

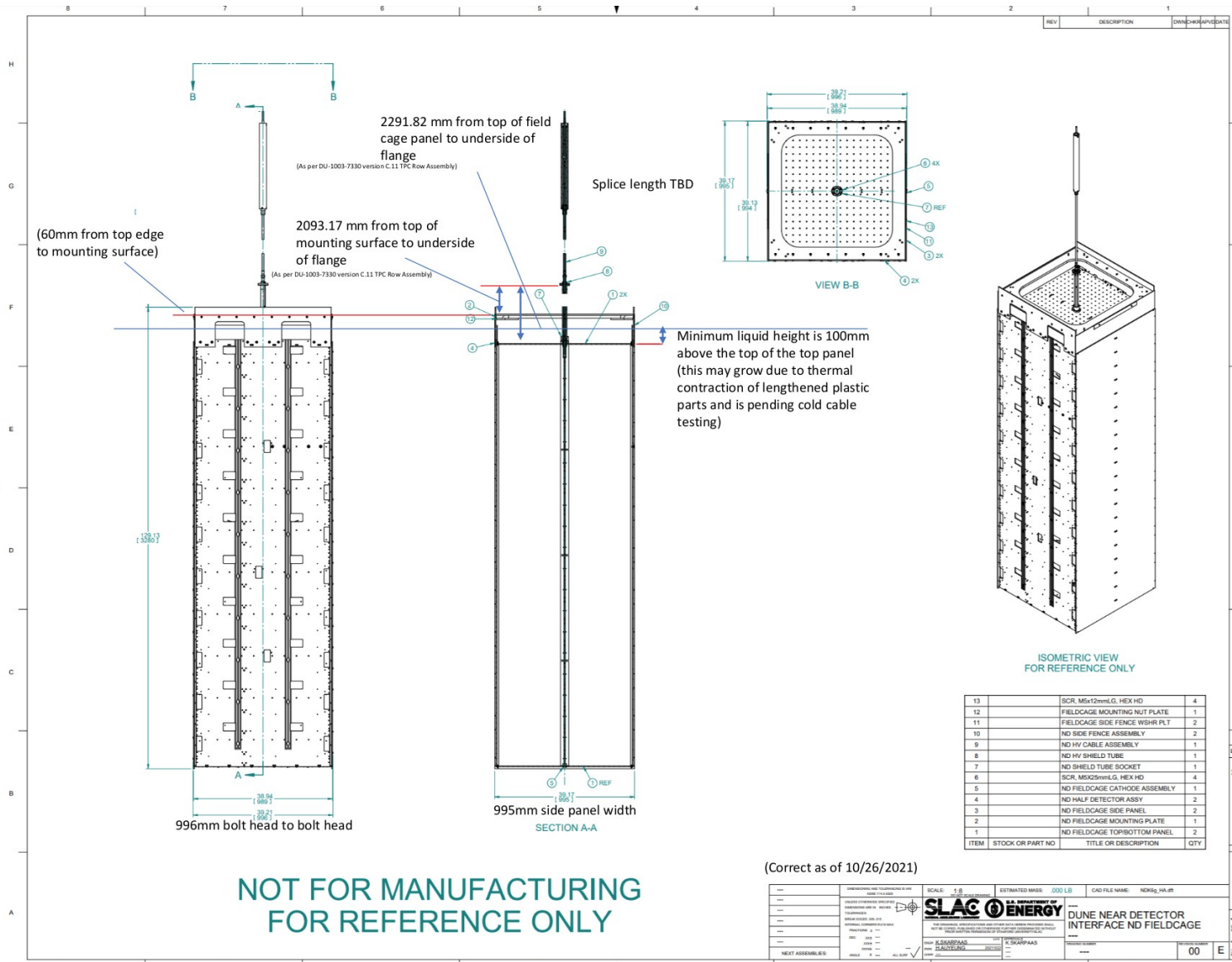


## Field Structure

Weekly Management Meeting  
December 8<sup>th</sup> 2021  
James Sinclair

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

# Scope



## HV Cable & Feedthrough

Connection between filter and cathode  
Warm cable with 2x male connectors  
Splice with 2x female connectors.  
Cold cable 1 x male connector and cathode connection.  
All cable 8.4 kΩ/m.

## Cathode & Field Shell

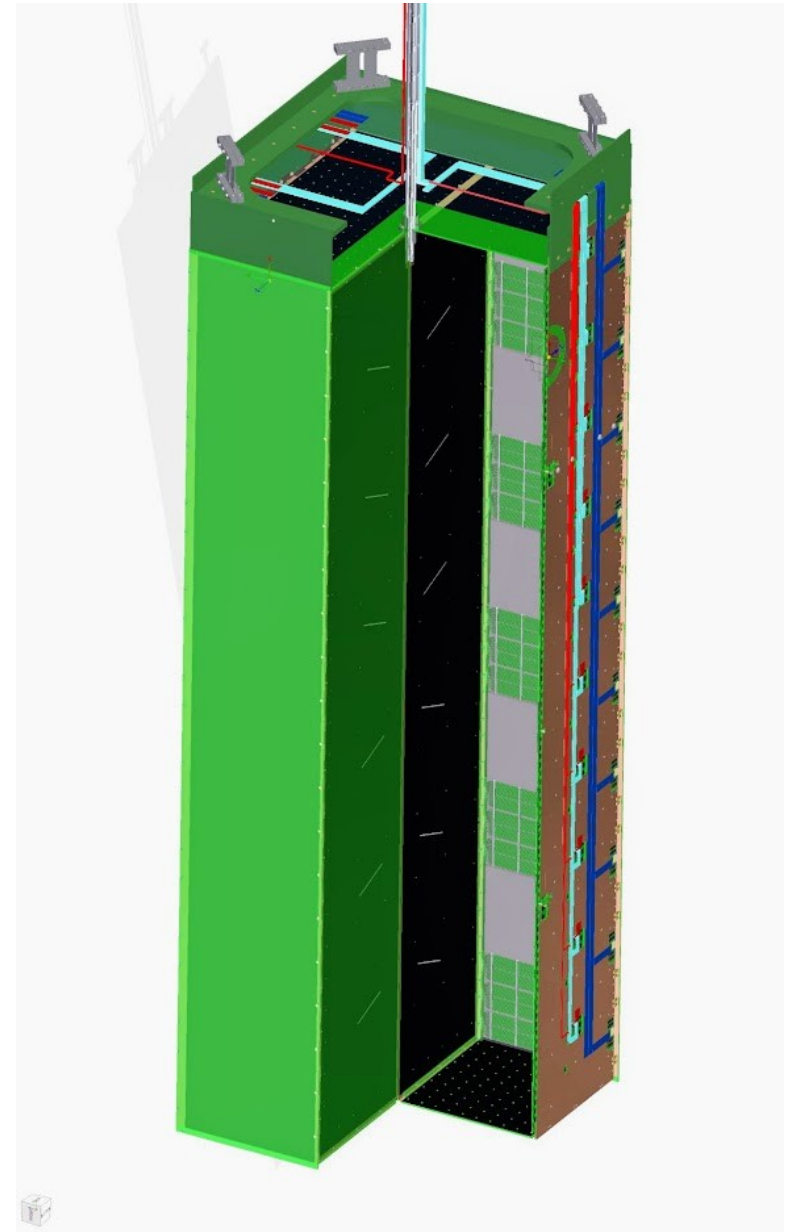
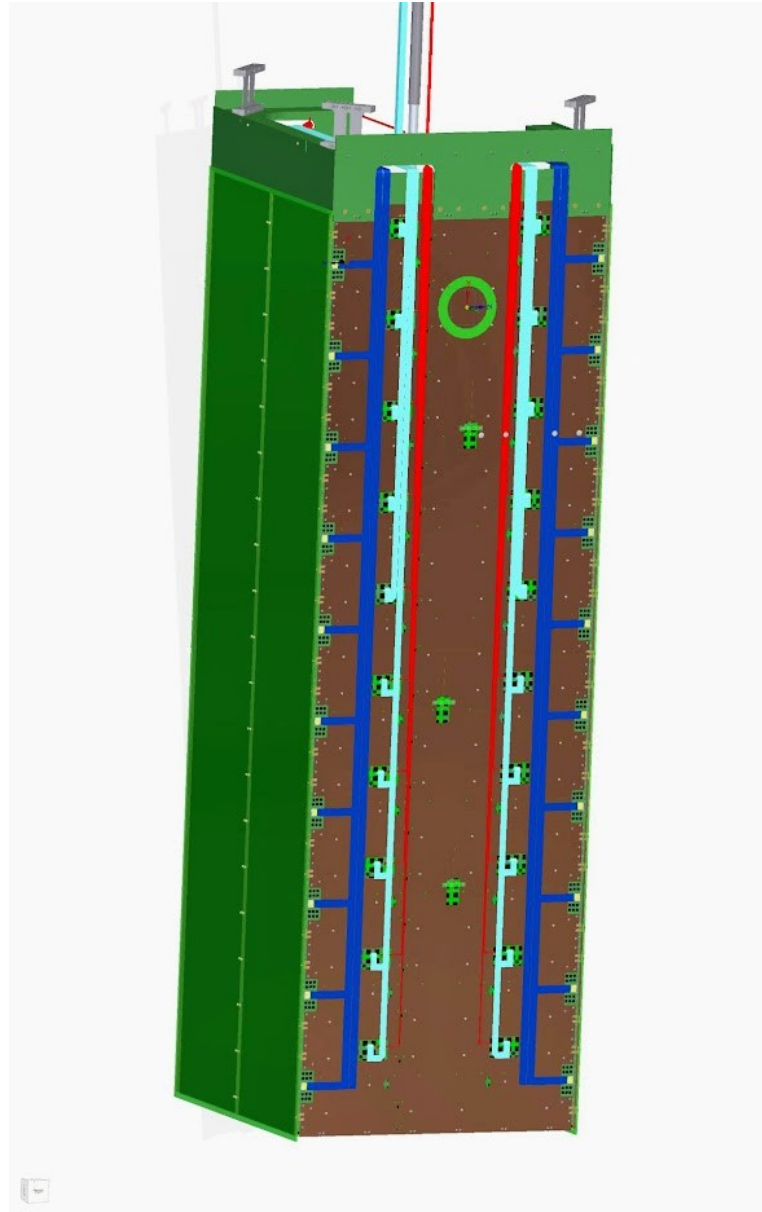
3 m panels + connection plates to couple into the Module structures G10 frame.  
Weir plates to contain injected LAr.  
Cathode resistive/metalized coating.  
Shell material TBD

## Anode support plane

Integrate all instrumentation & calibration.  
Provide rigidity to TPC.  
Component location WRT ASIC location.

## Additional

Support structures and calibration components



# Scope

Task/Item	Quantity	Institutions	Funding Source	Funding Status	Detailed description
HV Cables	40	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
HV Feedthroughs	40	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
HV Cathode Attachments	40	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
Cathode panels	40	MSU/SLAC	DUNE-US Project	Allocated	MSU/SLAC: Design; MSU production and assembly including the assembly of calibration targets (currently in Calibration WBS)
Field Cage panels, top	40	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
Field Cage panels, bottom	40	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
Field Cage panels, side	80	SLAC	DUNE-US Project	Allocated	Design, production, and assembly
Anode Support panels	80	SLAC	DUNE-US Project	Allocated	Design, production, and assembly (Need to talk with Mike)
Field Structure Assembly		SLAC/CSU/MSU	DUNE-US Project	Allocated	Design, SLAC/MSU/CSU: Assembly of First Module@MATF
Attachment hardware		SLAC	DUNE-US Project	Allocated	Design and production, SLAC/MSU/CSU: Assembly of First Module@MATF
Field Structure QA/QC tooling		SLAC/MSU/CSU	DUNE-US Project	Allocated	SLAC/MSU: Sub-components Design, production, and assembly, SLAC/MSU/CSU: QA/QC of First Module@MATF
Field Structure QA/QC labor		SLAC/MSU	DUNE-US Project	Allocated	SLAC/MSU: Sub-components Execution of QA/QC program, SLAC/MSU/CSU: QA/QC of First Module@MATF
Packaging and shipping		SLAC/MSU	DUNE-US Project	Allocated	Packaging and shipping to MATF
Assembly Procedures		SLAC/MSU	DUNE-US Project	Allocated	Subsystem procedures for use during A&T and I&I
Support during ND A&T		SLAC/MSU	DUNE-US Project/ SLAC (in-kind)	Allocated	Technical/scientific support during TPC Module assembly and test program at the MATF, including travel.
Support during ND I&I		SLAC/MSU	DUNE-US Project	Allocated	Technical/scientific support during TPC Module installation and integration at the DUNE Near Detector Site, including travel.

[https://docs.google.com/spreadsheets/d/1W1cJ43kjG9t-Mck5bCkSAN9idgJM8C0i\\_xUbCNELf6I/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1W1cJ43kjG9t-Mck5bCkSAN9idgJM8C0i_xUbCNELf6I/edit?usp=sharing)

Document	Status	Notes	Location
Requirements	Immature	Advanced table, needs documenting	EDMS 2612982
Manufacturing & Procurement	Immature	Technology dependent, advancing, suppliers contacted	-
QAQC	Immature	Only notes of critical dimensions, measurements, & procedures. Will advance with prototypes.	-
Interface Charge	Immature	Advanced, requires checkout with charge, then documenting	-
Interface Light	Immature	Advanced, drawings accepted, requires documenting	-
Interface Module Structure	Immature	Needs further iterations	-
Interface Calibration	Immature	Needs further iterations	-
Interface Cryostat	Immature	Must provide liquid level constraints, pending HV design	-
Interface HV	Immature	Lacking	-
PDR	Outdated	Needs extensive update	<a href="https://overleaf.com/project/5eeb98755627c2000104032c">overleaf.com/project/5eeb98755627c2000104032c</a>

## Prototyping HV

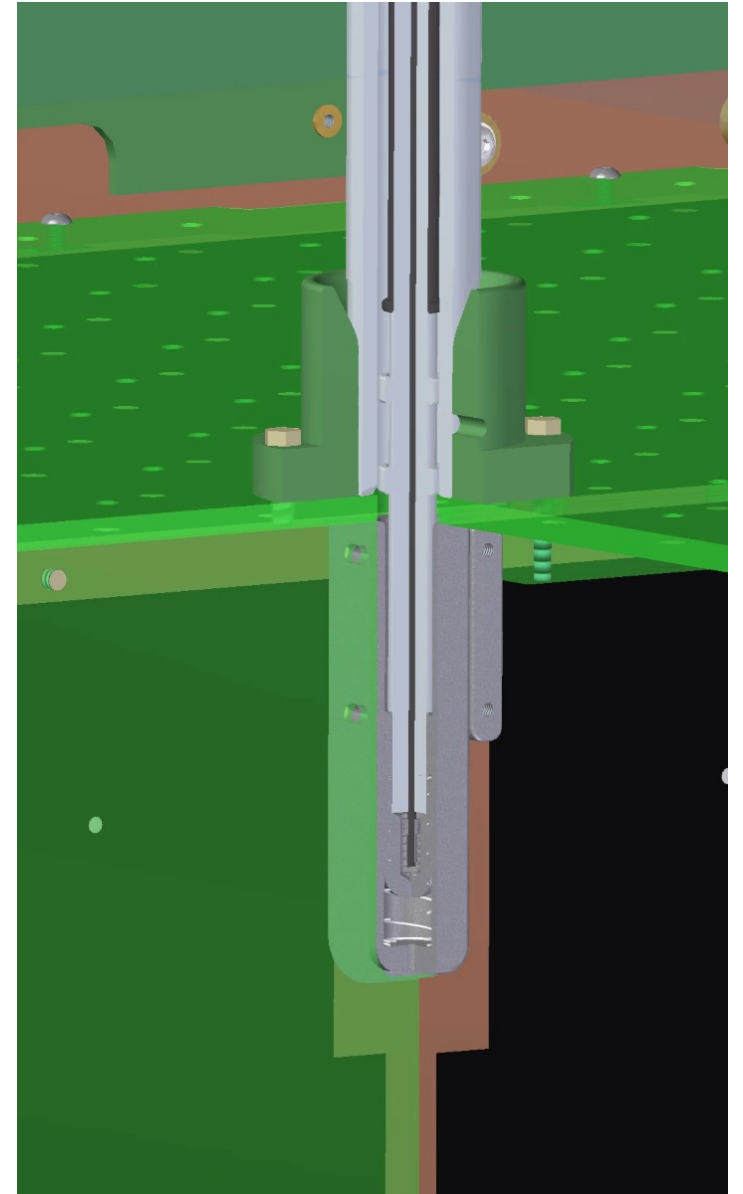
Design is well understood from nEXO, LZ, & 2x2.

Requires optimizing for ND in order to mitigate risk of change in liquid level.

Cathode connection construction technique is being optimized for safe mass production.

Cable for entire ND (warm & cold) has been purchased.

Connectors are needed to build next prototypes.



# Prototyping Field Shell

Split between 3 test stands:

## HV test stand, SLAC

Long-term field dependent aging  
 Operation pending voltage monitor and replacement PSU

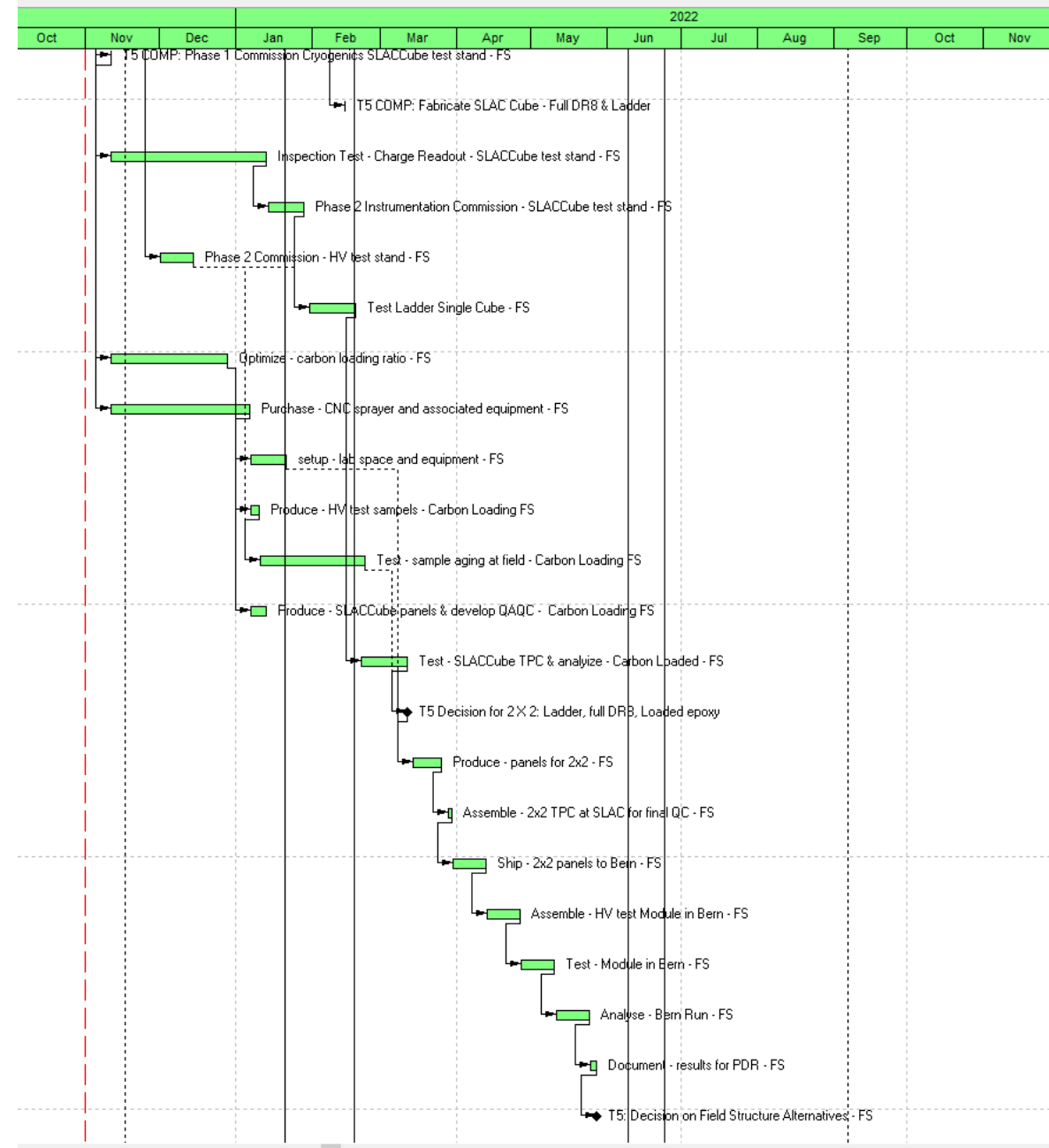
## SingleCube, SLAC

TPC functionality  
 Operation pending LArPix

## SingleModule Bern

Scale-ability in 2x2 size module  
 Operation April/May 2022

**Goal is Technology down select in May 2022 in readiness for FSD production October 2023.**



## Immediate issues (making use of a captive audience)

### **HV Connections:**

We need to use the same style of connectors Bern has specified for the filter.

Unfortunately, there is no US distributor and the only German supplier will not accept credit card.

Can we purchase these through Bern?

### **LArPix for SLAC SingleCube:**

We need the charge readout in order to reconstruct events at the edge of the TPC and analyze field distortions.

There have been some issues getting the charge readout working, Brooke is helping, but we may need a new pixel tile.

To speed up debugging, can someone from LBNL visit SLAC?