

Preparation of the DUNE-SP HV Preliminary Design Review

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General Information

- **DUNE-SP HV Preliminary Design Review will be at CERN on 4-5 June**
 - June 4 morning sessions in 222/R-003 & afternoon sessions in 13/2-005, and June 5 in 513/1-024
- **Agenda:**
 - CERN: <https://indico.cern.ch/event/813154/>
 - Mirror at FNAL: <https://indico.fnal.gov/event/20450/>
- **Review Committee:**
 - Mar Capeans (CERN) - Chair
 - Fernando Baltasar (CERN)
 - Dan Wenman (UW, Madison)
 - Marco Verzocchi (FNAL)
 - Hanguo Wang (UCLA)
 - Filippo Resnati (CERN)
 - Manhong Zhao (BNL)
- TC/JPO is invited to participate and ask questions

The DUNE single-phase (SP) HV system includes all parts to generate, distribute, and regulate the voltages that create a stable and precise E field within a SP module:

- HV power supplies and services
- HV Feedthrough into cryostat
- CPA array: Cathode plane assembly (CPA) arrays held at HV
- Field Cage (FC), formed sets of conductors at graded voltages surrounding the drift volumes to ensure uniformity of the E field

Documentation

- EDMS: Models, drawings, interface documents, requirements
<https://edms.cern.ch/project/CERN-0000195415>
- Structured access to documentation and ProtoDune Documents:
<https://indico.fnal.gov/event/20450/page/0>
- As reference, the final design review report for ProtoDUNE- SP HV:
<https://indico.fnal.gov/event/12785/contribution/17/material/minutes/0.pdf>
- Relevant TDR chapter, that provides a good explanation of the system
https://edms.cern.ch/ui/file/2149175/1/TDR_Single_Phase_High_Voltage_5-6-19.pdf

Review Charge

DUNE Single Phase Detector High Voltage Preliminary Design Review (Preliminary Design Review for TDR)

The committee is requested to review the DUNE high voltage system design and determine if it meets the requirements of the preliminary mechanical and electrical design as outlined in the DUNE Far Detector Design Review Plan (DocDB-9564) and in the forthcoming TDR.

1. Have design choices been fully identified and do they meet detector requirements?
2. Are the specifications and drawings for standard and custom components substantially complete and available in EDMS? Are they of sufficient maturity to proceed to final design?
3. Have interfaces with other detector components been addressed and documented? Do risks of design changes in other systems have appropriate mitigation strategies?
4. Are engineering analyses sufficient to ensure the design is safe during all phases. Which applicable design codes and standards have been used?
5. Are system grounding details documented and in EDMS? Are electrical connections specified and do schematics exist in EDMS? Are all wires, cables and connections documented?
6. Is the design in accordance with possible procurement strategy scenarios ?
7. Are quality assurance and testing plans sufficiently developed to proceed to final design?
8. Have lessons learned from ProtoDUNE been implemented?
9. Are plans for additional prototyping reasonable and sufficient?
10. Are plans for the next post TDR design being sufficiently justified and presented ?
11. Have appropriate cost estimates and schedule been determined? Are plans for required technical resources consistent with scope of remaining work?

Safety and Engineering Aspects

- Parallel engineering review by the Engineering Safety Review team (Olga Beltramello, Farshid Fezi and Terri Shaw) of the engineering design document will hopefully be available before or following this review.
- No focus on general safety aspects in this PDR

Review Committee responsibilities

- **Executive Session on Tuesday 4th 8-8:30h**
 - Introduction to the review
- **Executive Session on Tuesday 4th 16:15-17 h**
 - Preparation of “Homework Questions”; to be answered by team on June 5th 9-10h
- **Executive Session on Wednesday 5th 10-12 h**
 - Preparation of Slides & Draft report: Findings, Comments (concerns) and Recommendations
- **Closeout on June 5 at 12h.**
 - The committee should present its findings, comments and recommendations in a closeout with DUNE Technical Coordination
- **The committee should provide a final written report by June 14.**

Report Structure Proposal

- **Introduction**
- **CPA: Findings, Comments and Recommendations**
- **Field Cage: Findings, Comments and Recommendations**
- **HV feedthrough & Interconnects: Findings, Comments and Recommendations**
- **System aspects (QA/QC, systems tests, prototype and R&D work...): Findings, Comments and Recommendations**
- **Risks, schedule, resources**
- **Additional suggestions**
- **Answers to Charge questions**

Need to scrutinize each HV component from different points of view: maturity of mechanical and electrical designs, results of prototypes, QA/QC, ...

Then, scrutinize system aspects: tests, R&D ahead, installation...

Then, review organizational aspects: schedule, management, resources, responsibilities...

The input from each panel member, with their complementary expertise, is needed.

Report will be assembled by Mar with the comments of panel members during the review, your 'private' notes, and end-of-day discussions

Assign questions to individuals; see **proposal** in next slide

Talk	Charge Question		Lead Editor
System Overview	1	Have design choices been fully identified and do they meet detector requirements?	M.Capeans
Electrical Design Mechanical Design HV Feedthrough Design HV interconnects	2	Are the specifications and drawings for standard and custom components substantially complete and available in EDMS? Are they of sufficient maturity to proceed to final design?	F.Baltasar
	3	Have interfaces with other detector components been addressed and documented? Do risks of design changes in other systems have appropriate mitigation strategies?	D.Wenman
	4	Are engineering analyses sufficient to ensure the design is safe during all phases? Which applicable design codes and standards have been used?	M.Zhao F.Baltasar
Electrical Design and Interfaces	5	Are system grounding details documented and in EDMS? Are electrical connections specified and do schematics exist in EDMS? Are all wires, cables and connections documented?	M.Verzocchi
Fabrication Plan and Schedule	6	Is the design in accordance with possible procurement strategy and manufacturing scenarios?	M.Capeans
QA/QC	7	Are quality assurance and testing plans sufficiently developed to proceed to final design?	H.Wang
ProtoDune Lessons	8	Have lessons learned from ProtoDUNE been implemented?	F.Resnati
R&D, Value Engineering	9	Are plans for additional prototyping reasonable and sufficient?	D.Wenman
Post TDR	10	Are plans for the next post TDR design being sufficiently justified and presented ?	All
Fabrication Plan and Schedule	11	Have appropriate cost estimates and schedule been determined? Are plans for required technical resources consistent with scope of remaining work?	M.Verzocchi