

Status Report

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Introduction

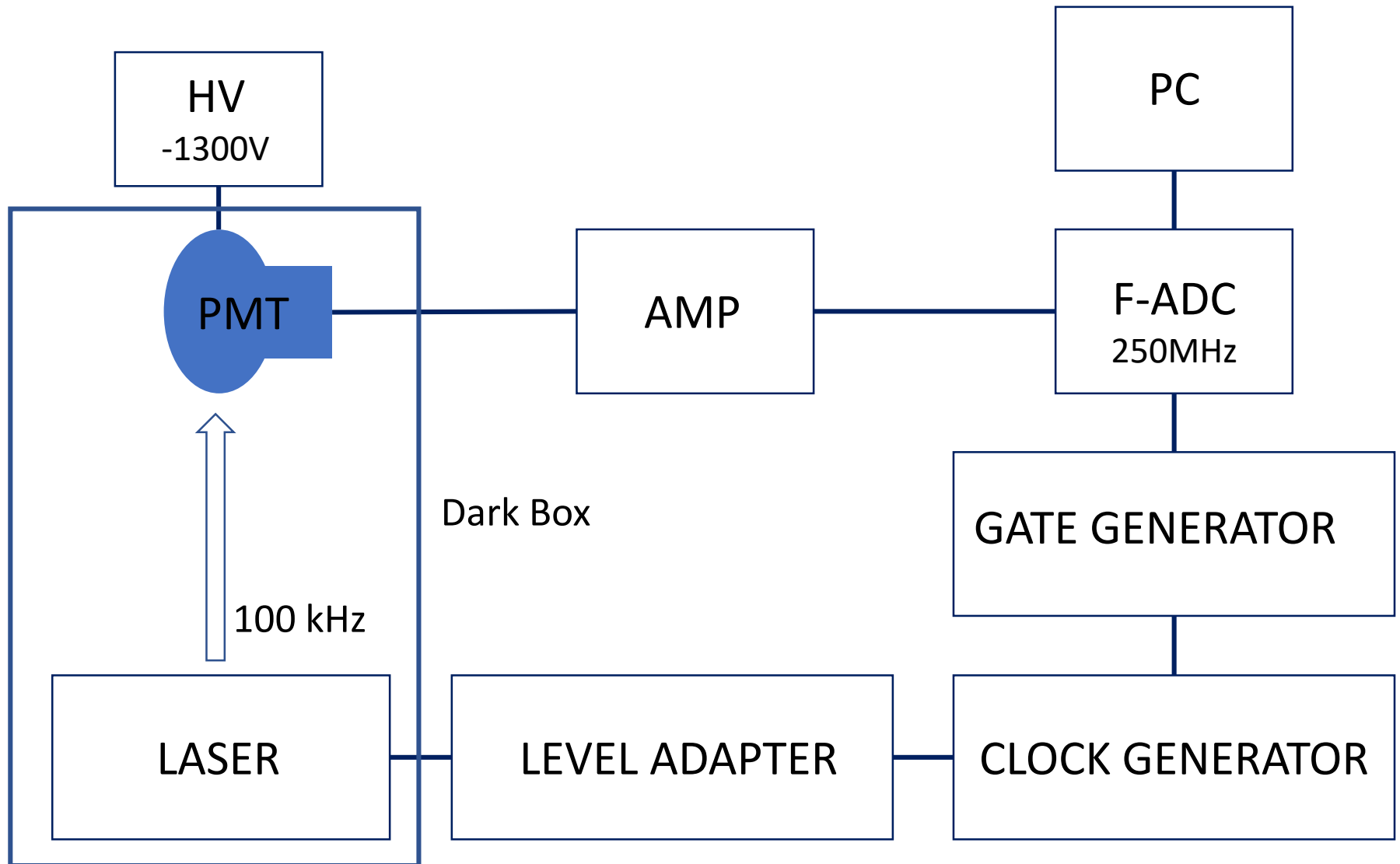
- We have measured the after pulse which is the signal of PMT that can be detected after the main signal.



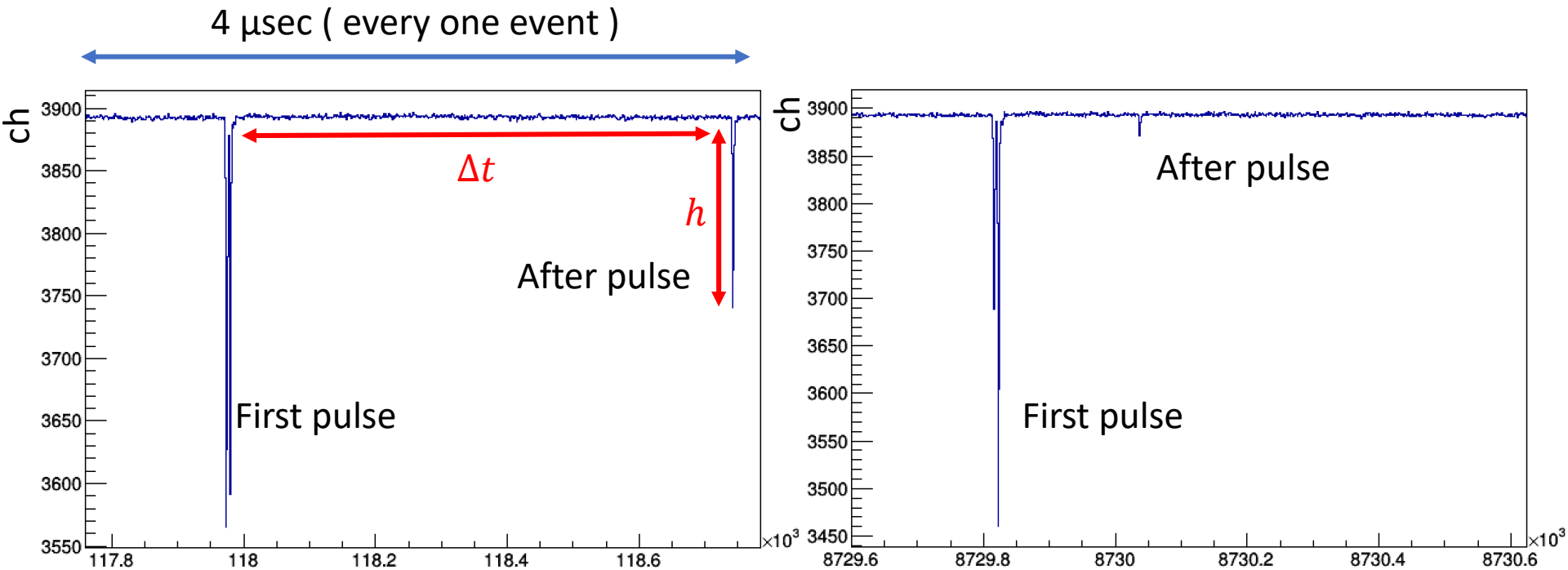
Measurement

- We illuminated the PMT with laser and measured the signals by F-ADC.
- We changed the power of laser (80 and 85mA) to check the dependence of first pulse height.

Setup

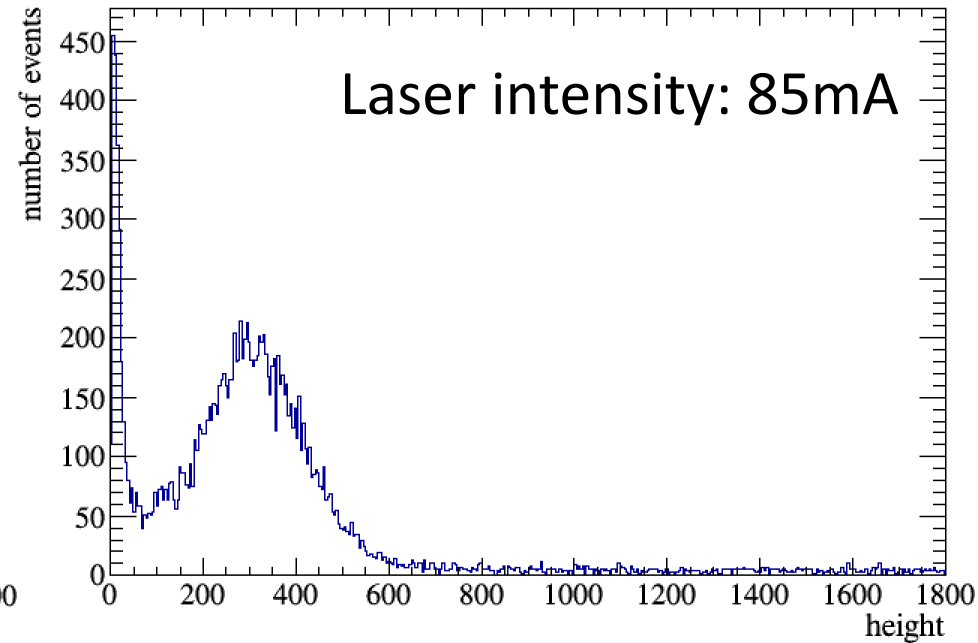
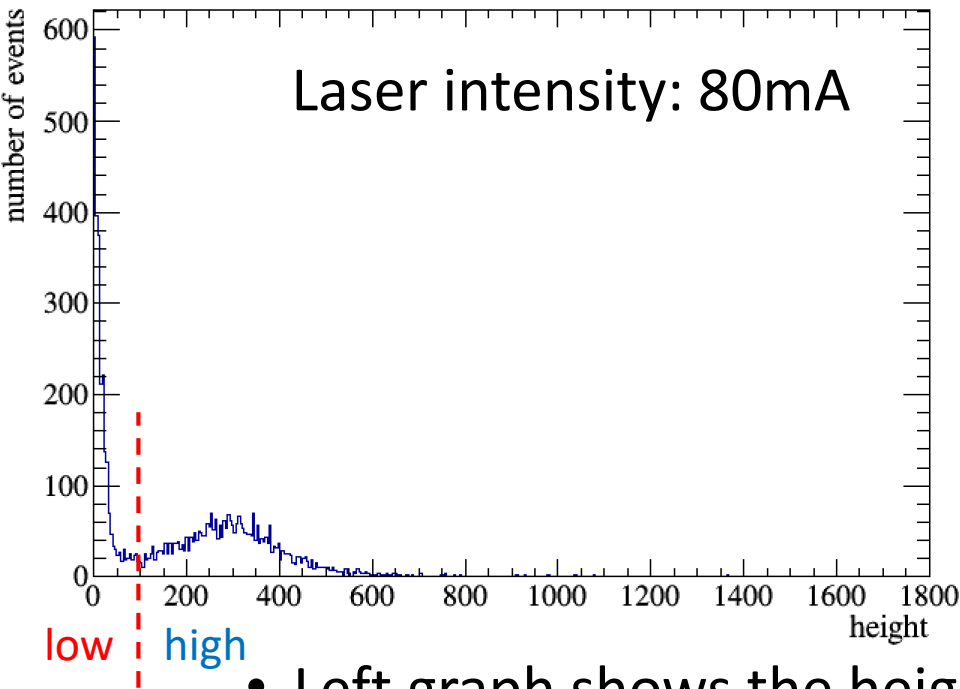
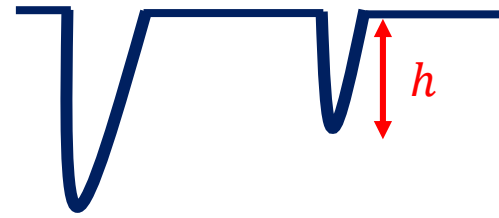


Signal Example



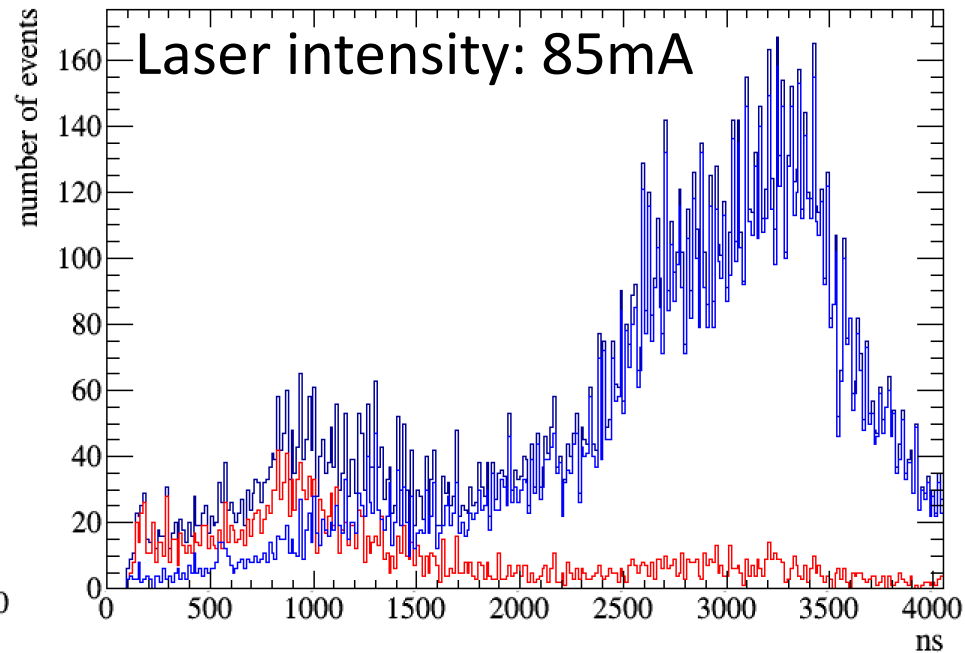
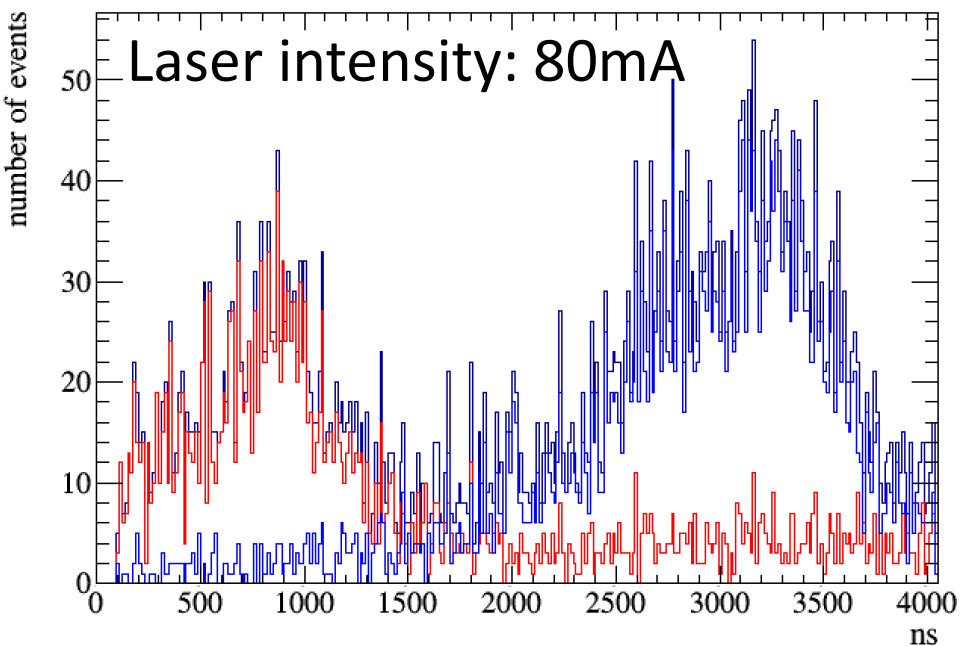
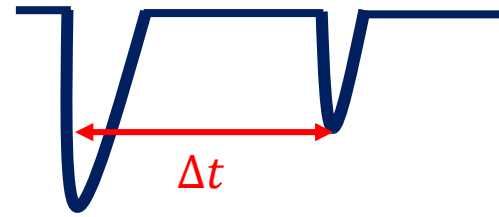
- The first pulse is synchronized with laser.
- The second pulse is considered as the after pulse.

After pulse height : h



- Left graph shows the heights of after pulses.
- The peak at around 300 ADC counts corresponds to single photo electron.
- There are two components of after pulse.
 - High : one photo electron signal
 - Low : small signals well below single photo-electron

Time intervals: Δt

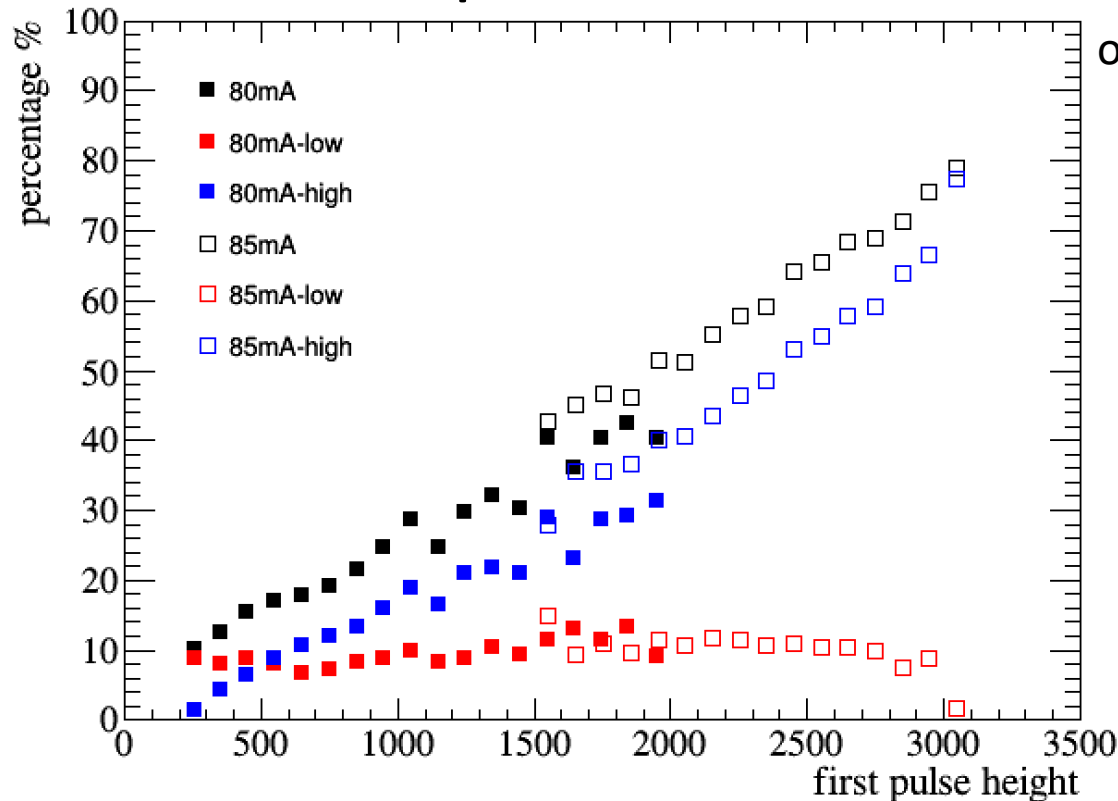


- The histograms show the time intervals between the first and second pulse.
- The second pulses were found at around 1μs and 3μs after the first signal.

Red : low after pulses were found at 1μs

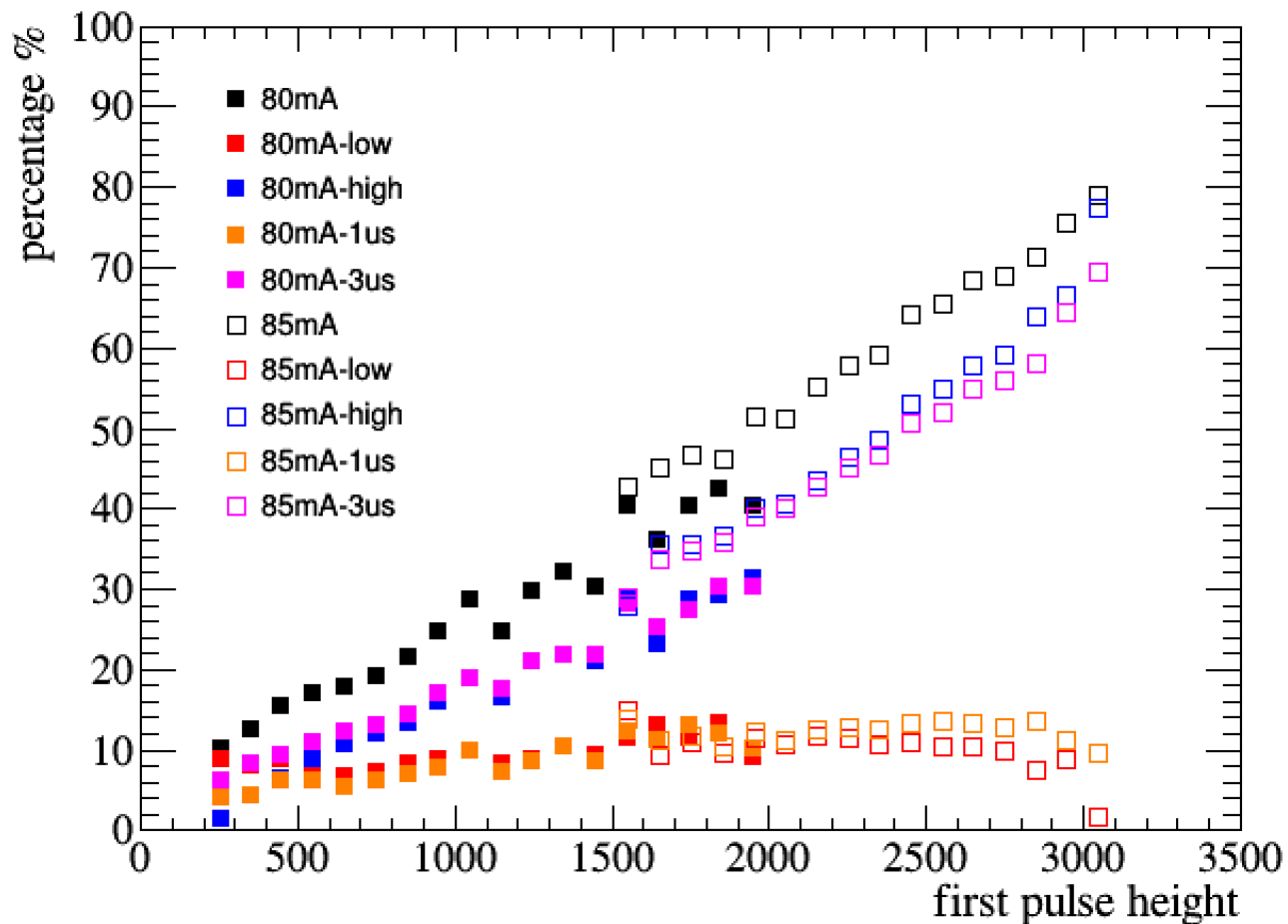
Blue : high after pulses were found at 3μs

Fraction of after pulse occurrence



overall : 80mA - 21.01%
: 85mA - 60.96%

- The plot shows the fraction of events with after pulse as a function of the heights of the first pulses.
- Red and blue points show the fraction with low and high after pulses respectively.

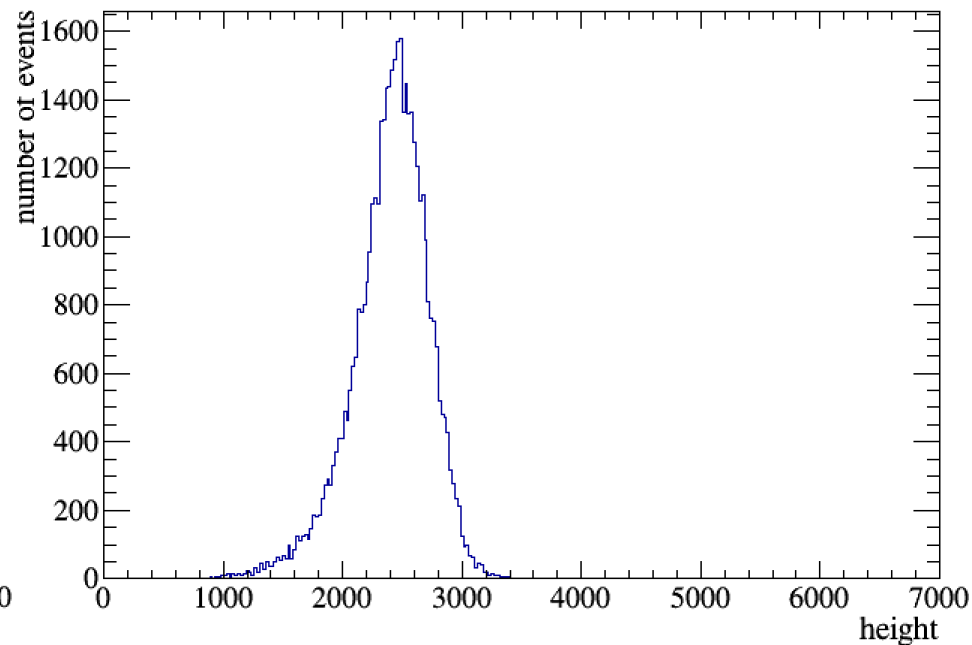
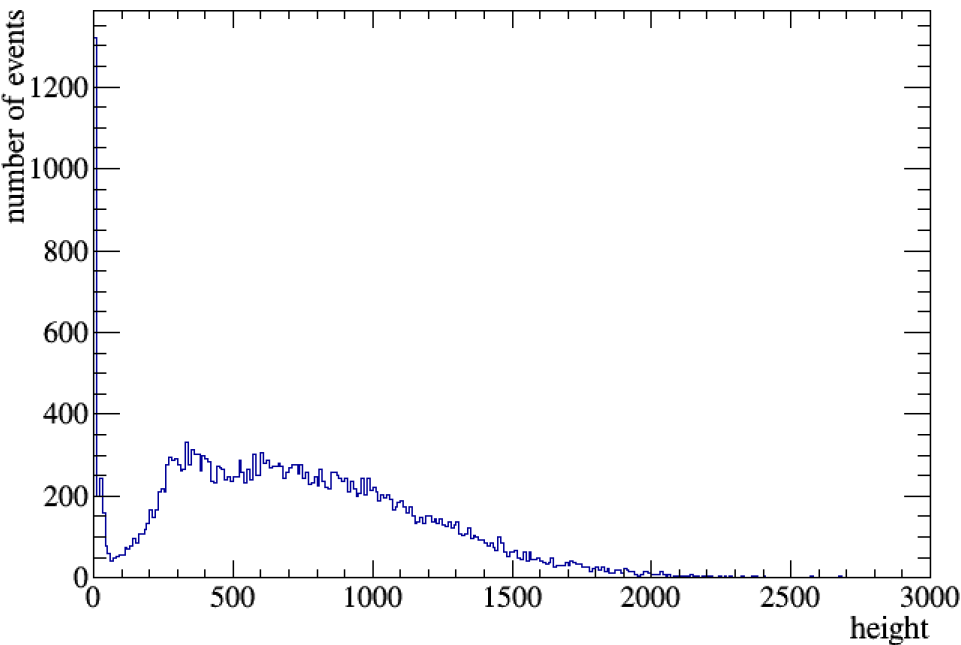


- As a confirmation, I made the same plot as the previous page but separate the events with the time interval between the first and second signals.
- Red and blue points show the fraction with the after pulses at $\Delta t < 1.8\mu s$ and $\Delta t > 1.8\mu s$ respectively.

Summary

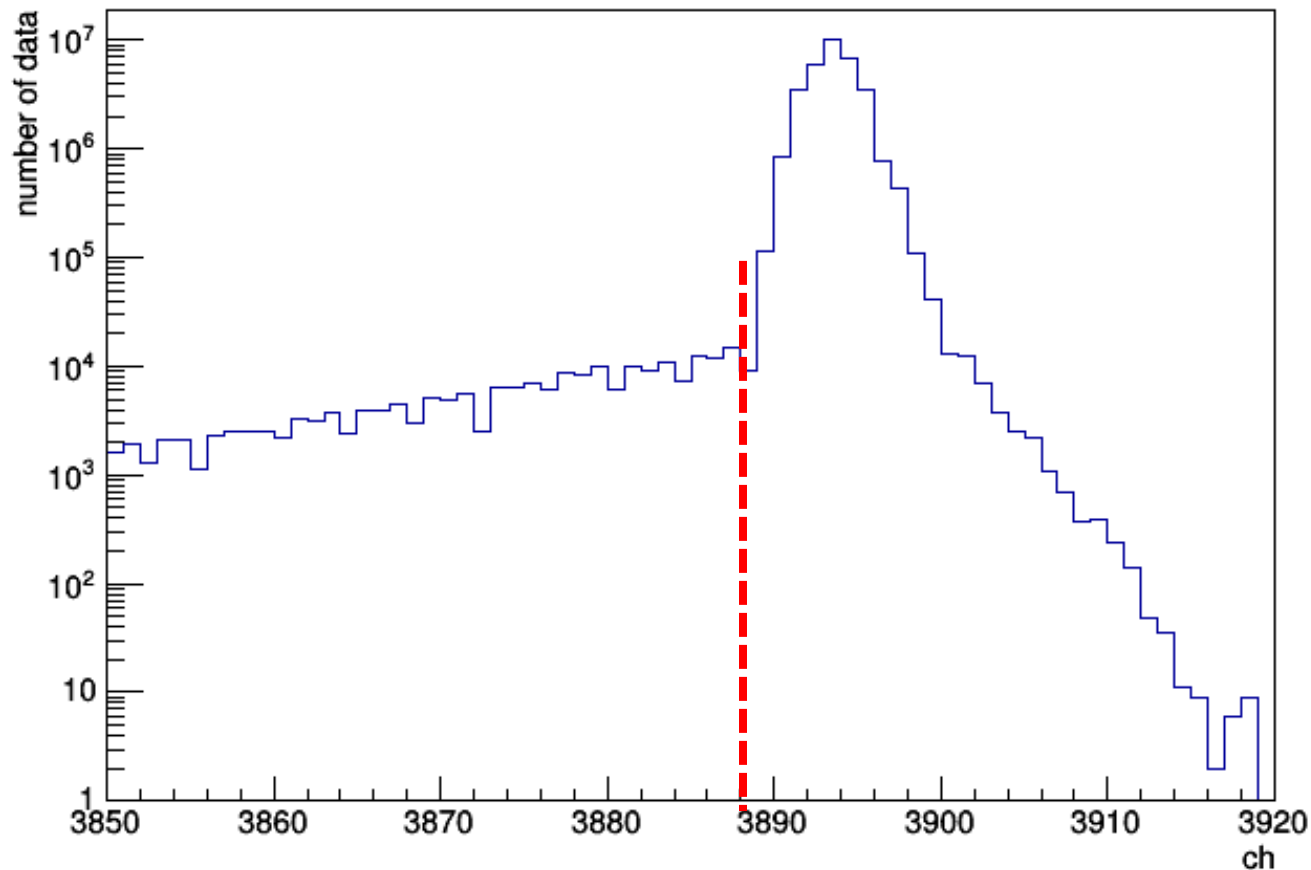
- I measured the after pulse of 3-inch PMT with laser and F-ADC.
- There are two components of after pulse, low and high.
- Low after pulses were found at $1\mu\text{s}$ and High after pulses were found at $3\mu\text{s}$.

Back up 1 : first pulse height



- Each graph shows the height of first pulse. (left-80mA ,right-85mA)

Back up 2 : after pulse



- The horizontal axis shows ADC channels around baseline. The vertical axis shows the number of ADC counts.
- Red line is threshold to regard after pulse.