

# Data Quality Monitoring Thoughts for 2x2 MINERvA

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ND-LAr Workshop, Bern  
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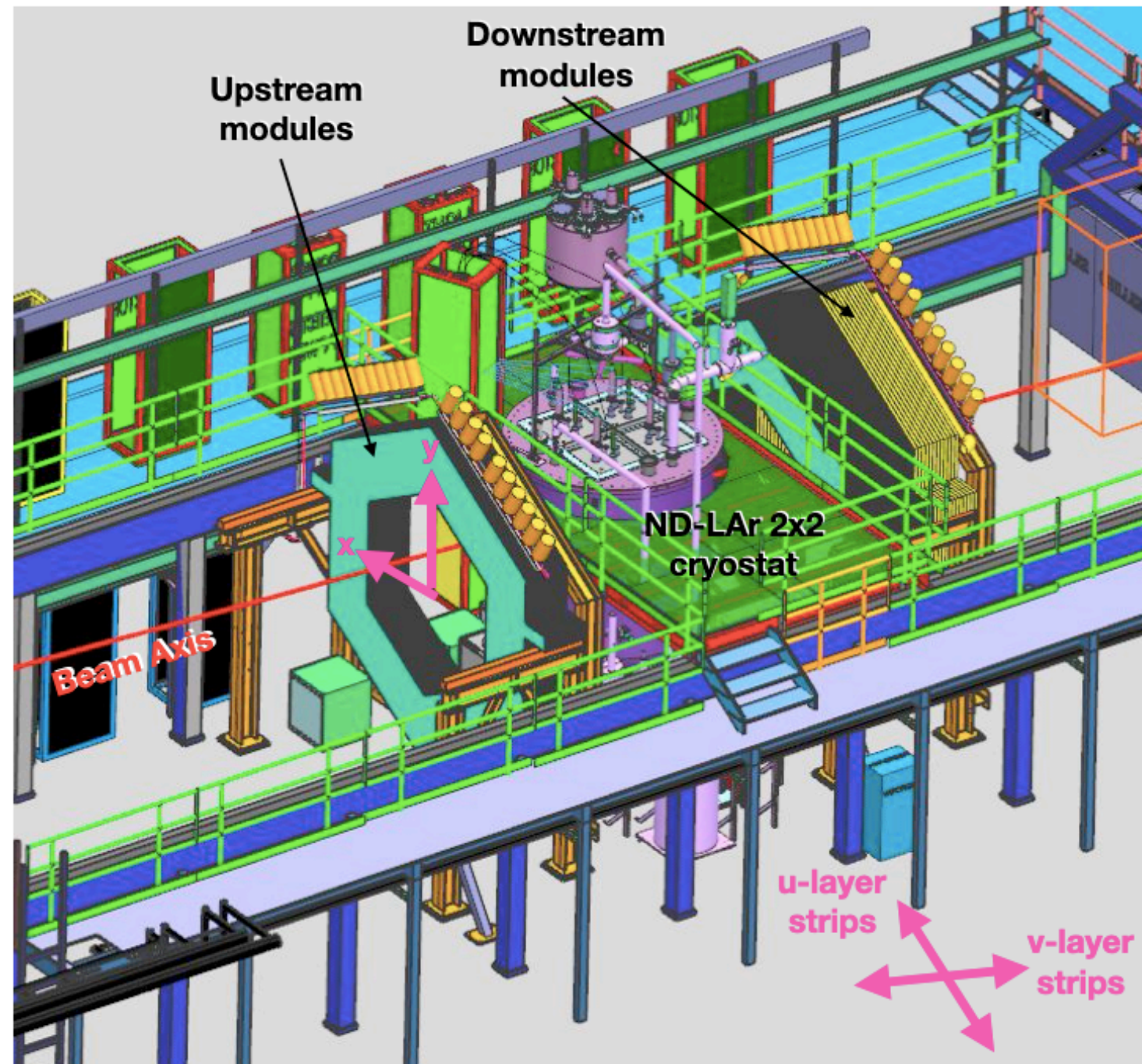
# Some Caveats

- I'm not a MINERvA collaborator
- But have been trying to compile some info about the 2x2 MINERvA configuration for an expert handbook <https://www.overleaf.com/read/dtxtrpywkspp>
- In this talk will try to summarize the MINERvA data quality monitoring and what remains of it
- Thanks to Debbie Harris and Howard Budd for useful discussions about MINERvA monitoring

# 2x2 MINERvA Detector

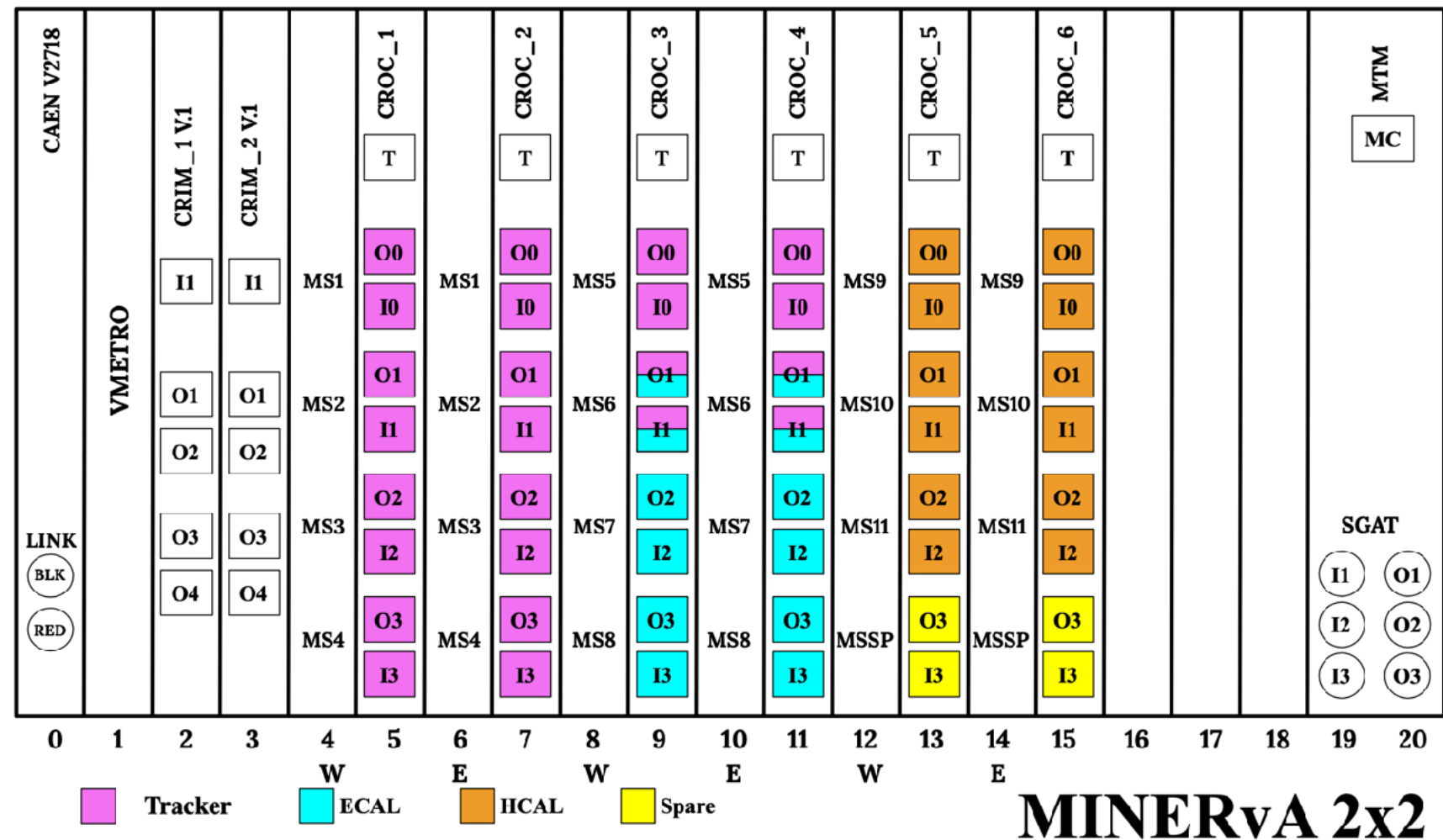
# 2x2 MINERvA Layout

- 44 modules with a total of 76 scintillator planes
- 12 **upstream tracker** modules, each composed of two scintillator planes (UX or VX)
- 10 **downstream tracker** modules, each composed of two scintillator planes (UX or VX)
- 10 **downstream ECAL** modules, each composed of two scintillator planes (UX or VX) and two lead layers
- 12 **downstream HCAL** modules, each composed of one scintillator plane and one steel plate



# 2x2 MINERvA Electronics

- Fibers from four modules are grouped into modules sets, which are read out by **64-pixel PMTs**.
- Each PMT has a front-end board (FEB).
- FEBs for each module set are read out a **chain of up to 10 FEBs**, with one East side chain and one West side chain per module set.
- Up to four module set chains are read out by a **CROCE** board.
- For 2x2 MINERvA there is **one VME crate** that has six CROCE boards. (The full MINERvA had two crates.)



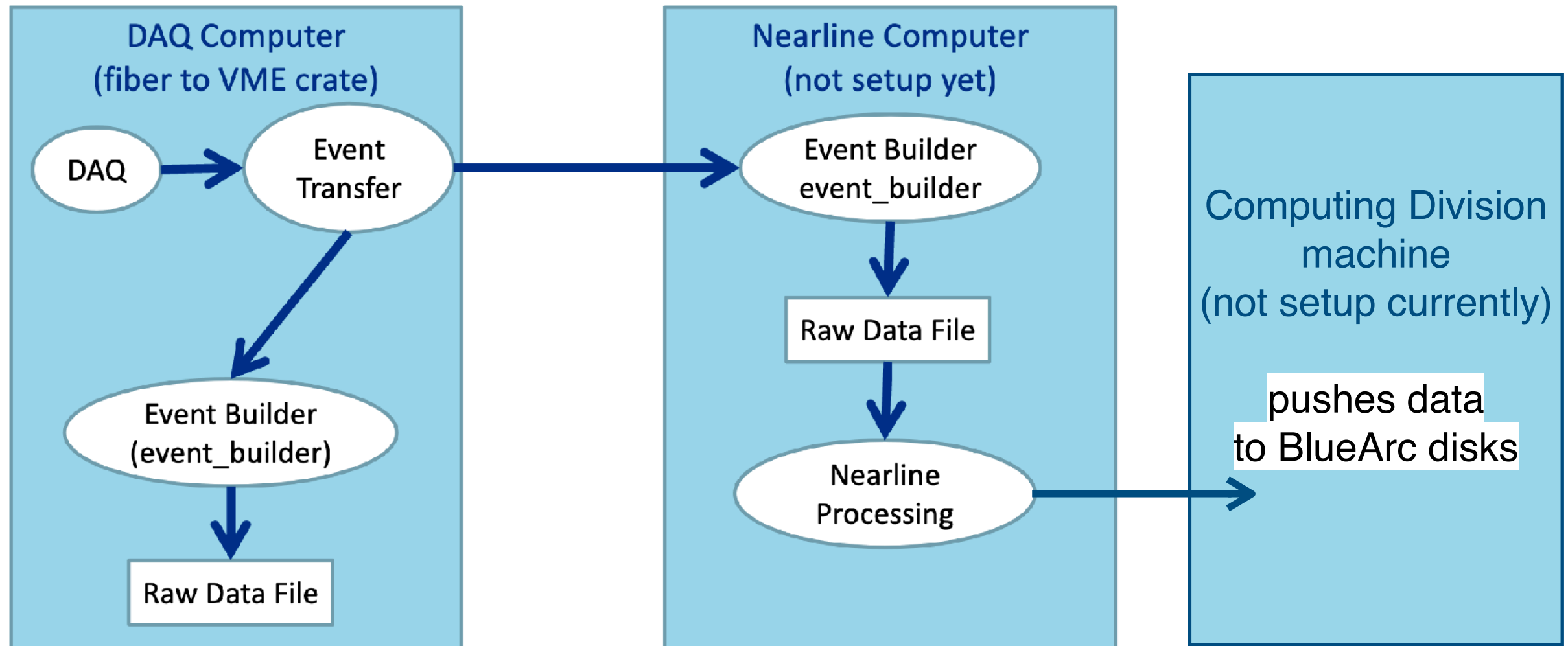


# Current Status of Data Taking

- Have local data collection on an underground DAQ computer.
- Currently **don't have the plex** defined to convert electronics hits (crate/croc/board/channel) to detector hits (module/strip). (Might still have software to prepare this?)
- Have original HV setting for each PMT from MINERvA and currently using those.
- Don't have reconstruction yet.

# MINERvA Nearline Monitoring

## Data Flow Overview



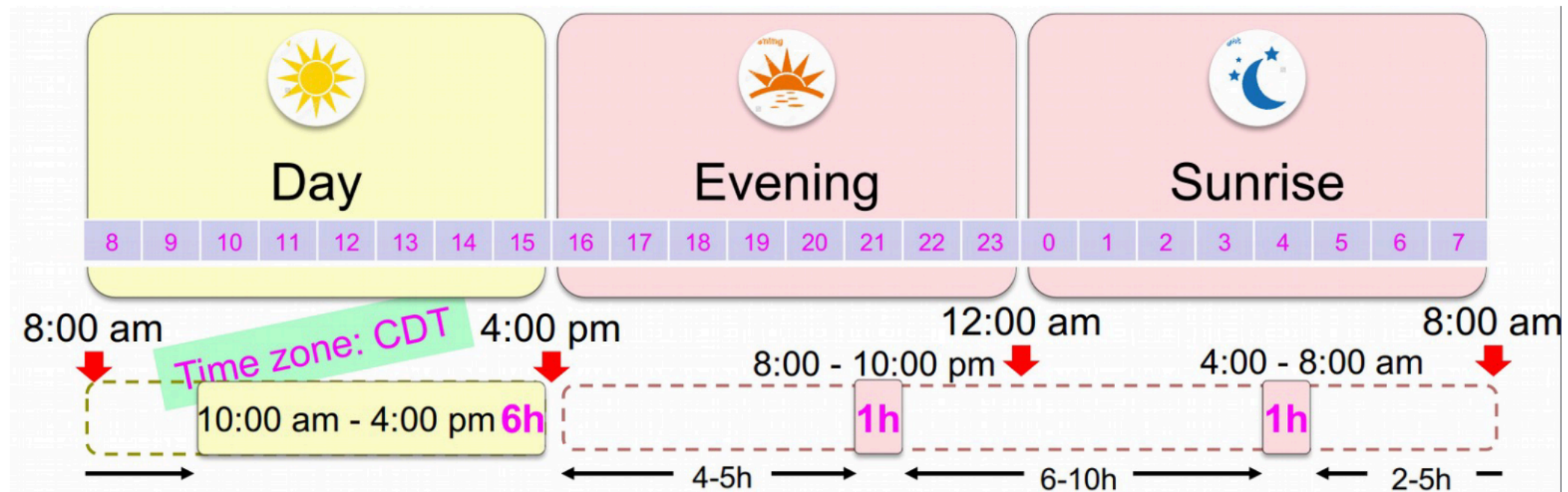
- Modified from G. Savage, DUNE-doc-27149. EventTransfer Is a J-Lab product.
- Nearline machine currently in lab F at FNAL running SLF6, so needs an update.

# **MINERvA Detector Monitoring for the Full MINERvA Detector**



# MINERvA shift Structure

- Starting in 2017, one “expert” day shift one site, remote shifts in evening and night that involved monitoring detector for one hour in middle of shift
- If DAQ crashed during beam, DAQ expert was paged automatically. But this didn’t catch all issues.
- Presumably for 2x2 demonstrator we will have continuous shifts



- Image from minerva-doc-21415

# MINERvA Shift Tasks

- Detailed MINERvA shift instructions at [https://cdcvcs.fnal.gov/redmine/projects/minerva-ops/wiki/Minerva\\_Shift/](https://cdcvcs.fnal.gov/redmine/projects/minerva-ops/wiki/Minerva_Shift/). Also minerva-doc-21415
- Shift responsibilities (will discuss these more in next few slides)
  - Check that DAQ is running in the **run control**.
  - Check the run information in the **echecklist**.
  - Look at **shift summary plots** for every run.
  - Monitor **event display**.
  - **Monitor rock muons** daily.
  - Monitor veto wall. (doesn't apply anymore)
  - MINOS monitoring. (doesn't apply anymore)
  - Note any issues in the **elog**.

MINERvA run control interface showing status and control options.

Connection: **Connected** to: mnvonline06.fnal.gov

Control: **In control**

Start

Skip to next subrun

Stop

Status: **Configuration**

Data acquisition: **RUNNING**

Run: **26137**

Series:


Subrun	# gates	Configuration
6	1500	Mixed beam/LI
7	1500	Mixed beam/LI
8	1500	Mixed beam/LI
9	1500	Mixed beam/LI
10	1500	Mixed beam/LI
11	700	NuMI beam
12	700	NuMI beam
13	700	NuMI beam
14	700	NuMI beam
15	700	NuMI beam
16	700	NuMI beam
17	700	NuMI beam
18	700	NuMI beam
19	700	NuMI beam

Hardware: local node, monitor node

Status summary: Run: **26137**, Subrun: **18**, Last trigger, number: 26137/18 112, type: NuMI, time (CST): 16:31:34, Running

# Run Control, Elog, and eChecklist

- **Run control** software is running now and has been used for the re-installation and checkout
- **Elog:** So far have been using the ArgonCube2x2 one during installation (<https://dbweb8.fnal.gov:8443/ECL/argoncube/>). Keep using it.
- **eChecklist:** Was on mnv-cr-02 machine that doesn't exist anymore. Unclear where this code might be stored, but on acd-srv03 I do see a directory in ~/cmtuser/Minerva\_v10r9p1\_v95/Tools/ControlRoomTools that might have some code for it



Date (yyyy-mm-dd)	Time (hh:mm:ss)	Run	Sub Run	Run Type	Num. Gates	DAQ Status	Auto Data Qual.	DST Status	Manual Data Qual.
2018-12-06	16:28:48	26137	18	numib	700	Current	-	Waiting	-
2018-12-06	16:13:01	26137	17	numib	700	Finalizing	-	Processing	-
2018-12-06	15:57:13	26137	16	numib	700	Finished	Good	Processing	-
2018-12-06	15:41:25	26137	15	numib	700	Finished	Good	Finished	Check me
2018-12-06	15:25:39	26137	14	numib	700	Finished	Good	Finished	Check me
2018-12-06	15:09:51	26137	13	numib	700	Finished	Good	Finished	Check me
2018-12-06	14:54:03	26137	12	numib	700	Finished	Good	Finished	Check me
2018-12-06	14:38:15	26137	11	numib	700	Finished	Good	Finished	Good
2018-12-06	14:20:42	26137	10	numil	1500	Finished	Good	Finished	Good
2018-12-06	14:03:28	26137	9	numil	1500	Finished	Good	Finished	Good
2018-12-06	13:46:20	26137	8	numil	1500	Finished	Good	Finished	Good
2018-12-06	13:28:47	26137	7	numil	1500	Finished	Good	Finished	Good
2018-12-06	13:11:26	26137	6	numil	1500	Finished	Good	Finished	Good
2018-12-06	12:52:35	26137	5	numil	1500	Finished	Good	Finished	Good
2018-12-06	12:33:41	26137	4	numil	1500	Finished	Good	Finished	Good
2018-12-06	12:14:49	26137	3	numil	1500	Finished	Good	Finished	Good
2018-12-06	11:55:57	26137	2	numil	1500	Finished	Good	Finished	Good

# Online Monitoring

- Still seems to be running at <https://minerva-exp.fnal.gov/shift/gmbrowser.html>?



## MINERvA Shift



Pager: Expert Shifter - 630-996-0092, SOS - 630-255-4094. Click for More Info.

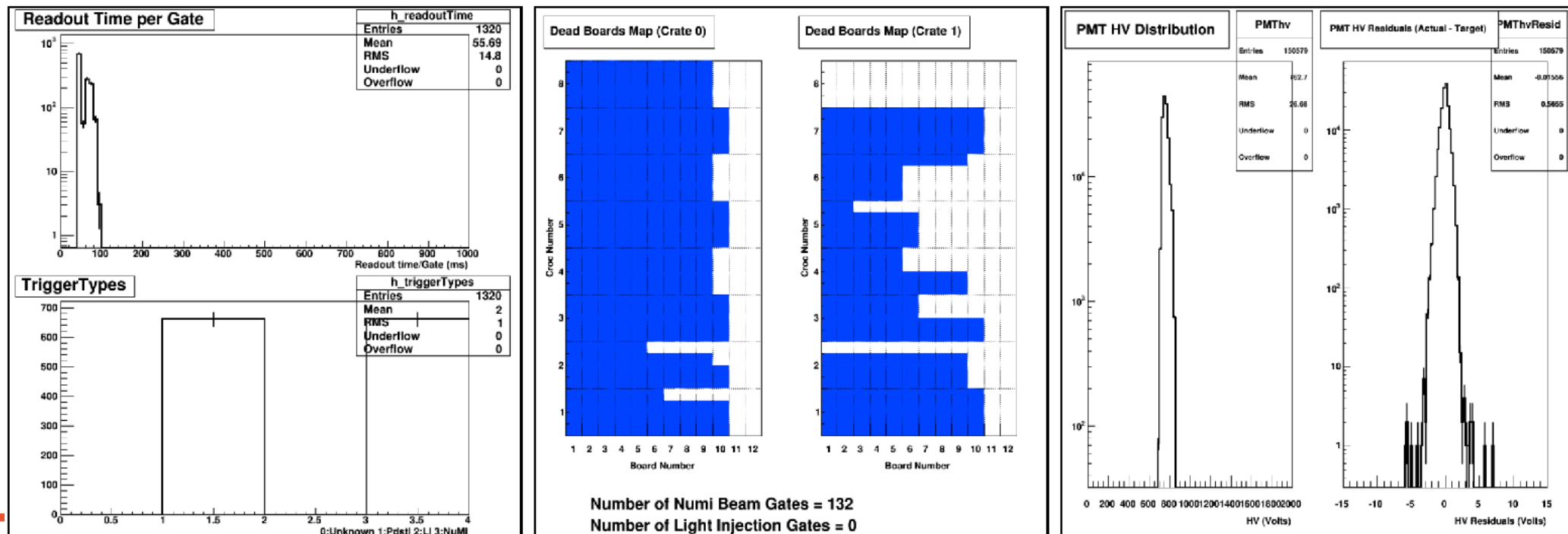
Thu, Jan 12, 2023 12:47:22 (update ~every 10s)

HOME RunControl GMBrowser MINOS VetoHV LIVE ShiftSummary  
Links ECL Chat Wiki echecklist Calendar NuMI Arachne Misc. CAM-E CAM-U

GMBrowser Cycle

DAQ Detector Beam Related Veto Numib NHits Numib AvgQhi Linjc NHits Linjc AvgQhi Pdctl NHits Pdctl AvgQhi

### DAQ and Detector Status



# GMBrowser

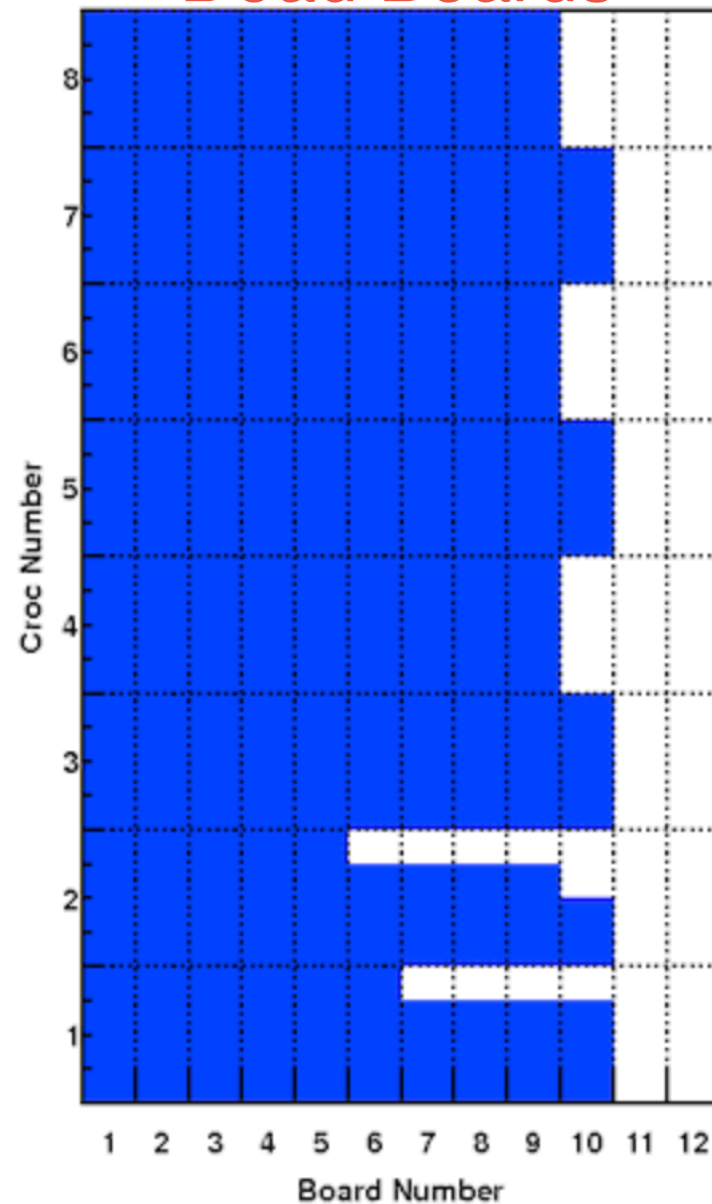
- According to [https://cdcv.s.fnal.gov/redmine/projects/minerva-ops/wiki/Nearline\\_Overview](https://cdcv.s.fnal.gov/redmine/projects/minerva-ops/wiki/Nearline_Overview) MINERvA used **GMBrowser** from DZero to view histograms of data
- Really nice page at [https://cdcv.s.fnal.gov/redmine/projects/minerva-ops/wiki/Interpreting\\_the\\_Online\\_Monitoring\\_Plots](https://cdcv.s.fnal.gov/redmine/projects/minerva-ops/wiki/Interpreting_the_Online_Monitoring_Plots) that lists all of the plots and what to look for
- Do we still have code to make the histograms? Looks like maybe in Tools/ControlRoomTools. It will need to be modified for the current layout



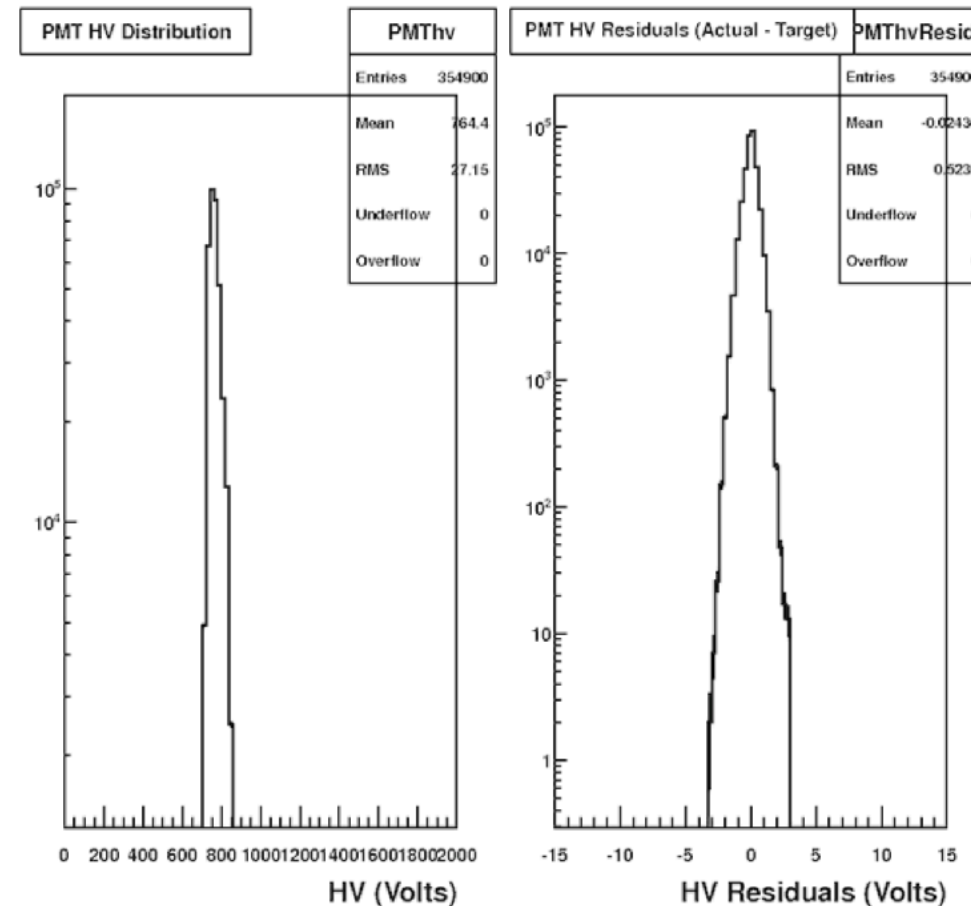
# Examples of Online Monitoring Plots

Dead Boards Map (Crate 0)

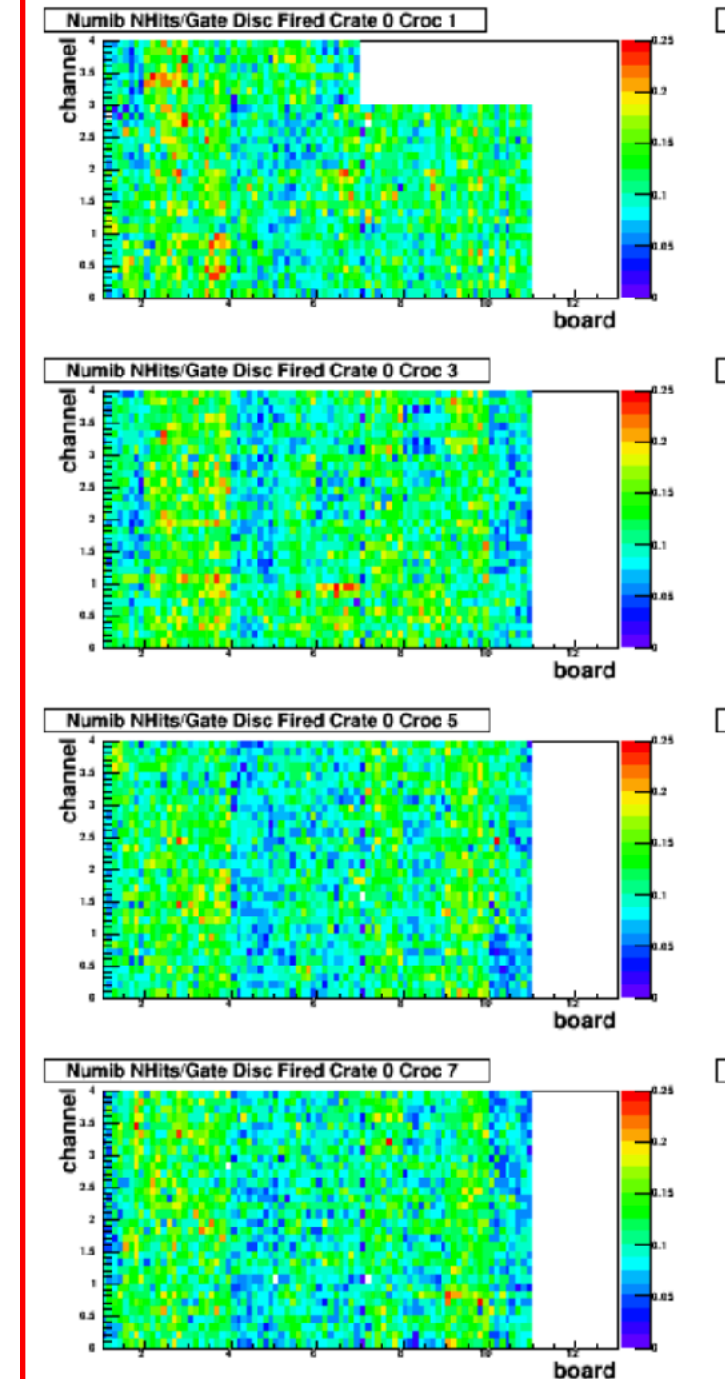
Dead Boards



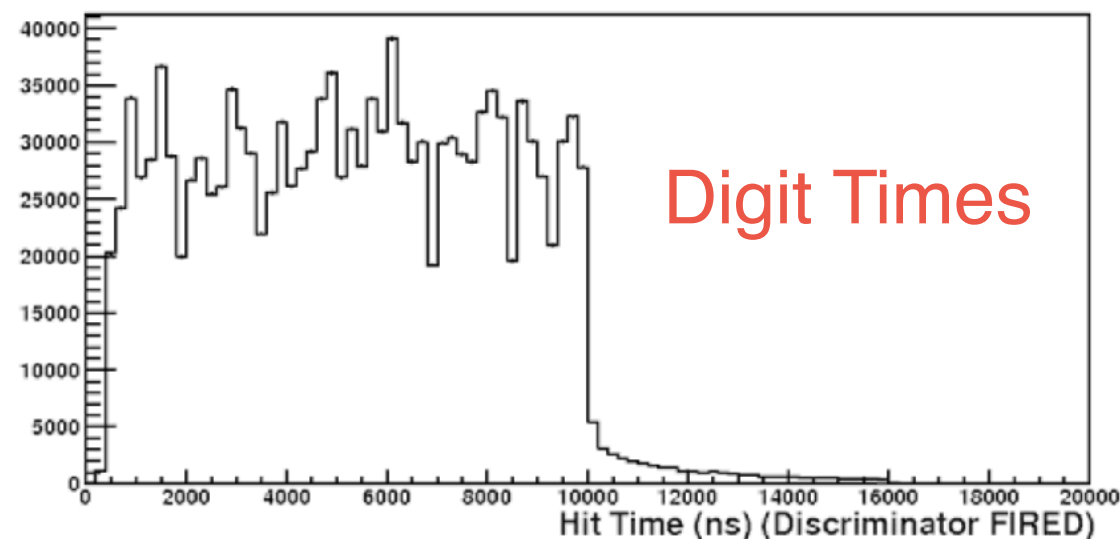
HV



Hit Maps



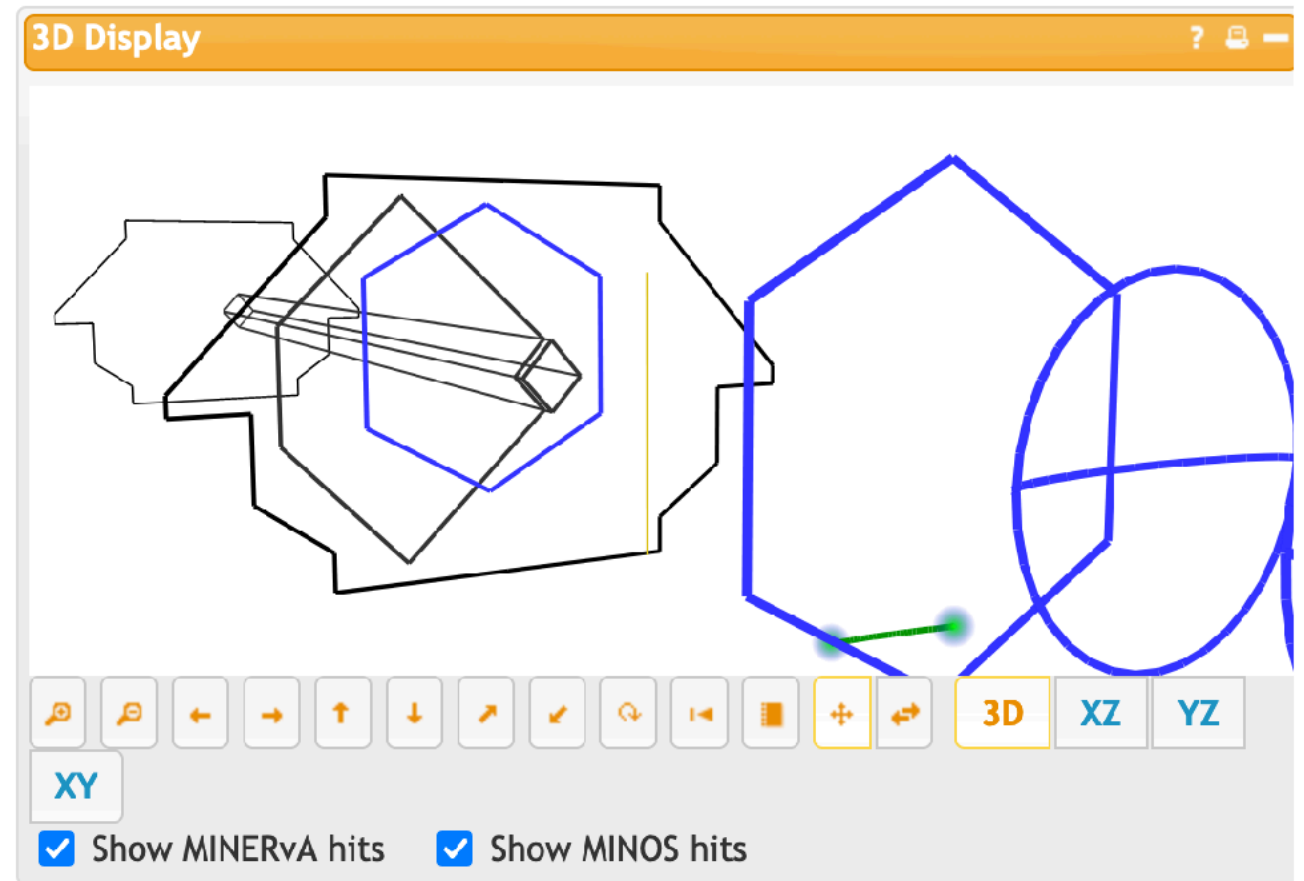
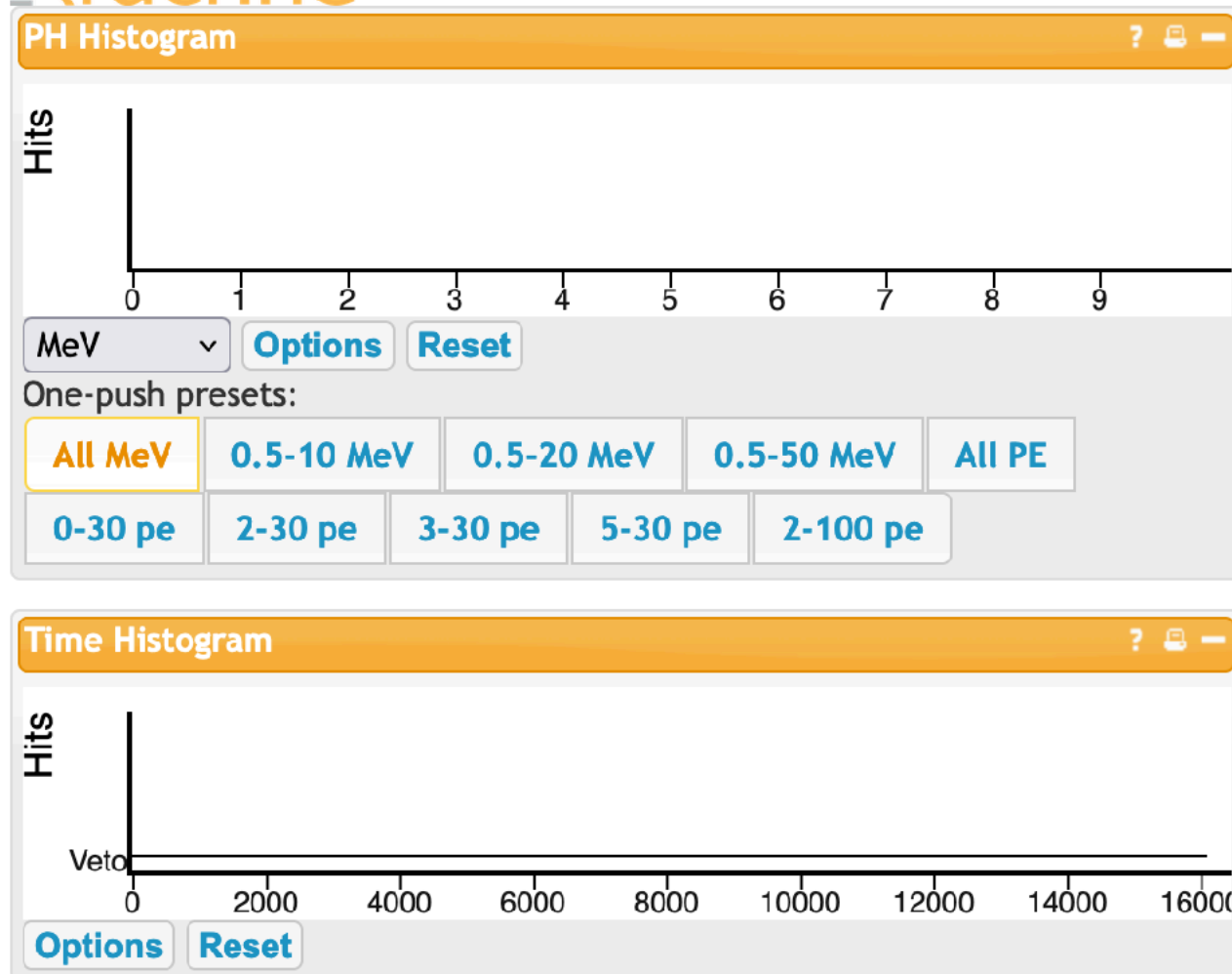
Digit Times for all Events





# Event Display

Arachne



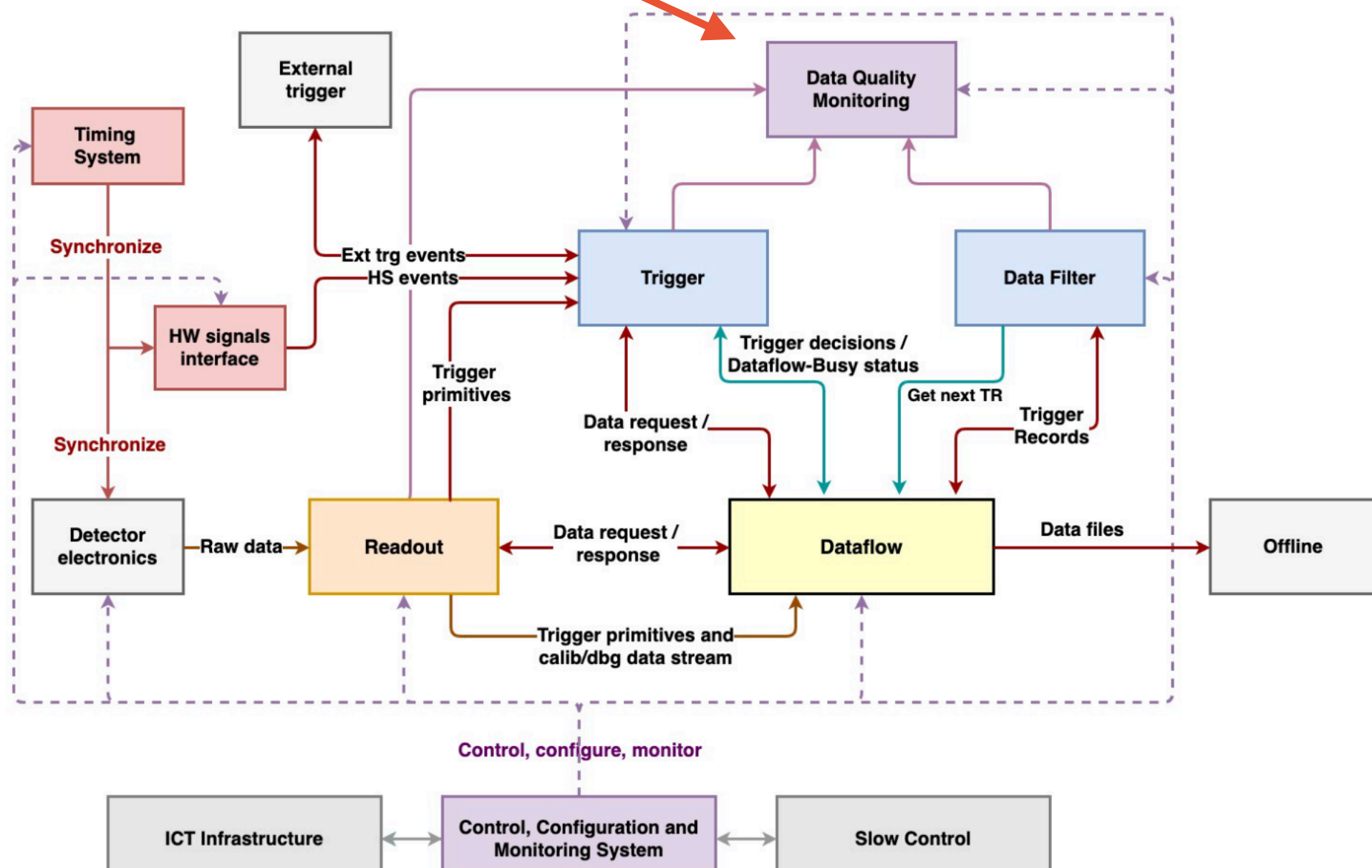
- Expert on the MINERvA event display has left the field and it hasn't been supported for a while.
- Could be useful to have a **simple root one** soon to check that the plex looks correct and check that LI events are not mixed into beam events, etc.
- Perhaps a combined ArgonCube+MINERvA one would be more useful eventually?

# Rock Muon monitoring

- Was a separate script for this I think. Haven't found any code for it so far. (Maybe Chris knows more?)
- Used some reconstructed information, which we don't have right now
- **Important for checking MINOS+MINERvA timing**, so likely need to redevelop something like this to monitor ArgonCube + MINERvA timing.
- Was also useful to provide info about NuMI beamline
  - What NuMI **beamline monitoring** do we need to do? What is NOvA doing?
  - There is a functional NuMI monitoring page with the muon alcoves, etc. at <https://dbweb9.fnal.gov:8443/ifbeam/bmon/numimon/Display>

# Three Approaches for Data Quality Monitoring

- Rebuild existing MINERvA nearline monitoring including GMBrowser
- Or is ArgonCube using something to view histos that we should use instead?
- Use **DUNE DAQ** monitoring? Planned, but not ready yet



# Proposed Action Items

- In short term try to get as much of the existing MINERvA data quality monitoring running
  - Develop a plex for the 2x2 layout
  - Setup a nearline machine (maybe lab F one?)
  - Set up long term data storage?
  - Try to resume processes to transfer data to storage, produce data quality histos (with some modifications eventually)
  - Setup a control room computer and try to start viewing plots with GMBrowser and see if eChecklist software can be revived
- In longer term develop an event display and rock muon monitoring plots?

