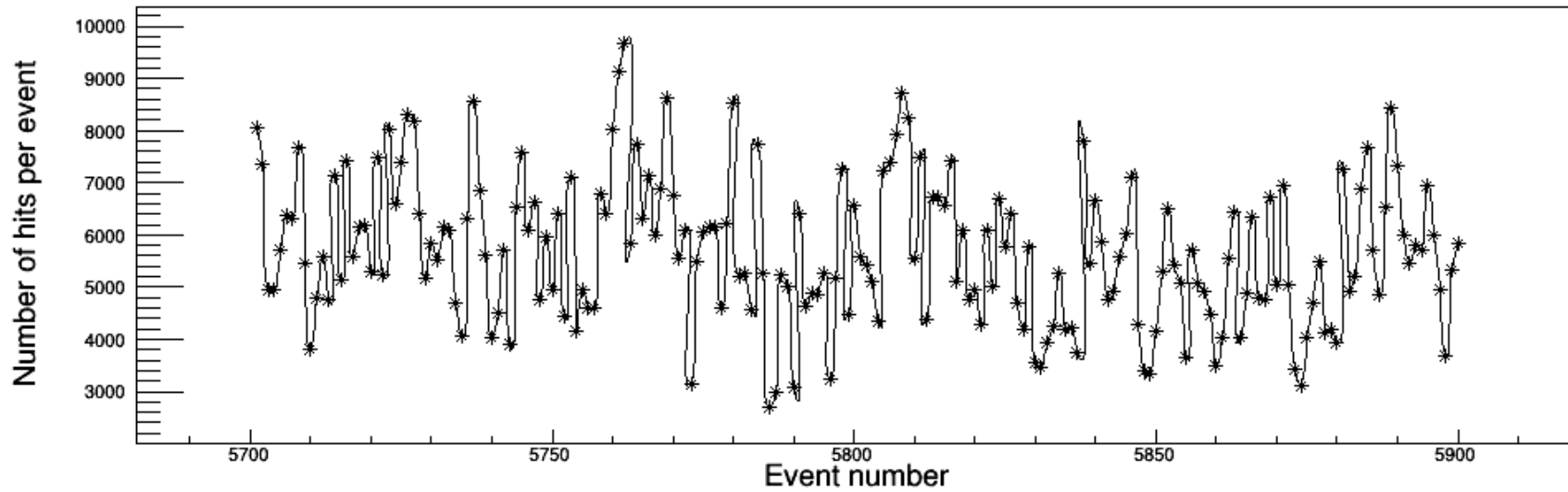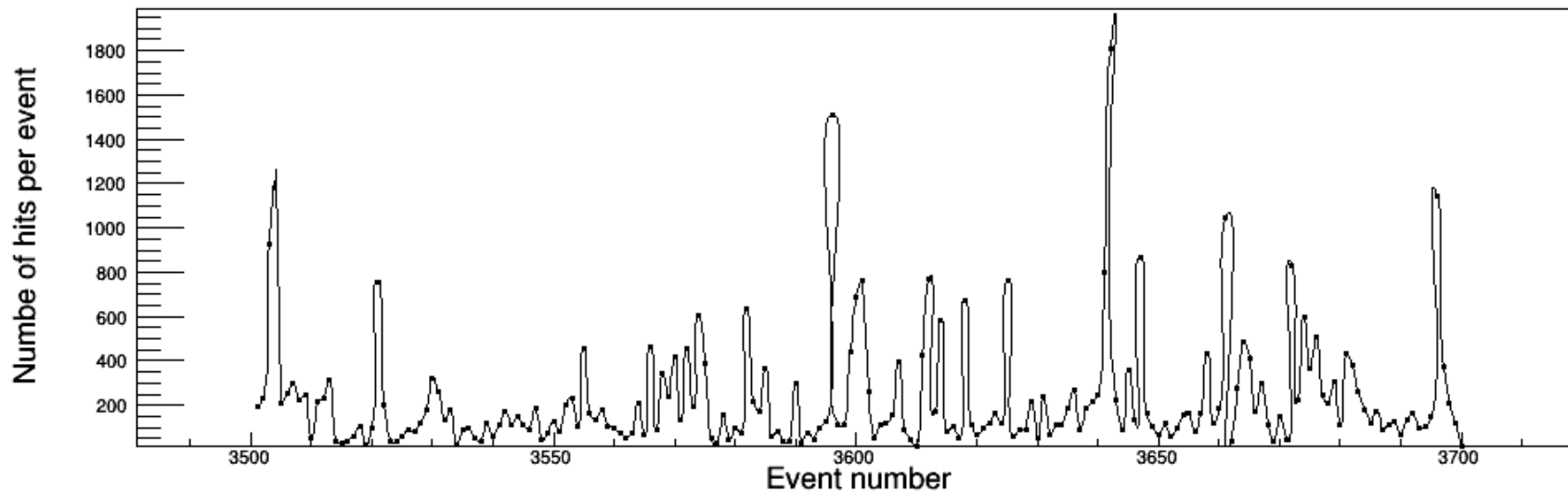# Time evolution: Row charge

Time evolution: Charge distribution
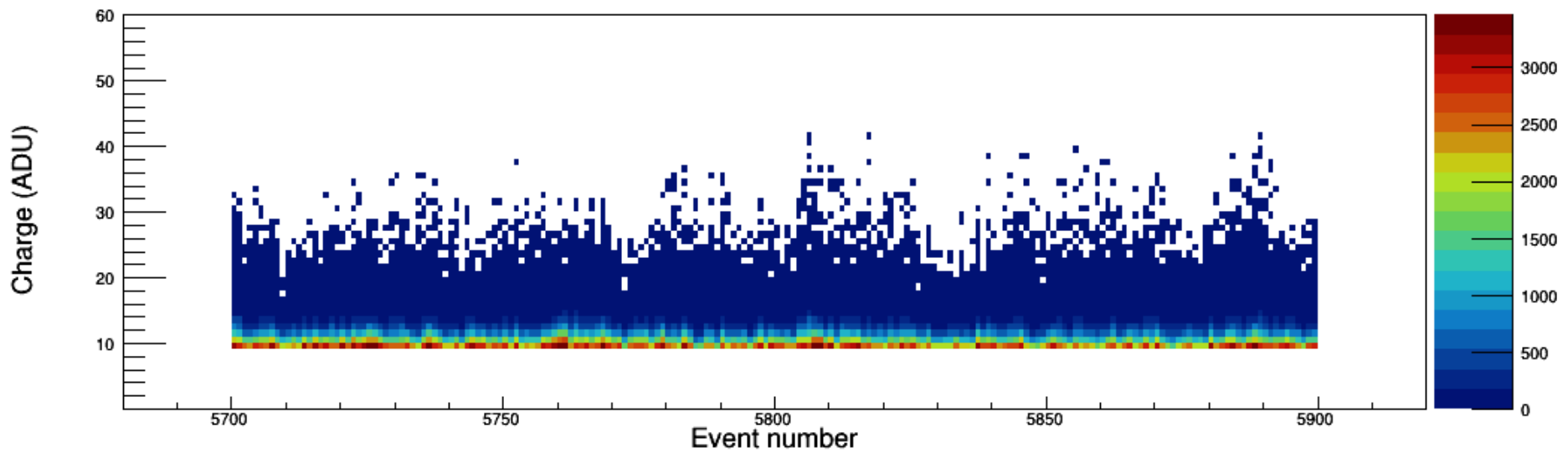
Zooming into
the 'trough' region

Time evolution: Column charge
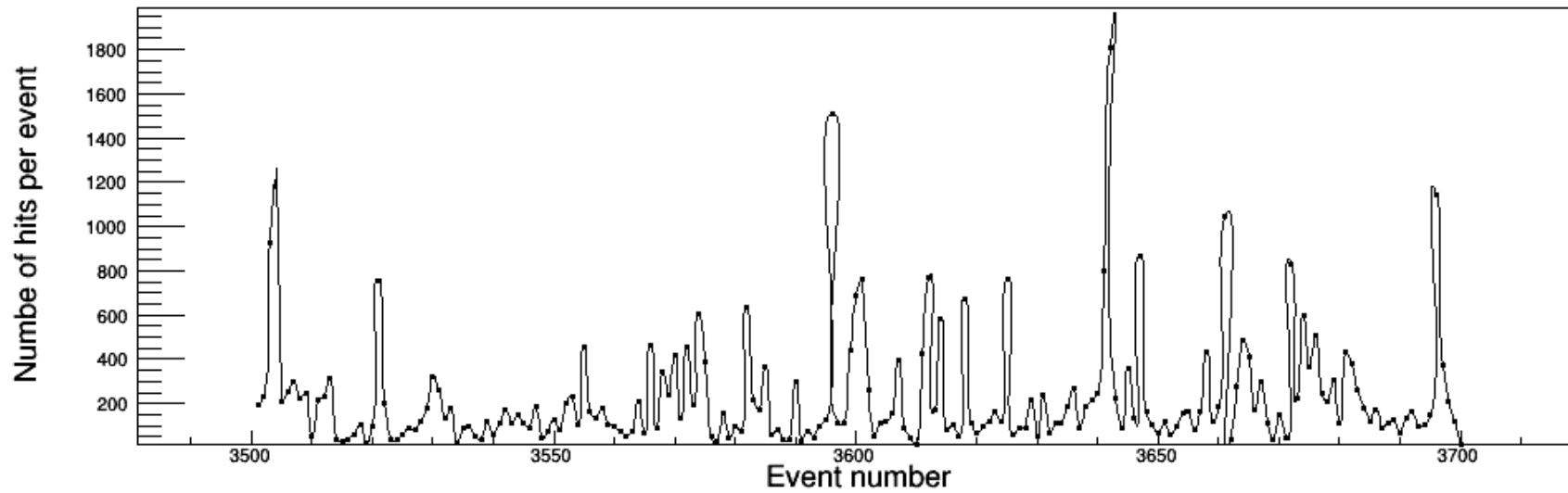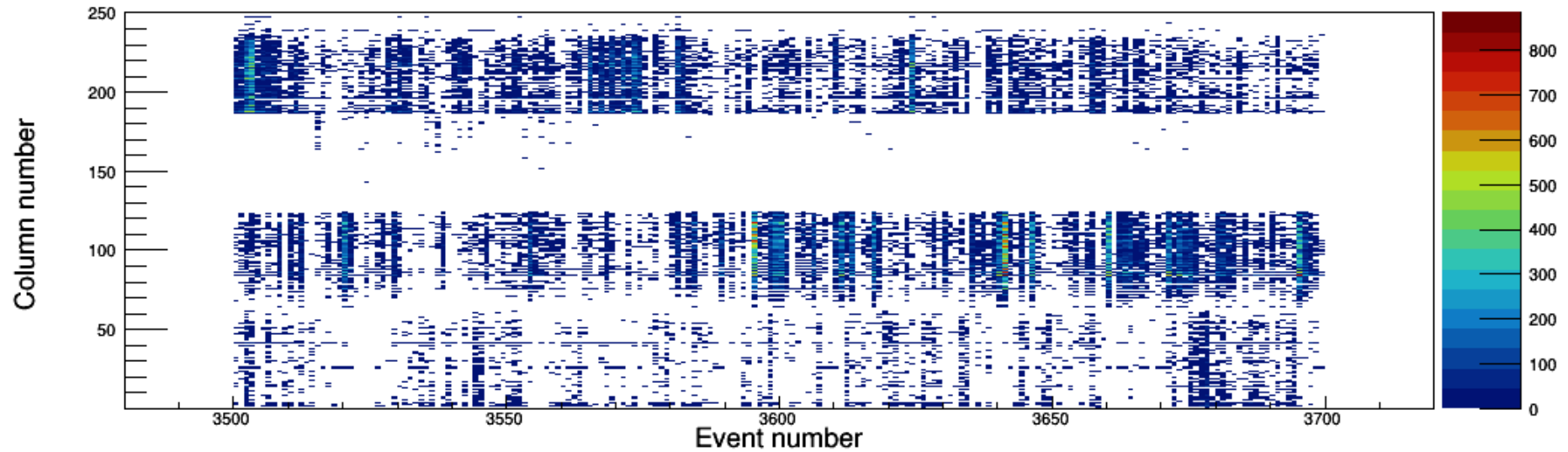
Time evolution: Row charge
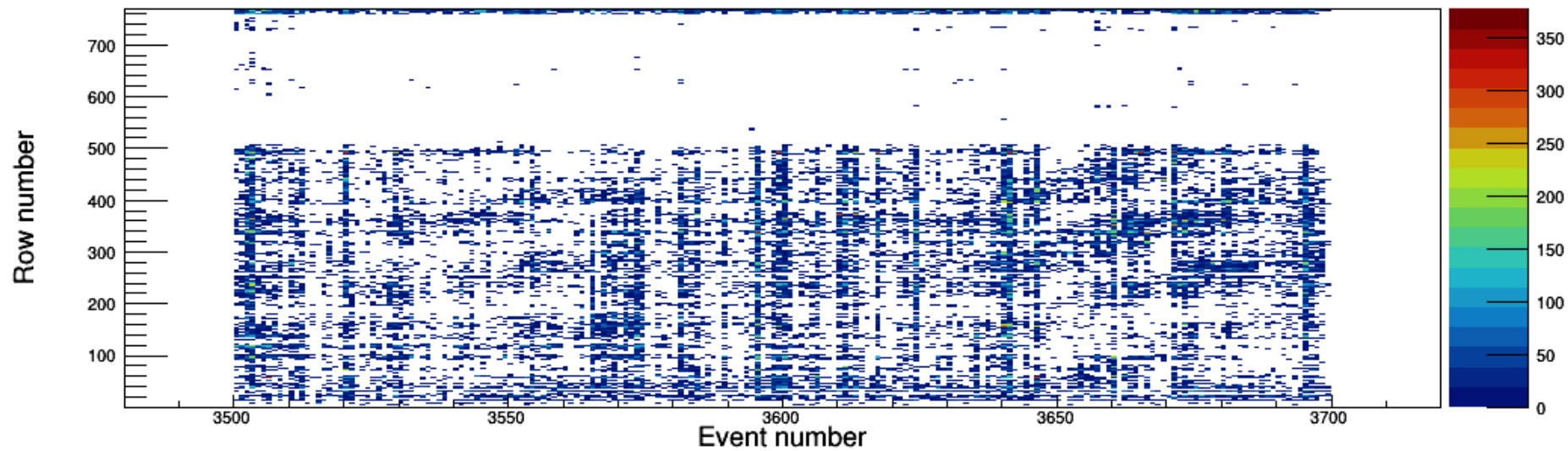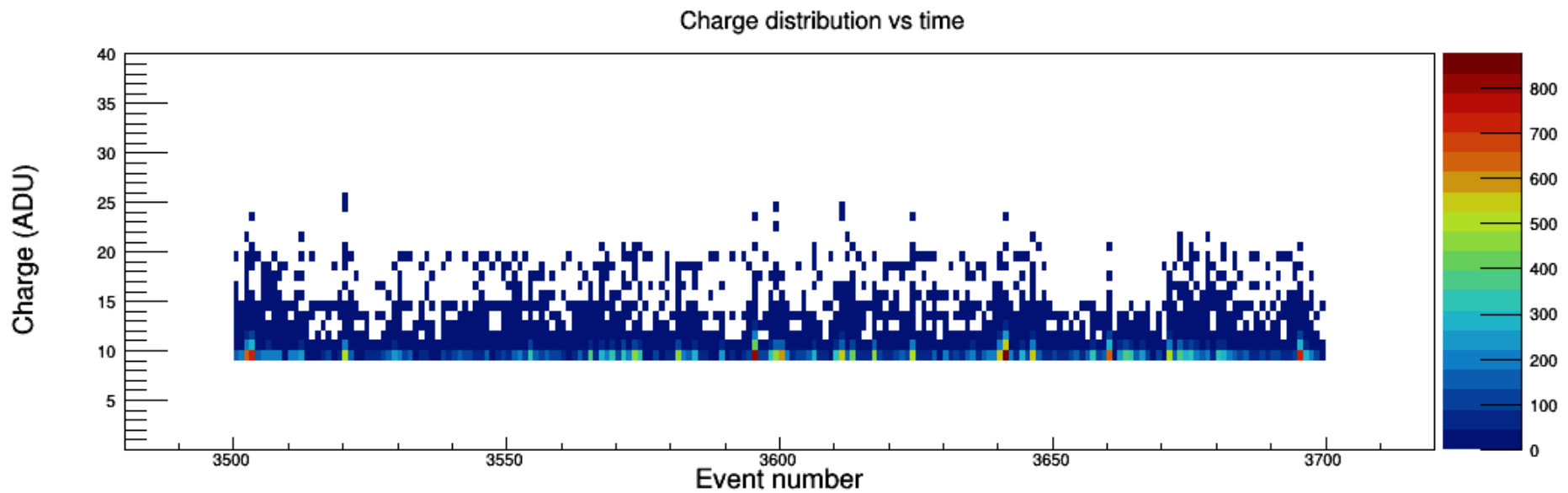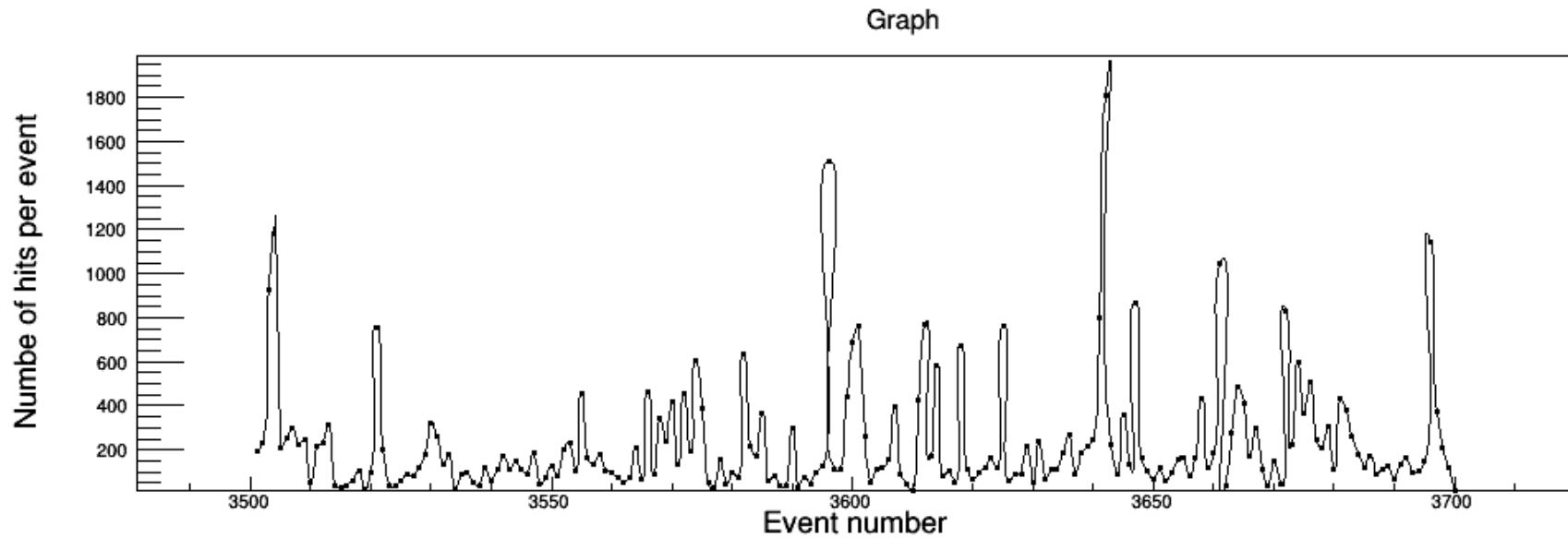
Time evolution: Charge distribution

Single Event distributions

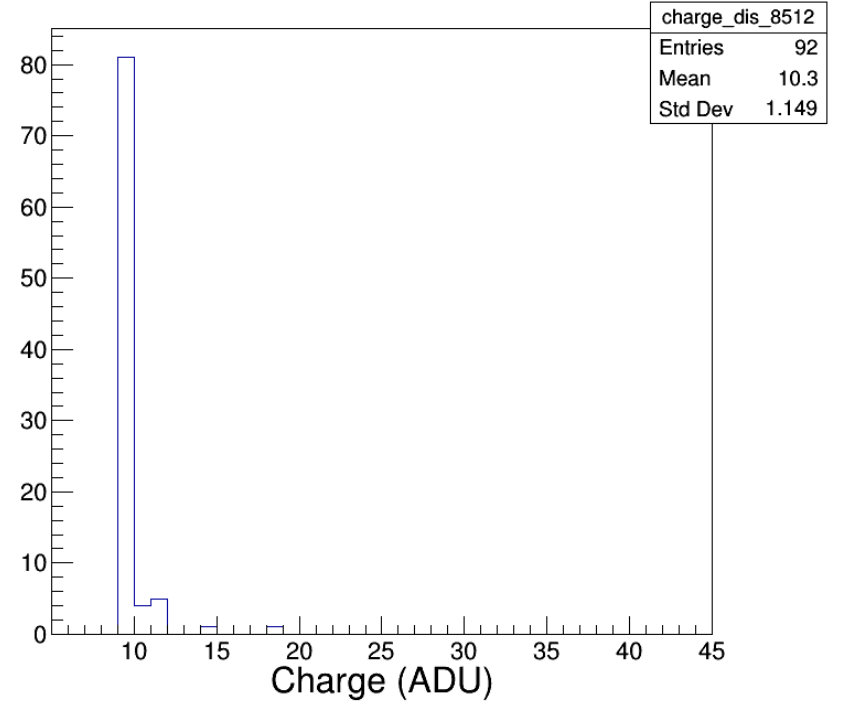'Local peaks' and 'local troughs' in the overall peak and trough regions.

Event 3637: Local minima in overall trough region (~100 fired pixels)

Event 3642: Local maxima in overall trough region (~1.8K fired pixe

Charge Map : Event 3642

charge_map_8512	
Entries	1806
Mean x	99.7
Mean y	304.9
Std Dev x	14.37
Std Dev y	148.3

Charge distribution : Event 3642

charge_dis_8512	
Entries	1806
Mean	10.84
Std Dev	1.18

Charge (ADU)

Column charge : Event 3642
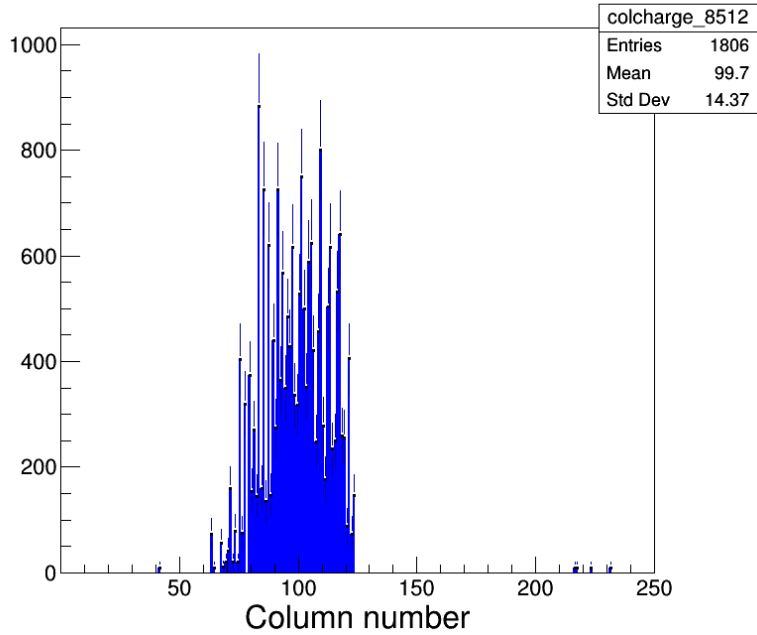
colcharge_8512	
Entries	1806
Mean	99.7
Std Dev	14.37

Column number

Row charge : Event 3642

rowcharge_8512	
Entries	1806
Mean	304.9
Std Dev	148.3

Row number

33

Event 5773: Local minima in overall peak region (~3K fired pixels)

Charge Map : Event 5773
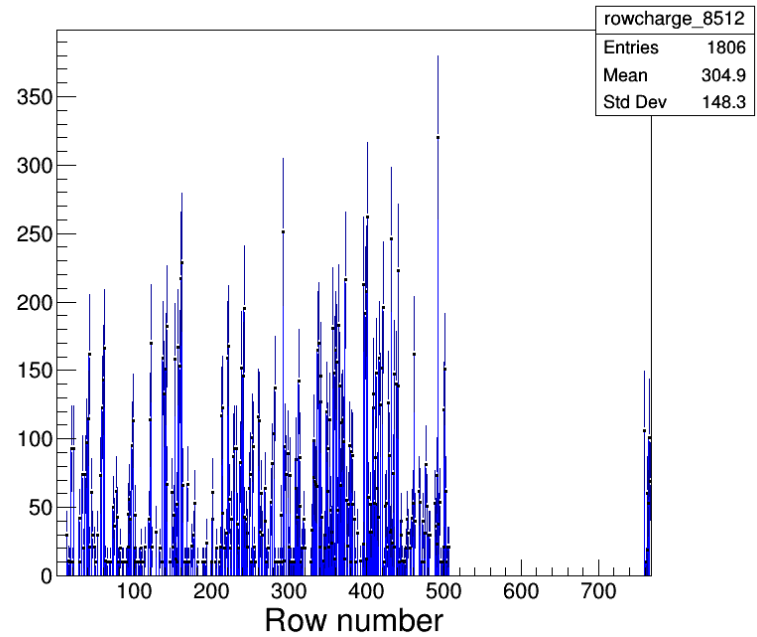
charge_map_8512	
Entries	3156
Mean x	146.7
Mean y	308
Std Dev x	81.94
Std Dev y	142.6

Charge distribution : Event 5773

charge_dis_8512	
Entries	3156
Mean	10.77
Std Dev	1.133

Charge (ADU)

Column charge : Event 5773

colcharge_8512	
Entries	3156
Mean	146.7
Std Dev	81.94

Column number

Row charge : Event 5773
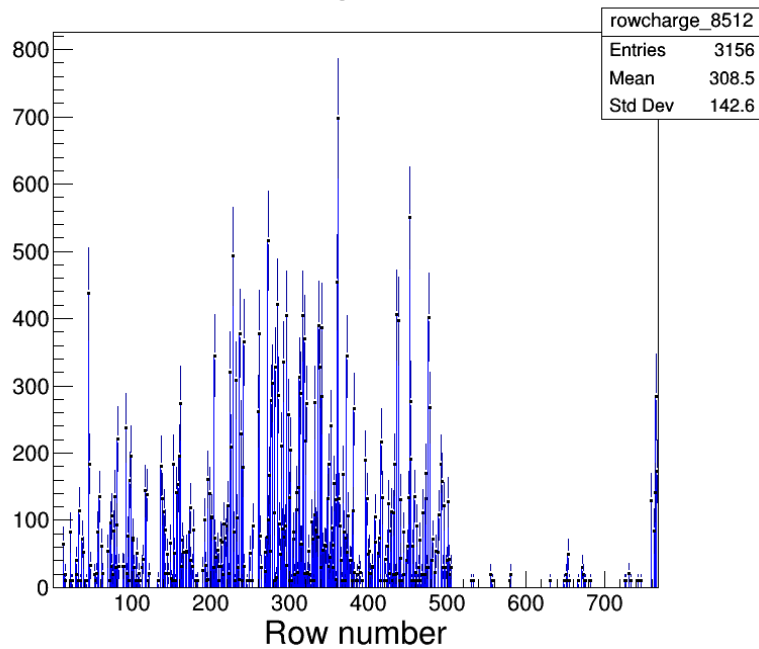
rowcharge_8512	
Entries	3156
Mean	308.5
Std Dev	142.6

Row number

34
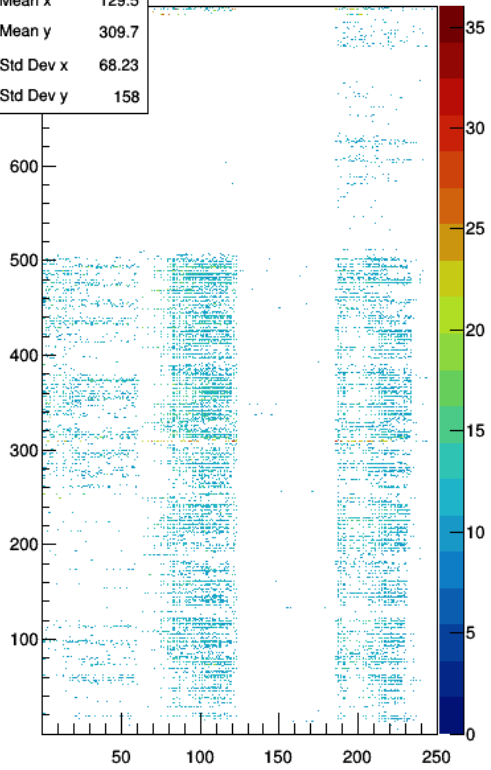
Event 5762: Local maxima in overall peak region (~10K fired pixels)
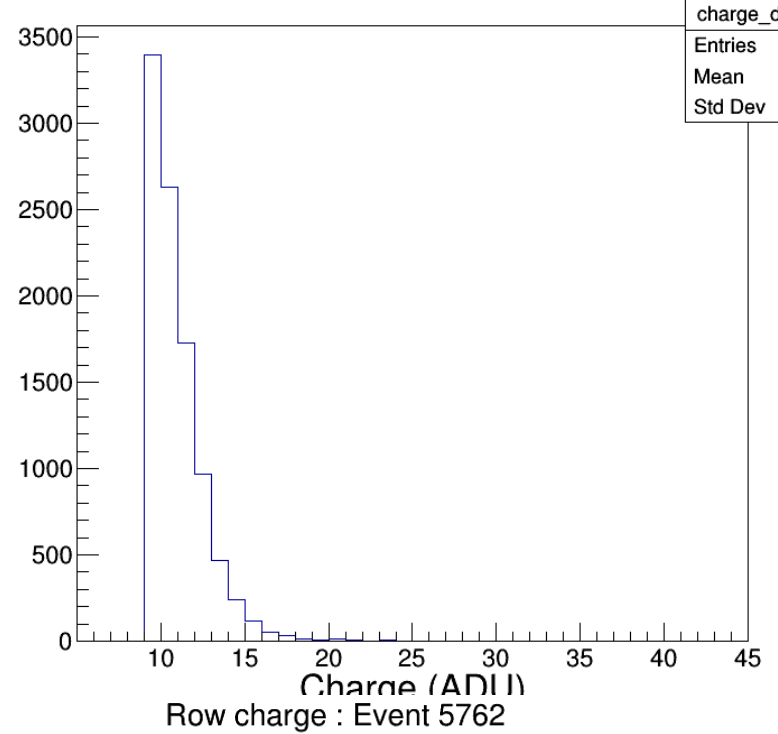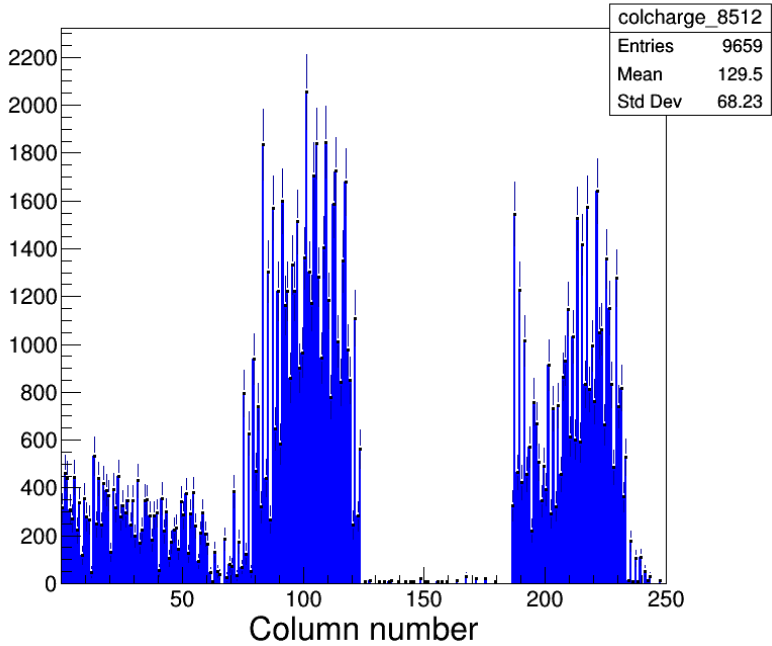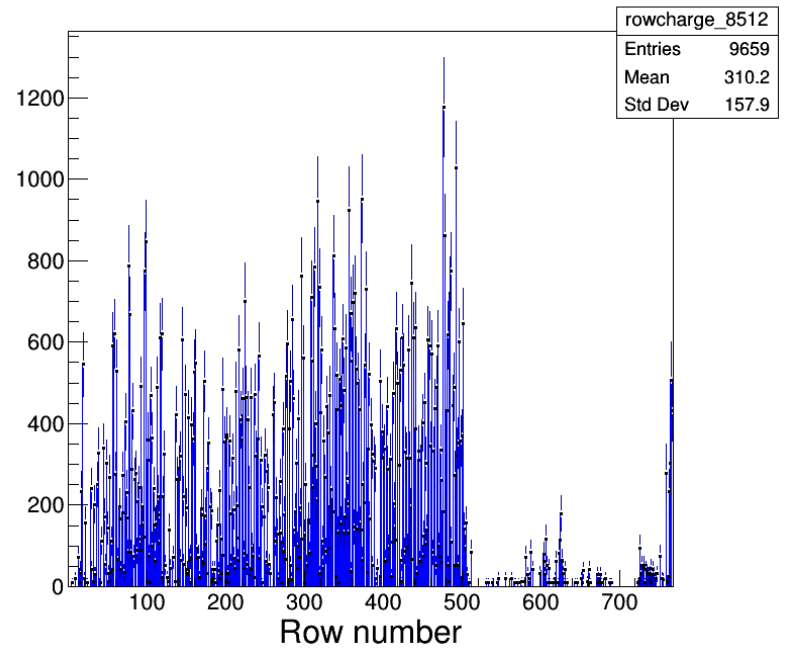
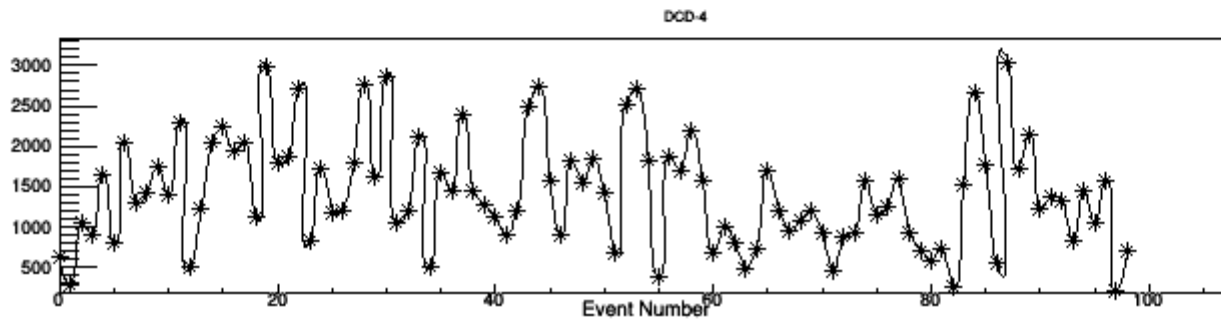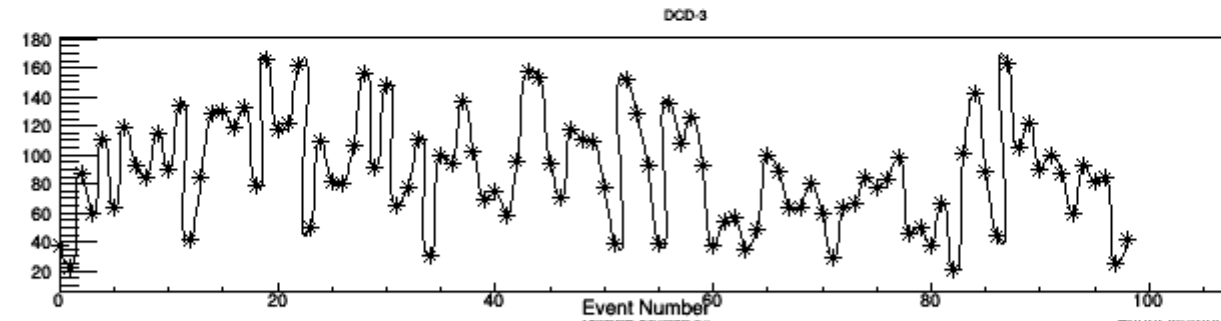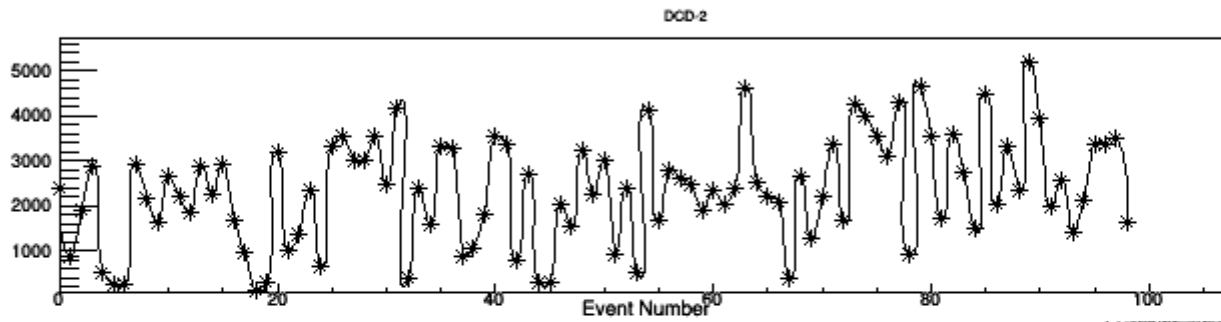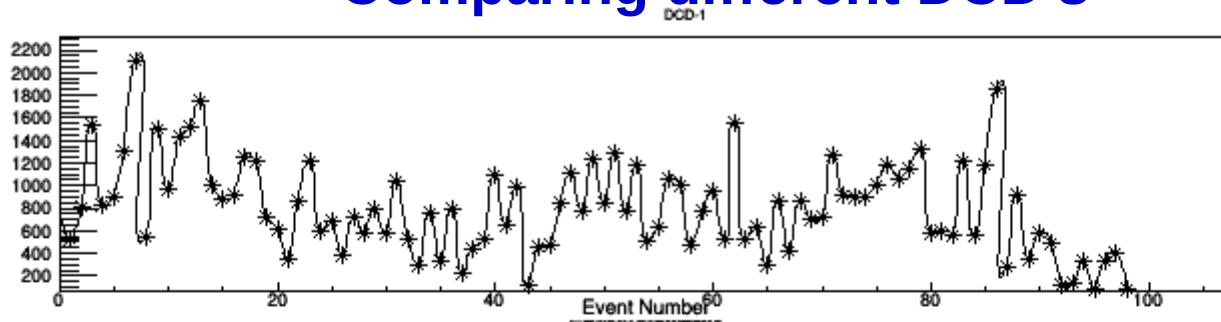# Correlations between data rates between sensor regions?

First 100 events
Comparing top 1/3 vs bottom 2/3 regions
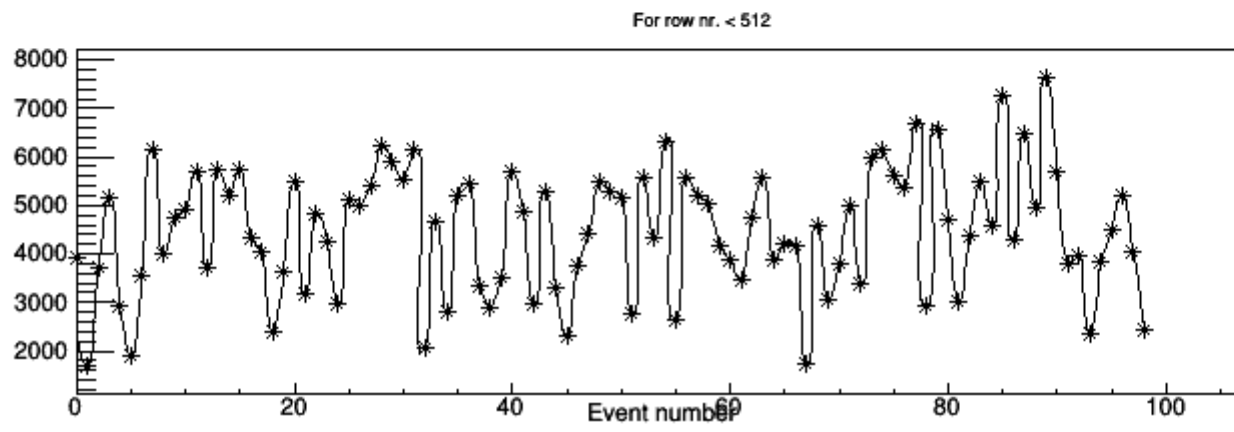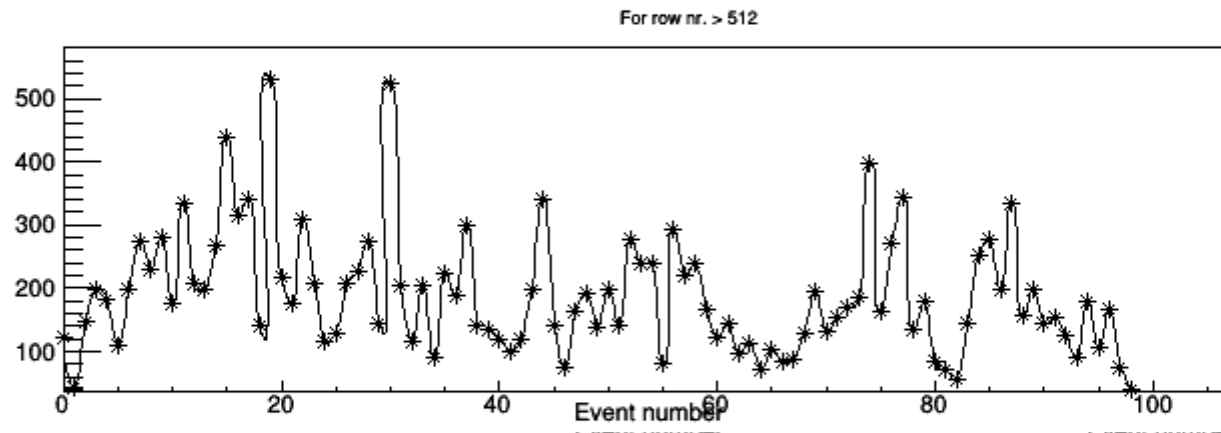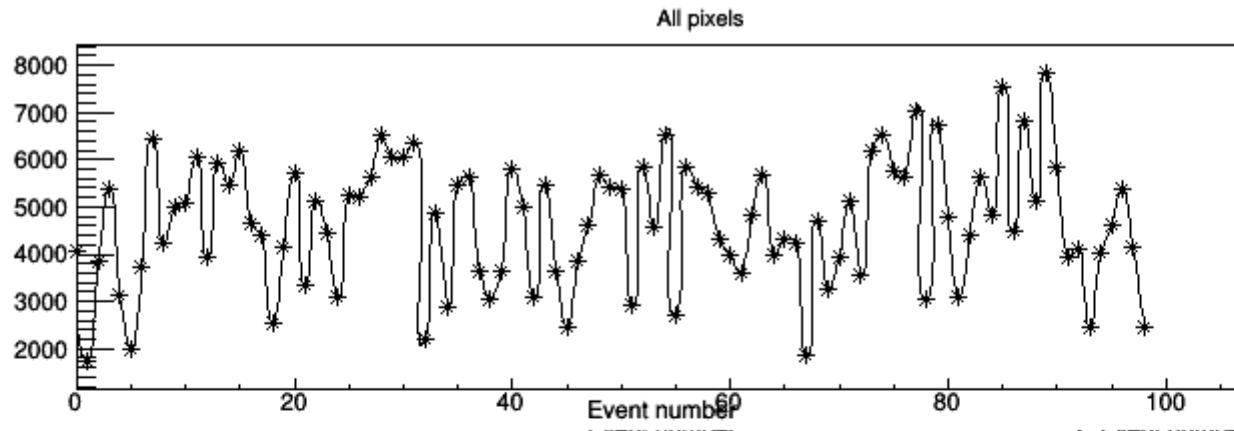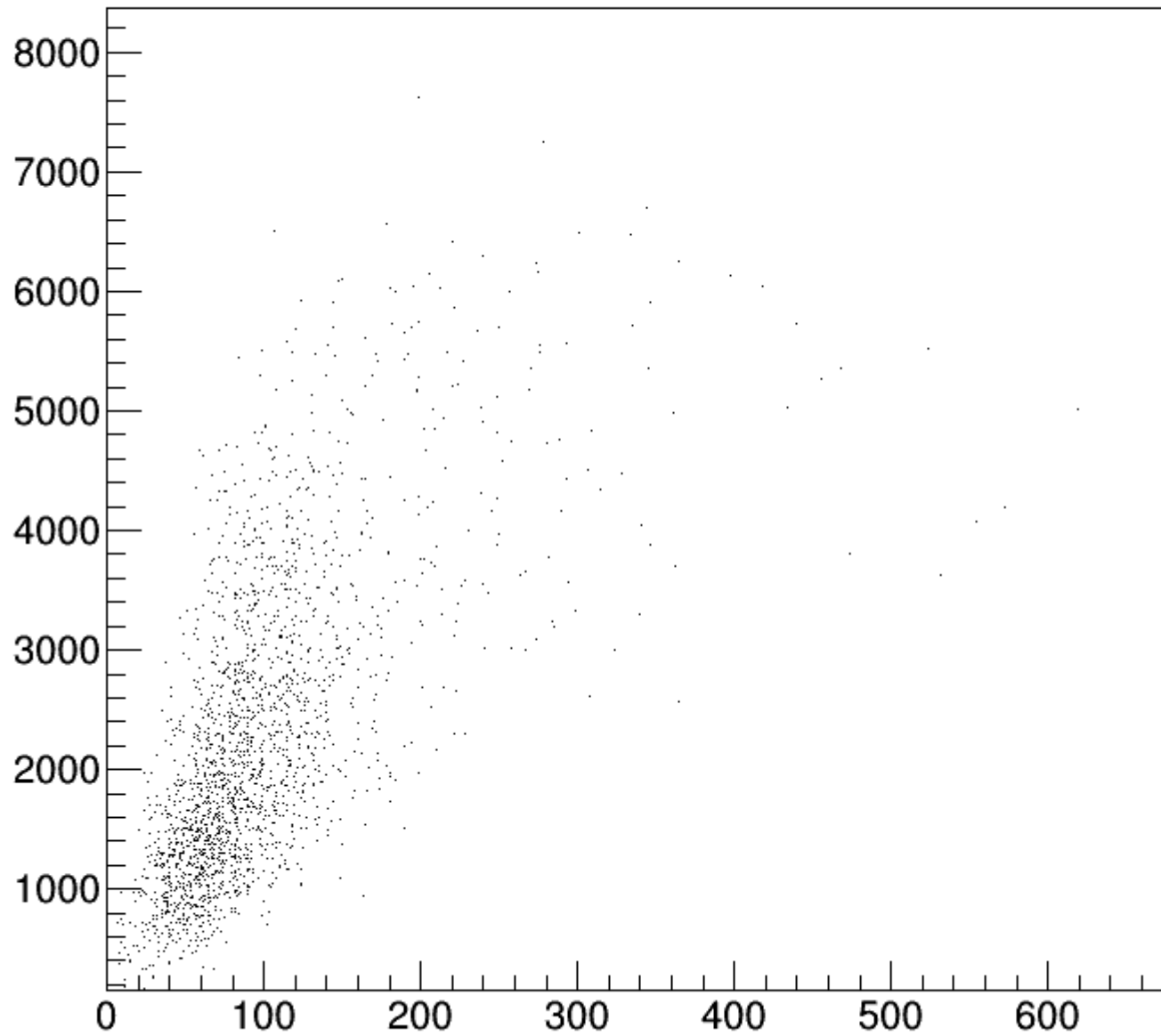
First 100 events
Comparing different DCD's

First 2000 events
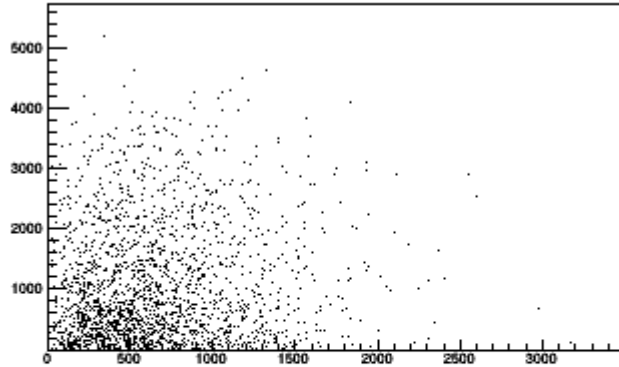## Correlations: Comparing top 1/3 vs bottom 2/3 regions

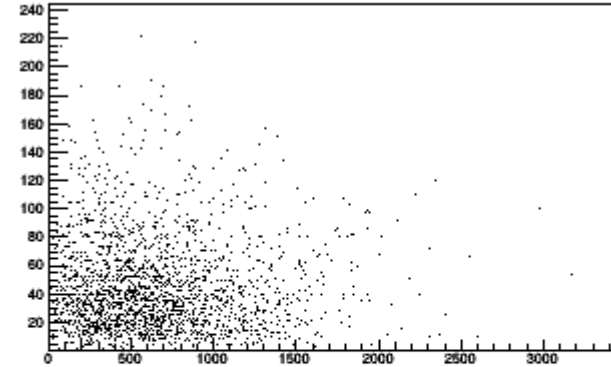Top 1/3rd region vs bottom 2/3rd region

First 2000 events
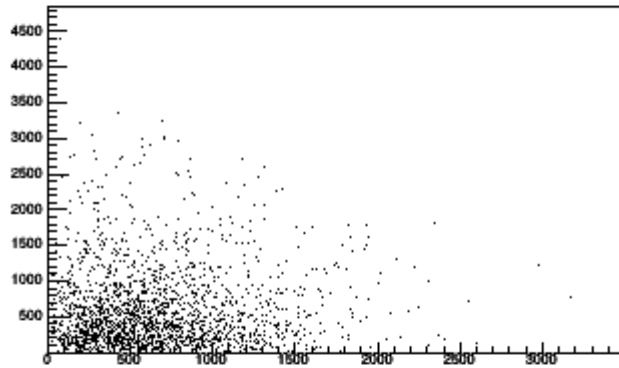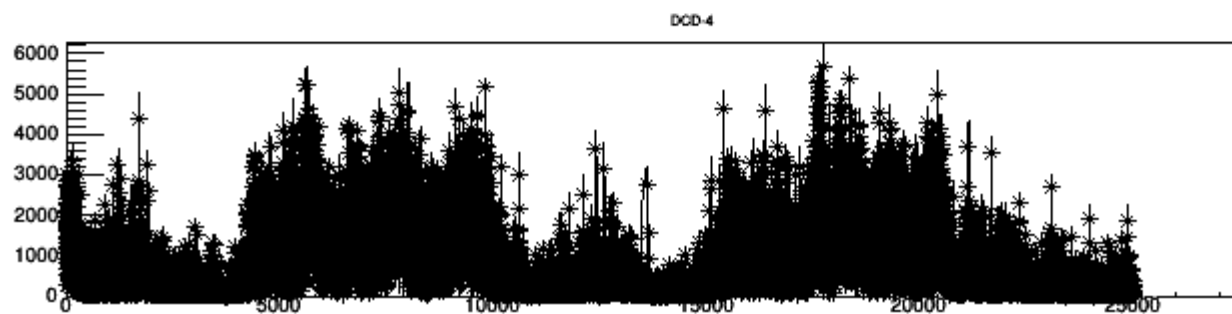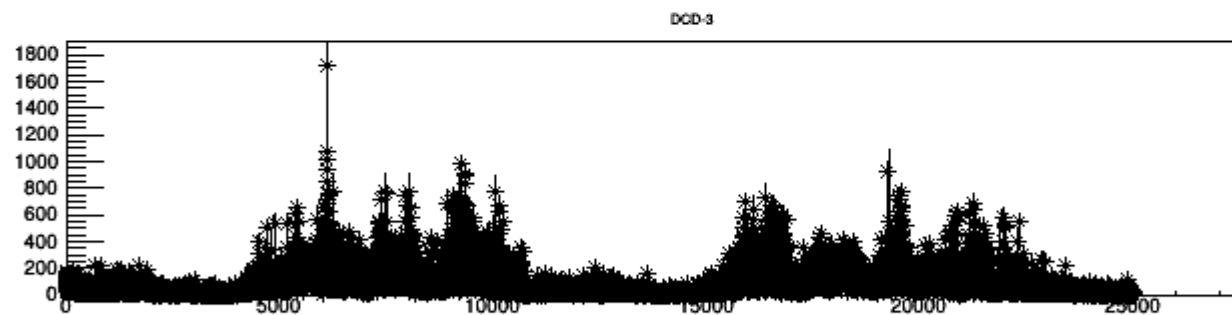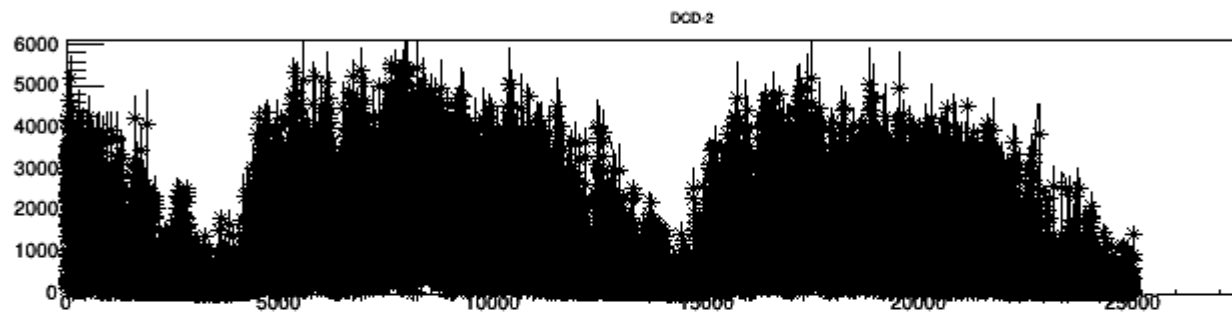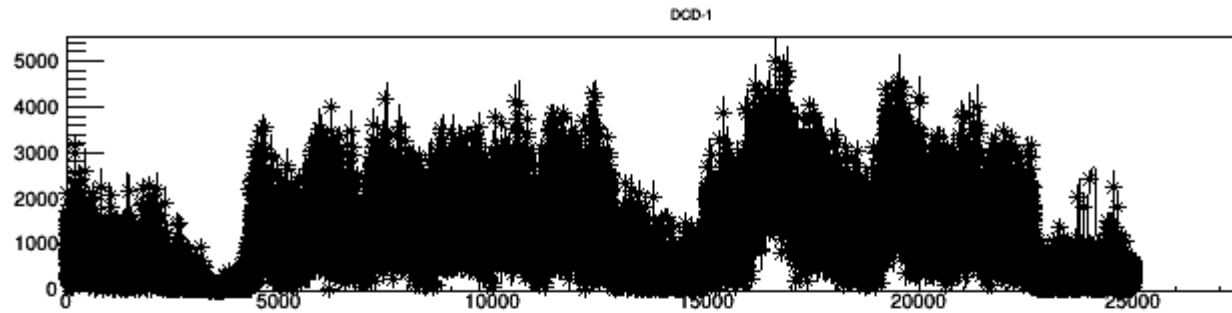## Correlations: Comparing different DCD's
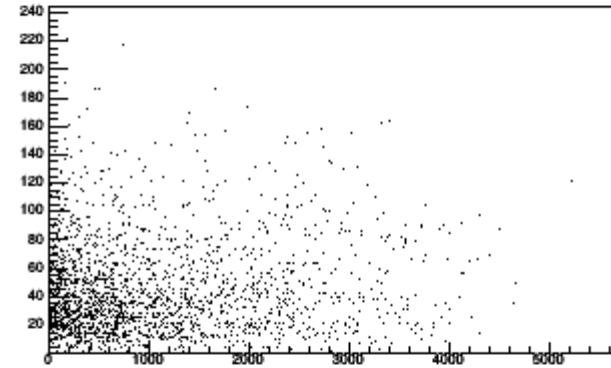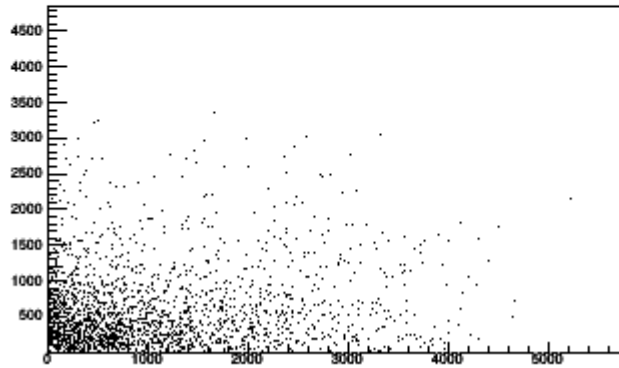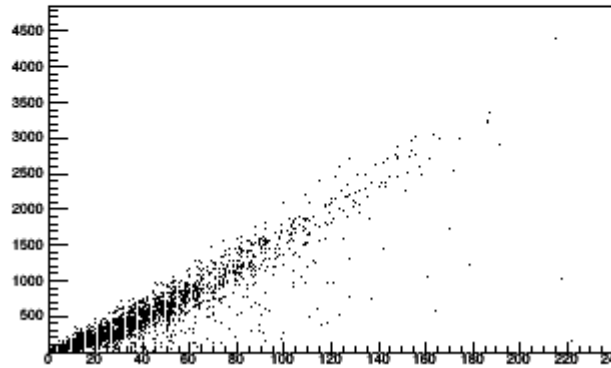
All events
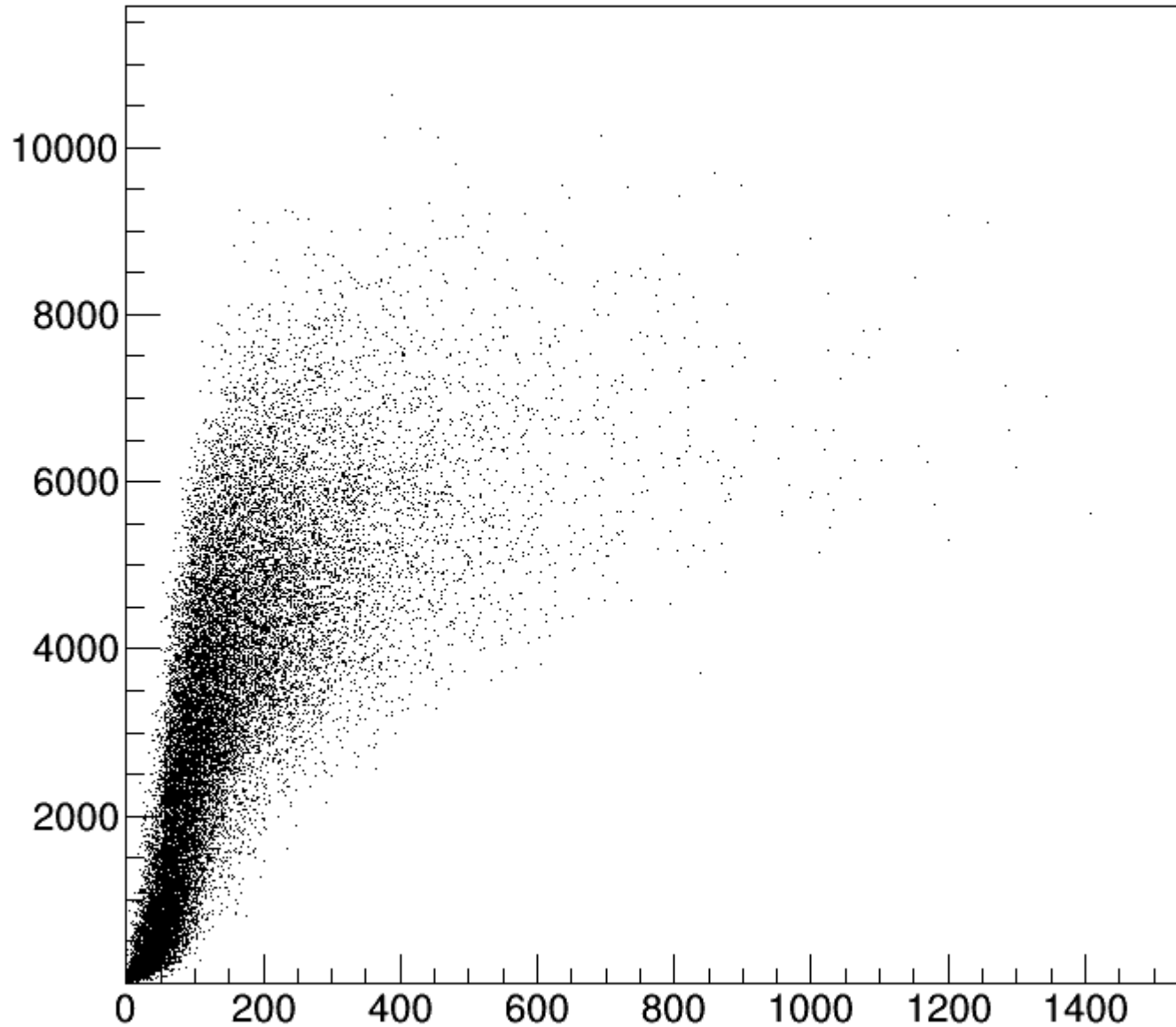## Fired pixels: Comparing top 1/3 and bottom 2/3 regions
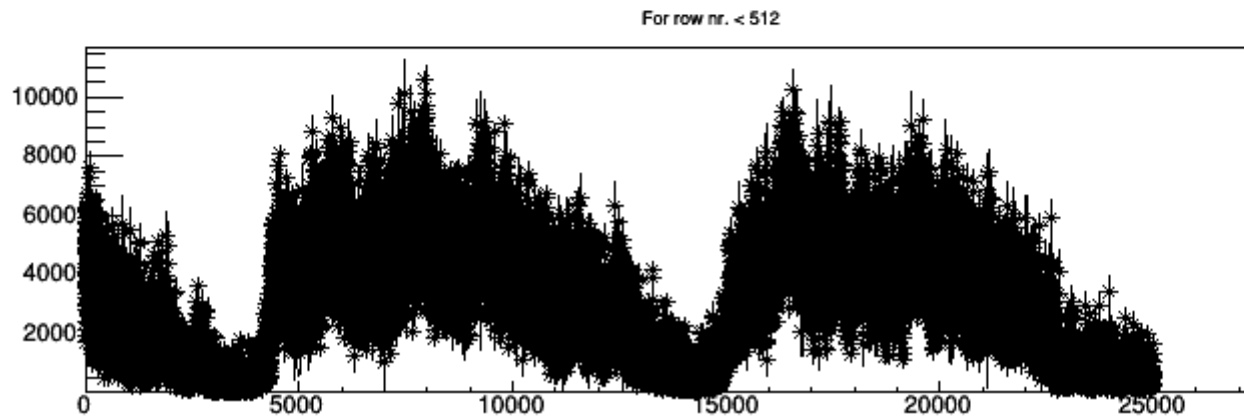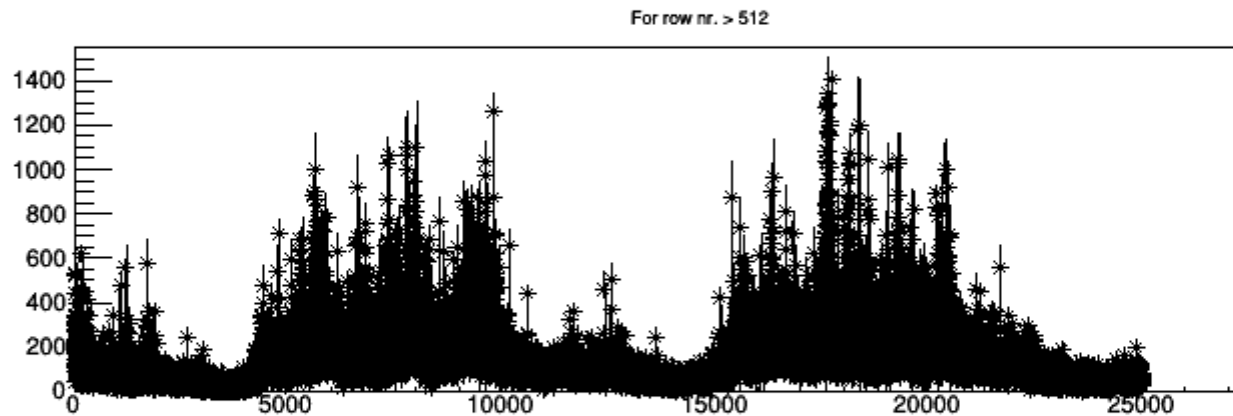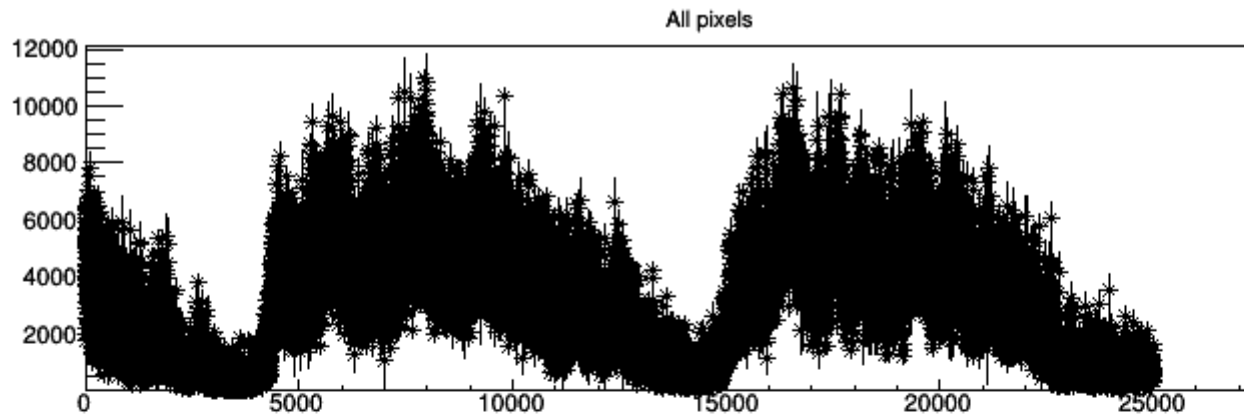
All events
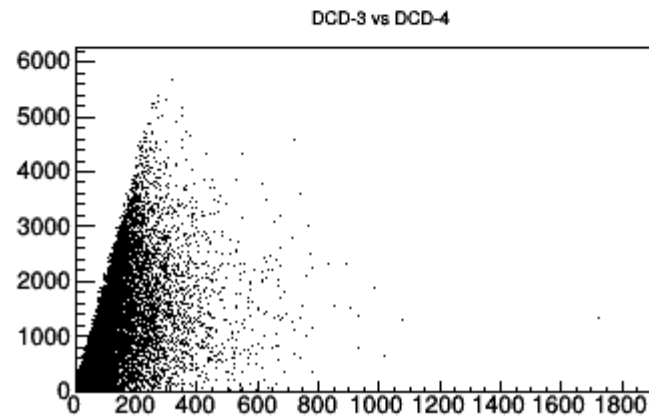## Fired pixels: Comparing different DCD's

All events
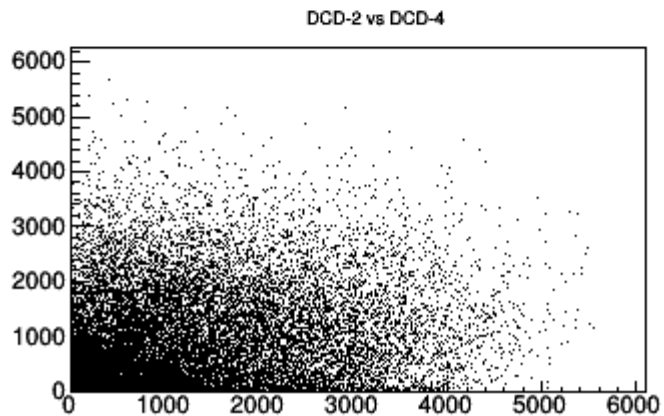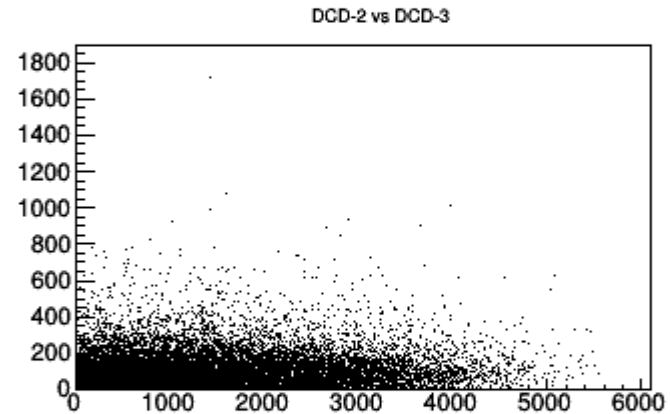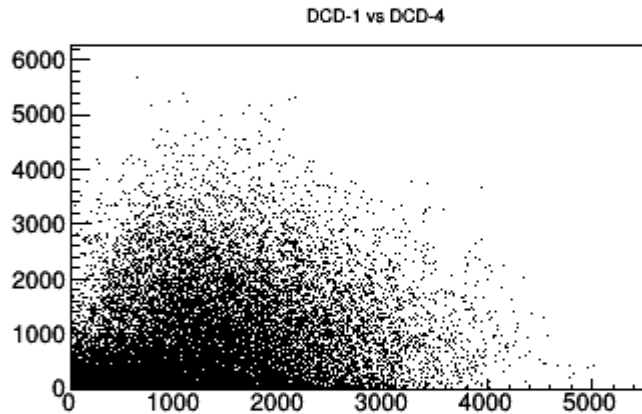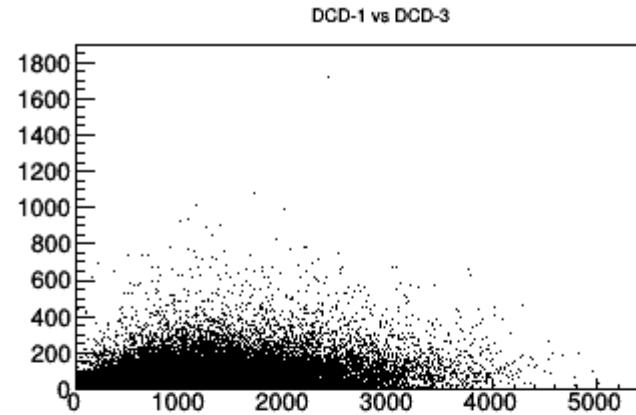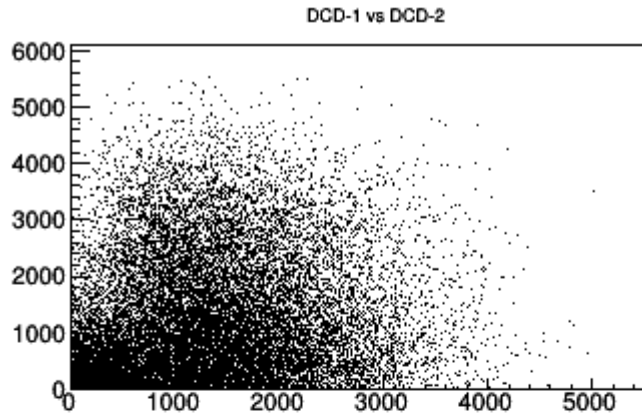## Correlation: Top 1/3 vs bottom 2/3

Top 1/3rd region vs bottom 2/3rd region

All events
Correlation between different DCD's

Backup

First 2000 events
Zooming in: Correlation between DCD-3 and DCD-4

DCD-3 vs DCD-4