PIP-II HB650 Transportation Frame Final Design Review Report

Document number: ED0012593

Document Approval

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Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision | Date Release | Originator:  Role: | Description of Change |
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|  |  |  |  |

*Revision control is managed via Fermilab Teamcenter Workflows.*

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# Introduction

The production HB650 Cryomodules for PIP-II will be produced at STFC-UKRI and transported, mostly assembled, to FNAL. The prototype HB650 module will be produced at FNAL and transported to STFC-UKRI and back to validate the performance of the integrated transport system. Central to the transportation system is a mechanical frame which provides:

* a protective stay-clear boundary during transport
* mounting/storage area for transportation instrumentation
* mechanical vibration isolation for the cryomodule and
* lifting attachment points for the entire transport system.

The scope of this review includes these features of the transport frame.

# Review Agenda

| HB650 Transport Frame FDR Agenda |
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| --- | --- |
| Location: | Online Only - Teams |
| Date: | 22/9/2020 |
| Time:  Indico Site: | 7:30-12:30 CDT (FNAL), 13:30-18:30 GMT+1 (UK), 14:30-19:30 GMT+2 (CERN)  https://indico.fnal.gov/event/43802/ |

Participants:

|  |  |  |
| --- | --- | --- |
| Jeremiah Holzbauer | FNAL – PIP-II | Role: Coordinator |
| Mitchell Kane | STFC-UKRI | Role: Presenter |
| Josh Helsper | FNAL – TD | Role: Presenter |
| Sergey Cheban | FNAL – TD | Role: Presenter |
| Saravan Chandrasekaran | FNAL – TD | Role: Presenter |
| Brian Hartsell | FNAL – AD | Role: Review Chair |
| Ed Daly | JLab | Role: Reviewer |
| Kurt Artoos | CERN | Role: Reviewer |

Agenda details:

## Introduction: Jeremiah Holzbauer - FNAL

### Overview of the HB650 Transportation Plan

### Overview of the HB650 Transportation Specification

### Document management structure

### Project Perspective: Risks and Mitigations

## Transportation Frame Design: Mitchell Kane – STFC-UKRI

### Transportation System Overview

### Mechanical Design of the Transport Frame

### Expected Isolation System Performance

### Transport Frame as Lifting Fixture

### Interface Description including drawing/model review

## Prototype Frame Procurement and Validation: Jeremiah Holzbauer/Mitchell Kane

### Proto Frame Procurement

### Dummy Load Procurement and Testing at FNAL

### Dummy Load Shipment to STFC-UKRI/Validation Testing at STFC-UKRI

### Local Road Testing at FNAL with Prototype HB650

### Integrated Validation Transport to and from STFC-UKRI

### Integrated QC and Safety Efforts

## Summary of HB650 Cryomodule Transportation Design: S. Cheban/J. Helsper

### Brief summary of the HB650 transportation design calculations

## Closeout – Review Chair

### Summary Statement

### Preliminary Findings

### Preliminary Comments

### Preliminary Recommendations

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# Review Charge Statement

This is a Final Design Review of the HB650 Transportation Frame. The scope of this review includes the form and function of the frame itself as part of the overall transport system up to and including Cryomodule interfaces (envelope and mounting points). While the Cryomodule internal transport design is not within the scope of this review, the transport configuration and internal calculations will be summarized for context. The specific charge questions are as follows:

1. Is the documentation (Transport Specification, Transport Plan, Interface drawings/model, and others) sufficiently mature and complete to drive a successful Transport Frame design?
2. Is the Transport Frame design, as presented, likely to successfully meet the specified performance?
3. Is the Transport Frame design, as presented, at the final design level (90%)?
4. Are the Procurement and Validation plans, as presented, likely to result in a successful Transport System while minimizing the technical and schedule risk?
5. Have the lessons learned from previous projects been incorporated into this design?

# Attendance List

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

|  |  |
| --- | --- |
| Name | Organization |
|  |  |
|  |  |
|  |  |

# Reference Documents

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

|  |  |
| --- | --- |
| 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 | 121.02 SRF and Cryo Systems Design Plan DocDB # [2605](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2605) |
| 6 | 121.03 Accelerator Systems Design Plan DocDB # [2599](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2599) |
| 7 | 121.04 Linac Installation and Commissioning Design Plan DocDB # [2581](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2581) |
| 8 | 121.05 Accelerator Complex Upgrades Design Plan DocDB # [2593](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2593) |
| 9 | 121.06 Conventional Facilities Design Plan DocDB # [2587](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2587) |
| 10 | PIP-II Value Engineering Plan DocDB # [2830](https://pip2-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=2830) |

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 | Status  (preliminary, final, released) | Comments |
| **Requirements and Specifications** | | | |
| 1 | PIP-II HB650 Cryomodule STFC-UKRI Transportation Specification | Released | ED0012328 |
| **Interfaces** | | | |
| 2 | HB650 Cryomodule Long Range Transportation Configuration Envelope Drawing | Released | F10141930 |
| 3 | HB650 Long-Range Transportation Configuration Interface Drawings | Released | F10143970, F10138314 |
| **Risk and Safety** | | | |
| 4 | HB650 Cryomodule Transportation FMEA | Released | ED0012325 |
| 5 | HB650 Cryomodule Transportation Prevention through Design Table | Released | ED0012559 |
| **Design Documents** | | | |
| 6 | HB650 Transportation Design Report | In workflow | ED0012420 |
| 7 | HB650 Transportation Frame Design Report | Released | ED0012560 |
| 8 | Transport Frame Drawing Package | Released | ED0012560 |
| **Validation and Procurement** | | | |
| 9 | PIP-II HB650 Transportation Plan | Released | ED0012594 |
| 10 | HB650 Transport Frame Procurement Plan | Preliminary | In presentation slides |

# 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.

Table 2 - Documents presented at this Review

|  |  |  |  |
| --- | --- | --- | --- |
|  | Document Title | Status  (preliminary, final, released) | Comments |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |

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.

# Value Engineering Opportunities

Value Engineering (VE) opportunities are often discovered during conceptual and preliminary design reviews.  The Review Committee will consider Value Engineering in their assessment of the reviewed materials proposed design and provide a list of suggested opportunities below. The PIP-II Project established a *PIP-II Value Engineering Plan* to support this effort [10]. VE opportunities are not intended to be recommendations. Recommendations are captured in Section 9 above. If no VE opportunities are identified, please indicate.