

Coordinate Detector Status Update

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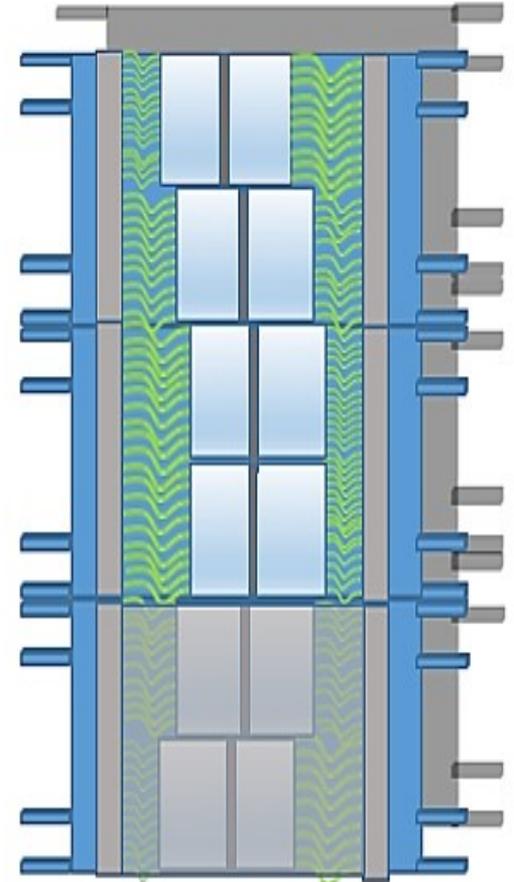
SBS Collaboration Meeting
23rd February 2018

Acknowledgements

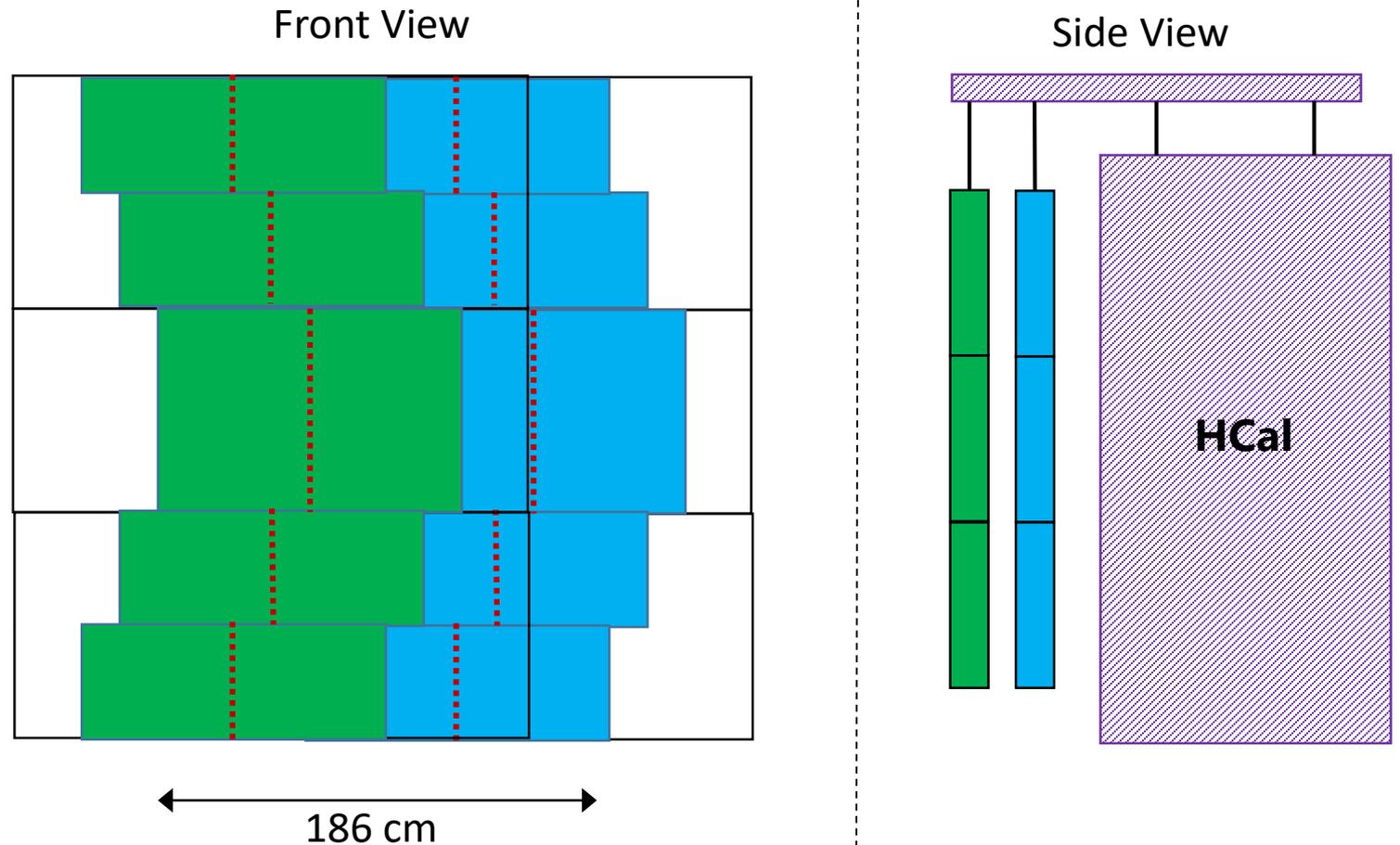
- Contributions from many people!
- CNU: Peter Monaghan, Ed Brash, [Ralph Marinaro](#), [Katie Whitcomb](#)

Coordinate Detector Configuration

- Detector has two planes each with an active area of $(102 \times 294) \text{ cm}^2$
- 6 modules; 3 per plane; 28 scintillator **groups** in each module.
- Each group consists of 14 scintillator **paddles**.
- Total of 2352 channels.
- Each paddle has a **wavelength shifting fiber** (WLS) along its center for light collection.
- Each group of WLS connected to 16-channel **maPMT**



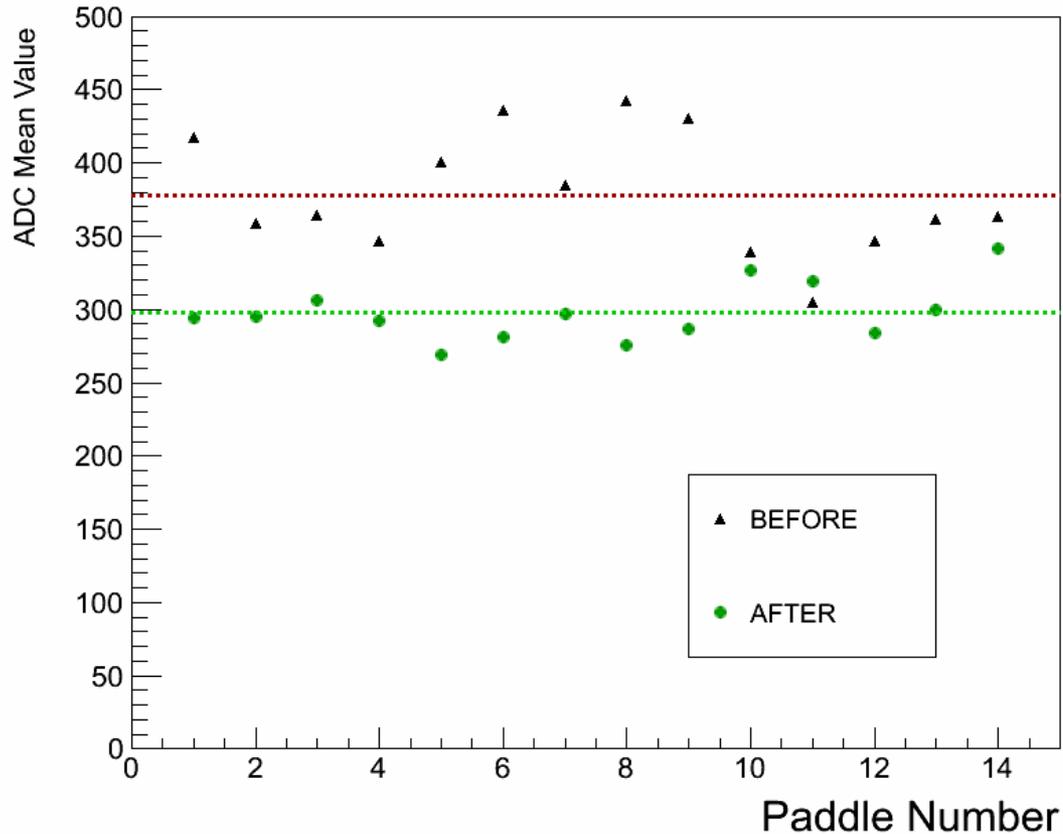
Acceptance Coverage for Gm_n



- Offset planes to cover HCal acceptance

Charge Equalisation

Comparison of Mean ADCs - PMT 7



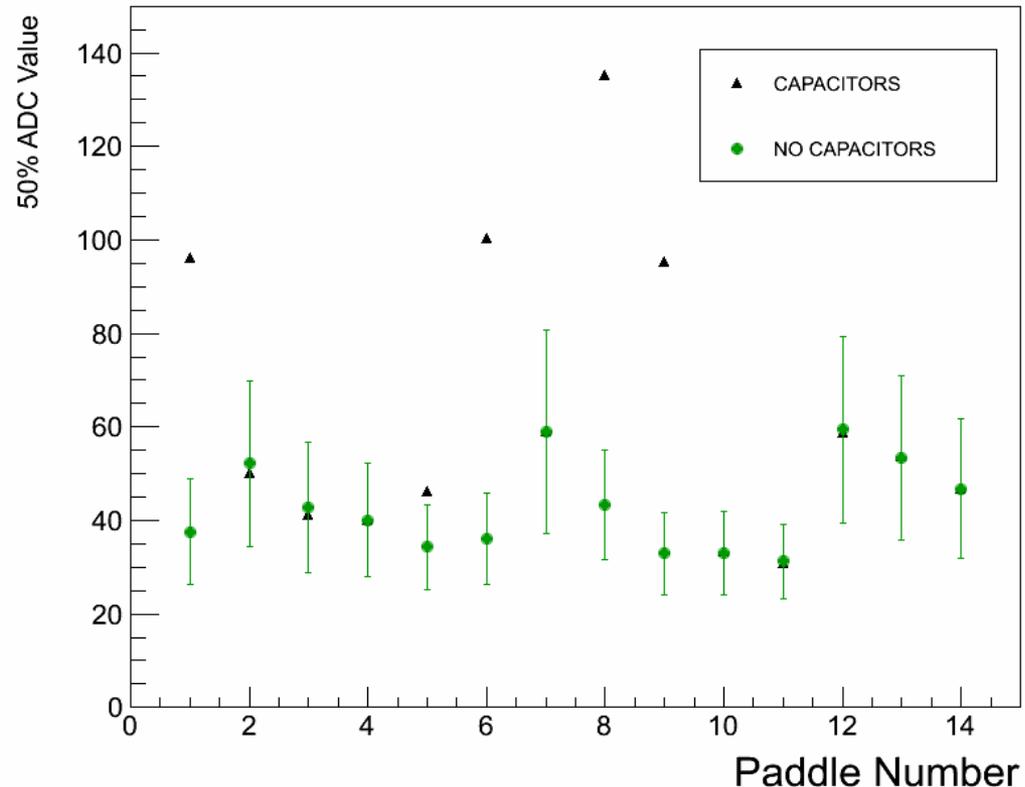
- Mean ADC for single paddle cosmic events.

Single Pixel Threshold

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

- Set 50% ratio as threshold
- Removed capacitors from connectors between PMT and NINO
- Threshold now more consistent between all paddles

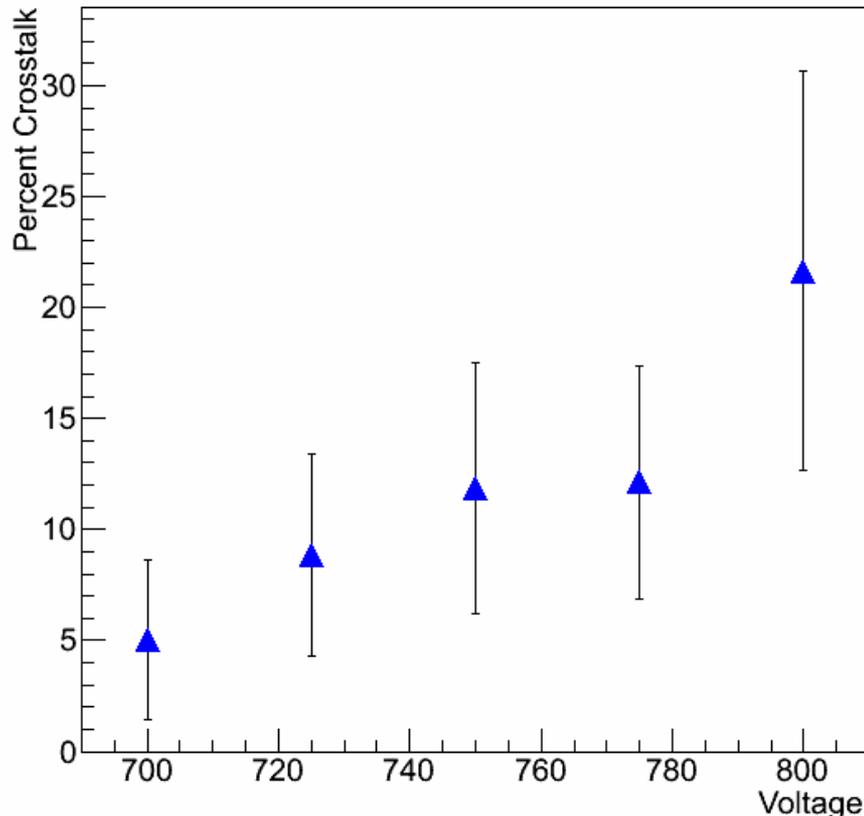
Comparison of Efficiency Ratio - PMT 7



- Threshold independent of PMT voltage

Capacitive Crosstalk

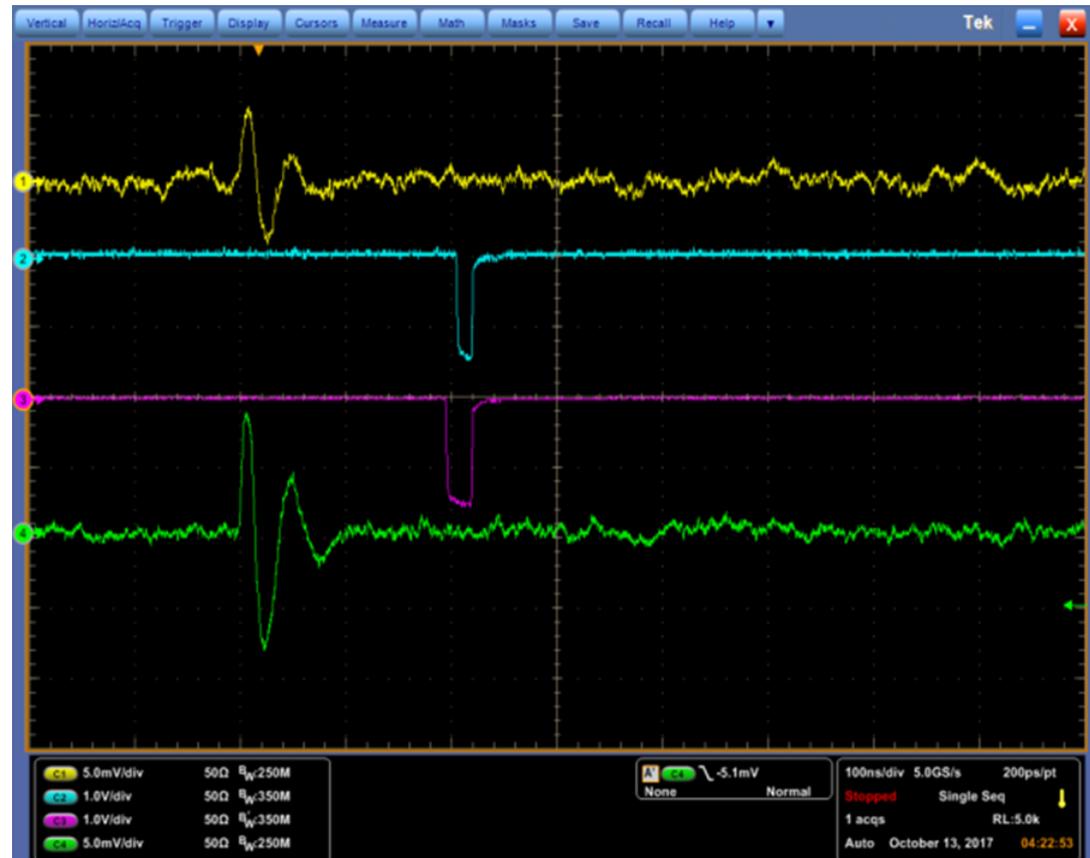
Percent CrossTalk vs Voltage



- Consider single track in middle paddle.
- Define crosstalk as percentage of events where TDC fired in either of the two adjacent paddles.
- Dependent on PMT voltage

Crosstalk Reduction

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



Tasks for Completion

- Systematically complete commissioning of each module
 - Methods/problems almost ironed out for M1
- Start design solution to hang first plane (3 modules) on the detector frame.
 - Will need some engineering consulting
- Goal: attempt to hang first two/three modules during the summer.
- Consideration of cables, electronics modules and integration into experiment DAQ still required.

Software (Ed Brash)

- Analysis software being developed
 - Currently in use for commissioning.
 - Using updated Hall A decoder.
- Software incorporated with Hall A SDK
- Summer: develop physics analysis in parallel with G4SBS development
- HV control software
 - CNU purchased a CAEN HV mainframe and enough HV pods for the entire CDet.
 - Will develop HV controls to integrate into whatever common system experiments use.

Manpower Commitment

- Two CNU faculty: Monaghan & Brash
- Two CNU undergraduate students: Katie Whitcomb & Ralph Marinaro
 - Secured summer funding for students!
- Funding dependent!
 - NSF and DOE grants applied for!

Summary

- Commissioning in progress.
 - Charge equalization ✓
 - Threshold determination ✓
 - Detector efficiency determination ✕
 - Crosstalk is a problem
- Determine ideal HV setting for PMT
- Analysis software development in progress.
 - Need guidance on what functionality the collaboration wants/needs for experiments