

Interface Documentation for ND-LAr 2x2 Test at Fermilab

Dune docDB 23046

Linda Bagby, MinJeong Kim, Ting Miao and Mike Zuckerbrot

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This document provides management control of technical and programmatic interfaces between the subsystems of ND-LAr 2x2 prototype test program at Fermilab. The documentation contains tables, Table 1 – list of subsystems and their lead and contact person and Table 2 and Table 3 – list of interface topics and responsibilities of involved subsystems

2x2 TPC module will be first tested individually at a time at U of Bern in a LAr cryostat vessel. Afterward, modules will be delivered to Fermilab for integration test underground in MINOS hall. A larger cryostat vessel of 2 meter in diameter and 2.5 meter tall will be delivered to FNAL for 2x2 test. The cryogenic design at Bern for the single module test is the starting point for 2x2 cryogenics. Electronics of subsystems from JINR of Russian (Dubna), LBNL and U. of Bern will be delivered to Fermilab separately for the 2x2 setup.

The interface documentation is focusing on the deliverables from ND-LAr consortium subsystems and integration efforts of cryogenics and electronics installations at Fermilab.

Table 1: 2x2 subsystems and lead/contact persons

2x2 subsystem	Subsystem lead/contact
Installation and integration	Min Jeong Kim
FNAL Cryogenics system	Mike Zuckerbrot
Electronics integration	Linda Bagby
Light readout electronics	Nikolay Anfimov / Sasha Selyunin (Dubna)
Charge readout electronics	Armin Karcher (LBNL)
Drift HV - power supply, cable, filter box	Saba Parsa (Bern)
Drift HV feedthrough	Knut Skarpaass (SLAC)
TPC module structure	Davide Porzio (Bern)
Cryostat, cryogenics and cryo feedthrough	Igor Kreslo / Roger Haenni (Bern)

Table 2: Interface topics and subsystem responsibilities

Interface Issues	Subsystem Responsibly	DUNE docDB
Cryogenic equipment specification and procurement	Bern provides initial P&ID and list of equipment, their connection on main cryostat top and on TPC modules	
	FNAL Cryogenics group completes the P&ID and equipment list, and specify additional procurement	
LAr filter vessel design	Bern provides CAD file of filter vessel from singleCube test and list of equipment and connections implemented	
	FNAL Cryogenics group modifies the vessel diameter and specify procurement plan	
Cryo equipment AC and networking requirements	FNAL Cryogenics group provides AC power and networking requirements for cryogenics equipment	23112, 23093, 23090, 23096, 23098, 23106
	Electronics group provides AC outlets and network switch	
Cryo control rack layout and networking	FNAL Cryogenic group to provide specification of PLC rack, its power budget and network connection	21459, 21958
	Electronics group provides AC outlets, emergency backup power and network switch	
Cryo equipment layout and support requirement	FNAL Cryogenics group provides dimension of cryogenics equipment and piping connection scheme	
	Installation group provides layout design and installation support	
Piping routing and length	FNAL Cryogenics group provides piping scheme of cryogenics, venting and ODH mitigation	
	Installation group provide layout design and installation support	
Cryostat and cryogenics equipment access support	FNAL Cryogenics group provides cryostat and cryogenics operation and access requirement	
	Installation group designs and builds access platform, support stand and transfer cart	

Table 3: Interface issues and subsystem responsibilities

Interface Issues	Subsystem Responsibly	DUNE docDB
Rack layout and installation	Electronics group provides list of racks, size of racks, access and space clearance requirement	22971, 22639
	Installation groups provides layout 3d model and installation support	
Cable routing and cable tray	Electronics group provides cable routing scheme from TPC to electronics on the cryostat top and in the electronics readout racks	
	Installation group provides layout 3d model, cable length calculation and installation support	
Cable tray support installation	Electronics group provides list of cable trays and their locations	
	Installation group provides layout 3d model and cable tray support design	
Layout and AC support for on-detector TPC electronics	Dubna/LBNL/Bern groups provide equipment list, AC/DC power budget and networking requirement for light/charge/drift HV electronics located on top of cryostat flange	21540, 20615, 20681, 18300
	Electronics and installation groups provide AC distribution, electrical safety protection, network switch and layout 3d model	
Rack building for electronics and DAQ	Dubna/LBNL/Bern groups provide single line electrical diagram of light/charge/drift HV readout and control electronics placed inside electronics racks	22809, 21809, 20490, 20943, 20681
	Electronics group provides clean AC outlets, racks, rack protection, network switch, cabling support and guidance for operation readiness clearance (ORC) review	
Cryostat feedthrough and safety review	Bern/SLAC/DUBNA/LBNL groups provide list of feedthroughs, design file and their pressure test of module structure, drift high voltage, light and charge readout systems	21579
	Cryogenics group provides 3d layout, guideline for feedthrough pressure test, guidance for operation readiness clearance (ORC) review	
Cryostat and TPC module installation	Bern/LBNL groups provide CAD file, equipment list on cryostat and TPC modules	
	Installation group provides integration 3d model, lifting fixture and installation engineering and safety review	
TPC module assembly and QA/QC	Bern provides TPC module QA/QC procedure and instruction from module-0 experience.	
	Installation group to provide mechanical support	