

SBN Program Status

Peter Wilson – SBN Program Coordinator

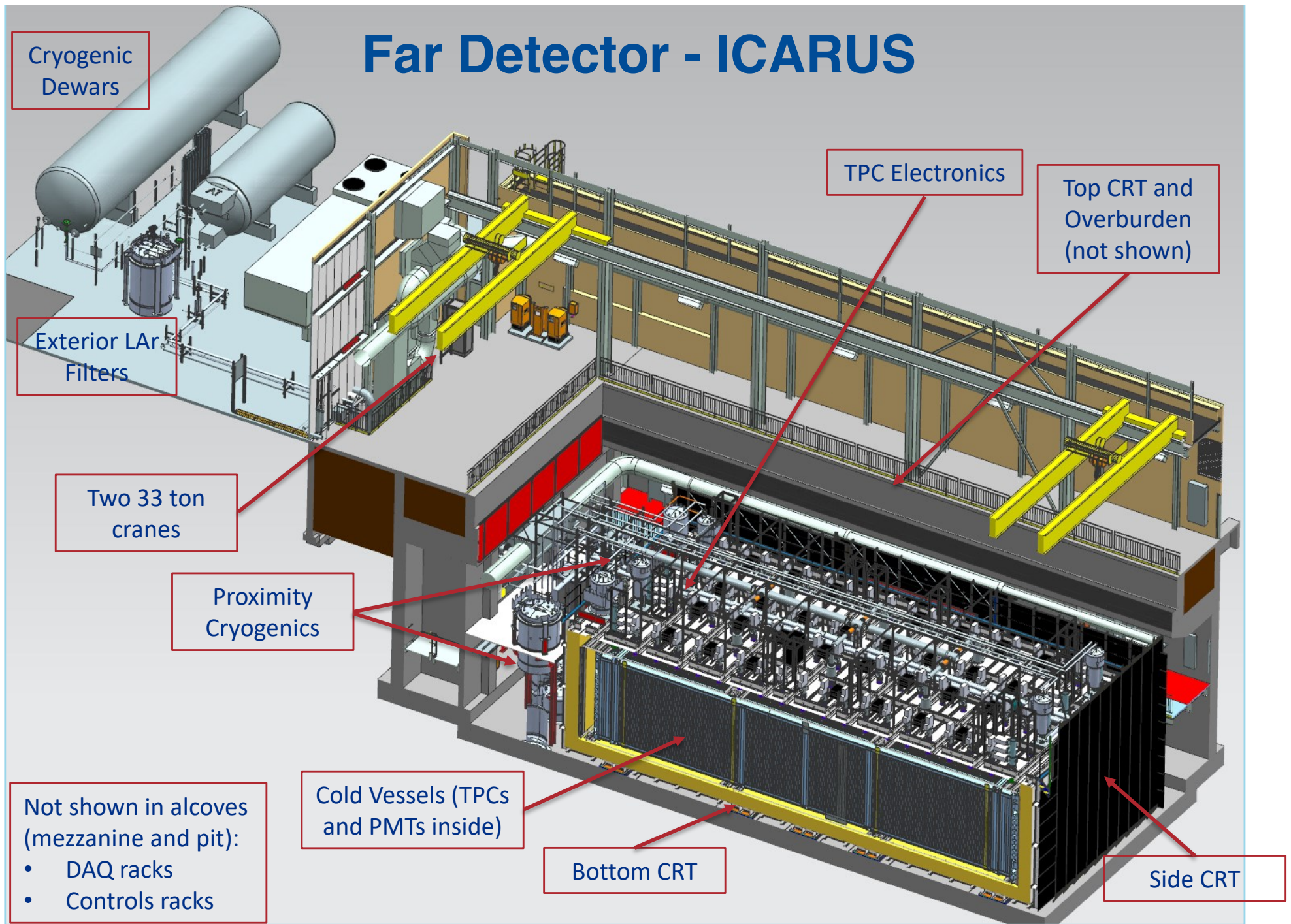
Oversight Board

13 March 2020

Outline

- ICARUS technical progress
- SBND technical progress
- SBND Feb 2020 Director's Review

Far Detector - ICARUS



Far Detector Cryogenics

- Cryogenics installation:
 - ✓ Proximity cryogenics installed
 - ✓ External cryogenics installed
 - ✓ Controls hardware installed
 - ✓ Controls software complete



Installing Ar Vent Line



Rigging valve boxes



Cryogenics Installed

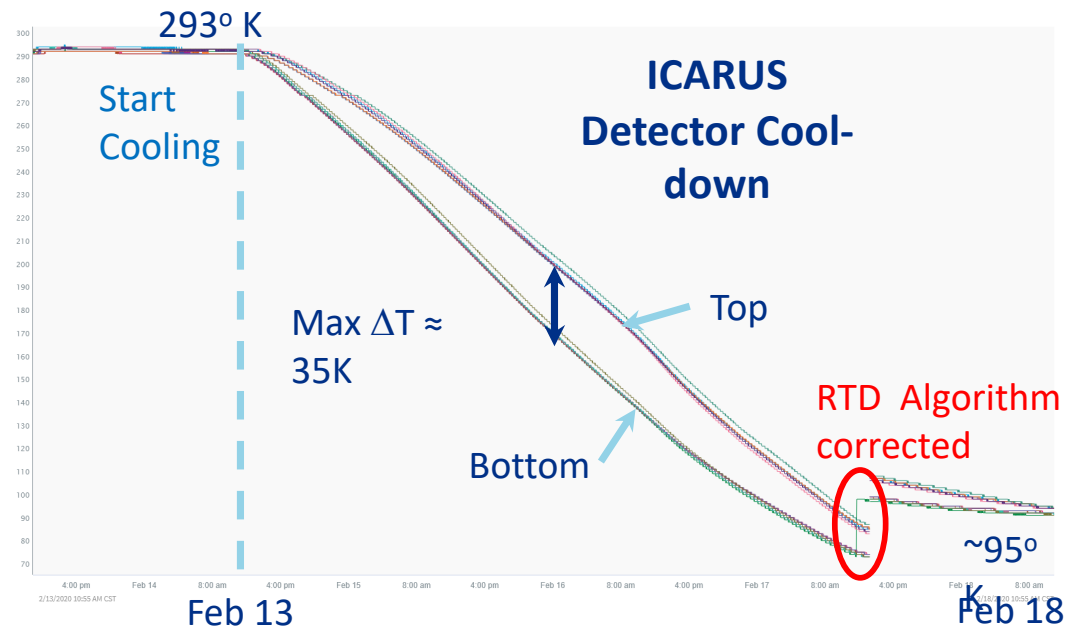


Piping installation



ICARUS Cryogenics Commissioning

- ✓ On schedule defined in December (at time of last OB meeting)
- ✓ ORC for cryogenics - Jan 31
- ✓ Cool-down/fill process – Feb 13
 - ✓ Cool down complete – Feb 18
 - ✓ Start of LAr fill – Feb 21
 - ✓ Daily LAr delivery started Feb 24
 - ✓ Excellent purity – at least factor of 10 better than spec for every truck so far
 - ✓ 18 of ~48 planned deliveries as of Mar 12
- Fill expected to complete by mid-April
- Collaborative effort of CERN and FNAL cryogenics + TC (Claudio Montanari)
 - Continues with CERN personnel remote
 - Daily cryogenics commissioning meeting
- Collaboration monitoring shifts in ROC west started Feb 13



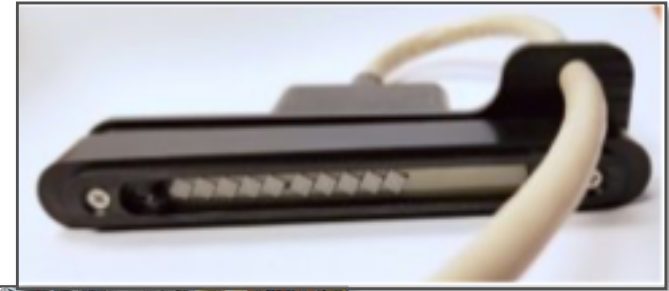
ICARUS Cryogenics Commissioning - Plan

- Plan
 - Complete fill in mid-April
 - Two-week cryogenics stabilization period
 - Detector turn-on in May
 - Detector on before beam ends in early June
- COVID – 19 response
 - No travel from Italy:
 - Remote shift taking starting end of March
 - Expect delay of detector turn-on waiting for availability of detector experts
 - No travel from CERN:
 - Continue cryogenics commissioning activity with CERN remote participation
 - FNAL engineers operating with close consultation and monitoring from CERN
 - Working on plans for next phases: possible filter regeneration, operation of condensers, LAr recirculation startup
 - Contingency plans in preparation for levels of possible lab closure w/ lab management
 - LN2 delivery highest level of priority for operations
 - Maintaining LAr deliveries is next level of priority

Far Detector Cosmic Tagger

- Side modules (reuse of MINOS modules)
 - ✓ West wall rolling section (1/3) installed, cabled and under test
 - ✓ East wall mounting structure nearly complete
 - Remaining installation after LAr fill
 - Side CRT modules
 - Top CRT mounting beams
 - Lighting and fire protection
 - Top CRT modules
- Overburden install after top CRT modules

SiPM module



CRT North wall



CRT West rolling module



Far Detector Top CRT

- Construction of 125 Top CRT modules completed at INFN Frascati Lab
- Every module tested (electric functionality, light tightness, efficiency, light yield)
- Finalizing the procedure to transport the modules (two 40 ft containers one 20 ft container) from Frascati to CERN in progress.
Transport to Fermilab will follow.
- Power distribution for Top CRT reviewed:
 - Weiner PL512 Power supply to be used
 - Power distribution box to be produced
 - Order of cables, servers in progress
- Installation of support structure:
 - Right after side CRT installation, vertical rim support structure will be placed and vertical part of Top CRT installation will follow
 - After commissioning of ICARUS detector, flat part of Top CRT installation will follow.



Courtesy of Umut Kose

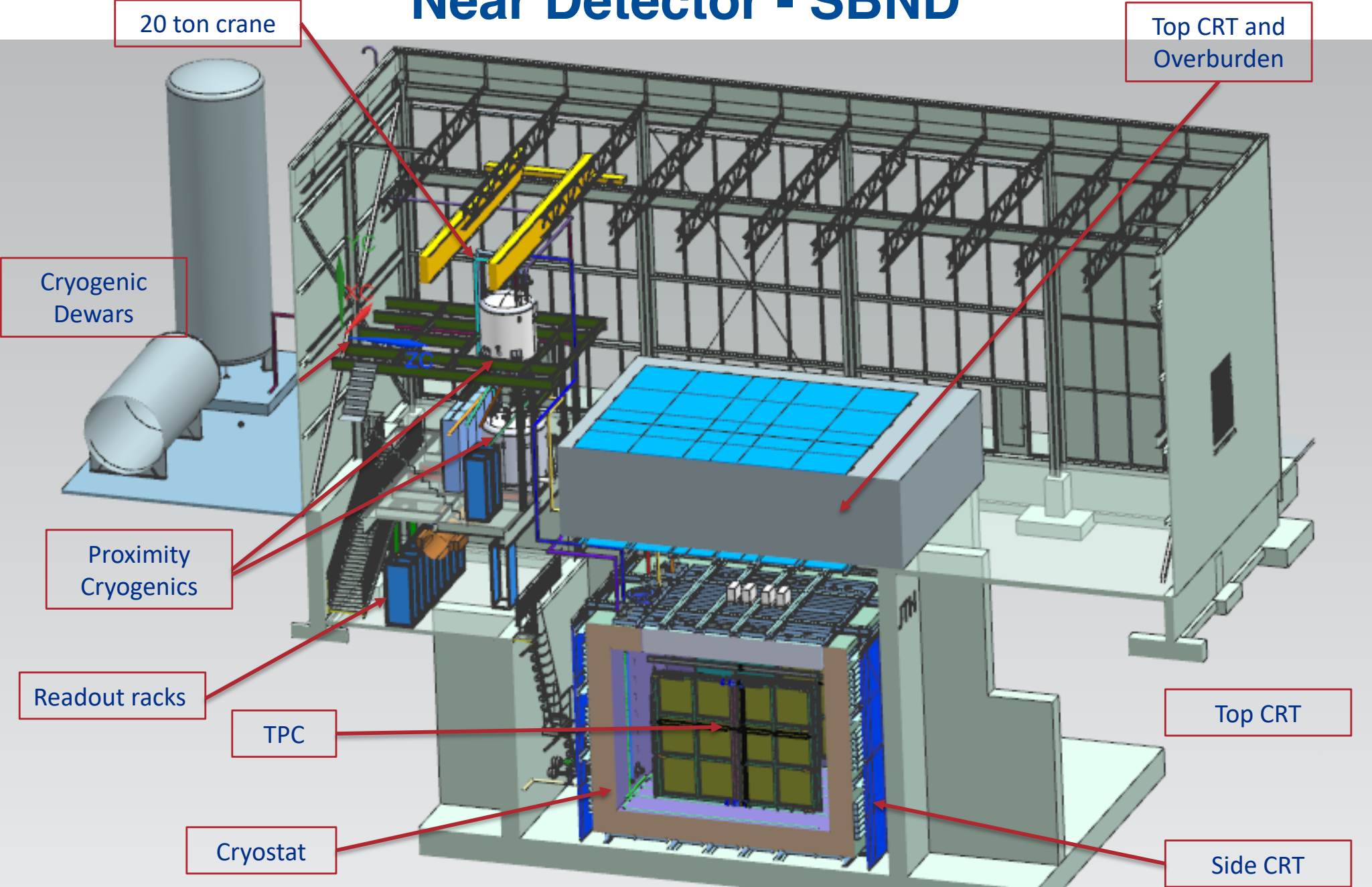
ICARUS Milestones to I-1 Ready to Fill

Intermediate Milestone	Owner	Baseline Date	Forecast Date		Actual Date
Vessels rigged into building	P. Wilson	16-Aug-2018		✓	16-Aug-2018
Manholes welded and vacuum test successful	C. Montanari	10-Oct-2018		✓	11-Oct-2018
Warm Vessel roof complete	C. James	15-Nov-2018		✓	31-Oct-2018
Cryo Platform complete	C. James	15-Dec-2018		✓	04-Oct-2018
Proximity cryogenics installation begins	B. Norris	15-Jan-2019		✓	28-Jan-2019
DBB & flanges installation complete and tested	A. Fava	15-Feb-2019		✓	15-Mar-2019
Cold proximity cryogenics installation complete	B. Norris	15-Apr-2019		✓	21-Jun-2019
1 st T300 readout installation complete	A. Fava	15-Mar-2019		✓	11-Apr-2019
All detector readout installed	A. Fava	1-May-2019		✓	17-May-2019
Begin vacuum pumping	C. Montanari	15-Jul-2019		✓	10-Jun-2019
Cryogenic operation approved	B. Norris	15-Jul-2019		✓	31-Jan-2020
I1: ICARUS detectors ready to fill with LAr	P. Wilson	30-May-2019		✓	31-Jan-2020

ICARUS Milestones to I-2 Detector Filled

Intermediate Milestone	Owner	Baseline Date	Forecast Date		Actual Date
Cold shield cooldown complete	C. Montanari	7-Aug-2019		✓	18-Feb-2020
Vessels filled & ullage pressurization completed	M. Geynisman	30-Sept-2019	10-May-2020		
Drift HV operational	Z. Williams	15-Oct-2019	18-May-2020		
PMTs operational	G. Raselli	30-Oct-2019	25-May-2020		
Cryogenics commissioning complete	M. Geynisman	30-Nov-2019	29-May-2020		
Cosmic tracks are observed in the TPC	A. Fava	30-Nov-2019	08-Jun-2020		
I2: detector is filled with liquid argon and ready for physics commissioning (LAR purity adequate for physics has been achieved)	P. Wilson	30-Nov-2019	08-Jun-2020		

Near Detector - SBND



atf status

- The assembly transport frame (atf) is a welded steel structure that will hold the detector during the assembly at DAB and during the move from DAB to the ND building
- The atf was procured and assembled in 2019.
- A load test of the atf was completed on Dec 23, 2019.
- We are currently installing flooring and clean tent, to get the atf ready for detector assembly.



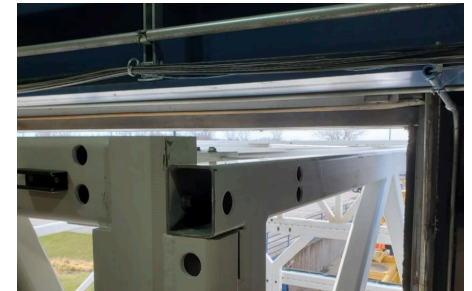
Atf with test load on external crane



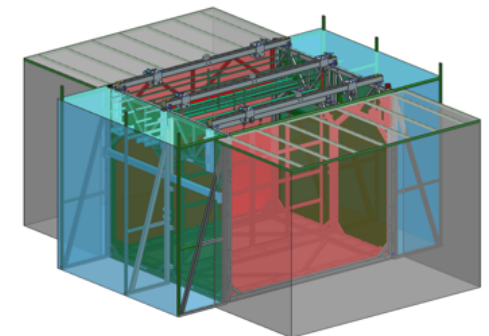
Atf with test load on external crane



Atf being pulled out of DAB.



Garage door clearance at DAB.



atf facility with clean tents

SBND TPC Assembly Status

- Completing preparations to start assembly at DZero
 - Installed and tested of support rest pads for APA/CPA beams into atf
 - Adjustments to atf components to facilitate future steps
 - Preparing clean tent materials
 - Final machining of APA support beams
 - Completing design of CPA support beam
- Clean tent set up completed in the Dzero Hurricane Deck room for assembly of light detection components



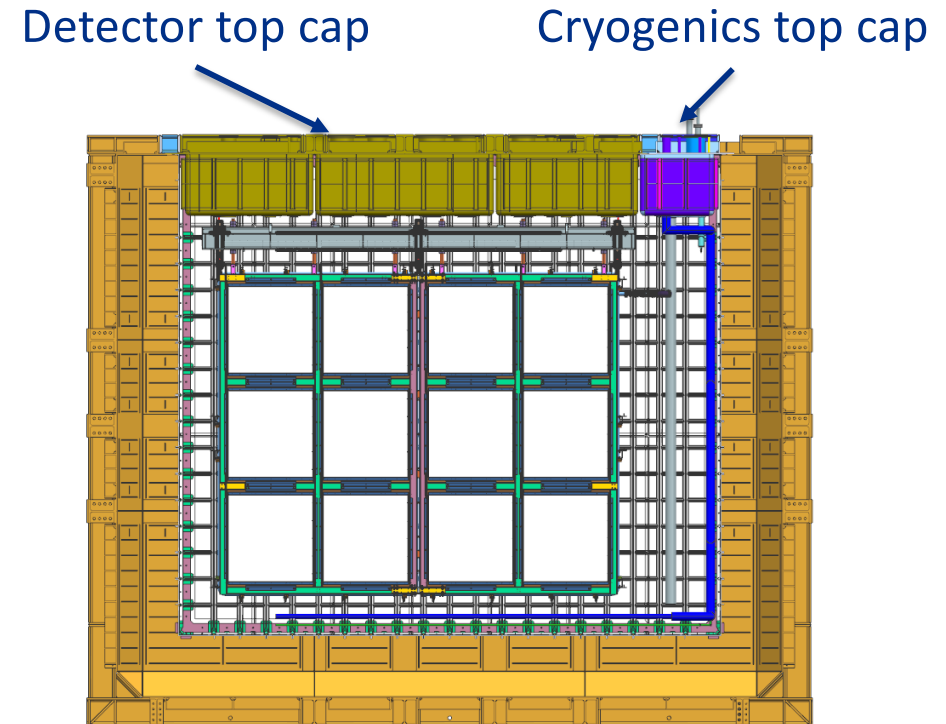
Rest Pads Installed



Clean tent fabrication

SBND Cryostat

- Warm vessel
 - Leak check in progress
 - 3D survey planned for April – needed to plan membrane installation
- Top caps
 - Four pieces fabricated at CERN:
 - Cryogenics (1) + Detector (3)
 - Sized for transport
 - Detector cap assembled into one unit at Fermilab
 - Fabrication in progress @ CERN
 - Expect delivery to Fermilab in May
- Membrane Cryostat procurement
 - Bids received by CERN in December, in negotiation with vendor since January
 - Final offer received last week
 - Delivery schedule in negotiation
 - Working on placing contract
- **The cryostat is on the critical path**



Cryogenics top cap fabrication

SBND Electronics Installation

- Mezzanine racks installation:
 - All racks in position
 - AC Switch and Rack Protection Units production and assembly completed
- Racks equipment (Rack protection, power distribution, slow control units installed)
- TPC readout installation – readout crates, all the fans, PCIe cards, readout fibers and clock cables, power supplies – installed by the NEVIS Columbia team with FNAL support
 - Passed Operation Readiness Clearance (ORC)
- Ground monitor in place and passed ORC



SBND Planning - COVID 19

- In case of Fermilab closure plan to put SBND TPC assembly in safe state and stop
- Planning for designer and engineers to work from home

SBND Milestones to S-1 SBND ready to move

Intermediate Milestone	Owner	Baseline Date	Forecast Date (Schedule)		Actual Date
First set of APAs shipped to Fermilab	K. Mavrokoridis	24-Sept 2018		✓	4-Mar-2019
PO for COTS ADCs placed	H. Chen	10-Oct-2018		✓	30-Oct-2018
All TPC Components at Fermilab	K. Mavrokoridis	1-Mar-2019		✓	27-Mar-2019
Complete atf assembly at DAB	J. Zennamo	1-May-2019		✓	27-Nov-2019
50% of motherboards delivered to Fermilab	H. Chen	15-May-2019		✓	22-May-19
APAs and CPAs installed in atf	N. McConkey/ J. Zennamo	15-Jun-2019	13-Jul-2020		
Field cage assembly complete	N. McConkey/ J. Zennamo	15-Jul-2019	20-Jul-2020		
Cold electronics installed and tested	H. Chen	23-Aug-2019	25-Aug-2020		
S1: TPC ready to move to SBN ND	A. Schukraft	30-Aug-2019	25-Aug-2020		

SBND Schedule re-plan - in progress

- Update of SBND assembly and installation schedule
 - ✓ Updated TPC assembly plan based on Sept 2019 CRR recommendations
 - ✓ Updated cryogenics resources based on FD lessons and cryostat schedule
 - ✓ Updated labor resource needs based on past experience at DAB (SBND) and SBN-FD (ICARUS)
 - ✓ Updated membrane cryostat procurement schedule to projection as of January
- Two phases:
 1. January: implemented first round changes for DOE budgeting in January and Annual SBND Program Director's Review in February
 - Had to stretch cryogenics work to fit FY20 budget
 2. March-April: update accounting for \$500k additional FY20 funds and input from Director's Review
 - Accelerate cryogenics work focused on long lead procurements
 - Further evaluation of resource needs
 - Adjust membrane cryostat procurement schedule to actual CERN contract
 - Discussions SBND collaboration about additional resources

SBND Director's Review – Feb 25-26

- Annual SBN Program Review focused on SBND completion
- Technical focus on remaining work
 - TPC Assembly
 - Cryogenics (external, internal, controls)
 - Installation of cryostat, detector and cryogenics
- Review of schedule re-planning that was in progress at time of review
- Summary of recommendations (final report next week)
 - Complete schedule re-planning by April 1, 2020
 - Review engineering and technician estimates and secure commitments for technician resources
 - Short Director's Review in approximately 3 months after re-planning complete focused on performance to the updated plan
- Action plan already in progress
 - Complete schedule updates by April
 - Keep technical progress in parallel

Backup