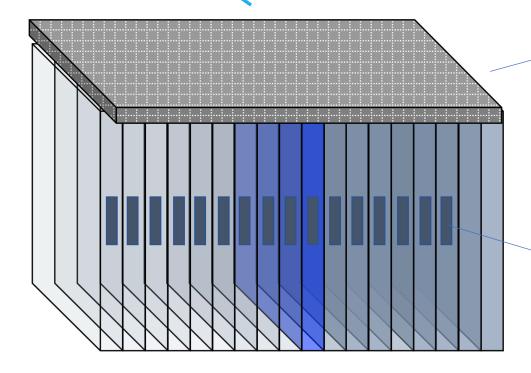
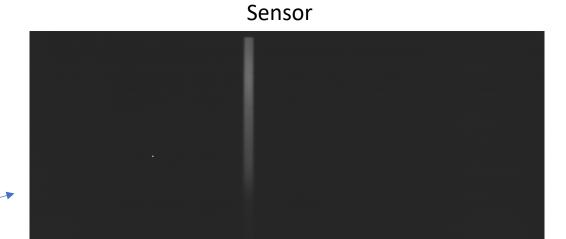
Optical fiber injecting UV light opposite to the PDs array and 90deg to the CMOS sensor

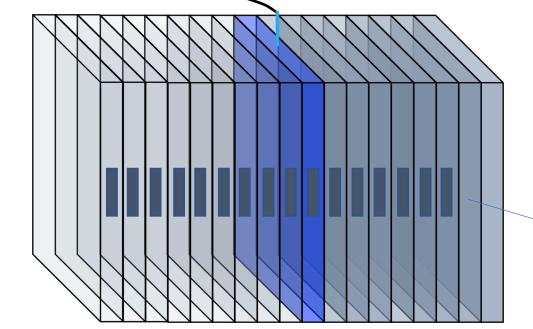




Very weak signal from photodiodes

**EXPERIMENTAL SETUP n.2** 

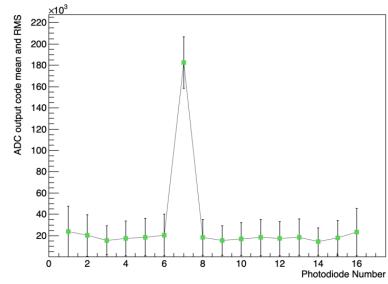
Optical fiber injecting UV light 90deg to the PDs array. Sensor removed.



Area of the sensor covered by PDs in this setup.



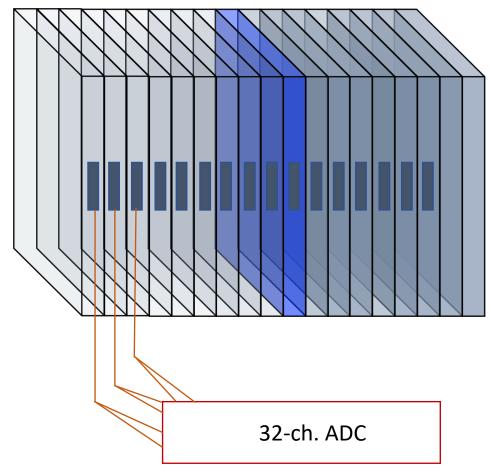




#### **MEASUREMENTS PERFORMED:**

- 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

#### **ELECTRONIC CONFIGURATION**



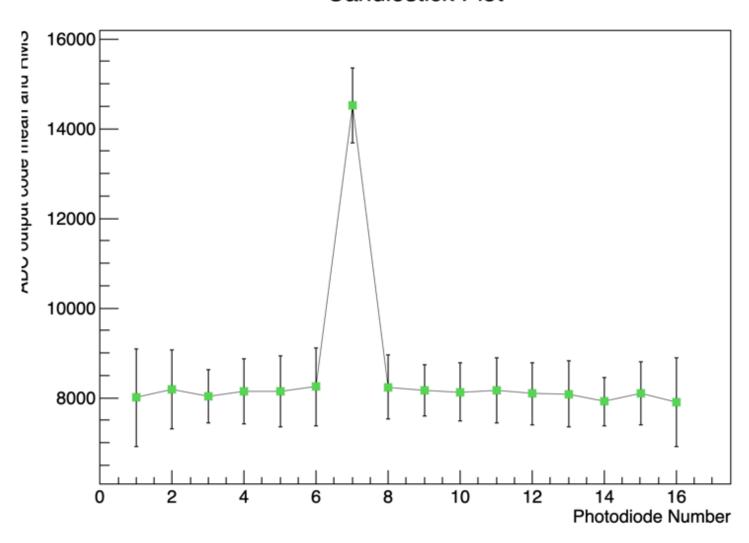
The signal from each PD is split in two ADC input channels

#### **Useful Links:**

- Photodiodes S1337-16BR

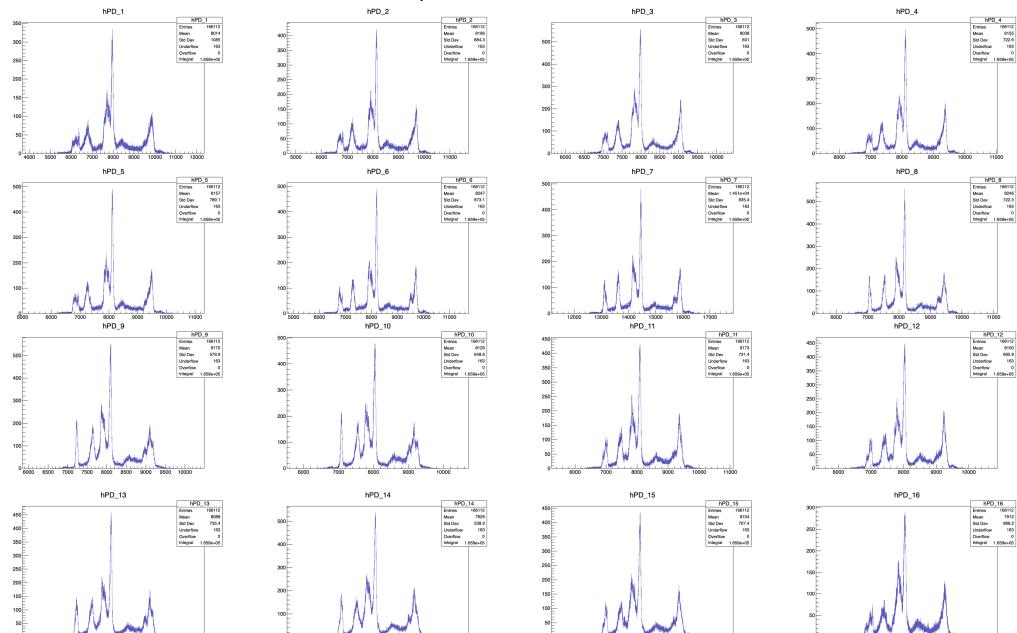
   https://www.hamamatsu.com/eu/e
   n/product/type/S1337 

   16BR/index.html
- Photodiodes S12915-16R
   https://www.hamamatsu.com/eu/e
   n/product/type/S12915 16R/index.html
- Experimental Runs
   http://www.hep.ucl.ac.uk/pbt/wiki
   /Proton\_Calorimetry/Experimental
   \_Runs/2020/Oct23



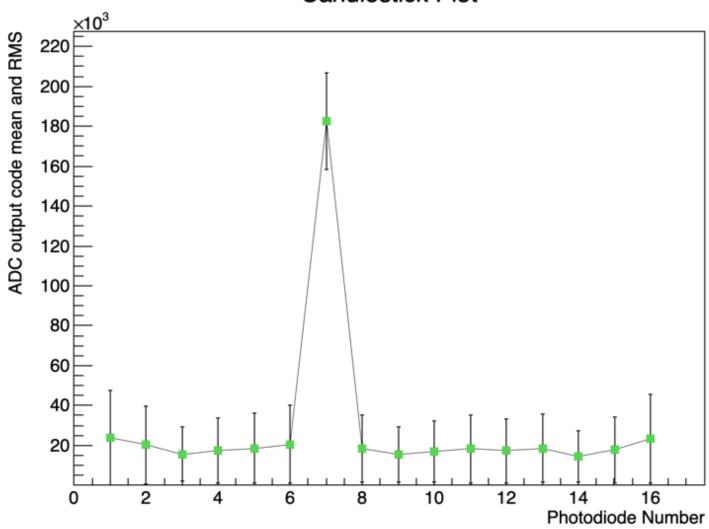
# Run001; Int time 170us; Full Scale 350pC

# Hamamatsu S1337-16BR



6500 7000 7500 8000 8500 9000 9500

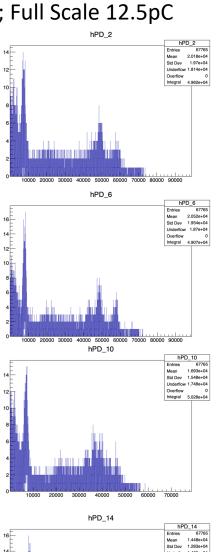




# Run002; Int time 170us; Full Scale 12.5pC

# hPD\_1 Entries 67765 Mean 2.399e+04 Std Dev 2.383e+04 Underflow 2.099e+04 Overflow 0 Integral 4.677e+04 hPD\_5 hPD\_5 Entries 67765 Mean 1.849e+04 Std Dev 1.753e+04 Underflow 1.723e+04 Overflow 0 Integral 5.054e+04 10000 20000 30000 40000 50000 60000 70000 80000 hPD\_9 60000 30000 40000 50000 hPD\_13 Entries 67765 Mean 1.858e+04 Std Dev 1.705e+04 Underflow 1.942e+04 Overflow 0 Integral 4.834e+04

10000 20000 30000 40000 50000 60000 70000 80000

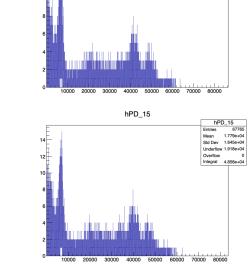


20000

30000 40000

50000

Underflow 1.483e+04 Overflow 0 Integral 5.294e+04



hPD\_3

hPD\_7

hPD\_11

20000

hPD\_3
Entries 67765
Mean 1.569e+04
Std Dev 1.381e+04

Underflow 1.556e+04

Overflow 0

Integral 5.22e+04

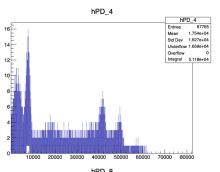
hPD\_7

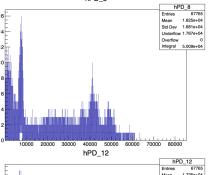
Underflow 8 Overflow 0 Integral 6.776e+04

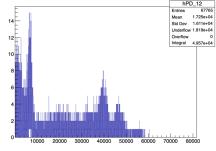
hPD\_11 Entries 67765 Mean 1.83e+04 Std Dev 1.703e+04

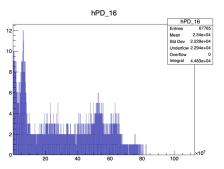
Underflow 1.906e+04

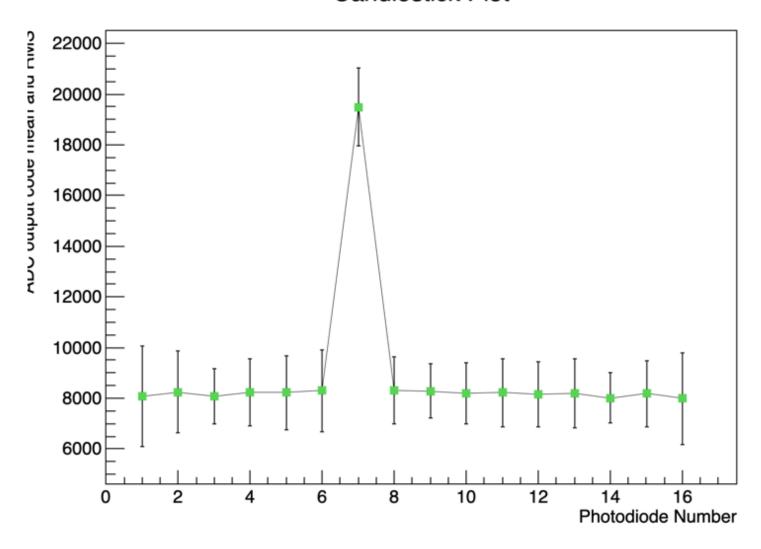
Overflow 0 Integral 4.87e+04



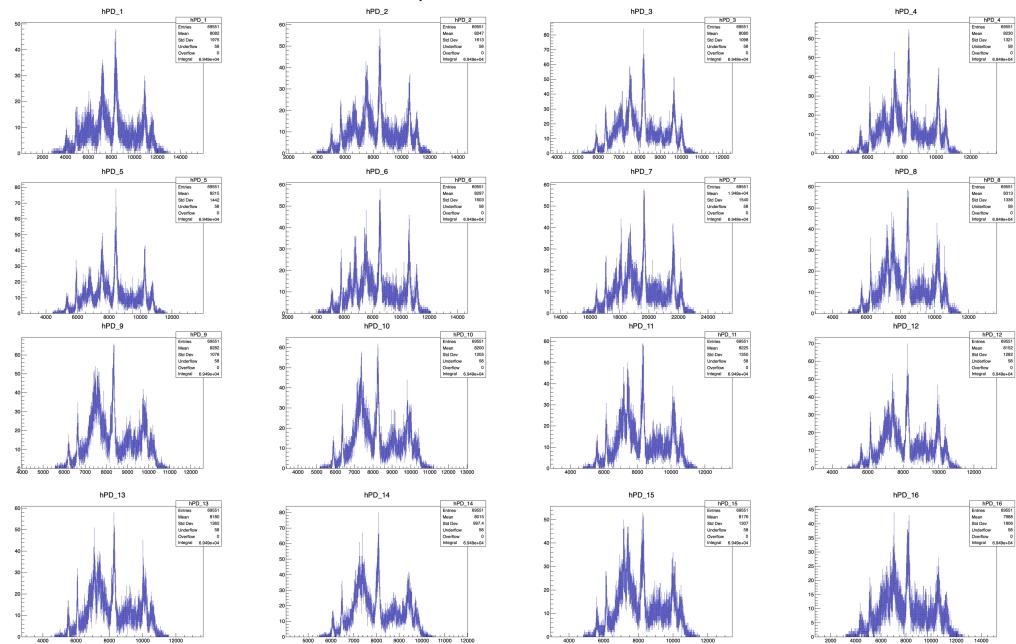




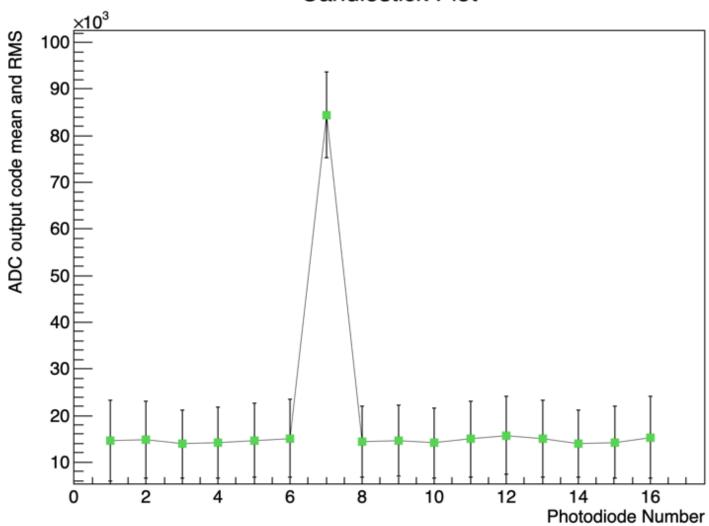




# Run003; Int time 170us; Full Scale 200pC

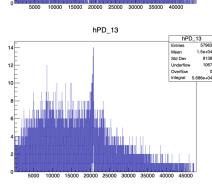


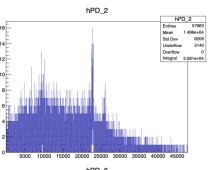


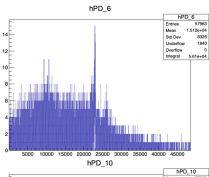


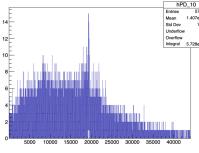
# Run004; Int time 2000us; Full Scale 350pC

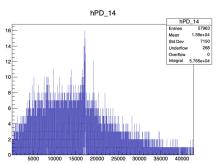
# hPD\_5 5000 10000 15000 20000 25000 30000 35000 40000 45000 hPD\_9

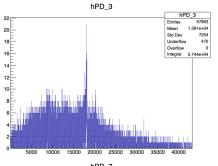


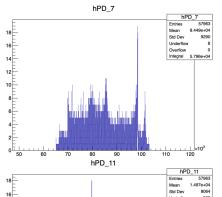


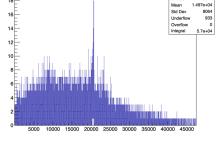


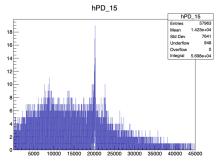


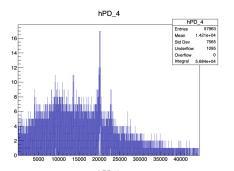


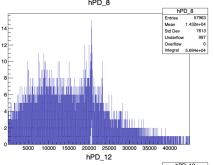


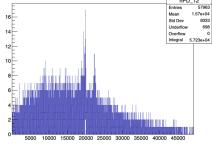


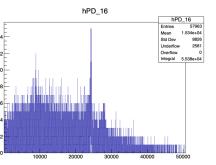




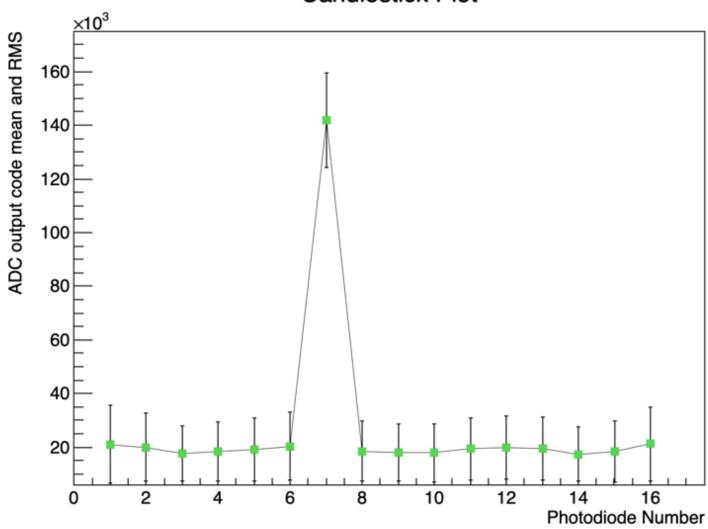






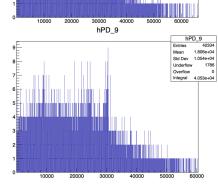


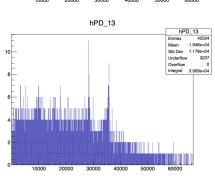


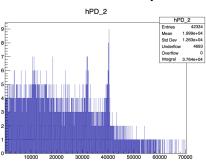


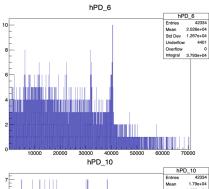
# Run005; Int time 2000us; Full Scale 200pC

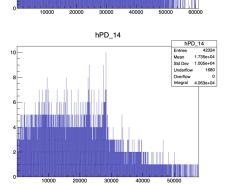
# Run005; Int time 2 hPD\_1 hPD\_1 Entries 42334 Mean 1.1056-04 Didention 0 0 Integral 3.550-04 hPD\_5 hPD\_5 hPD\_5 hPD\_6 Entries 42334 Mean 1.9136-04 Sid Dev 1.716-04 Underflow 3.550-04 hPD\_6 hPD\_7 Integral 3.856-04

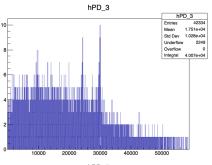


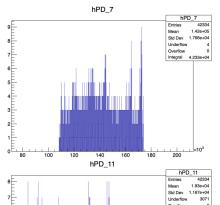


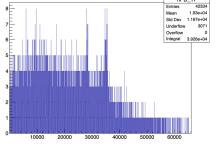


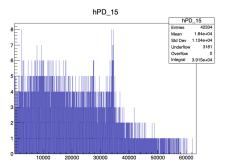


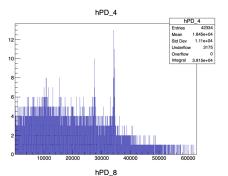


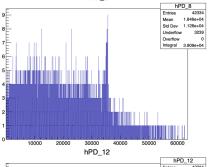


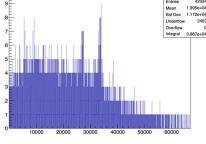


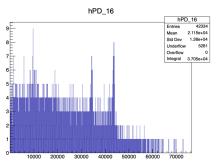




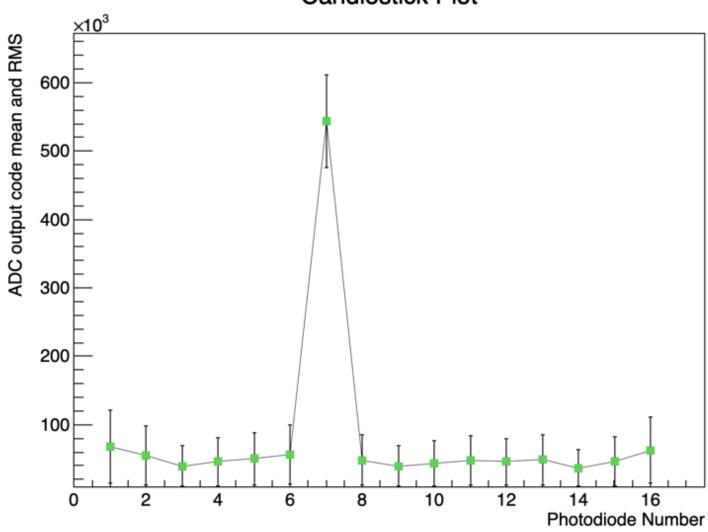












# Run006; Int time 2000us; Full Scale 50pC

hPD\_2
Entries 55108
Mean 5.549e+04
Std Dev 4.328e+04

Underflow 1.843e+04 Overflow 0 Integral 3.667e+04

hPD\_6
Entries 55108
Mean 5.591e+04
Std Dev 4.327e+04

Underflow 1.82e+04 Overflow 0 Integral 3.691e+04

Entries 55108 Mean 4.365e+04 Std Dev 3.314e+04

Underflow 1.63e+04

Overflow 0 Integral 3.881e+04

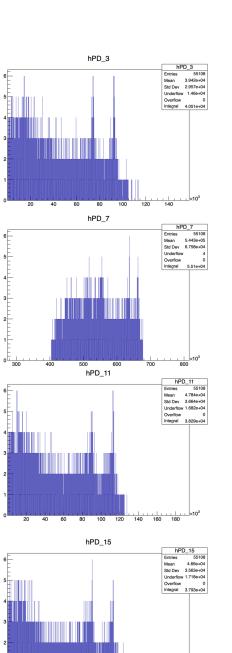
hPD\_14 stries 55108

Entries 55108 Mean 3.689e+04 Std Dev 2.704e+04

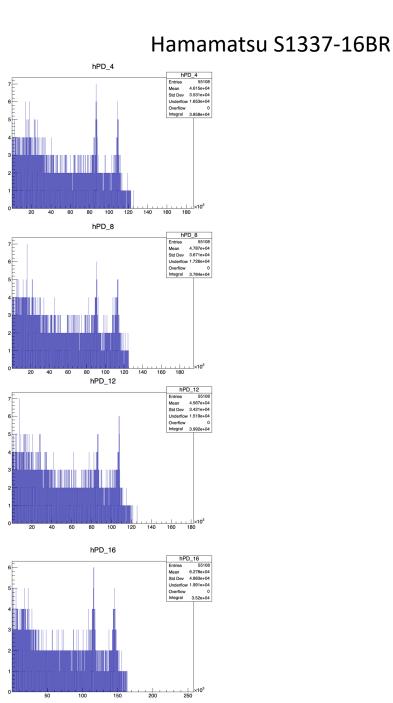
Underflow 1.352e+04 Overflow 0 Integral 4.159e+04

# Entries 55108 Mean 6.738e+04 Std Dev 5.336e+04 Underflow 2.088e+04 Overflow 0 Integral 3.423e+04 250 20 40 60 80 100 120 140 160 180 200 220 hPD\_5 hPD\_6 hPD\_5 Entries 55108 Mean 5.015e+04 Std Dev 3.847e+04 Underflow 1.725e+04 Overflow 0 Integral 3.786e+04 80 100 120 140 160 180 200 20 40 60 80 100 120 140 160 180 200 220 hPD\_9 hPD\_10 Entries 55108 Mean 3.98e+04 Std Dev 2.956e+04 Underflow 1.424e+04 Overflow 0 Integral 4.087e+04 120 140 80 100 hPD\_13 hPD\_14 Entries 55108 Mean 4.859e+04 Std Dev 3.673e+04 Underflow 1.68e+04 Overflow 0 Integral 3.831e+04

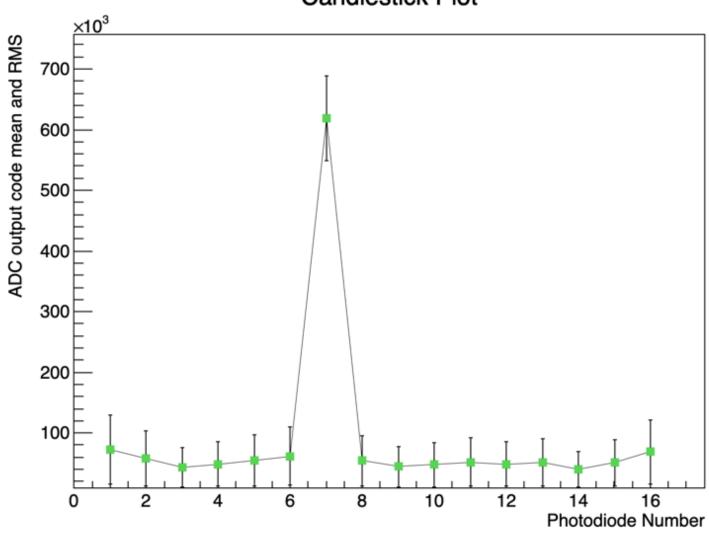
20 40 60 80 100 120 140 160 180



60 80 100 120 140







# Run007; Int time 2000us; Full Scale 50pC

# Entries 47592 Mean 7.204e+04 Std Dev 5.678e+04 Underflow 1.686e+04 Overflow 0 Integral 3.073e+04 20 40 60 80 100 120 140 160 180 200 220 hPD\_5 NPD\_6 hPD\_5 hPD\_5 Entries 47592 Mean 5.534e+04 Std Dev 4.222e+04 Underflow 1.404e+04 Overflow 0 Integral 3.356e+04 40 60 80 100 120 140 160 180 200 220 hPD\_9 47592 Entries 47592 Mean 4.482e+04 Std Dev 3.331e+04 Underflow 1.108e+04 Overflow 0 Integral 3.652e+04 40 60 80 100 120 140 160 180 120 100 hPD\_13 hPD\_14 Entries 47592 Mean 5.15e+04 Std Dev 3.932e+04 Underflow 1.425e+04 Overflow 0 Integral 3.334e+04

20 40 60 80 100 120 140 160 180 200 ×10<sup>3</sup>

# hPD\_3 hPD\_3 Entries 47592 Mean 4.344e+04 Std Dev 3.217e+04 Underflow 1.197e+04 Overflow 0 Integral 3.562e+04

hPD\_2
Entries 47592
Mean 5.828e+04
Std Dev 4.524e+04

Underflow 1.444e+04 Overflow 0 Integral 3.315e+04

hPD\_6
Entries 47592
Mean 6.192e+04
Std Dev 4.771e+04

Underflow 1.54e+04 Overflow 0 Integral 3.219e+04

Entries 47592 Mean 4.759e+04 Std Dev 3.62e+04

Underflow 1.368e+04

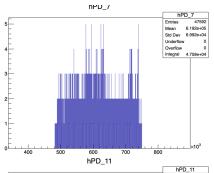
Overflow 0 Integral 3.391e+04

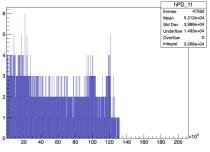
hPD\_14 stries 47592

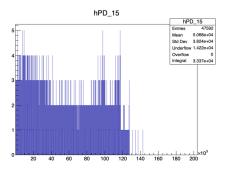
Entries 47592 Mean 3.949e+04 Std Dev 2.925e+04

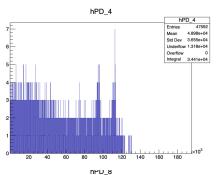
Underflow 1.208e+04 Overflow 0 Integral 3.551e+04

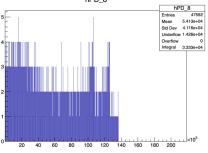
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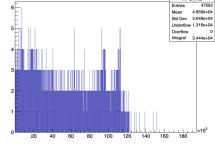


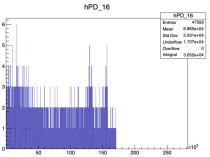




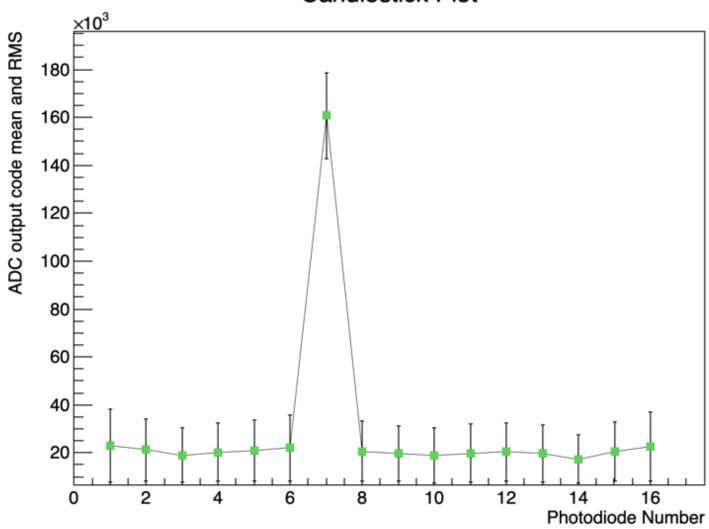




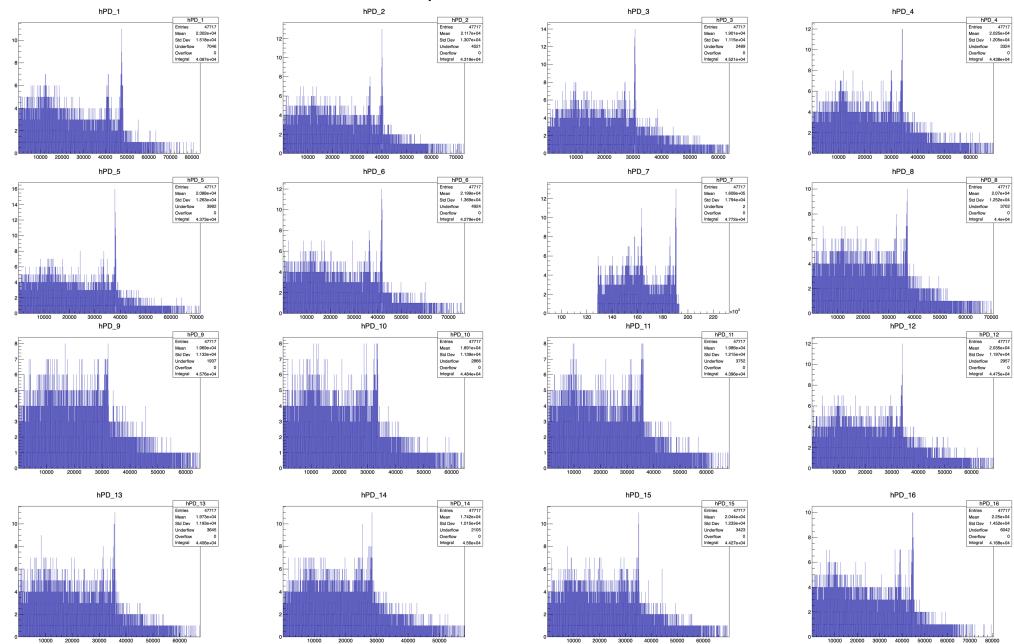




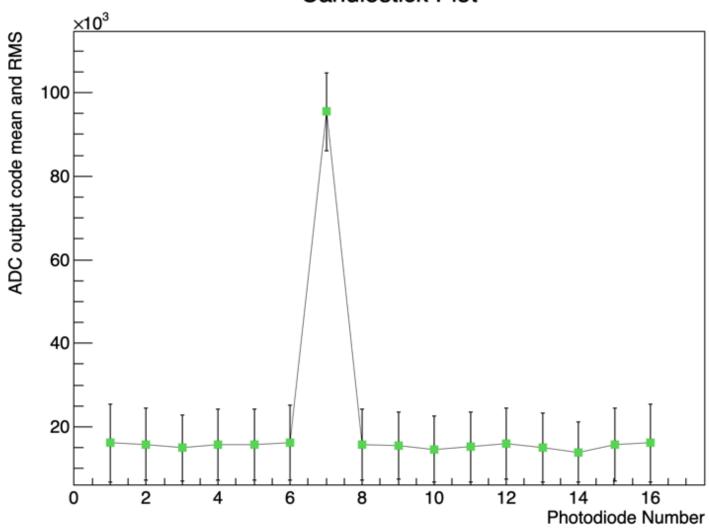




# Run008; Int time 2000us; Full Scale 200pC

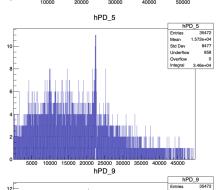


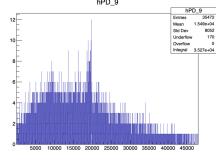


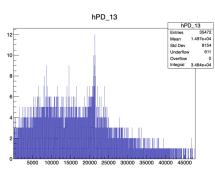


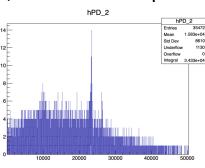
# Run009; Int time 2000us; Full Scale 350pC

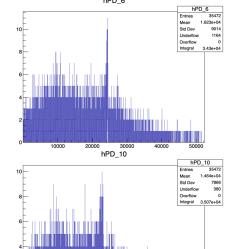
# 

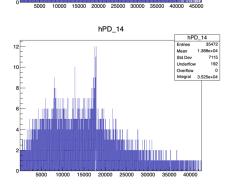


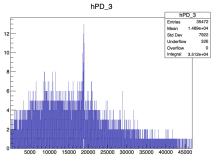


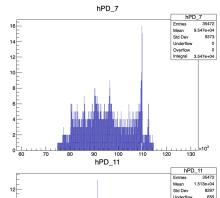


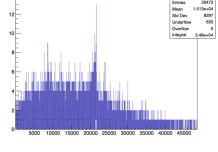


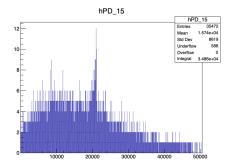


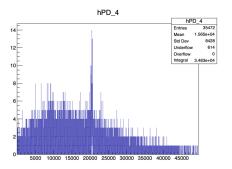


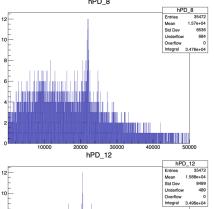


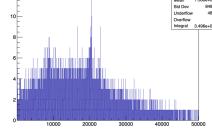


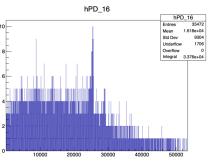


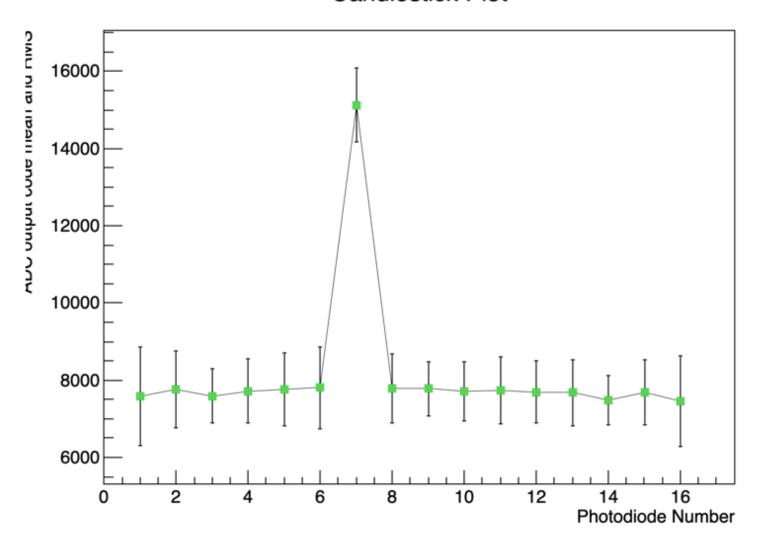




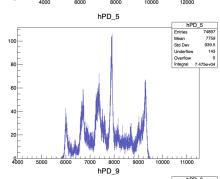


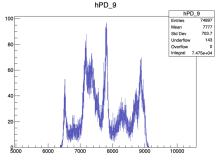


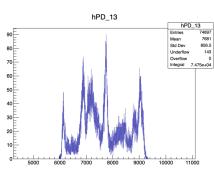


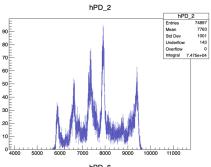


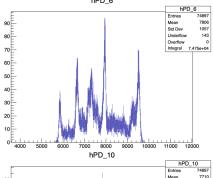
# Run010; Int time 170us; Full Scale 350pC hPD\_1 Entries 74897 Mean 7581 Std Dev 1274 Underflow 143 Overflow 0 Integral 7,475e+04

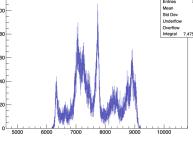


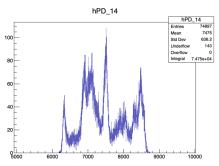


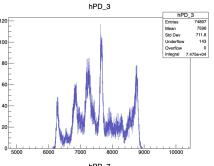


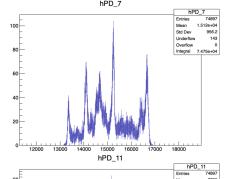


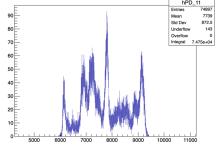


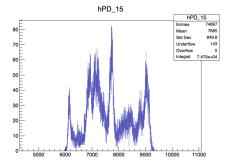


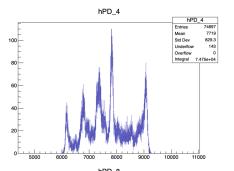


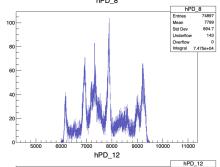


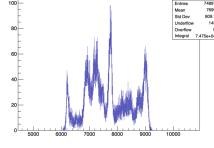


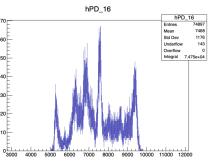


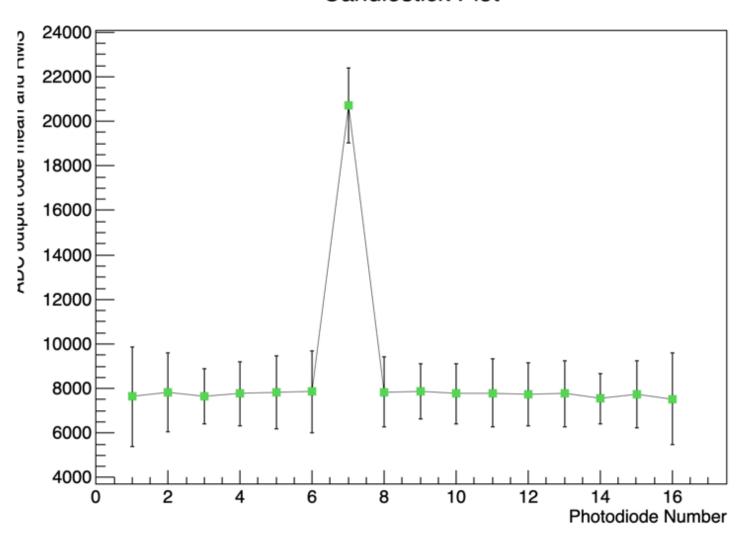




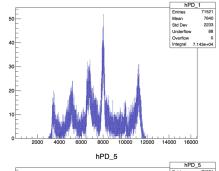


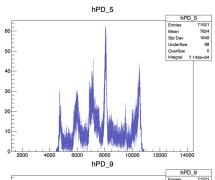


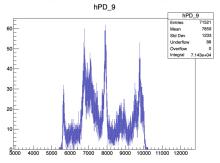


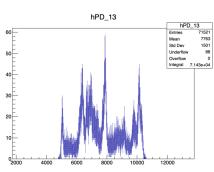


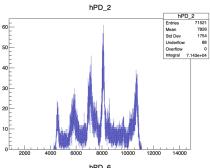
# Run011; Int time 170us; Full Scale 200pC

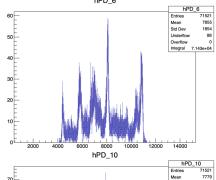


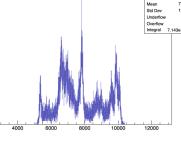


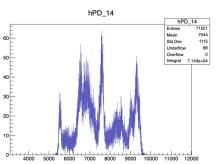


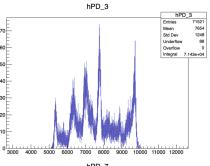


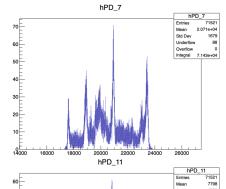


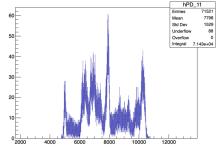


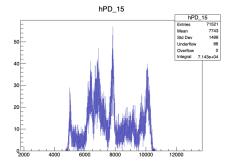


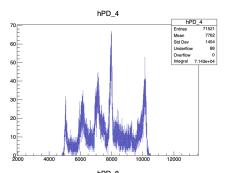


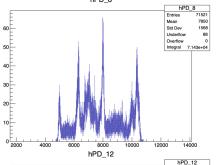


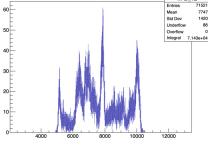


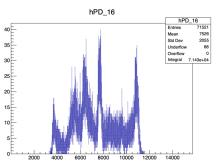




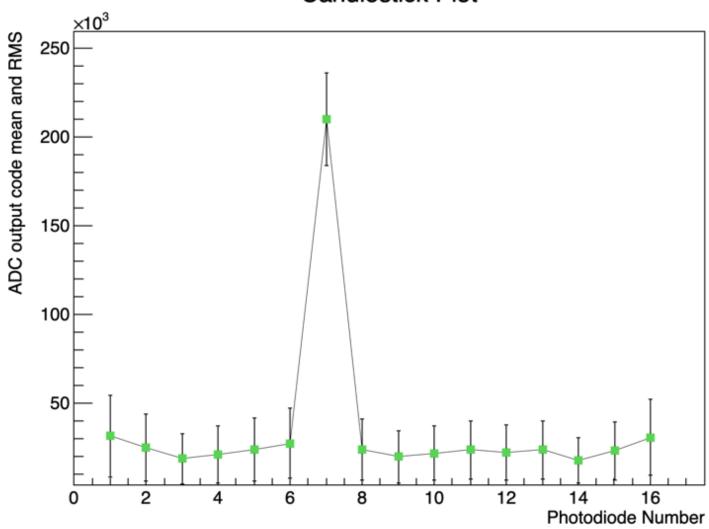












# Run012; Int time 170us; Full Scale 12.5pC

