TB 2021: Data Analysis

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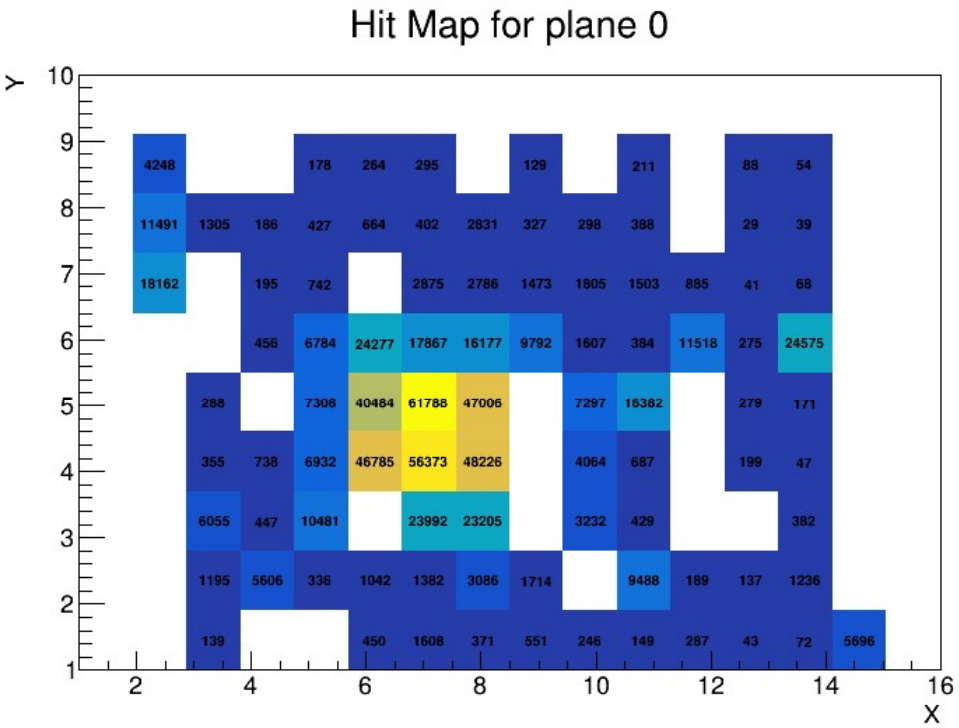
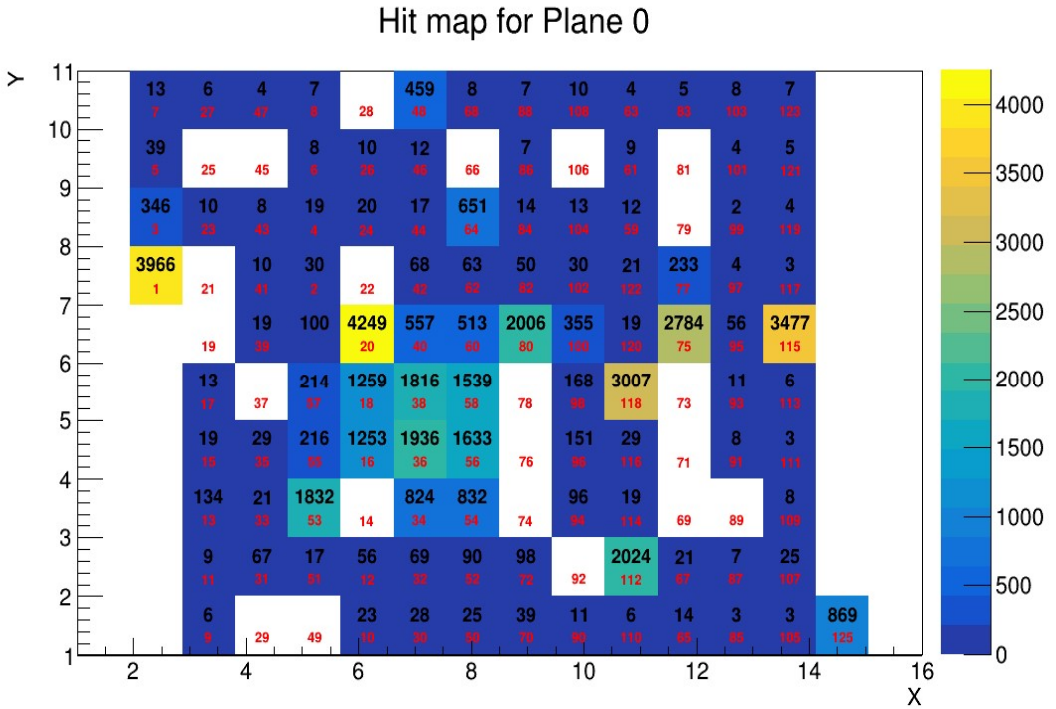
Anton1 sensor, run 652 - hit map

Run 652

- Anton1 sensor without W planes
- Beam energy 5 GeV
- Beam position on X: 0 ; Y: -10
- Number of events: 1 390 730





Hit map as in online .root file

- Hits concentrated in the beam area
- Pads outside of beam area with high signal / noise

Reconstructed hit map

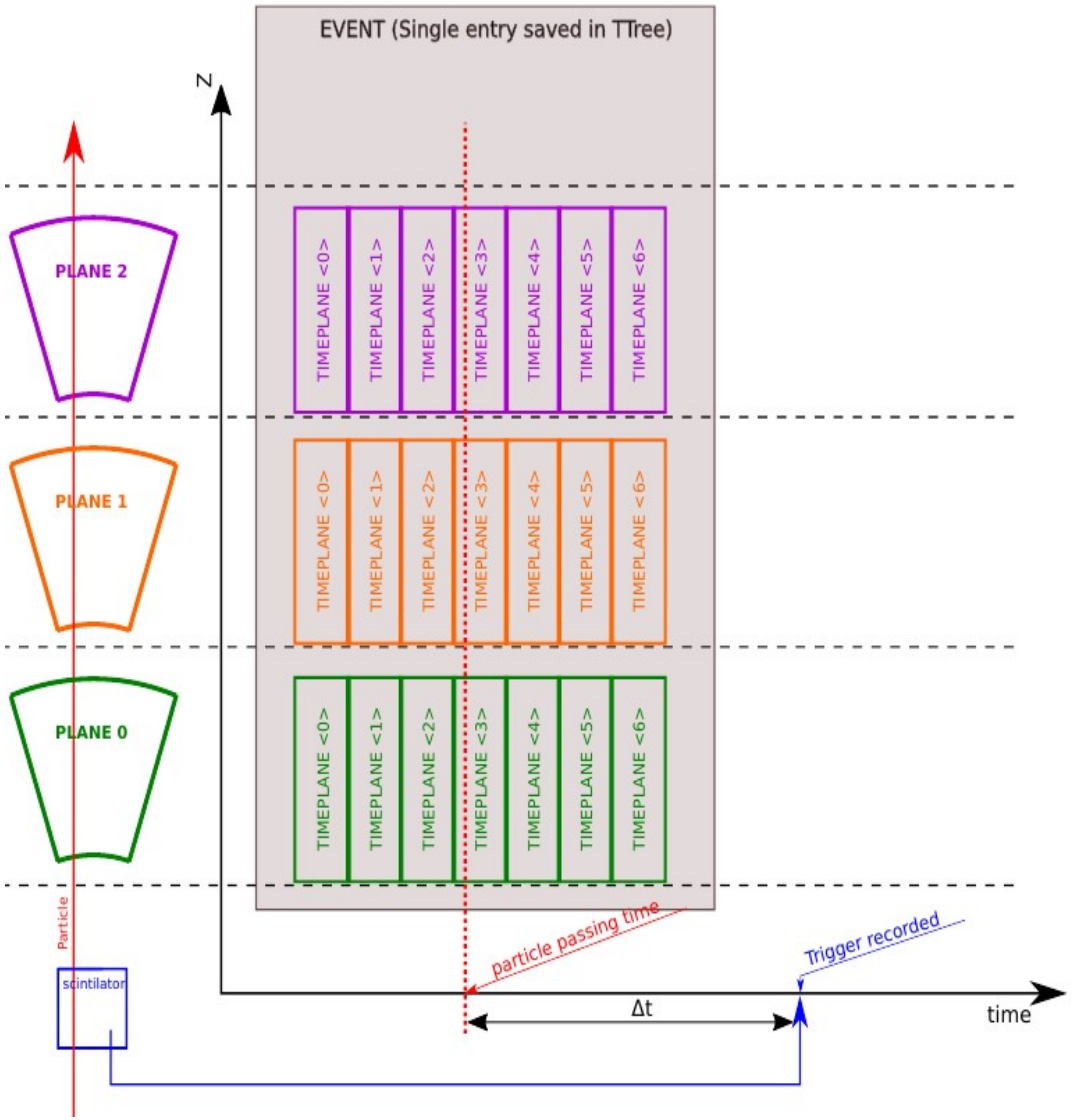
- Pad by pad reconstruction
- Pads outside of beam area with high signal / noise

Next step for data selection

- mainly selection on timeframes
- cut on noisy entries

Anton1 sensor, run 652 - 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)
- 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



Szymon's presentation on 24.11.2020 S&A meeting

Anton1 sensor, run 652 - timeframes

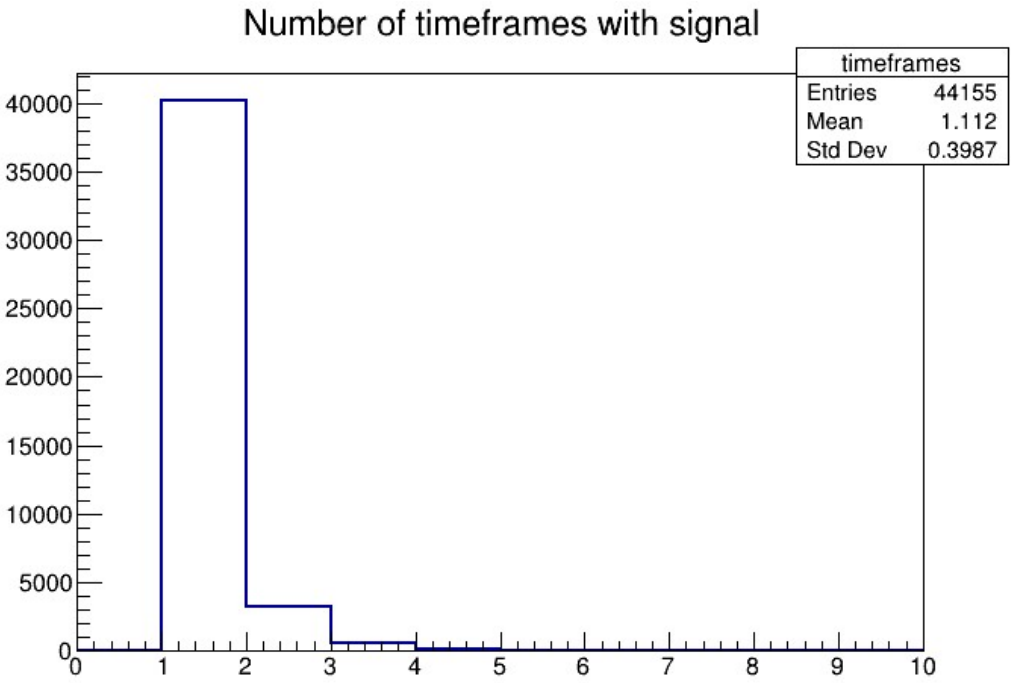
1. Number of timeframes with signal

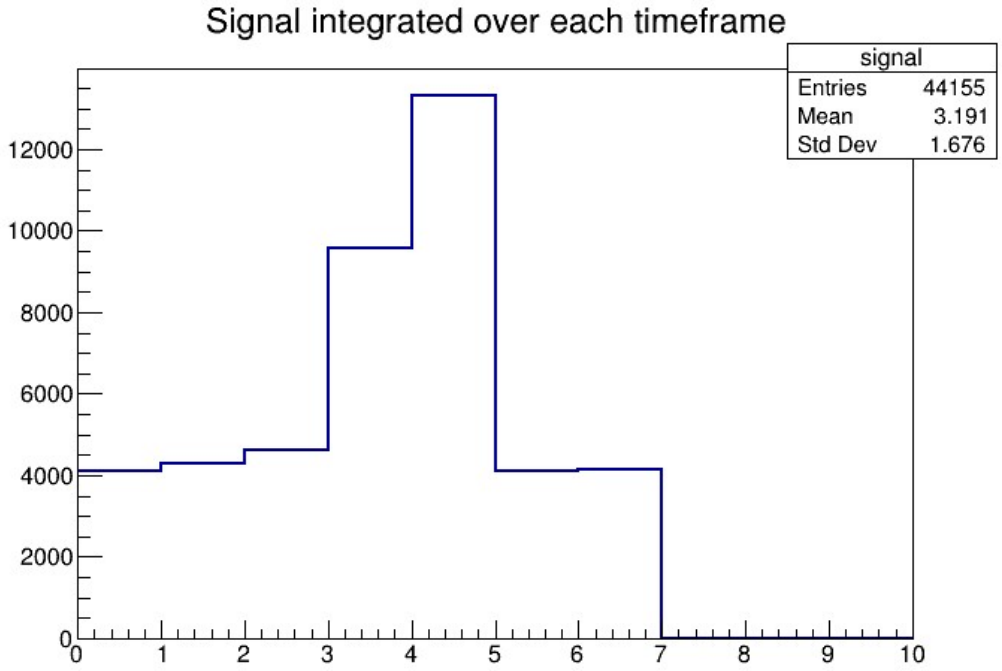
- Several events with signal in more than one timeframe
- mainly selection on timeframes
- cut on noisy entries

2. Signal over each timeframe

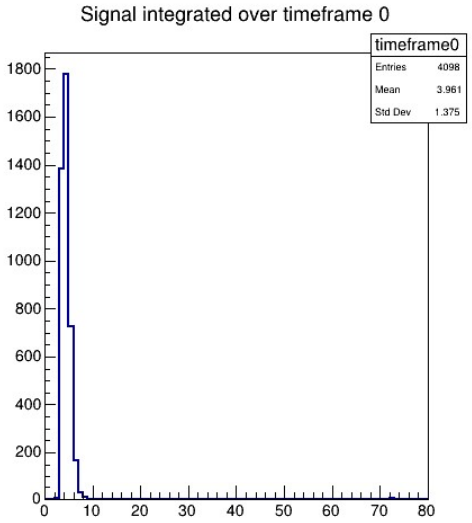
- mainly timeframes 3 & 4
- huge percentage in other timeframes – *need to be investigated*

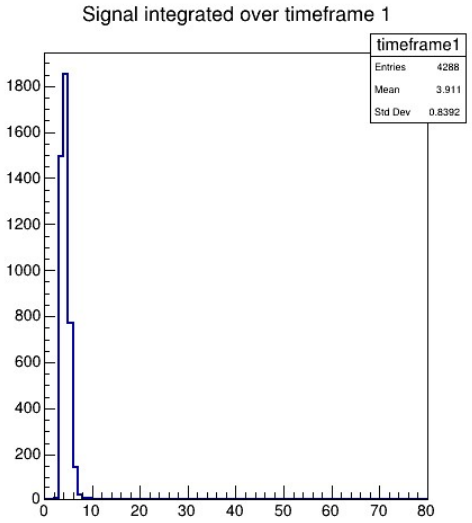
(the code for obtaining this was checked using data from previous testbeam and showed good agreement with Szymon's plots)

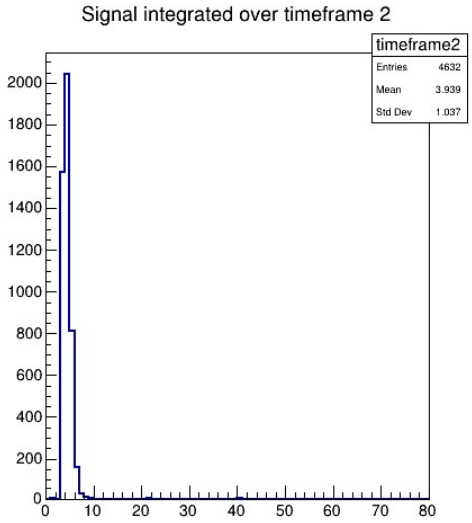


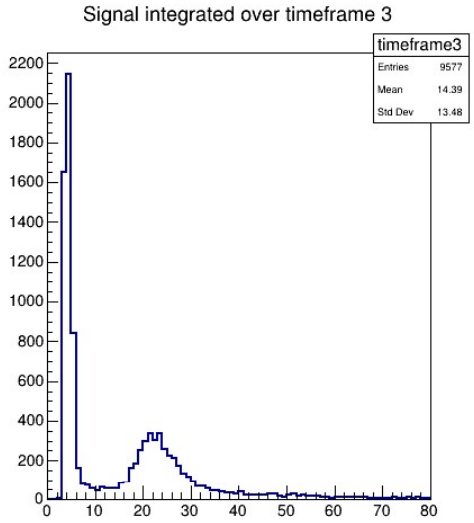


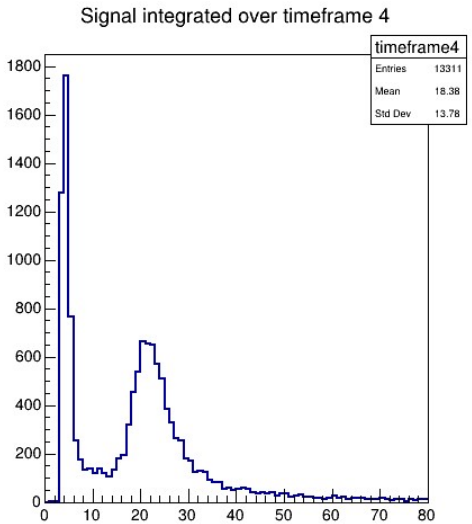
Anton1 sensor, run 652 - timeframes

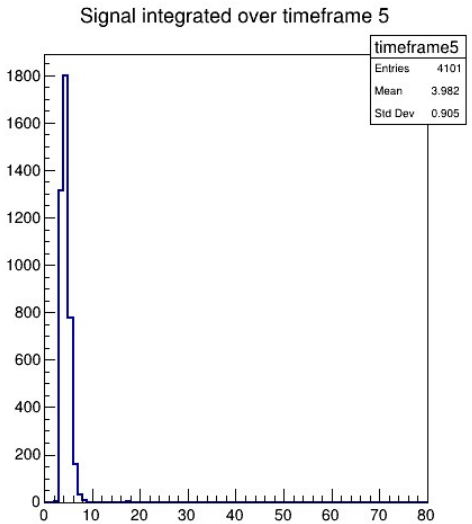


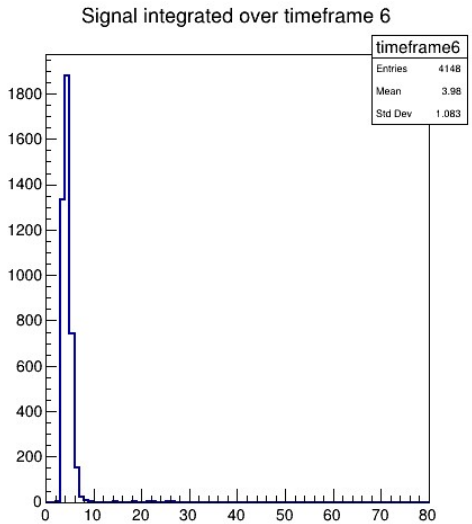










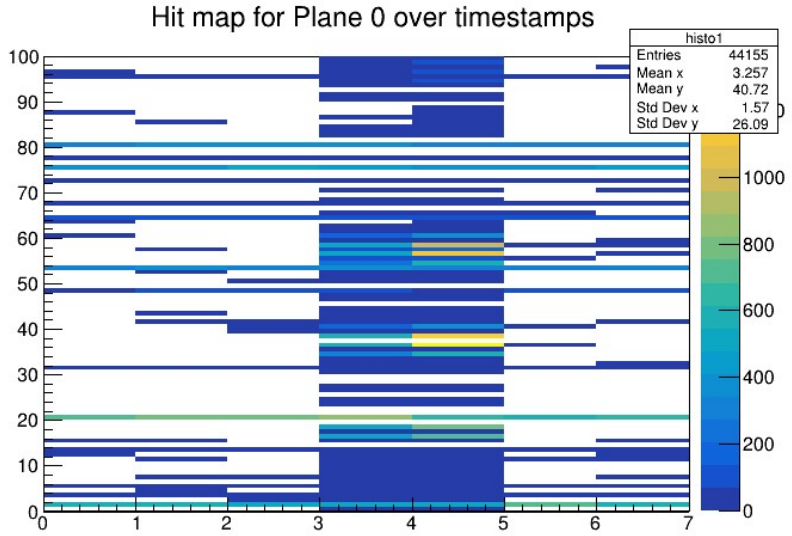


Signal for each timeframe

- confirm that timeframes 3 & 4 contribute most to the signal
- other timeframes seems to only get noise signal

check if applying cut on timeframes will improve hit map

Anton1 sensor, run 652 – reconstructed hit map

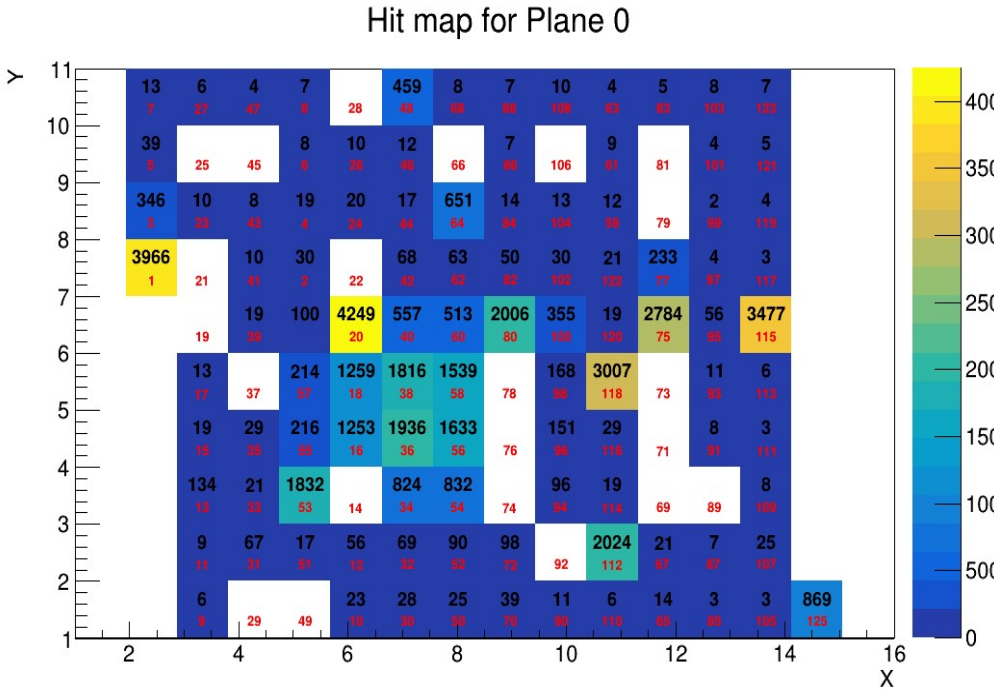


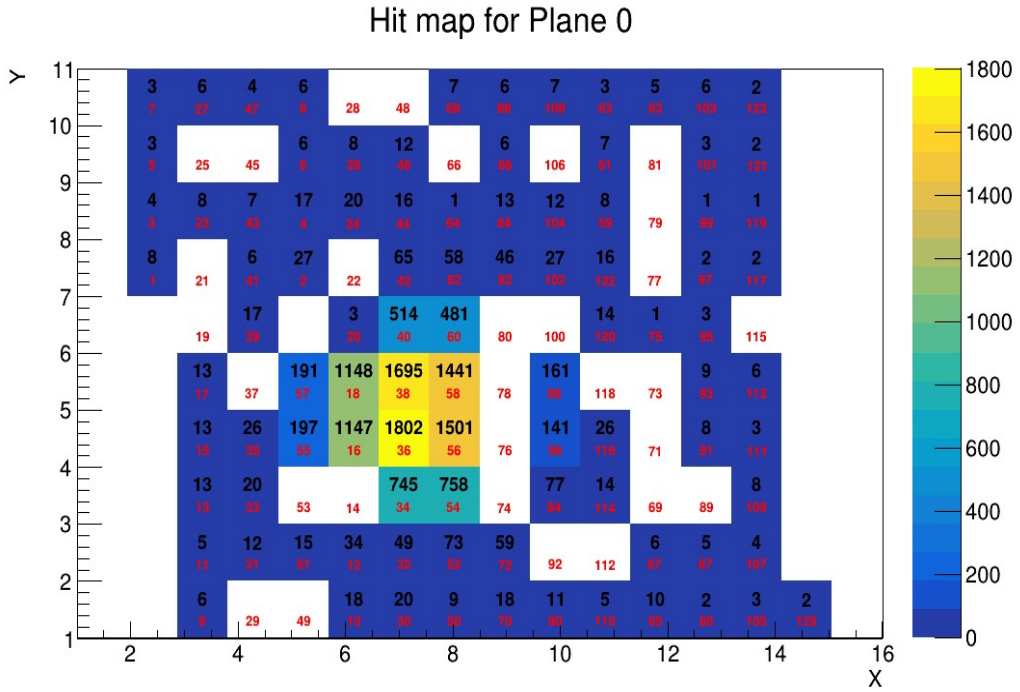
Reconstructed hit map

- Pad by pad reconstruction
- Pads outside of beam area with high signal / noise

Reconstructed hit map with *only timeframes 3 & 4*

- Timeframes 3&4 selected
- Threshold cut at 10 ADC

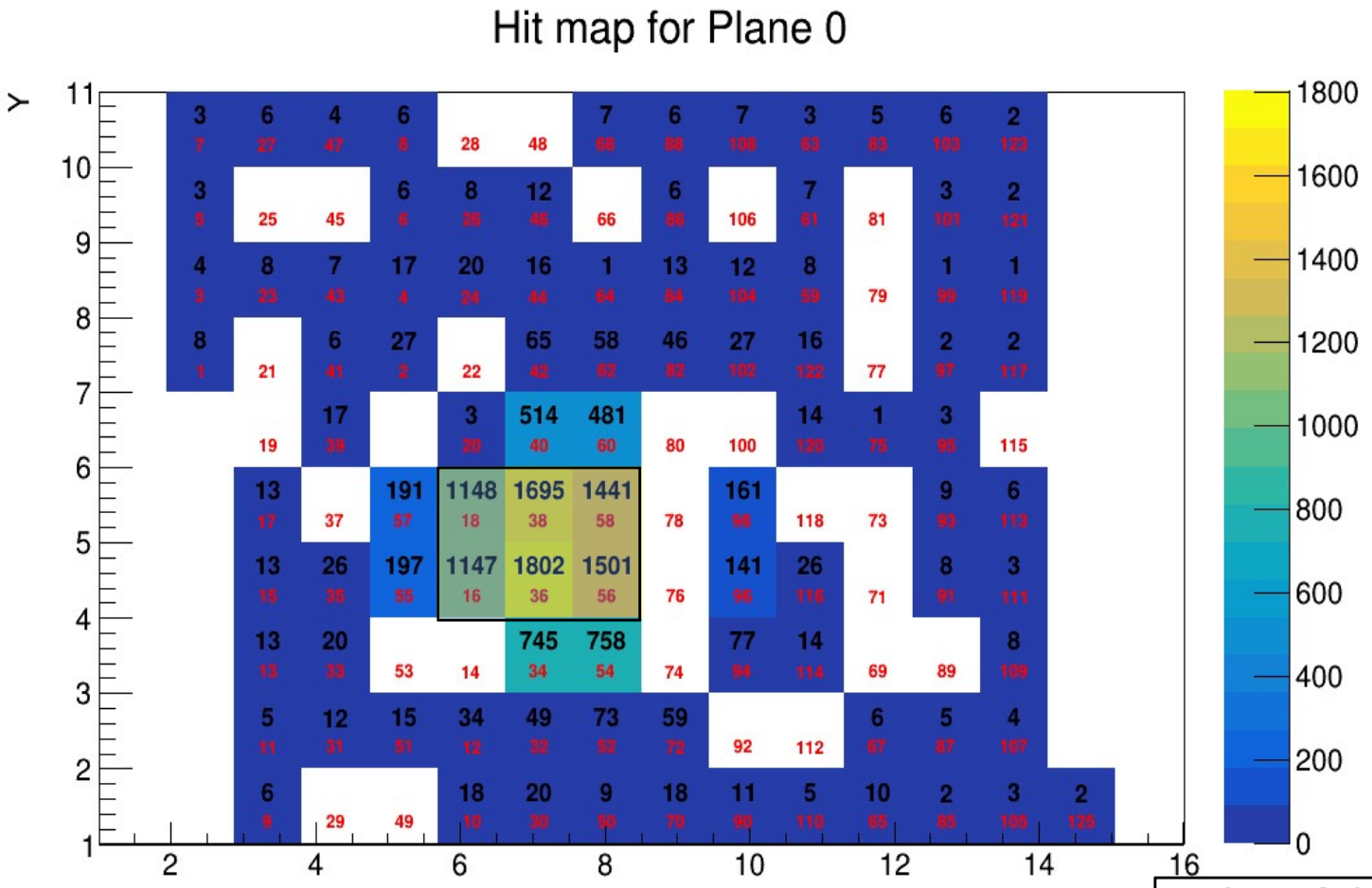




Anton1 sensor, run 652 – reconstructed hit map

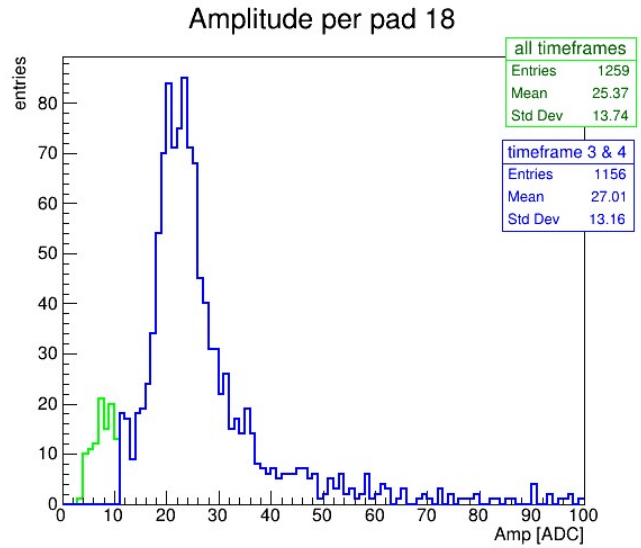
Timeframes - conclusions

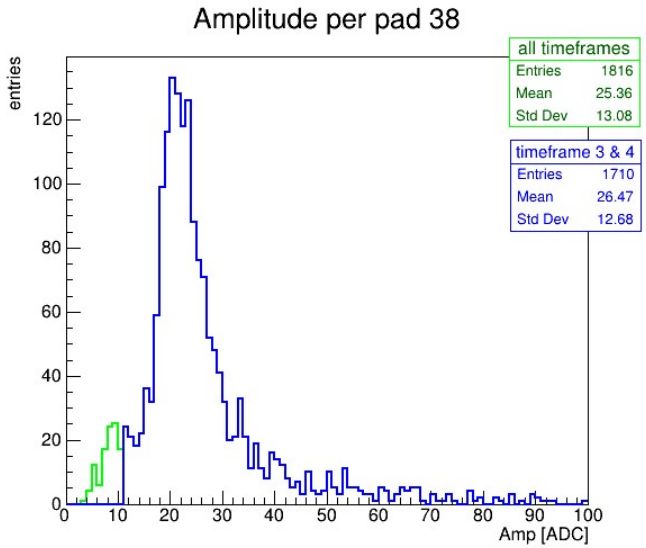
- Make a threshold cut for noise at 10
- Get signals only from timeframes 3 & 4
- Timeframes 3 & 4 merged BUT excluded all events for which the same pad responded twice

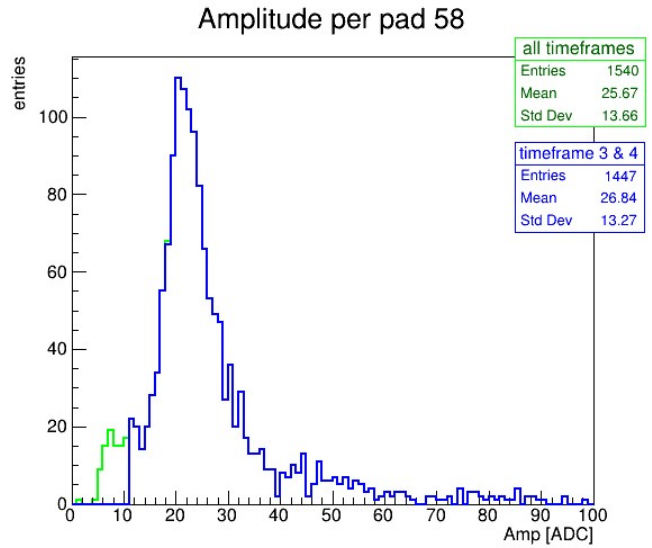


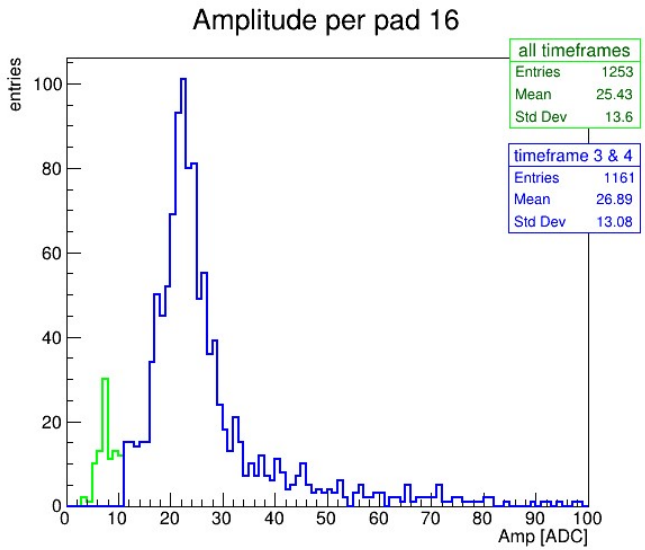
Selected the pads where the beam hit: 18, 38, 58 and 16, 36, 56

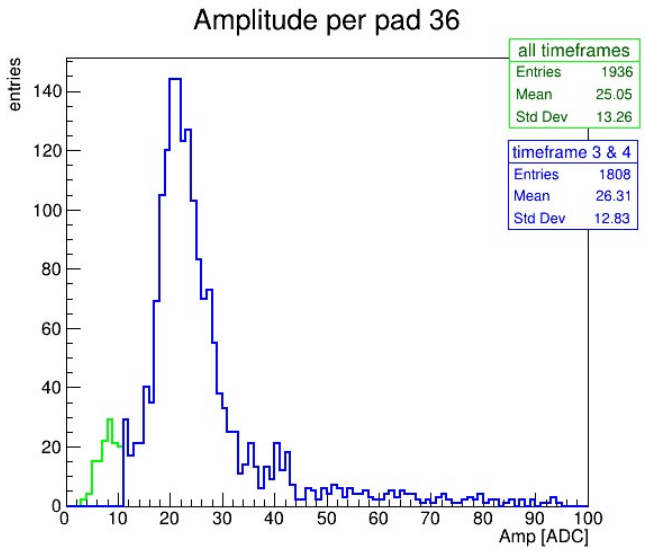
Anton1 sensor, run 652 – central pads

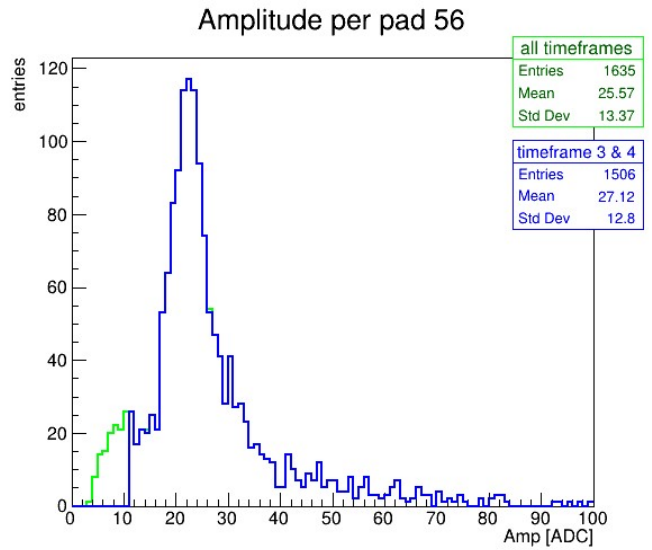






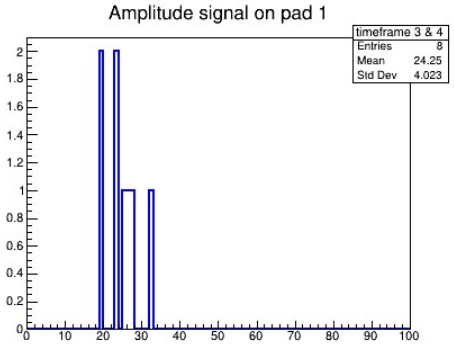


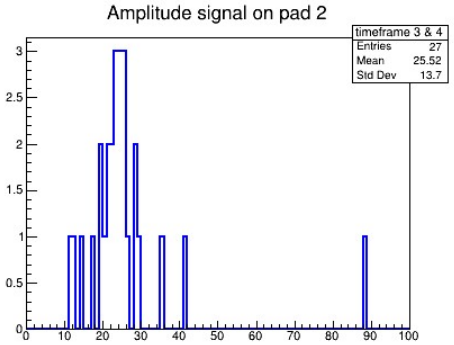


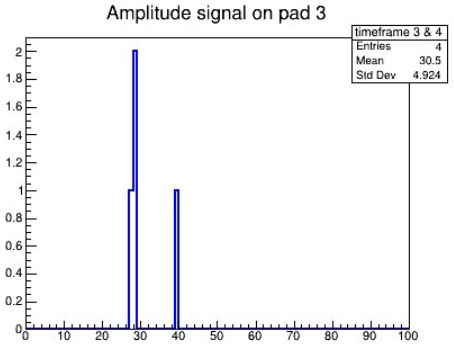


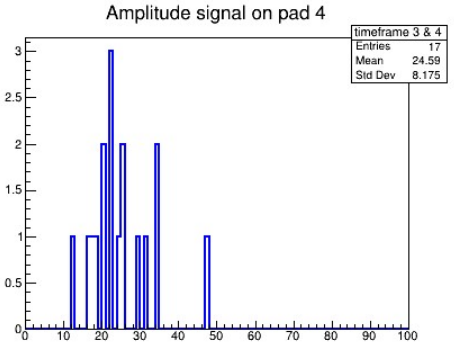
- **no differences if we selected only timeframes 3 & 4**
- **threshold cut at 10 ADC**

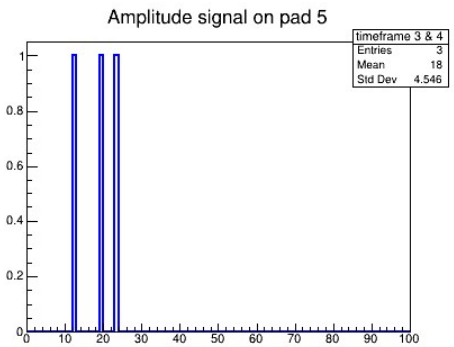
Anton1 sensor, run 652 – pads 1 ÷ 12

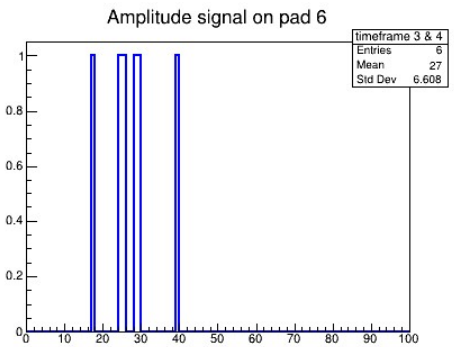


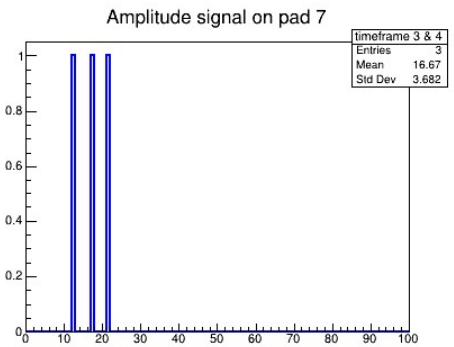


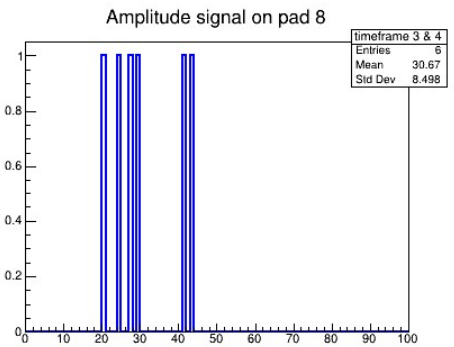


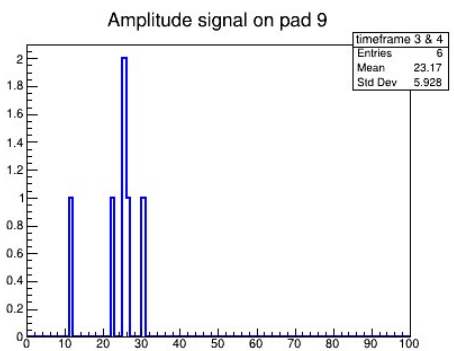


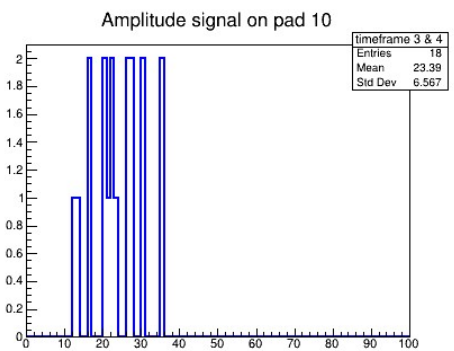


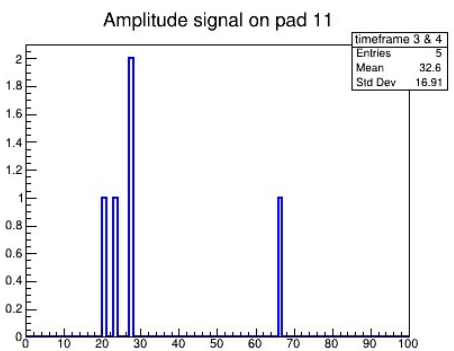


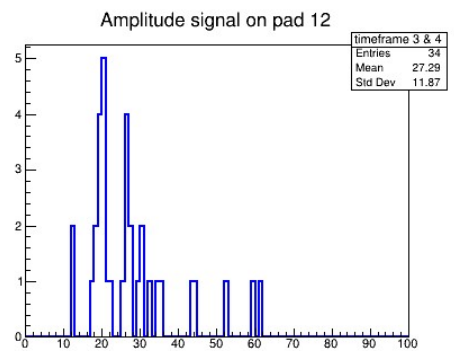




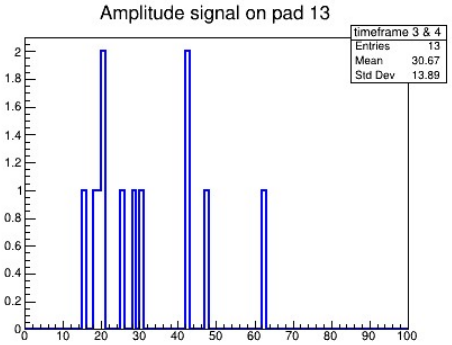


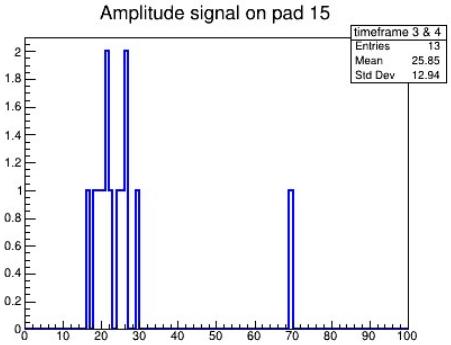


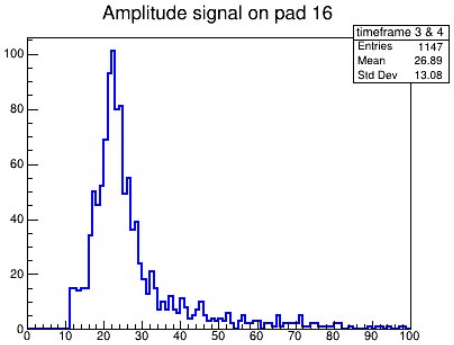


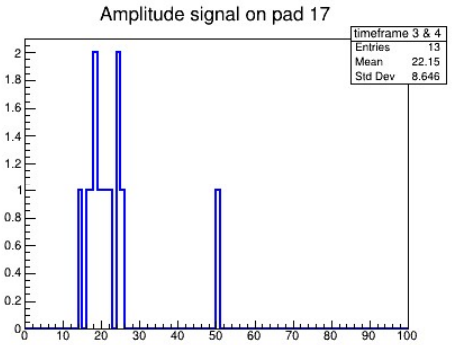


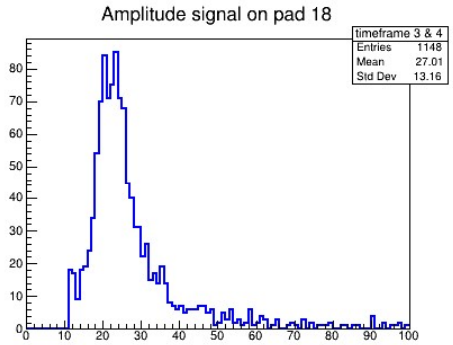
Anton1 sensor, run 652 – pads 13 ÷ 24

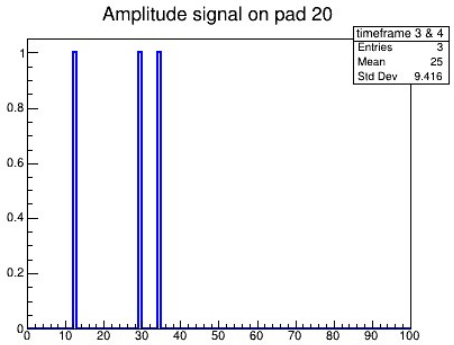


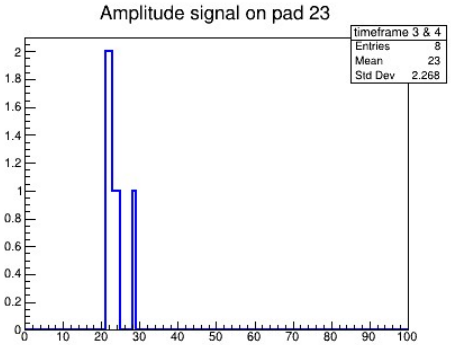


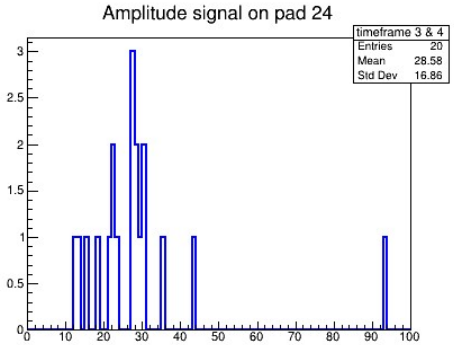




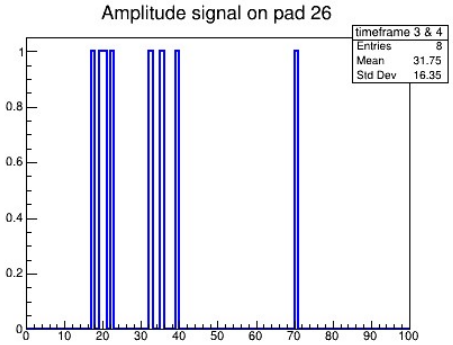


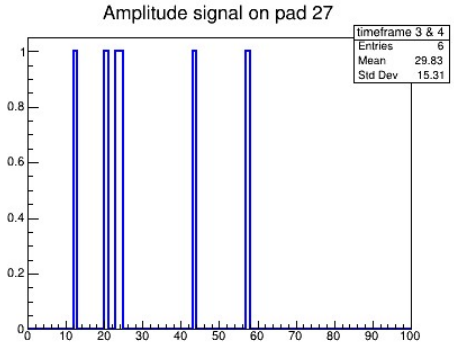


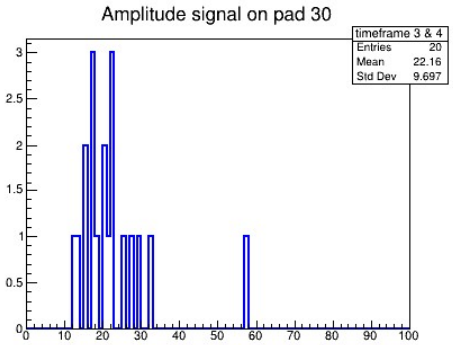


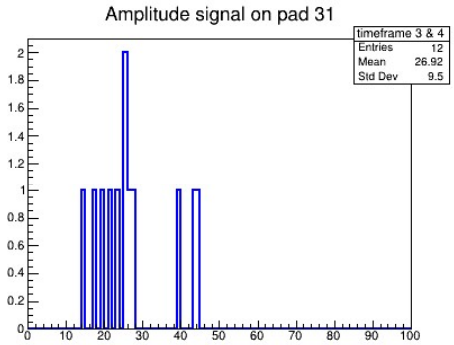


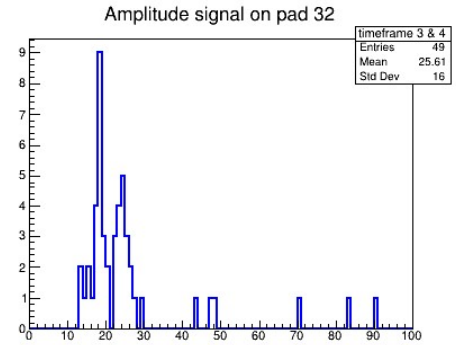
Anton1 sensor, run 652 – pads 25 ÷ 36

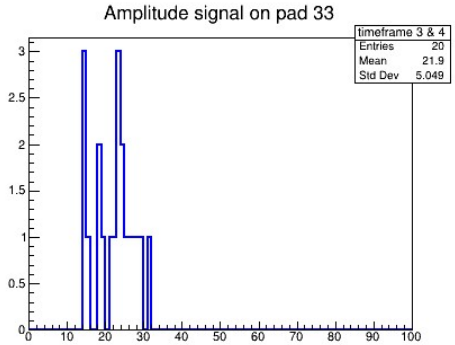


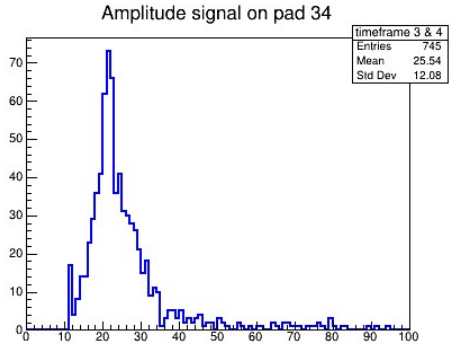


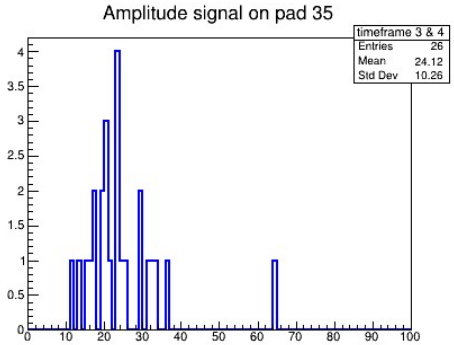


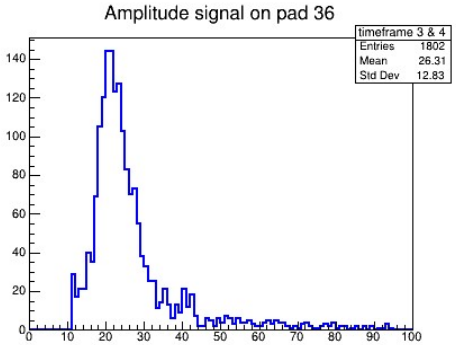




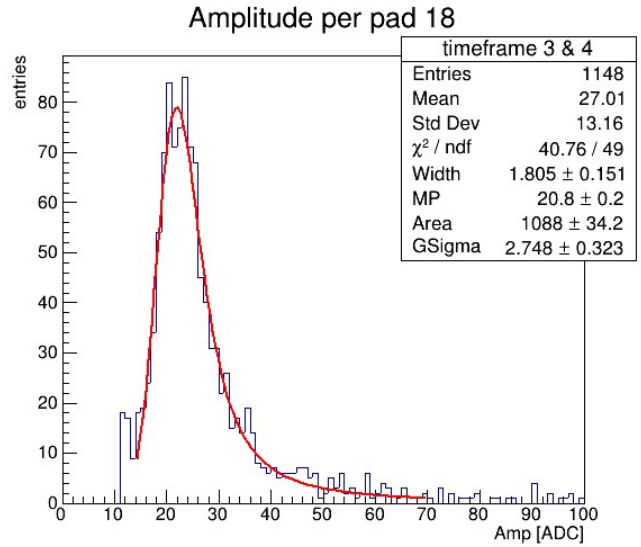


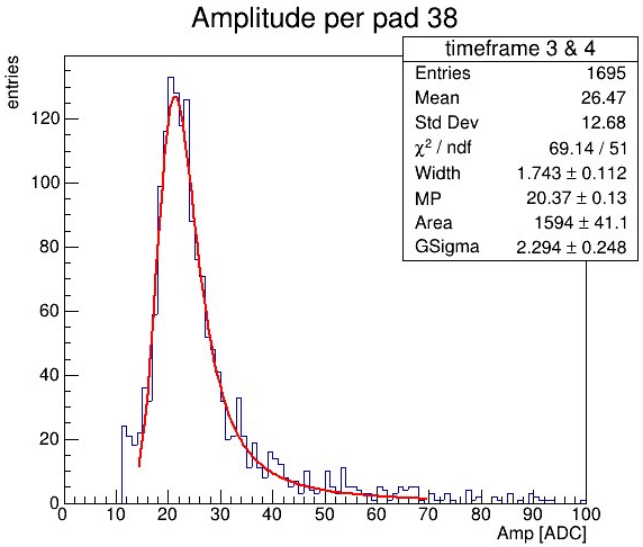


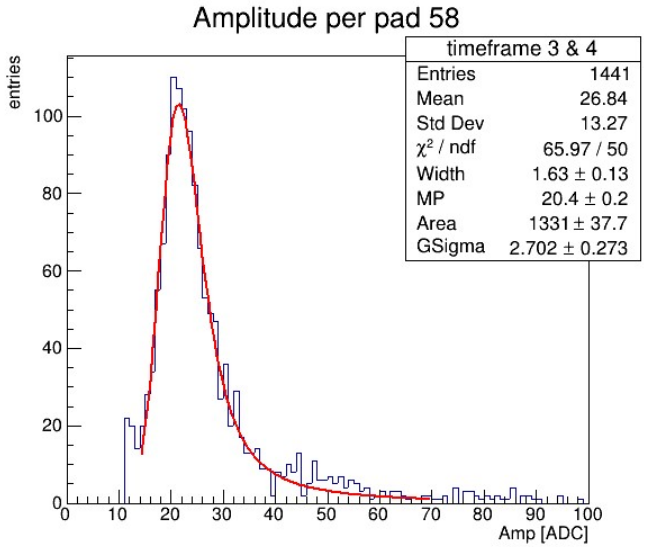


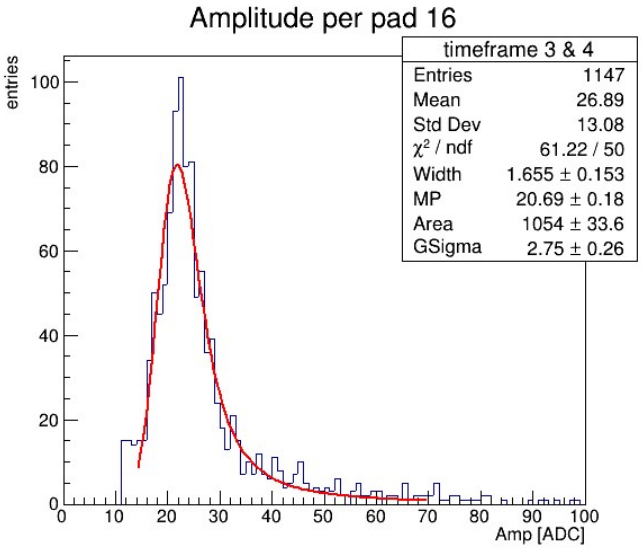


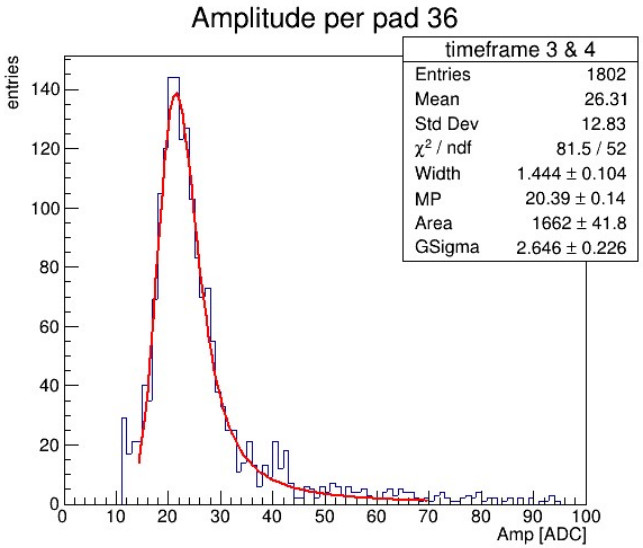
Anton1 sensor, run 652 – central pads

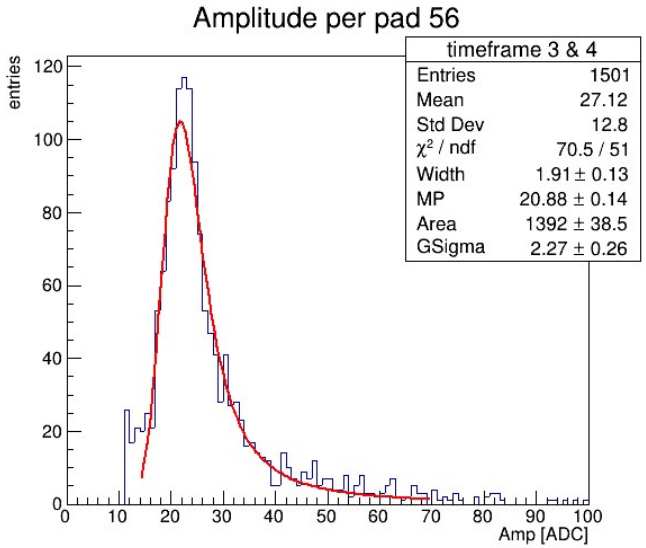










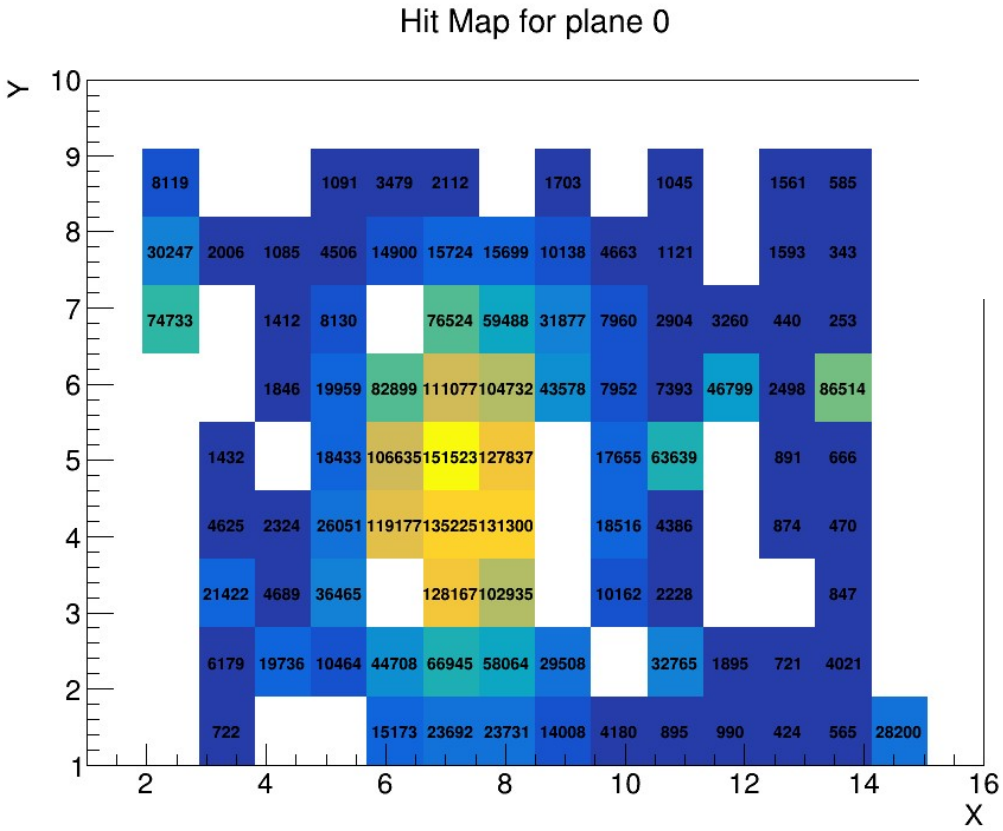


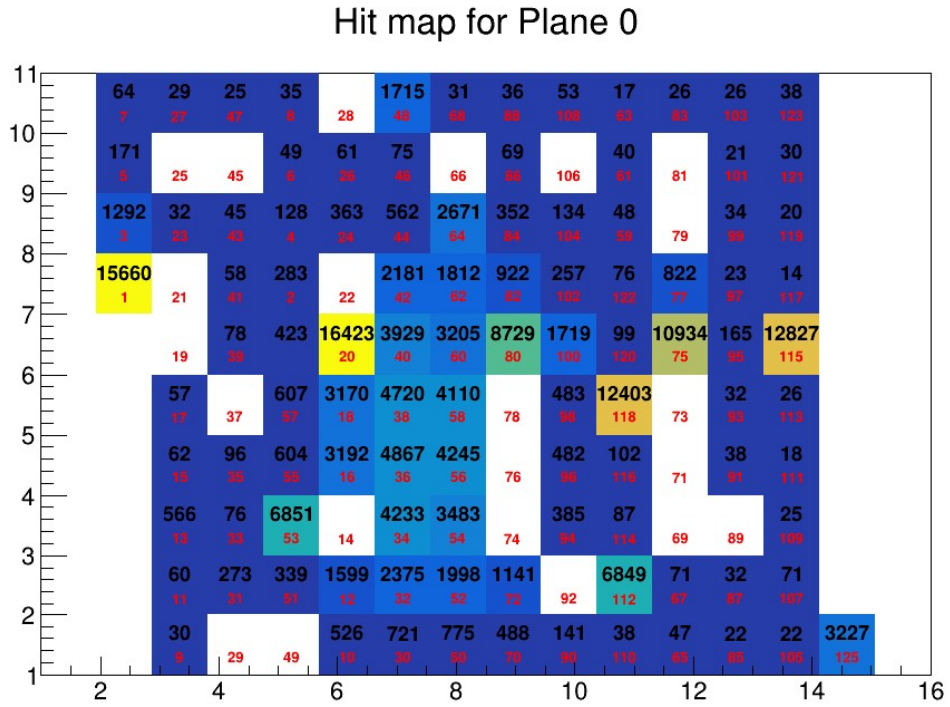
- **Landau Gauss convoluted fit**

Anton1 sensor, runs 650-654 - hit map

Concatenation of Runs 650, 651, 652, 653, 654

- Anton1 sensor without W planes
- Beam energy 5 GeV
- Beam position on X: 0 ; Y: from 0 to -20
- Number of events: 5 957 674





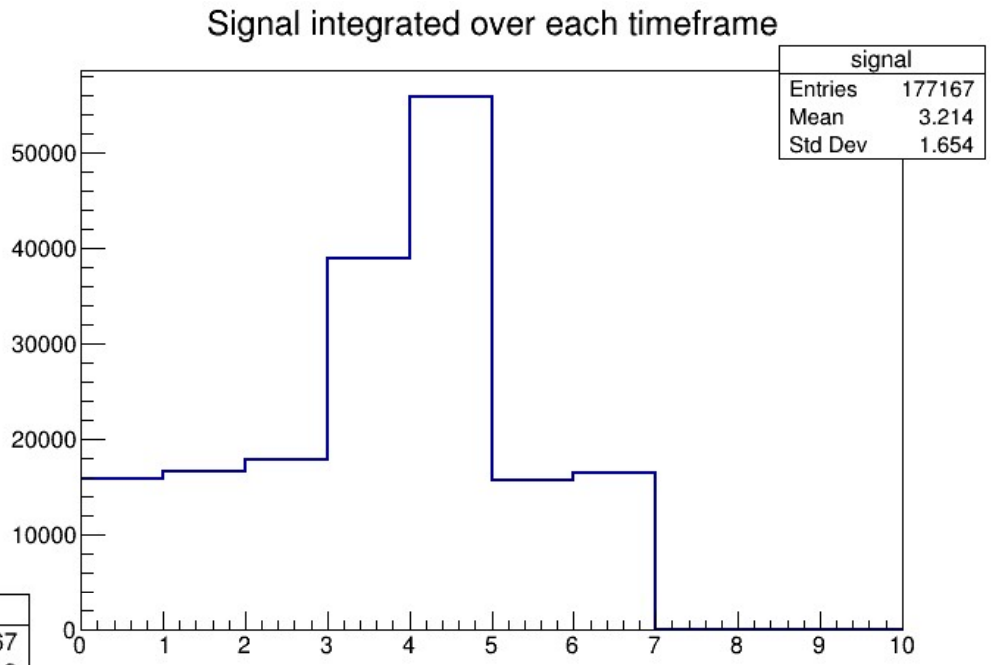
Hit selection

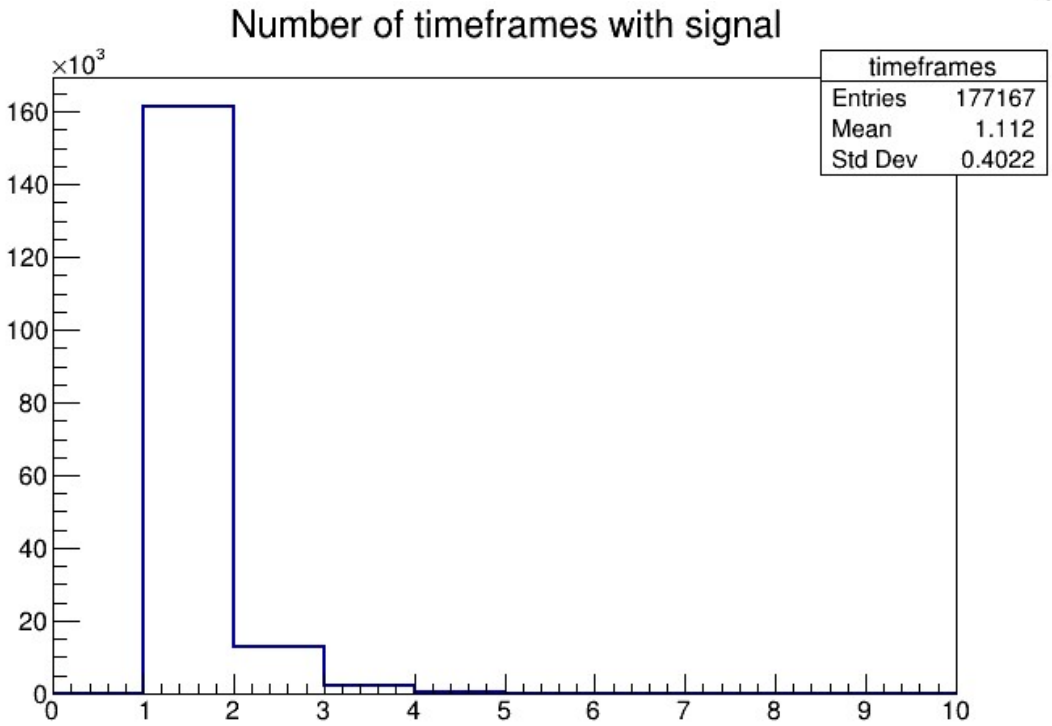
- one needs to develop a proper procedure for data selection
- selection on timeframes
- cut on noisy entries

Anton1 sensor, runs 650-654 - timeframes

Concatenation of Runs 650, 651, 652, 653, 654

- Anton1 sensor without W planes
- Beam energy 5 GeV
- Beam position on X: 0 ; Y: from 0 to -20
- Number of events: 5 957 674



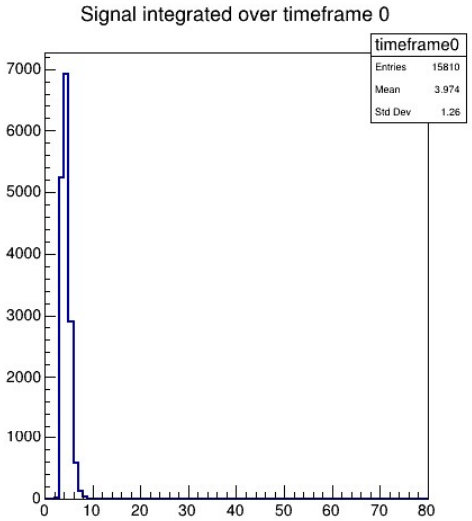


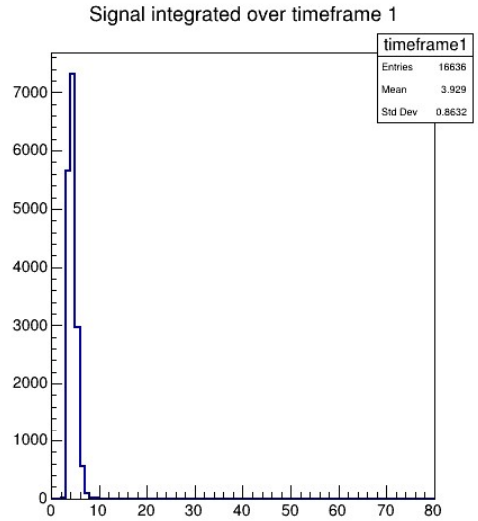
Timeframes evaluation

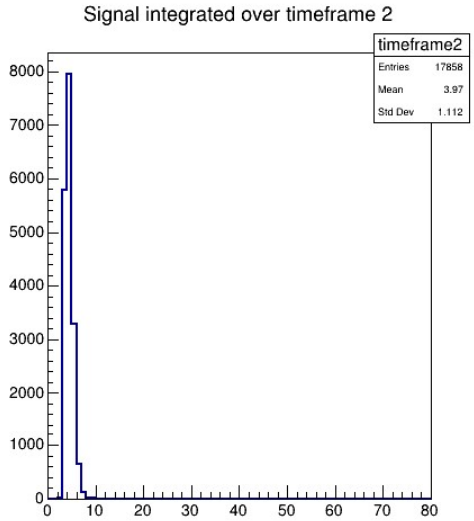
- Same behavior in all runs
- Number of events when more then one timeframe respond is still high

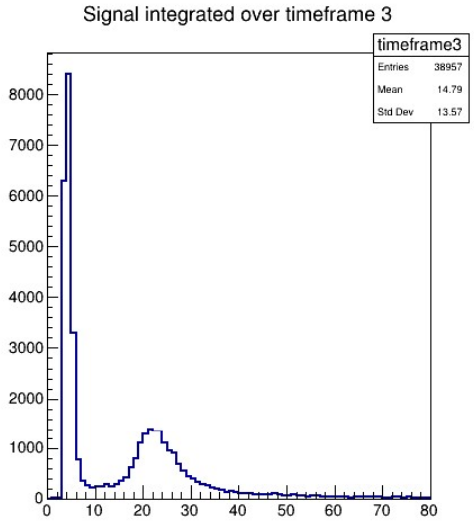
Anton1 sensor, runs 650-654 - timeframes

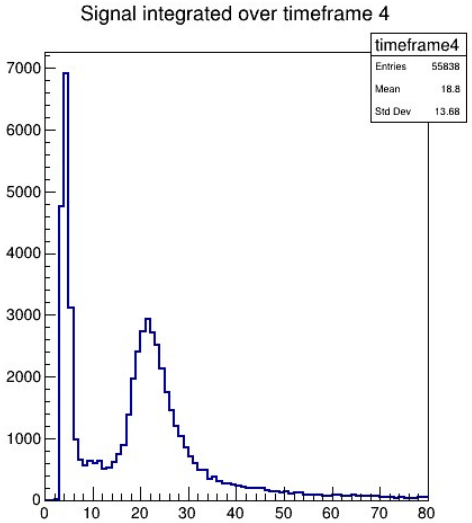
- **Amplitude on each timeframe**

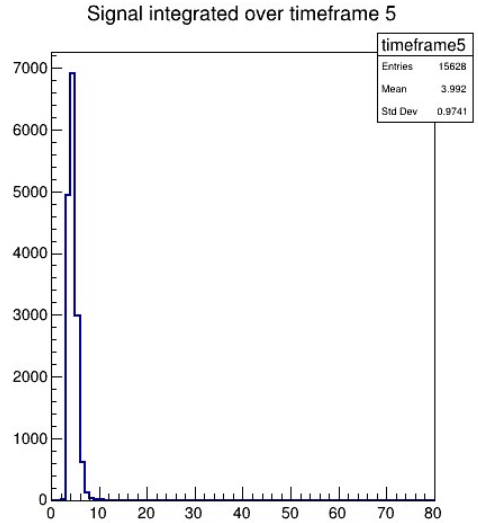


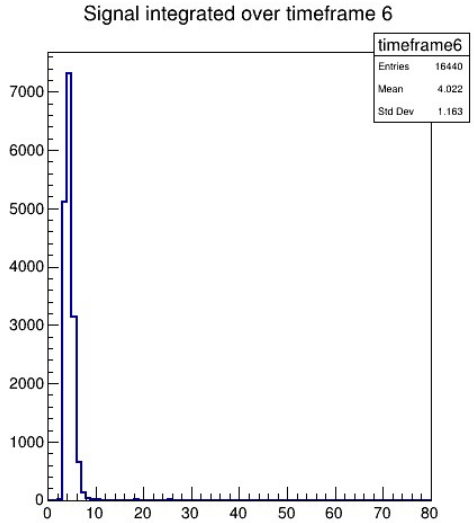






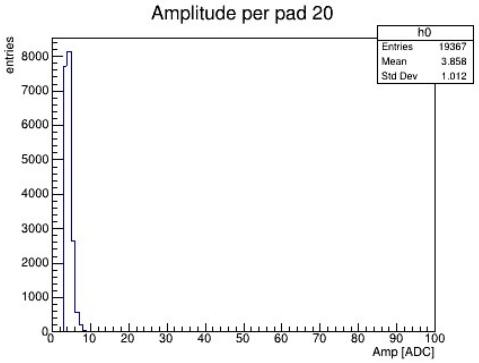


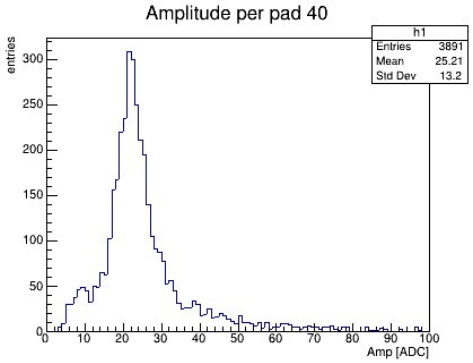


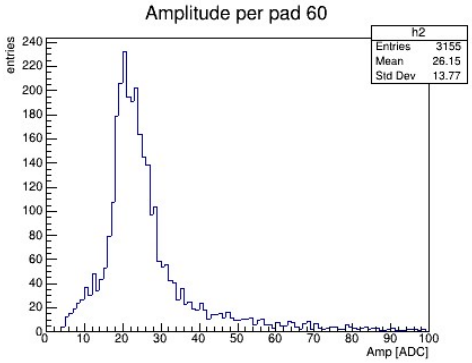


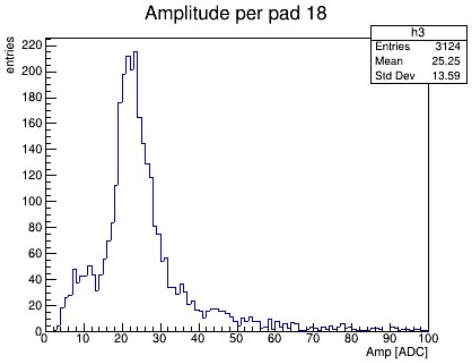
Anton1 sensor, runs 650-654 - signal

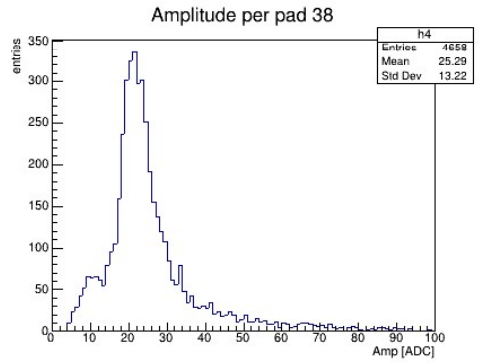
pads where the beam hit: 20, 40, 60, 18, 38, 58, 16, 36, 56, 14, 34, 54

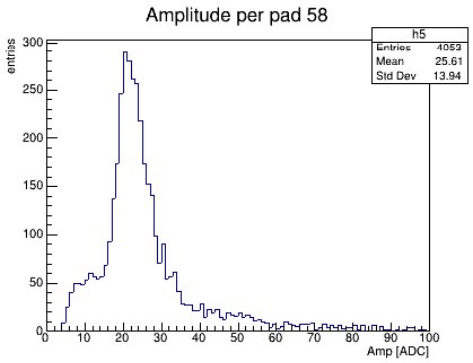


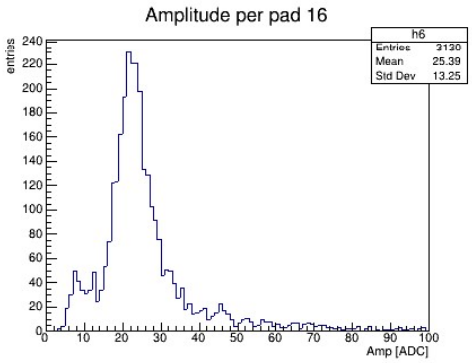


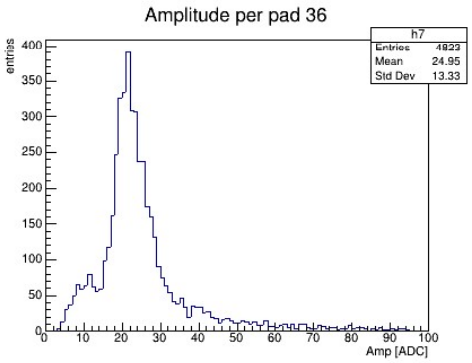


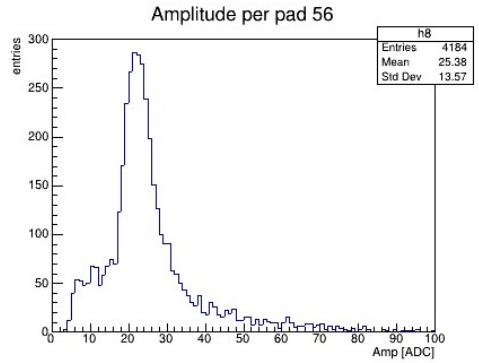


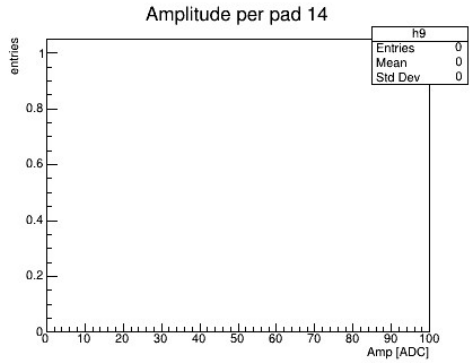


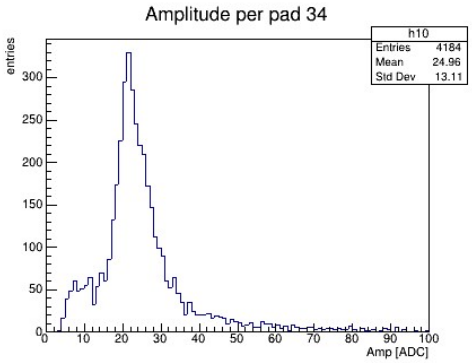


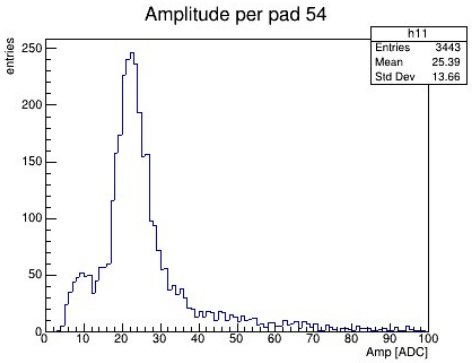






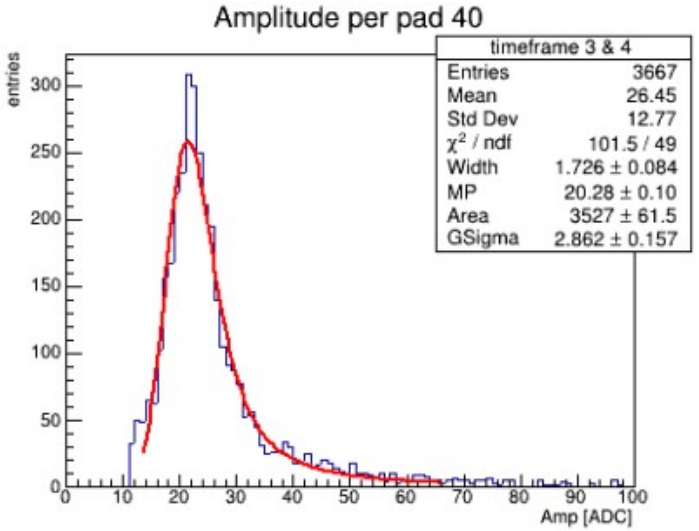


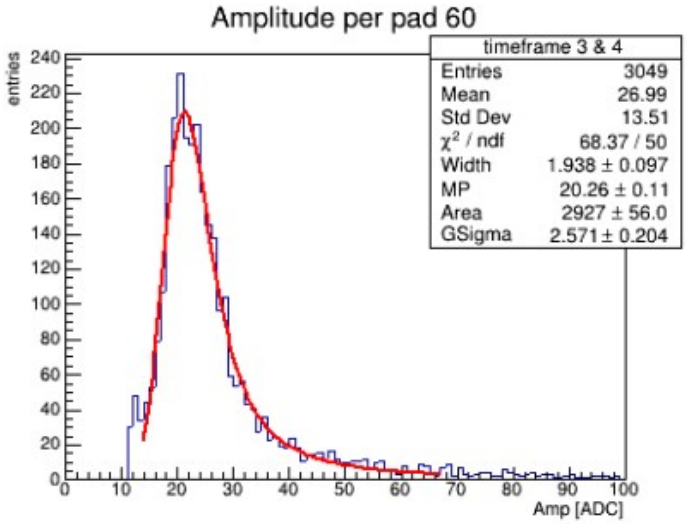


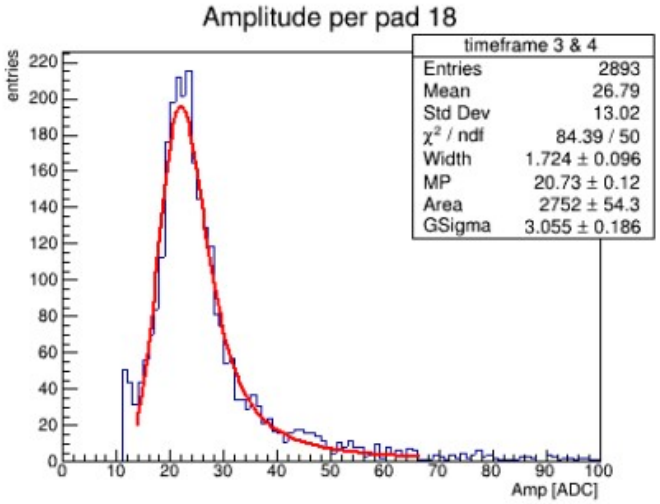


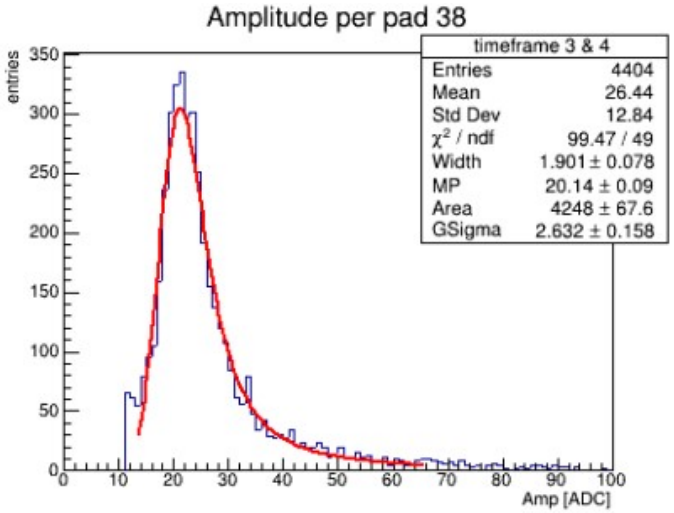
Anton1 sensor, runs 650-654 – convoluted fit

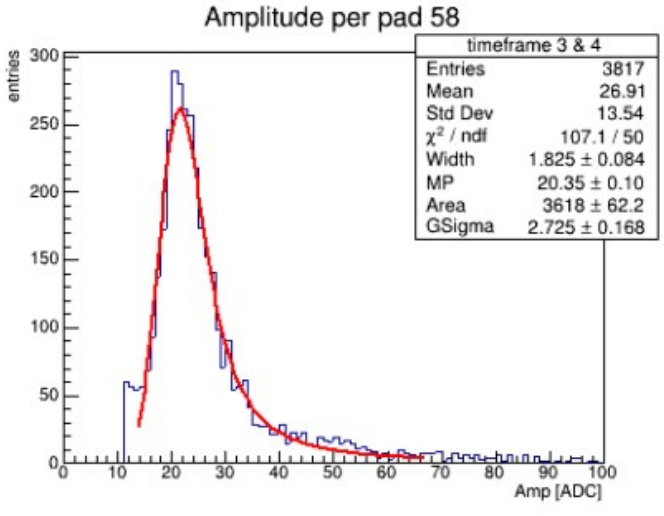
- Landau Gauss fit range [14,70] on each central pad
- pads where the beam hit: 40, 60, 18, 38, 58





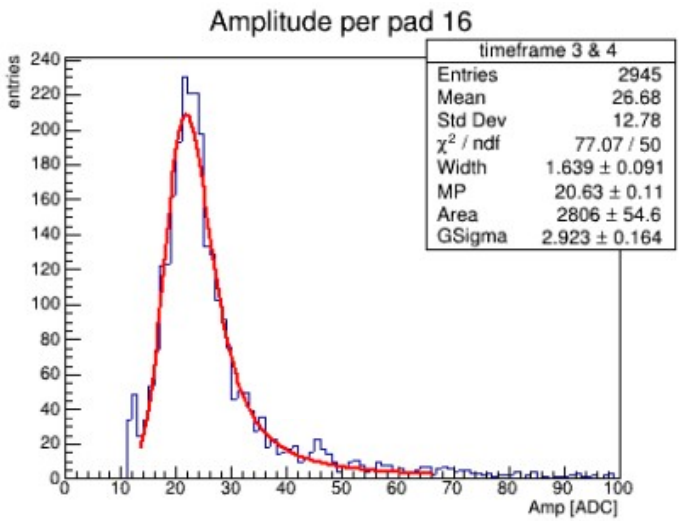


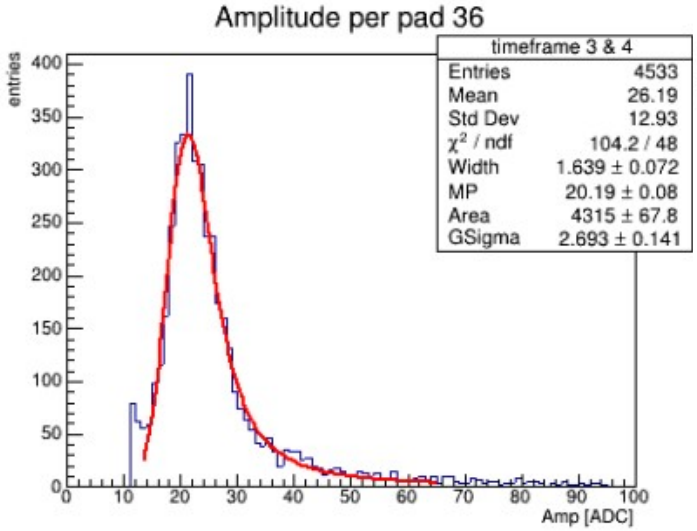


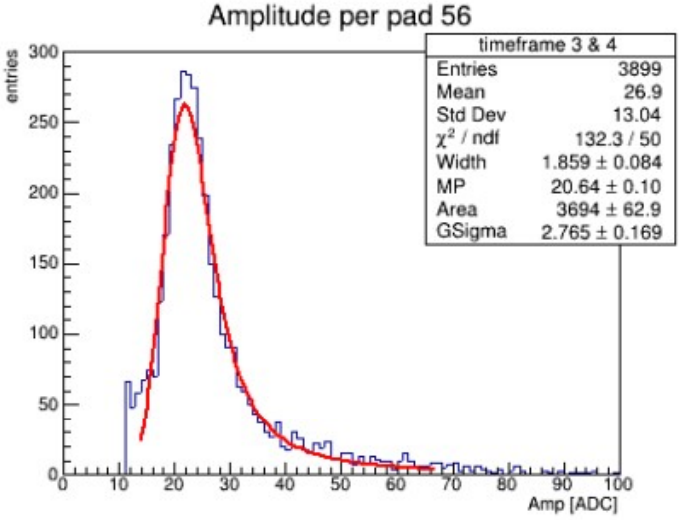


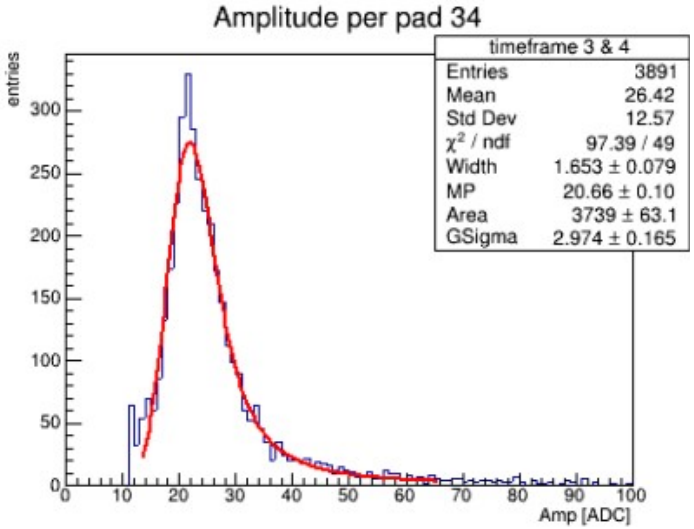
Anton1 sensor, runs 650-654 – convoluted fit

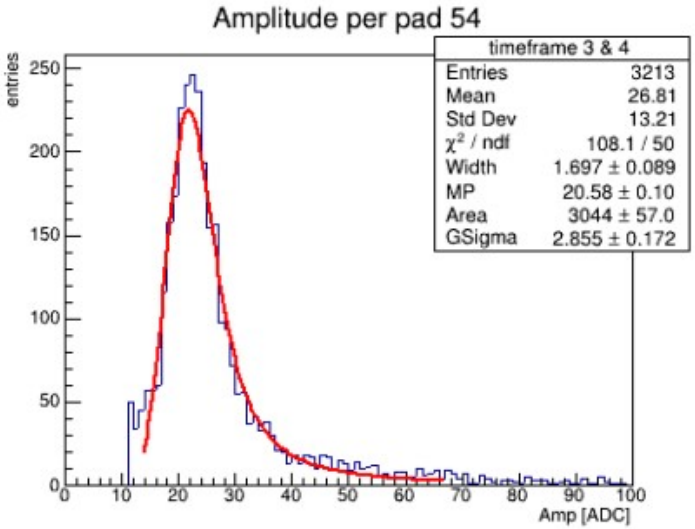
- Landau Gauss fit range [14,70] on each central pad
- pads where the beam hit: 16, 36, 56, 14, 34, 54





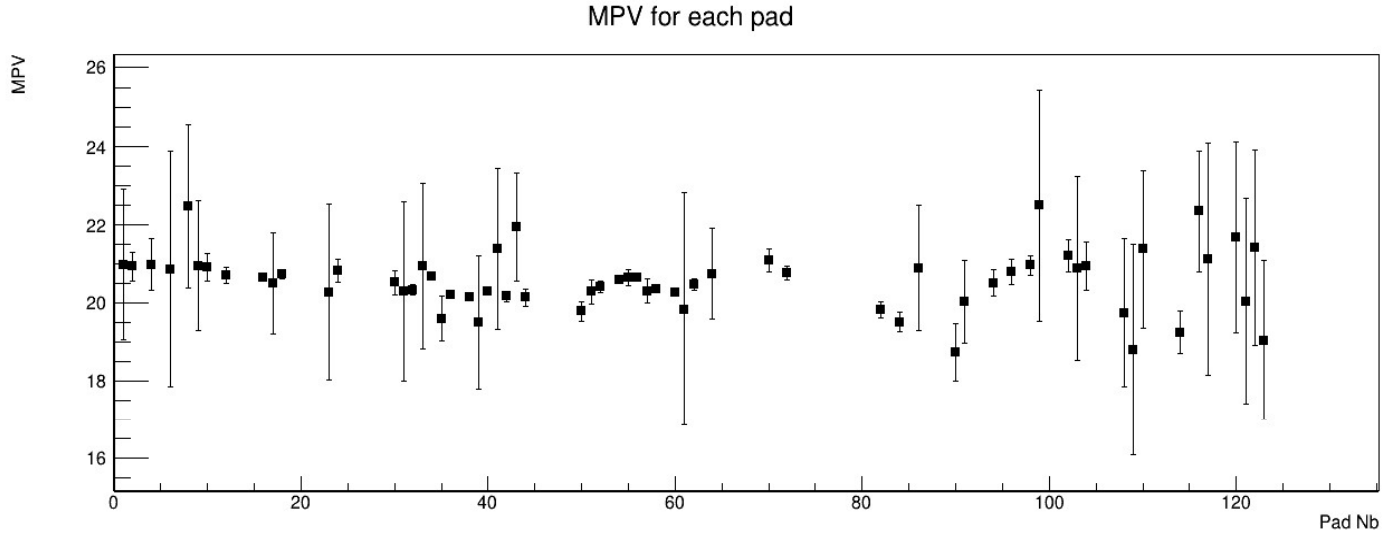


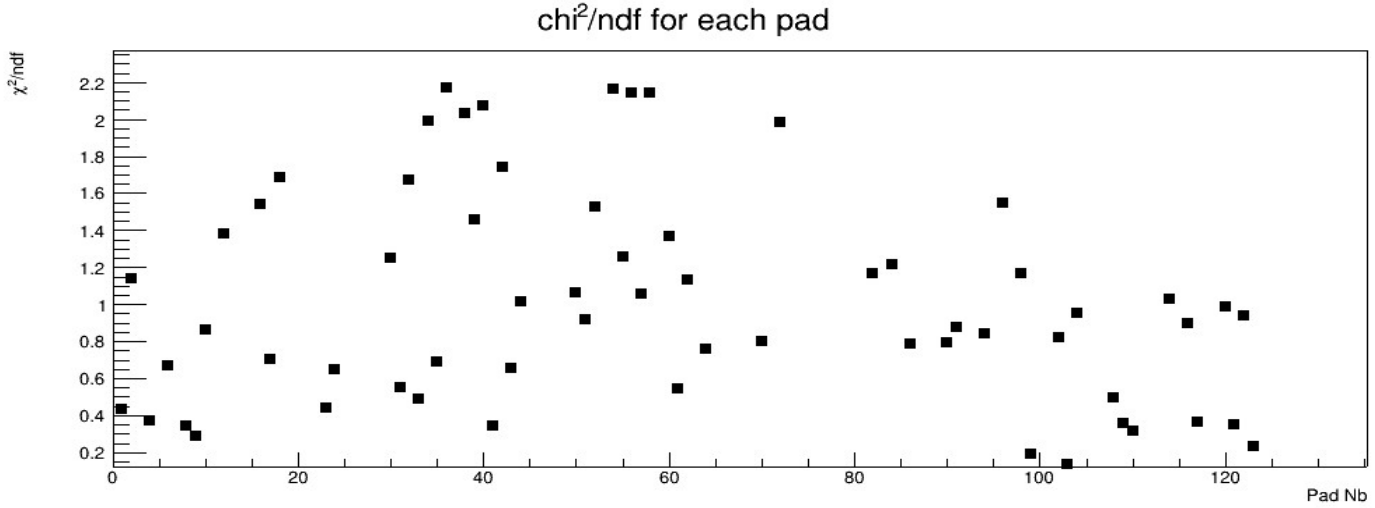




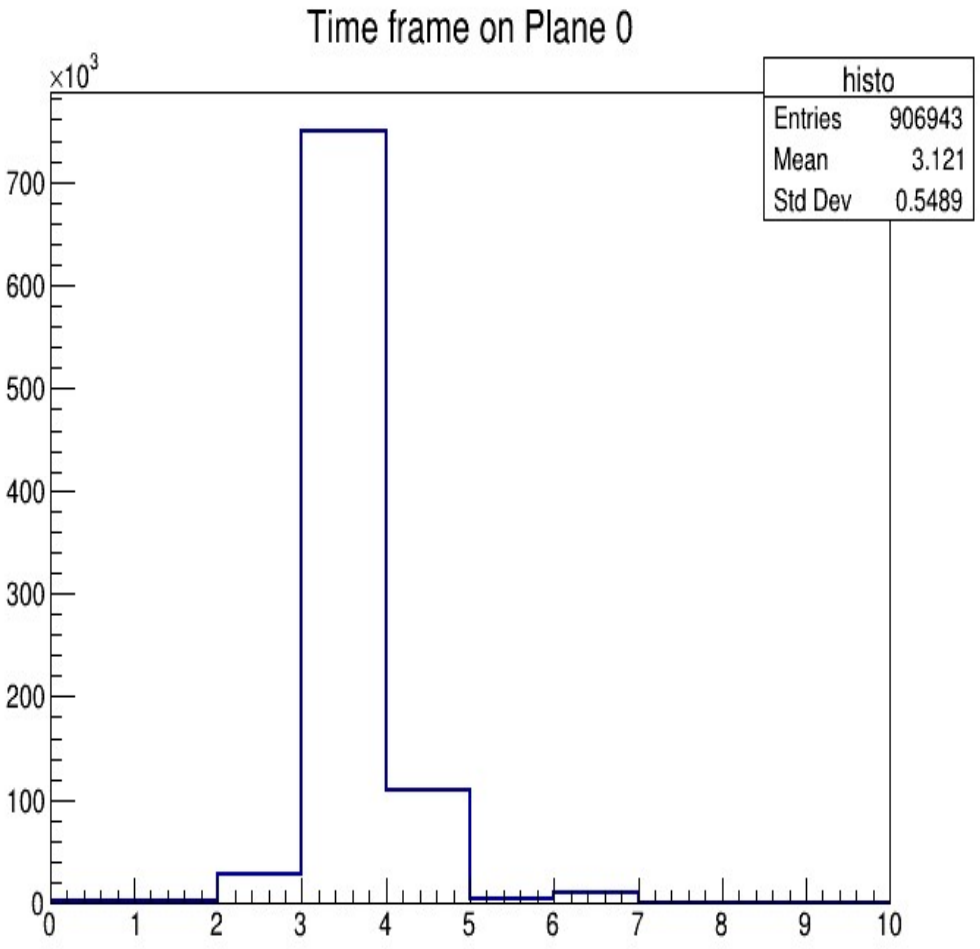
Anton1 sensor, runs 650-654 – convoluted fit

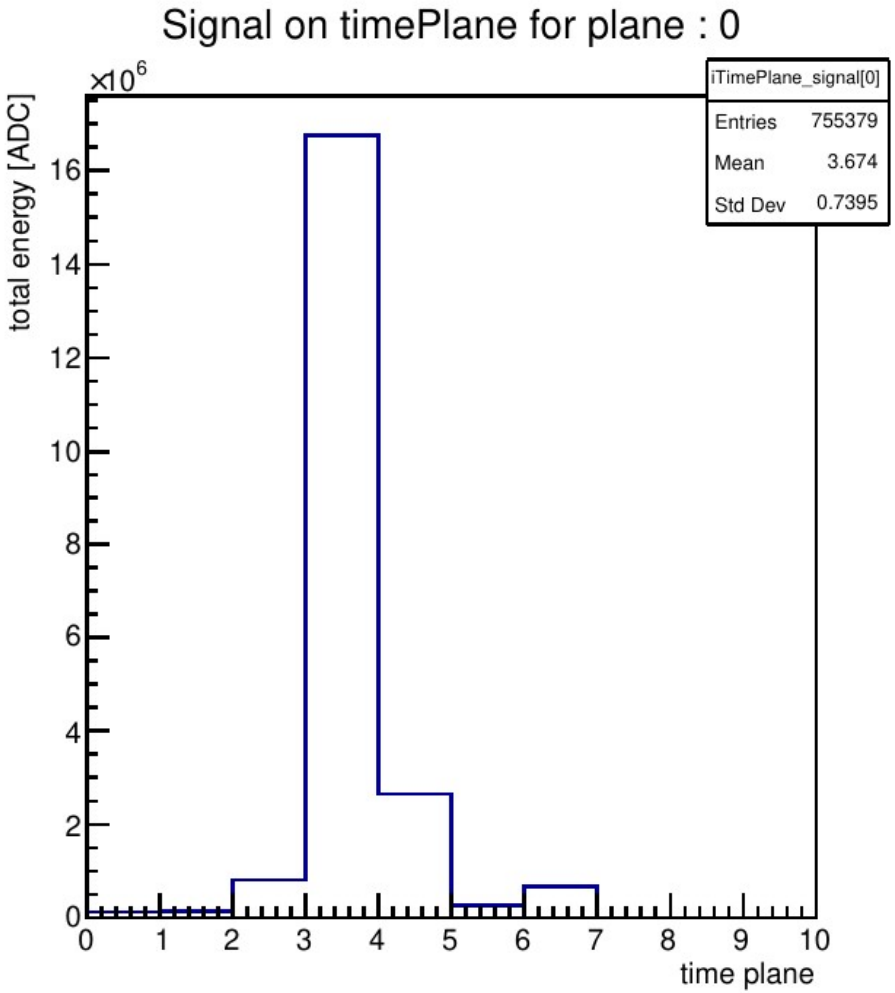
- **MPV of Landau Gauss fit for each pad with signal**





Validation of timeframes reading





My own code

- **Data from TB 2020**
- **more runs concatenated**

Szymon's plot