



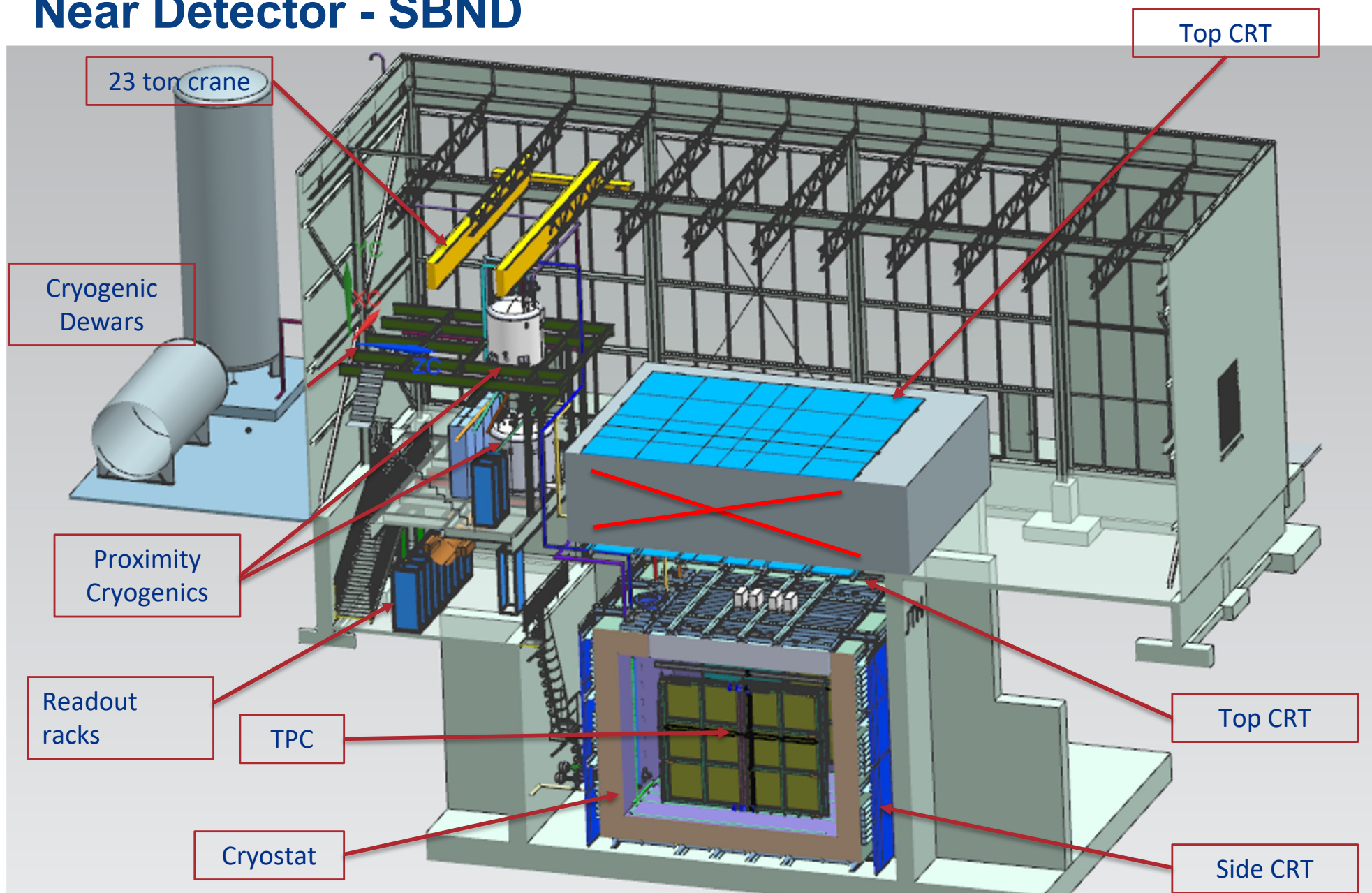
Short Baseline Neutrino

SBND Installation Status

Peter Wilson
SBN Oversight Board Meeting
Sept 8, 2023



Near Detector - SBND



High-level Status (since June)

- Detector QC post installation **Complete**
- Cryostat top cap welded closed **Complete**
- HV feedthrough Installation **Complete**
- Detector QC post installation **Complete**
- CRT North Wall cabling **Complete**
- Detector cable tray installation **Complete**
- Detector cable installation **Nearly Complete**
- Cryogenics installation **Nearly Complete**
- Cryogenics controls **Nearly Complete**

TPC Calibration Laser

- Univ of Bern team was here during the week of June 12 to install the four TPC Calibration laser feedthroughs on the cryostat
- Assembly of laser heads has progressed at DAB
- Working with Accelerator Division to test/calibrate the lasers in the laser lab in NML
- Expect to install laser heads later this year or early next year – not needed before LAr



Installation of the four laser feedthroughs on the cryostat

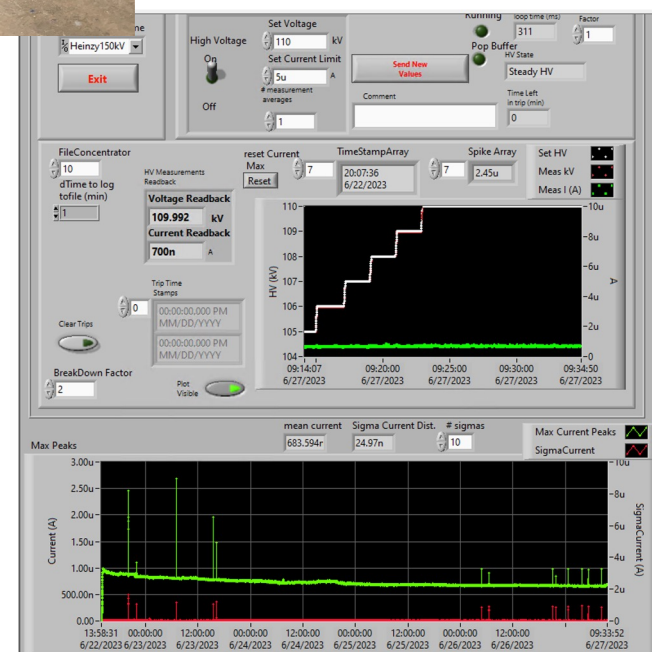
HV Feedthrough Testing

- The production HV Feedthrough (deliverable of Yale/production by CINEL) was successfully tested at NLTF (former PAB) in June
 - FT held 105kV stably for 6 days (100kV nominal operating voltage)
 - The backup FT (designed by UCL) didn't reach design voltage in testing.
 - However, an extra feedthrough is available at NLTF, previously tested successfully to -150kV, is available as a backup for SBND



HV FT Test Setup in BLANCHE @NLTF

HV monitoring display



Preparation for HV Feedthrough Installation

- On June 16, made the first successful access inside of the cryostat
 - attached a cable to the cathode for field cage QC testing
 - took measurements of TPC and HV donut arm positioning wrt the cryostat walls

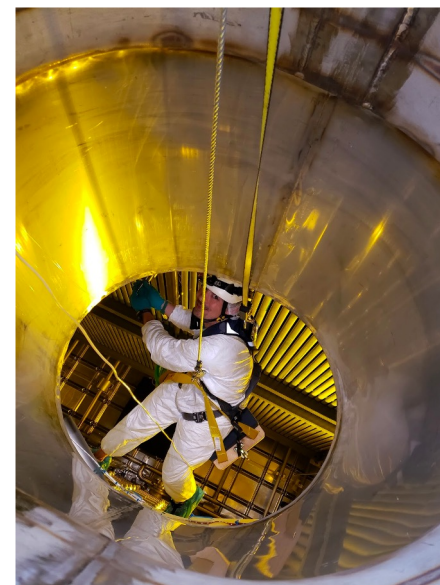
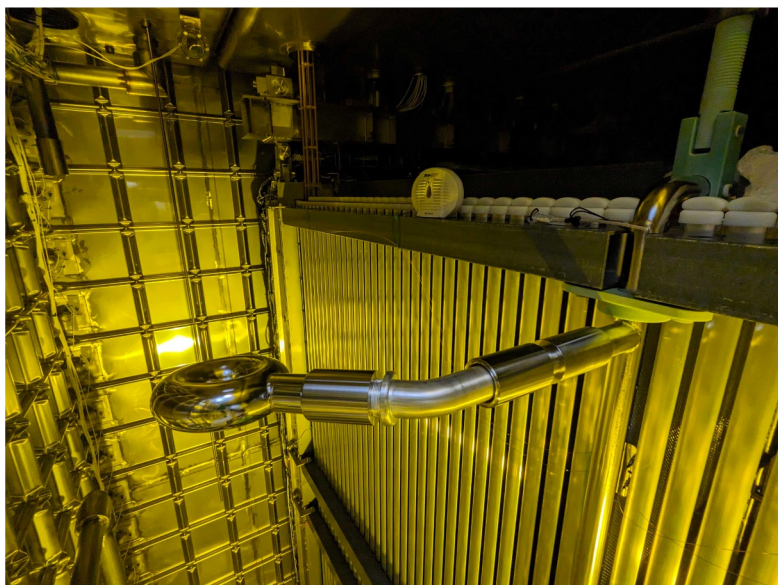
Thanks to Paul Satti, Tom Gibbs, and Marcel Borcean for assistance in planning and identifying appropriate equipment for safe entry



Access to the inside of the cryostat through an access port on the cryogenics top cap using a bosun's chair

HV Feedthrough Installation

- High Voltage Feed Through (HV FT) successfully installed in the cryostat on July 20
 - The HV donut arm was successfully installed on the cathode from inside the cryostat on July 6
 - The HV FT test at NLTF has successfully concluded at the end of June
 - additional spring tips (longer) for the FT were fabricated



HV donut arm and feedthrough installation

Purity Monitors

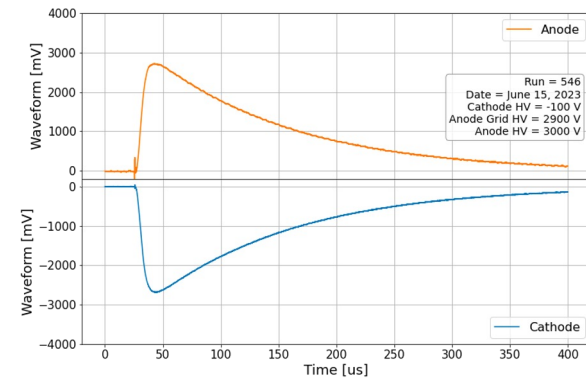
- Three purity monitors: two in-cryostat (short and long) and one in-line downstream of LAr filter
- Testing nearly complete
 - The two cryostat-internal purity monitors successfully tested in vacuum
 - Short purity monitor working per design in LAr, some problems getting full design voltage for long monitor but should be solved
 - In-line purity monitor working per design
- Installation at SBN ND planned for late September



HV FT Test Setup in
BLANCHE @NLTF



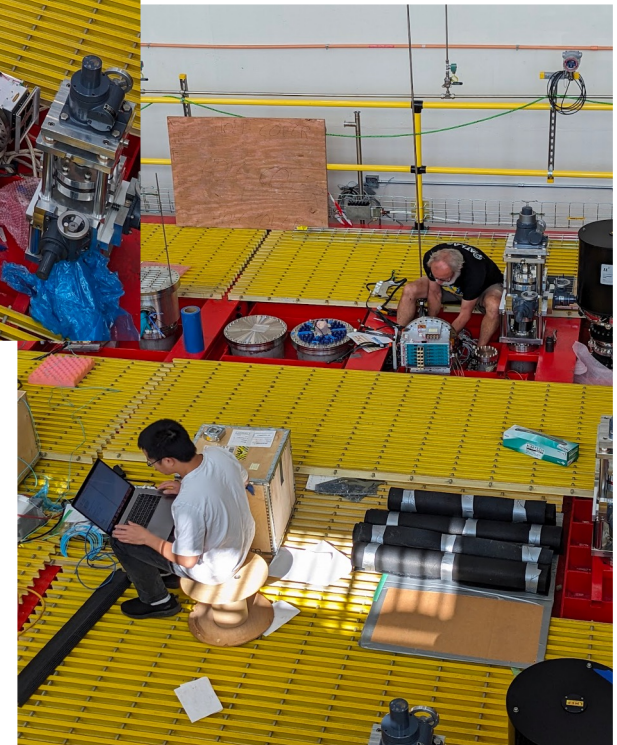
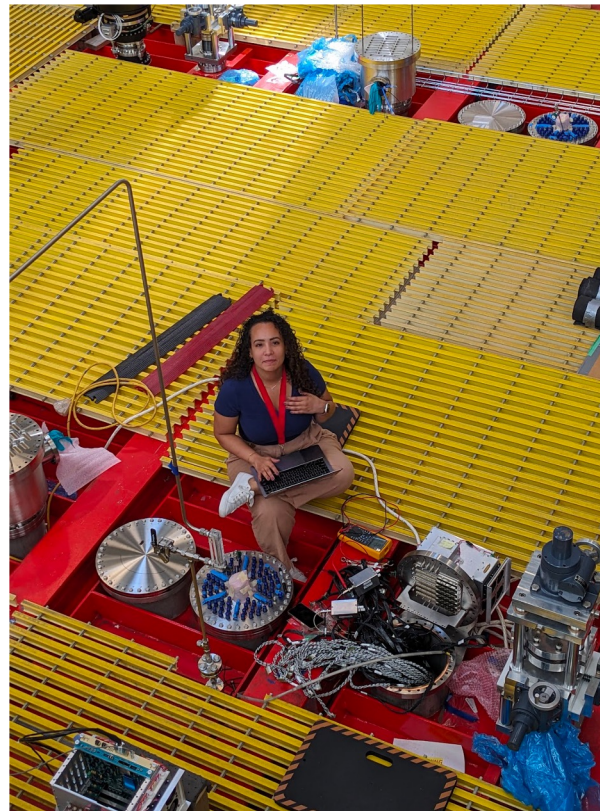
Purity Monitor Test Setup at NLTF



PM signal

TPC Cold Electronics

- The BNL team at SBN ND during the week of June 19 to install the four TPC cold electronics flanges
 - ✓ Installation went smoothly
 - ✓ Noise measurements look reasonable
 - Plan to repeat CE noise level measurements with wire bias ramped up prior to welding
- Additional QC tests:
 - Setup to repeat the test of the Field Cage chain is being finalized
 - Additional test of the wire bias system to understand some anomalies and dependence on external conditions

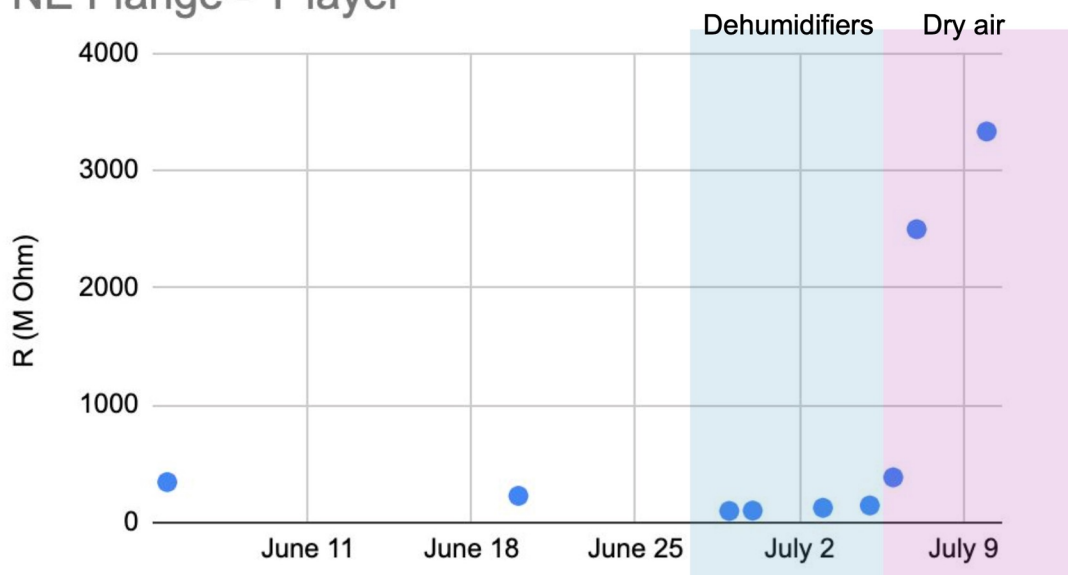


*TPC flange installation
& TPC QC tests*

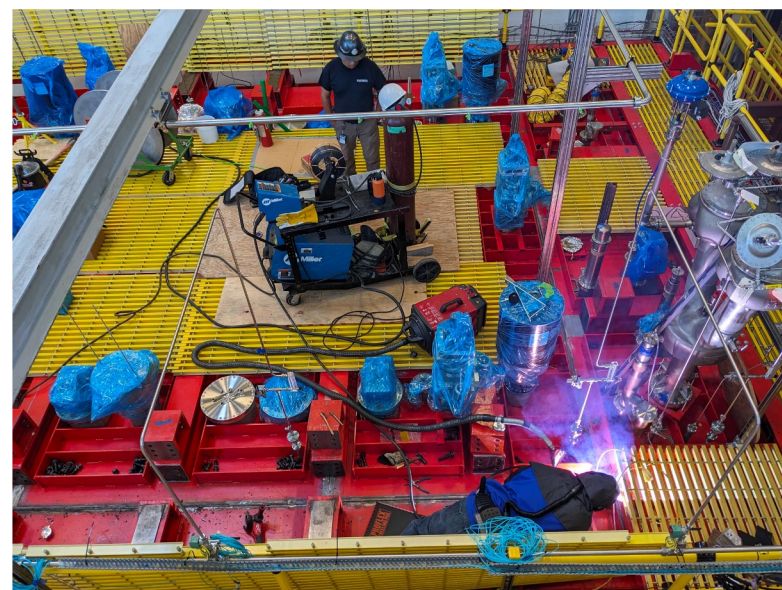
QC Checks and top cap welding

- Successfully completed pre-weld QC checks
 - ✓ Field Cage test post-rigging complete - checked out ok
 - ✓ wire bias leakage currents understood to be humidity dependent
 - in dry environment, leakage currents behave as expected
 - Now flowing clean dry air to cryostat
 - ✓ Cold Electronics noise levels back to nominal after TPC flange installation & operation grounding conditions installed
- Welding of the detector top cap took place between Jul 11 - 19 - **complete**

NE Flange - Y layer



Resistance between U-plane and ground on the East APA vs time



Top cap welding

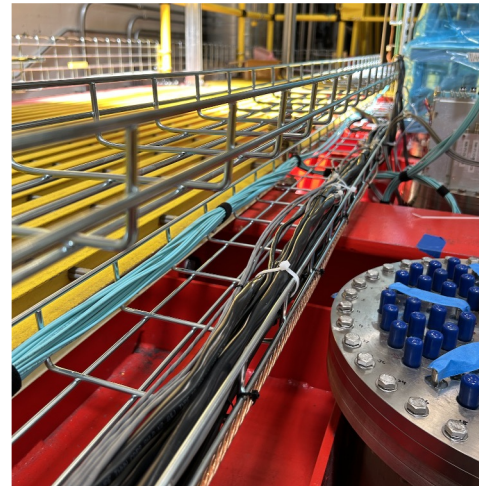
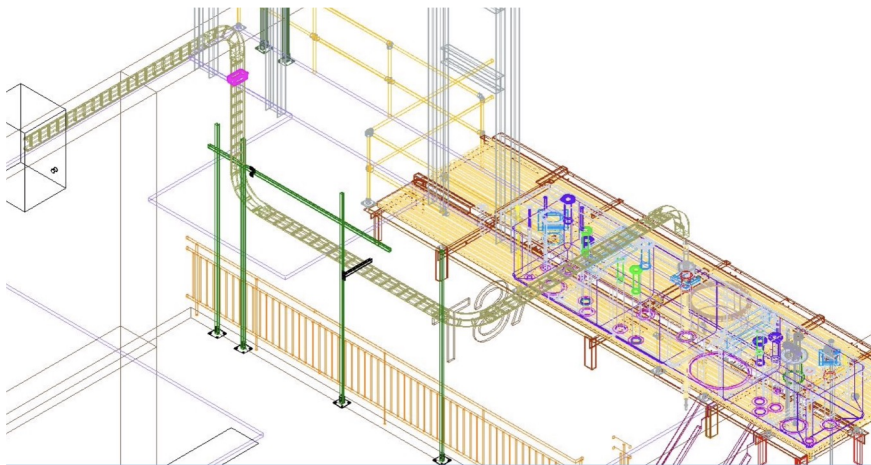
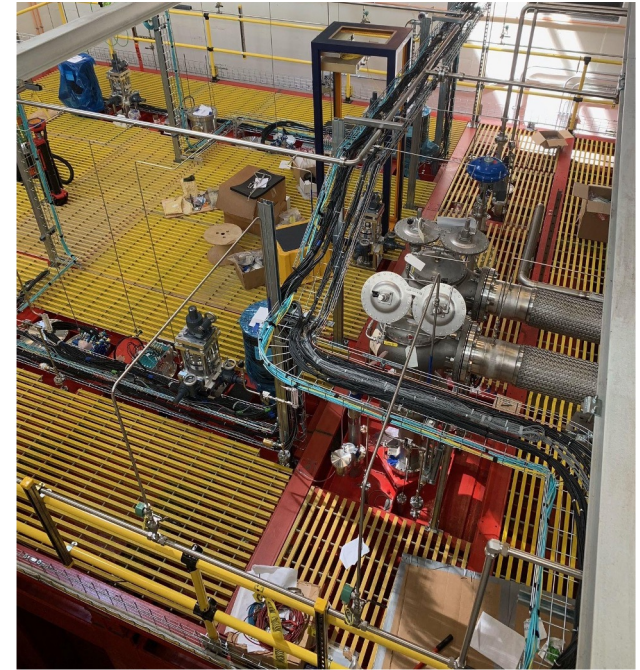
Installation post welding

- The post-weld QC testing of all subsystems internal to the cryostat is complete
- A survey of the fiducials on the outside of the TPC hangers and HV FT was performed
 - this is to know the position of the TPC wrt the building and beam post rigging
 - after filling with LAr, the survey will be repeated and adjustments of TPC position can be made
- The CRT North Wall was cabled up and tested during the week of July 31
 - the power distribution is incomplete due to wrong parts and will be finished in a few weeks



Electrical Installation

- **Top-cap cable trays fully installed!**
- Racks for laser + internal purity monitor positioned
- Cabling in in progress
 - Top-cap networking finished
 - PDS cables in trays
 - WIB power/interlock, wire bias, fan power cables finished
 - WIB clock fibers in progress
- Unistrut supports for HV cable tray installed; all trays + mounting hardware in hand
- Cryo detector controls rack pORC complete



Detector Installation Outlook

- The following will be installed by early October:
 - Remaining warm cabling between the detector top cap and readout racks
 - RTD cables
 - Camera system cables
 - Upon completion of warm cabling, all subsystems repeat their QC tests
 - Cathode HV cable tray and cable
 - Purity monitors installed in cryostat
 - Two racks on detector top cap will be populated: TPC calibration laser controls & readout, and the purity monitor and camera system electronics;
- Detector will be ready for start of cryogenics commissioning by beginning of October
- CRT modules for the east, west, and south walls plus the top:
 - Modules being tested at DAB (~1/3 complete) expect to finish in October
 - Fabrication of wall mounting structures nearly complete
 - East, west and south walls to be installed after LAr fill and stable cryogenics operation in early 2024
 - Top CRT support structure in final design
 - Installation after the CRT walls

Cryogenics Installation Progress

- ✓ LAr contract in place for the filling
- ✓ LAr and LN2 dewars tested, completed Operational Readiness Clearance (ORC) and approved for use by head of Neutrino Division
 - First LAr load planned for next week
- ✓ Instrument air compressor powered on and ready, all distribution piping ready
- ✓ Gas analyzers system complete
- ✓ Warm GAr collection system complete
- ✓ Cryostat (nitrogen) insulation purge system (almost) complete
 - A few pressure reliefs left to install (in-hand)
- ✓ Filter regeneration system (moved for SBN-FD) complete
 - Controls logic to complete in next week
 - ORC in progress now
 - Plan for operation within 2 weeks: regenerate ICARUS east cryostat recirculation filters as first use
 - SND filters will follow
 - First major step of cryogenics commissioning

Cryogenics: Remaining Tasks

from Fritz Schwartz

- Insulate Protego valve with cryogel (insulation arrived on-site)
- Fill warm gas filter on cryo platform with filter media
- Cryogenics controls making steady progress
- Safety panel review of remaining documents (e.g. cryostat engineering note)
- Installation of five Vacuum Jacketed LAr transfer lines (connect the cryostat to the various Demaco valve boxes) is setting the critical path:
 - Constructed by a vendor in Ohio
 - Received partial delivery of ~80% of each transfer line in May 2023
 - Remaining five pieces each contain the electrical isolator, which separates detector (cryostat) ground from building ground, contained inside a bellows
 - Supply chain issue with the five bellows for the vacuum jacket and vendor ordered the wrong electrical isolator for two of them both causing production delay
 - Estimated complete by end of September – now 6 months late
 - Fermilab engineers making visit to vendor next week
- Current estimate for cryogenics operations (S-2 milestone) ~end of Oct

Preparing for commissioning and operations

- Hand-off of detector systems to commissioning after final QC tests that are coming up for each system
- Well developed detector commissioning plan and timeline has been created by the commissioning team led by Michelle Stancari (Comm. Coord.) and Lauren Yates (Deputy Comm. Coord.)
 - Under review at this time
 - Step by step process during the cryostat cool-down up through all systems operating well enough for relatively smooth data-taking
- Collaboration developing Experiment Operations Plan (EOP) under leadership of the spokespeople aiming toward an Operations Readiness Review (ORR) by Fermilab in late 2023

Summary

- Detector install is within a few weeks of completion
- Cryogenics installation has been further delayed by delivery of vacuum jacketed transfer lines but should complete around the end of October
- Full cryogenics commissioning is forecast to start in early November
 - Follow well developed plan based on MicroBooNE, ProtoDUNE and ICARUS experience
- Planning for detector commissioning well advanced and ready for first stages
- Next OB meeting expect a report on commissioning

Backups