PIP-II Final Design Review Report for PIP2IT 650 MHz Test Stand Intermediate Cryo Transfer Line

Document number: ED0012586

Document Approval

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Revision History

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| --- | --- | --- | --- |
| Revision | Date Release | Originator:  Role: | Description of Change |
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*Revision control is managed via Fermilab Teamcenter Workflows.*

Table of Contents

[1. Introduction 4](#_Toc50481879)

[2. Review Agenda 4](#_Toc50481880)

[3. Review Charge Statement 6](#_Toc50481881)

[4. Attendance List 6](#_Toc50481882)

[5. Reference Documents 7](#_Toc50481883)

[6. Reviewed Document List 9](#_Toc50481884)

[7. Findings 9](#_Toc50481885)

[8. Comments 10](#_Toc50481886)

[9. Recommendations 10](#_Toc50481887)

[10. Response to Charge Questions 10](#_Toc50481888)

# Introduction

The PIP2IT 650 MHz Test Stand Intermediate Cryo Transfer Line Final Design Review (650 CTL FDR) is an independent evaluation of the final design of the new intermediate cryogenic transfer line that is needed to tie the existing PIP2IT cryo transfer line (CTL) to the 650 MHz cryomodules that will be tested in the PIP2IT cave. The review committee is requested to assess if the 650 CTL design and its associated documentation is at the final design level (~90-100% maturity) and that that the design meets the requirements of the system and project, including the PIP-II FDR deliverables list for this review.

*The Introduction provides a brief narrative of the following:*

* *Overview statements that include the Review Title, summary of the Review Charge, goals and anticipated outcomes, context of the review*
* *Brief description of the Project area under review (descriptions of the System, Sub-system, and device or requirement under review)*
* *Brief summary of the thoroughness, effectiveness, and general summarized committee thoughts of the review itself.*

# Review Agenda

| “650 CTL FDR” Agenda |
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| --- | --- |
| Location: | Zoom meeting – see meeting invitation for Meeting ID and connection information |
| Date: | Thursday 9/24/2020 |
| Time:  Indico Site: | 8:30 – 2:20  <https://indico.fnal.gov/event/43805/> |
|  |  |

Participants:

|  |  |  |
| --- | --- | --- |
| Jerry Leibfritz  leibfritz@fnal.gov | Fermilab | Role: Coordinator |
| Bill Soyars  soyars@fnal.gov | Fermilab | Role: Review Chair |
| Mike White  mjwhite@fnal.gov | Fermilab | Role: Reviewer |
| Jay Theilacker  theilacker@fnal.gov | Fermilab | Role: Reviewer |
| Joe Hurd  jhurd@fnal.gov | Fermilab | Role: Presenter |
| Ben Hansen  bhansen@fnal.gov | Fermilab | Role: L4 Mgr CTL |

Agenda details:

## Introduction (15 min)

### Welcome & logistics – Jerry Leibfritz

### PIP-II Review guidance – Alex Martinez

### Perspective from Cryo Dept. – Ben Hansen

## Overview of 650 Test Stand and PDR (20 min): Jerry Leibfritz

### Summary of the PIP2IT 650 Test Stand project & PDR results

## 650 CTL Final Design (60 min): Joe Hurd

### 650 CTL purpose and final design progress

### Status of FDR deliverable documents

### Procurement, fabrication, installation and validation plan

## Questions/Discussion (45 min): All

### General discussion and questions from committee

### Any other information committee needs to develop report

## Executive Session (3 hrs): Review Committee

### Closed session for Review Committee to discuss/develop report

## Closeout (20 min) – Review Chair (Bill Soyars)

### Summary Statement

### Preliminary Findings

### Preliminary Comments

### Preliminary Recommendations

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# Review Charge Statement

The PIP2IT 650 MHz Test Stand Intermediate Cryo Transfer Line Final Design Review (650 CTL FDR) is an independent evaluation of the final design of the new intermediate cryogenic transfer line that is needed to tie the existing PIP2IT cryo transfer line (CTL) to the 650 MHz cryomodules that will be tested in the PIP2IT cave. The review committee is requested to assess/answer the following questions:

* Is the 650 CTL design and its associated documentation at the final design level (~90% maturity)?
* Is the design consistent with system and project requirements, as defined by the System Design Plan document deliverables list for this review?
* Have the recommendations from the PDR been addressed?
* Is the level of design sufficiently mature to proceed with the completion/release of final drawings, purchasing of materials, and fabrication of components?

The committee is requested to provide a final written report within 14 days of the 650 CTL FDR that addresses the specific charge questions, along with a list of any findings, comments, and recommendations to be addressed prior to the procurement/fabrication stage of the project.

# Attendance List

List review attendees here, including committee, speakers, and prominent audience members. Remote attendees should be included and noted as remotely attending.

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| Name | Organization |
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# Reference Documents

The documents listed below establish the framework for all technical reviews held during the PIP-II Project Lifecycle.

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| --- | --- |
| 1 | PIP-II Technical Review Plan – TC ED0008163 |
| 2 | PIP-II Quality Assurance Plan DocDB # [142](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=142) |
| 3 | PIP-II Systems Engineering Management Plan – TC ED0008164 |
| 4 | PIP-II IESH Management Plan DocDB # [141](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=141) |
| 5 | PIP-II Value Engineering Plan DocDB # [2830](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2830) |
| 6 | PIP-II Linac Install and Comm System Design Plan – TC ED0010553 |

The review coordinator should populate this following table with the document list for this review from their SDP.

Table 1 - Document Deliverables for this review from the System Design Plan

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Document Title | Reference | Status | Comments |
| **Requirements & Interfaces** | | | | |
| 01  02  03  04  05 | L3 Functional Requirements Specification for PIP2IT Test Infrastructure (FRS)  Master Interface Control Document (ICD)  Interface Specification Document 650MHz RF Distribution  Interface Specification Document HB650 Cryomodule  Interface Specification Document LB650 Cryomoudule | ED0001223  ED0010433  ED0012144  ED0007562  ED0007561 | Released  Released  Released  Released  Prelim. | These are the PIP-II requirements and interface documents used to guide the requirements for PIP2IT, including the 650 Test Stand. These documents are provided for reference and are not planned to be presented at this review. |
| **Risk and Safety** | | | | |
| 06 | FMEA (and V&I List) for CTL | ED0012597 | Final | Pending review at FDR |
| 07 | Prevention through Design (PtD) Table for CTL | ED0012596 | Final | Pending review at FDR |
| 08 | ODH Calculations | Posted on Indico site | Final | Will be added to TC when ODH note (EN02827) is updated |
| **Project Documents** | | | | |
| 09 | Schedule for 650 MHz Test Stand | PIP-II P6 | Baseline | High level summary of P6 included in talks |
| 10 | PDR Review Response - including resolution of recommendations | Posted on indico site | Final | Pending review at FDR |
| **Design** | | | | |
| 11 | CTL Drawings (assembly and sub-components) | F10126703  (multiple) |  | This review will determine status |
| 12 | CTL 3D Model (assembly and sub-components) | F10126703  (multiple) |  | This review will determine status |
| 13 | CTL P&ID | F10042546 | Final | Will be updated in TC closer to installation (required for approval of the Engineering note) |
| 14 | CTL Relief Calculations | Posted on Indico site | Final | Part of Piping Engineering Note (EN04344) |
| 15 | CTL Flexibility Analysis | Posted on Indico site | Final | Part of Piping Engineering Note (EN04344) |
| 16 | CTL Engineering Note  & Pressure Test Form | EN04344 | Prelim. | Will be completed after fabrication |
| **Procurement/Production/Installation** | | | | |
| 17 | QA/QC Plan for CTL | ED0011285 | Final Draft | Pending review at FDR |
| 18  19 | CTL procurement, fabrication, Installation and validation plan/schedule  650 U-tube insertion & isolation procedure | Posted on Indico site  ED0012574 | Prelim.  Final | Installation/Validation Plan is a combination of schedule, QA/QC plan, u-tube insertion procedure, etc. – a summary of the plan/schedule will be presented at FDR |
| **Misc. Documents not included in SDP List** | | | | |
| 20 | 650 CTL Engineering Risk Assessment | Posted on Indico site |  |  |

# Reviewed Document List

This section indicates which documents the committee reviewed as part of this review. The document list provided should match the documents identified in the relevant WBS L2 System Design Plan referenced above.

These documents can be found on the indico site for this review: https://indico.fnal.gov/event/43805/

Table 2 - Documents presented at this Review

|  |  |  |  |
| --- | --- | --- | --- |
|  | Document Title | Status  (preliminary, final, released) | Comments |
| 1 |  |  |  |
| 2 |  |  |  |
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Committee comments should note any of the following:

* Documents that were expected but not presented.
* Documents that were in a state not commensurate with the review in question (e.g. conceptual design documents at a final design review).
* Standard documentation that, in the committee’s expert opinion, should have been in the SDP and presented but was not included.

# Findings

General, factual observations about material presented which require no response.

# Comments

Observations with value judgments, or “soft” recommendations that require action by the design/engineering team, but where a formal written response is not requirement.

# Recommendations

Items that require formal action and closure in writing prior to receiving approval to move into the next phase of the project, or items that require formal action and closure in writing prior the next review.

# Response to Charge Questions

If the charge is written in the form of questions, duplicate them and directly respond to them here. These responses should reference the relevant recommendations/comments/findings as appropriate.

* Is the 650 CTL design and its associated documentation at the final design level (~90% maturity)?
* Is the design consistent with system and project requirements, as defined by the System Design Plan document deliverables list for this review?
* Have the recommendations from the PDR been addressed?
* Is the level of design sufficiently mature to proceed with the completion/release of final drawings, purchasing of materials, and fabrication of components?