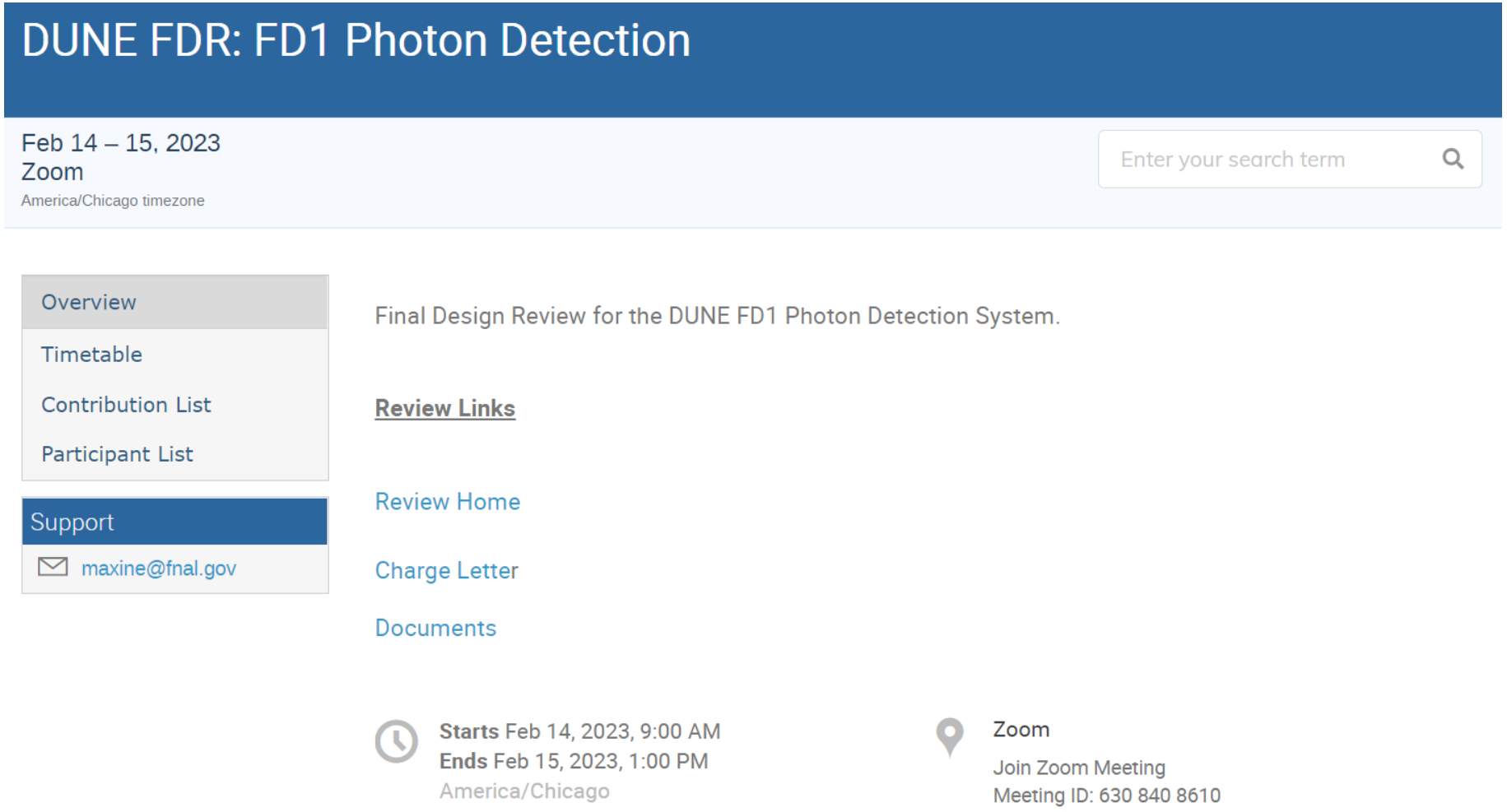
FD1 PDS FDR Status Update

Dave Warner, Gustavo do Amaral Valdiviesso

January 17, 2023

FD1 PDS FDR Planning

https://indico.fnal.gov/event/57823/



Review Committee:

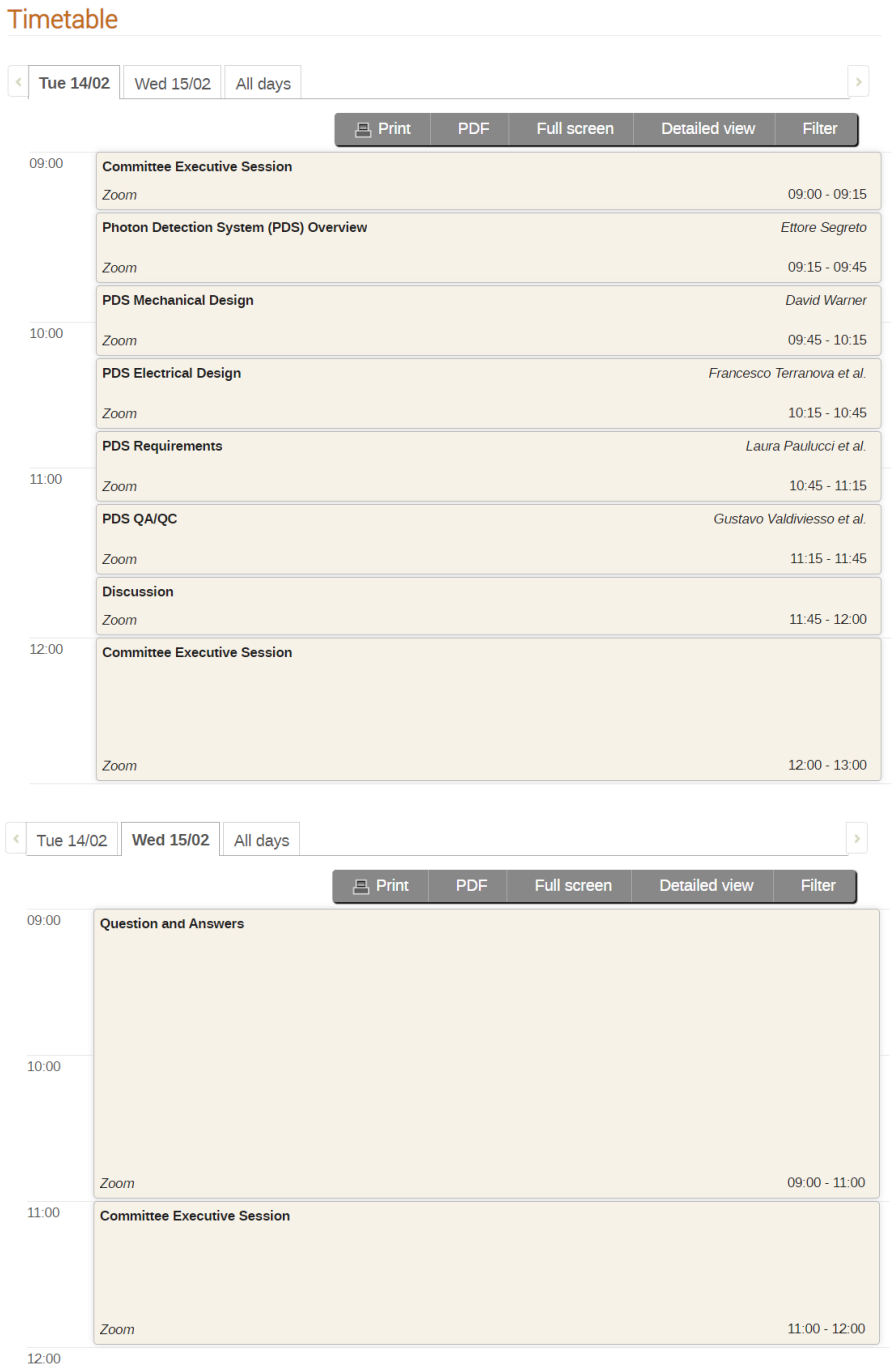
Reviewers

Ed Blucher, Carl Grace, Josh Klein (Chair), Giovanna Lehmann, Jose Maneira, and Andrew Mastbaum.

Ex-officio

Mike Andrews, Linda Bagby, Olga Beltramello, Mary Bishai, Kevin Fahey, Jack Fowler, Eric James, Jolie Macier, Jim Mateyack, Bill Miller, Marzio Nessi, Duane Newhart, Terri Shaw, Jim Stewart, Robert Svoboda, Kyle Zeug

Agenda:


Timetable
Tue 14/02
Wed 15/02
All days
Print
PDF
Full screen
Detailed view
Filter
09:00
Committee Executive Session
Zoom
09:00 - 09:15
Photon Detection System (PDS) Overview
Ettore Segreto
Zoom
09:15 - 09:45
PDS Mechanical Design
David Warner
10:00
Zoom
09:45 - 10:15
PDS Electrical Design
Francesco Terranova et al.
Zoom
10:15 - 10:45
PDS Requirements
Laura Paulucci et al.
11:00
Zoom
10:45 - 11:15
PDS QA/QC
Gustavo Valdiviesso et al.
Zoom
11:15 - 11:45
Discussion
Zoom
11:45 - 12:00
12:00
Committee Executive Session
Zoom
12:00 - 13:00
Tue 14/02
Wed 15/02
All days
Print
PDF
Full screen
Detailed view
Filter
09:00
Question and Answers
10:00
Zoom
09:00 - 11:00
11:00
Committee Executive Session
Zoom
11:00 - 12:00
12:00

DUNE Final Design Review Charge

FD1 Photon Detection System

31 January 2023

The committee is requested to review the final design of the DUNE FD1 Photon Detection System (PDS). The review scope includes all mechanical and electrical aspects of the PDS design. A summary of the documents released for this review can be found in EDMS-XXXXXX. For reference, the final committee report from the PDS Preliminary Design Review can be accessed at EDMS-2396666.

The committee should assess if the design meets specified requirements for final design (90%) outlined in the LBNF/DUNE Review Plan (EDMS-2173197) as supported by the DUNE Far Detector FDR deliverables defined in EDMS-2413117.

The committee should consider:

1. How design choices satisfy the requirements.
2. The completeness of the documentation of mechanical specifications, including 3D model and the 2D drawings for standard and custom components as well as the Compliance Office evaluation focusing on both safety and the proper application of design codes and standards.
3. The completeness of the documentation of electrical specifications, including system schematics, drawings, connections, and grounding details.
4. Whether transportation and installation plans are mature enough to provide assurance that the PDS components, as currently designed, can be safely transported and installed within the detector.
5. Whether lessons learned from ProtoDUNE-SP and other prototypes have been appropriately incorporated within the current design and if the design has been validated through the integration, testing, and installation of Module 0 components for ProtoDUNE-II.
6. If draft documentation detailing plans for procurement, manufacturing, quality control, and part identifiers exists at a sufficient level of maturity for this stage of the design.
7. If project planning materials including interface documents, risk assessments, schedules, and cost estimates exist at a sufficient level of development for this stage of the design.
8. Whether recommendations from previous reviews have been appropriately addressed.

Review Findings:

The committee should present its findings, comments and recommendations in a final report by March 3, 2022.

Dates and Comments:

- 1/23/23 Drafts of all new documents
  - Already received from many people
  - Please try to have drafts ready by this Friday!

- 2/6/23 Post all documents for reviewers

- We are working to coordinate a structure in EDMS to direct the reviewers to the required documents
  - Please don’t post documents to EDMS
    - Some already have as updated to existing documents-- Thank you, but PLEASE make sure you let Gustavo, and me know where and when you posted them.
    - We will establish a temporary drop box until the structure is ready
    - We will post the documents into the required location once it is ready.

QC document Template

- Jim Mateyack of the QC/QA office has generated a template for all consortium QC planning

- We will need to integrate our plans into this format.

DEEP UNDERGROUND NEUTRINO EXPERIMENT | PLAN

Title: DUNE FD1 Photon Detector System (PDS) Quality Control Plan

Author(s): James Mateyack | Approved: Kevin Fahey | Page **1** of **10**

Document ID: EDMS XXXXXXX | Version: 0 | Version Date: 5Jan2023

REVISION HISTORY

Version	Description of Change	Author	Effective Date
0	Initial release	James Mateyack	5Jan2023

Table of Contents

FD1 Design Report

- Bob Wilson is editing the required update of the TDR (Called the FD1 Design Report)

- He will be reaching out to many of you for information needed

BACKUP- Document Requirement List

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
Design Documents	TDR Chapter	DUNE EB	Sub-system Design Report from TDR. Assumed to include some discussion of value engineering process.	No additional requirements for Final Design Review.	Eric J.
				Updated, stand-alone version of orginal TDR chapter that accurately describes	
Design Documents	TDR Chapter	DUNE EB	Sub-system Design Report from TDR. Assumed to include some discussion of value engineering process.	No additional requirements for Final Design Review.	Eric J.
	Design Updates	Consortium	Written description of sub-system design changes made subsequent to the release of the TDR (TDR addendum).	Updated, stand-alone version of orginal TDR chapter that accurately describes sub-system design at time of Final Design Review. The document should include information on any prototyping activites since the Preliminary Design Review that have impacted the Final Design.	Eric J.
	Grounding & Shielding Plan	DUNE TB	Short document describing plan for sub-system adherence with detector grounding & shielding requirements.	Final document should include a sub-system grounding diagram with all components and cables identified, text which notes any sub-system grounding or isolation requirements, and EDMS references to documentation on all cables and custom or commercial equipment included in the grounding diagram. Physical implementation of grounding connections should also be described - this can be done through pictures, schematics, or mechanical drawings of the hardware connections. Plan should have sign-off from DUNE Grounding & Shielding Committee (contact Terri Shaw at tshaw@fnal.gov). An example of a grounding diagram (TPC electronics) can be found in EDMS 2364510. Detector system grounding rules for cables & shields can be found in EDMS 2095958. Infrastructure grounding rules are posted in EDMS 2095975.	Terri S.
	Mechanical CAD Model for Sub-system	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.	Final CAD model that serves as the basis for all production drawings. Although drawings include additional detail beyond that contained within the model, the drawings themselves should be being generated directly from this released model.	Jack F. Kyle Z.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
	Mechanical Engineering Drawings	Consortium	Engineering drawings for all sub-system mechanical components. Drawings do not need to be production quaility but should contain all crtical 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.	Drawings should be of the quality to send to an outside vendor for production and marked "For Module Zero Production". Drawing details should include materials of construction, component masses, pointers to higher-level drawings, default and critical tolerances, part finishes, cleaning procedures, as well as weld parameters and certifications where applicable. All drawings need to be released and set up within a versioning framework providing proper engineering change notification documentation.	Jack F. Kyle Z.
	Mechanical Assembly Drawings and Parts Lists	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 custon components.	Assembly drawings should be of the quality to send to an outside vendor for production and marked "For Module Zero Production". Drawing details should include references to applicable assembly procedures, bills of materials, list of assembly tools to be procured, CG markers, assembly masses (both wet and dry), indications of the proper orientations for asymmetric parts, and pointers to higher-level drawings. All drawings need to be released and set up within a versioning framework that provides proper engineering change notification documentation.	Jack F. Kyle Z.
	Electrical Schematics & Board Layouts	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 manurfactures (e.g. number and configuration of layers, required drill sizes and tolerances, hole plating requirements, and board trace widths and tolerances) should be provided.	Production schematic and manufacture information for all boards should be posted and released. ECOs from the pre-production boards should be listed and explained. A performance document should be included which shows that relevant system requirements have been met. A plan for tracking any future hardware modifications should be in place. A plan for tracking the history of individual boards (e.g. location & repairs) should also be in place	Terri S.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
	Specification of Electrical Cabling and Wiring Connections	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.	All cable specifications and drawings must be final and released in EDMS. Examples of cable specifications/drawings can be found in EDMS 2413129. Final wiring diagram must show connections between all subcomponents with connecting cables clearly identified. Analysis of all power paths must be included to demonstrate that connectors, wires, and boards can handle maximum possible currents and voltages or are protected/fused. Information provided must be sufficient for satisfying Operational Readiness Clearance (ORC) requirements, which as currently prescribed for FNAL are described in FESHM Chapter 2005 (https://eshq.fnal.gov/manuals/feshm/).	Terri S.
	Bills of Materials for Electronic Board Components	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.	Final BOMs should be released in EDMS. A plan should be in place to track any board ECOs.	Terri S.
	Documentation Links for Commercial, Off-the-Shelf Powered Components	Consortium	Not required for Preliminary Design Review.	Links to full documentation must be provided for any powered equipment which is commercial off-the-shelf (examples include power supplies, crates, commercial modules, ...) This will be required for ORC.	Terri S.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
Requirements Documents	EB-Held Requirements	DUNE EB	High-level detector requirements with impact on physics performance.	No additional requirements for Final Design Review.	Eric J.
	TB-Held Requirements	DUNE TB	Next level detector requirements with potential impacts on multiple subsystems.	No additional requirements for Final Design Review.	Eric J.
	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.	No additional requirements for Final Design Review.	Eric J.
Installation Documents	Detector Installation Plan	Integration Office	Chapters detailing sub-system installation plans should be complete and updated.	The relevant chapters need to be finalized. Must include requirements on positional tolerances. Any ProtoDUNE-II and initial DUNE installation tests at Ash River should be completed and lessons-learned from these exercises incorporated within the installation plan. Once finalized, the document needs to be approved and signed-off on.	Jim S. Bill M.
	ProtoDUNE-II Installation Plan	Integration Office	Not required for Preliminary Design Review.	Plan describing how the module zero components will be installed in ProtoDUNE-II.	Jim S. Bill M.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
Interface Documents	Consortium-Consortium	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.	Document should be updated to reflect any negatiated changes to interfaces that have occured since Preliminary Design Review. All "To do" list items must be resolved and all referenced documents must be completed and available (released) in EDMS. Final document must also be released and have all required signatures (as prescribed through the project sign-off process)	Terri S. Jack F. Kyle Z.
	Consortium-Installation	Integration Office	Released version of document detailing detector sub-system interfaces with the detector installation plan.	Document should be updated to reflect any negatiated changes to interfaces that have occured since Preliminary Design Review. All "To do" list items must be resolved and all referenced documents must be completed and available (released) in EDMS. Final document must also be released and have all required signatures (as prescribed through the project sign-off process)	Terri S. Jack F. Kyle Z.
	Consortium-DSS	Integration Office	Released version of document detailing detector sub-system interfaces with the Detector Support Structure (DSS)	Document should be updated to reflect any negatiated changes to interfaces that have occured since Preliminary Design Review. All "To do" list items must be resolved and all referenced documents must be completed and available (released) in EDMS. Final document must also be released and have all required signatures (as prescribed through the project sign-off process)	Terri S. Jack F. Kyle Z.
	Consortium-Facilities	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).	Document should be updated to reflect any negatiated changes to interfaces that have occured since Preliminary Design Review. All "To do" list items must be resolved and all referenced documents must be completed and available (released) in EDMS. Final document must also be released and have all required signatures (as prescribed through the project sign-off process)	Terri S. Jack F. Kyle Z.
	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.	Interface drawings are one type of referenced documents within the interface documents described above. As such, they must all be finalized and released in EDMS. All interface drawings referenced in the documents need to be available at the time of the Final Design Review.	Terri S. Jack F. Kyle Z.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
Engineering Analysis Documents	Analysis Plan	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.	Analysis Plan should be updated to include details of the FEA model(s) and methods used for analyzing the different load cases as further clarification of the required deliverables. Final document needs to be jointly signed-off by the consortium and compliance office.	Olga B. Giuseppe G.
	Structural Analysis Note(s)	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.	Engineering note(s) need to be updated to address all recommendations received on the previous note version from the Compliance Office and through the Preliminary Design Review. Source models used in carrying out the analysis should be made available in EDMS along with the note. Updated note(s) need to be re-reviewed and approved by the Compliance Office.	Olga B. Giuseppe G.
	Independent Review Report(s)	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.	Final report indicating concurrence with actions taken based on all previous recommendations and overall Compliance Office approval must be in place at least one month prior to date of Final Design Review.	Olga B. Giuseppe G.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
QA/QC Documents	Preliminary QA/QC Plan	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.	Plan needs to be updated to provide further clarfication of items that had not been fully developed or were unknown at the time of the Preliminary Design Review. Plan should include information about codes and standards that will be applied during the testing process (e.g. those used in determining the quality of welds)	Kevin F. Jim M.
	ProtoDUNE Lessons-Learned	Consortium	Short document detailing sub-system issues uncovered during ProtoDUNE and the steps being taken to address these.	No additional requirements for Final Design Review.	Kevin F. Jim M.
	Preliminary Manufacturing and Procurement Plan	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 needs to be updated to provide further clarfication of items that had not been fully developed or were unknown at the time of the Preliminary Design Review. Plans for local storage of items prior to them being shipped to the near or far site should be described.	Kevin F. Jim M.
	Plan for Prototyping Activities	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)	New document describing any planned prototyping activities subsequent to the Final Design Review. Include information on any planned testing at Ash River or ProtoDUNE-II that could potentially lead to design changes between Final Design Review and Production Readiness Review.	Kevin F. Jim M.
	Fabrication, Inspection, and Test Procedures	Consortium	Not required for Preliminary Design Review.	Written procedures for the detailed steps necessary to fabricate, inspect, and test each of the sub-system components and assemblies.	Kevin F. Jim M.
	Fabrication, Inspection, and Test Forms (Travelers, Test Reports, and Inspection Reports)	Consortium	Not required for Preliminary Design Review.	Completed templates of all necessary forms for recording QC information during the fabrication, inspection, and testing of the sub-system components and assemblies.	Kevin F. Jim M.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
QA/QC Documents	Preliminary QA/QC Plan	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.	Plan needs to be updated to provide further clarfication of items that had not been fully developed or were unknown at the time of the Preliminary Design Review. Plan should include information about codes and standards that will be applied during the testing process (e.g. those used in determining the quality of welds)	Kevin F. Jim M.
	ProtoDUNE Lessons-Learned	Consortium	Short document detailing sub-system issues uncovered during ProtoDUNE and the steps being taken to address these.	No additional requirements for Final Design Review.	Kevin F. Jim M.
	Preliminary Manufacturing and Procurement Plan	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 needs to be updated to provide further clarfication of items that had not been fully developed or were unknown at the time of the Preliminary Design Review. Plans for local storage of items prior to them being shipped to the near or far site should be described.	Kevin F. Jim M.
	Plan for Prototyping Activities	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)	New document describing any planned prototyping activities subsequent to the Final Design Review. Include information on any planned testing at Ash River or ProtoDUNE-II that could potentially lead to design changes between Final Design Review and Production Readiness Review.	Kevin F. Jim M.
	Fabrication, Inspection, and Test Procedures	Consortium	Not required for Preliminary Design Review.	Written procedures for the detailed steps necessary to fabricate, inspect, and test each of the sub-system components and assemblies.	Kevin F. Jim M.
	Fabrication, Inspection, and Test Forms (Travelers, Test Reports, and Inspection Reports)	Consortium	Not required for Preliminary Design Review.	Completed templates of all necessary forms for recording QC information during the fabrication, inspection, and testing of the sub-system components and assemblies.	Kevin F. Jim M.

Category	Document	Controlled by	Required for Preliminary Design Review	Required for Final Design Review	Defined by
Tracking Documents	Responses to Past Review Recommendations	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).	Spreadsheet should be updated to include recommendations and responses from the Preliminary Design Review and any additional reviews that have occured in the interim.	Steve K.
	Review Office Report on Responses to Past Reviews	Review Office	Not required for Preliminary Design Review.	Memo from Review Office confirming that all prior review recommendations (as documented in spreadsheet) have been acted on appropriately. This memo should be in place and signed-off on at least four weeks prior to the scheduled Final Design Review date.	Steve K.