

DUNE-DAQ in ICEBERG for Run 9

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DUNE DAQ Meeting

~~July 15 2024~~ July 29 2024

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ICEBERG at PAB

Integrated Cryostat and Electronics Built for Experimental Research Goals

- ICEBERG is a 3000L cryostat at the Noble Liquid Test Facility AKA PAB

[June 26 Commissioning meeting with status and plots](#)

ICEBERG e-Log:

<https://dbweb8.fnal.gov:8443/ECL/dune/E/index>

Wiki:

[https://wiki.dunescience.org/wiki/ICEBERG WIB-Ethernet DAQ](https://wiki.dunescience.org/wiki/ICEBERG_WIB-Ethernet_DAQ)



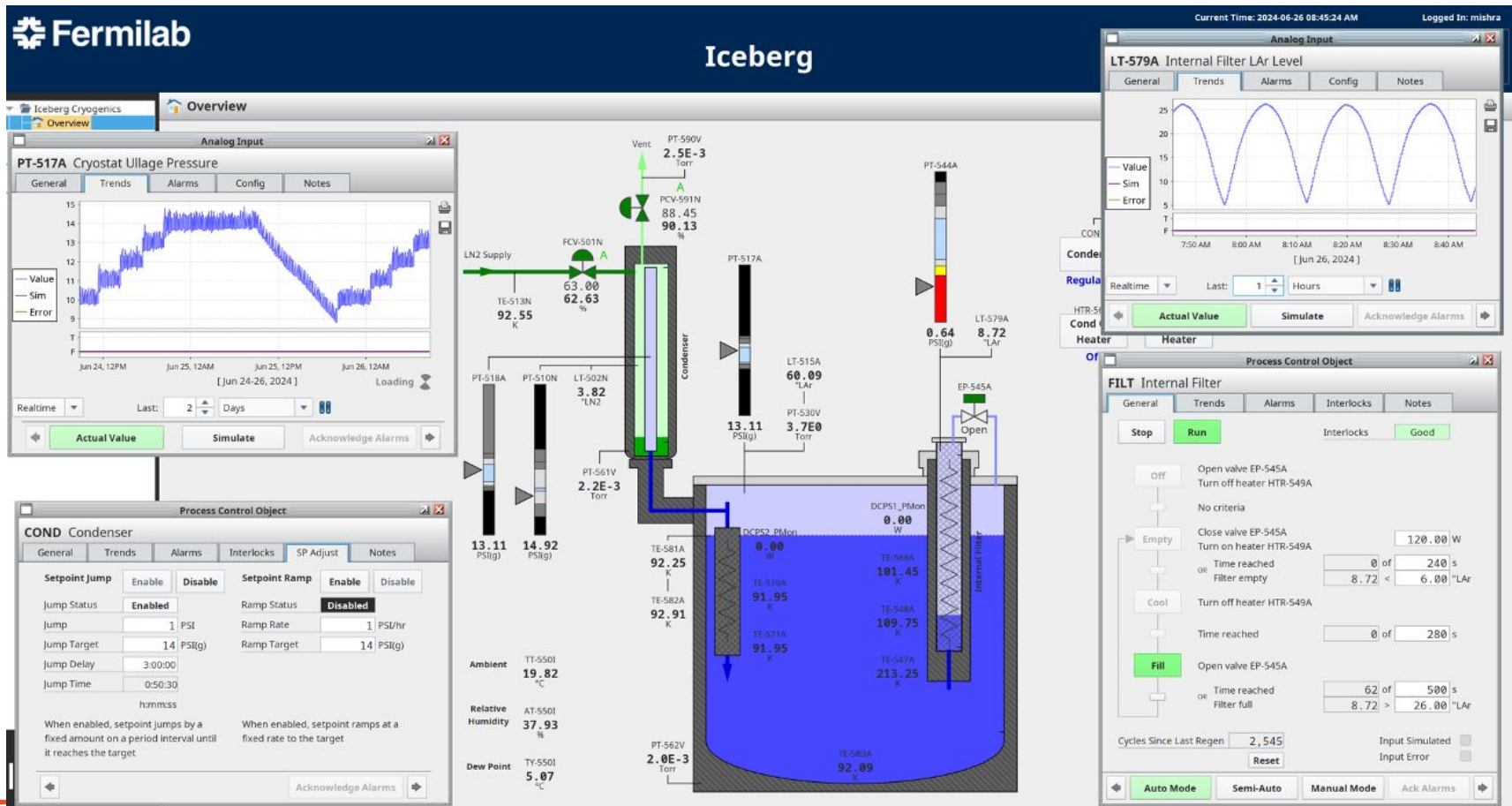
ICEBERG at PAB

ICEBERG has a TPC with smaller APAs

- 3 WIBs and 10FEMBs
 - 4/4/2
- Available triggers:
 - Timing Logic Unit
 - Cosmic Ray paddles
 - (no beam)
- Used to characterize cold electronics and opportunisitically by the DAQ
- Now in/completing Run 9



ICEBERG at PAB



Ignition screenshot from S. Mishra



Computing setup

3 servers:

- iceberg03.fnal.gov
 - **Ethernet readout**
 - PowerEdge R750 Server (210-AYCG)
 - 356 (8x32GB) RDIMM, 3200MT/s, Dual Rank 16Gb BASE x8 (370-AGDS)
 - 2xIntel Xeon Gold 5317 3G, 12C/24T, 11.2GT/s, 18M Cache
 - NVIDIA Ampere A100
- iceberg01.fnal.gov
 - **FELIX readout for DAPHNE v2**
 - **Pocket**
 - **Slow Controls (EPICs)**
 - Intel Xeon 4216 16-Core 2.10GHz 22MB
 - 192GB DDR
 - 2xIntel 665p 2 TB Solid State Drive - M.2 2280 Internal - PCI Express NVMe
 - RAID10
 - FELIX readout BNL-712
- protodune-daq02.fnal.gov
 - Old 35T server

Run Plan and goals- From S. Mishra

1. Measure Individual Channel Linearity (INL) using pulser data.
2. Determine the precision of individual channel gain (LArASIC + ColdADC; e-/LSB) using pulser data.
3. Measure and decide the optimal gain setting: 14 mV/fC or 7.8 mV/fC
4. Determine optimal baseline for collection plane: 200+ mV
5. Study shaping time effect on ENC (1 μ sec vs 2 μ sec)
6. Measure cross talks.
7. Determine optimal ColdADC Vref settings.
8. Learn to use particle interaction in LAr to determine absolute calibration of the TPC + Electronics response (MeV/LSB-tick)
 1. MIP dE/dX
 2. Michel electrons
 3. Ar-39
9. DUNE-FD2-PD: Integration of DAPHNE-V3 in Ethernet DUNE-DAQ

<https://indico.fnal.gov/event/65338/> fro June 26 ICBERG Commissioning meeting

Tales from the deployment: expert parameters

- Types of runs configured:
 - Cosmic
 - LArASIC
 - All channels
 - Individual channels (for crosstalk detection)
 - WIB Pulser
 - More precise pulse control
 - Pulser runs use HSI periodic trigger
- These parameters weren't adjustable by the config generation scripts
- A set of pre and post config generation scripts were used to adjust parameters needed for the studies

Tales from the deployment: WIB Pulser

- Problems configuring WIB pulser, adjustments had no effect
 - Bug was identified in wib_server, parameters could only be changed for NP04 detector(s), fix to be implemented

Tales from the deployment - more

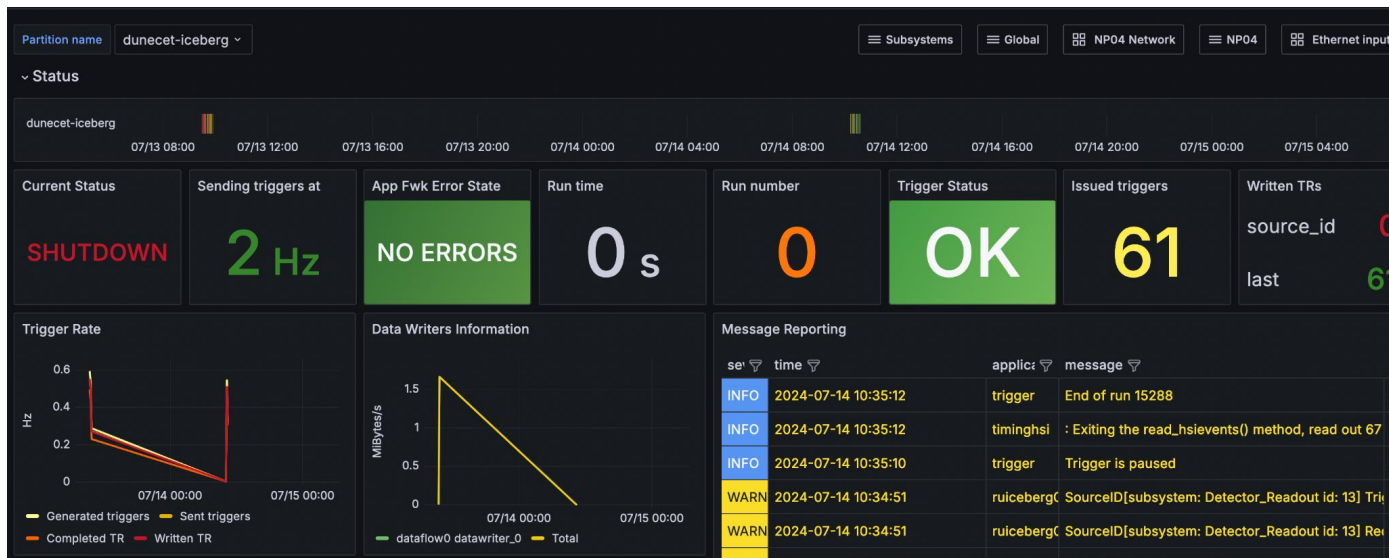
- V4.4.2 → v4.4.3
- Initially 4.4.2
- missing/inconsistent data
- Shekhar magic shutdown
- Disable irqbalance service, implement cpu pinning
- 3 forms of running: cosmics, pulser, wibpulser
- tc_type_name discussions
 - “kDTSCosmic”, “kDTSPulser”
 - offline_data_stream: “cosmics”, “calibration”
 - → v4.4.3

Data transfer

- Metadata creation script given to Shekhar, data is being duplicated to other disks, to be done

Pocket

- Pocket and daq-kube deployed without issue on iceberg01.fnal.gov
- Some manual edits to the np04-specific configs for kafka



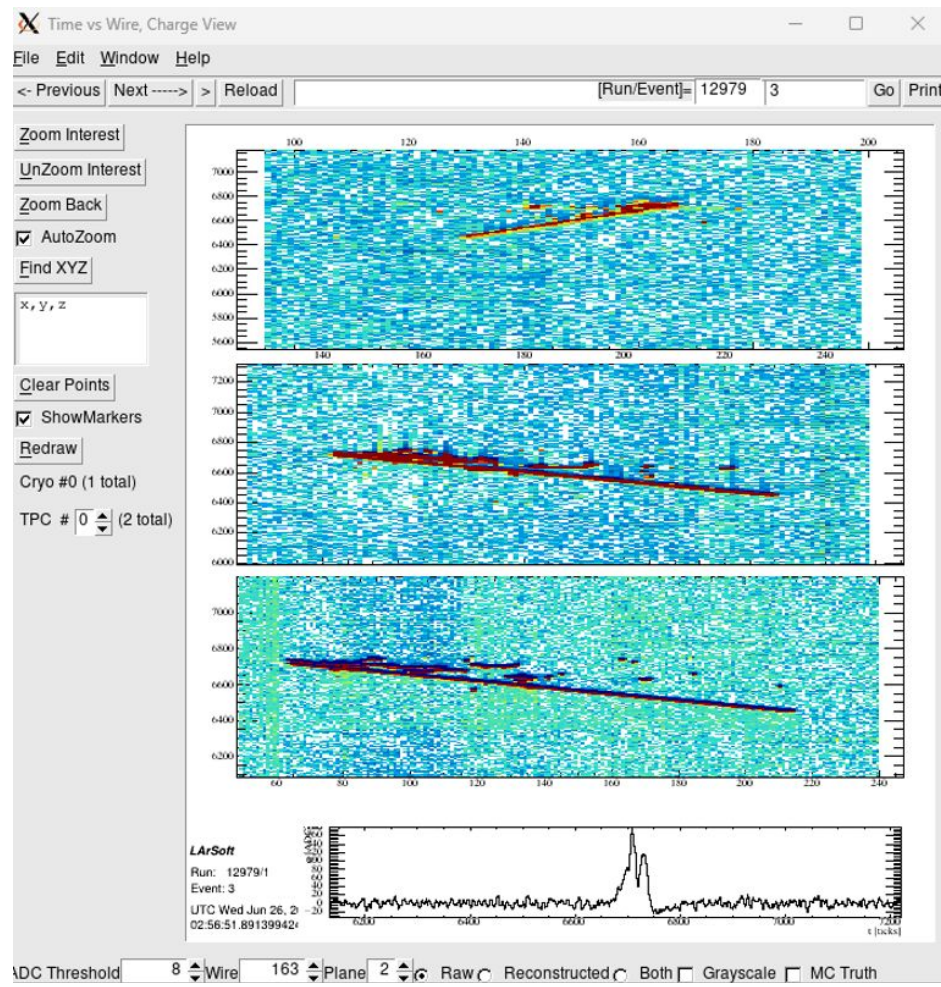
justintime

- Deployed justintime on iceberg01.fnal.gov with a copy of .hdf5 files on local NVMe disk
- Works out of the box for a basic sanity check, but additional plots are being generated separately using DUNEsw using SL7 container

runservices

- Currently using a simple script to generate run number and relying on configs saved on the file system
- Bonnie working on getting runregistry and runnumber microservices running in with Postgres for the ICEBERG environment

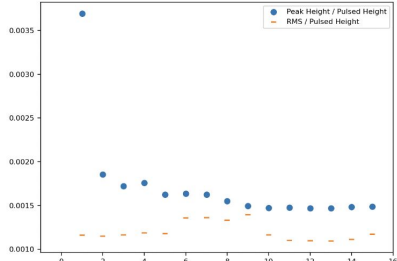
ICEBERG: Cosmic Track



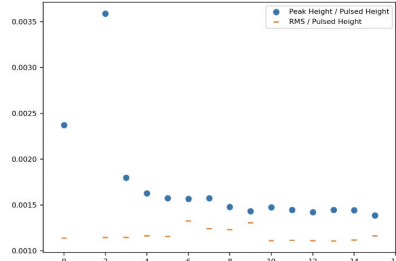
Plots from Slack

Cross-Talk Plots

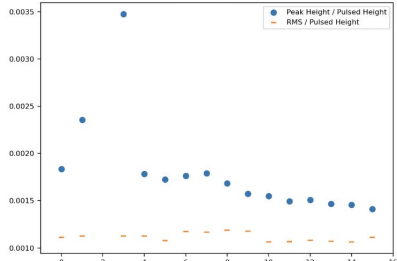
Pulse Ch. 0



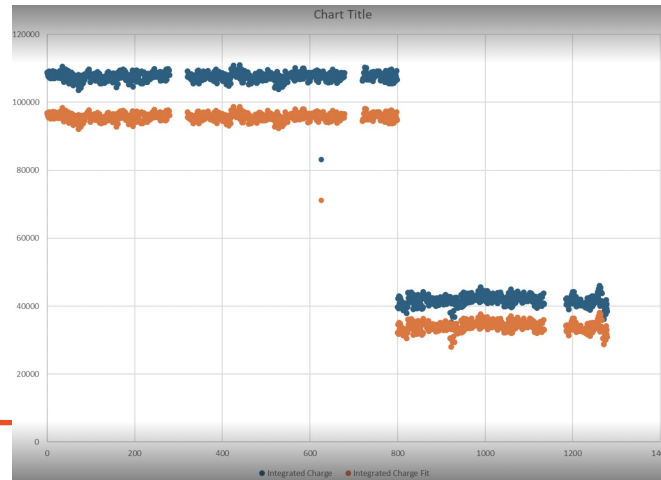
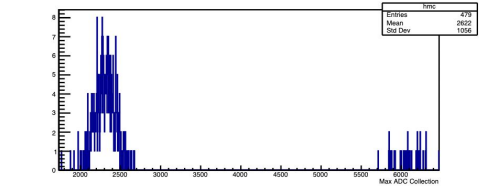
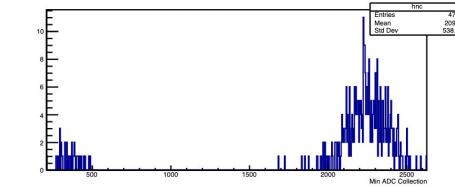
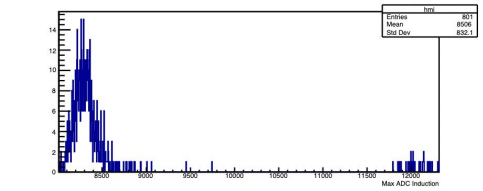
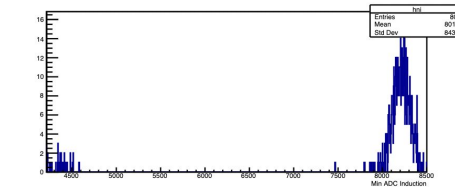
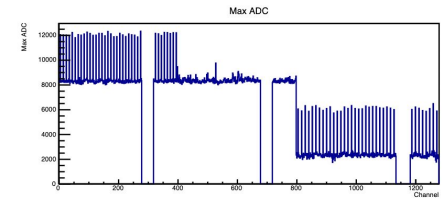
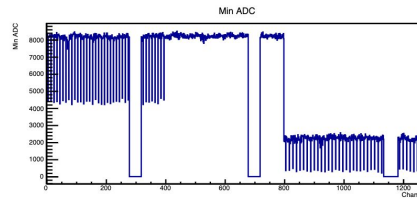
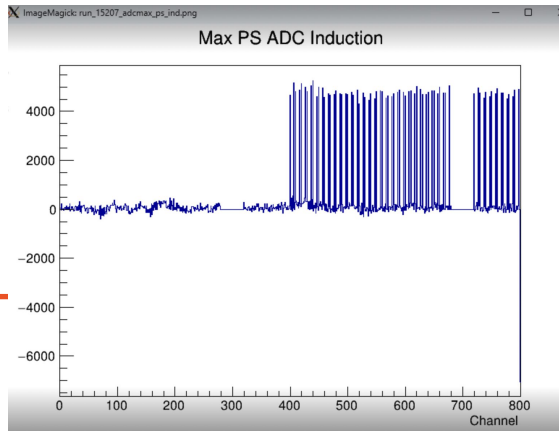
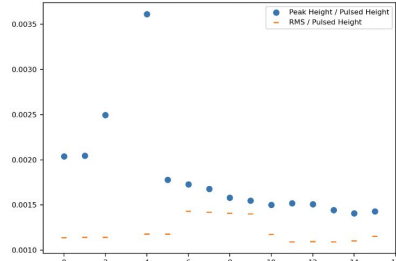
Pulse Ch. 1



Pulse Ch. 2



Pulse Ch. 3

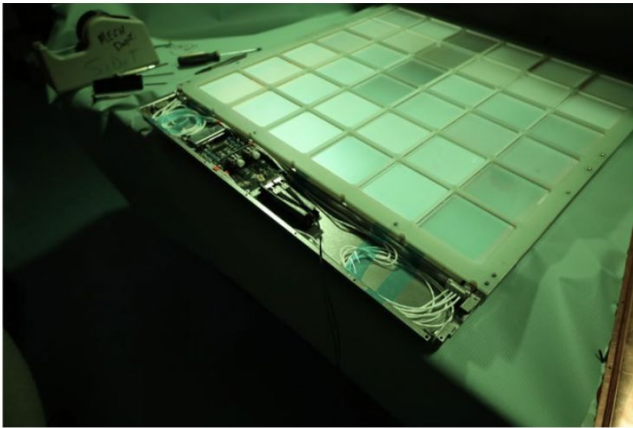


DAPHNE v2 with FELIX

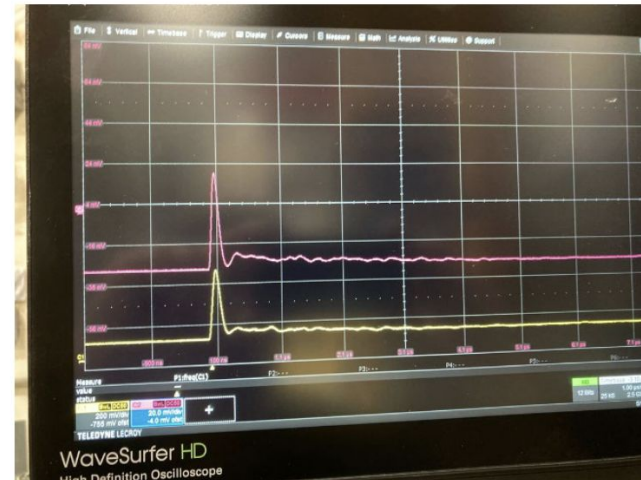
- Spy buffer data has been taken and analyzed
- Adventures connecting DAPHNE MTP-12 vs MTP-24
- Kernel module things
 - 5.14.0-284.25.1.el9_2.x86_64 works with patches from NP04
 - Have not succeeded in loading the kernel on 362 or beyond, freezing iceberg01 kernel
 - Known issue from ATLAS
- Now getting data with FELIX and DUNE-DAQ

Future plans

DUNE-FD2-PD: Integration of DAPHNE-V3 in Ethernet DUNE-DAQ



X-ARAPUCA Under the ICEBERG TPC



Detector is powered using PoF
Photon Signal from the detector.

PD Trigger

- CE has requested DAPHNE to HSI trigger
- DAQ says this is a good effort if driven by CE (?)

Trigger Primitive Generation

- Address after run 9

Other proposals and work in ICEBERG

- In-network compute with smart switches
- AI/ML work with nvidia
 - Some info here
<https://indico.fnal.gov/event/65032/contributions/293465/attachments/178634/243518/ICEBERG%7BStatus%20and%20Plan%20%28June%205%202024%29.pdf>
 -
 - Porting DUNE-DAQ to nvidia GH100 (ARM)?
 - Really means better understanding of the software system, performance, and plan

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