

Collaboration Meeting: TDAQ Update

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March 18th 2024



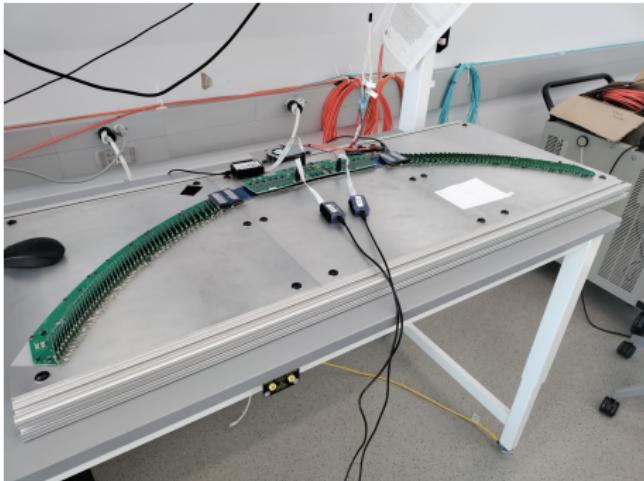
Based on work of many people working on TDAQ. Monica, Richie, Vadim, Pasha contributed the most.

A snapshot of the current job

- Currently in the phase of commissioning and integration;
- Reading out from a tracker station is imminent;
- Getting ready to read the detector;
- Learning how to read panels;
- We are reading the individual panels (teststands).

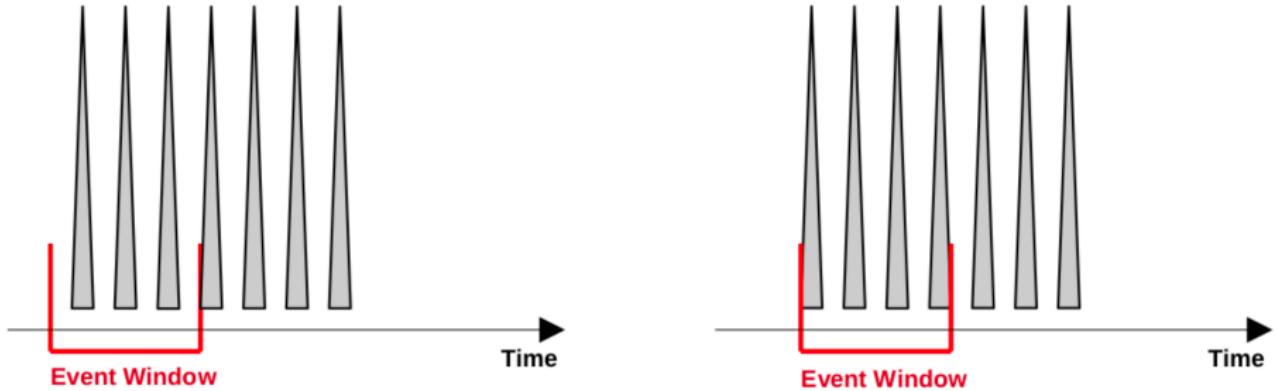
⇒ The rest of the talk will be about what we are doing and what we have accomplished during GR1

Working area



- Each teststand has 96 channels;
- DRAC card connected to the DTC installed in the DAQ computer mu2edaq09 via optical fibers;
- A pulser implemented in the DRACs is sending pulses to the preamps (CAL side);
- 40 MHz ADCs;
- Pulse every 8 channel;
- One DTC and 1 or 2 ROCs at the same time.
- 3 test stands @IERC (only 2 have been used).

Description of the readout logic



- Running, most of the time, with an EW of $50 \mu\text{s}$;
- The timing of the readout is uncorrelated with the generator timing sequences → number of readout pulses is variable;
- ROC is reading digiFPGAs;
- ROC hit buffer stores up to 255 hits (DOCDB47837);
- The channel readout sequence is fixed.

Available Histograms and Error Identification

Real Time Monitoring:

- **Channel histograms**
- **ROC histograms**
- **Event histograms**

Real Time Diagnostic:

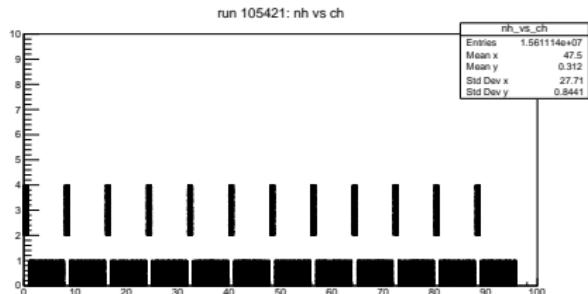
- Number of bytes error bit;
- Number of ADC packets > 2;
- Undefined link ID;
- Invalid channel ID;
- More hits than the maximum in a given channel.

To be implemented:

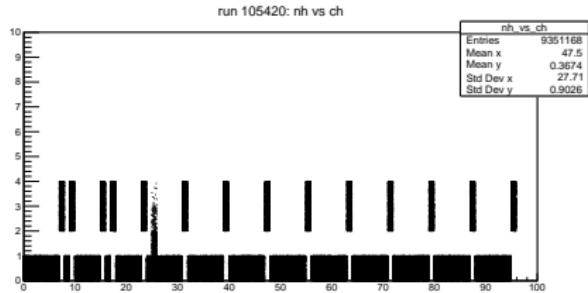
- Slow control of the low and high voltages.

Channel response and crosstalks

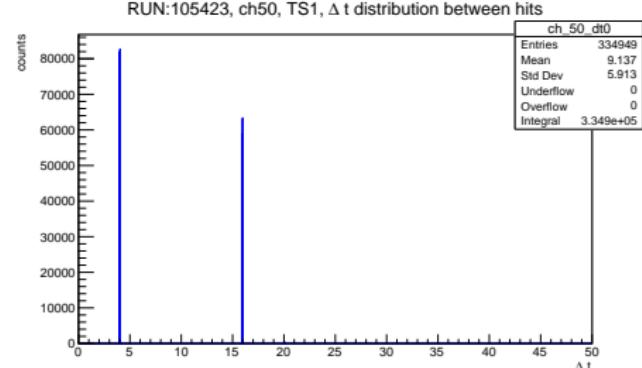
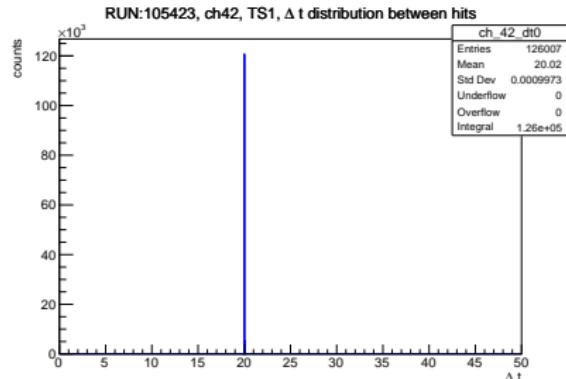
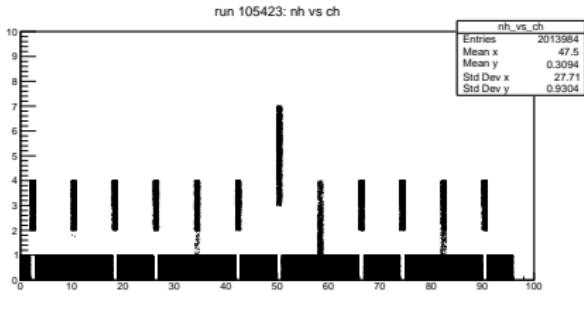
- Cross talks between channels:
⇒ 1 pulsed channel out of 8.
- normal case:



- Cross talks in odd pulsed channels only;
- Asymmetric cross talks (e.g. 3→5, not seen 3→1).



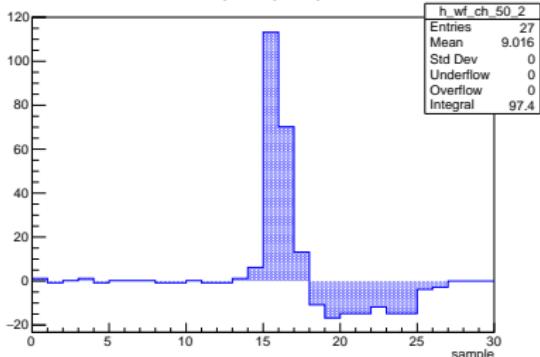
Different channels response



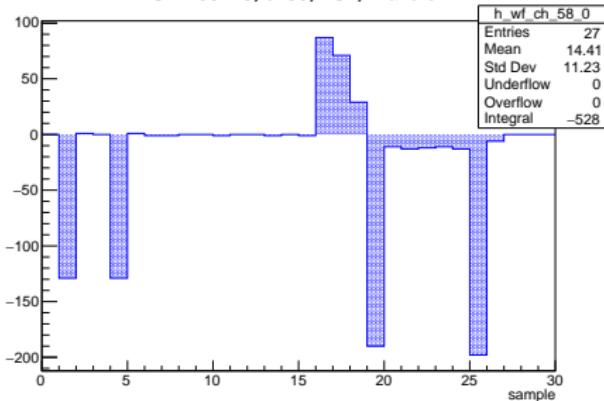
- one DEAD channel found;
- Less hits than expected;
- More hits than expected:
 - ⇒ Δt distribution.
 - ⇒ inverted waveforms (next slide).
- need to reduce pulse duration.

Waveforms

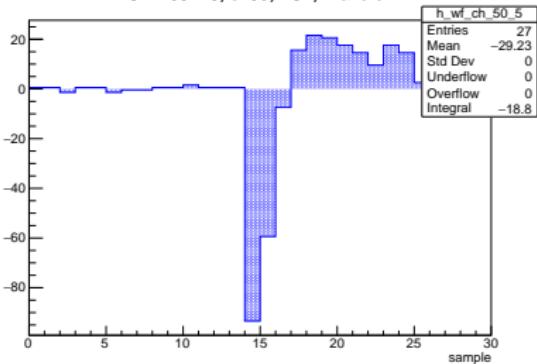
RUN:105423, ch50, TS2, Waveform



RUN:105423, ch58, TS2, Waveform



RUN:105423, ch50, TS2, Waveform

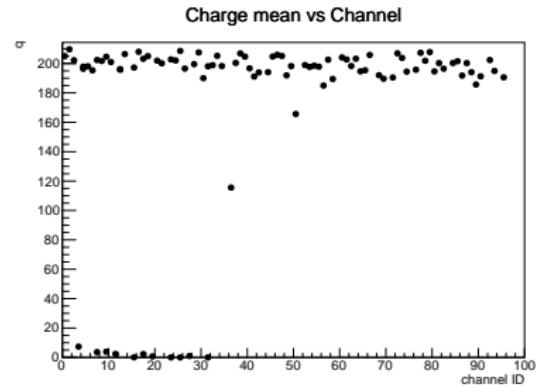
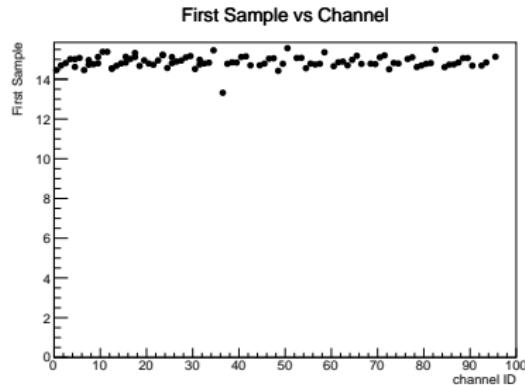


- Negative peaks (baseline and tail);
- Peaks depth is 64, 128 or 192 (6th or/and 7th bit error);
- Reconstruction of the waveforms: isolation of negative peaks;
- Inverted wfs → Δt distribution.

Initial DQM Histograms

Checking that all channel respond the same way to identify problematic channels (noise, inverted wf)

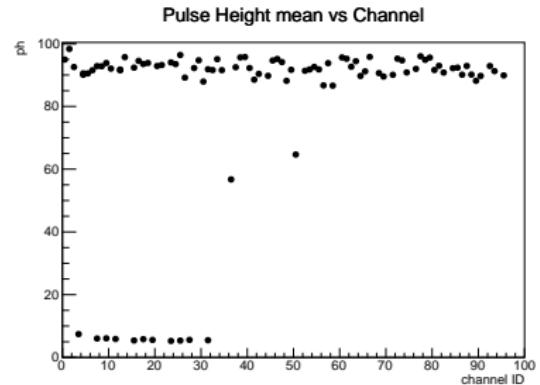
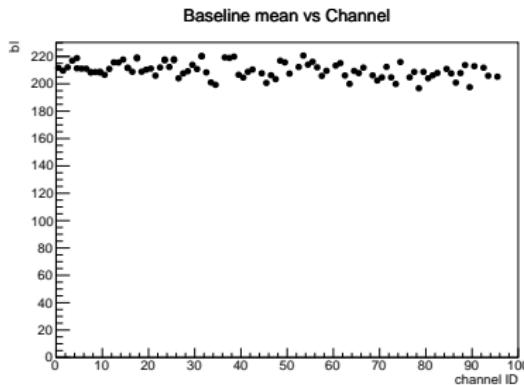
Fist sample and charge mean versus channel ID:



Initial DQM Histograms

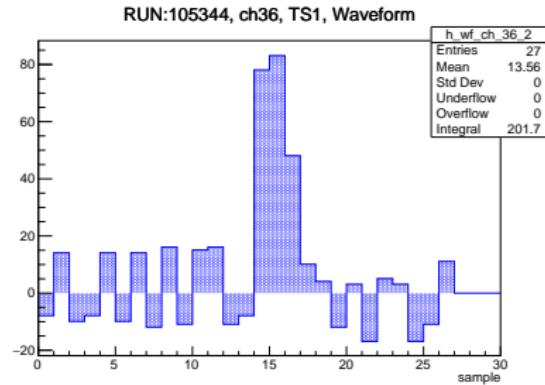
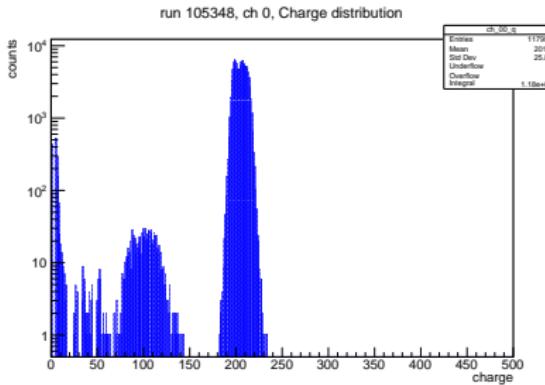
Checking that all channel respond the same way to identify problematic channels (noise, inverted wf)

Baseline and pulse height mean versus channel ID:



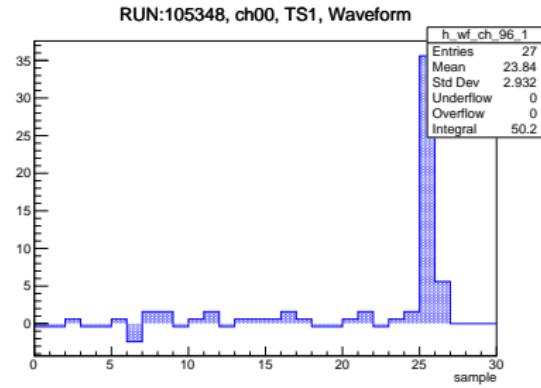
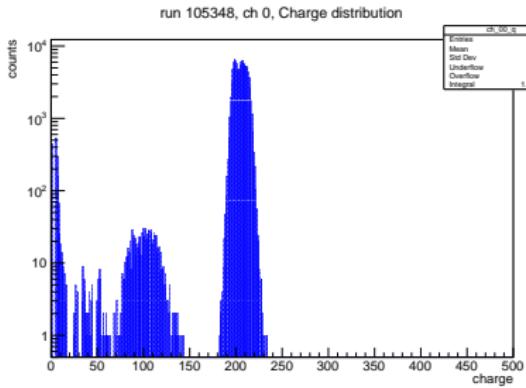
Noisy channels

- noisy channels: value of the charge sistematically lower than the expected;
- $q \sim 0$;



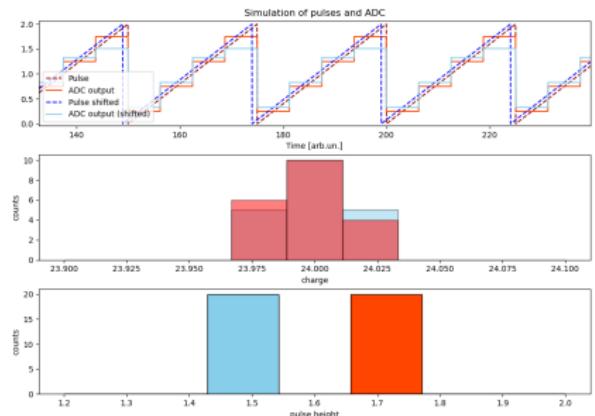
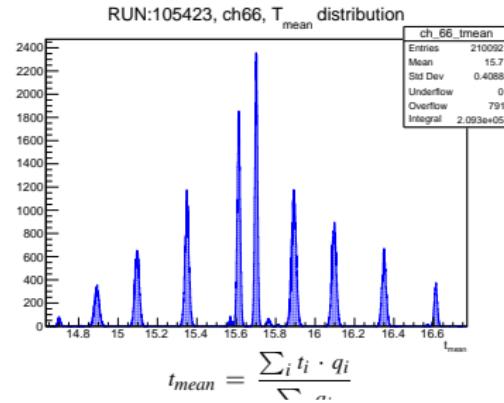
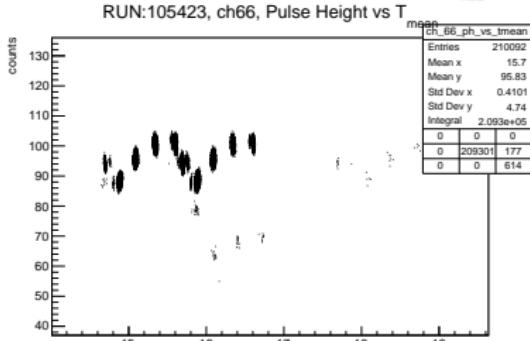
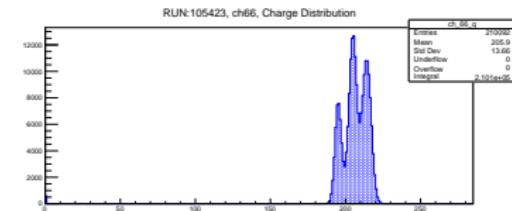
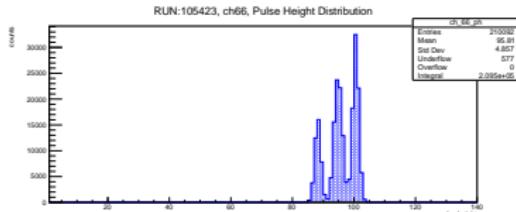
Glitches

- Different value of charge with respect to "normal", inverted and noisy pulses ($20 < q < 70$);
- origin of the glitches not understood yet.



Analysis of the charge and pulse height distribution

WRITE SOMETHING



Artdaq Testing

Global Run 1 Updates

- Horizontal Slice Test: all detectors talked with one CFO;