

Answers to charge questions of protoDUNE- SP CryoInstrumentation Review April-2017 - shown to LBNC 6-2017

1) Does the Cryogenic Instrumentation design meet the requirements? Are the requirements/justifications sufficiently complete and clear?

Partly:

Temperature monitor – Yes;

Gas analyzer – Yes if at least one system will be made available; Internal purity monitor – Yes;

External purity monitor – Yes, but currently not in the project plan;

Cameras: – No, need to prioritize and develop a plan.

2) Does the design represent a good development path towards DUNE?

Yes, most of the elements can be scaled up or the quantity increased

to satisfy DUNE.

3) Does the design lead to a reasonable production schedule, including QA/QC, transport, installation and commissioning?

Yes, for everything except for the camera system.

4) Is the installation plan sufficiently far advanced to assure that the detector can be installed as designed?

Most of the designs have NOT been completed. Once these are complete they must be electrically and mechanically integrated in the overall experiment and EHN1 infrastructure.

5) Are all internal interfaces between components (cryostat, cryogenics, TPC) documented, clearly identified and complete?

The integration of the components with the TPC, cryogenic piping

and facility has NOT been defined.

6) Are the interfaces with the slow control system well defined and understood?

No, not yet defined.

7) Is the grounding and shielding of the Cryogenics Instrumentation understood and adequate?

No, all of the items need to be electrically integrated and must be

reviewed by the grounding and shielding committee.

8) Are operation conditions (when will/can instrumentation be turned on) listed, understood and comprehensive?

Partly, this is known for commissioning but not for the operation level.

9) Are the analyses of the Cryogenics Instrumentation components sufficiently comprehensive for safe handling, installation and operation at the CERN Neutrino Platform?

Not yet. All of these designs must be completed and integrated with the experiment and EHN1 facility. Then they must be evaluated by CERN design and HSE before being approved for installation.

10) Is the Cryogenics Instrumentation quality assurance, quality control and test plan adequate? Have applicable lessons-learned from previous LArTPC devices been implemented into the device testing and into the system design?

Yes, for everything except for the camera system. The camera design and engineering are not complete. If a camera system is to be installed, a prioritized list of locations in the cryostat must be created soon, so that the mounting and cabling can be developed.

Sub-element	Recommendation	Status Date	Status	Comment	Closed?
Temp Monitors	Mechanical space requests must be submitted to the project team soon so that proper planning can be done.	6/20/17	In progress		No
Temp Monitors	Perform thermal simulation to verify that the design is appropriate.	6/20/17	This request has been communicated to the computational fluid person and simulation results are expected by the end of the summer.		No
Temp Monitors	The Collaboration is encouraged to revisit the decision to avoid temperature probes on the detector structures.	6/20/17	This is a recommendation to the group responsible for the TPC. It has been communicated to them with the response that they will not put sensors on the detector structures.	We consider this should be closed.	No
Temp Monitors	A full thermal analysis of the Temperature Gradient Monitors should be performed by end of this summer and the results discussed within the Collaboration.	6/20/17	This request has been communicated to the computational fluid person and simulation results are expected by the end of the summer.		No
Temp Monitors	A demonstration that the movable solution works as expectation is required for Hawaii Temperature Gradient Monitors and alternatives to the bellow should be considered. Alternatively, the static solution for both Temperature Gradient Monitors should be considered.	6/20/17	A test has been performed in the LAPD cryostat to demonstrate the cross-calibration technique and the data are under analysis. The bellows design has been replaced with a ferro-fluidic feedthrough. We intend to pursue the moving solution taking care to ensure that the motion does not threaten the nearby APAs.	This recommendation has 3 linked items. The first is in progress, the second has been accepted, and the third has been considered as required.	No
Temp Monitors	3D computation of the field in the structure is required to be sure that no point exceeds the maximum allowed value.	6/20/17	A set of calculations for one proposed geometry has been performed with satisfactory results.	I would consider this closed.	No
Temp Monitors	Define the installation procedure so that it is viable with all the constraints from the other detector components and the facility (for instance the crane height).	6/20/17	In progress using realistic clearances and crane-hook heights.		No
Temp Monitors	Cable support is not defined and must be discussed with GTT and co.	6/20/17	We do not know the status here..	This is in the hands of CERN/GTT	No
Gas analyzers	The in-line gas analysis system appears to be mandatory at least during detector purging, filling and commissioning to guarantee that the Argon quality is at any time within specifications. Investigate a way to procure at least a system, which ensures the minimal set of measurements.	6/20/17	We are looking to define the minimal system that meets the requirements. Discussions with the Neutrino Platform are also ongoing	The procurement of the analyzers is a financial issue outside the scope of our group.	No
Gas analyzers	Integration with the cryogenics system slow control is recommended.	6/20/17	Preliminary discussions have been held	It has been noted that direct integration of the gas analyzers with the executive cryogenics system requires careful analysis of the safety/controls issues.	No
Gas analyzers	Alarms and control points need to be discussed and defined in collaboration with the persons responsible for the cryogenics and purification systems operation.	6/20/17	No work has been done on this yet but see comment ..	Experience from LAPD, the 35 ton, and the WA105 filling will serve as the basis for the alarms and set points.	No
Gas analyzers	An impact study of Gas analysis system operation at the conditions foreseen for DUNE should be done as part of the experience of operation on ProtoDUNE.	6/20/17	Long-term retention and accessibility to the requisite data will be provided by the slow controls group.		No
Purity Monitors	Consider the possibility to invest in the external purity monitor, which would provide useful information during filling/ commissioning and to monitor filter purification efficiency.	5/17/17	The external purity monitor and its associated electronics will be available.	We fully agree with the recommendation that at the very least ports with valves that would allow future installation of an external purity monitor should be installed. We will also continue to stress the importance of this external purity monitor so that it can be included in the cryogenics system	No
Purity Monitors	Installation of valves on the ports already foreseen for the installation of an external purity monitor is warmly recommended. This would allow the installation of external devices at any moment.	5/17/17	The Johnston couplings that would allow the addition of a vessel containing the external purity monitor are 'in the plan' of the cryogenic system.	We fully agree with the recommendation that at the very least ports with valves that would allow future installation of an external purity monitor should be installed. We will also continue to stress the importance of this external purity monitor so that it can be included in the cryogenics system	Yes
Purity Monitors	Integration with the Gas analyzer response and with the cryogenics and purification control system is also recommended.	5/17/17	We will finalize the integration with the slow controls group and will setup a protocol for the system to send/receive signals to/from other subsystems		No
Cameras	Engineering resources should be allocated to produce a camera system which will work well at ProtoDUNE.	6/20/17	Arrangements are under way to try to obtain engineering resources.		No
Cameras	Devote a lot of effort to complete the design, working in close contact with the DP groups. An additional internal review is possibly needed before the end of the summer, for a final decision on the use if cameras in the SP cryostat.	6/20/17	Contacts have been made with the DP group; some progress is being made on the mechanical supports for a camera system. A systematic study of signal behavior in different cables and also of heater requirements is starting.		No