Overshooting issue
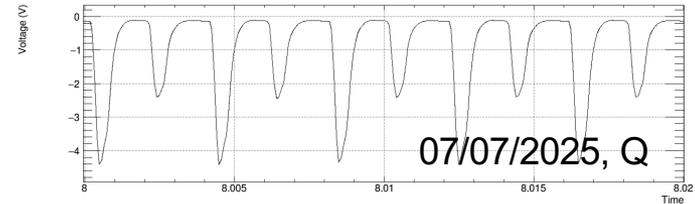

07/07/2025, Q

- We observed an overshooting in SiPM signal during Q state runs. (It had unusual shape ⇧)

- Overshooting is not typically seen in regular H state data. This is possibly because the overshooting is cancelled out by the following bin.

- With Peiran's help, we took new data with one polarization blocked, in both H and Q states.
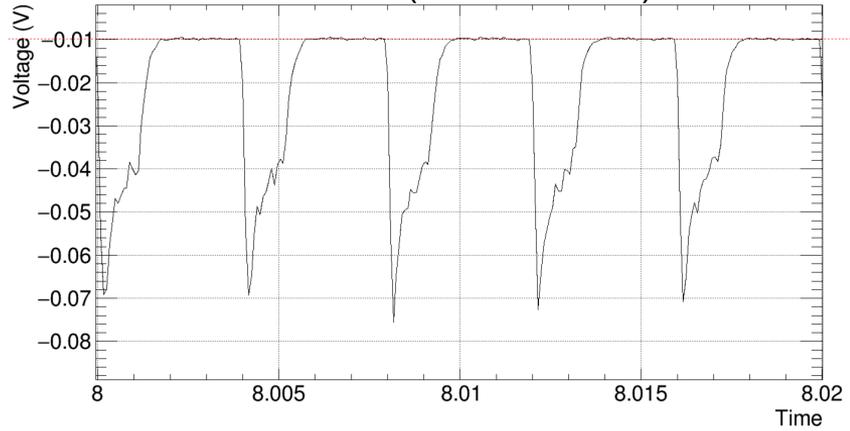
Goals:

- Quantify the overshooting and understand what affects its size.

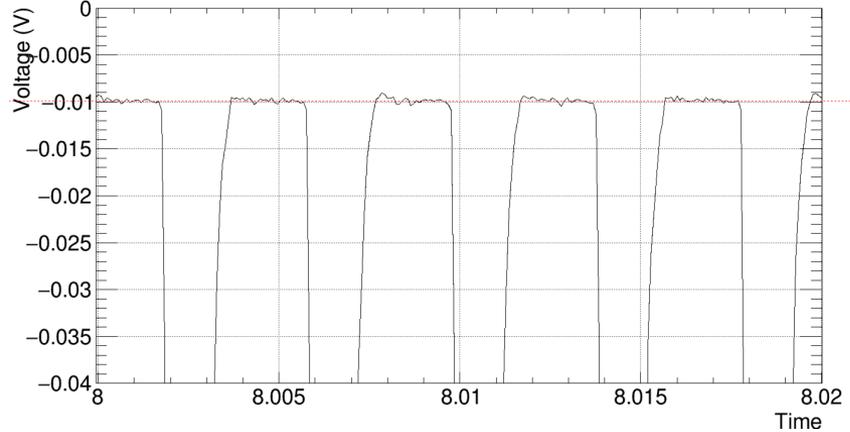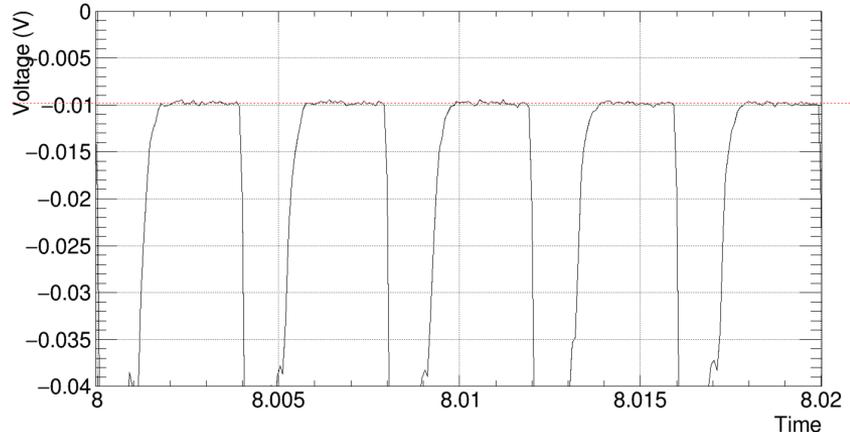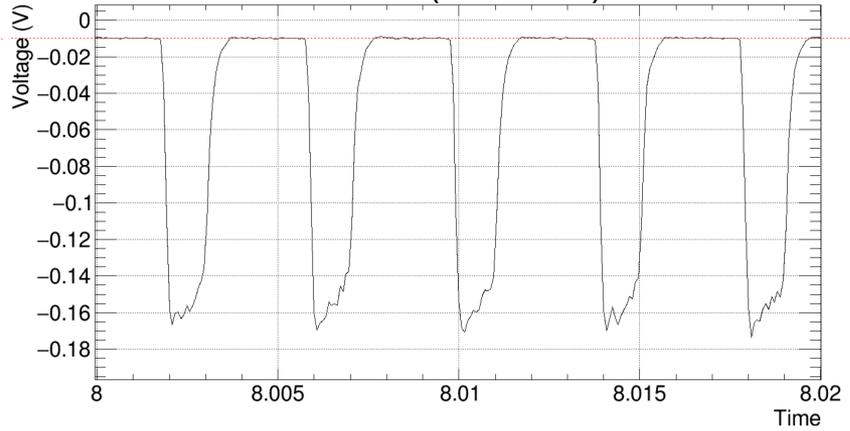- Evaluate its impact on the asymmetry calculation.

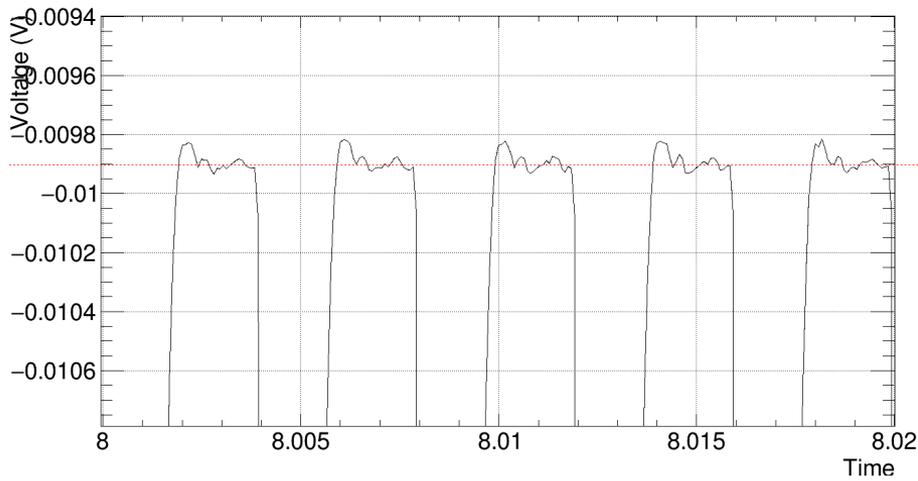# Waveform (blocking one polarization)

25 shots avg, ch0

H state (0013.634-638)

Q state (0013.623)

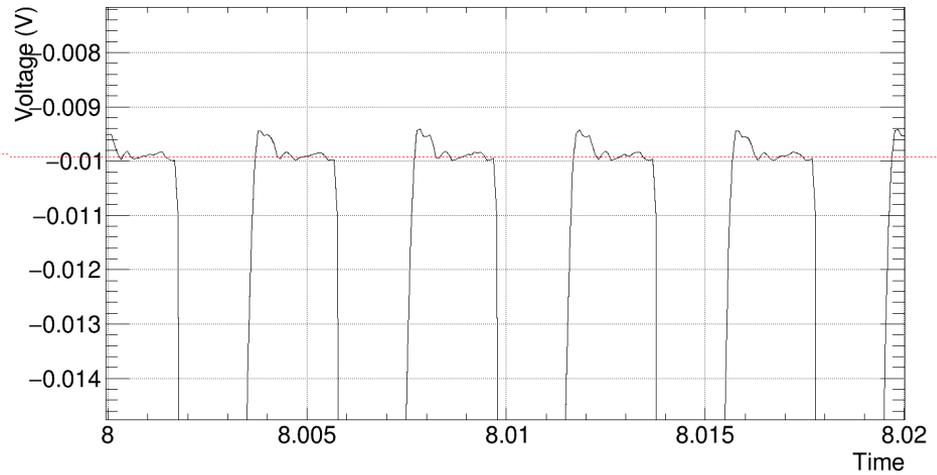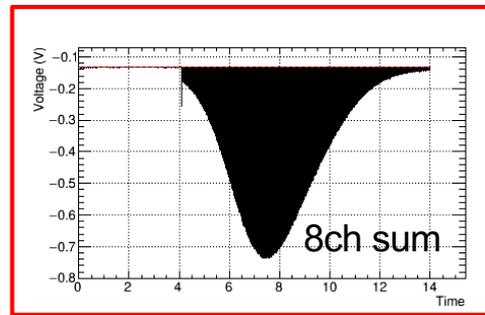# Overshoot zoom

H, 16000 shots avg

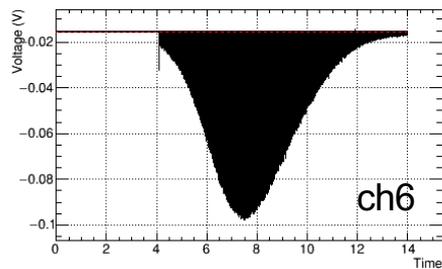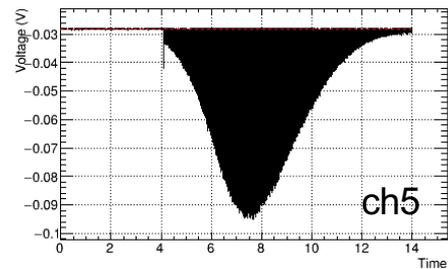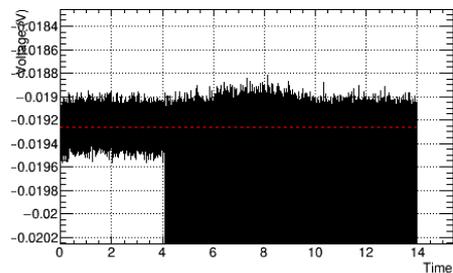Q, 3200 shots avg

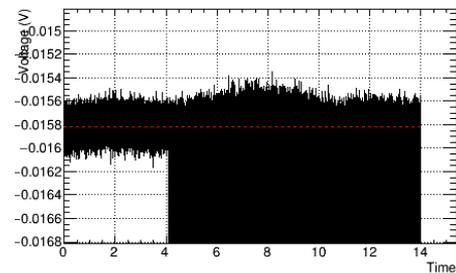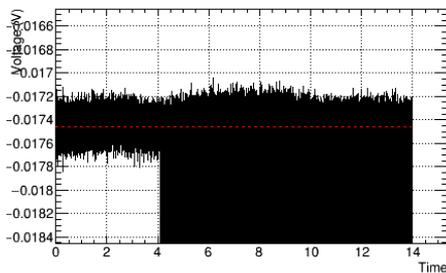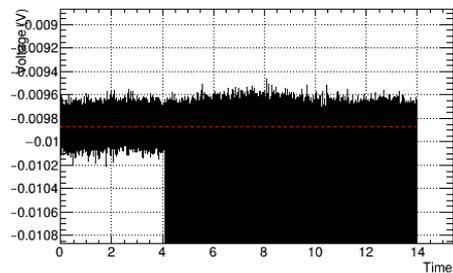# Overall waveform, H

100 shots avg
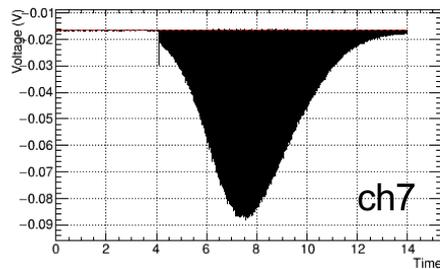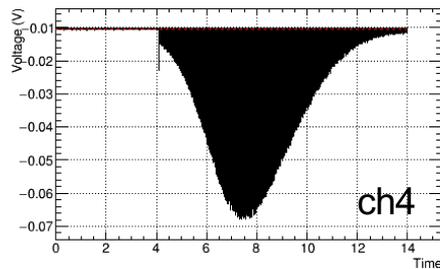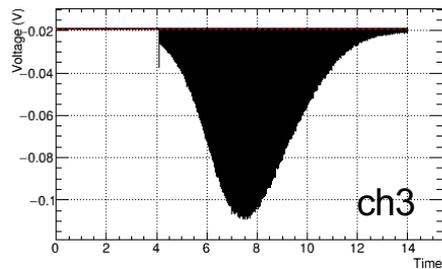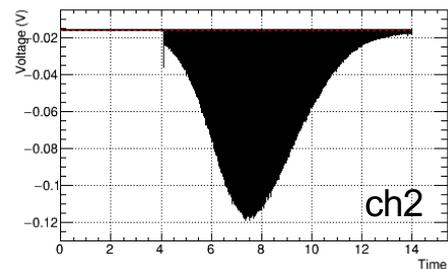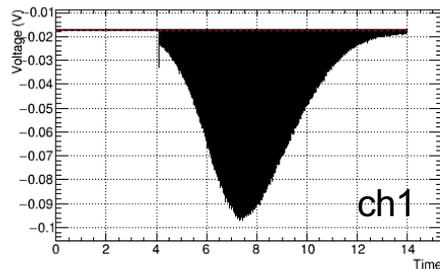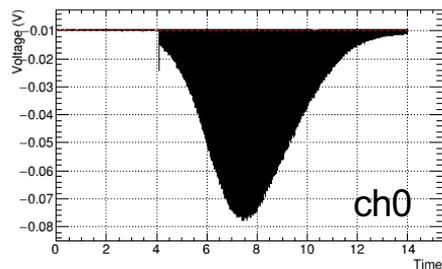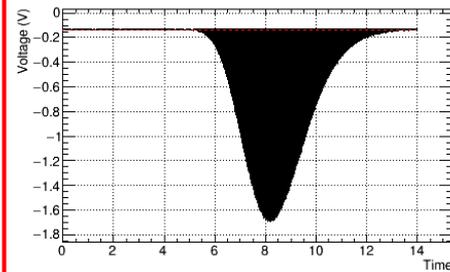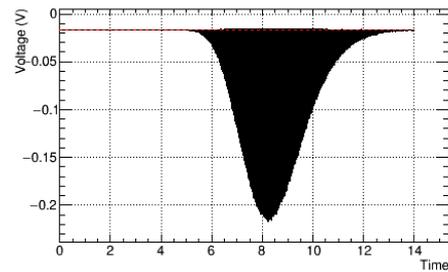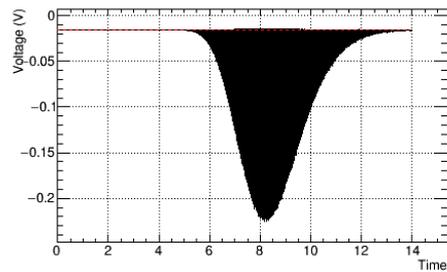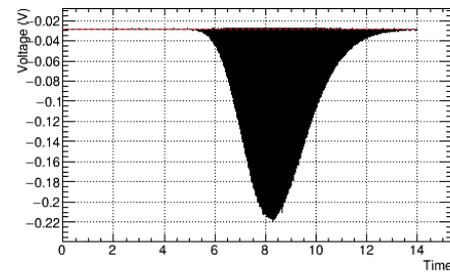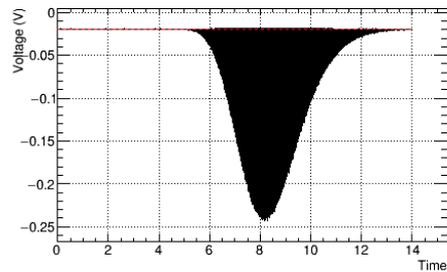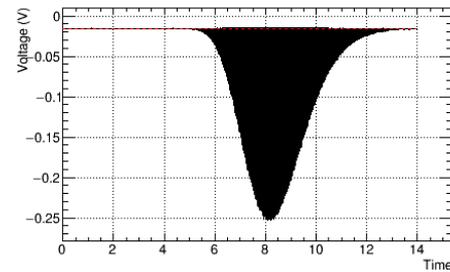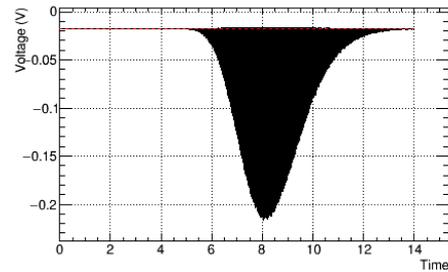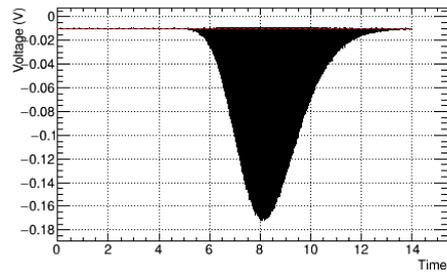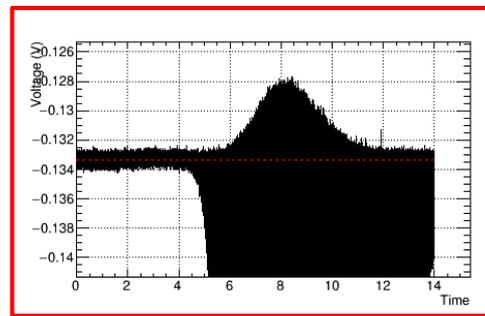
Overall waveform, H, zoom

100 shots avg
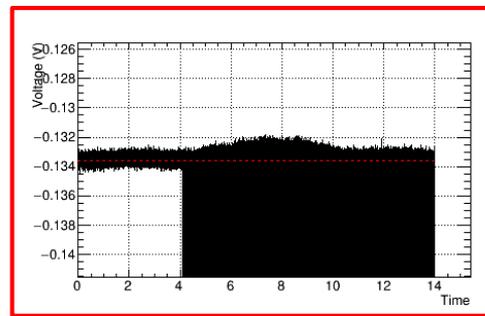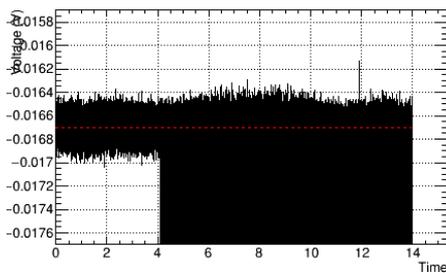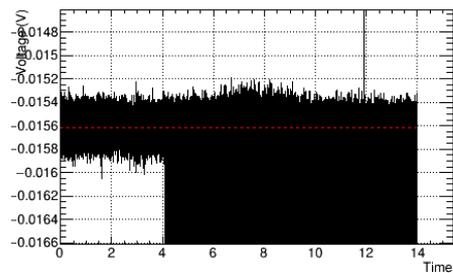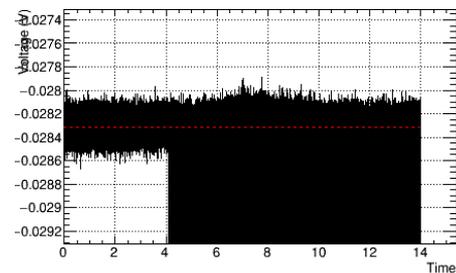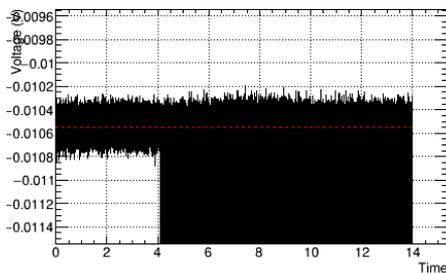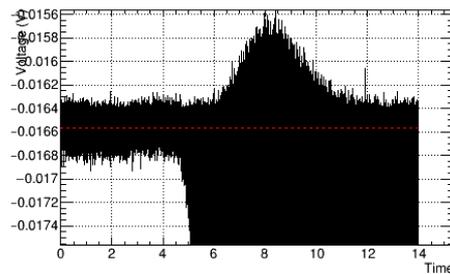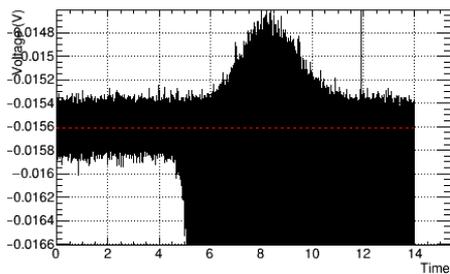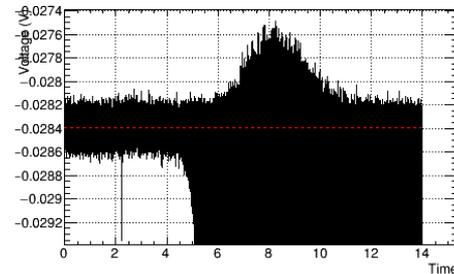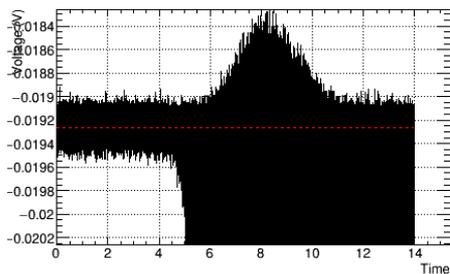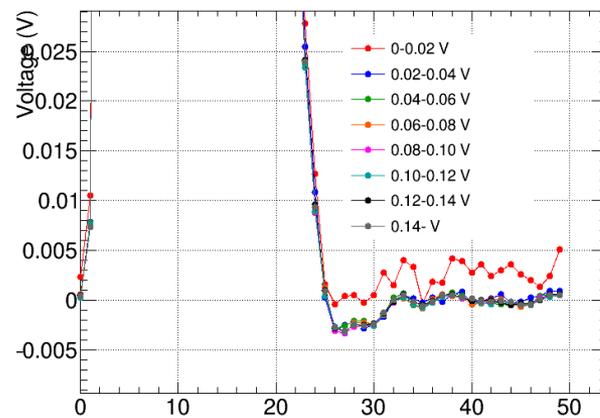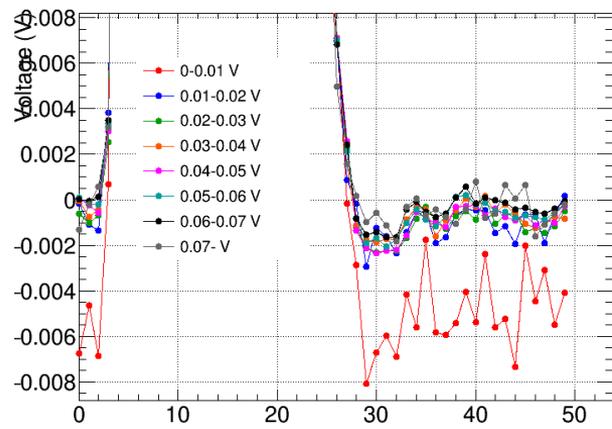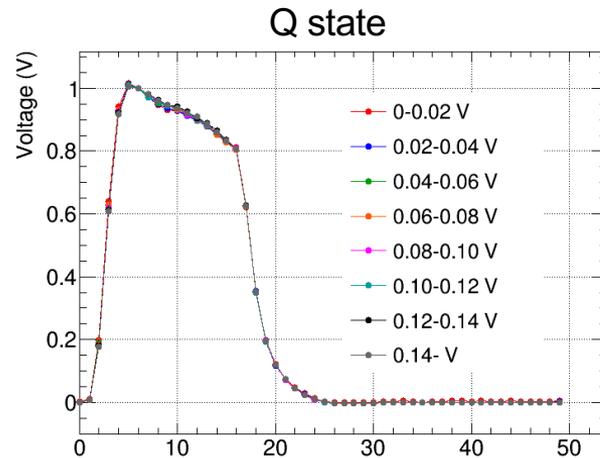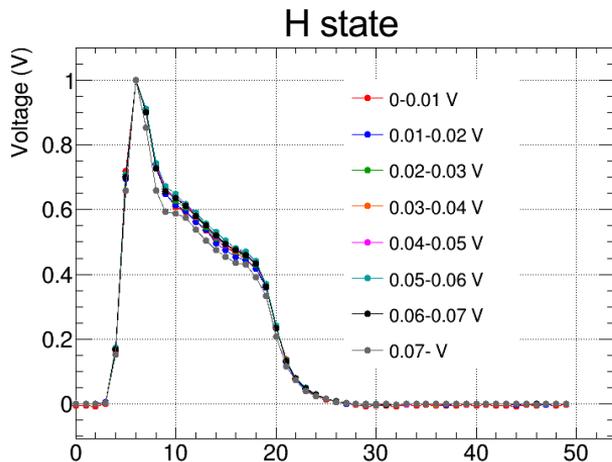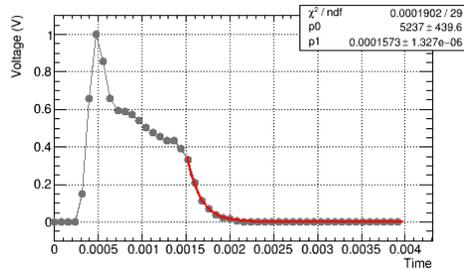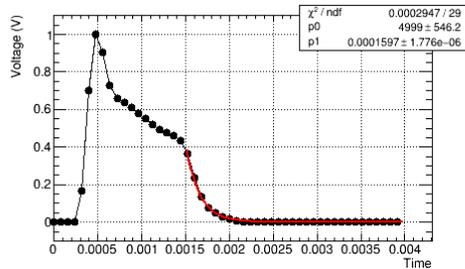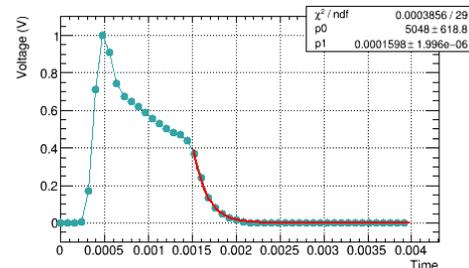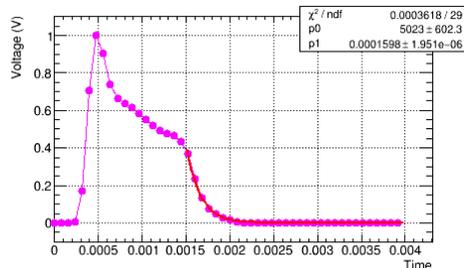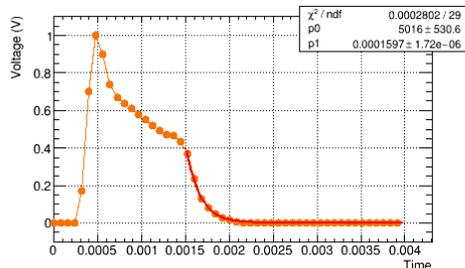
Overall waveform, Q
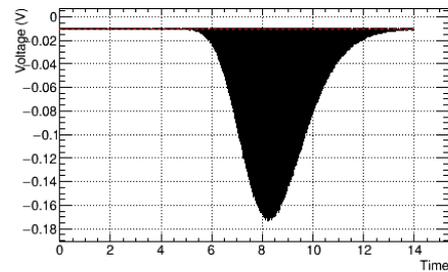
Overall waveform, Q, zoom
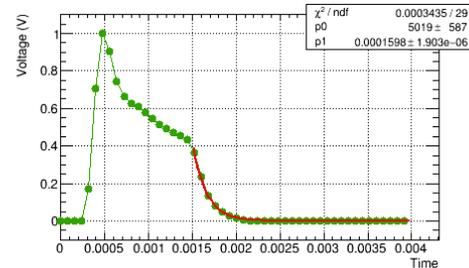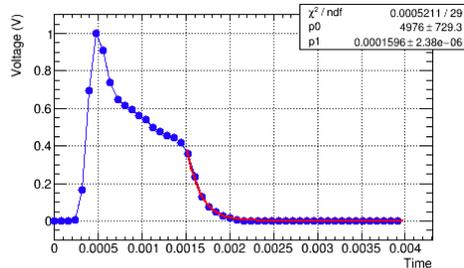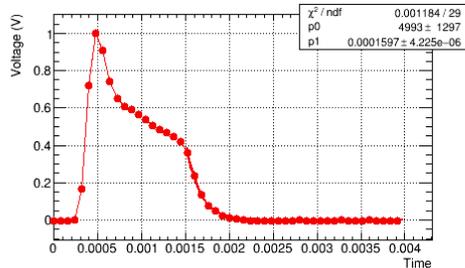
100 shots avg
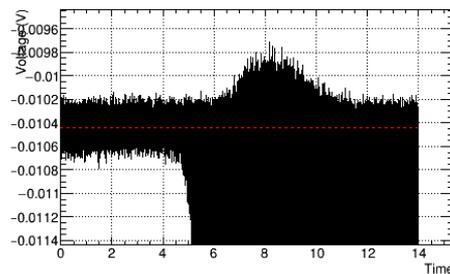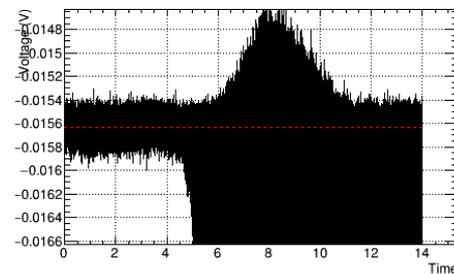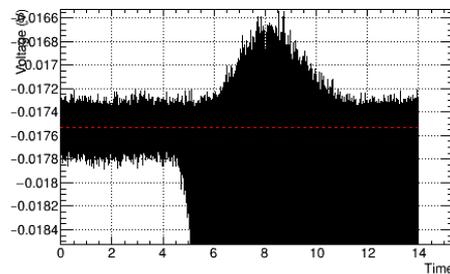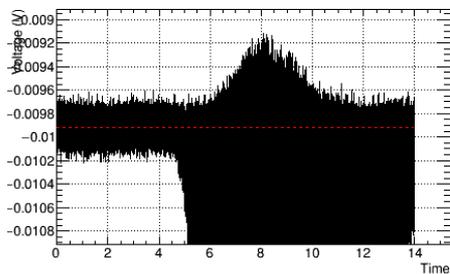
Waveform

From 3499 bins, pick signals with similar heights, average and normalized them.
25 shots average, 8ch sum

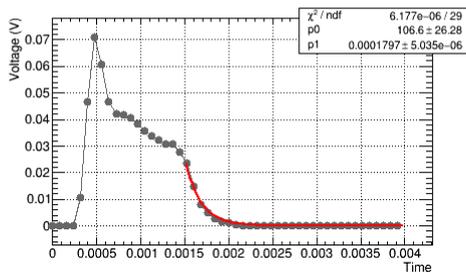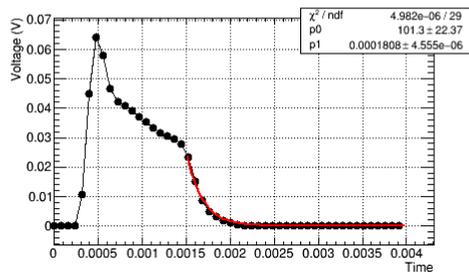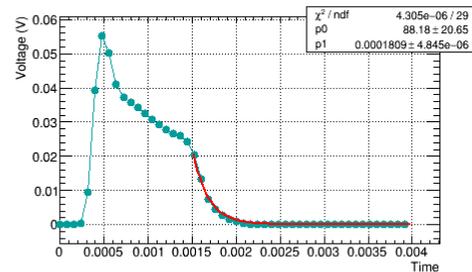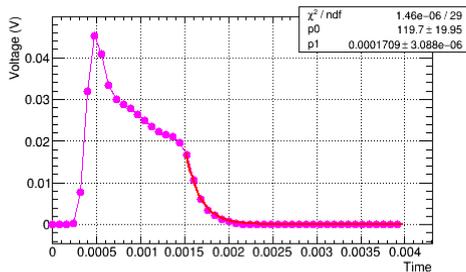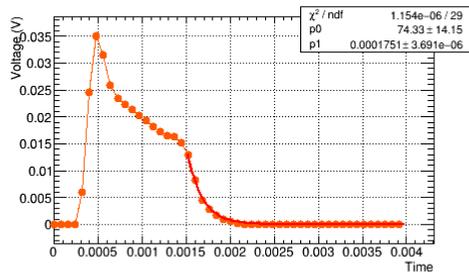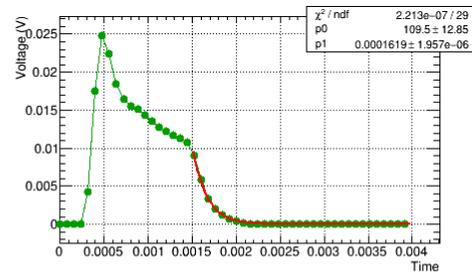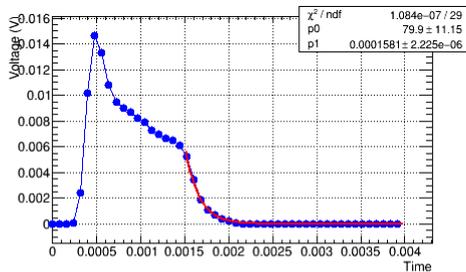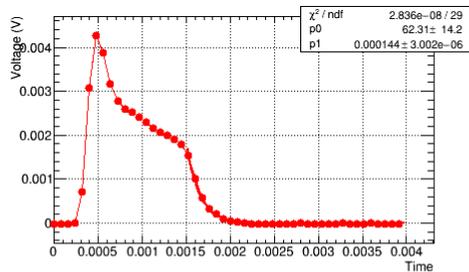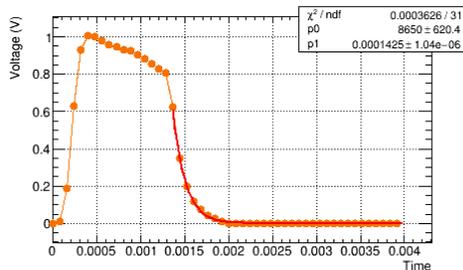# Waveform tail fit, H (after normalization) <= same as page 7

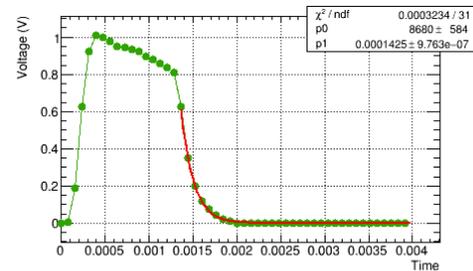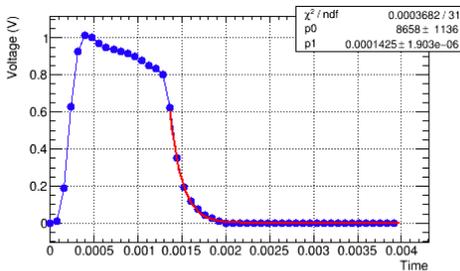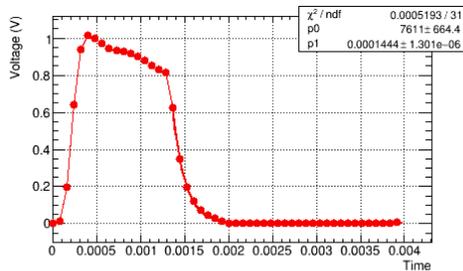$$y = p0*exp(-x/p1)$$

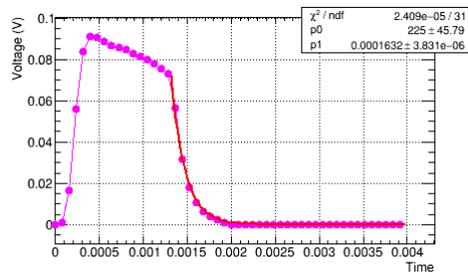# Waveform tail fit, H (before normalization)
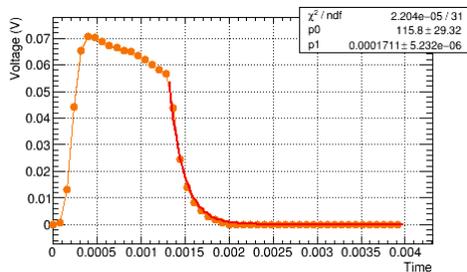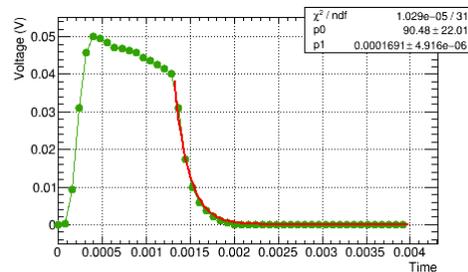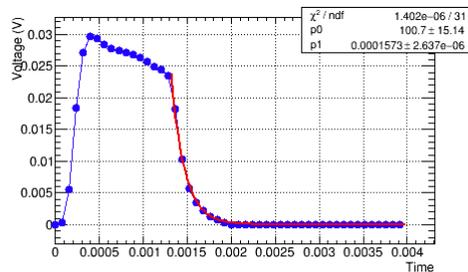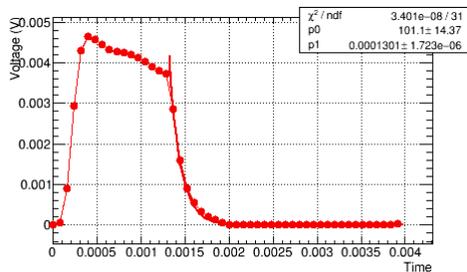

$$y = p0 \cdot \exp(-x/p1)$$

Waveform tail fit, Q (after normalization) <= same as page 7

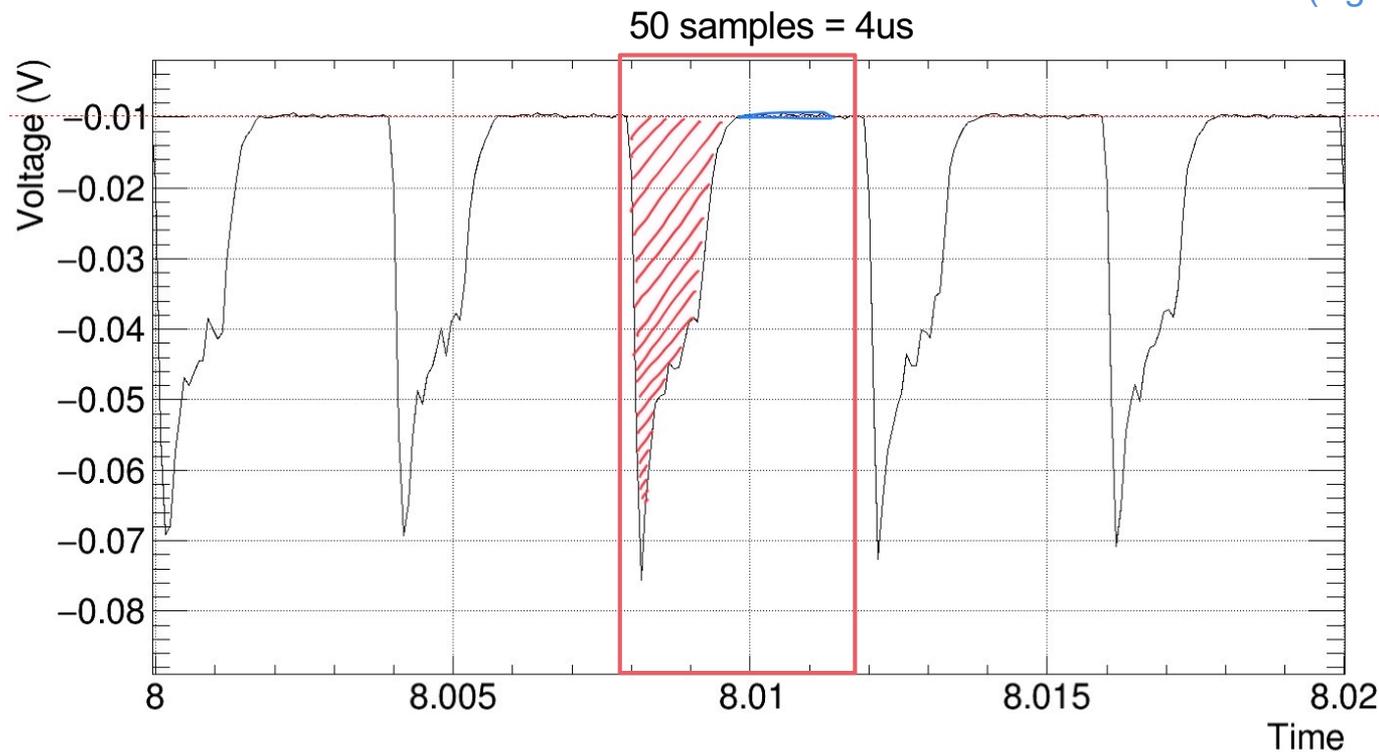$$y = p0*exp(-x/p1)$$
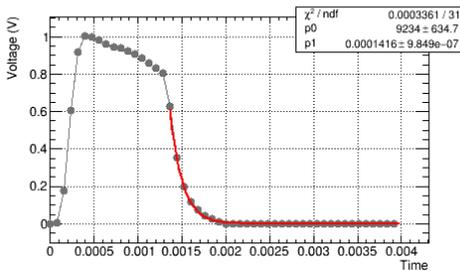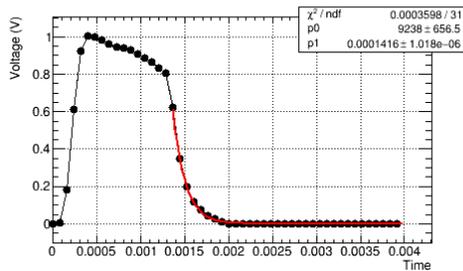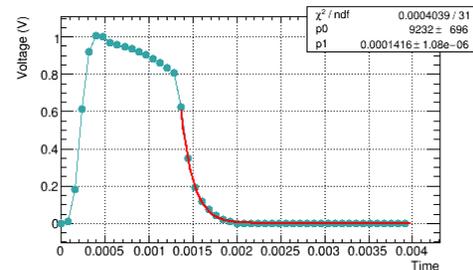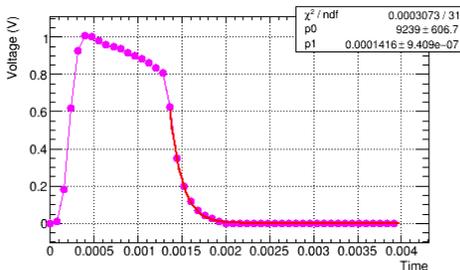
Waveform tail fit, Q (before normalization)
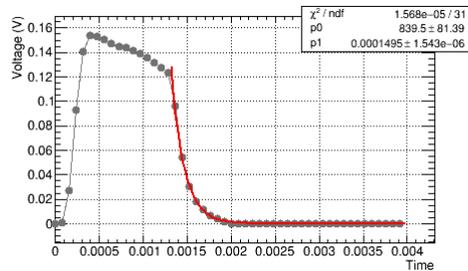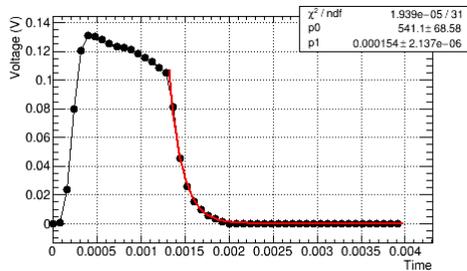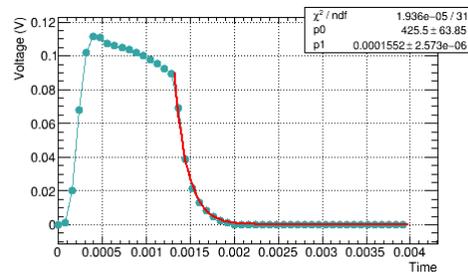
$$y = p0*exp(-x/p1)$$

Overshoot evaluation

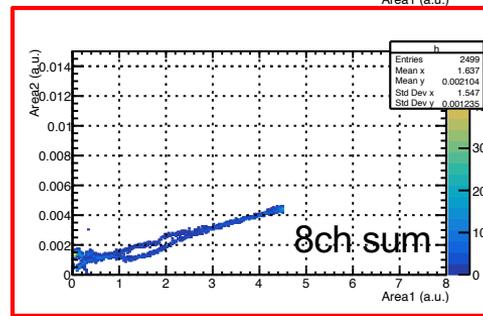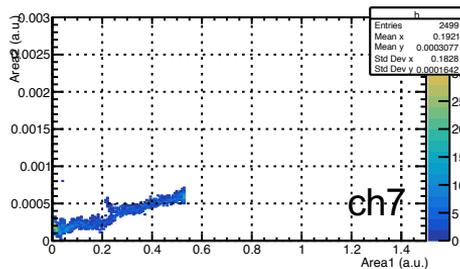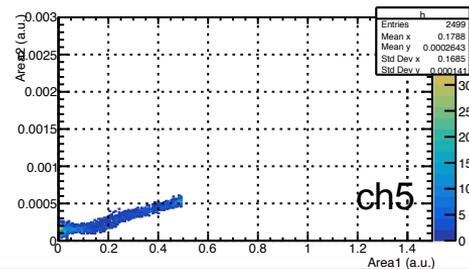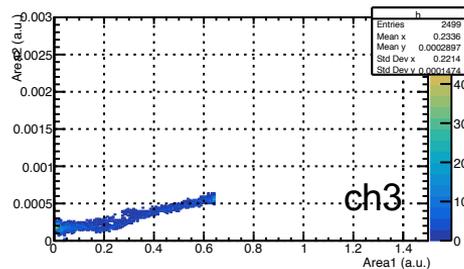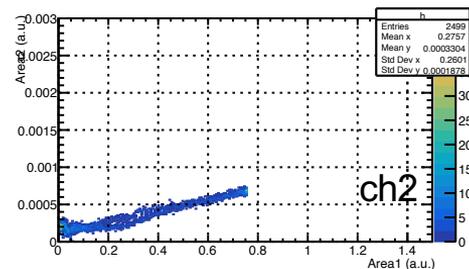Area1 = sum of (signal < baseline)

Area2 = sum of (signal > baseline)

50 samples = 4us
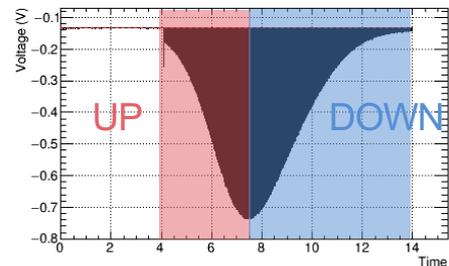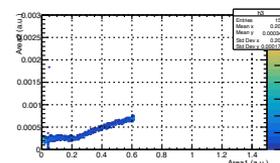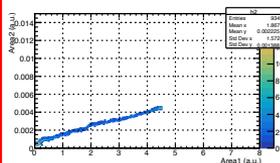
Area 1 vs Area 2, H state

16000 shots avg
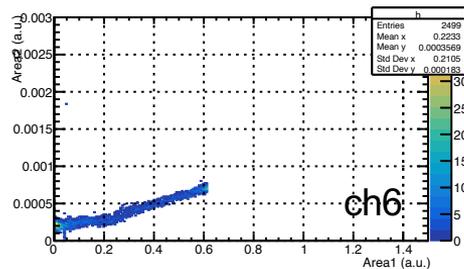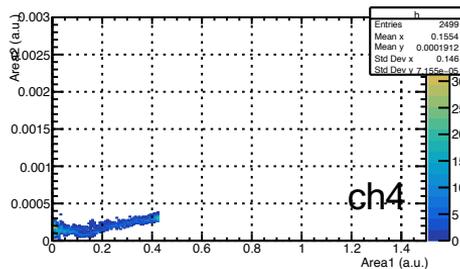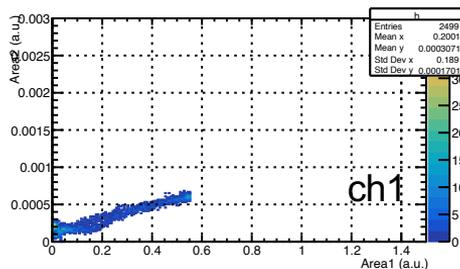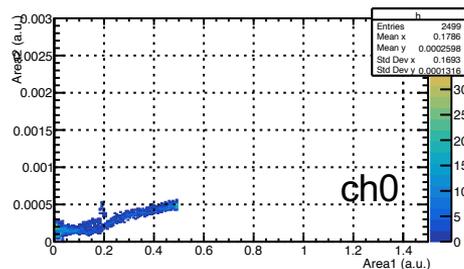
Hysteresis?

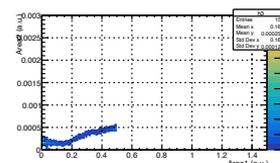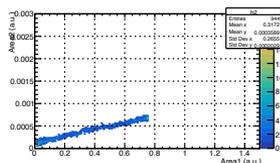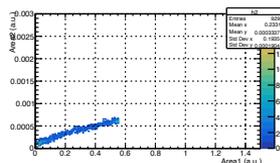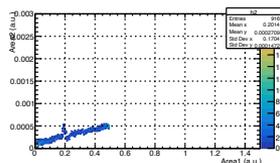Maybe it's the same one we saw during SiPM bias evaluation?

100 shots avg

UP
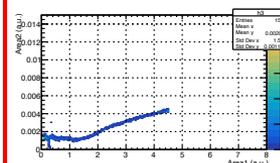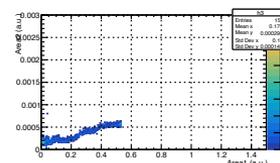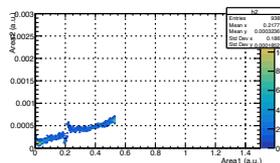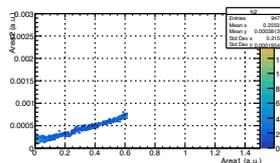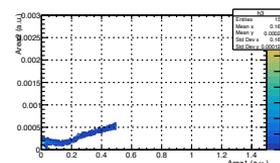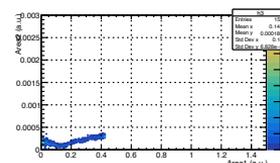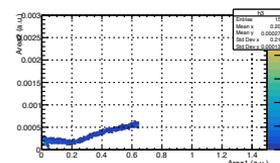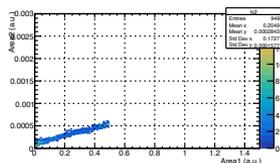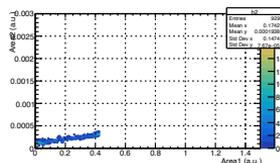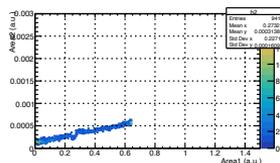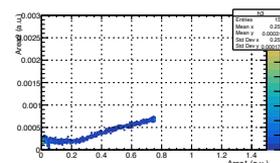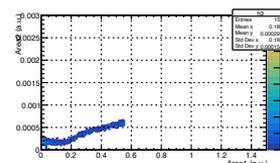
DOWN

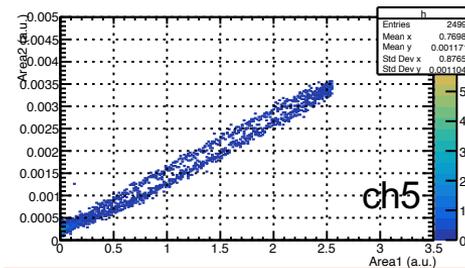# Area 1 vs Area 2, Q state

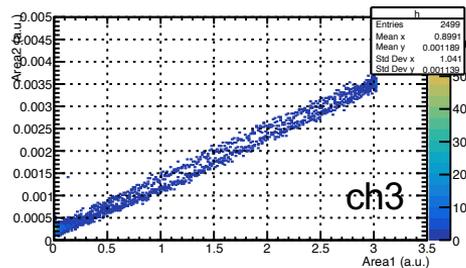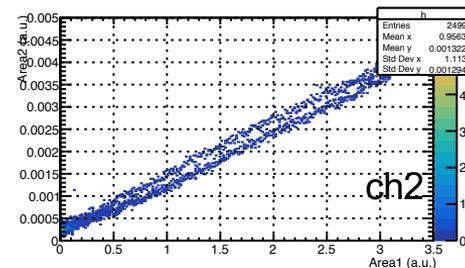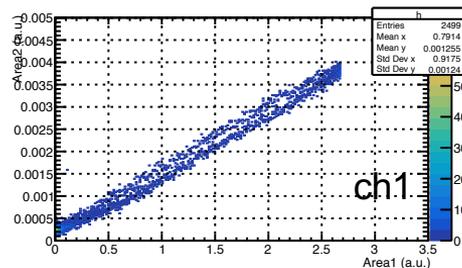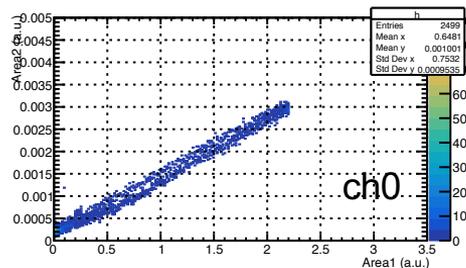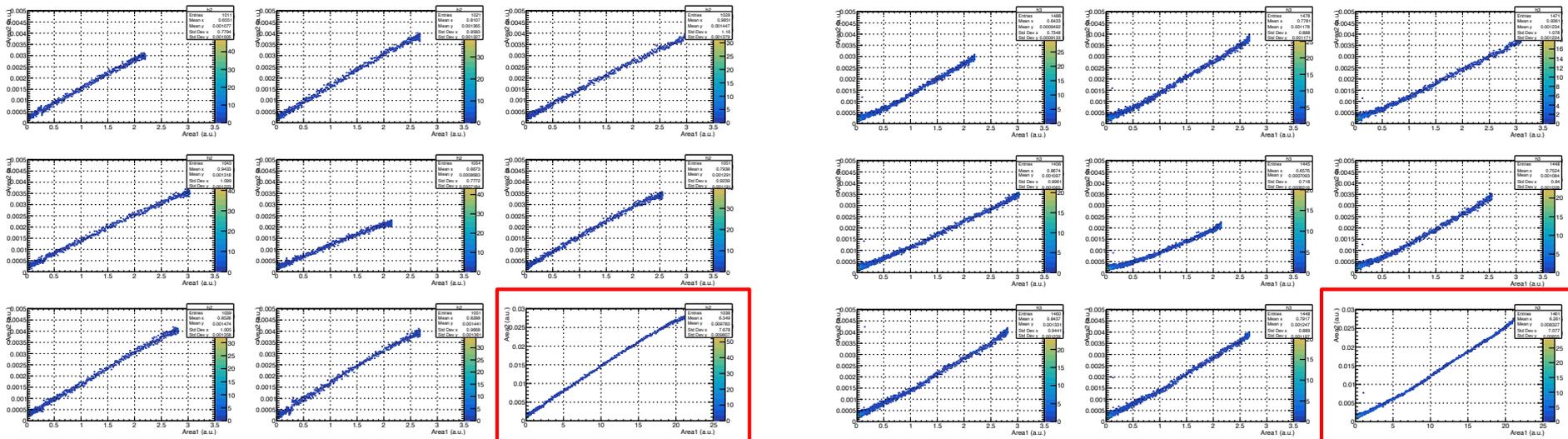3200 shots avg
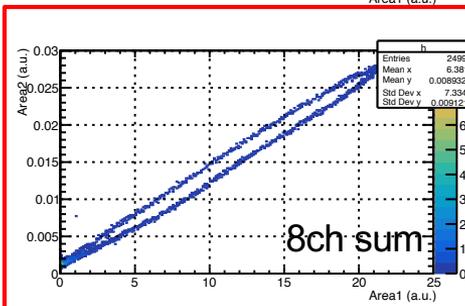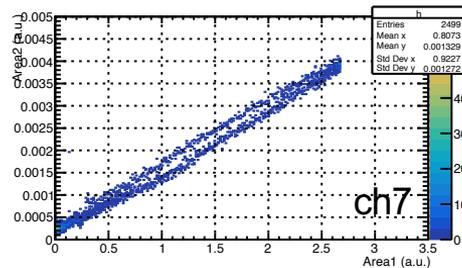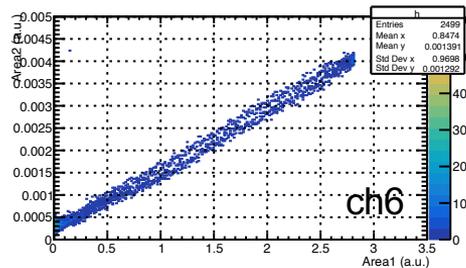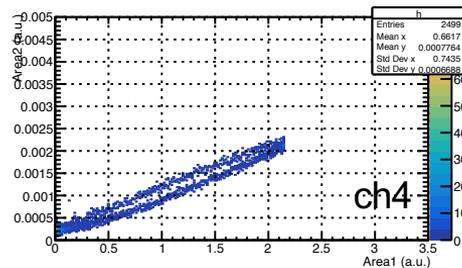
Area 1 vs Area 2, Q state

100 shots avg

UP

DOWN

single photon response