SBND Operations Report

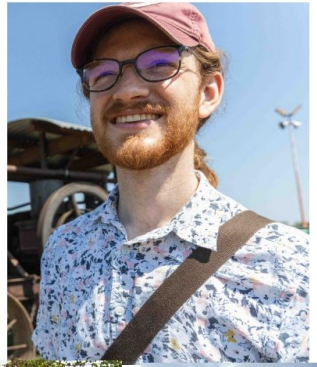
SBND Operations: **Erin Yandel**, Gray Putnam, Monica Nunes, Thomas Wester

Proton PMG Meeting

October 3, 2024

New RunCos

- Have moved most day-to-day operations from the commissioning team over to the operations team (RunCos + Operations Coordinator)
- October 1st was the RunCo term changeover
- Thomas has finished his term
- I (Erin) have now moved from deputy to RunCo
- Gray has joined the team as the new deputy
- Next changeover will happen January 1st



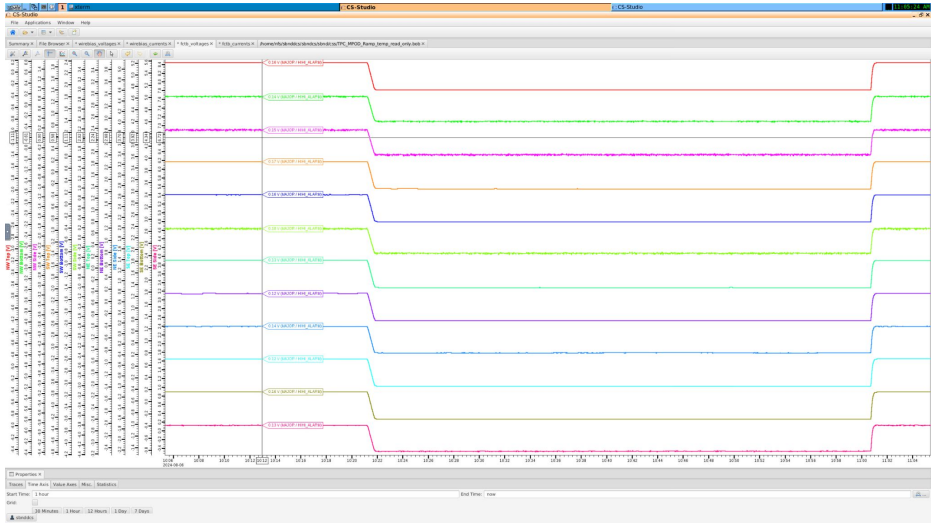
Power Outages

- On August 3rd at ~10:30pm, we experienced an unexpected power outage caused by a fire at the Kautz Road sub-station
- Shifter called run coordinator: operations personnel (Ops. lead, run coordinators, commissioning coordinators) all alerted within ~30 minutes.
- Erin was within driving distance & arrived at ND within an hour.
- Card readers were working but door was not unlocking, so security had to be called to provide physical key to ND
- Systems that were on, which suddenly lost power:
  - Cathode at 100 kV
  - TPC cold electronics
  - 109 PMTs
  - Wire biases
  - CRTs
  - PTB, NTB, readout electronics, DAQ servers
- The next day systems were brought back up and the TPC and PMT HV were ramped back up later that week

The fire on Saturday night (taken by the Fermilab Fire Chief) →

Power Outages

- We have now had 4 more power outages since this unexpected one, including an all day one yesterday
- The first was on August 23rd, we were given ~1.5 hours warning and managed to rapidly ramp down all systems and restore things over the weekend
- The next three we were given more warning and have been able to turn off and recover our systems well every time
  - Have not always had enough time in between to fully ramp up the TPC and PMTs but the ramp has gone smoothly when we have
- HV instabilities have not reoccured for any ramps and field cage remains electrically connected

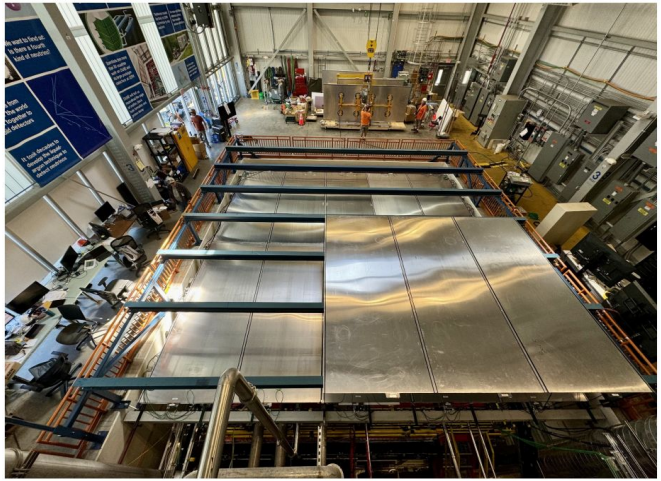


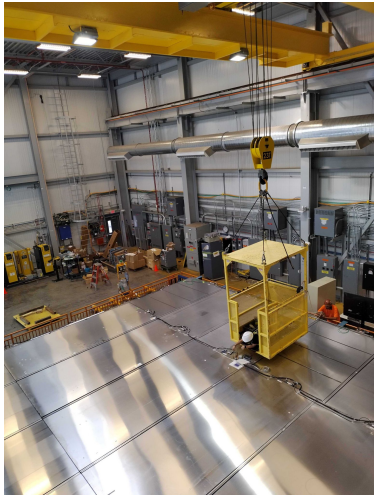
Field cages showing proper responses before a ramp up, no signs of disconnection

Installation

- CRT is fully installed!
- Last wall (top high) finished installation and received ORC approval to operate on September 23rd. We've been running with the full CRT ever since (with the exception of some West Wall issues, see next slide).
- Only remaining "installation" tasks are for the X-Arapucas, which are not essentially for physics running. They are just waiting for some amplifier boards to arrive to finish installation and testing of the readout electronics.

CRT	Working	Installed
Bottom	✓	✓
North	✓	✓
East	✓	✓
West	✓	✓
South	✓	✓
Top (lower)	✓	✓
Top (upper)	✓	✓





CRT West Wall Power Issues

- CRT West Wall power has been a bit finicky
- Often a one or two boards would not turn on properly
  - They would *look* on but when we tried to talk to them with the DAQ in any way they would either appear disconnected or would connect but send no data
- Would often take multiple power cycles before all modules came back up ok
  - We didn't feel comfortable power cycling too many times in a row and so would sometimes leave it off and out of running if too many cycles were needed
- After a lot of effort by the CRT team, finally tracked down a problem FEB and replaced it last week. Wall has been up and stable ever since.

Cryo Issue

- On Thursday, September 19th at 2:06AM, the individual independent PLC systems started reporting heartbeat errors (Det_Util Heartbeat Stale Data), after which communication from the PLC's to ignition ceased
  - This means Cryo Engineers were unable to control equipment and instrumentation through the Ignition program
- We were asked to ramp everything down while the Cryo Engineers figured out what the issue was and reestablished controls
  - Lined up with power outages in such a way that we lost a week or two of data-taking time
- Power cycling resolved the issue for a bit but communication was still unstable, the issue was eventually tracked to a new Fermi PCL version that contained unoptimized code
- A Hotfix patch was made and things are stable now

	Fermi PCL Version					
	2.5.0	**2.4.0**	**2.4.1**	**2.4.2**	**2.5.0**	**2.5.1**
Real-Time CPU Usage	**80%**	60%	65%-70%	65%-70%	**80-85%**	60%-65%
CPU Exceed rate	~1 every 5s	Stable	Stable	Stable	~1 every 5s	Stable
PLC Task Usage	7000µS	4600µS	4700µS	4700µS	7200µS	4700µS
Task Exceed rate	~1 every 10s	Stable	Stable	Stable	~1 every 10s	Stable

The updated FermiPCL library that was installed the week of September 9th

Previous versions of FermiPCL

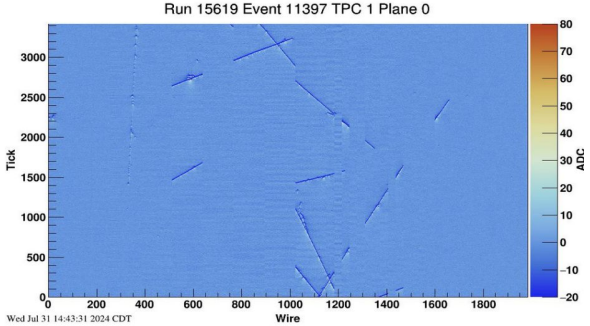
The tested Hotfix version of the updated Library

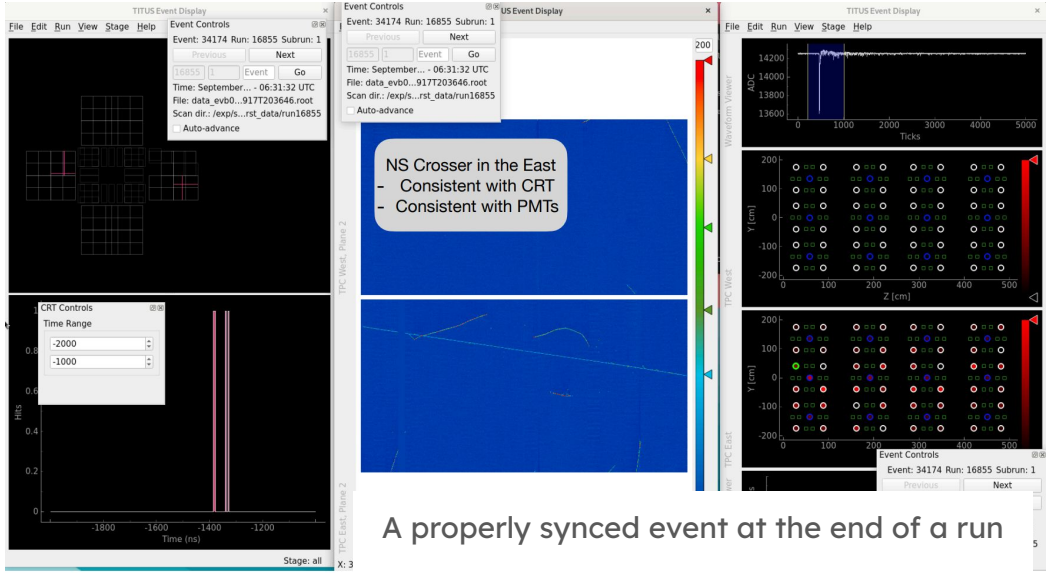
“Choppy Events” Fixed

- The trigger propagation from NTB to the TPC FEMs failed when external triggers to the NTB fell on (or close to) the TPC readout frame boundary.
  - Sometimes the trigger propagation (for NTB event N) failed for SOME of the FEMs, in which case the TPCs would send data for NTB trigger N+1 for some of the FEMs, and trigger N for the rest of them, leading to “choppy” or “scrambled” event displays.

- An NTB firmware modification fix was identified and implemented
- No signs of “choppy events” since

“Choppy” event example





A properly synced event at the end of a run

Other Work and Plans

- Ongoing work on trigger commissioning to get light triggers up and running
- DAQ debugging and optimization in the works, been steadily increasing run time and stability
- TPC wire bias and transparency studies underway, collecting more data this weekend
- Final CRT voltages and configurations being set
- Planning for calibration runs
- Getting everything in place to be ready for physics data when beam returns!