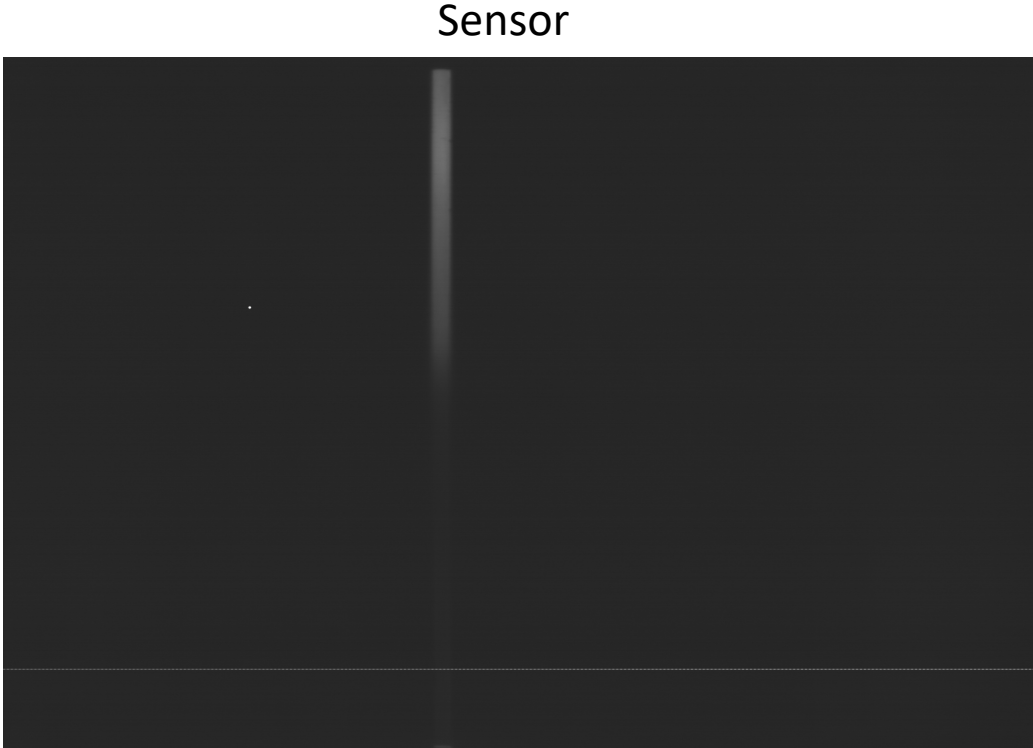
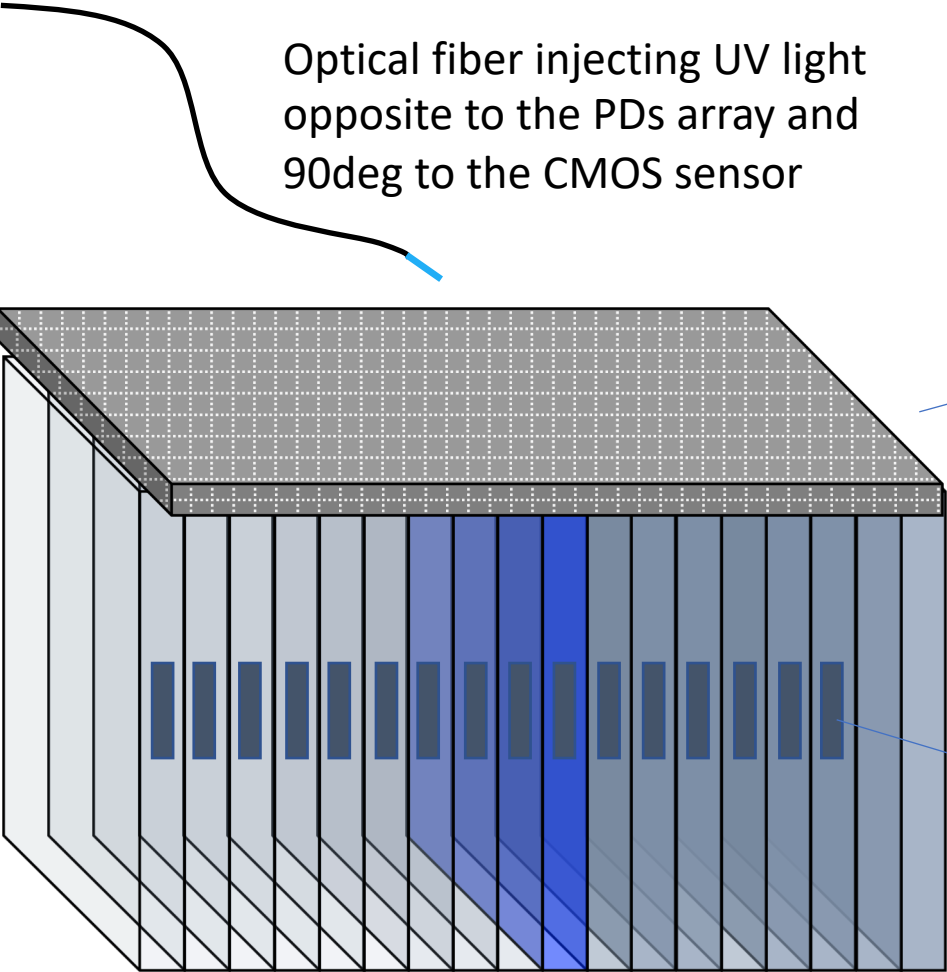


Test of the detector prototype using photodiodes.  
Preliminary results.

11 Nov 2020

Raffy, Saad.

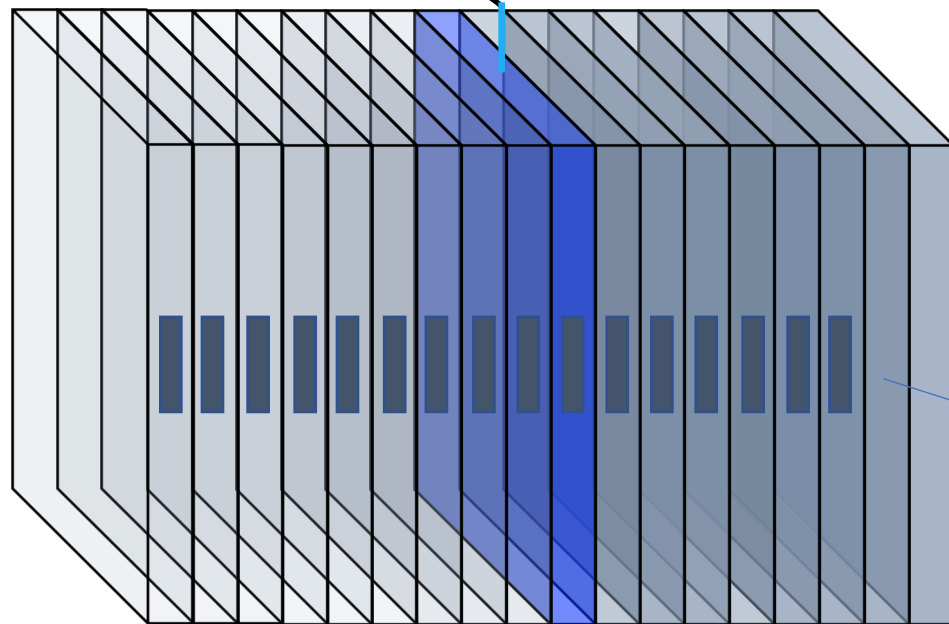
EXPERIMENTAL SETUP n.1



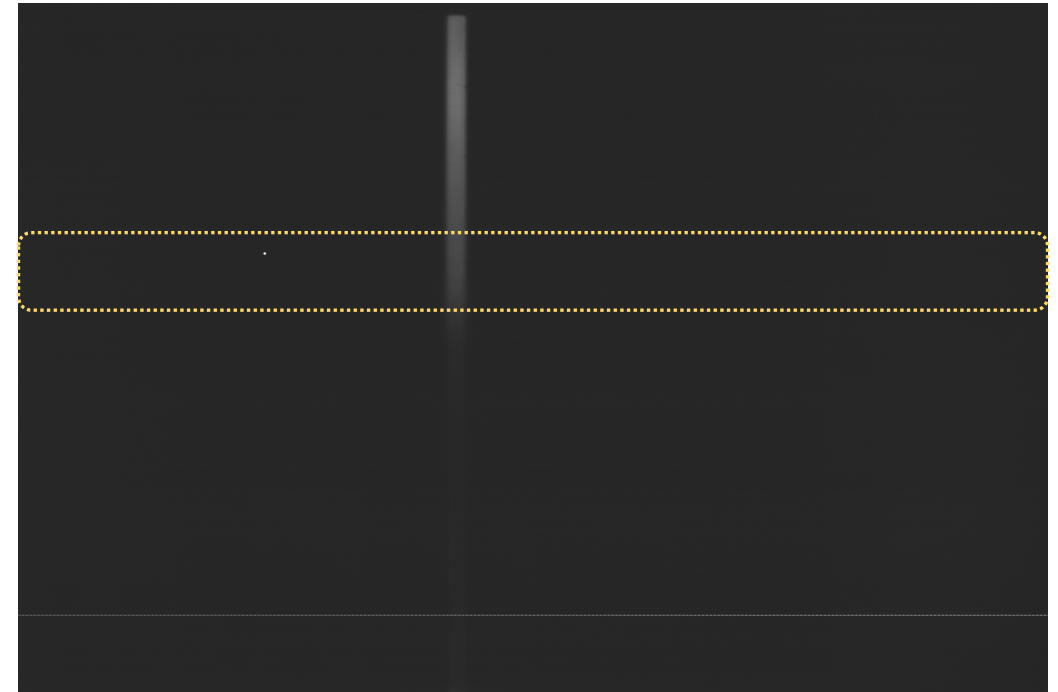
Very weak signal from photodiodes

# EXPERIMENTAL SETUP n.2

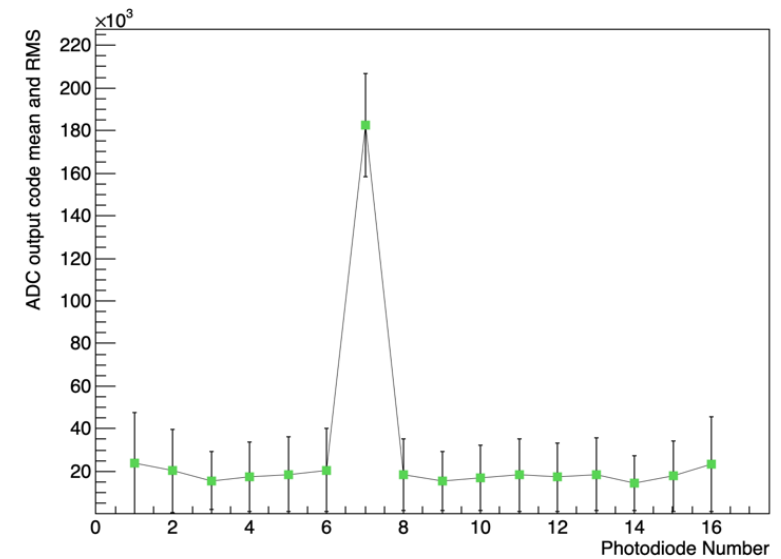
Optical fiber injecting UV light 90deg to the PDs array. Sensor removed.



Area of the sensor covered by PDs in this setup.



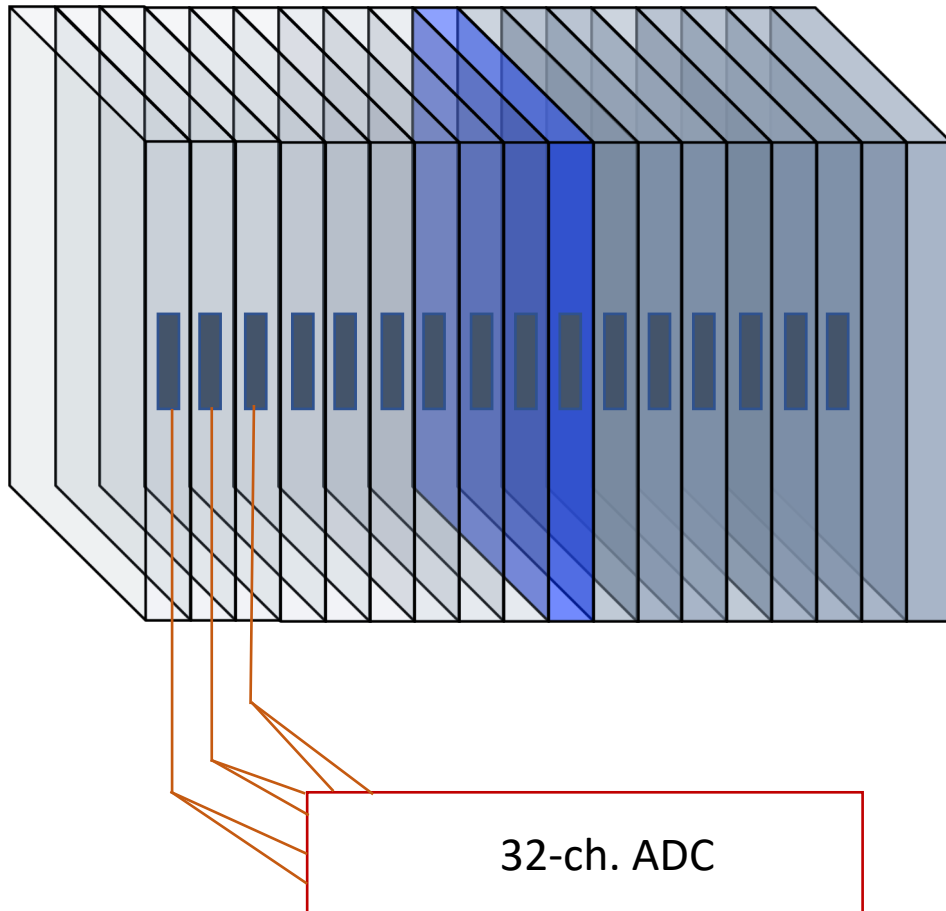
### Candlestick Plot



## MEASUREMENTS PERFORMED:

- Array of 16 photodiodes tested using a 32-channel current-input ADC. No reverse voltage applied.
- 2 different PD arrays tested using Hamamatsu S1337-16BR and S12915-16R
- Different integration times and ADC Full Scale ranges
- Light injected in photodiode n.7

## ELECTRONIC CONFIGURATION

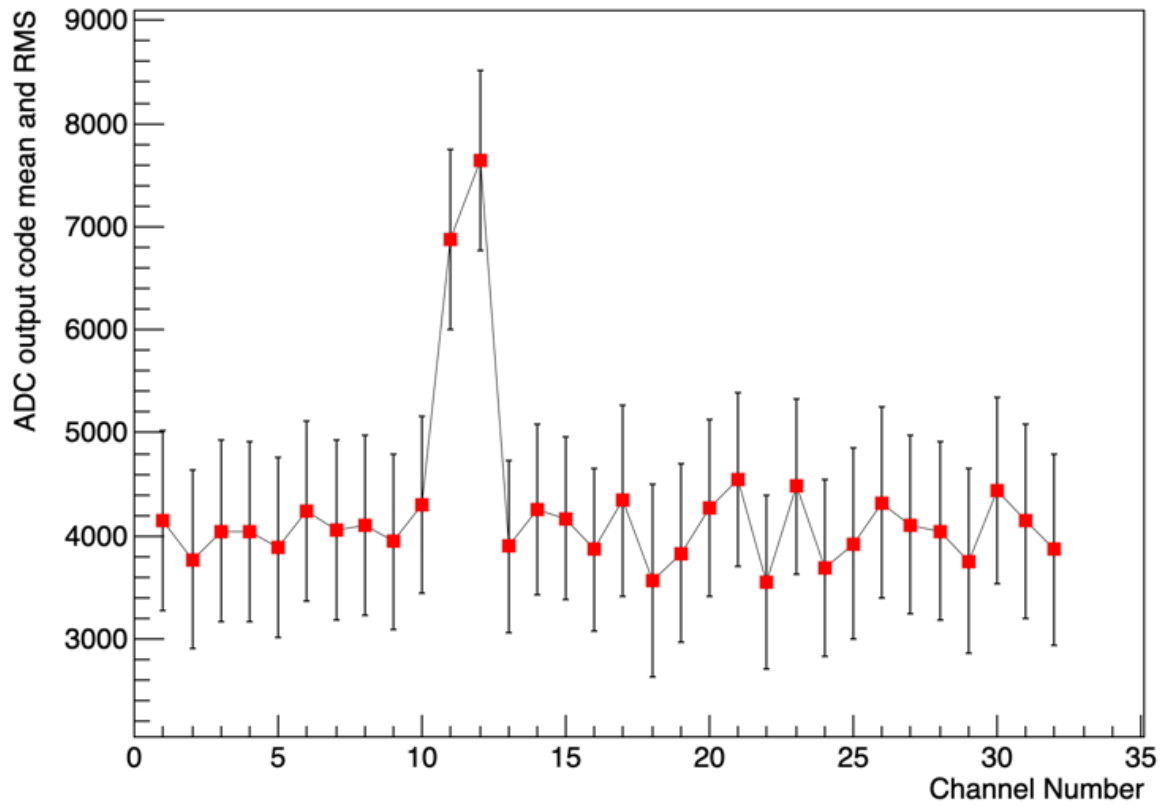


- The signal from each PD is split in two ADC input channels:
- ADC channel 11 + channel 12 correspond to photodiode 7
  - ADC channel 13 + channel 14 correspond to photodiode 4

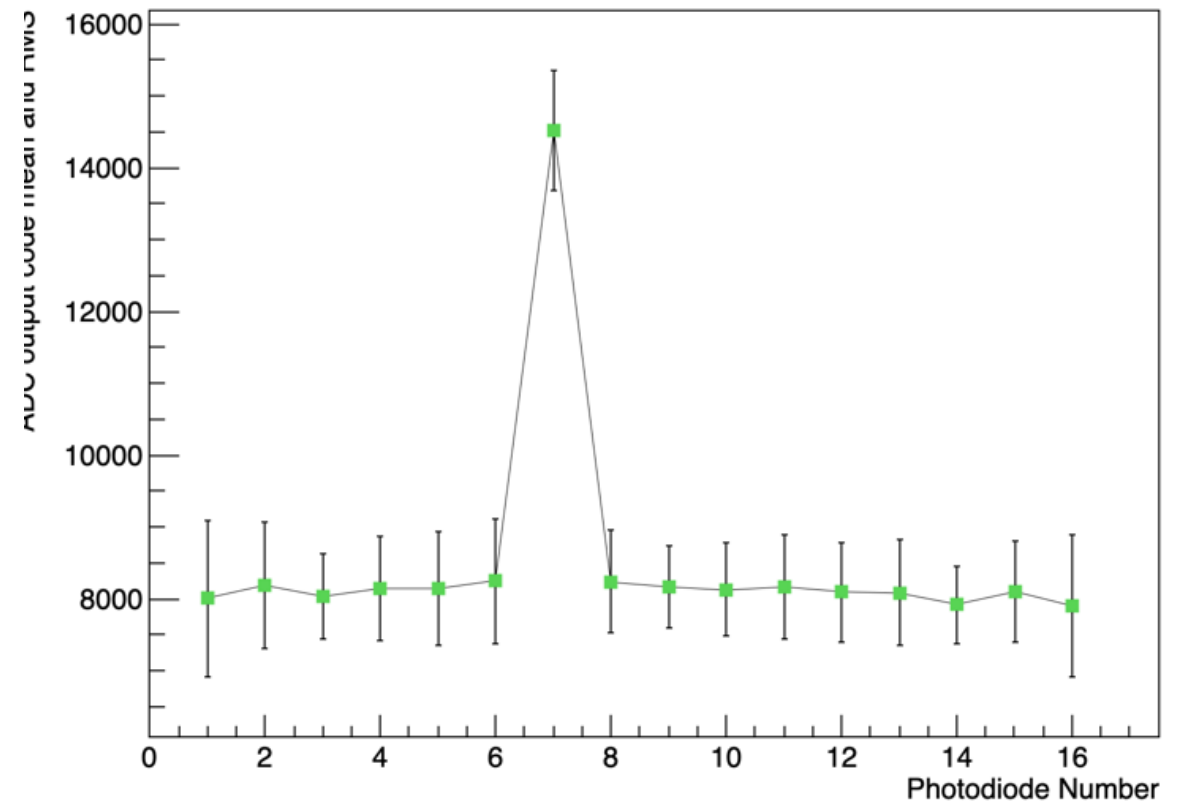
List of experimental runs:

- Run001; Int time 170us; Full Scale 350pC ; Hamamatsu S1337-16BR
  - Run002; Int time 170us; Full Scale 12.5pC ; Hamamatsu S1337-16BR
  - Run003; Int time 170us; Full Scale 200pC ; Hamamatsu S1337-16BR
  - Run004; Int time 2000us; Full Scale 350pC ; Hamamatsu S1337-16BR
  - Run005; Int time 2000us; Full Scale 200pC ; Hamamatsu S1337-16BR
  - Run006; Int time 2000us; Full Scale 50pC ; Hamamatsu S1337-16BR
  - Run007; Int time 2000us; Full Scale 50pC ; Hamamatsu S12915-16R
  - Run008; Int time 2000us; Full Scale 200pC ; Hamamatsu S12915-16R
  - Run009; Int time 2000us; Full Scale 350pC ; Hamamatsu S12915-16R
  - Run010; Int time 170us; Full Scale 350pC ; Hamamatsu S12915-16R
  - Run011; Int time 170us; Full Scale 200pC ; Hamamatsu S12915-16R
  - Run012; Int time 170us; Full Scale 12.5pC ; Hamamatsu S12915-16R
- 
- In this presentation are reported results from Run001, Run002, and Run004.
  - Similar conclusions for same conditions, but different PD model.

Candlestick Channels Plot



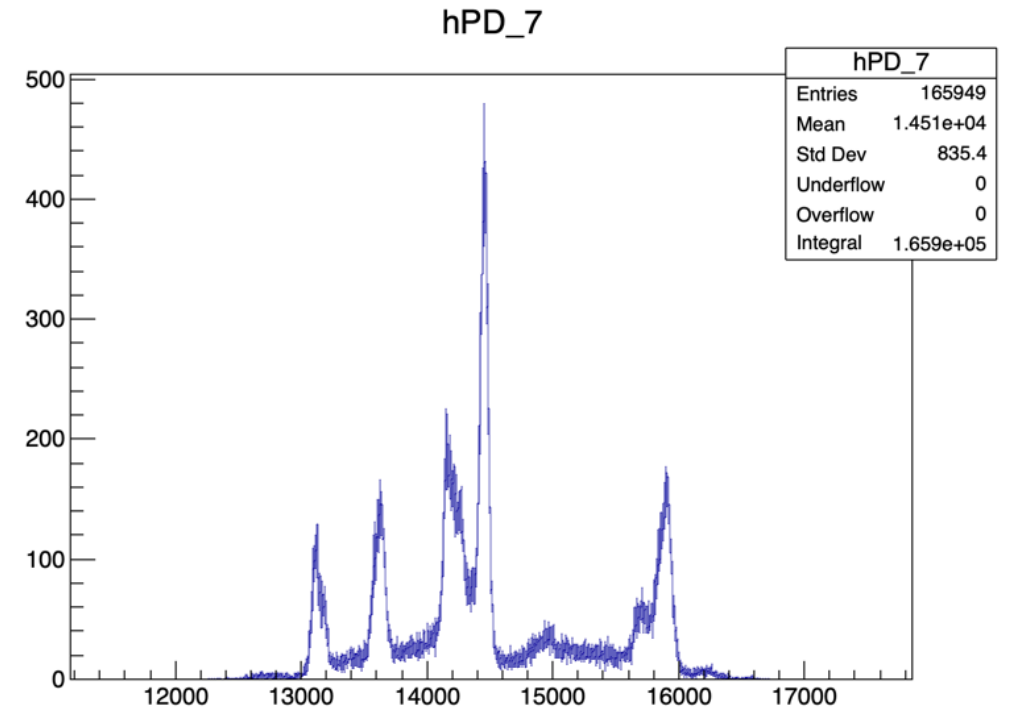
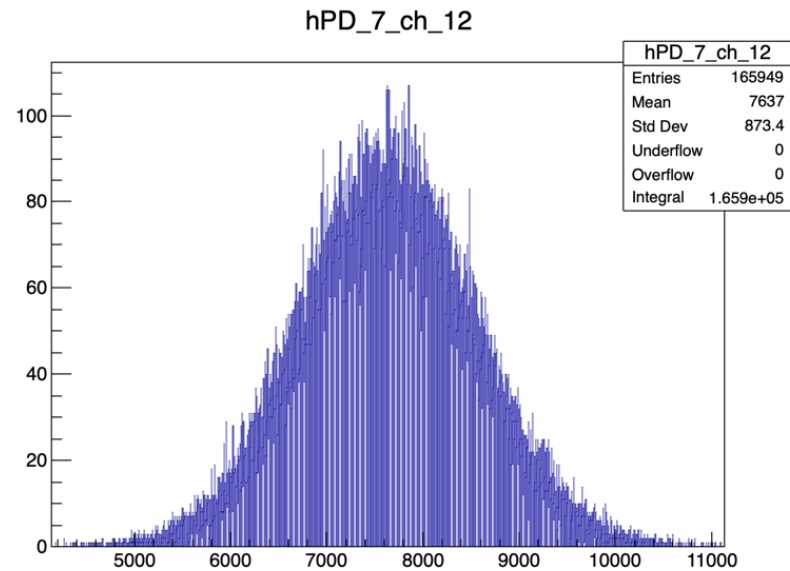
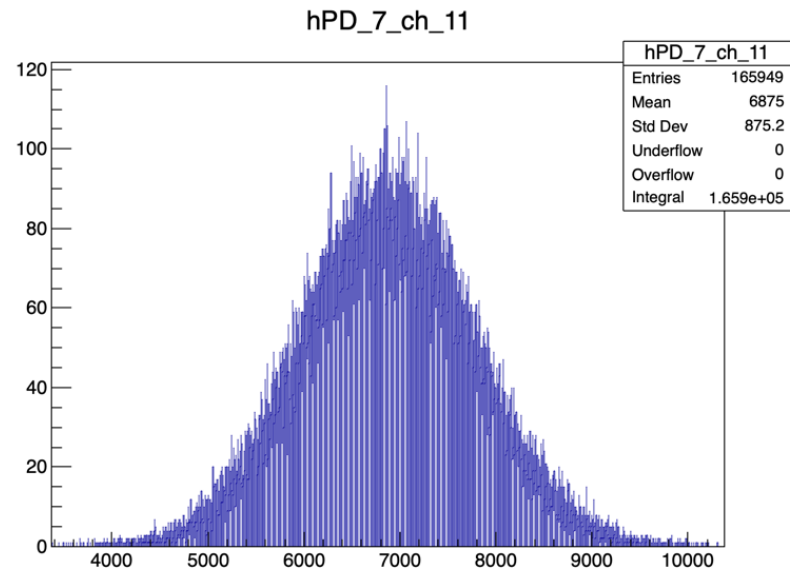
Candlestick Plot



Run001; Int time 170us; Full Scale 350pC

Hamamatsu S1337-16BR

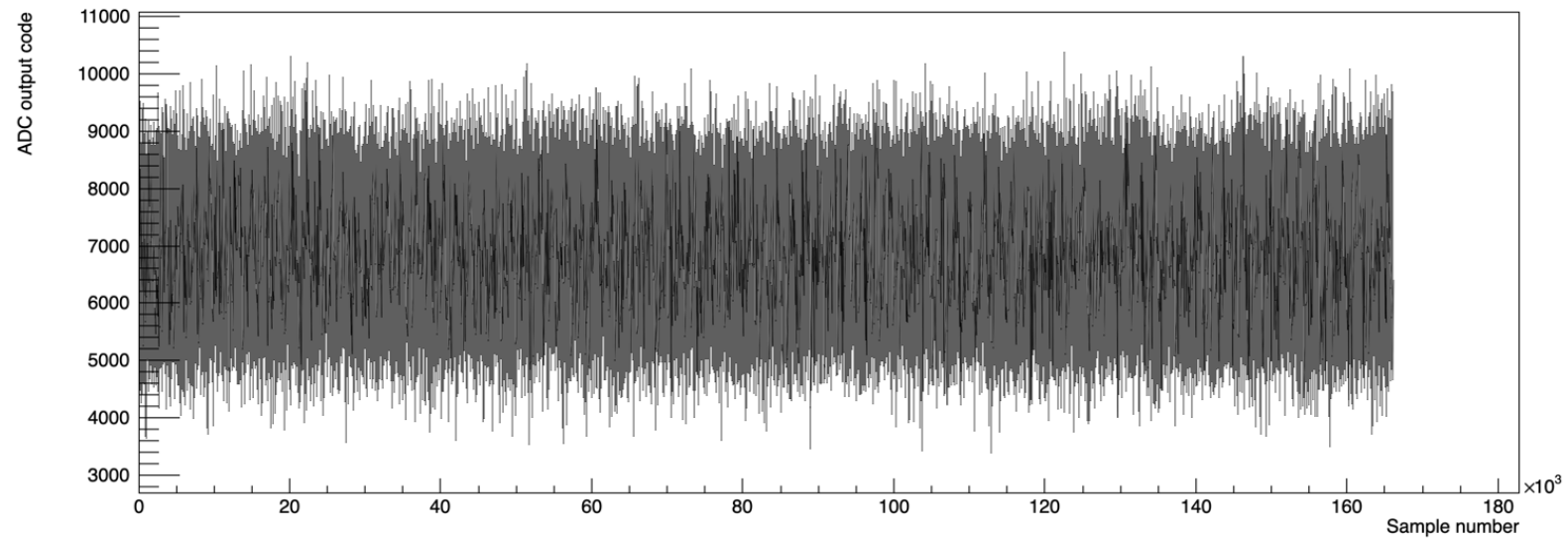
PD recording light



Run001; Int time 170us; Full Scale 350pC

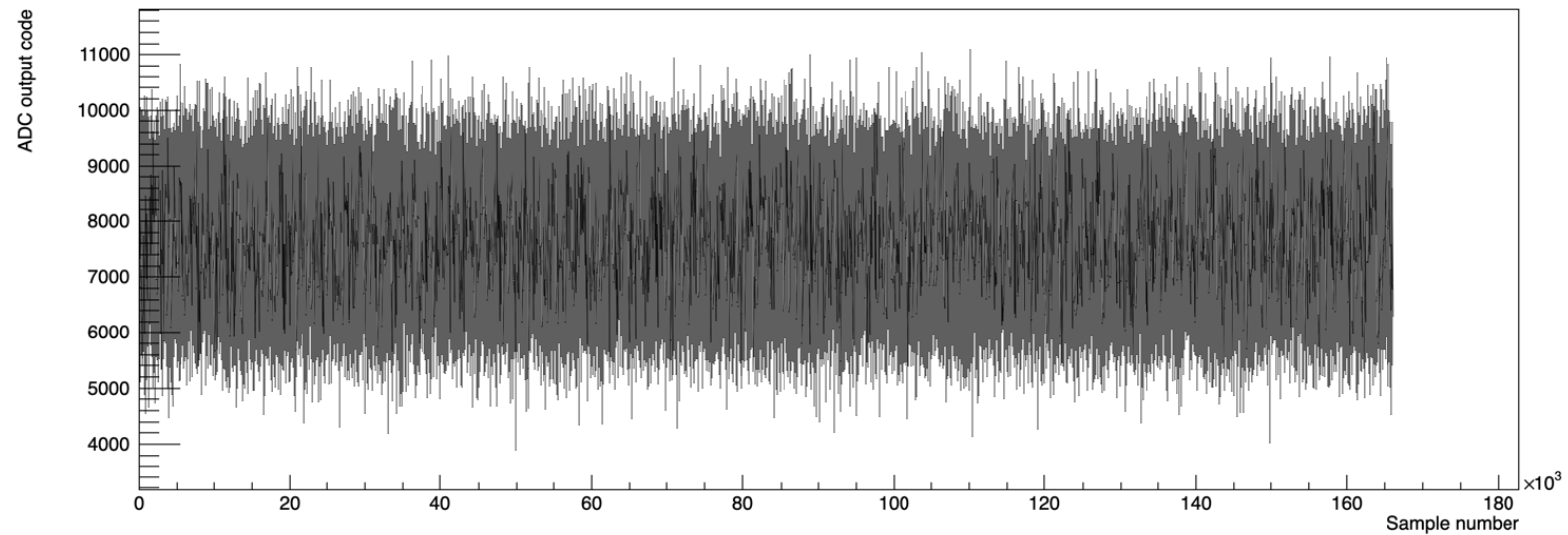
Hamamatsu S1337-16BR

Single Channel Line Plot Ch 11



PD recording light

Single Channel Line Plot Ch 12

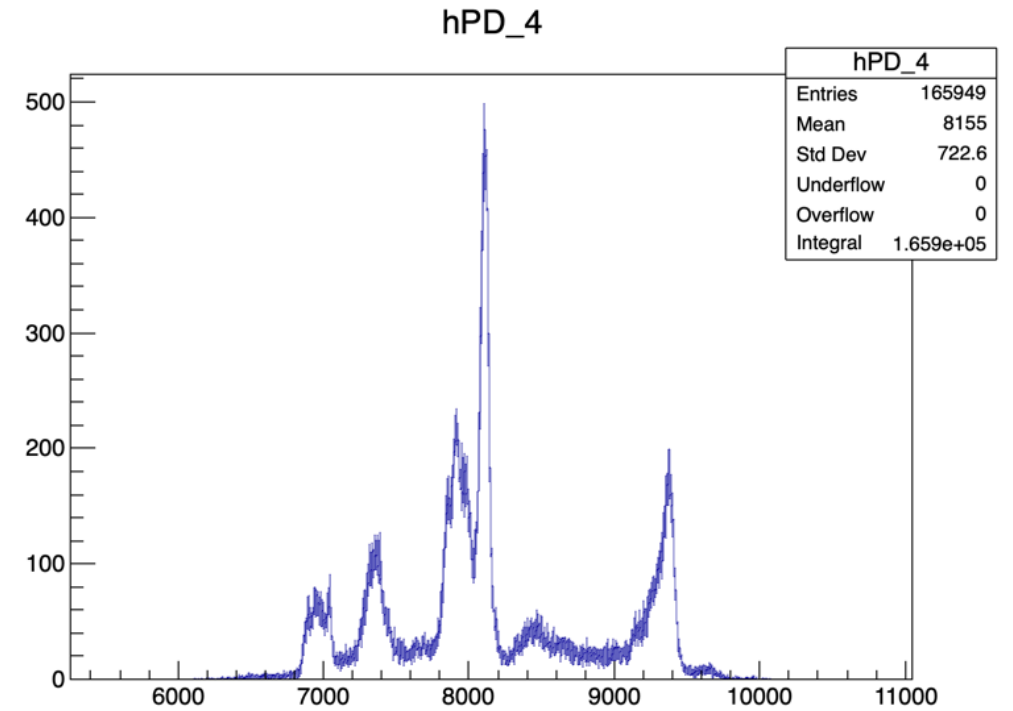
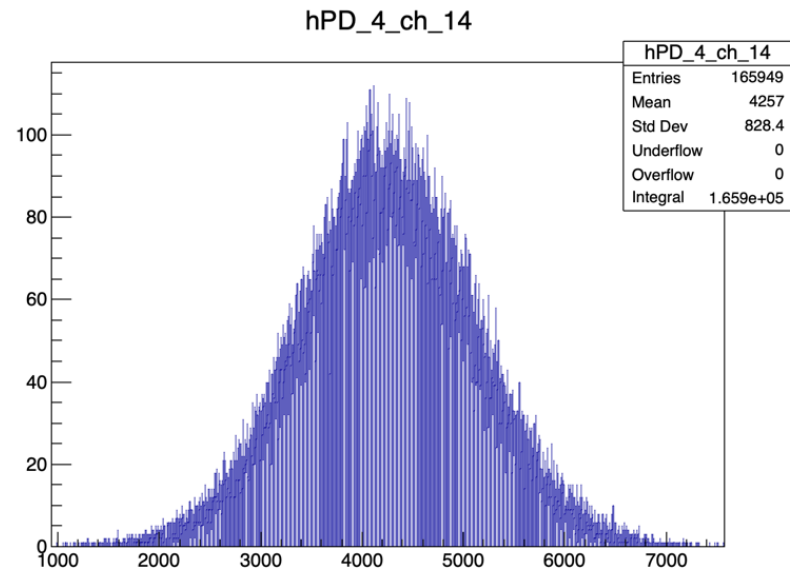
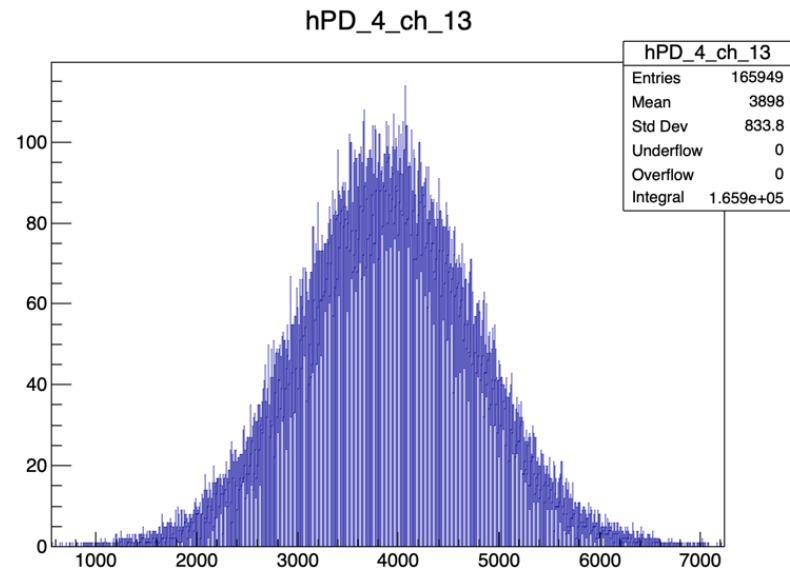




Run001; Int time 170us; Full Scale 350pC

Hamamatsu S1337-16BR

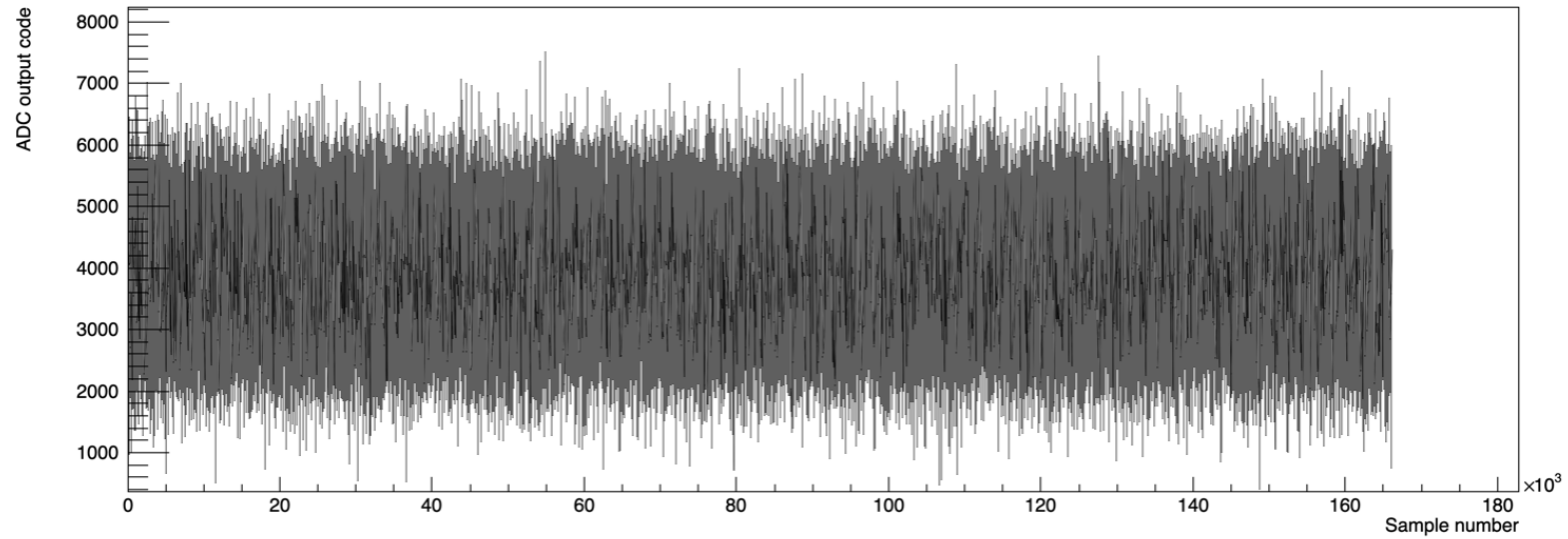
PD recording dark



Run001; Int time 170us; Full Scale 350pC

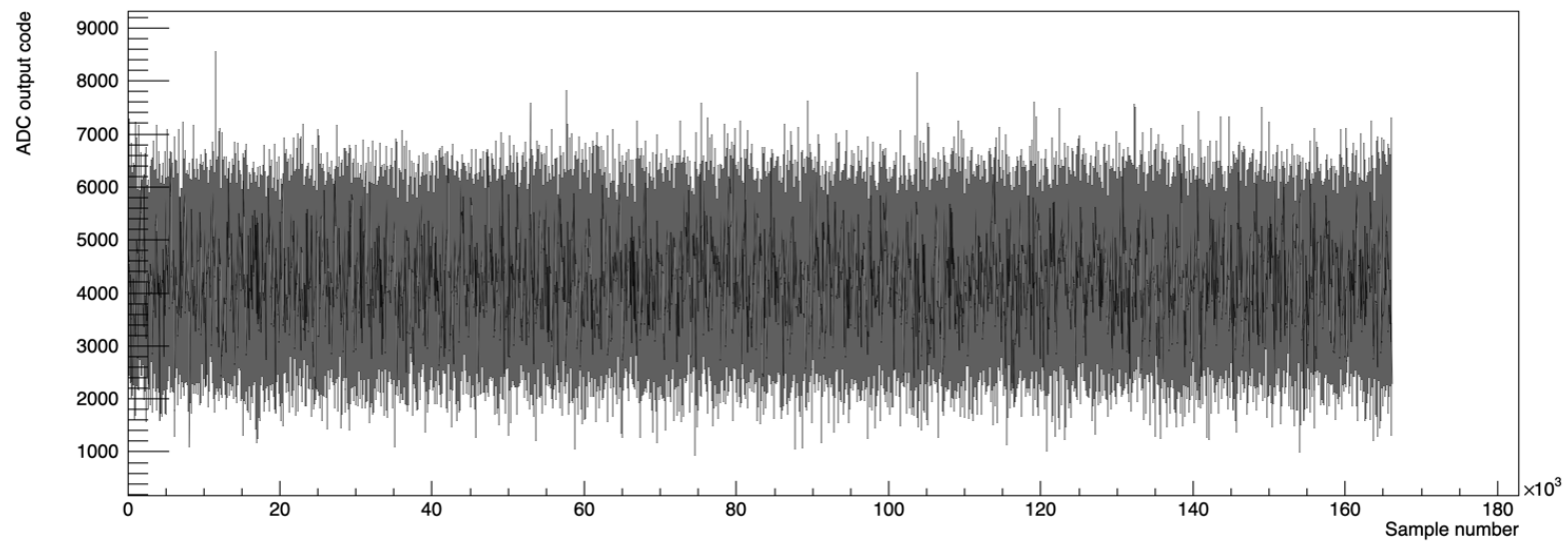
Hamamatsu S1337-16BR

Single Channel Line Plot Ch 13

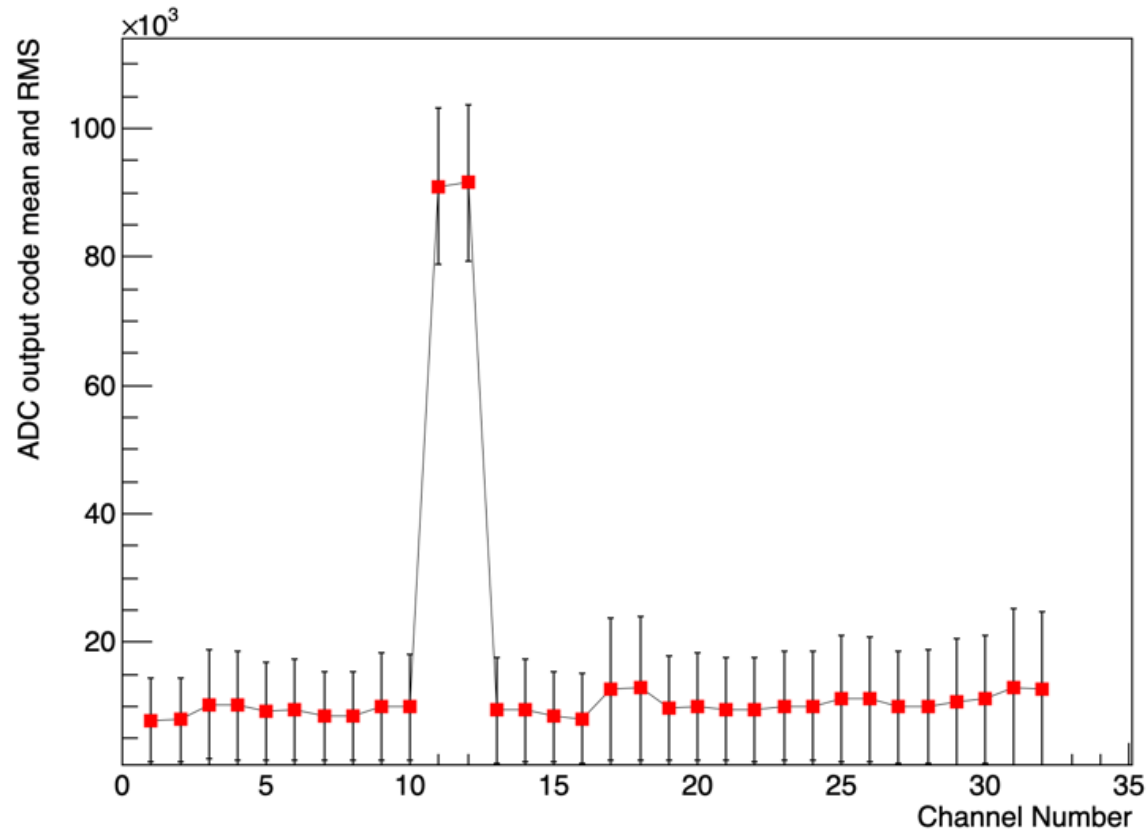


PD recording dark

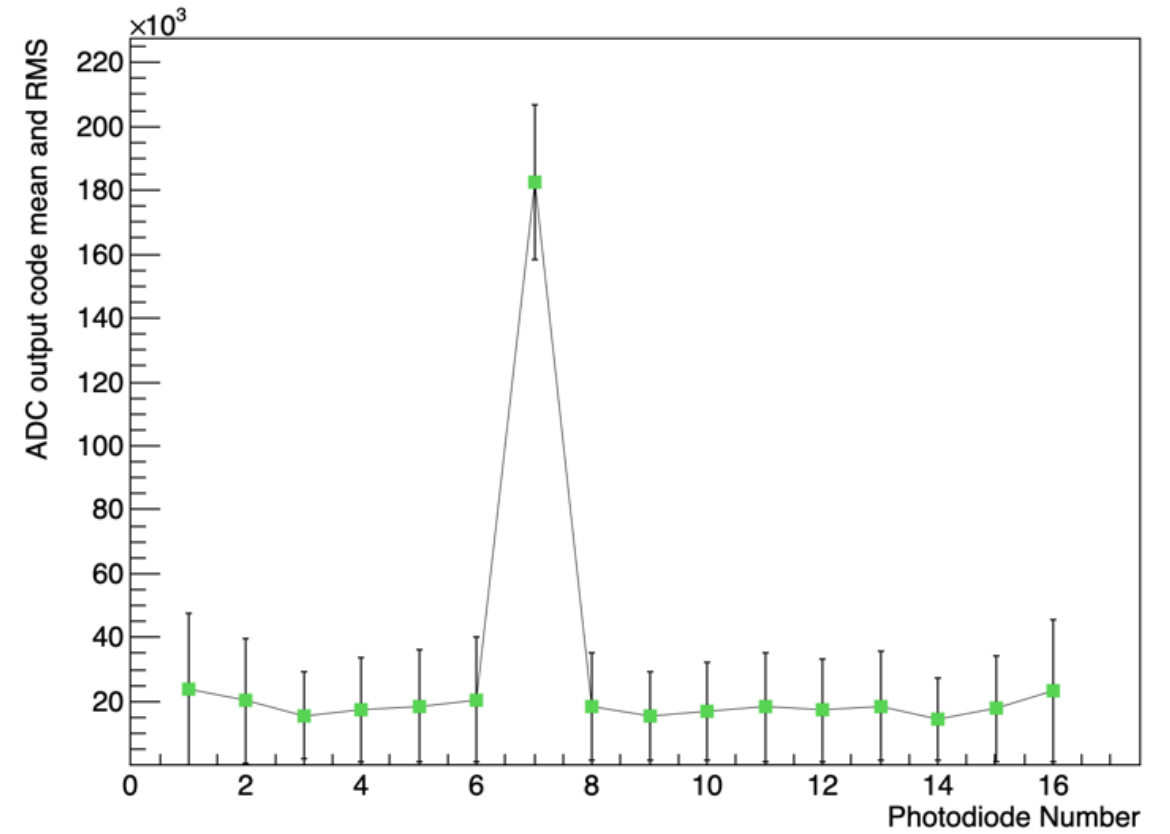
Single Channel Line Plot Ch 14



Candlestick Channels Plot



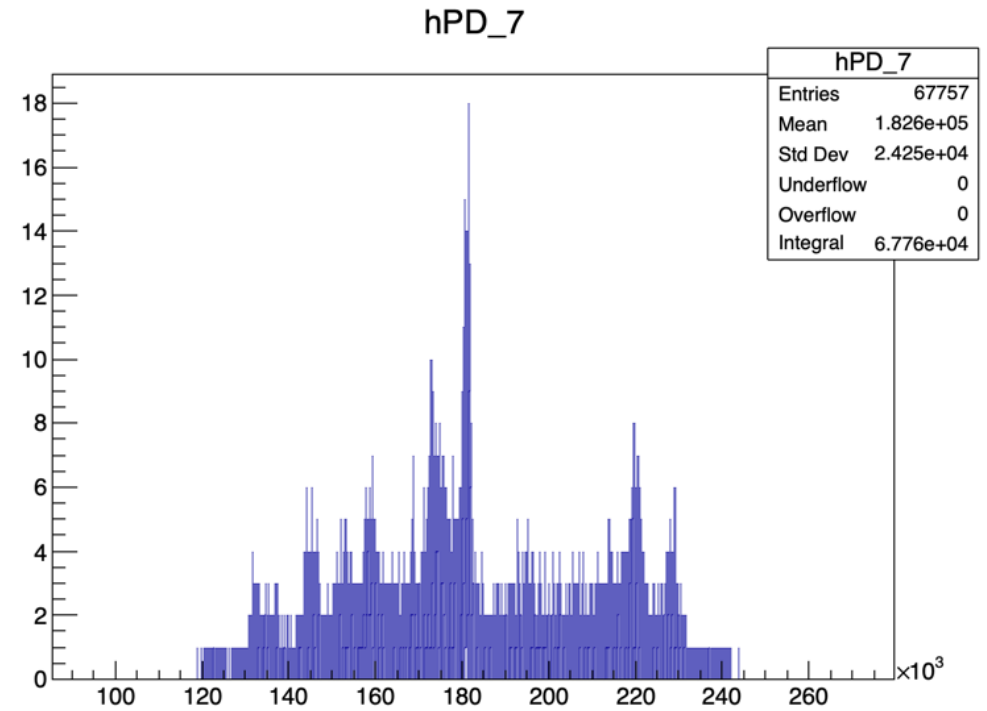
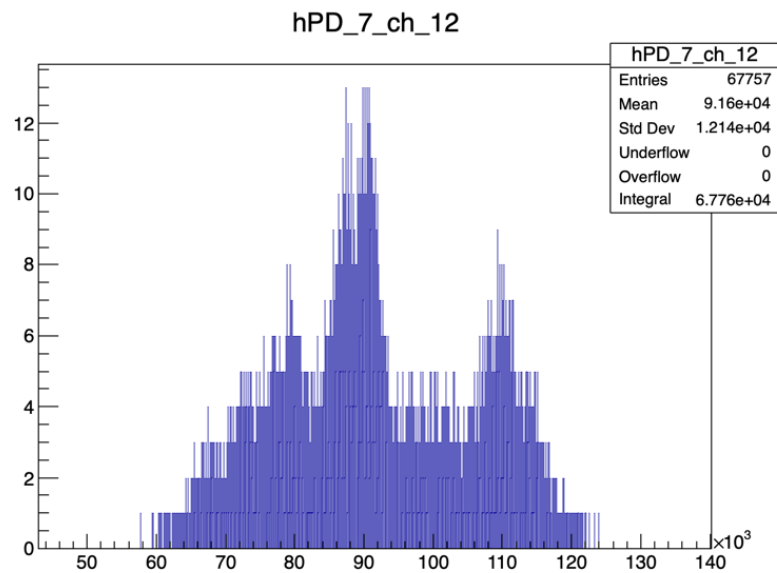
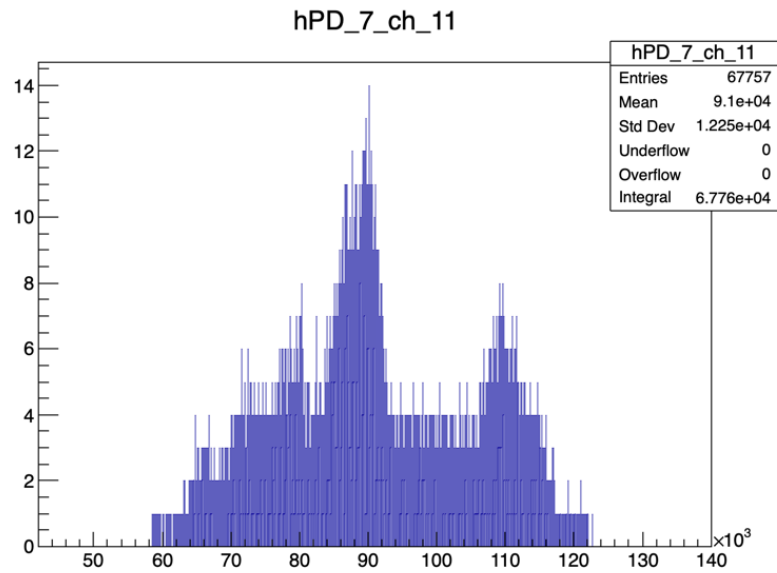
Candlestick Plot



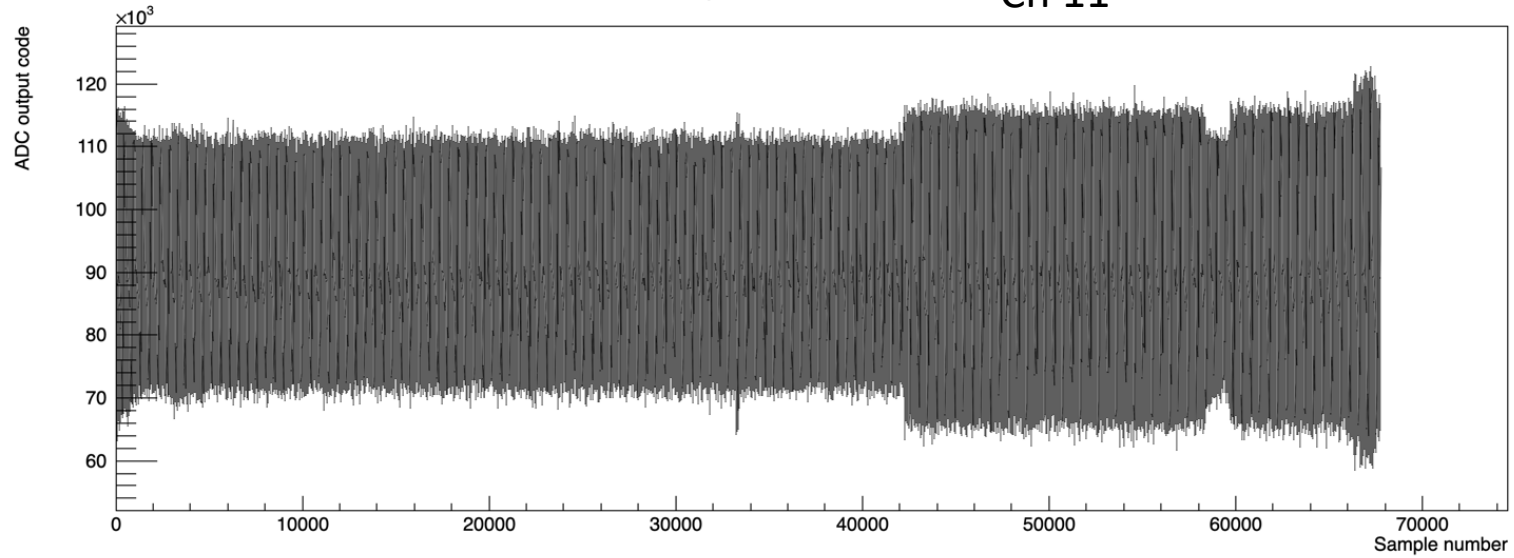
Run002; Int time 170us; Full Scale 12.5pC

Hamamatsu S1337-16BR

PD recording light

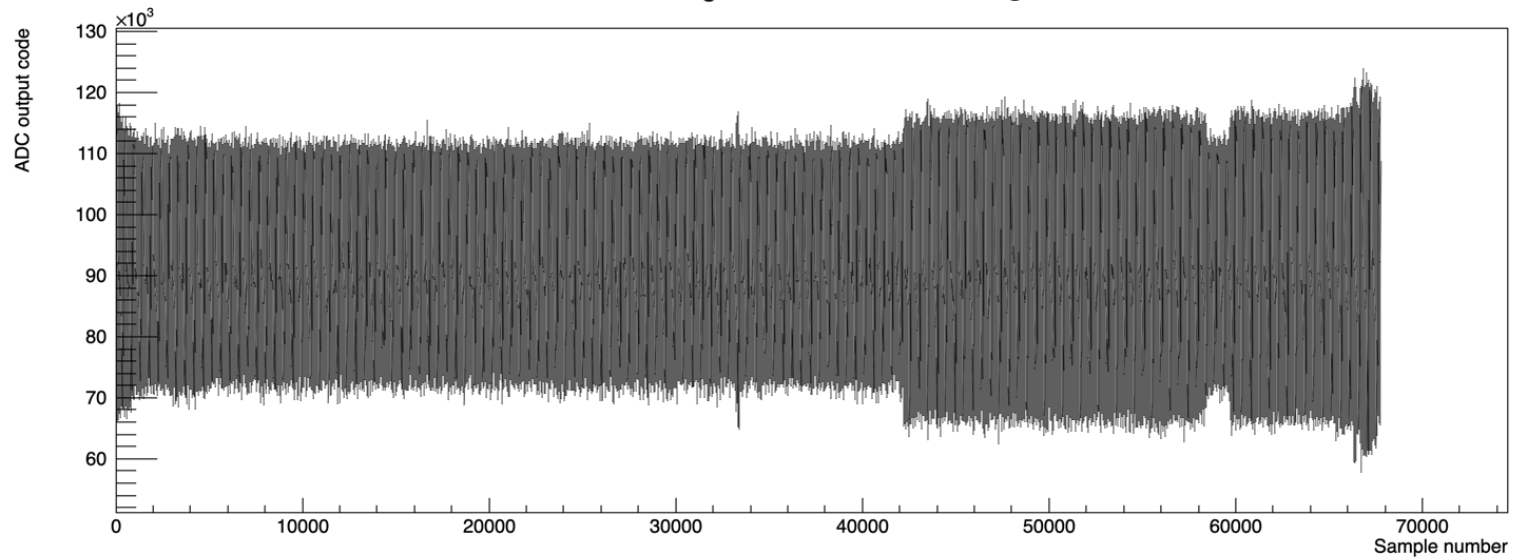


Single Channel Line Plot Ch 11



PD recording light

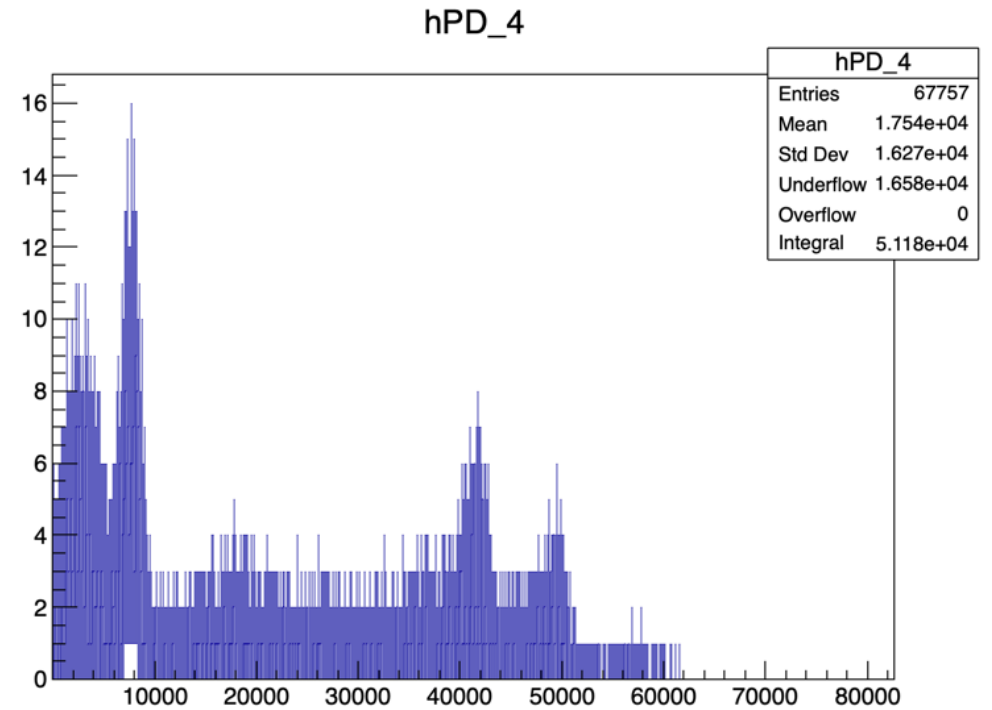
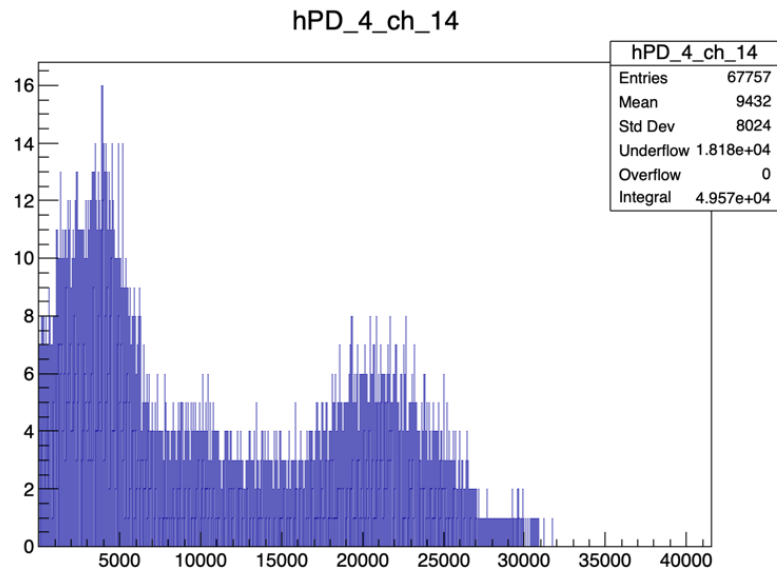
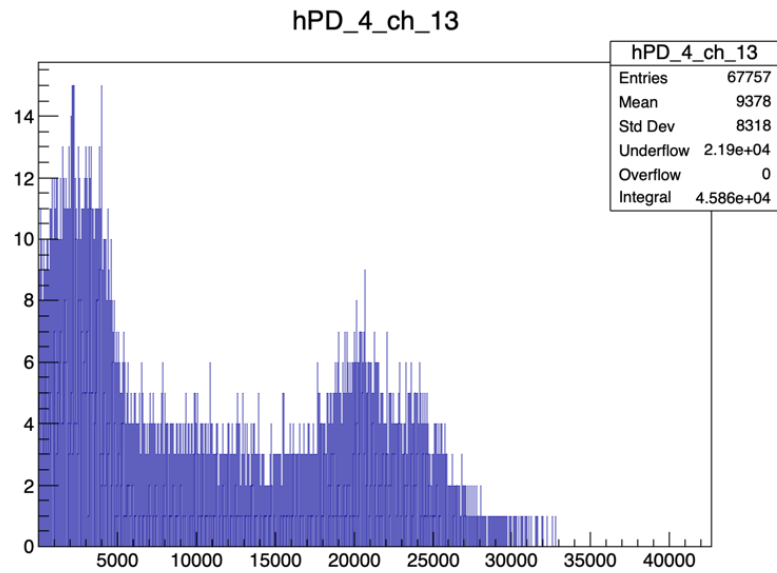
Single Channel Line Plot Ch 12



Run002; Int time 170us; Full Scale 12.5pC

Hamamatsu S1337-16BR

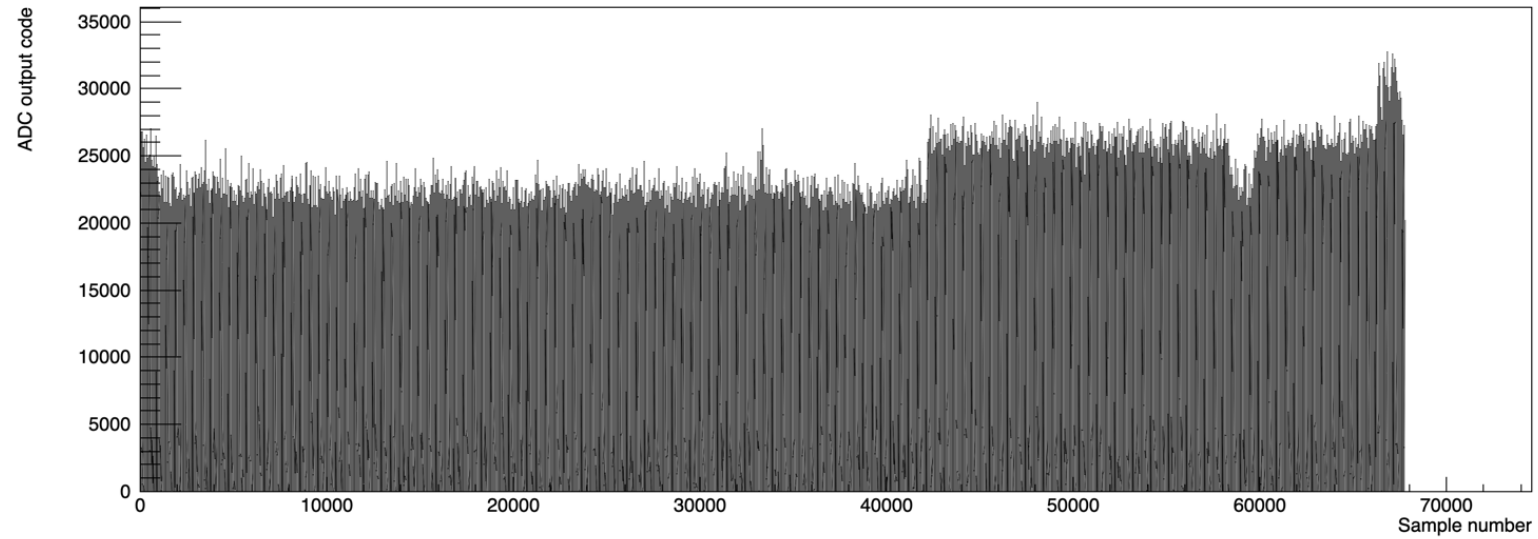
PD recording dark



Run002; Int time 170us; Full Scale 12.5pC

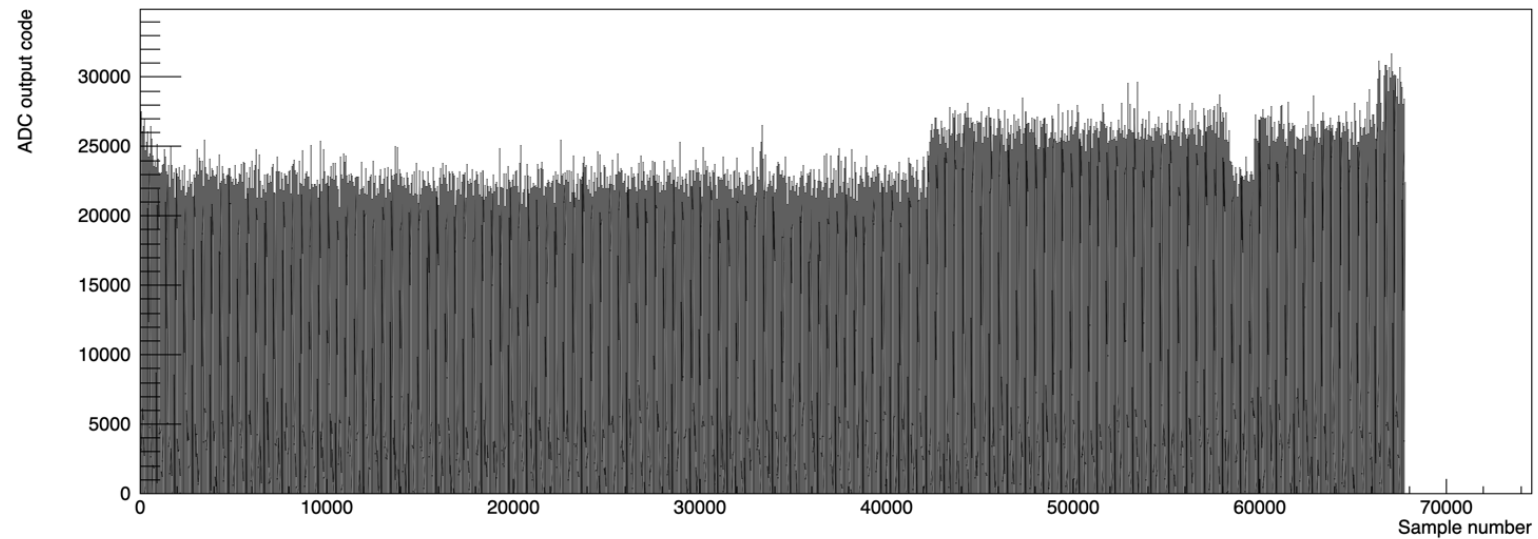
Hamamatsu S1337-16BR

Single Channel Line Plot Ch 13

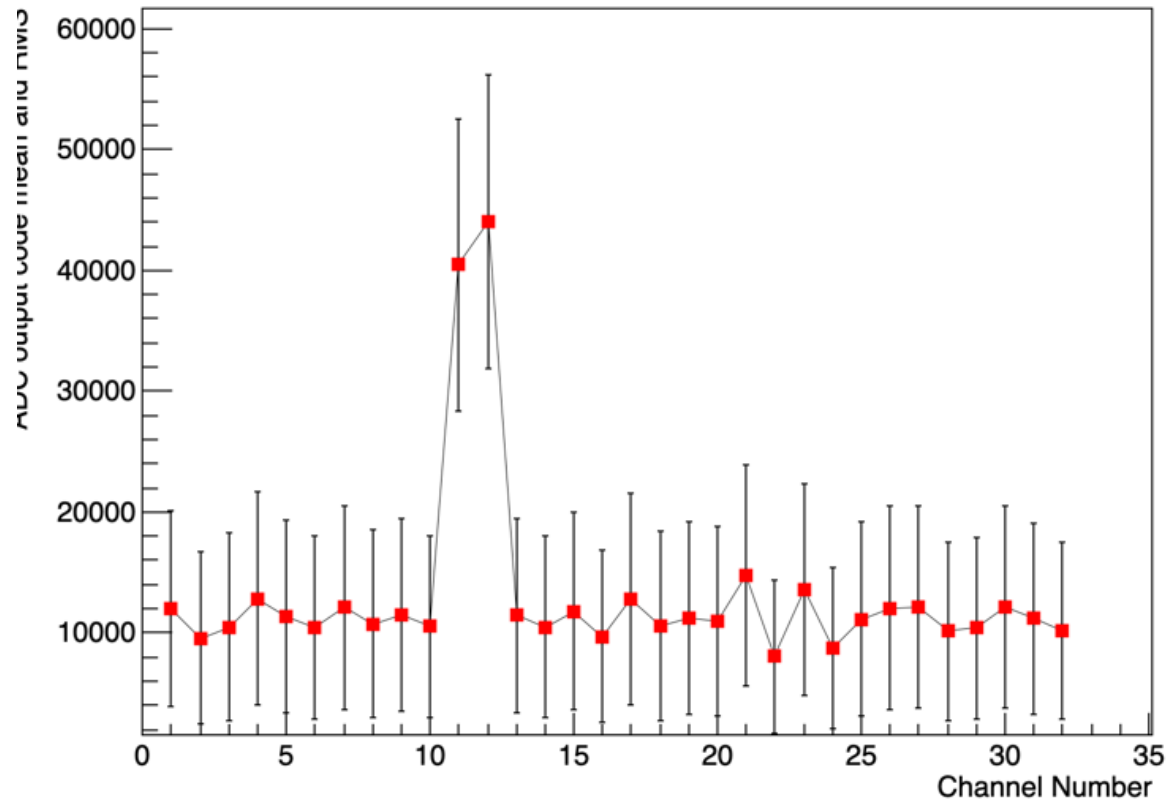


PD recording dark

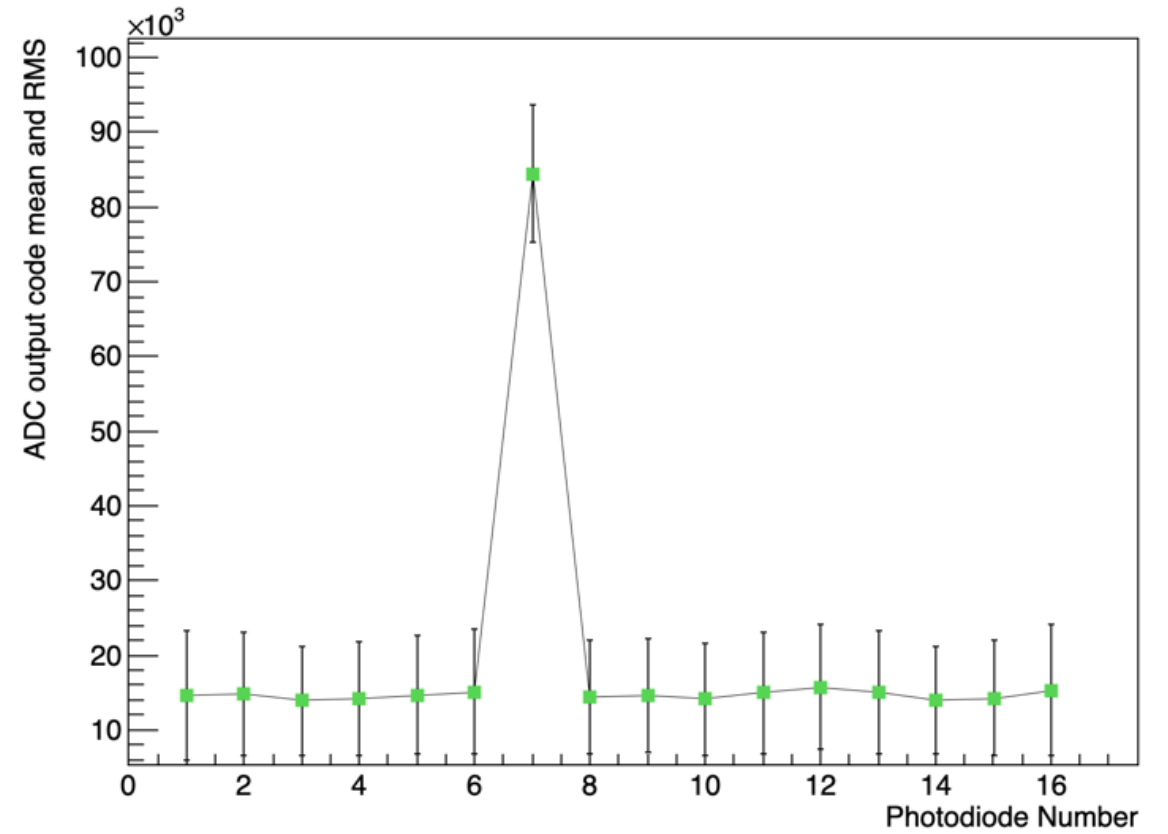
Single Channel Line Plot Ch 14



Candlestick Channels Plot



Candlestick Plot

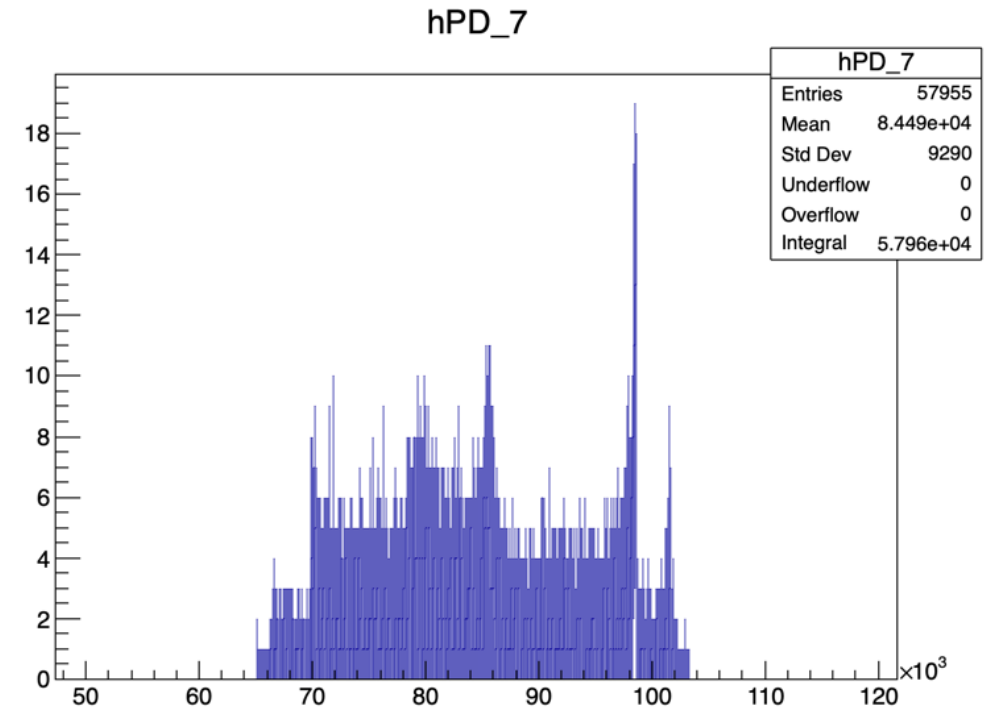
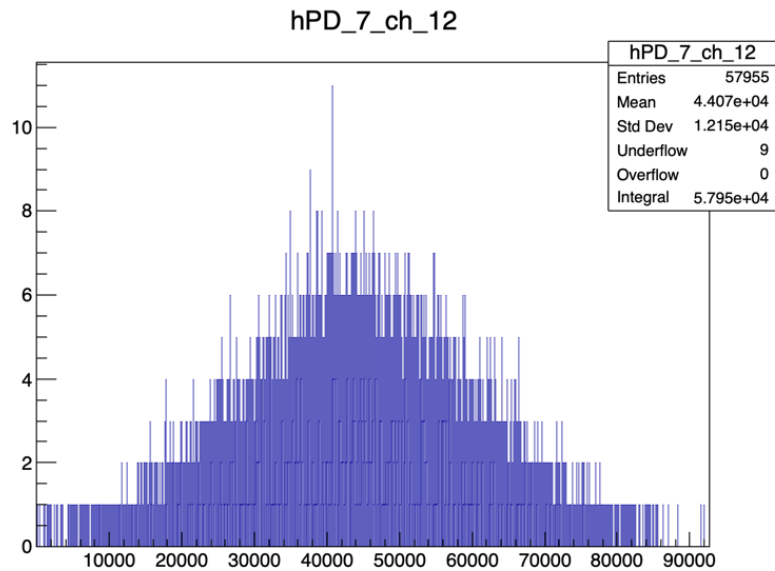
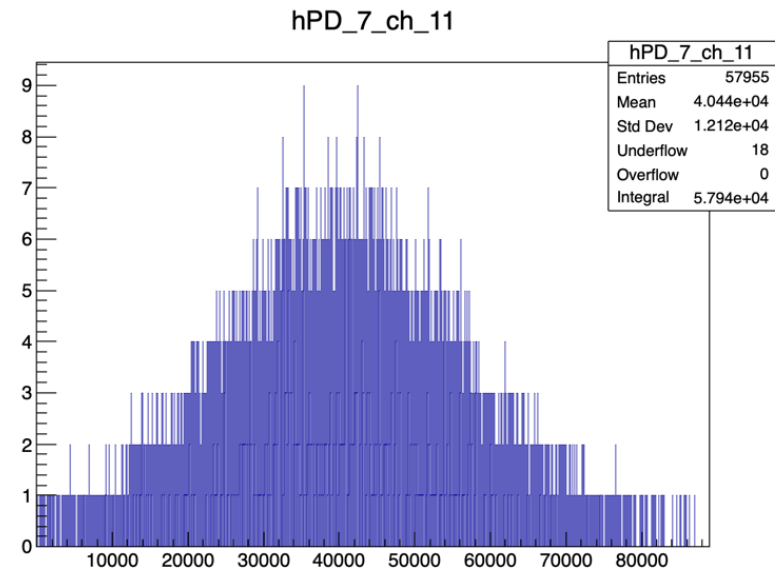




Run004; Int time 2000us; Full Scale 350pC

Hamamatsu S1337-16BR

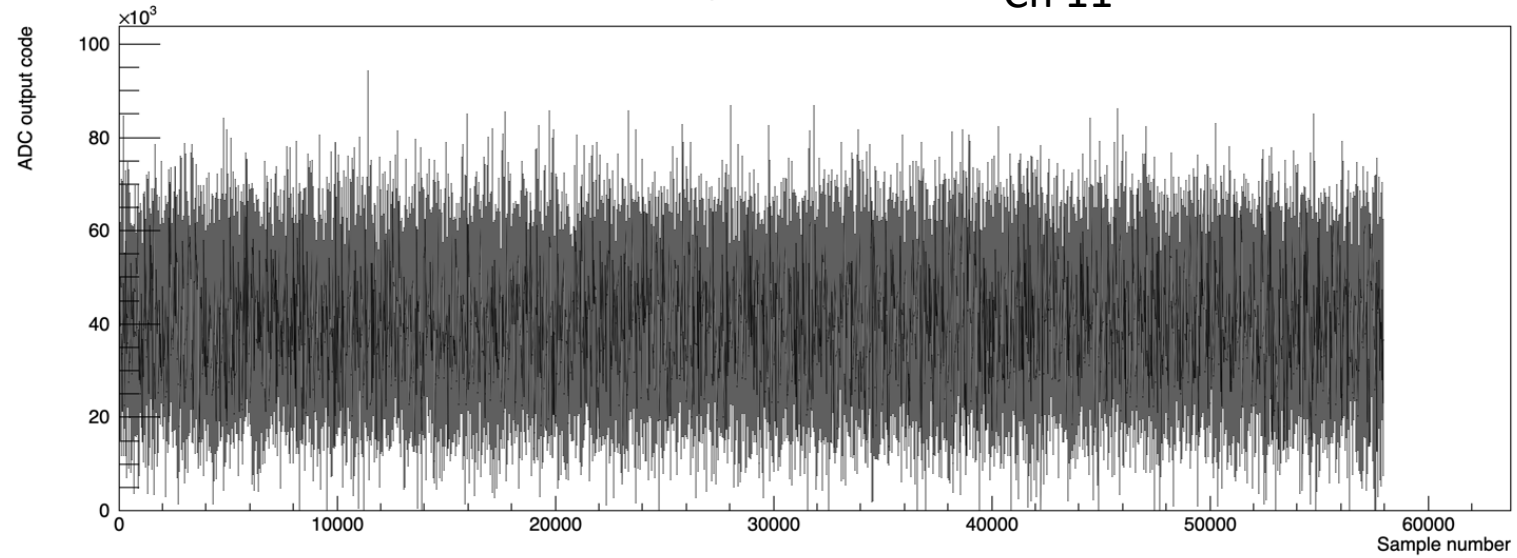
PD recording light



Run004; Int time 2000us; Full Scale 350pC

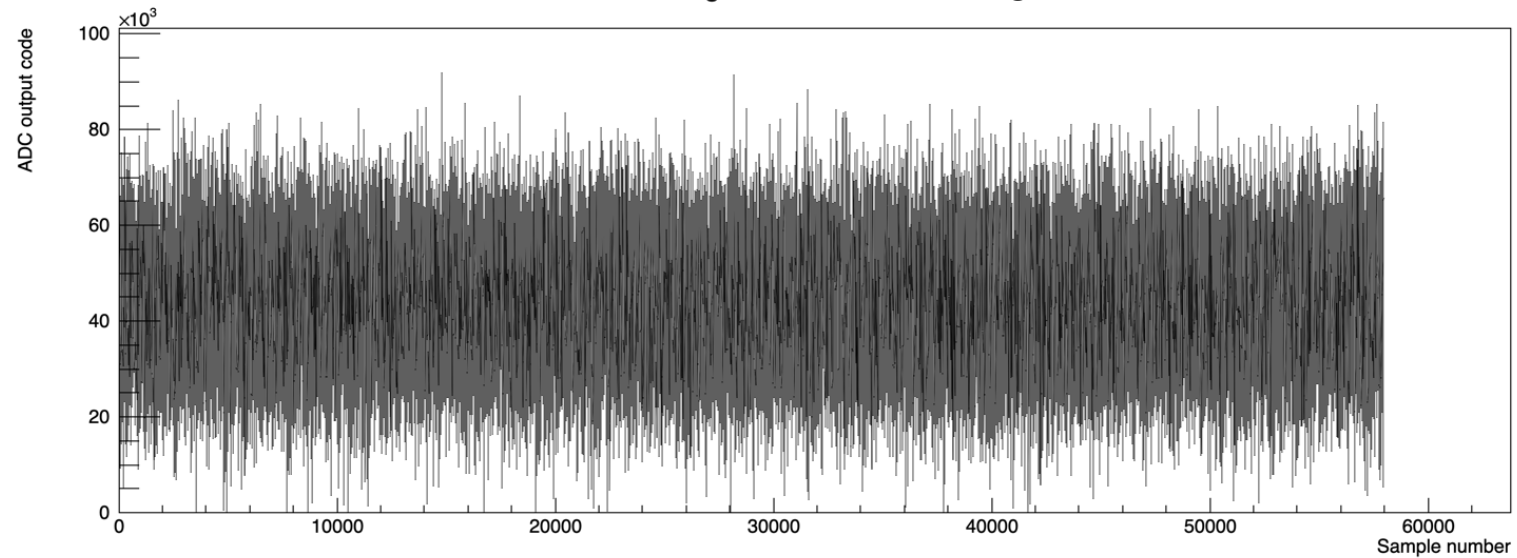
Hamamatsu S1337-16BR

Single Channel Line Plot Ch 11



PD recording light

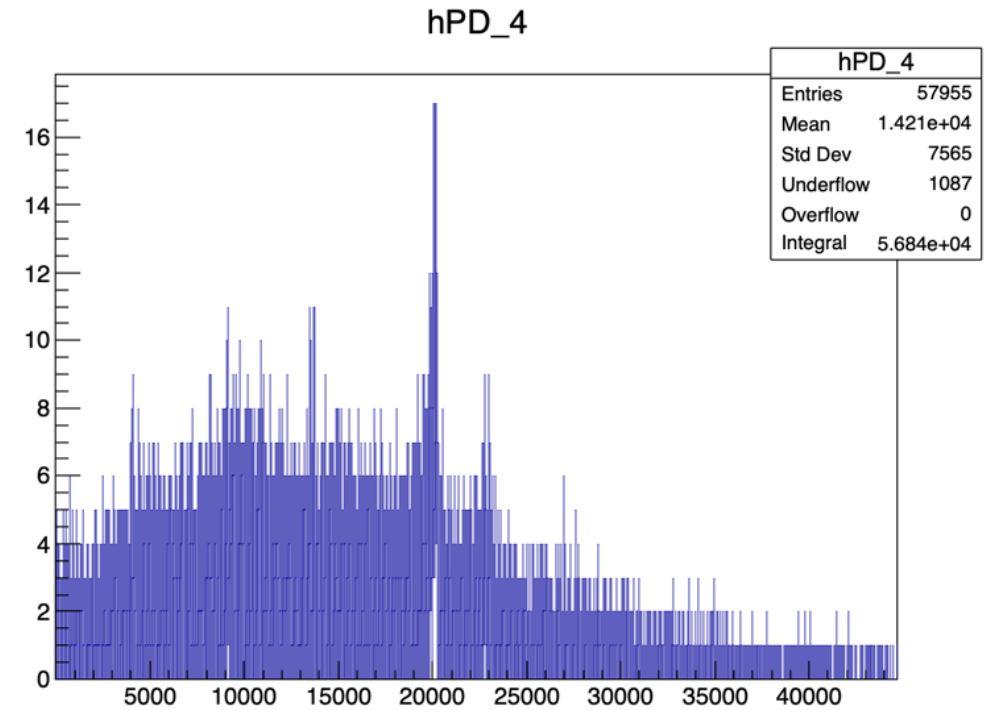
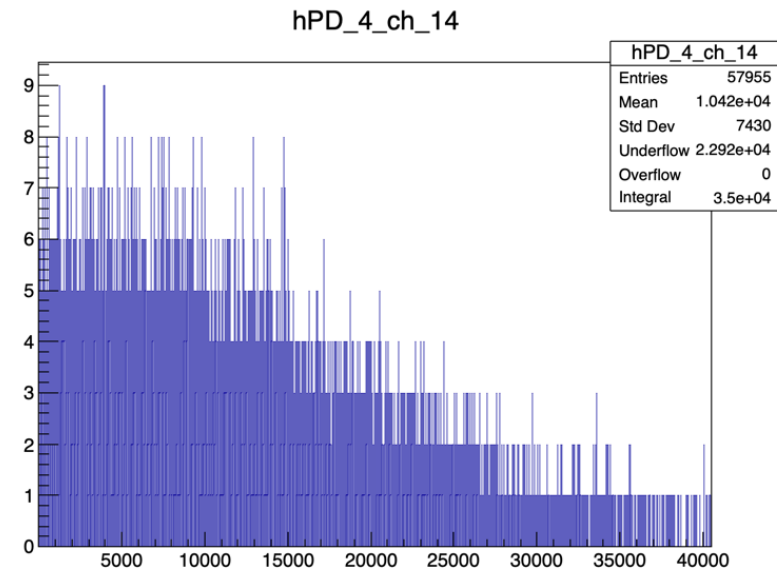
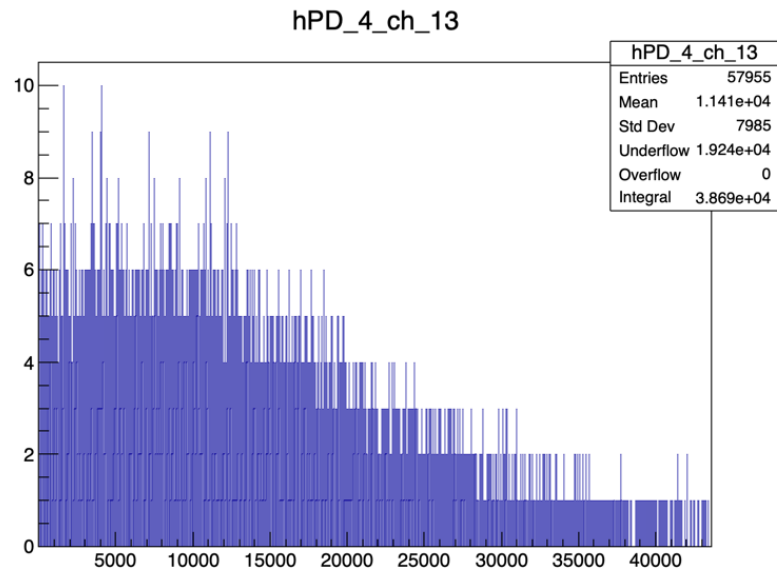
Single Channel Line Plot Ch 12



Run004; Int time 2000us; Full Scale 350pC

Hamamatsu S1337-16BR

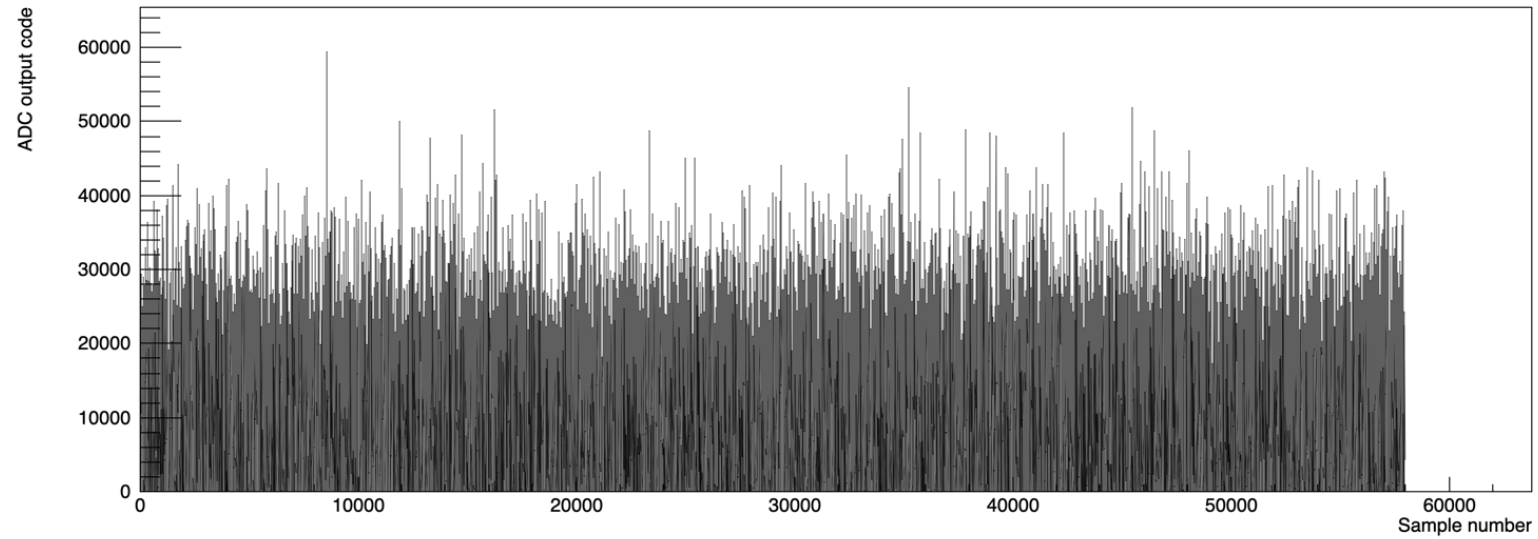
PD recording dark



Run004; Int time 2000us; Full Scale 350pC

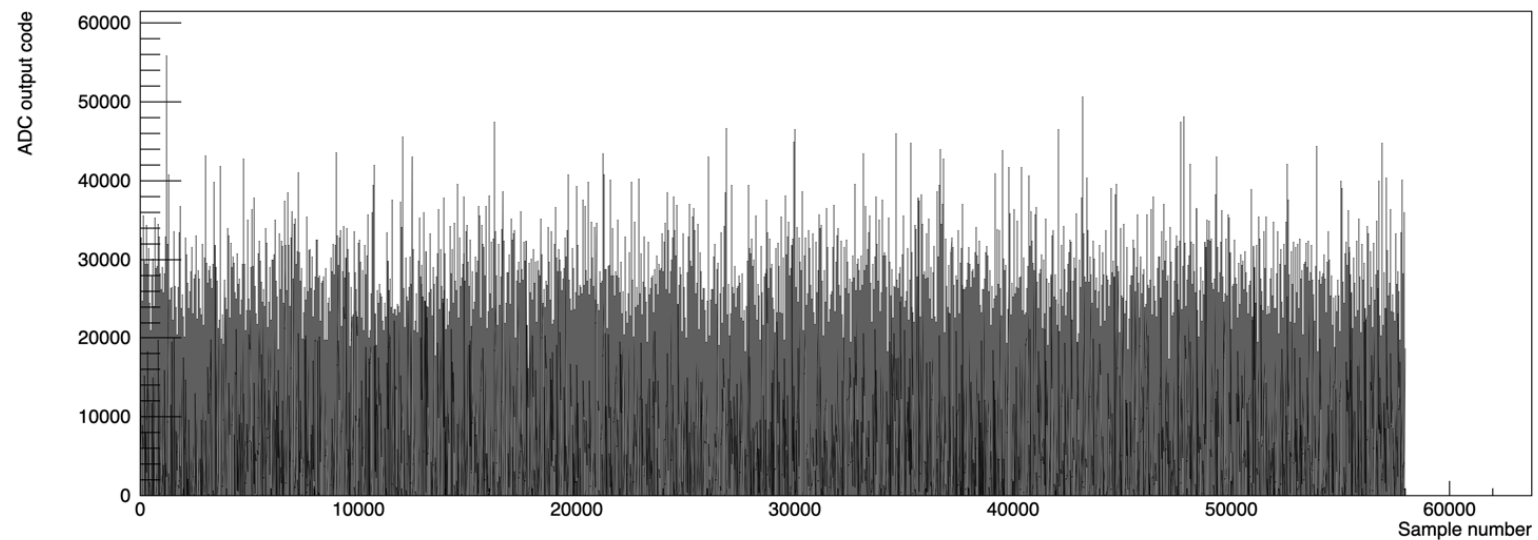
Hamamatsu S1337-16BR

Single Channel Line Plot Ch 13



PD recording dark

Single Channel Line Plot Ch 14



Important points to understand:

- Why do we have such big underflow for small FS or long integration time?
- Why the spectrum has peaks when plotted per photodiode?

Possible future measurements:

- Darkness with different int time and FS
- Saturation
- Light in all the sheets using many fibres
  - Same integration time and all possible FS values (8 values from 12.5 pC to 350 pC)
- We should try to save the same statistics for all integration times

### Useful Links:

- Photodiodes S1337-16BR <https://www.hamamatsu.com/eu/en/product/type/S1337-16BR/index.html>
- Photodiodes S12915-16R <https://www.hamamatsu.com/eu/en/product/type/S12915-16R/index.html>
- Texas Instrument DDC232  
[https://www.ti.com/lit/ds/symlink/ddc232.pdf?ts=1591718081453&ref\\_url=https://www.ti.com/product/DDC232](https://www.ti.com/lit/ds/symlink/ddc232.pdf?ts=1591718081453&ref_url=https://www.ti.com/product/DDC232)
- Experimental Runs  
[http://www.hep.ucl.ac.uk/pbt/wiki/Proton\\_Calorimetry/Experimental\\_Runs/2020/Oct23](http://www.hep.ucl.ac.uk/pbt/wiki/Proton_Calorimetry/Experimental_Runs/2020/Oct23)