

TMS PDR Planning

Hugh Gallagher / Tom Markiewicz / Tom LeCompte

Dec. 6, 2023 – TMS Consortium Meeting

Steve Manly has agreed to be the editor for the PDR. Thank you, Steve!

The Preliminary Design Report is the “first draft” of the Technical Design Report (TDR).

- It is needed to proceed through the review process for CD-2 approval.
- Continued work on the design through the Final Design Report, and CD-3 review process.

Review committees commented favorably on the level of technical maturity in the CDR.

Priority is work along two tracks:

- Big design questions: electronics configuration, module orientation.
- Shifting from “Concept” to “Design”. More engineering design, technical drawings, I&I.

Heart of the PDR is the description of the detector design:

- Support Structure (SLAC/ANL)
- Detector Steel (Jeff N. / Wes C.)
- Magnet Coils and Power supplies (Mat M/Holger M)
- Detector Modules (Andy F./Mayly S.)
- Detector Electronics (Thomas K / Vittorio P) + Camillo/? on timing/slow controls/DAQ
- Calibration Strategy (Gavin D / Mario A)

Performance Studies: (Lukas / Jeffrey + team)

I&I: Howard + team

Category	Document	EDMS	Controlled by	Required for Preliminary Design Review
Design Documents	TDR Chapter		DUNE EB	Sub-system Design Report from TDR. Assumed to include some discussion of value engineering process.
	Design Updates		Consortium	Written description of sub-system design changes made subsequent to the release of the TDR (TDR addendum).
	Grounding & Shielding Plan	xxxxxx	DUNE TB	Short document describing plan for sub-system adherence with detector grounding & shielding requirements.
	Mechanical CAD Model for Sub-system	xxxxxx	Consortium	Updated CAD model for sub-system released in EDMS. As part of the process for releasing the sub-system model, it will be integrated and checked within global CAD model.
	Mechanical Engineering Drawings	xxxxxx	Consortium	Engineering drawings for all sub-system mechanical components. Drawings do not need to be production quality but should contain all critical dimensions and tolerances. Drawings should be obtained directly from released sub-system CAD model and be marked "Draft/Not for Production". Drawings should also indicate component fabrication materials and masses consistent with EDMS 2281422. Drawings of any specialized components necessary for transporting or installing detector components should also be provided.
	Mechanical Assembly Drawings and Parts Lists	xxxxxx	Consortium	Assembly drawings and parts lists for all sub-system detector components. Drawings do not need to be production quality but should contain the baseline design and section views. Drawings should be marked "Draft/Not for Production", contain assembly masses consistent with EDMS 2281422, and indicate the center-of-gravity of the assembly (CG marker) . Parts lists should contain full specifications for any custom components.
	Electrical Schematics & Board Layouts	xxxxxx	Consortium	Schematics and board layouts for all sub-system electronics components. Along with the schematic and board layout files for each printed circuit board design, the additional board layout and manufacturing information typically sent to PCB manufactures (e.g. number and configuration of layers, required drill sizes and tolerances, hole plating requirements, and board trace widths and tolerances) should be provided.
	Specification of Electrical Cabling and Wiring Connections	xxxxxx	Consortium	Specification of all electrical connections between sub-system components. Needs to include complete information on all cables and connectors including maximum voltage and current ratings. Wiring diagrams should be provided as necessary such that all system inter-connections are fully defined.
	Bills of Materials for Electronic Board Components	xxxxxx	Consortium	Bills of materials including parts list with full manufacturer part numbers for each sub-system electronics component. As appropriate, information regarding the cryogenic qualification of specific parts should also be provided.
	Documentation Links for Commercial, Off-the-Shelf Powered Components	xxxxxx	Consortium	Not required for Preliminary Design Review.

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Requirements Documents	EB-Held Requirements	2346091	DUNE EB	High-level detector requirements with impact on physics performance.
	TB-Held Requirements	2346092	DUNE TB	Next level detector requirements with potential impacts on multiple subsystems.
	Consortium-held Requirements		Consortium	Spreadsheet with four tabs for Integration, Installation, Fabrication, and Transportation requirements. These requirements should be pulled from Interface documents, Far Detector Installation Plan, QA/QC Plan, and Manufacturing Plan as appropriate.
Installation Documents	Detector Installation Plan	2233449	Integration Office	Chapters detailing sub-system installation plans should be complete and updated.
	ProtoDUNE-II Installation Plan	xxxxxx	Integration Office	Not required for Preliminary Design Review.
		xxxxxx		
		xxxxxx		
		xxxxxx		
		xxxxxx		
Interface Documents	Consortium-Consortium	xxxxxx	DUNE TB	Released version of document detailing interfaces between detector sub-systems (APA, HV, SP-PD, SP-ELEC, DAQ, CALCI, COMP). Six in total for each consortium.
	Consortium-Installation	xxxxxx	Integration Office	Released version of document detailing detector sub-system interfaces with the detector installation plan.
	Consortium-DSS	xxxxxx	Integration Office	Released version of document detailing detector sub-system interfaces with the Detector Support Structure (DSS)
	Consortium-Facilities	xxxxxx	Integration Office	Released version of document detailing detector sub-system interfaces with facility infrastructure. Facility infrastructure includes cryostat penetrations, real estate on top of cryostat, racks on the detector and cryogenic mezzanines, as well as cryogenic systems and piping (both internal and external to the cryostat).
	Interface Drawings		DUNE TB & Integration Office	Required interface drawings (both mechanical and electrical) are specified within each interface document. Interface drawings once completed should be posted as an additional material within the EDMS entry of the corresponding interface document.
Engineering Analysis Documents	Analysis Plan	xxxxxx	Consortium & Compliance Office	Documents the load cases that need to be analyzed for the sub-system and the standards that will be used assess the structural calculations. This document is jointly signed-off on by the consortium and compliance office prior to starting any structural analysis.
	Structural Analysis Note(s)	xxxxxx	Consortium	Engineering notes detailing the structural analyses performed for each of the sub-system load cases defined in the analysis plan and comparison against identified standards.
	Independent Review Report(s)	xxxxxx	Compliance Office	Output from independent review of structural analysis note(s) performed by the Compliance Office. Report(s) should include recommendations for required updates needed prior to Final Design Review.

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QA/QC Documents	Preliminary QA/QC Plan	xxxxxx	Consortium	Short document describing consortium QA/QC plan with emphasis on sub-system testing plans covering fabrication, transport, storage, and installation stages. An example QA/QC plan can be found in EDMS 2414898.
	ProtoDUNE Lessons-Learned	xxxxxx	Consortium	Short document detailing sub-system issues uncovered during ProtoDUNE and the steps being taken to address these.
	Preliminary Manufacturing and Procurement Plan	xxxxxx	Consortium	Short document describing consortium plans for the procurement of needed materials, fabrication of detector components, and sub-system assembly. Example Procurement and Manufacturing plans can be found in EDMS 2414899 and EDMS 2414900, respectively.
	Plan for Prototyping Activities	xxxxxx	Consortium	Short document describing consortium plans for prototyping activities moving forward from the Preliminary Design Review including any Ash River activities and ProtoDUNE-II. Description of sub-system specific Ash River activities should be consistent with that in document describing overall plan for Ash River activities (EDMS 2169069)
	Fabrication, Inspection, and Test Procedures	xxxxxx	Consortium	Not required for Preliminary Design Review.
Cost/Schedule Documents	Fabrication, Inspection, and Test Forms (Travelers, Test Reports, and Inspection Reports)	xxxxxx	Consortium	Not required for Preliminary Design Review.
	Cost Estimate		DUNE EB	Consortia sub-system cost estimates are prepared by the DUNE Resource Coordinator working closely with the consortia leadership teams. Effort is currently underway to incorporate cost estimates within P6 to enable production of annual M&S and Labor profiles. Resource Coordinator will determine format for sharing this information with review committee.
	Institutional Responsibilities		DUNE EB	Not required for Preliminary Design Review.
	Schedule Summary		DUNE TB	Need to define a format to be extracted from P6. Should include a summary of consortium milestones and connections to high-level ProtoDUNE-II and Far Detector milestones.
Tracking Documents	Responses to Past Review Recommendations	xxxxxx	Review Office	Consortia should keep a spreadsheet of recommendations received from each stage of the review process. For each recommendation received, the consortia should provide within the spreadsheet a brief description of how the consortium has addressed the recommendation and an assessment of its current status (e.g. closed or in-progress).
	Review Office Report on Responses to Past Reviews	xxxxxx	Review Office	Not required for Preliminary Design Review.

	CDR	"Leaning Toward for PDR	Comments
Magnet	Vertical plates	"Short stack"	May use recycled MINOS steel
Scintillator formulation	MINOS-like	Whatever FNAL recommends – possibly more TiO ₂ .	
Scintillator thickness	10 mm	10 mm	It may be possible/desirable to go to 20 mm
Scintillator orientation	3 degree stereo	3 degree stereo	
Thin plate thickness	15 mm	5/8" (15.8 mm)	Steel availability

	CDR	Leaning Toward for PDR	Comments
WLS Fiber Material	Kuraray Y-11	Kuraray Y-11	Or equivalent
WLS Fiber Diameter	1.4 mm	Match SiPM size	
Panel Box	CDR design (glued covers)	Minnesota design	
Readiut electronics	Mu2e-derived	CAEN	KlauS decision deferred until German funding decision
Counter mounting	Shelf	Cassette	
Cables	HDMI/Display Port	Probably shielded ribbon	
Support structure	CDR Design	CDR Design	I&I would like this to be the same as for ND-LAr
PRISM rollers	8 powered	8 powered 2 unpowered	

These are not decisions we have taken yet –
but we did want to share a sense of “which way the wind is blowing” in order to make progress.

If you have strong feelings, now is the time to do the studies to show why an alternative path is better.

Given where we are, unlikely to have a PDR ready before mid-2024. We will be hearing on the new official schedule soon.

Getting Started:

- Tom LeCompte has prepared an Overleaf for the PDR, stripped down from the CDR, which he will share.
- Subsystem editors are free to make changes to bring document to date with your thinking.

ASAP (Jan 2024):

- Understanding exactly who does what, are there holes/gaps.
- Finalize the mapping between subsystems and the necessary engineering/technician support required for PDR prep.

Few day PDR-fest week of Jan 8-12, let Tom M and I know if you could join in person (SLAC).

Meeting with Anne Heavey for a reminder on DUNE Overleaf best practices.