

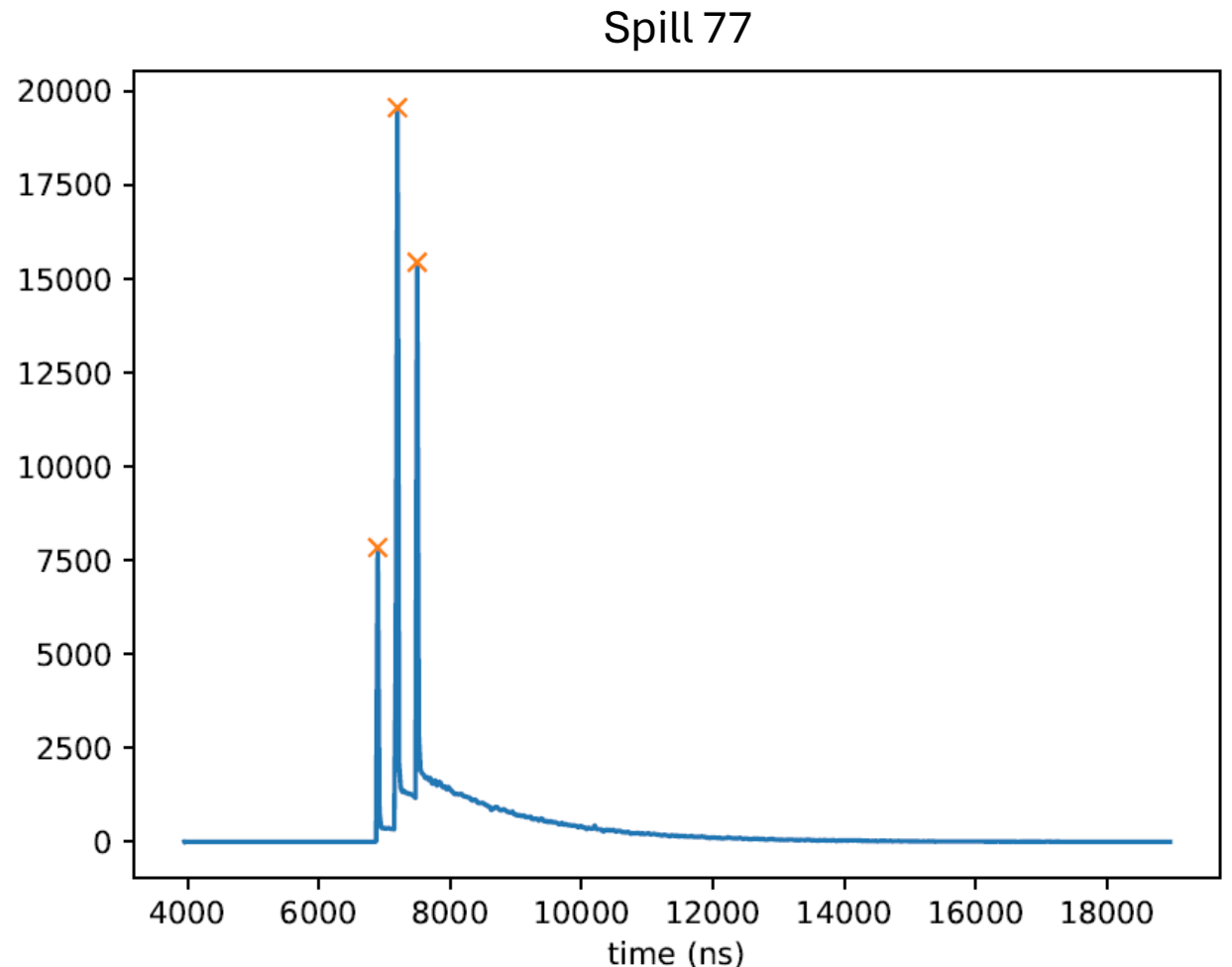
GRAIN wg meeting

25/10/2024

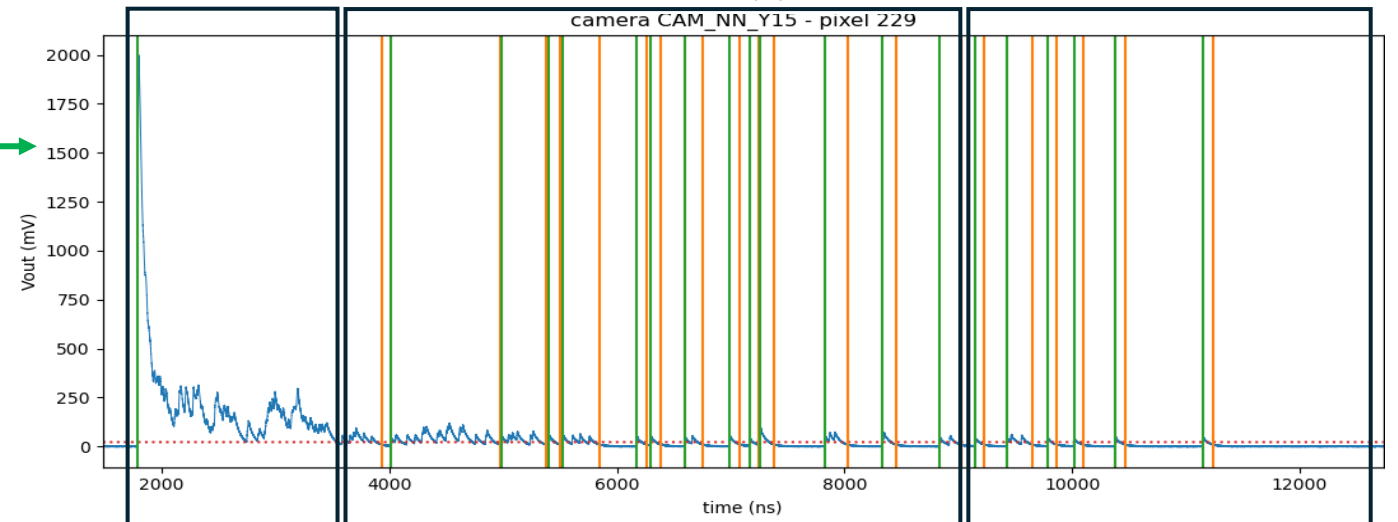
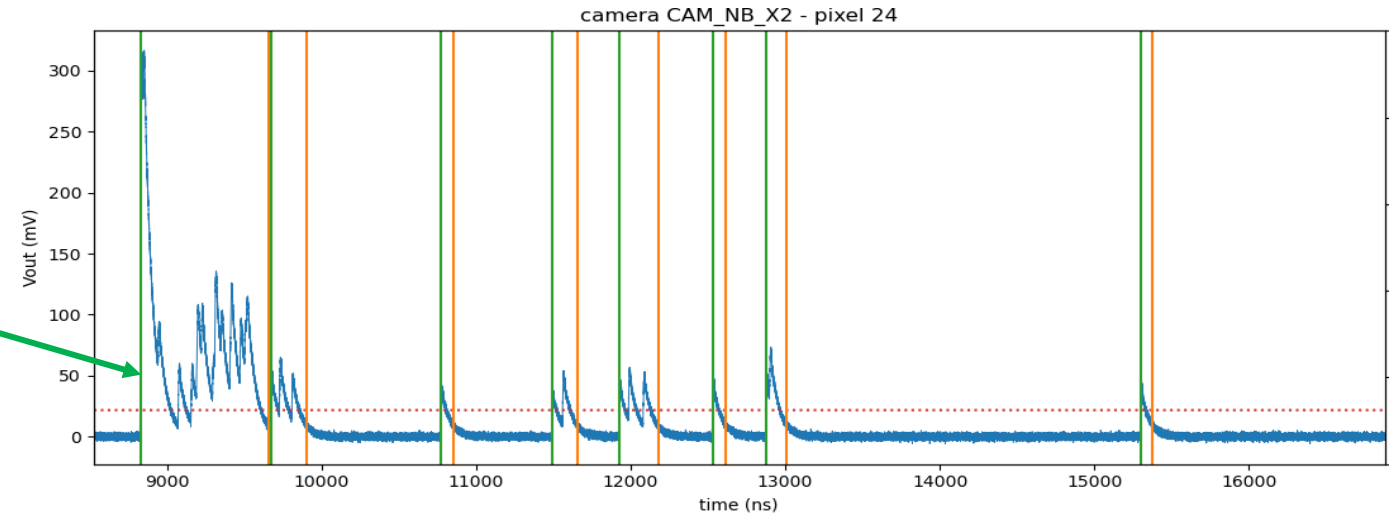
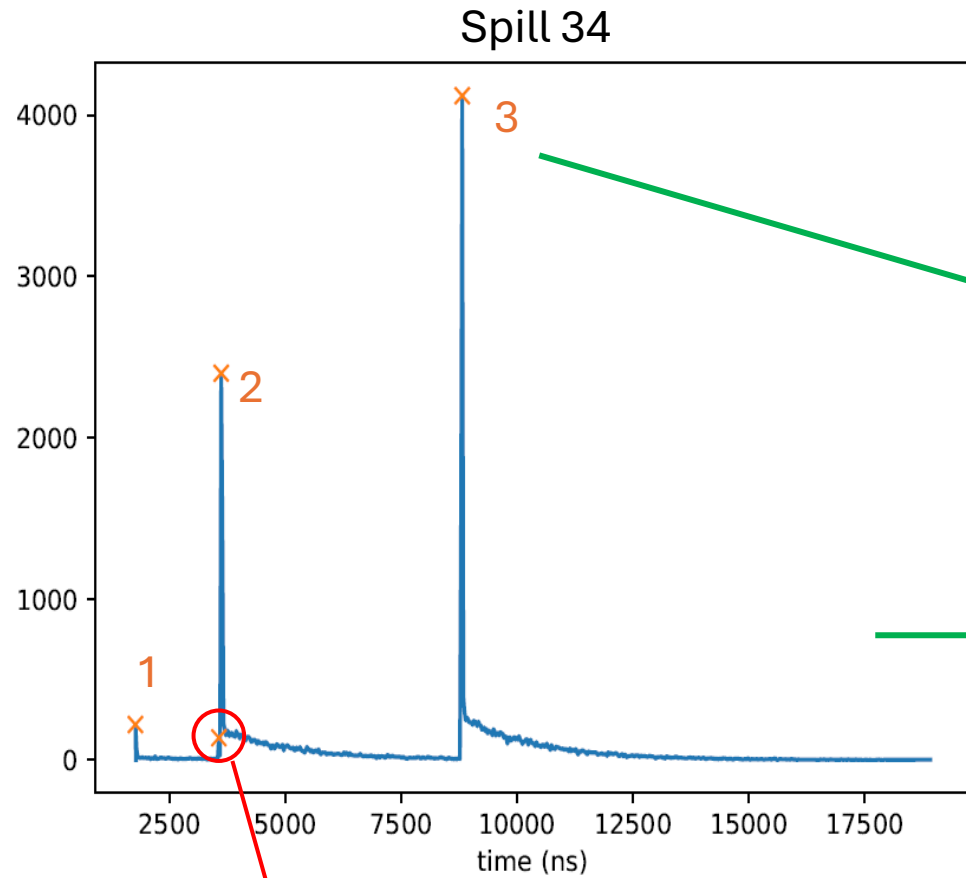
F. Chiapponi

Studies on signal pile-up

- 120 spill
- Identify peaks in the photon distribution of each spill
- look at the amplitude of signals in each pixel (of all cameras) in the time interval corresponding to the peaks.



Studies on signal pile-up



peak 1

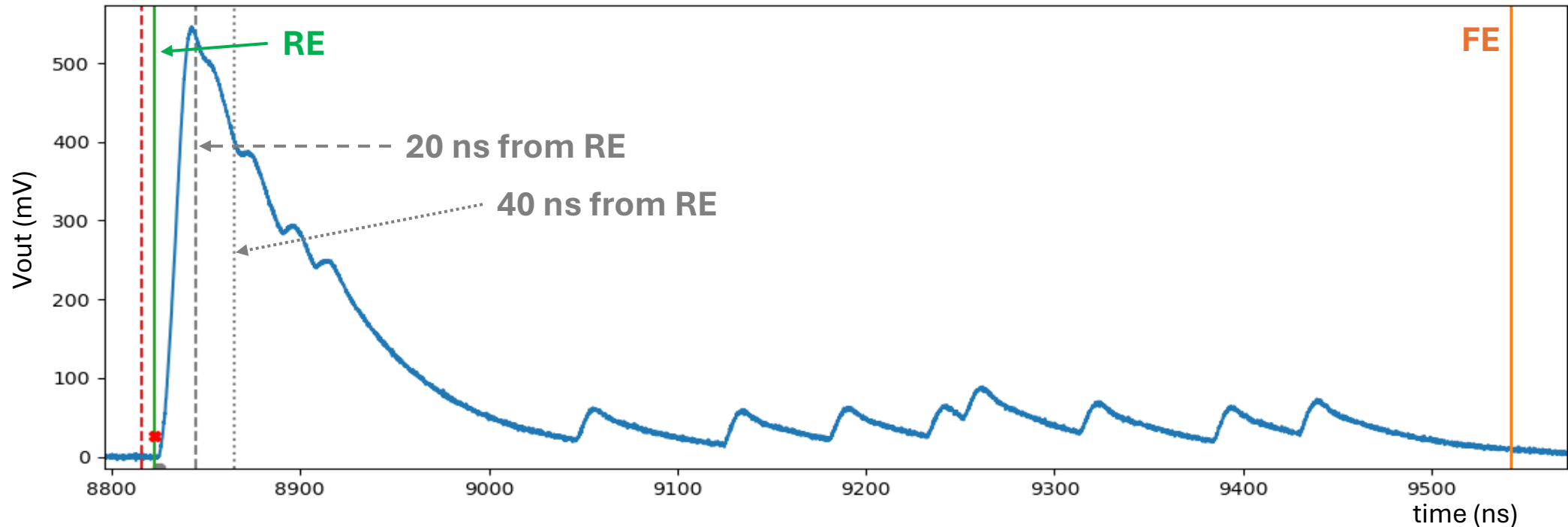
peak 2

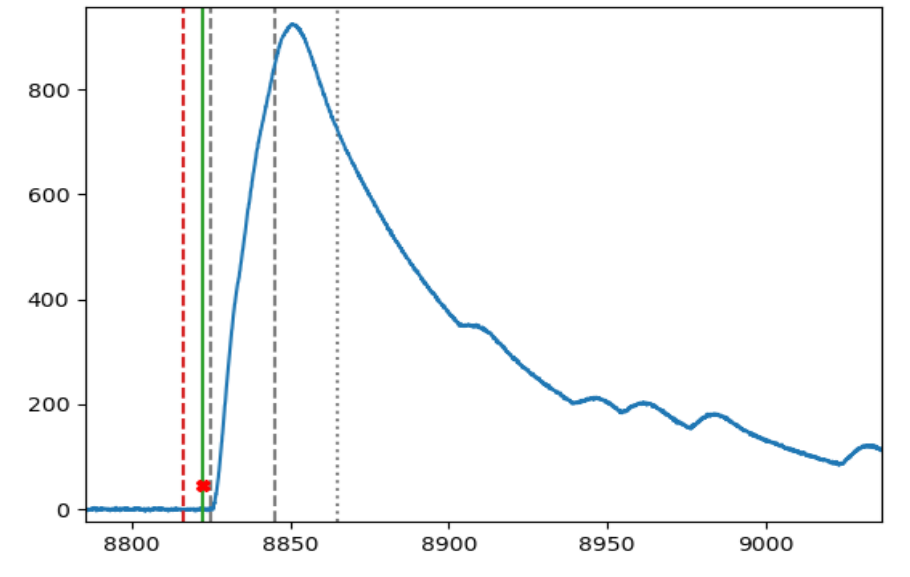
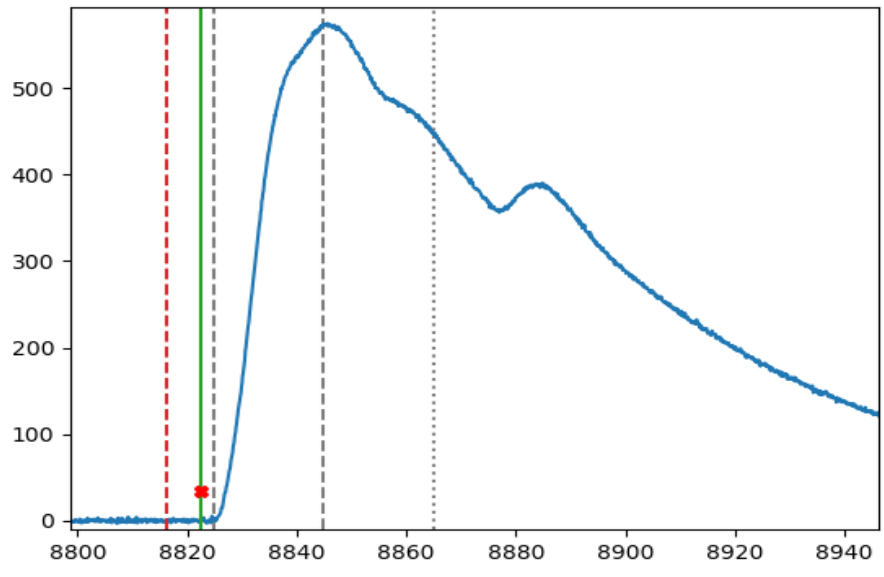
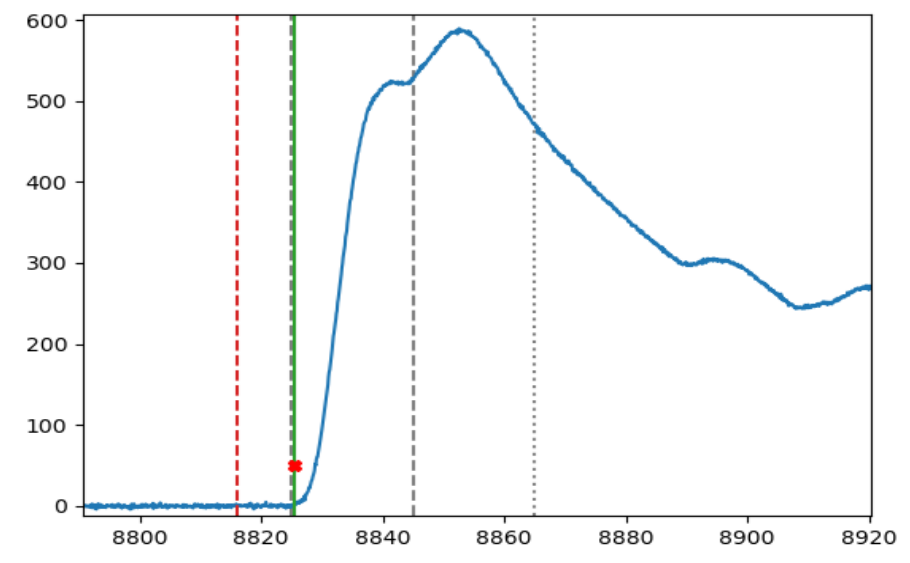
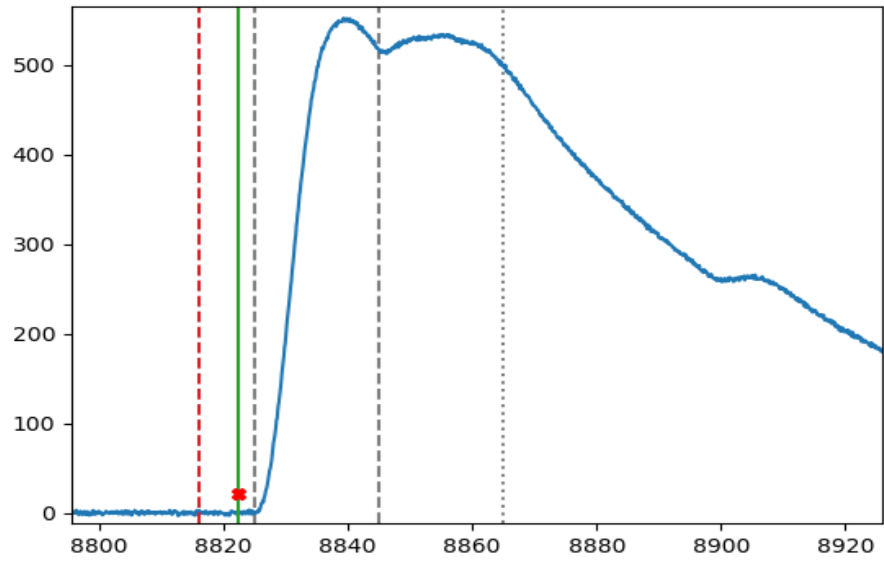
peak 3

How to estimate pile-up

1. Count Method

Counts # of timestamps in a **20 - 40 ns range from the rising edge** within the integration window

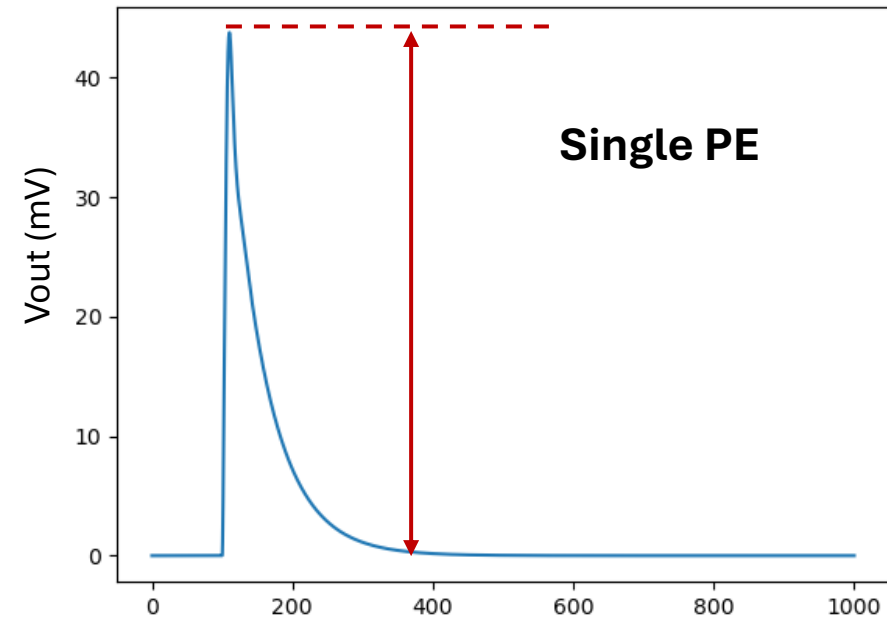
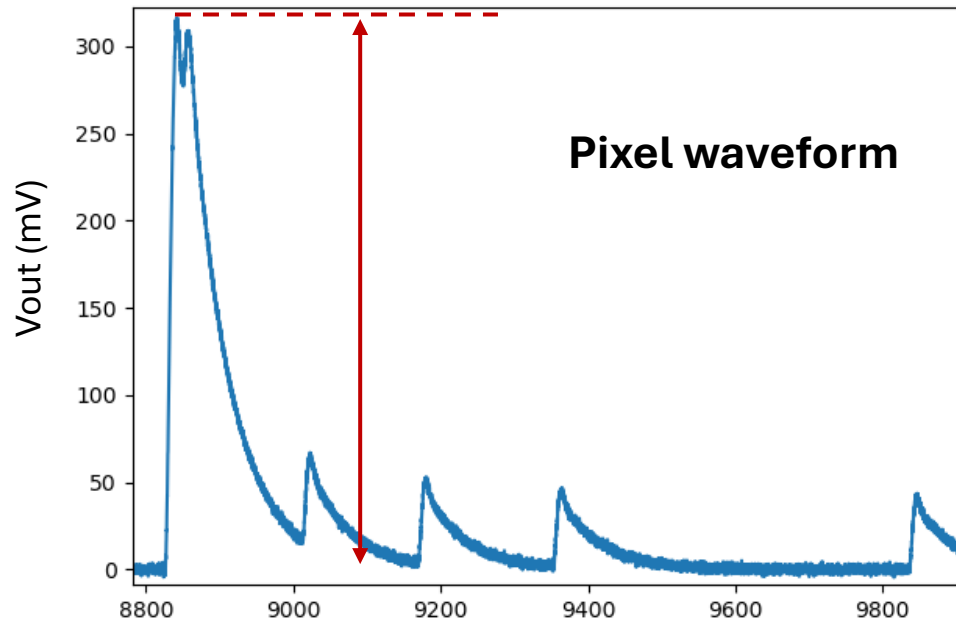




How to estimate pile-up

2. Ratio method

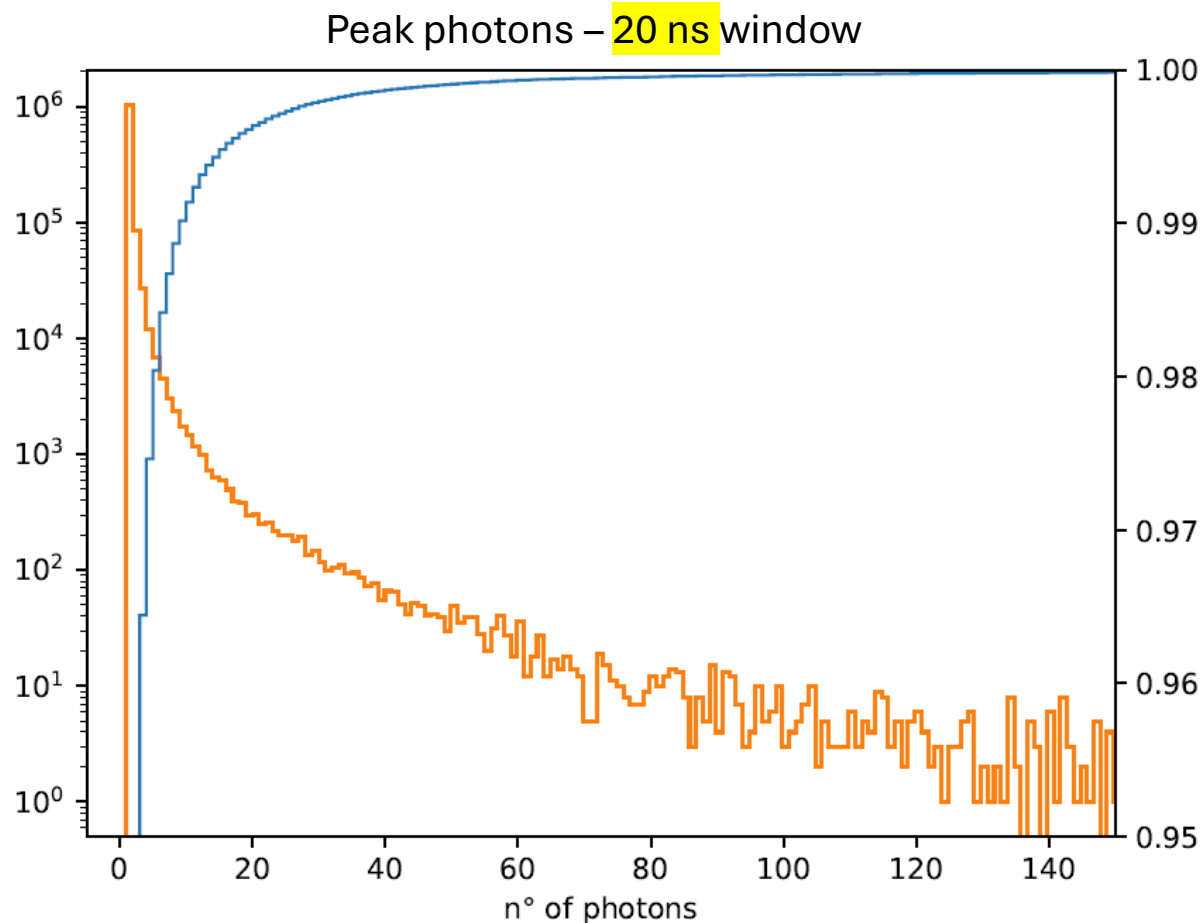
Compute ratio between amplitude of the waveform peak and the amplitude of a single PE signal



Signal pile-up – Count Method

Rq 500
Hold-on 40

The **distribution** of the number of photons in a **20 ns window** is displayed with its **cumulative**



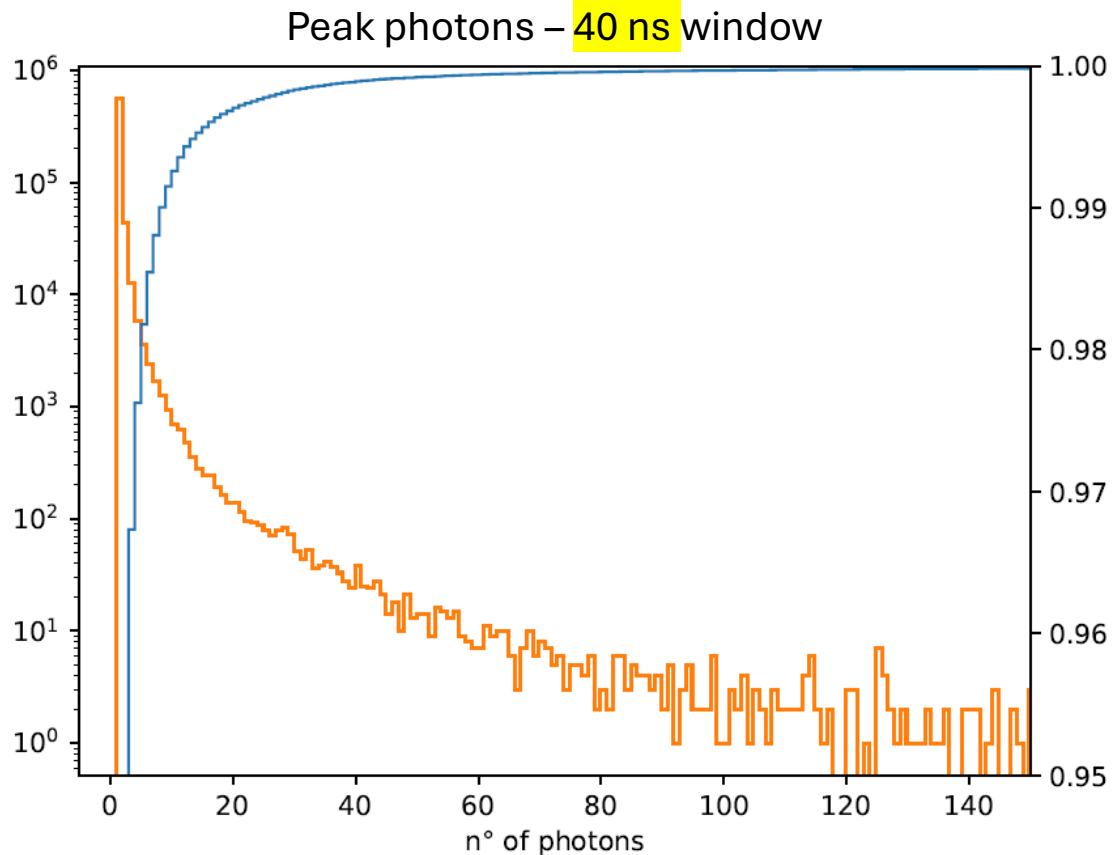
Fraction of events with < n°ph	n° ph	Fraction of events with < n°ph	n° ph
0.870	1	0.991	10
0.940	2	0.992	11
0.964	3	0.993	12
0.975	4	0.994	14
0.980	5	0.995	16
0.984	6	0.996	19
0.987	7	0.997	24
0.988	8	0.998	31
0.990	9	0.999	48

99.9% of events has < 48 photons

Signal pile-up – Count Method

Rq 500
Hold-on 40

The **distribution** of the number of photons in a **40 ns window** is displayed with its **cumulative**

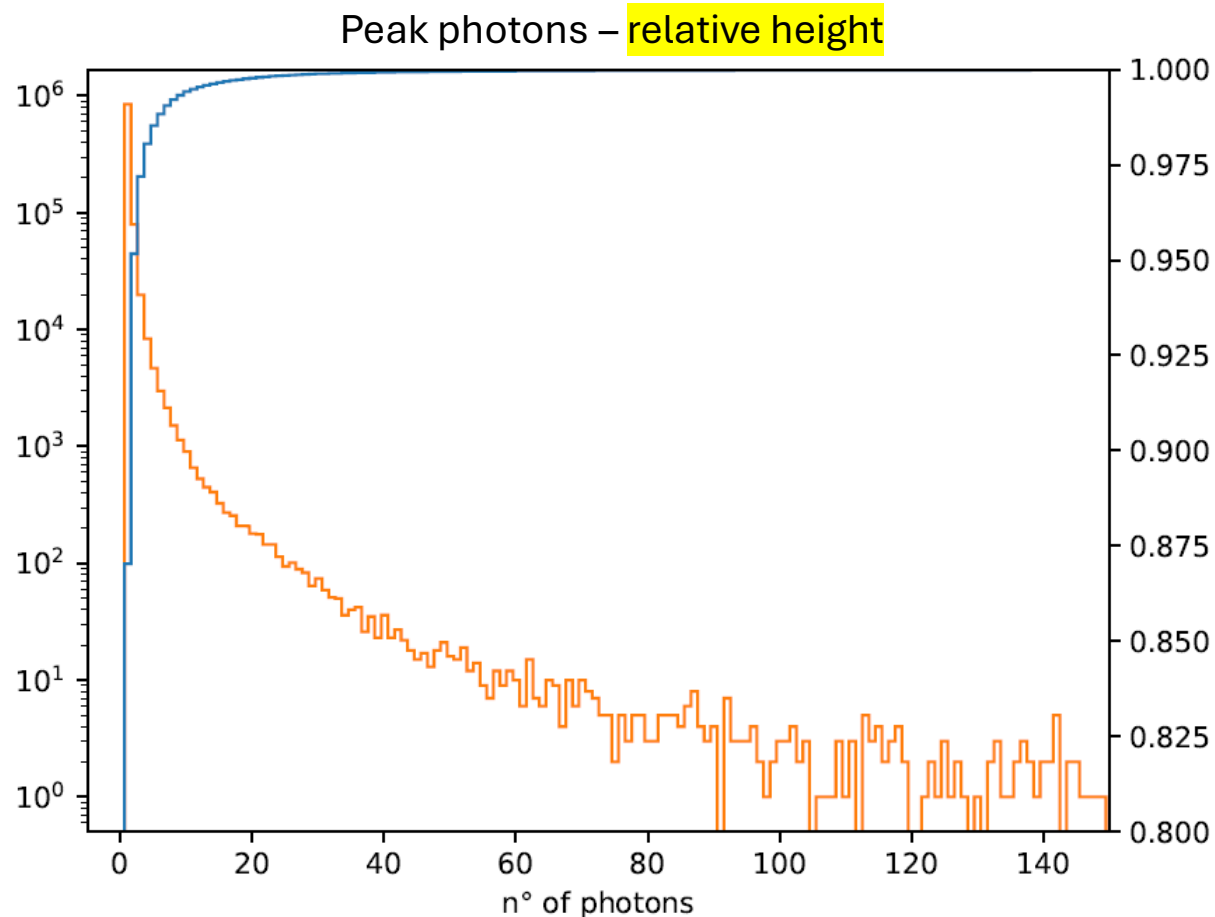


Fraction of events with < n°ph	n° ph	Fraction of events with < n°ph	n° ph
0.870	1	0.992	10
0.947	2	0.993	11
0.967	3	0.994	12
0.976	4	0.995	14
0.980	5	0.996	16
0.985	6	0.997	20
0.988	7	0.998	27
0.990	8	0.999	43
0.991	9		

Signal pile-up – Ratio method

Rq 500
Hold-on 40

The **distribution** of the number of photons obtained with the **ratio method** is displayed with its **cumulative**

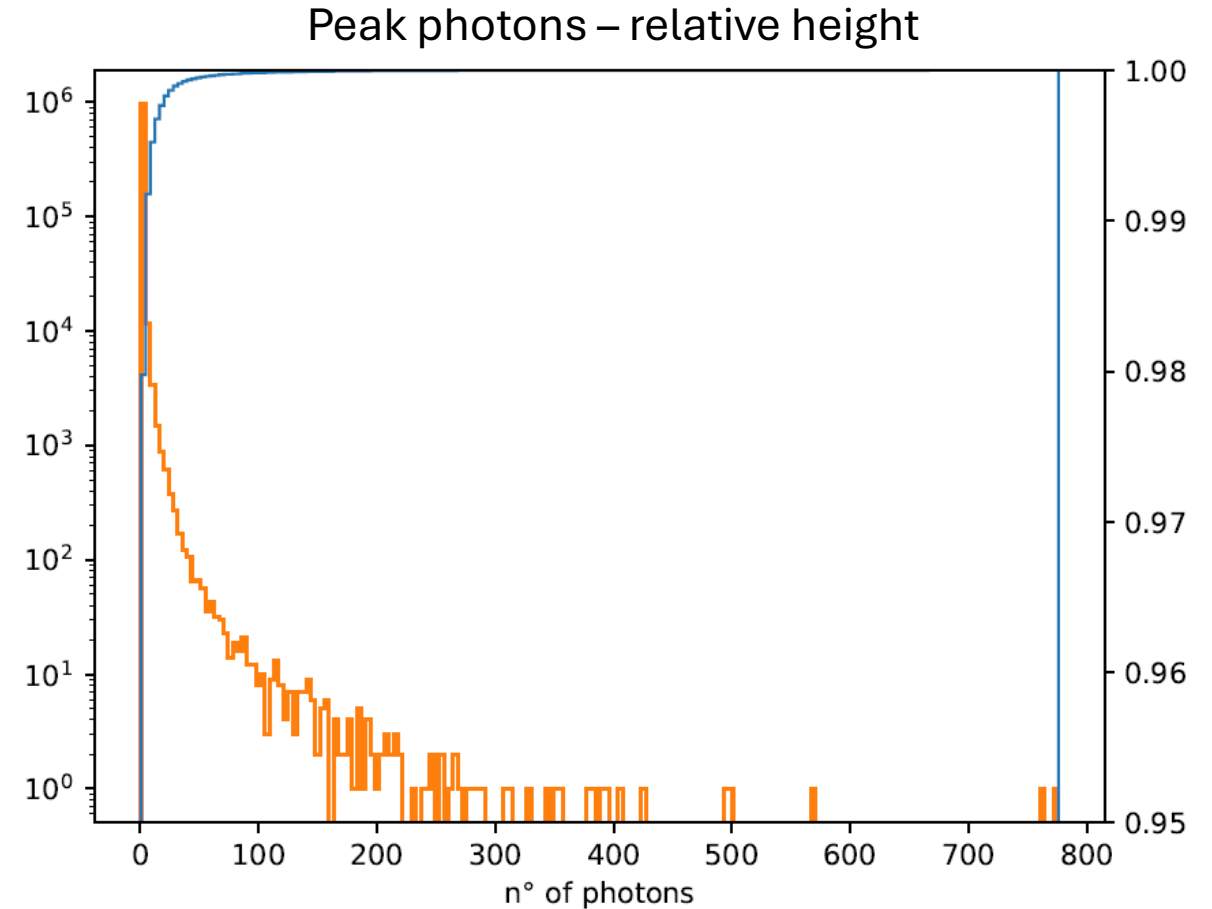
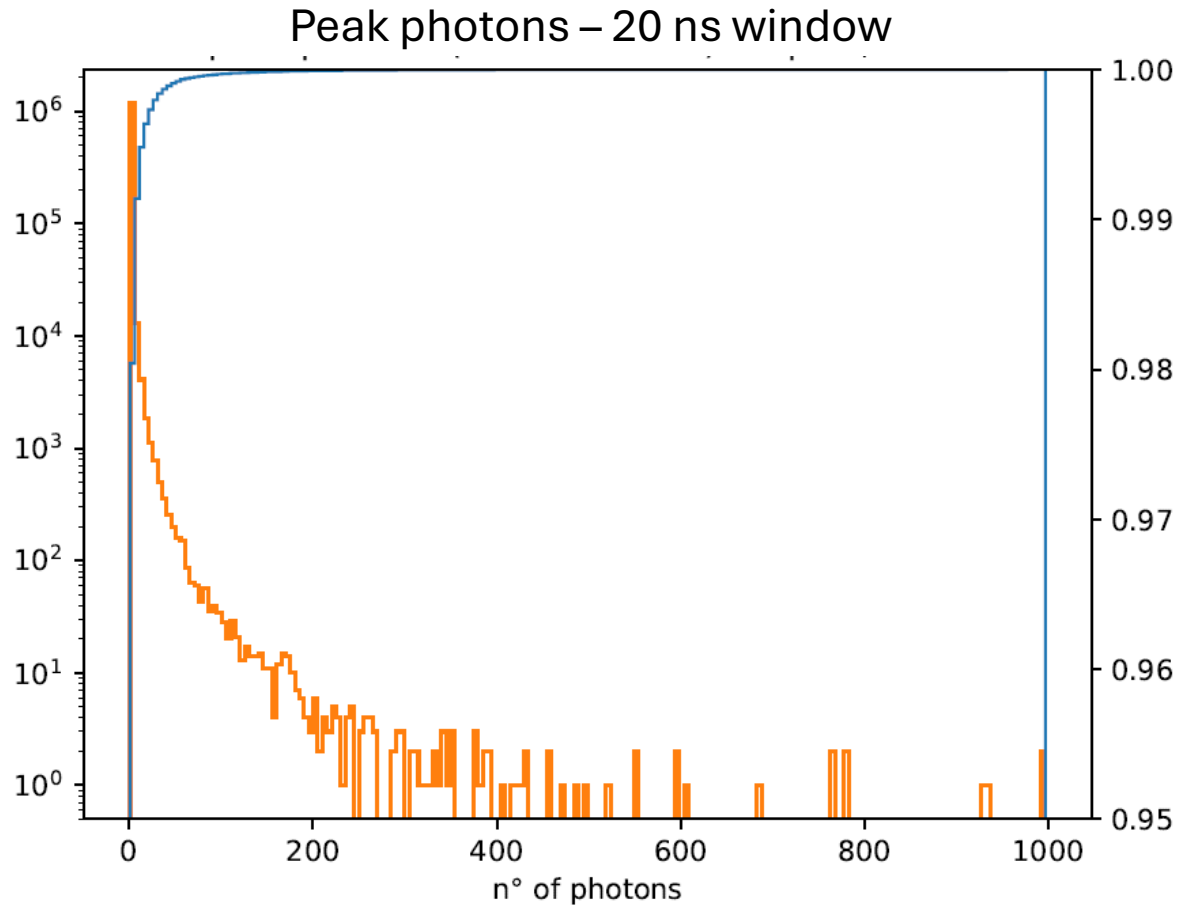


cumulative	n° ph	cumulative	n° ph
0.87	1	0.993	9
0.950	2	0.994	10
0.970	3	0.995	11
0.980	4	0.996	14
0.985	5	0.997	17
0.988	6	0.998	21
0.990	7	0.999	32
0.992	8		

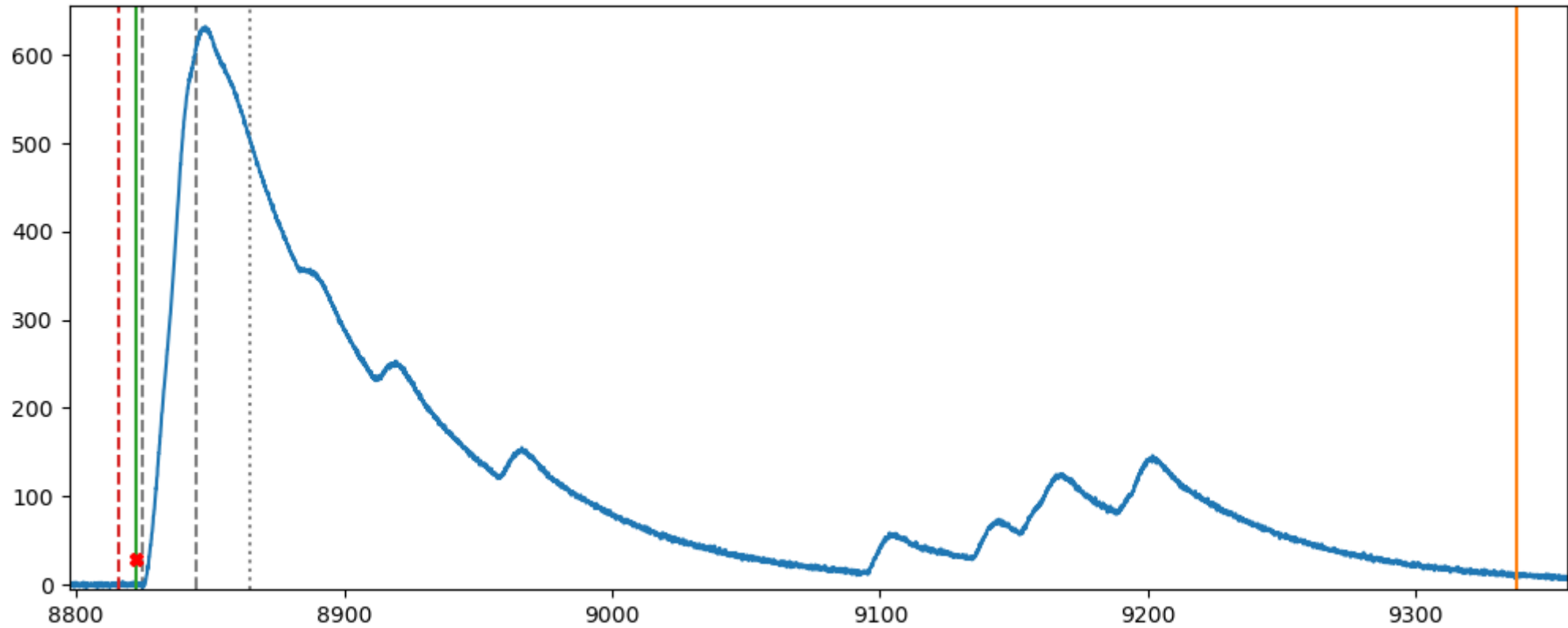
Backup

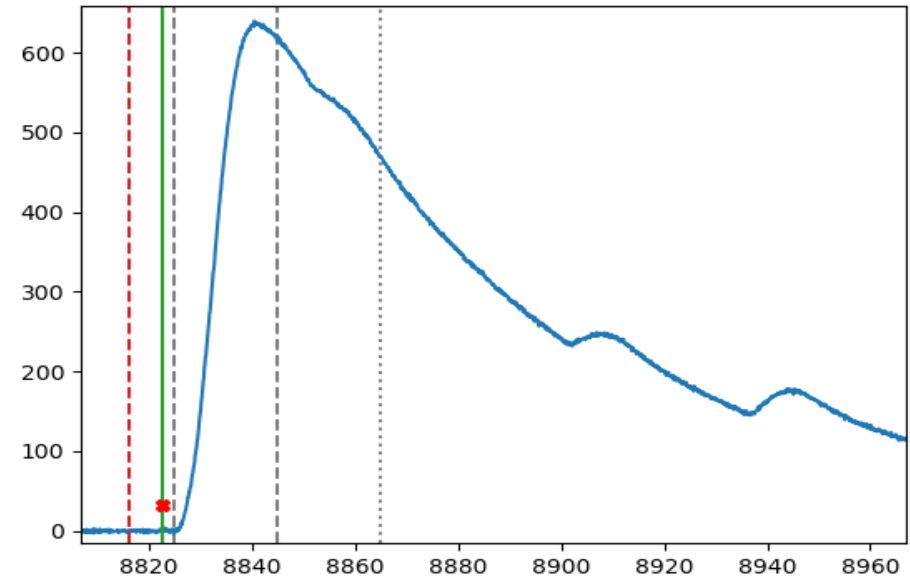
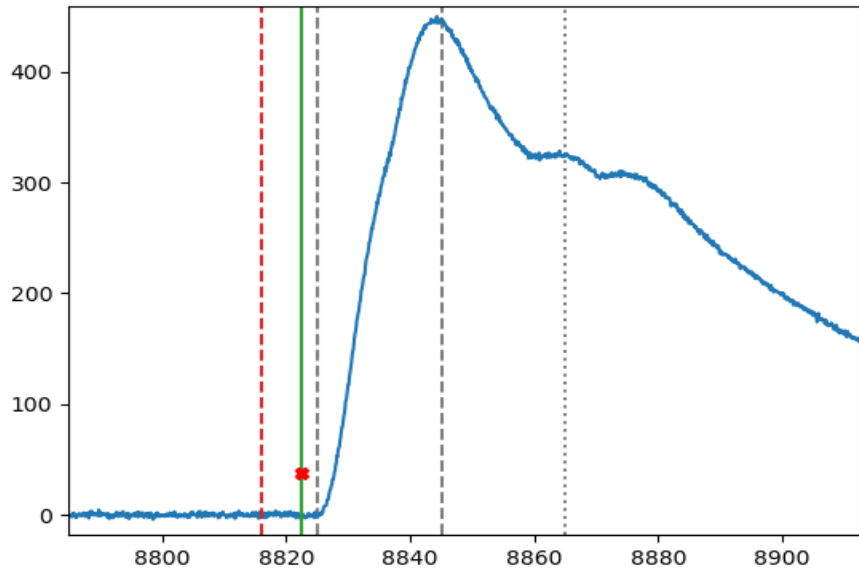
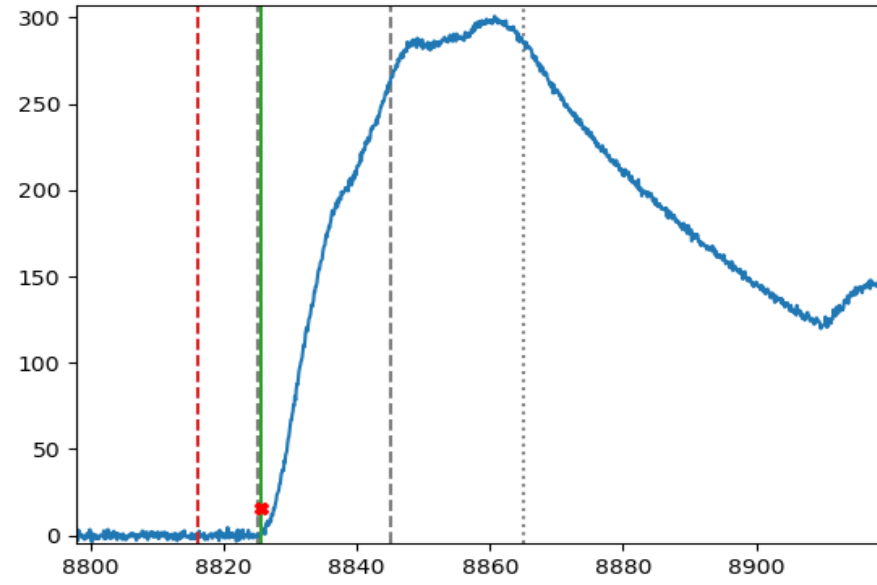
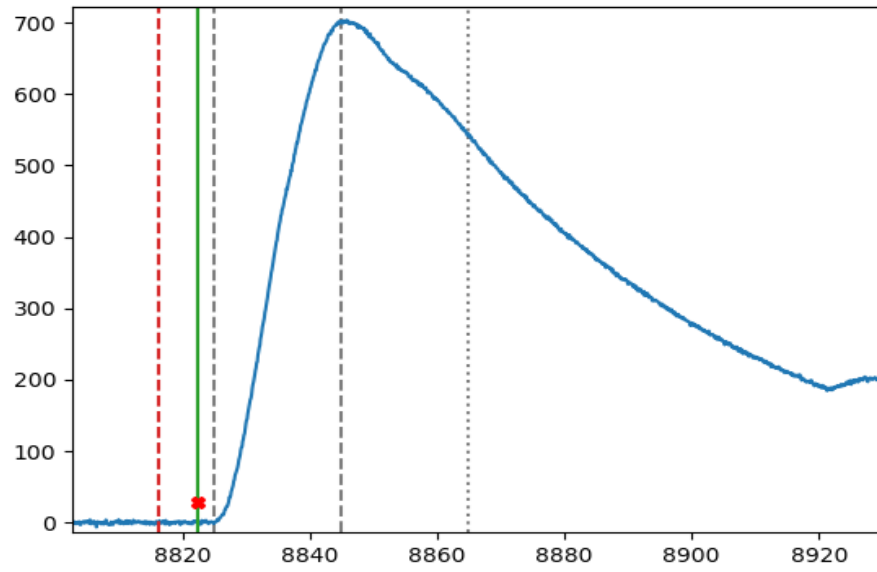
Studies on signal pile-up

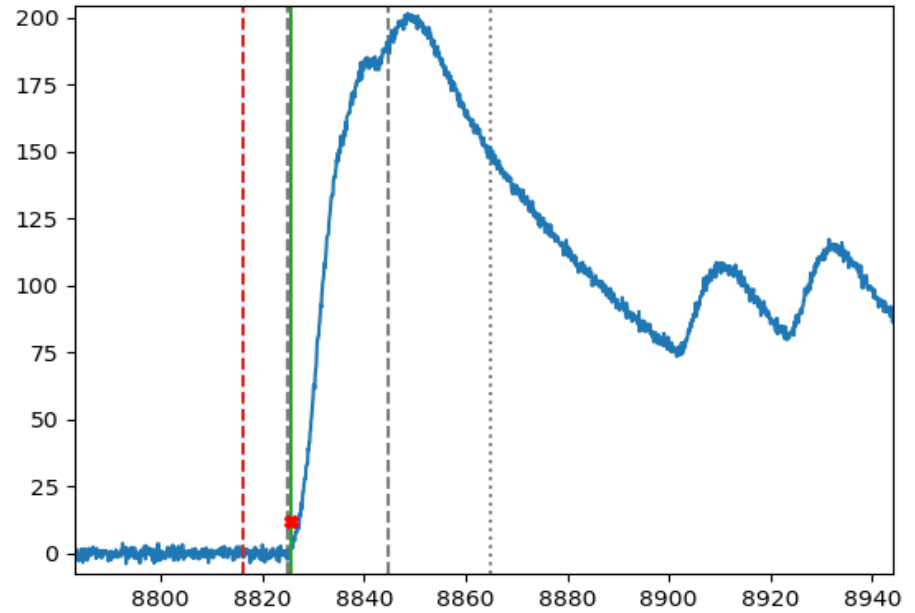
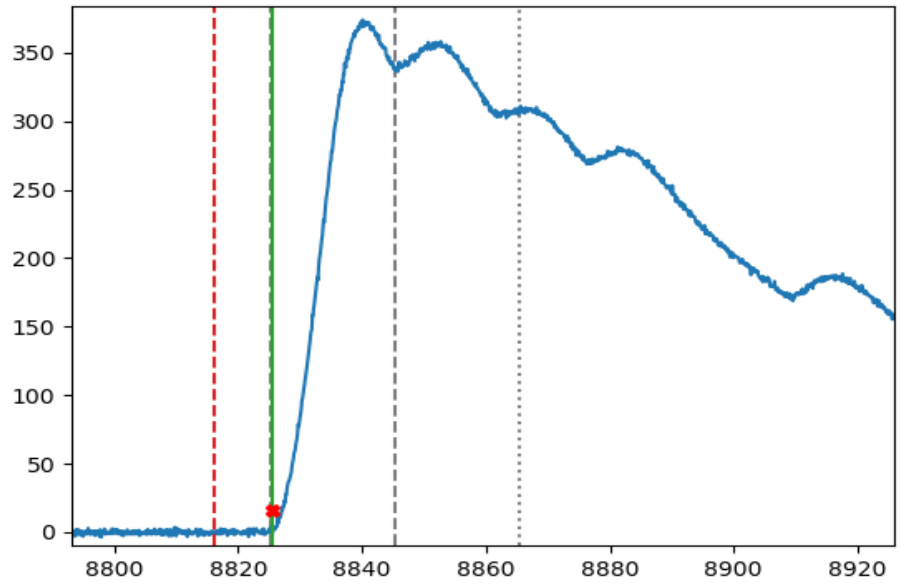
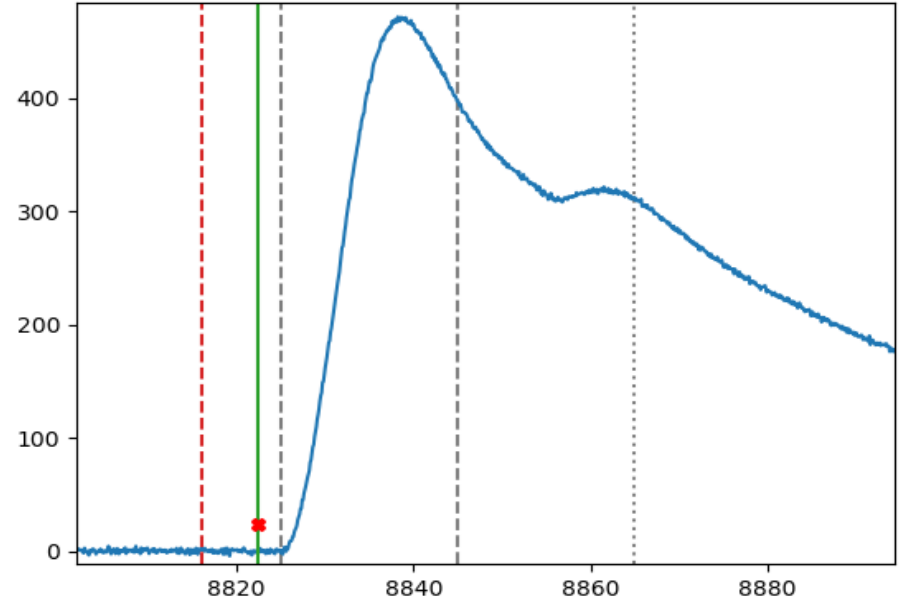
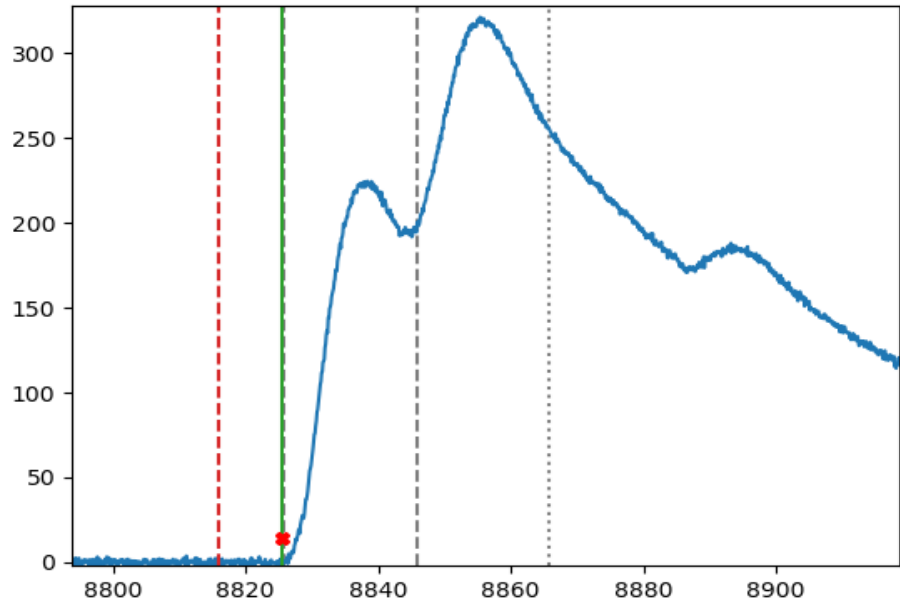
Rq 500
Hold-on 40



Some waveform examples



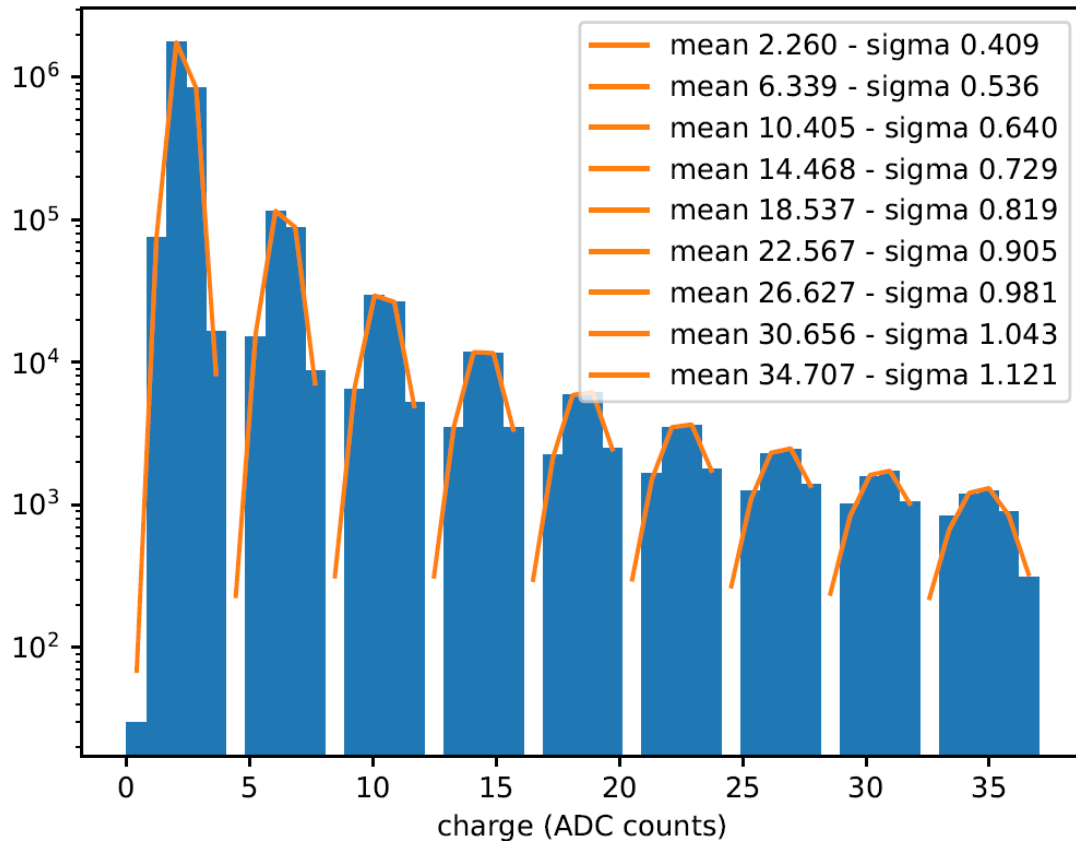




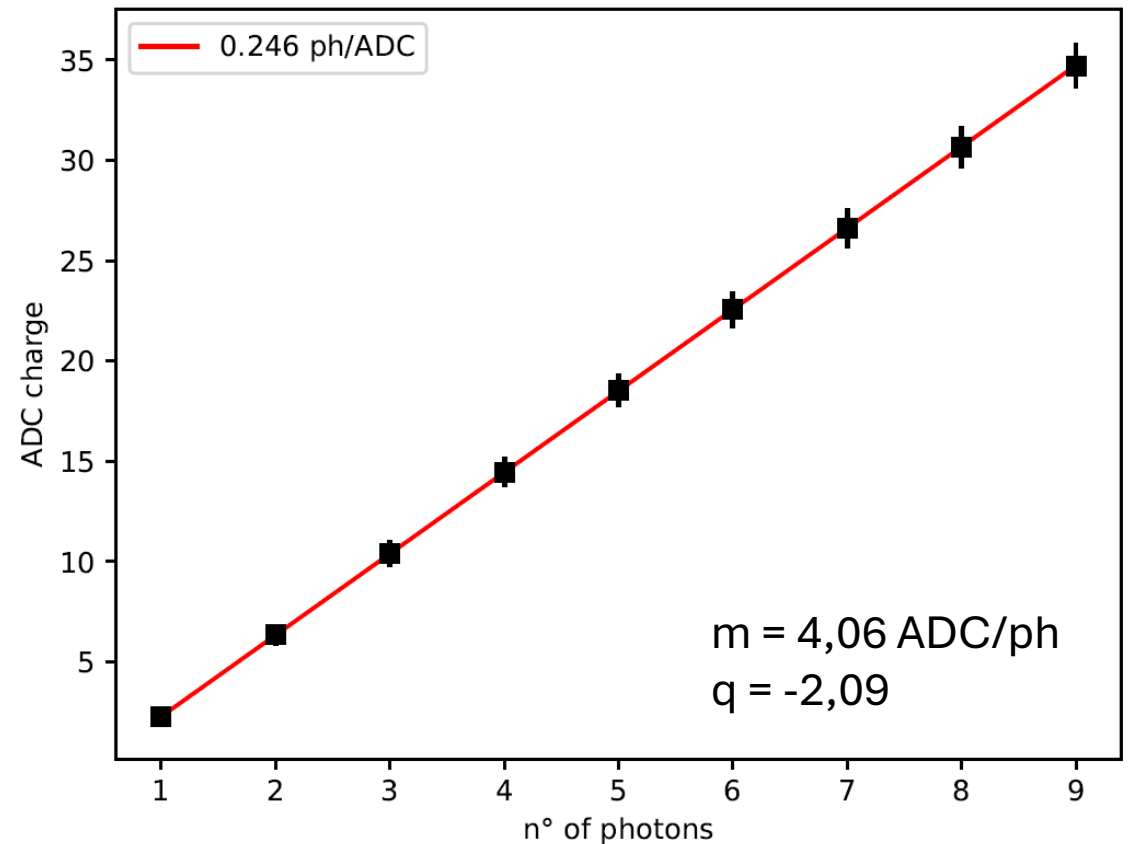
Charge calibration – INT. GAIN 0

FE GAIN 0

charge fit GAIN 0 - Rq 500 - ho 20 - clock 1



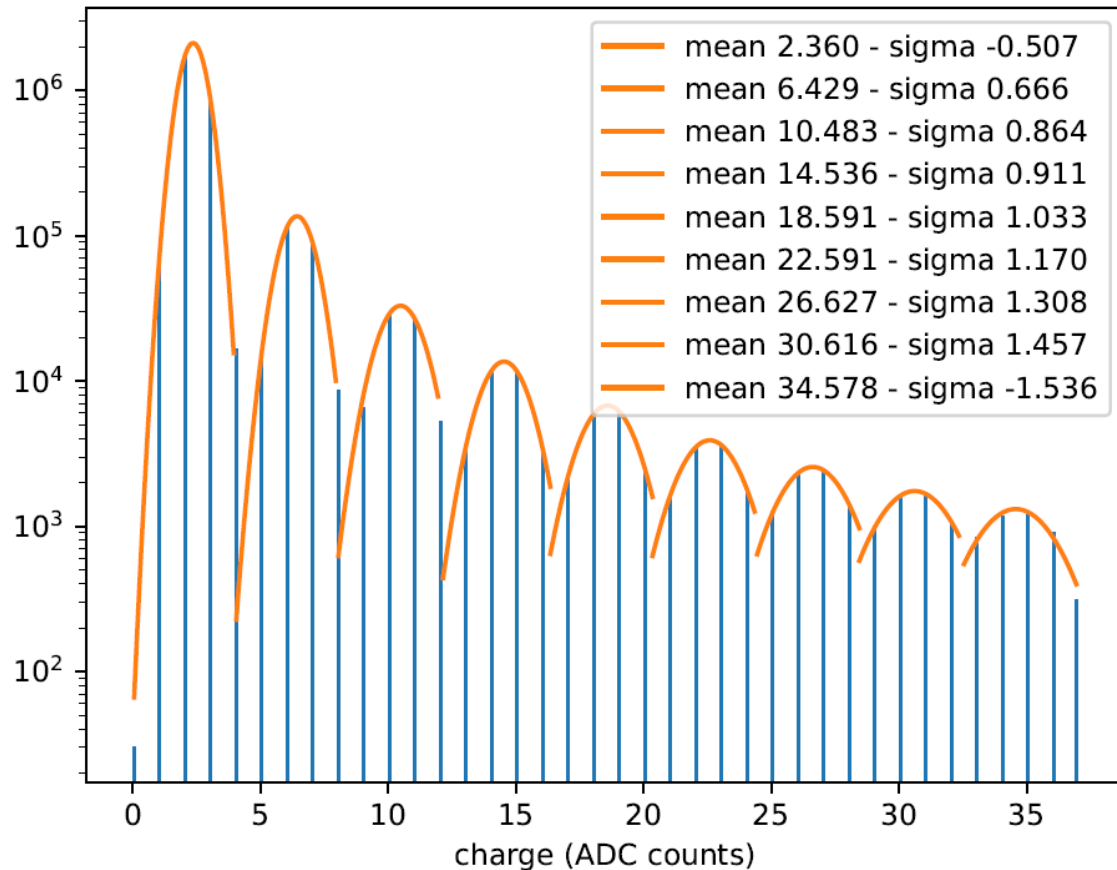
charge calibration - Rq 500 - ho 20 - clock 1



Charge calibration – INT. GAIN 0

FE GAIN 0

charge fit GAIN 0 - Rq 500 - ho 20 - clock 1



charge calibration - Rq 500 - ho 20 - clock 1

