




## Field Structure Requirements Initial documentation

Weekly engineering call  
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Cubism - Braque's Bottle and Fishes, Paris c.1910-12

# Field Structures Requirements

- EDMS [2612982](#)
- Field Structure Requirements:
  - Maintain a uniform and stable E-field throughout lifespan of DUNE.
  - Maximizing active volume, minimize dead material and gaps between neighbouring modules.
  - Precisely locate a support readout and calibration components.
  - Allow sufficient flow of LAr to purify active volume and cool readout electronics



DEEP UNDERGROUND  
NEUTRINO EXPERIMENT

FIELD STRUCTURE REQUIREMENTS

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Type: REQUIREMENT  
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iv. A.4

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Figure 2.

L1 Requirements

L2 Requirements: EDMS 2589287

L3 Requirements

Flow-down

ITS

requirements

	Value 1	Rationale
Electric field strength of the detector	TBD	Performance should be as good as far detector, in order to allow accurate prediction of the far signal from near data.
Field non-uniformity	5%	Field non-uniformity should be small enough, such that they can be measured and modeled to less than 1% to match the far detector performance. The electric field will be corrected in the event reconstruction analysis.

FCG-003	Requirement	Electric Field Strength	The field cage shall be able to support an electric field strength >250 V/cm (goal 500 V/cm) without voltage breakdown	>250 V/cm (goal 500 V/cm)	Equivalent electric field as FD to enable operation of the near detector with equivalent levels of electron
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recombination and other field-dependent effects.

ull pixel plane should be sealable without compromise on field distortions. otherwise, the effective read region of the detector decreases.






D-LAr should match the D specifications accounting for the different geometry/readout systems.

In addition to potential dead LAr volume, there is dead volume from all the module components which must be minimized. This should be suitably matched by ND-LAr.

location from system level specification of <100e- field structure materials must not emanate impurities that affect LAr electron lifetime

The field cage provides the mechanical support as well as cable routing

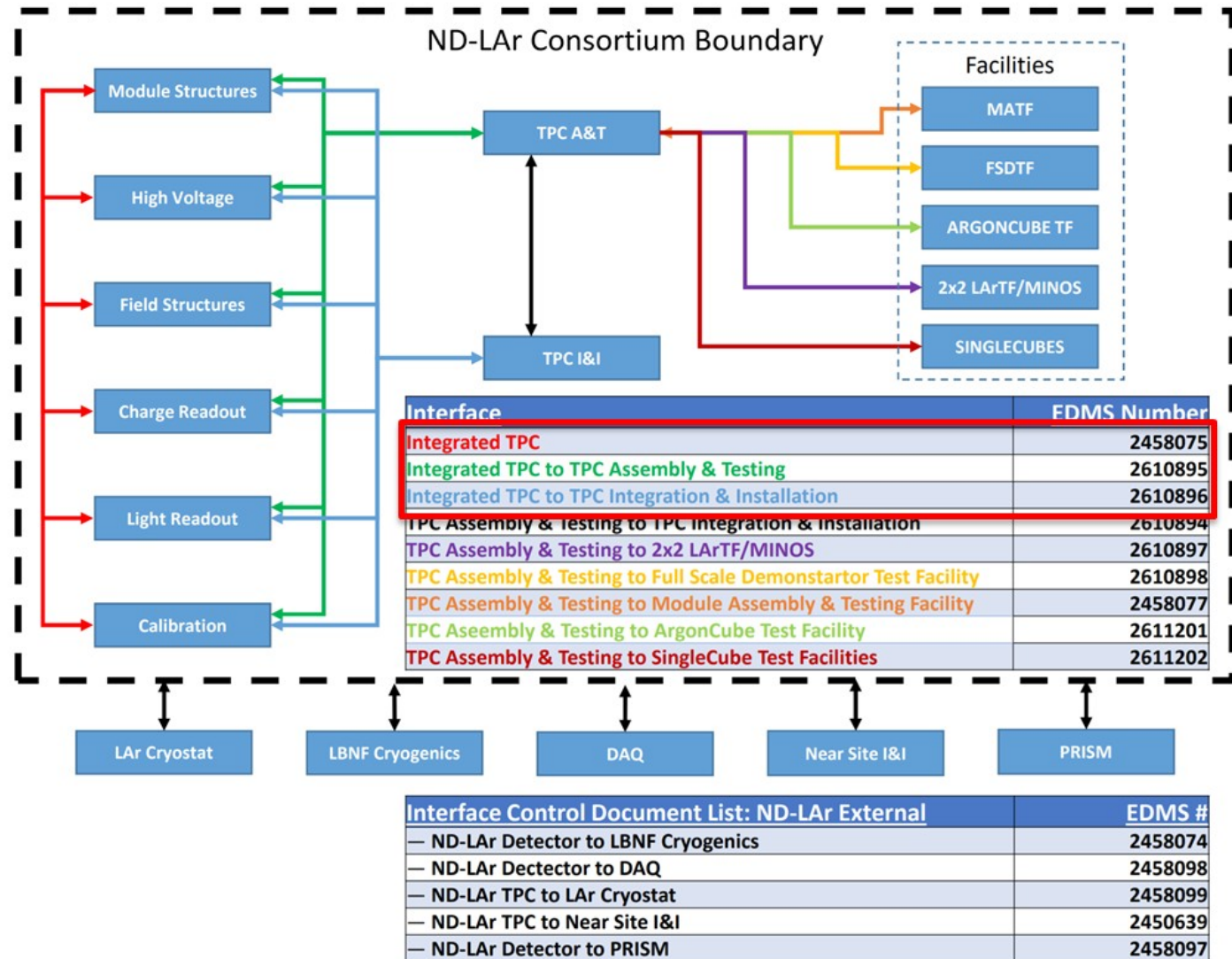
topping power, mass of the field structure needs to be small as compared to the mass of the LAr fiducial volume





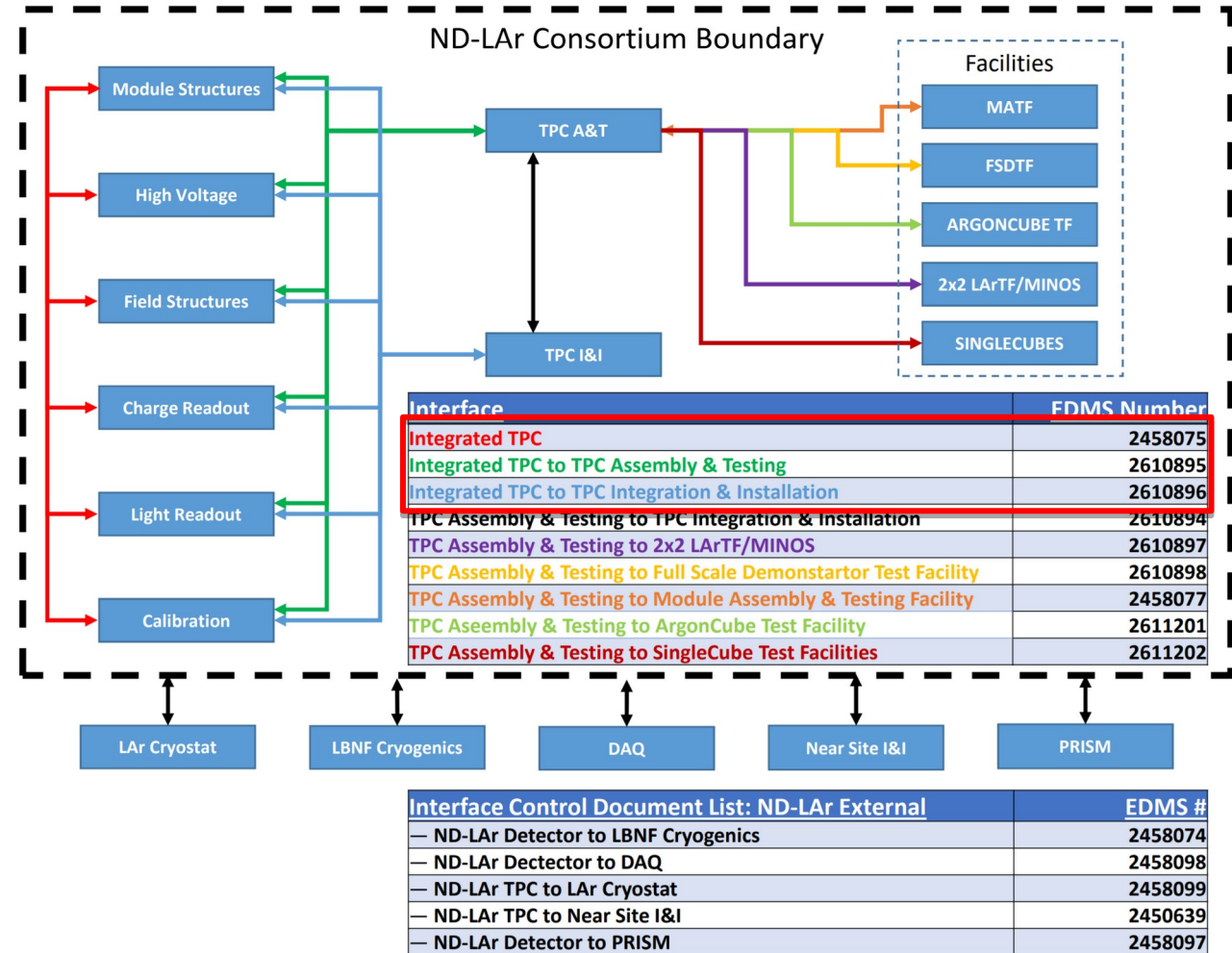
# Field Structure Interfaces

- EDMS [2458075](#) – Integrated TPC ICD
  - Calibration
    - Positioning and routing
  - Charge/light Readout
    - Heat dissipation, mechanical support, cable routing, grounding.
  - Module Structure
    - Connection to support structure, alignment/leveling, LAr flow, Temp sensor location
  - HV?
    - HV cathode connection, shielding



# Field Structure 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/Remaining Issues

- Requirements

- Review existing requirements against current design 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 with all interface groups to address any open questions with current design.
    - Offline coordination with L3s.

- Remaining Issues / Unknowns

- Down select of alternative field-shell options, ensuring they meet requirements, and new requirements do not need to be set.