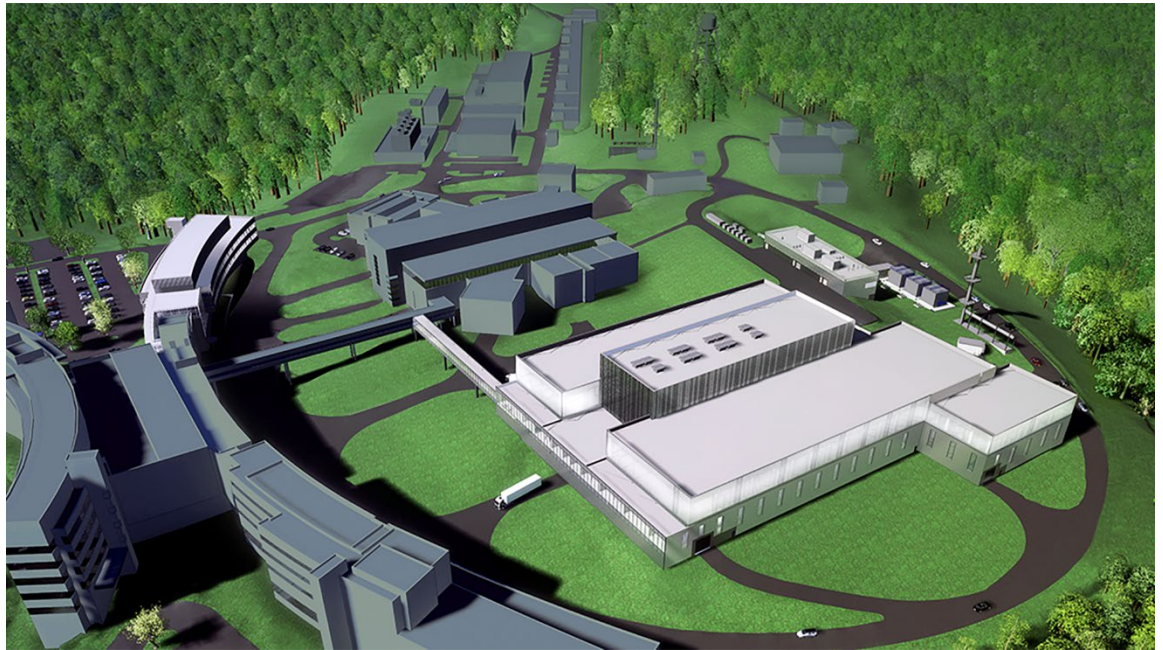


Second Target Station Project: Interface Sheet for Cryogenic Moderator System and Vessel Systems



Chris Anton
Jim Janney

March 2025



DOCUMENT AVAILABILITY

Reports produced after January 1, 1996, are generally available free via OSTI.GOV.

Website www.osti.gov

Reports produced before January 1, 1996, may be purchased by members of the public from the following source:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone 703-605-6000 (1-800-553-6847)
TDD 703-487-4639
Fax 703-605-6900
E-mail info@ntis.gov
Website <http://classic.ntis.gov/>

Reports are available to US Department of Energy (DOE) employees, DOE contractors, Energy Technology Data Exchange representatives, and International Nuclear Information System representatives from the following source:

Office of Scientific and Technical Information
PO Box 62
Oak Ridge, TN 37831
Telephone 865-576-8401
Fax 865-576-5728
E-mail reports@osti.gov
Website <https://www.osti.gov/>

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Second Target Station Project

**INTERFACE SHEET – INTERFACE SHEET FOR CRYOGENIC MODERATOR
SYSTEM AND VESSEL SYSTEMS**

Chris Anton
Jim Janney

March 2025

Prepared by
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, TN 37831
managed by
UT-BATTELLE LLC
for the
US DEPARTMENT OF ENERGY
under contract DE-AC05-00OR22725

Approvals

Document Title: Interface Sheet for Cryogenic Moderator System and Vessel Systems

ISSUE DATE:

PREPARED BY
Jim Janney

PROJECT
Second Target Station

DOCUMENT NUMBER:
S03000000-IST10010

	Signature / Date					
	Rev. 00	Date	Rev. 01	Date	Rev. 02	Date
Cryogenic Moderator System Lead Engineer						
Vessel Systems Lead Engineer						
Target Systems Team Leader						

Revision	Description
00	Initial Release

CONTENTS

CONTENTS.....	iii
1. Purpose	4
2. Scope.....	4
3. Acronyms and definitions	4
4. Documents Applicable to the interfacing sscs	4
5. Interface Definition.....	5
5.1 TECHNICAL DESCRIPTION OF THE INTERFACE	5
5.2 INTERFACE DATA	5
5.2.1 Core Vessel Penetration.....	5
5.2.2 CMS Clearance Management	5
5.2.3 CMS Transfer Line Supports	5
5.2.4 CMS Transfer Line Welding Access	5

1. PURPOSE

This document defines the interface between Target System's Cryogenic Moderator System (CMS) and Vessel Systems (VS). Requirements derived from this document will be included in the System Design Requirements for CMS and VS.

2. SCOPE

The scope of this document is the complete definition for the interface between CMS and VS.

1. INTERFACING PARTS OR COMPONENTS

No.	Components (CMS)		Components (VS)	
	Name	Functional reference Number	Name	Functional reference Number
1	Cryogenic Moderator System	S03030000-M8U-8800-A10000.asm	Vessel Systems	S03060000-M8U-8800-A10000.asm
2				
3				
4				

3. ACRONYMS AND DEFINITIONS

CMS	Cryogenic Moderator System
CV	Core Vessel
ICD	Interface Control Document
IS	Interface Sheet
MRA	Moderator Reflector Assembly
SSC	Structure, System or Component
STS	Second Target Station
VS	Vessel Systems
WBS	Work Breakdown Structure

4. DOCUMENTS APPLICABLE TO THE INTERFACING SSCS

Ref	Document Titles	Document Control System Location
[1]	Interface Sheet for Target Assembly, Moderator Reflector Assembly, and Vessel Systems	S01020500-IST10205-R0A

5. INTERFACE DEFINITION

5.1 TECHNICAL DESCRIPTION OF THE INTERFACE

CMS consists of the Hydrogen System and the Helium Refrigeration System. VS consists of the Core Vessel (CV), Core Vessel internal shielding, and Nozzle Extensions. The majority of the Hydrogen System and the entirety of the Helium Refrigeration System are located far from the monolith; however, the Hydrogen Transfer Line which transports liquid hydrogen between the Hydrogen Coldbox and the Moderator Reflector Assembly (MRA) penetrates the Core Vessel and is adjacent to Core Vessel internal shielding. The function of the hydrogen transfer line is critical to the safety of the facility as the primary and secondary vent path to transport hydrogen away from the primary radionuclide inventory of the STS facility; therefore, protection of the transfer line from falling objects and seismic events is critical. The subsequent sections define the interfaces between CMS and VS.

5.2 INTERFACE DATA

5.2.1 Core Vessel Penetration

The CMS Hydrogen Transfer Line must penetrate the core vessel boundary just below the core vessel lid flange. The CV penetration shall consist of an 8" tube welded to an ISO200 flange, such that the hydrogen transfer line can pass through the boundary while providing a vacuum seal and pressure seal up to the CV MAWP. The CMS will provide a mating ISO200 flange which is attached to the outer diameter of the transfer line via a bellows to allow for flange fit up. Note, the penetration is grossly oversized, and the nominal hydrogen transfer line center is offset from the penetration centerline such that the hydrogen transfer line can be displaced to allow for MRA insertion and removal without contacting the penetration.

5.2.2 CMS Clearance Management

In general, the CMS Hydrogen Transfer Line will run above the Core Vessel internal shielding within the core vessel; however, any shielding in the vicinity of the CMS transfer line should maintain at least 1" nominal clearance and should be restrained to prevent contact with the transfer line.

5.2.3 CMS Transfer Line Supports

It will be necessary to secure the CMS hydrogen transfer lines to the CV or CV shielding in order to limit line deflections in a seismic event. CMS is responsible for the design, procurement and installation of the transfer line supports. Vessel Systems is responsible for providing the necessary features in the CV shield stack to allow for installation of the transfer line supports. Once the transfer line supports are designed, details will be added to this section to solidify the interface.

5.2.4 CMS Transfer Line Welding Access

Upon installation of a new MRA, the existing CMS transfer line must be welded to the MRA transfer line in situ in the Core Vessel. The Core Vessel MRA lid hatches shall be designed to provide access for welding when removed and any CV shielding which would interfere with welding access shall be designed to be removable.
