

Coordinate Detector Status Update

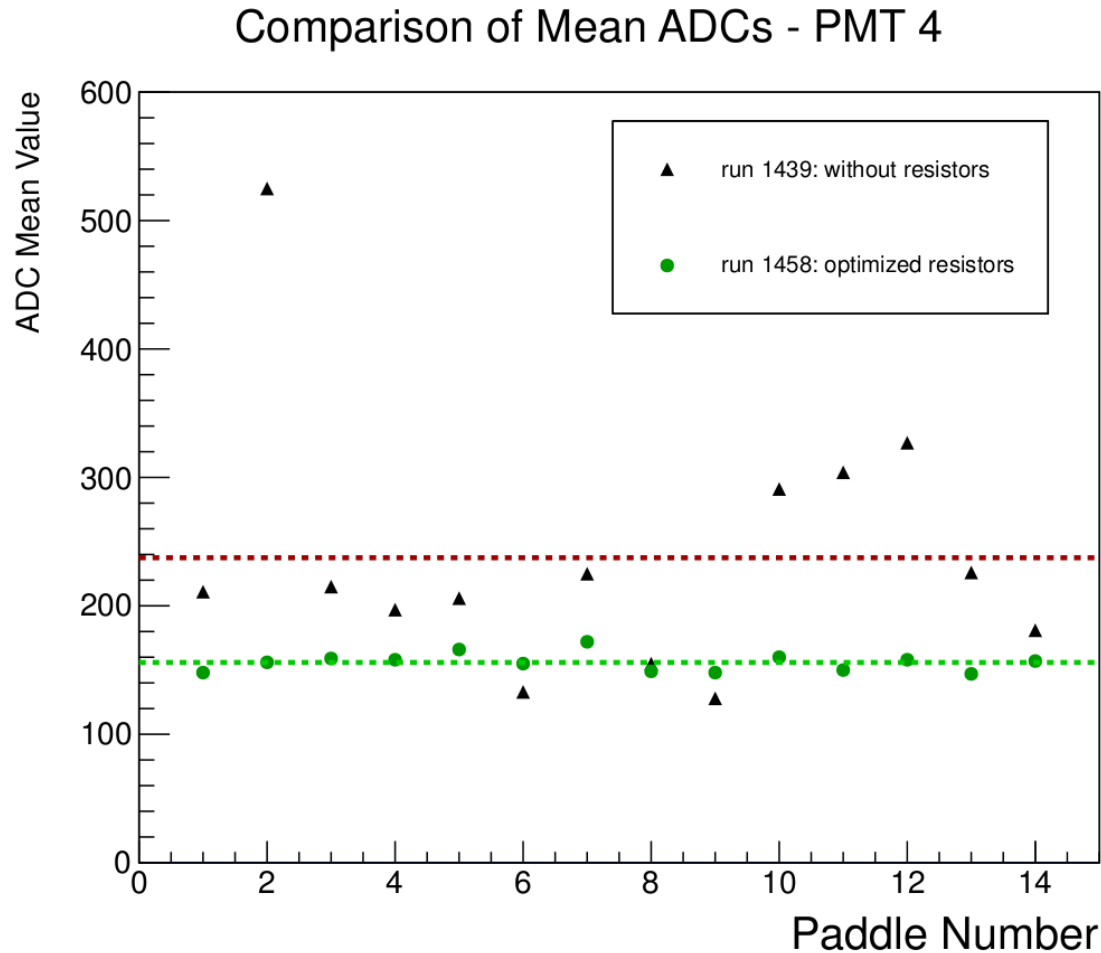
Peter Monaghan
Christopher Newport University

SBS Summer Collaboration Meeting
23rd July 2018

Commissioning in Progress

- Analysing cosmic data second half of module 1 (LEFT)
- Students (Ralph Marinaro and Katie Whitcomb) at JLab for summer
 - working hard in test lab!
- Charge Equalisation
- Threshold determination
- Crosstalk analysis
- Efficiency Determination
- Determine lowest HV setting for PMT

Charge Equalisation

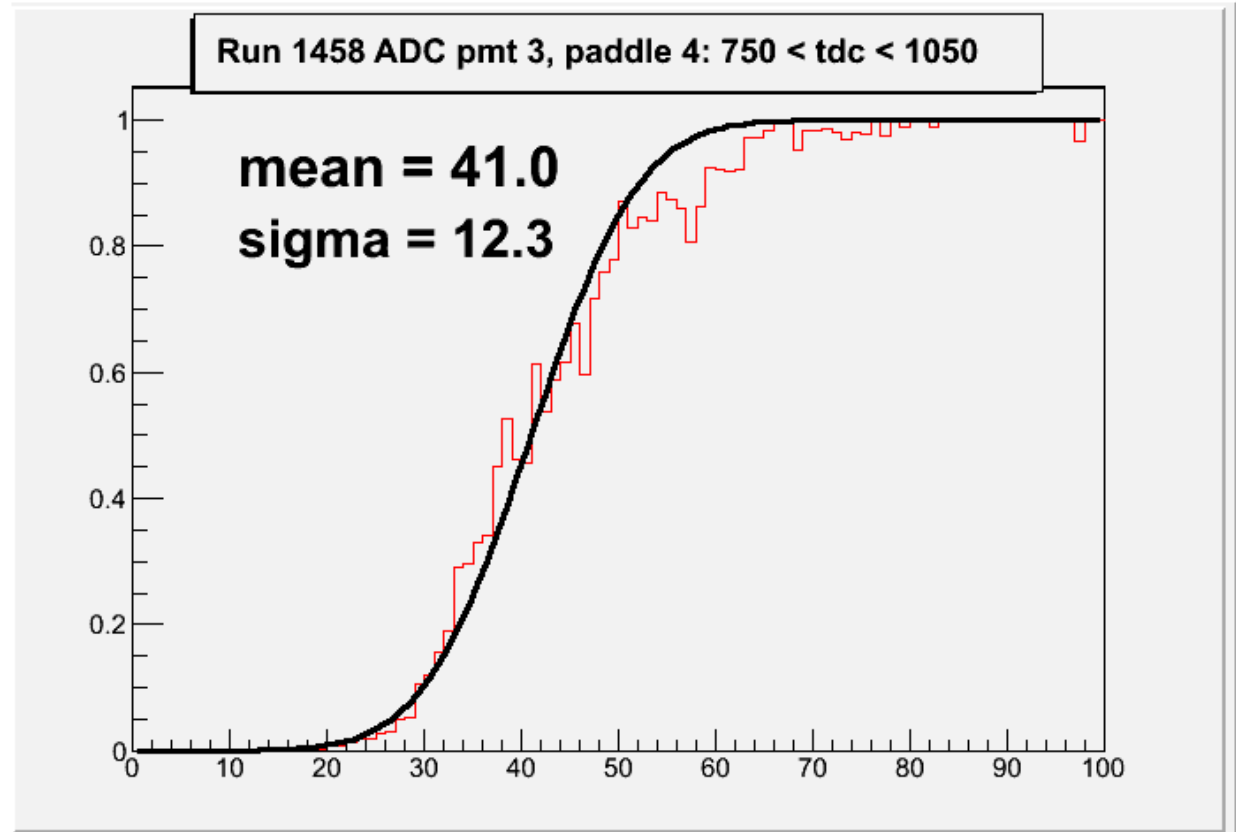


- Mean ADC amplitude for single paddle events

Threshold Determination

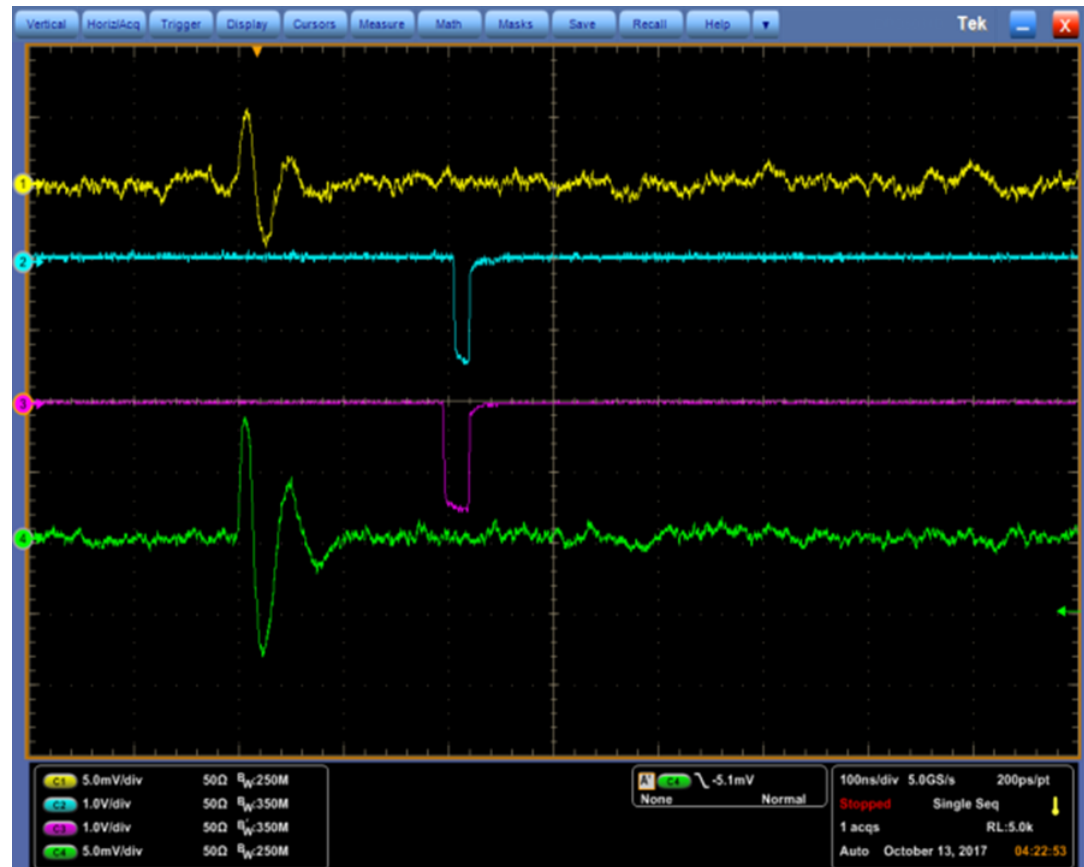
$$\eta = \frac{ADC (TDC \text{ cut})}{raw ADC}$$

- Set 50% ratio as threshold
- Fit with ERR function
- Mean is the 50% threshold



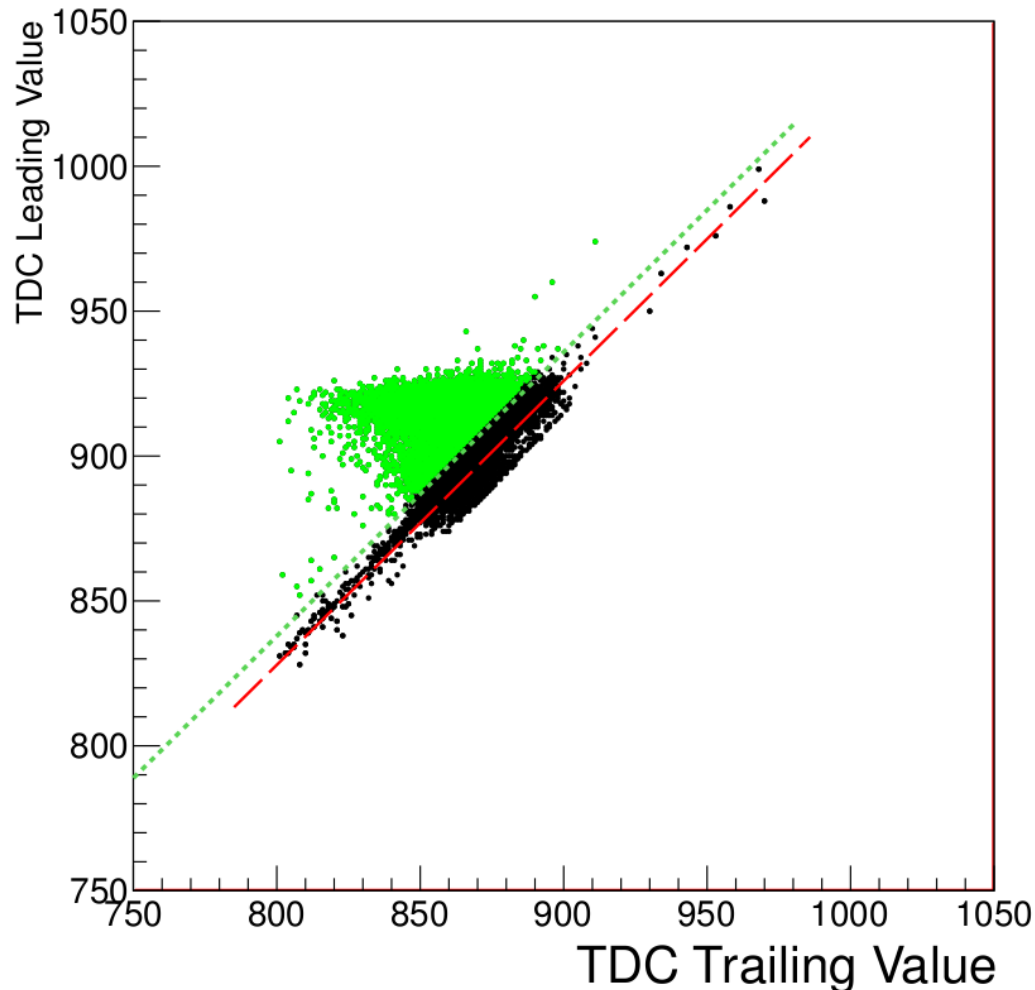
Crosstalk Reduction

- Observed many crosstalk events with narrower TDC width.
- Significantly reduce crosstalk with TDC width cut
($TDC_L - TDC_T$)



Determining TDC Width Cut

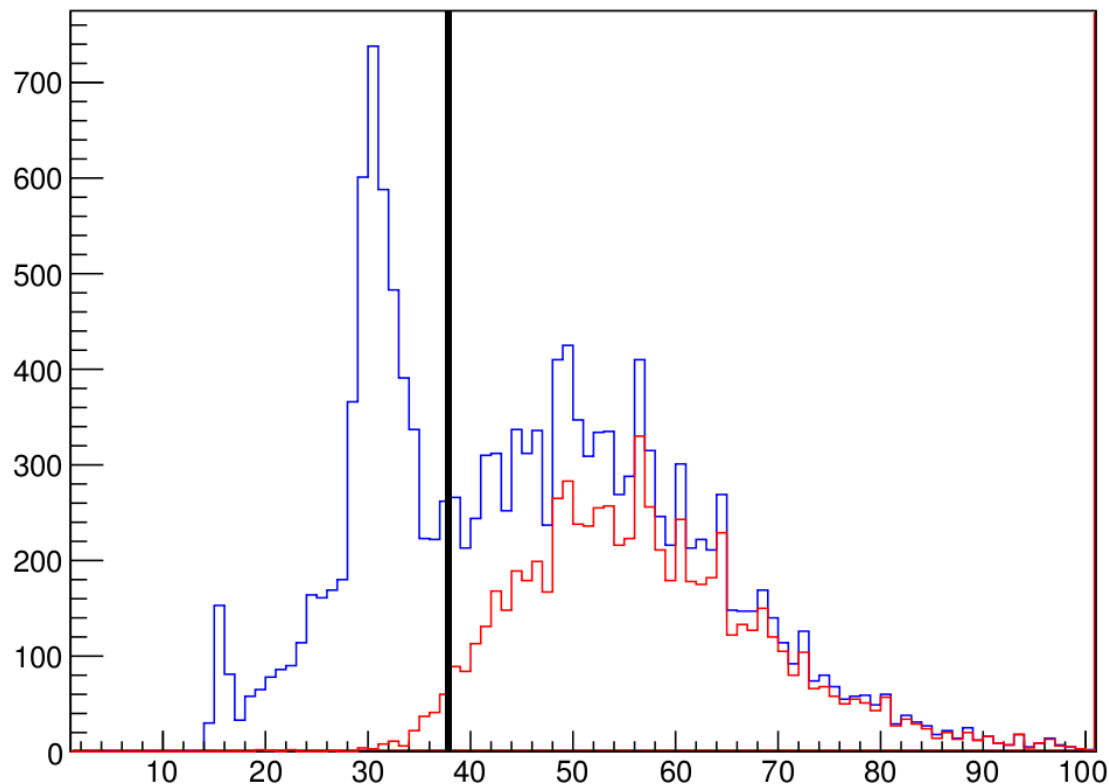
Comparison of TDCL vs. TDCT for PMT 3 Pixel 7



- Trying to cut out events with narrow width
 - low ADC as well
- Fit straight line to the narrow width events
 - Determine cut
 - Shift upwards – green events

TDC Width Cut

Run 1458 ADC pmt 3, paddle 7: $1 < \text{tdc} < 101$



- Apply TDC width cut – reduces low ADC events

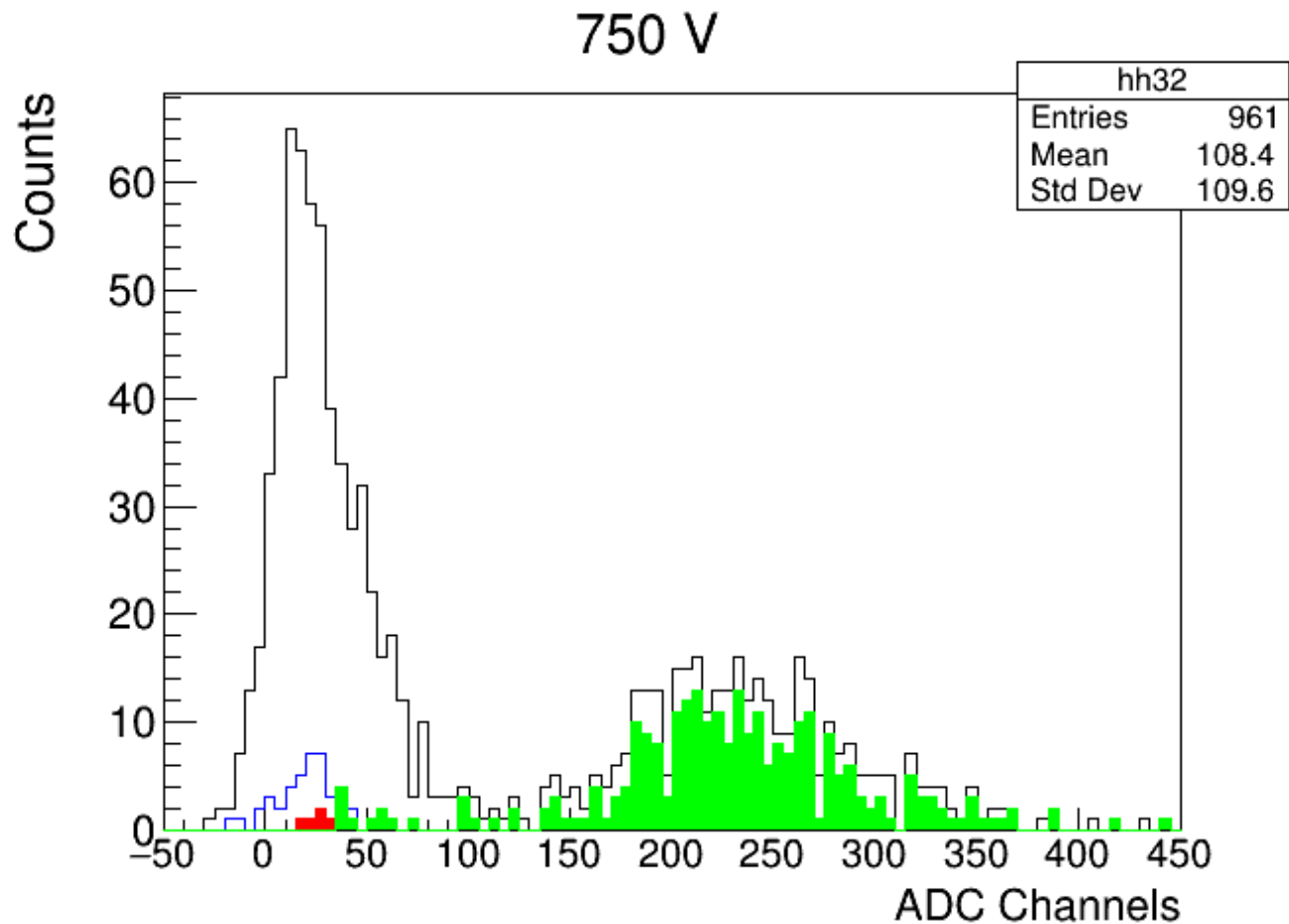
Efficiency Determination

- Determine the efficiency of the threshold cut on the ADC amplitude
- Applied all other cuts for good single paddle events
- Define efficiency as,

$$\varepsilon = \frac{\# \text{ ADC events AFTER threshold}}{\# \text{ ADC events WITHOUT threshold}}$$

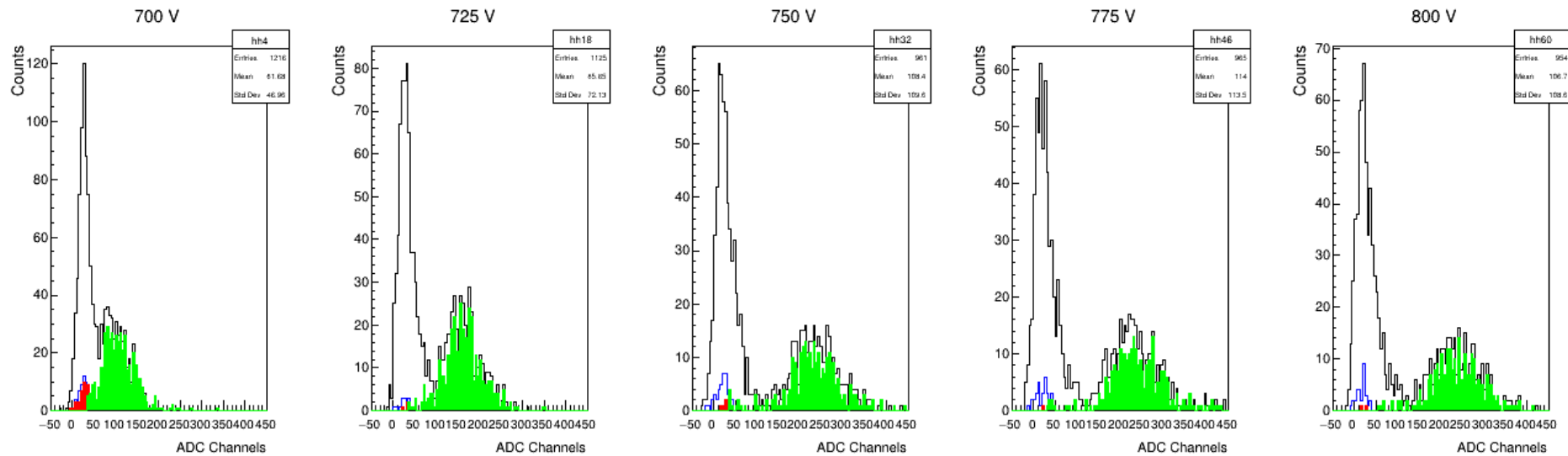
- Efficiency dependent on apply HV to PMT
- Determine optimal HV setting

Threshold Cut on ADC Spectra



- Threshold cut leaves events in green

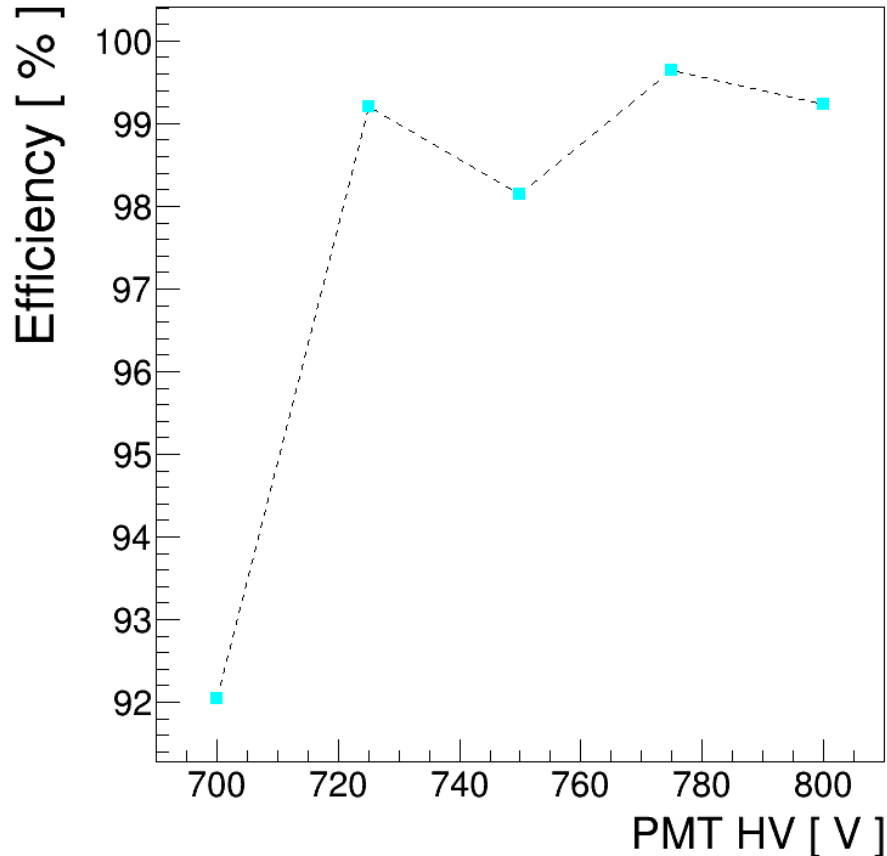
ADC Spectra as a Function of HV



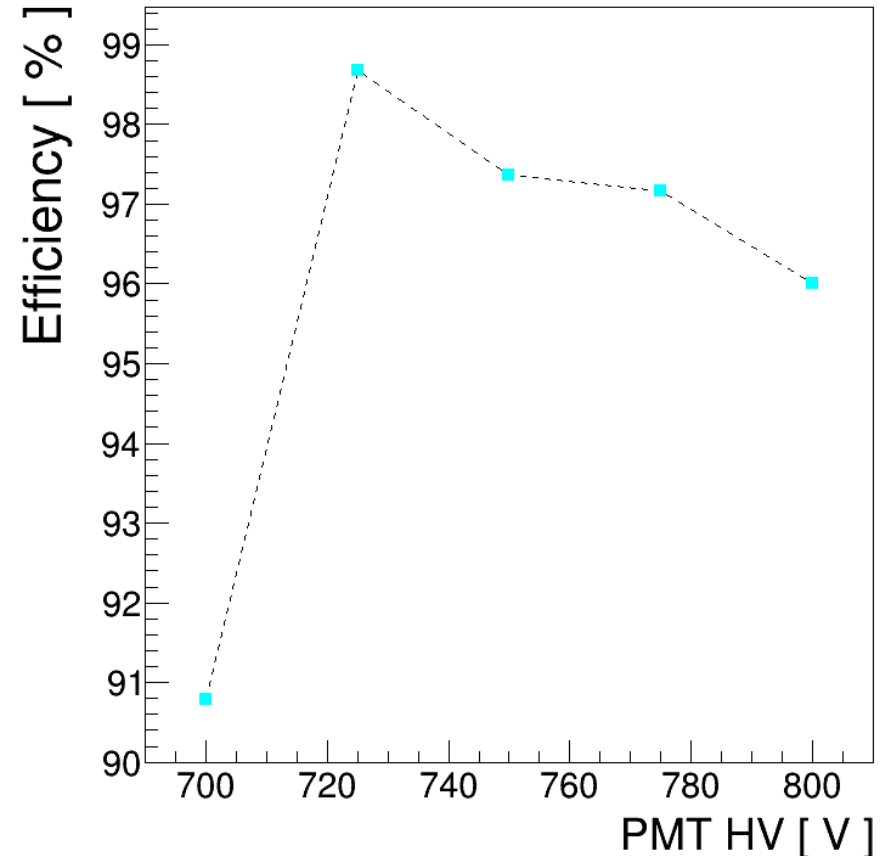
- Same pixel in PMT at five different HV settings
- Choose the minimum HV for each pixel

Efficiency as a Function of HV

Pixel 6 Efficiency



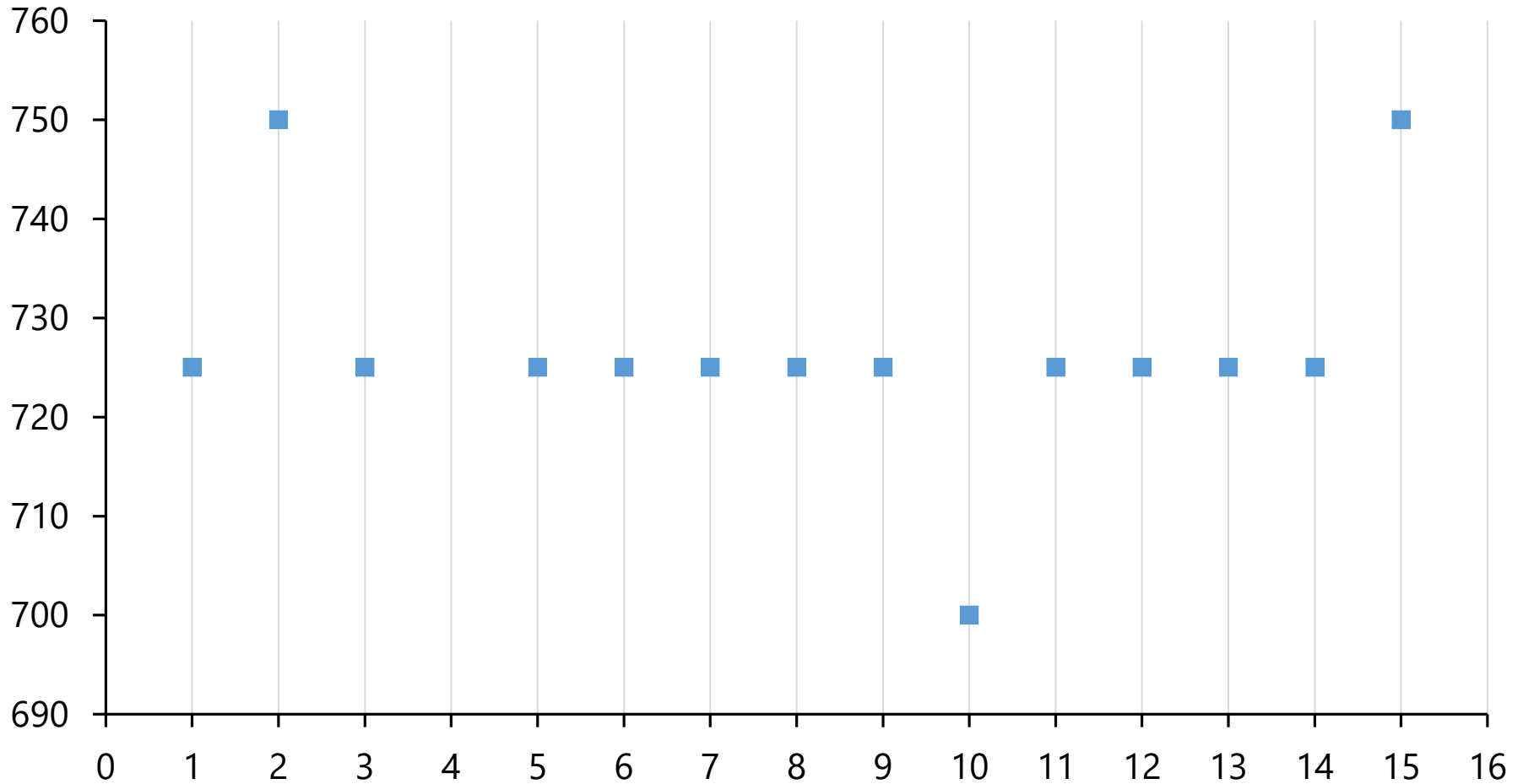
Pixel 12 Efficiency



- Not all pixels have same efficiency pattern

HV Setting Determination

Lowest HV Setting for each Pixel



Summary

- Commissioning in progress
 - Second half of module 1
 - Charge equalization ✓
 - Threshold determination ✓
 - Crosstalk analysis ✓
 - Efficiency determination ✘ (almost ✓)
 - Developing analysis for all pixels in single PMT
- Determine ideal HV setting for PMT
- NSF proposal approved! Funding for students during semesters and summer!