


Calibration Requirements

- EDMS [2612985](#)
- Calibration Requirements:
 - Measure E field with 1% precision at a given location
 - Calibrate E field uniformity at 1% in most of the active volume (96%?)
 - Calibrate E field all TPC modules
 - Monitor E field stability over time
 - Vertex reconstruction precision (0.5 cm)
 - Calibrate electron lifetime and diffusion with electron clouds from fixed targets on cathode





CALIBRATION REQUIREMENTS

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Type: **REQUIREMENT**
LBNL Category Code: **DU2006**



Document Status: **Working**



Page 7 of 10

Requirements

Requirements: **MS 2589287**


Requirements

	Rationale
1%	In order to reach the physics goals of DUNE, ND must deliver flux measurements for FD and not increase systematic errors associated with the measurements.
	Modeling of the as-delivered electric field needs to be better than FD.
	Match performance of FD TPC.



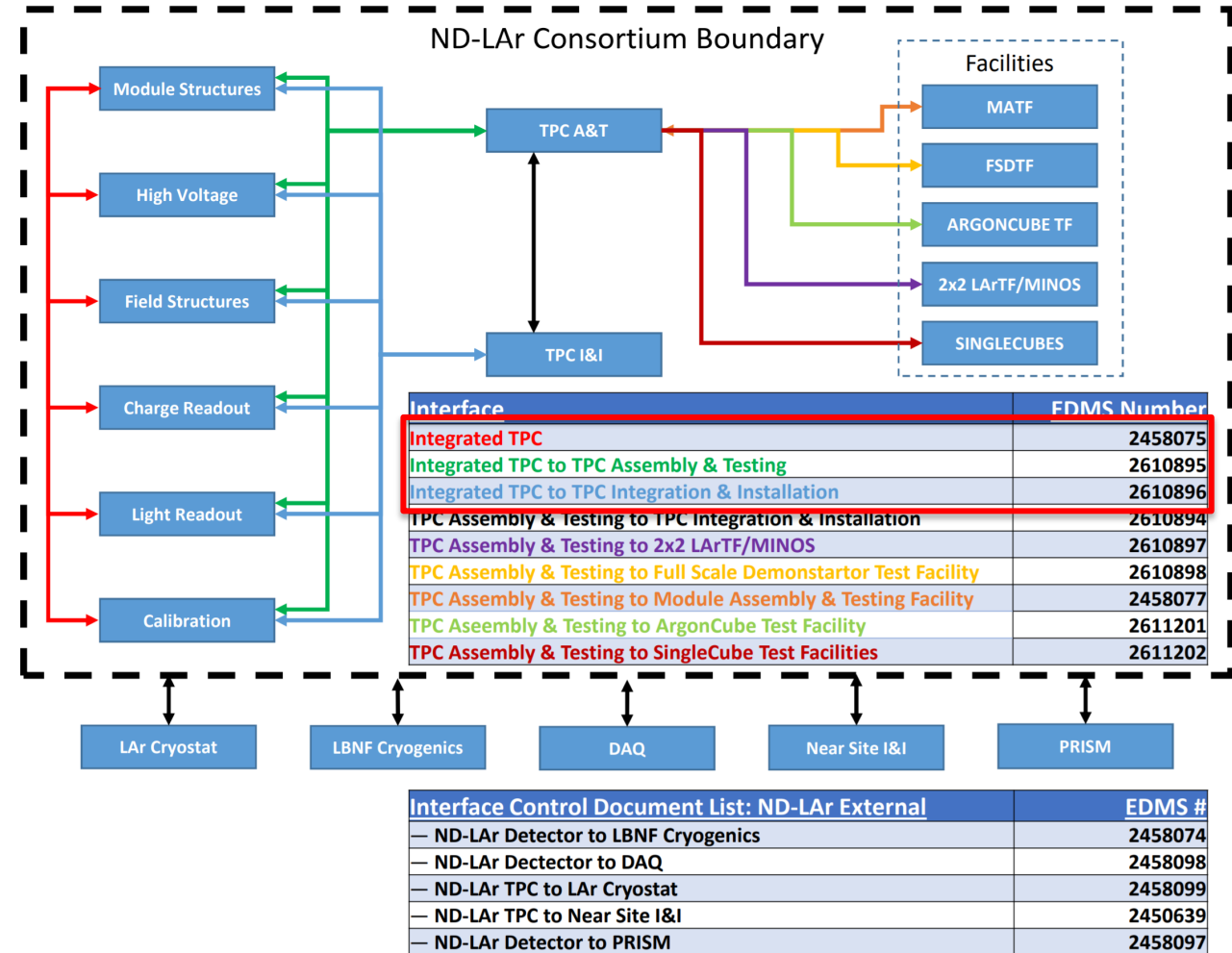
Page 9 of 10

10%	
1%	
	PE laser target position effects must be accurately understood to meet ND-C1.3
5%	
20%	
1%	Stability of the calibration must be accurately understood to meet ND-C1.4
1%	
10%	
30%	
000	
n or	



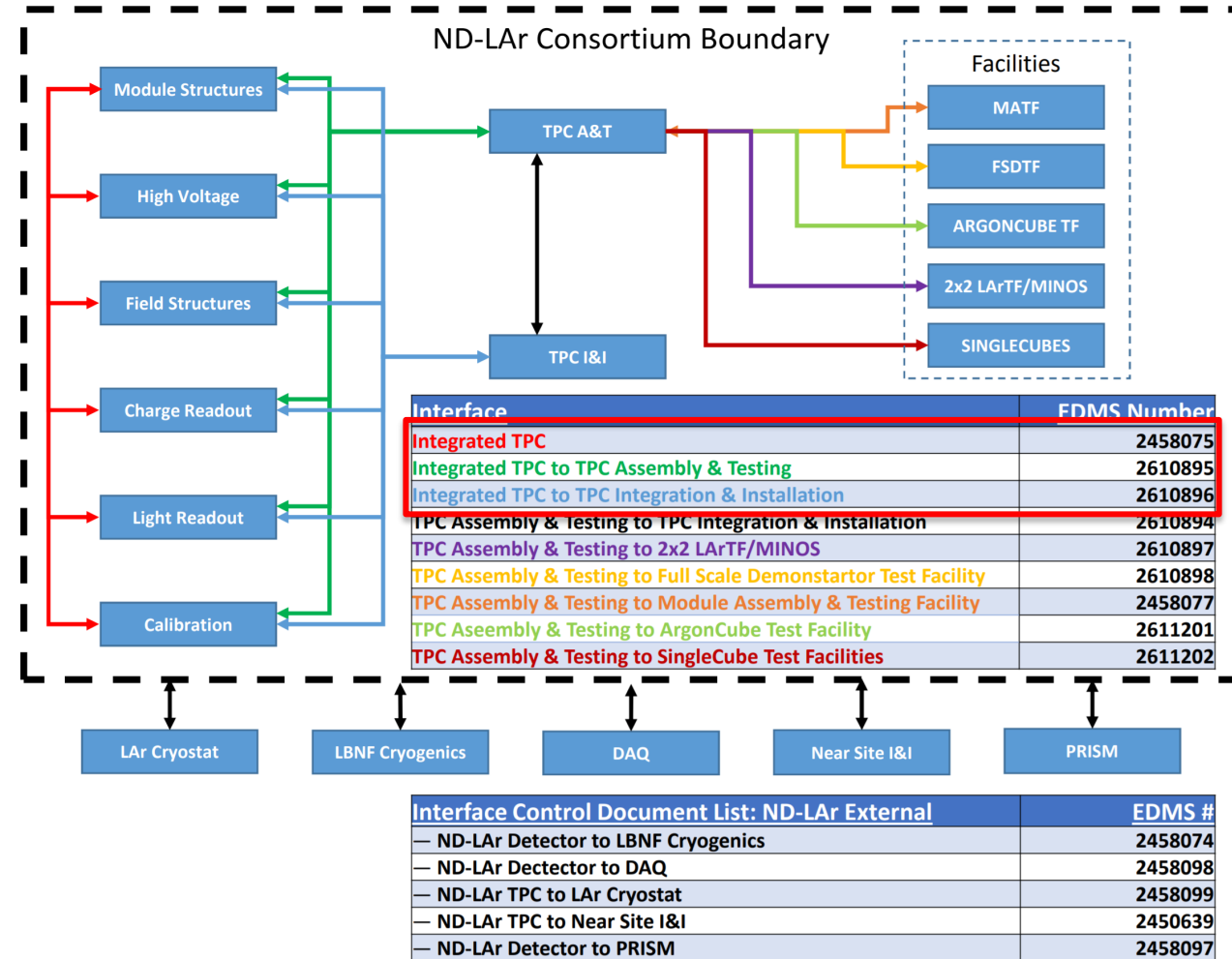
Calibration Interfaces

- EDMS [2458075](#) – Integrated TPC ICD
 - Field Structure
 - Fibers and cables will be routed above the top field cage plate.
 - Charge Readout
 - Physical interface – quartz light guides will be pushed inside holes in the anode tiles to inject light in the fiducial volume
 - DAQ interface – need to accommodate unique data profile and rate for calibration work
 - Cable routing on the backplate may not overlap with fibers routed on the back-pate and should not under any circumstances overlap with UV light injection locations on the backplate.
 - Light Readout
 - Utilize laser system for light readout timing calibration
 - Protect light readout from UV light damage



Calibration Interfaces Continued

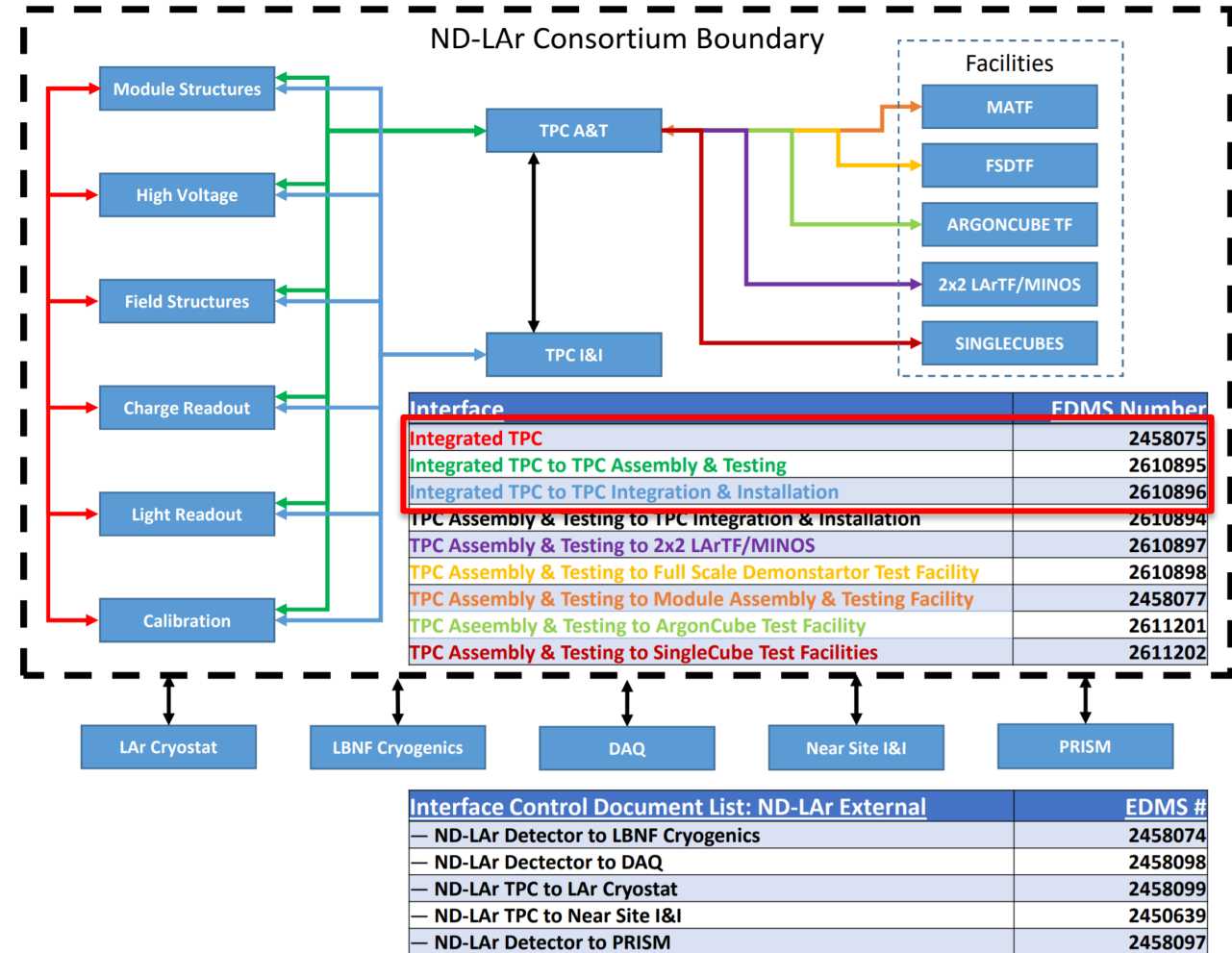
- EDMS [2458075](#) – Integrated TPC ICD
 - Module Structure
 - Arches on the top of the module structure to pass the fibers with sufficient bending radius from top of the TPC to backplate
 - Three large rectangular holes inside the backplate to accommodate fiber/quartz rod interface
 - Quartz rod holder attached to the backplate
 - Small holes for UV LED strips on the backplate
 - Routing of fibers and UV LED twisted pair wires
 - HV/Cathode
 - Metallic targets will be placed in predetermined location
 - Target positions will be surveyed prior to cathode installation inside the TPC.
 - Cryostat
 - Dedicated flanges on the cryostat need to accommodate fiber and UV LED cables



- Platform
 - Space on top of the cryostat for laser, optics and accompanying equipment

Calibration Interfaces

- EDMS [2610895](#) – Integrated TPC to TPC A&T ICD
 - Physical Deliverables (Components, Assemblies)
 - Inspection Reports
 - Travelers
 - Procedures
 - Safety Documentation
 - Site Support
- EDMS [2610896](#) – Integrated TPC to TPC I&I ICD
 - Physical Deliverables (Components, Assemblies)
 - Inspection Reports
 - Travelers
 - Procedures
 - Safety Documentation
 - Site Support



Next Steps

- Requirements
 - Next steps to move towards a first release of requirements document by 11/2021
- Interfaces
 - Next steps to defining interfaces agreements with other subsystems, first release 11/2021
 - Meetings: regular meetings on Mondays internally and with SLAC group members to discuss open issues regarding the installation
 - Meeting regarding calibration – charge readout (two so far)
 - Offline coordination – email exchange
- Remaining Issues / Unknowns
 - QE of the final target choice
 - Technology downselect between UV LEDs and laser → measurements designed to evaluate performance of each choice.