

Meeting focus: Discussion on status of Instrumentation FTs and a dedicated discussion on Field Calibration device for DUNE FD.

Indico link: <https://indico.fnal.gov/conferenceDisplay.py?confId=15234>

Talk 1: Status of Instrumentation Feedthroughs (Sowjanya Gollapinni)

A brief status and plans of instrumentation FTs (Purity Monitors, Thermometers and Cameras) is presented. The Cryogenic Instrumentation and Slow Controls consortium is working towards this. These items are relevant for Calibration TF as it affects the overall design of feedthroughs. The goal is to specify No. of FTs, location of FTs and width of each FT. The consortium had talks on Fluid flow modeling (Sep. 22) and Purity Monitors (Sep. 15). A 1-slide summary on current activities on laser is also mentioned.

Comments on the talk:

- For PMs, it is important to understand the field, best would be to provide a CAD model to Bo and understand the field on the East/West side of the cryostat. (Jim)
 - Agreed. Andrew/Jianming are in contact with Bo about this. (Sowjanya)
- It would be good to request each subsystem tomorrow on ideal locations, spares and how many. And if manholes are possible for their systems? (Kendall)
- We don't know the exact distances of instrumentation FTs and manholes from Field cage and cryostat end walls? (Sowjanya)
 - Jim kindly put in all the relevant drawings of cryostat and cryostat penetrations on the DUNE Wiki page. https://wiki.dunescience.org/wiki/Detector_Mechanical_Integration#Detector_Cryostat_Interface
 - The direct link to the penetrations from the EDMS page is here: https://edms.cern.ch/ui/file/1814480/1/LBNF_v2_Roof_Penetrations.pdf (this is where the drawings are stored. Great resource, thanks, Jim!)
 - Do we need a CERN account access for this? Jim: No. Public access
- Marzio made some changes, how do we track them? Including spares? (Kendall)
 - Should be in those EDMS pages. Modified on the 18th, looks like added 6 spares. Now we can check and follow changes. (Jim)
- We don't need to worry about gas analyzers and liquid level monitoring? (Kendall)
 - Although both of these are under the slow controls consortium, it is mainly LBNF's expertise. The scope needs to be further defined. The FTs for those are accounted for in LBNF's cryogenic ports. Will double check with David Montenari. The requirements on the liquid level are more of safety than calibration. (Sowjanya)
 - Jim (to Sowjanya): why don't you ask David to give a talk at the consortium meeting.

Talk 2: Possible DUNE FD Field response Calibration Device (Chao Zhang)

LArTPC signal processing involves removing field response effects from the signal. The impact of field response is most significant on the induction plane due to the nature of bipolar signals. Currently the prediction for field response function is based on simulation, the proposed device will provide a direct way to measure this. The goal is to first measure this in a test stand at BNL, but for DUNE, preserving this option would be useful allowing for in-situ calibration if simulation do not match with data. For the instrumentation and FTs, the proposal is to install one device in the region b/n one of the outer APA and cryostat side wall. One FT would be required to route the cables for the device. The clearance on top of the device and some engineering design is required to understand how to mount the device.

Comments during the talk:

- How wide is the device? Are any of the existing FTs workable for this? (Sowjanya)
 - 23 cm or so. That is definitely an option but we don't have all the details of the existing FTs (Chao)
- How close to the flange does the device need to be? Right above? (Jim)

- Can be on the side, and can bring in fiber. (Chao)
 - Okay, then you don't need a FT near the wall (Jim)
- How far the fibers can go? (Kendall)
 - Damage factor to the fiber is what is worrisome. Length of fiber is about 4 to 5 m max.
- What is the lifetime of this device? Fiber damaged after sometime? (Alberto)
 - Local optics team, after usage, 4 years, transmission reduced by about 20%. Also depends on how many shots through the fiber. (Yichen)
- You mention one device. Do you see a reason to have this at multiple locations for redundancy in case variations are observed in the one location? (Sowjanya)
 - Yes, it is sensible to have two devices at two different locations to test differences in distortions. For example, one can imagine locations where mechanical distortions are largest and where wires sag which affects wire patterns. (Chao)
- What are the other risks associated to this? Can you draft this into a document with requirements and risks? (Sowjanya)
 - Yichen and Chao to consider risks and report back with regard to impact on this and other systems and a baseline design.
- Mentioned 300L test stand at BNL. Timescale of that work? (Alberto)
 - Within in 1 year, have the system and initial measurements. 2 years we will have some results. (Chao)
- Any issues with longevity? In 35-ton, had issues of deposits. Had to recondition the gold cathode yearly. (Juergen)
 - Yes, seen locally. If we end up installing it in the far detector, need to establish a system to recover it. In FD, no good answer yet. (Yichen)
- This is a neat device but how do you put 1 device or even a set of devices and conclude about the behavior of all TPCs? Could just be huge variations across point to point across the planes? Maybe best with a test stand and maybe ProtoDUNE, and then map it out. (Tim)
 - Yes, exactly that is the plan. We have similar questions about this in-situ proposal. But, the main motivation for now is to be able to preserve this option in case we want to do this later. (Chao)
 - Also, if we can explore whether we can use an existing FT, it is even better. We don't have to request any new FTs and still know that option is possible if we decide to do this in the future. (Sowjanya)
- Maybe nice on the real detector, if you can measure the gap between APAs with such a device. May depends on the final geometry. (Jim)
- To reiterate, can purity and temp. spoolers be deployed through manholes? (Juergen)
 - Seems possible, but we are not clear yet on the exact locations of manholes. Also, for both temp. spoolers and purity monitors, we have to ensure fluid flow modeling and field distributions. Will explore this more in the future (Sowjanya)