

# HCal Status Update

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Jefferson Lab

# Coda 3 Upgrade

- **Completed.**
- In the process of upgrading DAQ to CODA 3. (Thanks, Bryan!)
  - New CODA configuration written.
  - DAQ readout lists almost updated.
  - About to install final VXS crate. (Thanks, Alex!)
- Need to test CODA 3 on cosmic data as final test.



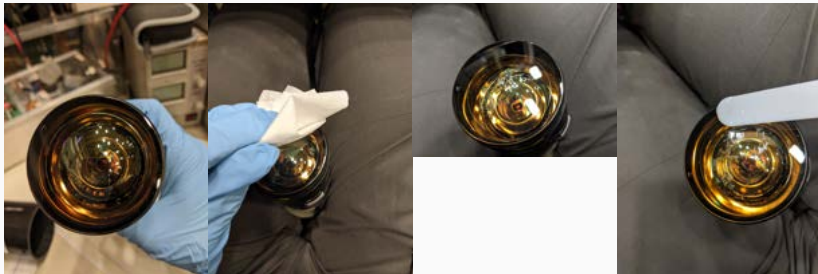
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ROL2	<input type="text" value="/home/daq/vol/event_list.so"/>	User String	<input type="text" value="userstring"/>
User Config	<input type="text" value="undefined"/> (optional)		
Description (optional)	<input type="text" value="undefined"/>		
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		<input type="checkbox"/> Sparsify	<input type="checkbox"/> IsSlop
<input type="button" value="Ok"/> <input type="button" value="Apply to All"/> <input type="button" value="Clear"/> <input type="button" value="Cancel"/>			



# PMT Greasing

- Juan Carlos Cornejo came to Jlab and greased the HCal PMTs.
- 9 PMTs need to be finished. 2 need to be aligned.



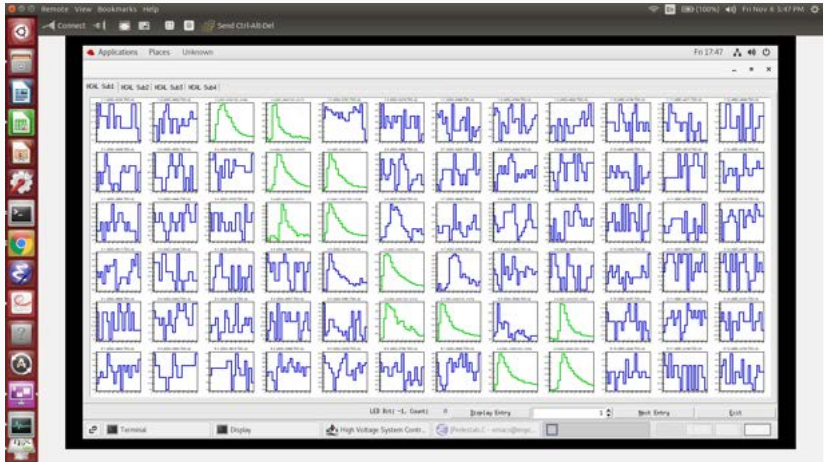
# Ensuring HCal PMTs are Light Tight

- After greasing reapplied tape to PMT bases to prevent light leaks.



# Cosmic Testing Reestablished

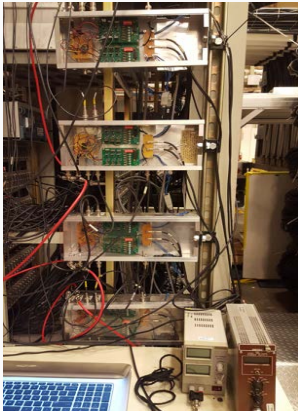
- Final VXS crate installed.
- Cosmics retimed for fADCs.
- Now able to run cosmics remotely.
  - Remote VXS crate power cycling.



# LED System Work

- HCal has a series of 6 LEDs that can illuminate each PMT.
- Powered by 8 LED power boxes on front-end (4 completed).
- Each LED power box controls 2 LED boxes on the sides of HCal (all 16 completed).

## LED Power Boxes



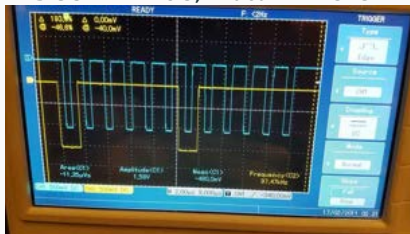
## LED Boxes



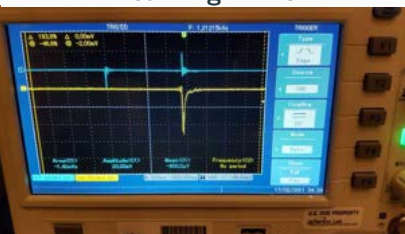
# LED System Work Cont.

- New HV cables (thank Chuck!).
- New LED pulse signal cable bundles.
- LEDs control boards use clock and data in signals.
- Retimed fADCs for LEDs (still need to retime F1TDCs).

**Clock = Blue, Data = Yellow**



**Retiming LEDs**

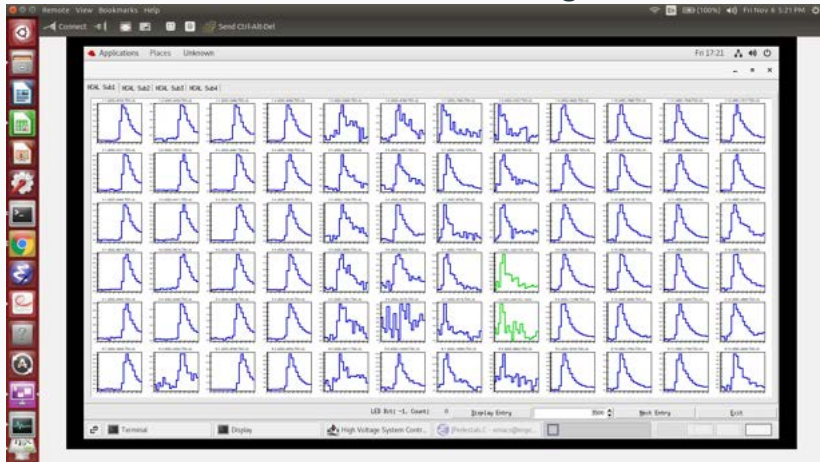




# LED System Work Cont.

- Left half HCal LEDs operational now.

## 12×6 Rows of PMT fADC Signals



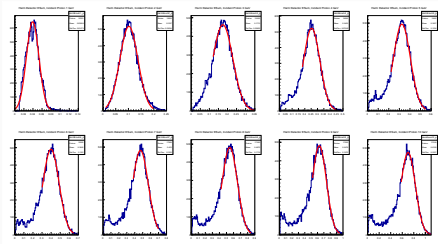
## Other Work Since Last Update

- New HCal cable maps for HV and DAQ.
- Updated HAlist for HCal test lab setup.
- fADCs inventoried.
- DNP HCal talk.
- Left half amplifier power crate occasionally has issues turning on. May want to replace just in case.
- Tested summing amps.
  - All appear operational. Half of one amp broken → swapped out.
  - Still need to test as trigger with cosmics.
- Running cosmics at different HV for signal calibration.
  - Vanessa and Sebastian working on.
- Energy deposition simulation studies.

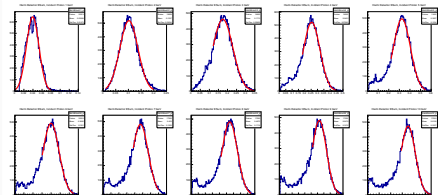
# Energy Deposition Simulation Studies

- Sebastian Seeds has been studying energy deposited in the scintillators from protons and neutrons with G4SBS.
  - Protons and neutrons incident on HCal in 1 GeV increments.

## Proton Fits

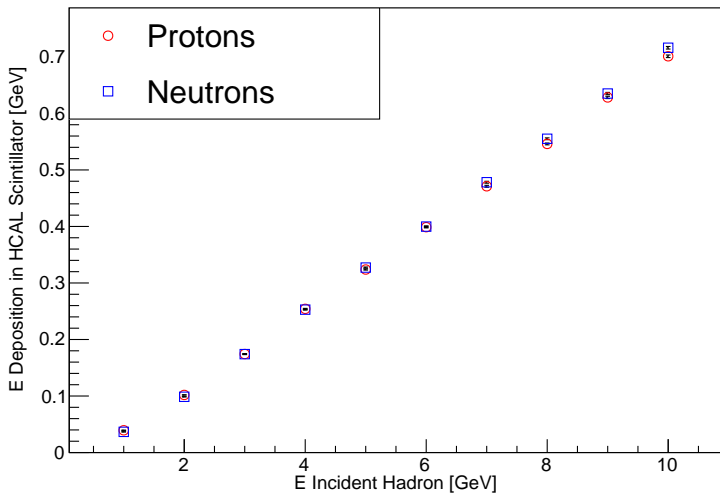


## Neutron Fits



# Energy Deposition Simulation Studies Cont.

Proton and Neutron Energy Deposition in HCAL Scintillator vs Incident Hadron Energy



## Completed:

- All DAQ electronics tested and working.
  - Except summing modules require testing.
- Operational decoder and readout lists (CODA 2→CODA 3).
- Full database implemented.
- Available Triggers:
  - Cosmic trigger.
  - LED pulser trigger.
- Flags file to configure ROCs (switch between triggers, set windows, prescales, etc).
  - Standardize across subsystems? GUI?
- Event display available.
- Simple cluster finding algorithm implemented (max energy module).
  - More advanced algorithm under development. (e.g. associates regions of BB with regions of HCal.)

## To-do:

- PMT QE calibration requires more LED data (test lab).
- Calibrate NPE to ADC signal (test lab).
- **In Progress:** Calibrate HV to ADC signal (test lab).
- **In Progress:** Test summing module trigger (test lab).
- Implement online monitoring software (maybe mimic Hall C).
  - fADC250 scaler mode. GUI exists (ask Steve Wood?).
- Determine alarm handler information.
  - HV alarms etc.
- Setup HCal in the hall.
  - Reestablish DAQ.
  - Synchronize timings.

## Completed:

- All front-end electronics, cables, patch panels etc. installed and operational.

## To-do:

- In progress: 9 remaining.
- Need to finish greasing PMTs.
  - Calibrations can't be finalized until this is completed.
  - Requires test lab access.
  - Unless we have a volunteer who can access the test lab, Scott will do this when authorized to enter.
  - Hopefully granted access when JLab enters SAD.
- Assemble 4 remaining pulser boxes (CMU).
- Fabricate remaining 3 shims that go between the 4 subassemblies. Other 20 installed already (JLab).
- Move to Hall A and revive the DAQ system.
- Install dry air supply for PMTs in the hall.

# Current Status Summary

- DAQ operational and detector fully assembled.
- Cosmics/calibrations will resume when test lab access is restored.
- To do: <https://docs.google.com/document/d/1S--0K01QL0gP-EP-2nf8LSBLx6Y6d6TAFrWK1UkRxBE/>
- 279/288 Grease remaining PMTs.
- Ongoing Calibrate relative PMT QEs.
- Ongoing Voltage scans.
- Ongoing Calibrate PMTs with cosmics.
- Soon Simulation cosmics vs. real.
- Completed Finish CODA 3 upgrade.
- Online monitoring.
- Analysis scripts.
- Assemble remaining pulser boxes.
- Fabricate shims.
- Move to Hall A.
- Install dry air supply.
- Personnel:
  - 2 postdocs: Scott Barcus and Juan Carlos Cornejo.
  - 2 students: Vanessa Brio and Sebastian Seeds. Possibly a third.
  - Brian Quinn and Bogdan Wojtsekhowski.
  - New collaborators: Jim Napolitano, Donald Jones, and Kent Paschke.



# Acknowledgments

Thanks to [Gregg Franklin](#) for his many dedicated years designing and overseeing the construction of HCal. Thanks to [Università di Catania](#) for their major financial contributions. Many other people and institutions were involved in making HCal possible, including, but not limited to:

- Thanks to the many students who have worked on HCal including [Alexis Ortega](#), [So Young Jeon](#), [Jorge Peña](#), [Carly Wever](#), [Dimitrii Nikolaev](#), and [Sebastian Seeds](#).
- Thanks to [Alexandre Camsonne](#) for helping us get the DAQ working and finding all the modules for us.
- Thanks to [Chuck Long](#) for all his help fixing and acquiring things.
- Thanks to [Bryan Moffit](#) for DAQ help.
- Thanks also to [Brian Quinn](#) and [Bogdan Wojtsekhowski](#).
- Thanks to [Vanessa Brio](#), [Cattia Petta](#), and [Vincenzo Bellini](#) for their cosmic commissioning efforts.

Questions?