

DAQ Status

Eric, Yale

Collaboration Meeting
17–November–2013

□ Recent Activity and Progress

- TPC/PMT (MRT/MRT+) readout at FNAL
- Run Control
- New Run Modes
- LArTF cluster
- SlowMonCon -- See Glenn's talk

□ Meetings

- 10:30, Thursdays WH12XO
- 2pm, Tuesday Run Control, WH12SW.

Test stand reminders

- DAQ Annex
 - Full TPC chimney and hardware
- MRT/MRT+ racks in/just-outside-of DAB tent.
 - PMT/TPC racks.
 - Full chimney, real PMTs and detector hardware
 - One's external trigger is driven by output pulse from the other
 - So, an artificial arrangement
 - No proper clock or trigger fanout
 - But, crucially, inside the official DAQ codebase
- Nevis properly configured TPC/PMT test stand
 - with hardware
 - with their own codebase

MRT

- MicroBooNE Reception Tests. A test stand with which we have worked with Ken/Chen from BNL to
 - do ASICs tests 6 months ago
 - test/install cold cables (and look at ASICS again!) about a month ago.
- “Simple” internal trigger, short drift windows
- gain tests, connectivity, mapping, run robustness

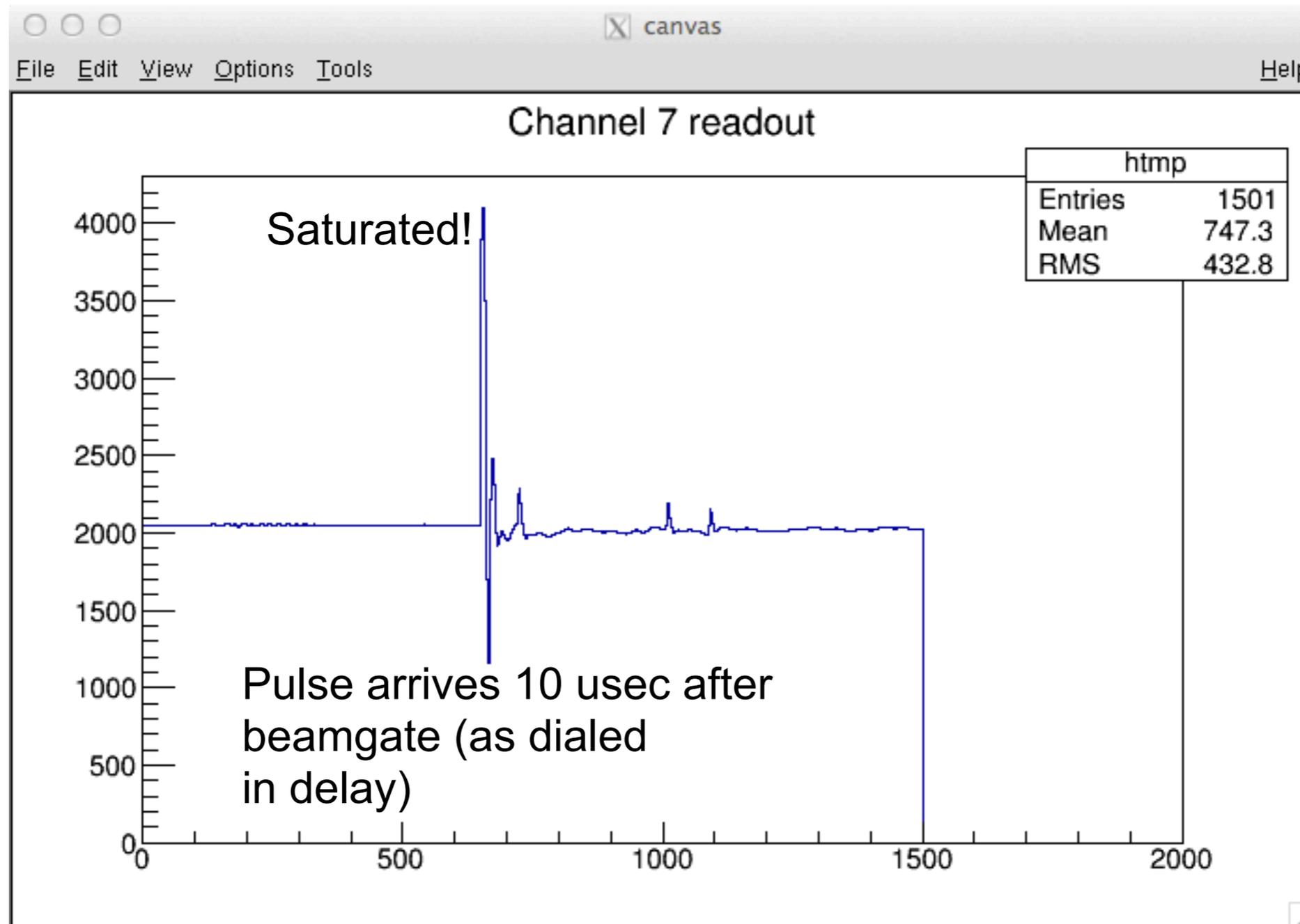
MRT/MRT+ : successful readout!

Georgia's docdb 2819, 2794

- The “+” means PMT crate with single PMT in darkbox
- MRT+: Nevis trigger is understood
 - by Kazu/Georgia/Chi, anyway. Now us too, I hope.
 - **It works!**
 - Can read a PMT:
 - N (1500) sample window around EXT
 - and M (20) sample windows when discr1 threshold is met
- Can run the DAQ, reading out TPC/PMT crates
 - Inside DAQ code, under control of message passing
 - Can configure both crates' runtime parameters almost, grr!
Assembler writes the file to disk
 - Can read that up with Wes's ROOT bin file parser

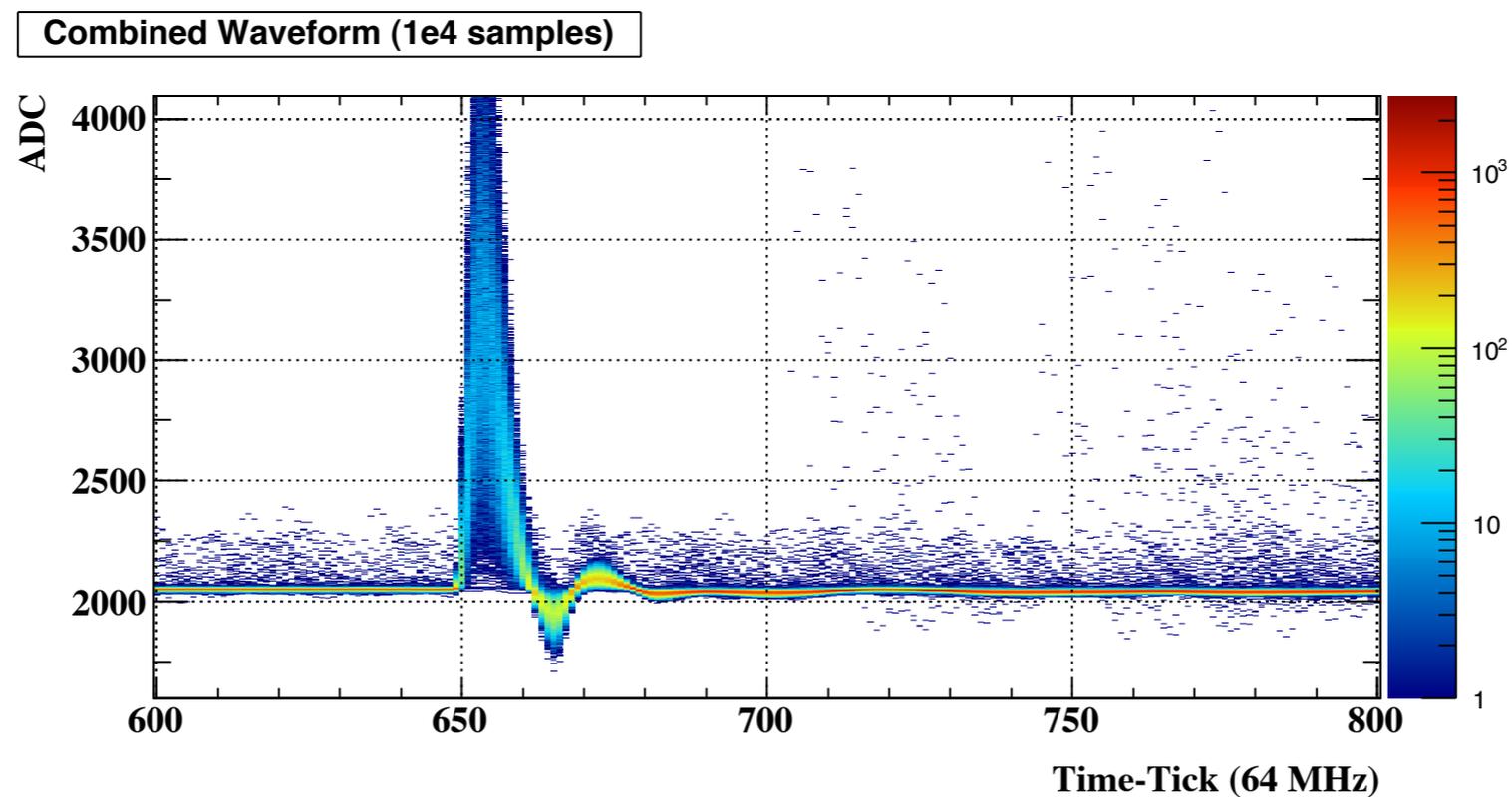
PMT signal

For the MRT+ readout we want simply 1500 samples around input trigger pulse, but we can get the 20 sample discr1 pulses too. This is the former ..



many PMT pulses

- <http://www2.lns.mit.edu/~kazuhiko/ToyDAB/ExampleWF.gif>



Great progress

- Big thanks to Gennadiy, Wes, Kazu, Gabriel, Georgia. Invaluable to have Kazu out here to transfer Nevis expertise inside uB DAQ codebase.
- Now, Sowjanya is talking to the MVME controller that controls BiRa PMT HV modules. Has started Epics on it. Is now configuring EPICs to control/mon/archive/alarm all 32+4 HV channels in the cryostat.
- It should then be “trivial” to read all channels in the cryostat
- ...and one flange worth of the wires simultaneously

Run Control

- Rashid, Anne, Joseph, David, Sowjanya are (becoming) the experts here.
- This is a big port of NoVA code, with which we're getting help now from Kurt/Gennadiy to understand and use.
- Everything builds -- though there are arcane rules that need to be put in the CMake rules.
- GUI pops up. Now it's a matter of "uboone-ifying"
 - very active group
 - I bet next collab mtg we'll have interesting things to show

RC

Screenshot from Rashid

The screenshot displays a Linux desktop environment with the following components:

- Terminal Window:** Shows the user's shell environment with the prompt `rmehti@uboone` and the current directory `/data/rmehti`. It lists several directories including `clusterTest01`, `config`, `daqlogs`, `DAQOperationsTools`, `FCCDAQ`, `NDOS`, `test`, and `UBOONE`.
- Open Resource Configuration Dialog:** A dialog box with a file browser showing the same directory structure as the terminal. It includes `Open` and `Cancel` buttons.
- FCCDAQ Detector Run Control, Partition 0:** The main application window. It features a menu bar (File, Configuration, Connections, View, Help) and a grid of control buttons: `Rediscover Resources`, `Select Resources`, `Reserve Resources`, `Release Resources`, `Select Configuration`, `Prepare Configuration`, `Load Connections`, `Make Connections`, `Load Hardware Config.`, `Configure Hardware`, `Load Run Config.`, `Configure Run`, `Begin Run`, `Pause Run`, and `End Run`. Below the buttons is an `Execute command:` input field. The status section shows `RC Server Status: Connected` and `RM Server Status: Connected`. It also displays `Run: 0` (0%), `Subrun: -1` (0%), `Num. Events: 0`, and `Run Type: Test`. The `Shifter: DAQ SW Tester` is selected. A log window at the bottom shows the execution progress, including a `WARNING: Resetting RC Server`.
- Resource Selection Window:** A window with a list of services and checkboxes. The `Id` column lists services like `Managers`, `Configuration Mana...`, `DDS Daemon`, `Data Logger`, `Event Dispatcher`, `Global Trigger`, `Message Analyzer`, `Message Facility Se...`, `Message Viewer`, `Resource Manager ...`, `Run Control Server`, `Simulation Manager`, `Spill Server`, `TDUManager`, `Trigger Scalars`, `Timing Chains`, `tdu01`, and `Buffer Nodes`. The `Disabled` column has checkboxes for each. `Select All`, `Deselect All`, `OK`, and `Cancel` buttons are at the bottom.

Two newly thought-through Run Modes

- PMT Flasher

- Laser

Flasher qua Calibration

- We've had some discussions with Ben J, and it's clear it's a pretty straightforward variation of our ASICs Calibration run
 - Run in software trigger mode
 - **That** pulses the AFG, which pulses the Flasher
 - Need to get the signal out on a USB to flasher on platform, repurpose the Strobe AFG. But easily done.
 - Flash in some pattern N times, readout PMTs at that same time. Close (sub)run, reconfig the flasher, ...

Laser

- Discussions with Bern. This is not entirely straightforward, but we have a design.
- What makes this challenging is: we need to send evt-by-evt data, which is different from Calibration/Flasher runs
 - Read a run configuration from dB. Write the run #.
 - Bern will pulse laser from sebApp process and move over detector, over the course of a run
 - True pulser aimed position can be different from that dialed in. This data at least needs to be recorded
 - At least in early days there's no known run pattern

Laser Run design

- The laser servers will be the 11th and 12th sebApps (in addition to the 9 TPC instances of sebApp). PMTs powered off.
- Read a run configuration from dB. Write the run #.
- laser servers will send a pulse to laser and write a struct to assembler over socket with data for that pulse
- assembler will ensure, via Message Passing, that all nine crates report for that event and that it was written out, and only then does it allow the laser server to send another pulse
- We will point Thomas to the two classes he needs to edit to get going

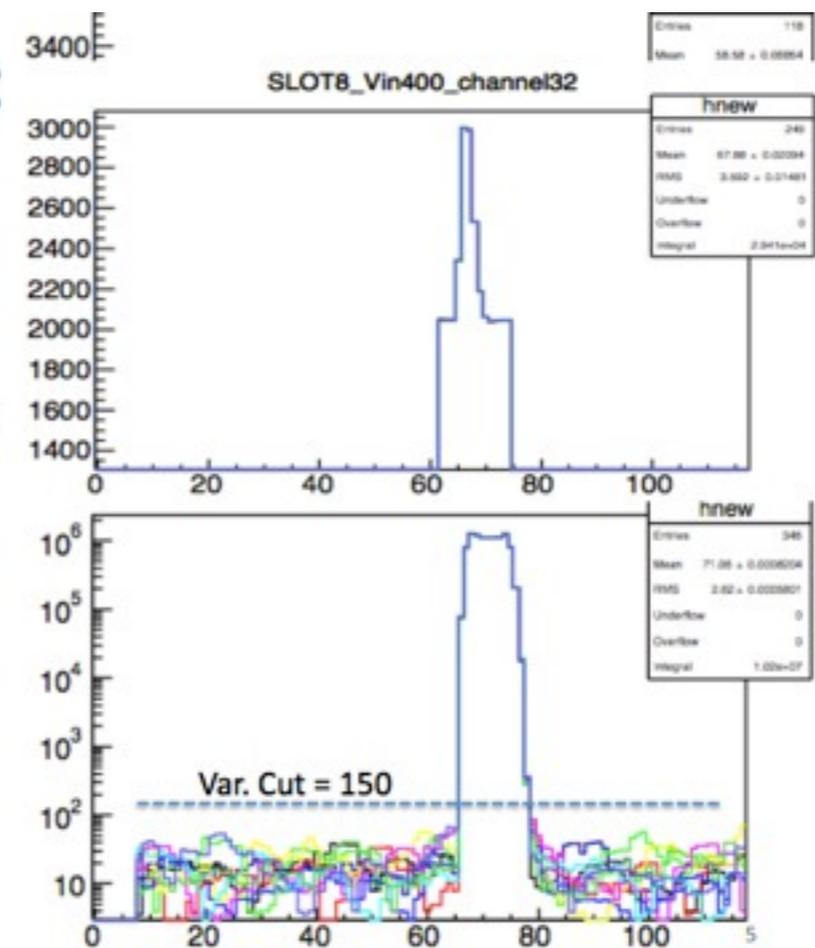
SN Compression

- Georgia/Nevis are working on compression schemes, which all acknowledge, in the end, depend heavily on the actual noise. We think we can provide good input on that after we close up the cryostat at DAB.

May perhaps obviate Huffman encoding for SN mode.

How it works:

- Input signal
- 'Variance' defined as:
$$\text{Var} = \sum_i (\text{ADC}_i - \text{mean}_N)^2$$
summed over the last N samples and using the mean as calculated from the same N samples (e.g. N=8)
- When 'variance' > threshold, Xth sample gets read out
- → N' samples read out in total
- Resulting compression factor (ignoring headers): ~120/15 in this example



LArTF cluster

- These machines are now up
 - ubdaq-prod-seb01 through seb10, -evb, -near01
 - also, unRAIDed, less beefy -ws01, -ws02 machines
 - Next ~2 wks is the test window
 - They will be wiped, and reinstalled (puppetized) one more time
- We will want to take some of our development to those machines over the next months.
 - Install LArSoft there
 - Install a condor farm on ubdaq-prod-near01, evb
 - Run DAQ with fake files.
 - Develop Online, RunControl.

LArTF test stand

- This is a Test Stand we've been discussing to gain IRM beam signal understanding out at the enclosure. Get the NIM-ology done, look for problems in advance.
- Under discussion now with Georgia, et al
- If crate components are available, or we cobble them together, and now that computer cluster is up, this is feasible.