DESIGN REVIEW DOCUMENTATION – RESULTS – No: 3016

Title: NSTX-U Metrology Mounts

CAT: ☐A1 ☐A2 ☒A3

Type of Review: ☐ Peer ☐ CDR ☐ PDR ☒ FDR

Cognizant Individual: S. Raftopoulos **Date of Review:** 11/26/18

Review Board Members:	Invited Attendees:	Other Attendees:
Chairperson R. Ellis	See attendance sheet	
RE VVIH D. Loesser		
TA (*Mechanical*) R.Ellis		
TA (Mech) I. Zatz		
QA Adolfo Aamaya		
ESH Not Included – see charge letter		
Regulatory Compliance		

Items Reviewed:	Sat.	Unsat.	Comments or n/a if not applicable
Appropriate requirements identified	☒	☐	
Development plans and schedules	☒	☐	
Reg. compliance incl. USI/USID and NEPA	☒	☐	
Disposition of CHITS from previous reviews	☒	☐	No chits were generated at previous reviews.
Cost objectives	☒	☐	
Other review objectives addressed	☒	☐	Objectives in the charge letter were addressed.

SUMMARY OF RESULTS:

The scope of this review was the welding permanent mounts for laser tracker reflectors onto the vacuum vessel. Steve Raftopoulos introduced the work, Peter Dugan presented the requirements, and Atiba Brereton presented the metrology mount locations and a summary of the weld tests of 303 stainless steel pucks to 316 stainless steel. The locations are sufficient for PF4/5 and center stack alignment. Sight lines from the monuments to the laser tracker locations need to be maintained during assembly. At present, the construction manager will be responsible for this. The same weld process used for test welds of 303 to 316 stainless steel should be used for the welds in the test cell. No chits were generated. The review is acceptable. Documentation and Presentations are here.
Charles Neumeyer and Tim Stevenson were unable to attend. After discussion with project engineers Y. Zhai and I. Zatz, the review proceeded without them. Doug Loesser covered for Mark Smith, who was out today.

Disposition: [check one]

xxxxxxx **Acceptable**

_____ **Acceptable pending resolution of concerns**- CHITS identified above must be resolved prior to installation.

_____ **Incomplete** - Additional design work is required prior to another design review.

_____ **Unsuccessful** – Corrective actions must be taken and another review process must be initiated.

Design Review Chair Person Robert Ellis Digitally signed by Robert Ellis Date: 2018.11.26 17:16:25 -05'00' Date: _____

Cognizant Individual Acceptance Steve Raftopoulos Digitally signed by Steve Raftopoulos Date: 2018.11.27 16:01:27 -05'00' Date: _____

Distribution: Review Board Members, Operations Center, Responsible Engineer (RE), Cognizant Individuals, Project Manager, Project Director, relevant Technical Authorities (TAs), Chief Engineer (CE), Fire Protection Engineer, Attendees, QA, ES&H, Security, Requesting & Performing Dept. Head

Attendance

R. Ellis*, chair and ME TA
D. Loesser*, RE VV+IH and Tokamak Core, also representing Mark Smith
Y. Zhai*, NSTX-U Recovery Project Engineer
S. Horst
S. Raftopoulos*, Cog Metrology, RE Magnets
M. Viola*, SME
M. Safabakhsh*, Head Fabrication Group
I. Zatz*, ME TA
A. Amaya*, QA
A. Brereton
P. Dugan representing Stefan Gerhardt
W. Gattoni
K. Cortes
T. Young
N. Atnafu
J. King (DoE) (remote)

*Design Review Committee

National Spherical Torus eXperiment Upgrade

VVIH-181106-YZ-01

TO: S. Raftopoulos
FROM: Y. ZHAI
SUBJECT: CHARGE FOR METROLOGY MOUNT FINAL DESIGN REVIEW – Rev. 1

1 Introduction

The NSTX-U Recovery Project completed a Peer Review in September 2018 (3016-PEER-001) for the metrology mount of the monuments onto the vacuum vessel. This FDR will confirm the welding monument locations and provide assurance that the proposed ex-vessel monuments can meet requirements such as compatibility and they pose a minimum technical and cost risk for installation.

The General Requirements Document, NSTX-U-RQMT-GRD-001-01, defines the overall engineering requirements as well as those specific to each major element of Vacuum Vessel and associated structures. More detailed requirements and interfaces related to the vacuum vessel are defined in the System Requirement Document, NSTX-U-RQMT-SRD-004-02 and NSTX-U-RQMT-SRD-005-01.

Design review methodology will conform to the latest version of ENG-033 (Rev. 7) based on A3 risk classification.

2 Purpose

The purpose of the FDR is to review locations of the permanent monuments and provide assurance that new products used for the welding monuments onto the ex-vessel are NSTX-U compatible.

3 Requirements

- NSTX-U System Requirements Document for Vacuum Vessel and Torus Support Structure, NSTX-U-RQMT-SRD-004-02
- NSTX Structural Design Criteria, NSTX-CRIT-0001-02

4 Scope

The FDR shall confirm the locations of the monuments and show that

- Monuments are compatible with the NSTX-U components that they are being welded to,

- Locations support the future critical alignment tasks, the realignment of PF-4/5 and the alignment of the TF bundle.
- Pose no integration issues.
- Compatibility with PPPL and sub-contractor metrology systems

Issues specific to the vacuum vessel or alignment of coils are considered out-of-scope for this review.

5 Methodology

The FDR shall be conducted in accordance with existing PPPL procedure ENG-033 “Design Verification”, supplemented by the participation of the NSTX-U Project Engineer.

The following are the FDR objectives/deliverables (as applicable):

- Review and verify that the final design satisfies all requirements and is ready for implementation.
- Verify resolution of chits from previous reviews.
- Verify that detailed analyses, calculations, and tests are complete and documented including calculation checking.
- Review and verify that the final product can be manufactured, inspected, assembled, stored, delivered, and installed reliably, safely, and cost effectively.
- Review and verify that appropriate documentation is available for producing the final product (e.g. drawings, installation procedures).
- Review and verify that procurement issues have been identified and resolved.
- Review and verify that appropriate test plans for the final product have been established.
- Review and verify that identification and control of items has been addressed.
- Review and verify any SAD/ASE considerations have been resolved.
- Review and verify that human factors are appropriately addressed in the design.
- Formally convey the design output for approval via the Design Approval Form (ENG-033 - Attachment 6).

Review materials shall be presented to the Design Review Committee and Project Engineer for acceptance, and then distributed to the review committee one week in advance of the review.

6 Review Committee

The Design Review Committee shall be constituted as follows:

S. Raftopoulos	Cog Metrology/RE Magnets
R. Ellis	Chairman

S. Gerhardt	NSTX-U System Integration
D. Loesser	RE VV+IH and Tokamak Core
C. Neumeyer	Chief Engineer
M. Smith	COG CSC Design
T. Stevenson	Operations
M. Viola	SME
M. Safabakhsh	Head Fabrication Group
I. Zatz	ME TA
Y. Zhai	NSTX-U Recovery Project Engineer
QA Representative	F. Malinowski or B. Jedic or A. Amaya or A. Castaneda

Note: ES&H is not included because there are no SAD/ASE considerations related to the scope of this review.

7 Agenda

The review shall be accomplished less than half day, scheduled for November 26, 2018, with the following preliminary agenda.

Nov 11-26-18	**NSTX-U Cooling Tube FDR**		
	Agenda		
Start	Duration	Topic	Presenter
2:00	10	Introduction	S. Raftopoulos
2:10	10	Requirements	P. Dugan
2:20	40	External Alignment Monuments	A. Brereton
3:00	10	Cost and Schedule	A.Brereton
3:10	20	Chit Disposition	R. Ellis
3:30	Adjourn		

cc:

N. Atnafu
P. Dugan
T. Egebo
R. Ellis
R. Feder
S. Gerhardt
P. Johnson – PSO
M. Kalish
J. King – DOE
S. Langish
J. Levine
D. Loesser
J. Menard
C. Neumeyer
J. Petrella
S. Raftopoulos
V. Riccardo
T. Stevenson

M. Viola
S. Weidner – PU
I. Zatz
Y. Zhai

PPPL QA

NSTX-U File