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Interface Sheet (IS)

IS-16-55-104 Interface Sheet between PBS 16 Blanket Manifolds and PBS 55.F3 Plasma Position Reflectometry

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Approval Process			
	Name	*Action*	*Affiliation*
Signatory	**Bao L.**	**01 Dec 2015:signed**	**IO/DG/COO/TED/INC/BKT**
Co-signatories	**Martinez hinojosa G.** **Sirinelli A.** **Zhao T.**	**01 Dec 2015:signed** **01 Dec 2015:signed** **02 Dec 2015:signed**	**IO/DG/COO/CIO/DIN** **IO/DG/COO/TED/PPD/IVD** **IO/DG/COO/CIO/CMD**
Reviewers	**Macklin B.**	**02 Dec 2015:recommended (Fast Track)**	**IO/DG/COO/CST/TAD**
Previous Versions Reviews	**Edwards P.** **Udintsev V.** **Martin A.**	**26 Nov 2015:recommended v1.0** **29 Nov 2015:recommended v1.0** **25 Nov 2015:recommended v1.0**	**IO/DG/COO/TED/INC/BKT** **IO/DG/COO/TED/PPD/CPPE** **IO/DG/COO/CIO/DIN**
Approver	**Raffray R.**	**02 Dec 2015:approved**	**IO/DG/COO/TED/INC/BKT**
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Read Access	**LG: DA RO to sign off ICDs, GG: AIF- CEA SSA Liaison Committee Members &experts, LG: F4E-Architect/Engineering company, GG: MAC Members and Experts, GG: STAC Members & Experts, GG: CEA Decommissioning Experts, LG: CEA view, GG: DA Heads, Co-ordinators and Management, AD: ITER, AD: External Collabor...**		

Change Log			
IS-16-55-104 Interface Sheet between PBS 16 Blanket Manifolds and PBS 55.F3 Plasma Position Reflectometry (N83YW7)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v0.0	In Work	06 Feb 2014	
v1.0	Signed	24 Nov 2015	The first submission.
v1.1	Approved	01 Dec 2015	Incorporating reviewer's comments.

Table of Contents

1 Purpose

This document is to define the interfaces data which will be used for the design of the both interfacing PBS.

2 Scope

The scope of this document is the interface points identified in the concerned ICD between Blanket Manifolds (PBS 16) and Diagnostics (PBS 55). This Interface Sheet (*IS-16-55-104 Interface Sheet between PBS16 Blanket Manifolds and PBS 55.F3 Plasma Position Reflectometry)* is part of the ICD [1].

3 Definitions

For a complete list of ITER abbreviations see: ITER_D_2MU6W5 - ITER Abbreviations

CMAF	CAD Model Approval Form
CMM	Configuration Management Model
HFS	High Field Side
ICD	Interface Control Document
IS	Interface Sheet
LFS	Low Field Side
PPR	Plasma Position Reflectometry
RH	Remote Handling

4 References

4.1 Applicable Documents

Ref	Document Titles	IDM Links	Version
[1]	ICD-16-55-100 ICD between Blanket Manifolds (PBS 16) and Diagnostics System (PBS 55)	ITER_D_66L2LH	v1.2
[2]	SRD-16 (Blanket Manifolds) from DOORS	ITER_D_35DNL8	v2.3
[3]	SRD-55 (Diagnostics) from DOORS	ITER_D_28B39L	v4.0
[4]	Interface Management Procedure	ITER_D_28VNJG	v3.0
[5]	Standard Template for Interface Sheet	ITER_D_33RGW2	v1.2

4.2 Reference Documents

Ref	Document Titles	IDM Links	Version
[6]	Blanket Manifolds Design Description Document	ITER_D_MU4WFZ	v1.0
[7]	System Design Description (DDD) 55.F3 Plasma Position Reflectometry	ITER_D_76MW26	v1.9
[8]	IC-CMAF BLANKET Manifolds	PNXC6V	v2.0
[9]	IC-CMAF CMM of In-Vessel Diagnostics	RLTCFK	v1.0
[10]	In Vessel Component Variants	ITER_D_983KQA	v1.19

[11]	Status of Clearances between In-Vessel Components	ITER_D_R2KPV3	v1.0
[12]	IS-16-55-105 Interface Sheet between PBS 16 Blanket Manifolds and PBS 55.F9 High Field Side Reflectometry	ITER_D_NBRMXU	v1.0
[13]	IS-22-55-106 - Interface Sheet between Machine Assembly and Tooling (In-Vessel) (PBS 22.IV) and Diagnostics (PBS 55.F3/F9) - Microwave Reflectometers (In-Vessel)	ITER_D_KTM4HD	In work

5 Interface Requirement Data

5.1 Technical Description of the Interface Points

The interface between the Blanket Manifolds and the Plasma Position Reflectometry is established on the In-vessel routing for gap 4 & gap 6. There are identical interfaces between Blanket Manifolds with the gap 6 of 55 F3 Plasma Position Reflectometry and the 55 F9 High Field Side Reflectometry located in VV Sector 05&09, referring to [12] for more information:

- The required clearance for in-vessel components between two PBSs, including all tooling required for installation during the whole of the assembly trajectory/process, shall be a minimum of 5mm.
  The nominal gap between the In-vessel elements of Plasma Position Reflectometry and Blanket Manifold is defined in [11].
- The reaction brackets for Bi-axial Connections shall be provided by PBS 16 at all locations where diagnostic components are located to provide protection and enable the hard stop feature reacting normal to the surface.
  Currently there is no reaction bracket required for protection of in-vessel waveguides for Plasma Position Reflectometry.

5.2 Interface Data

5.2.1 PBS 16 Blanket Manifolds

The Blanket Manifolds supply the cooling water to the Blanket Modules mounted on the interior wall of the VV, which consists of a system of pipes arranged in bundles and routed from the 18 Upper Port Chimneys and through 2 Lower Ports.

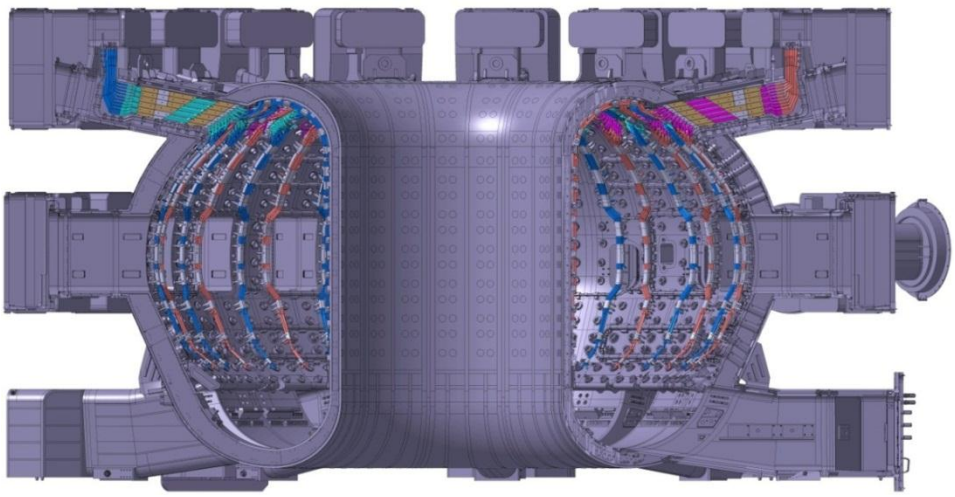
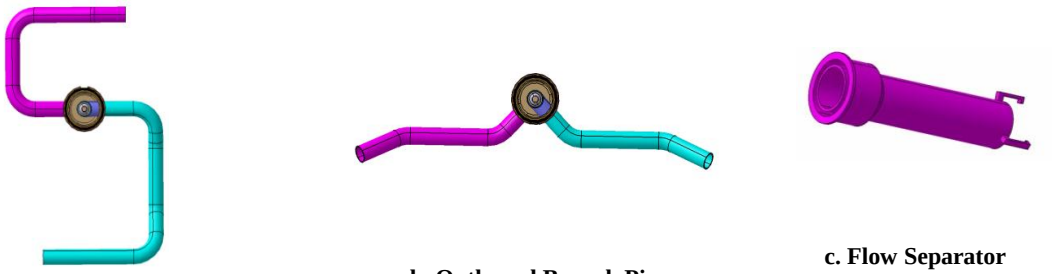


Figure 1 Integration of the Blanket Manifold System in the VV (for illustration only)



a. Inboard Branch Pipe with CC

b. Outboard Branch Pipe with CC

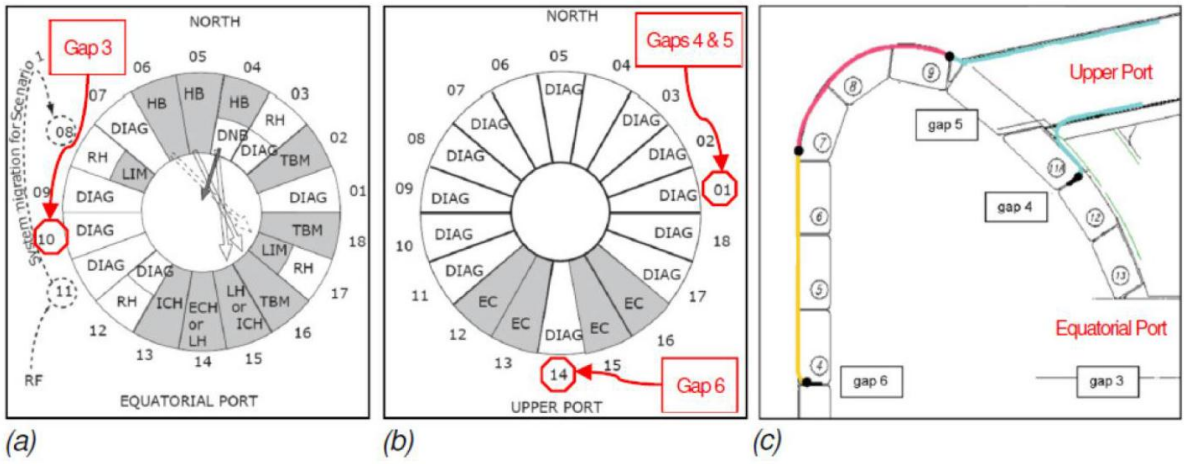
c. Flow Separator

Figure 2 Inboard/Outboard Branch Pipe with CC and Flow Separator (for illustration only)

5.2.2 PBS 55 F3 Plasma Position Reflectometry

The Plasma Position Reflectometry (PBS 55 F3) provides information for plasma operation and for establishing performance characteristics. It measures the edge electron density profile and provides information of the plasma shape.

The Plasma Position Reflectometry is located in the Equatorial Port 10 (1 pair), Upper Port 1 (2 pairs), and in-vessel routed from Upper Port 14 (gap 6, between Blanket Modules 3 and 4, 1 pair, HFS, VV sector 7) and Upper Port 1 (gap 4, between Blanket Modules 11 and 12, 1 pair, LFS, VV sector 9).



(a) equatorial port; (b) upper ports; (c) proposed waveguide routing in the vacuum vessel.

Figure 3 Location of gaps

The In-vessel elements (for gap 4 & gap 6) of Plasma Position Reflectometry System generally comprises the antenna systems, 90º waveguide bends, In-vessel waveguides, feedthroughs and supporting features. The proposed design for In-vessel elements for PBS 55 F3 is the same as PBS 55 F9 High Field Side Reflectometry System, as shown in Figure 6.

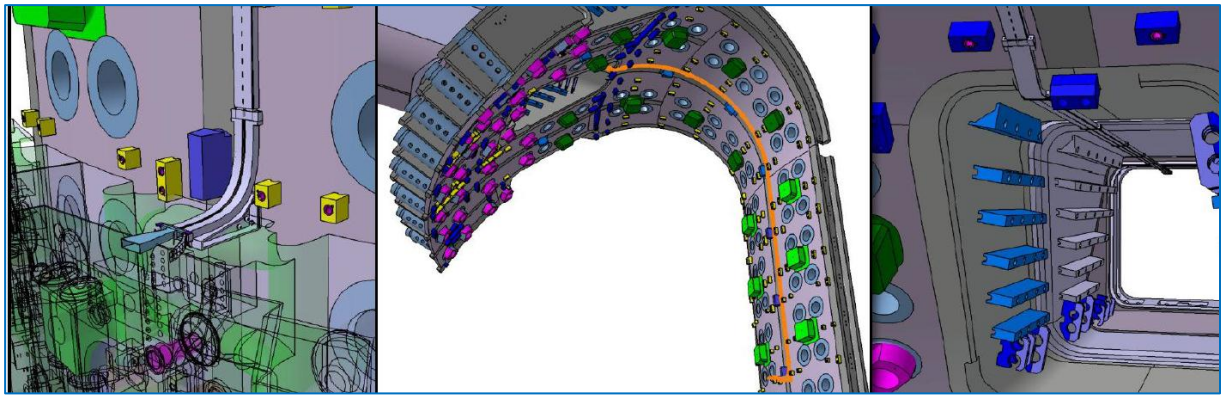


Figure 4 Plasma Position Reflectometry located in gap 6 (Upper Port 14, VV Sectors 07)

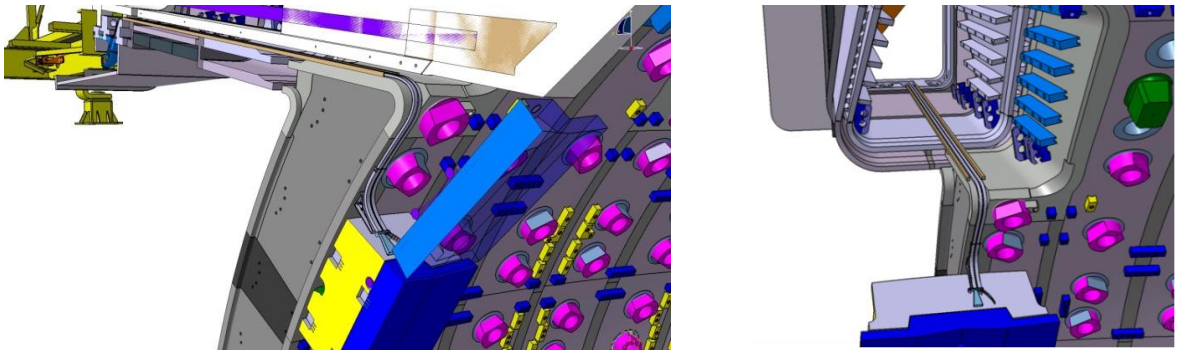


Figure 5 Plasma Position Reflectometry located in gap 4 (Upper Port 1, VV Sectors 01/09)

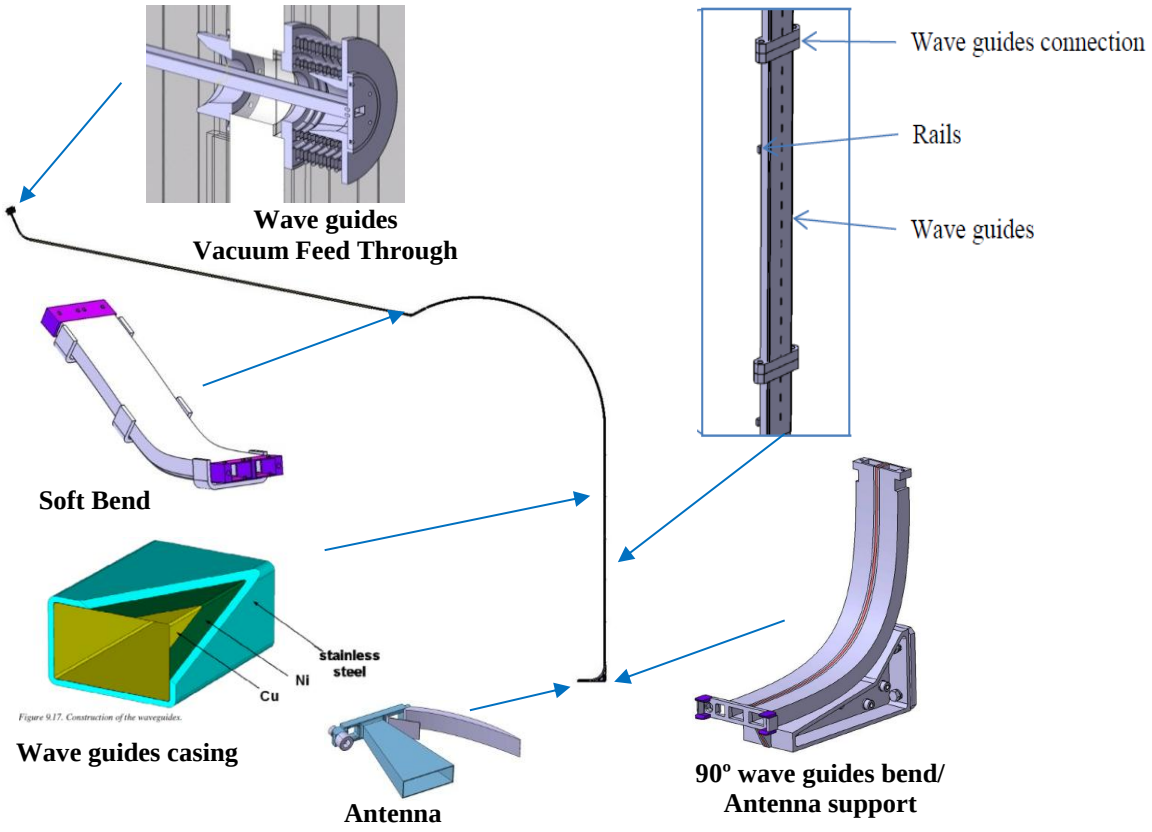


Figure 6 Overview of the In-vessel HFS Reflectometry located in gap 6 (for illustration only)

5.2.3 Interface between Blanket Manifolds and Plasma Position Reflectometry

The clearances between Blanket Manifold and Plasma Position Reflectometry are optimised, which include tooling required for installation during the whole of the assembly trajectory/process and also consider manufacturing and assembly tolerance.

The recommended installation and maintenance strategy of in-vessel components for both systems is listed as below:

- During Assembly Phase I
  The In-vessel waveguides (except the 90º waveguide bend) and the Manifold Bundles will be installed with below sequence:
  - The In-vessel waveguides (except the 90º waveguide bend) shall be installed before the Manifold Bundles, as the waveguide is partially obscured by the Manifold Bundle. The operation include welding of baseplate for 90º waveguide bend, and welding of

rails for waveguide which shall be clear of the Manifold Supports to ensure sufficient clearance for welding access.
- Installation of Manifold Bundles

➢ During Assembly Phase II

The Branch Pipe assembly, 90º waveguide bend and In-vessel antenna will be installed during Assembly Phase II. Sufficient clearance shall be provided for orbital welding and re-work of the Branch Pipe Assembly which located near In-vessel antenna.
- Installation of 90º waveguide bend (bolting)
- Installation of neighbouring Branch Pipe assembly
- Finally the In-vessel antennas will be installed after the impacted Shield Blocks are in place (after installation of 90º waveguide bend and Branch Pipe assembly).

➢ During maintenance

The Blanket Manifolds are classified as RH 3 components [2], and the In-vessel antenna for Plasma Position Reflectometry will be classified as RH 2 components which to be finalized during PDR of PBS 55.F3 scheduled in Jun. 2018.

In case maintenance is required for Blanket Manifolds located near Plasma Position Reflectometry, the recommended sequence near In-vessel antennas is shown as below:
- Unbolting and removal of In-vessel antennas by Multi-Purpose Deployer before removal of impacted Shield Blocks
- Cutting and removal of Branch Pipe assembly
- Removal of Inboard Manifold Bundle through 71 degrees vector
- Installation of new Manifold Bundles and Branch Pipe assembly
- Installation of In-vessel antennas after the impacted Shield Blocks are in place

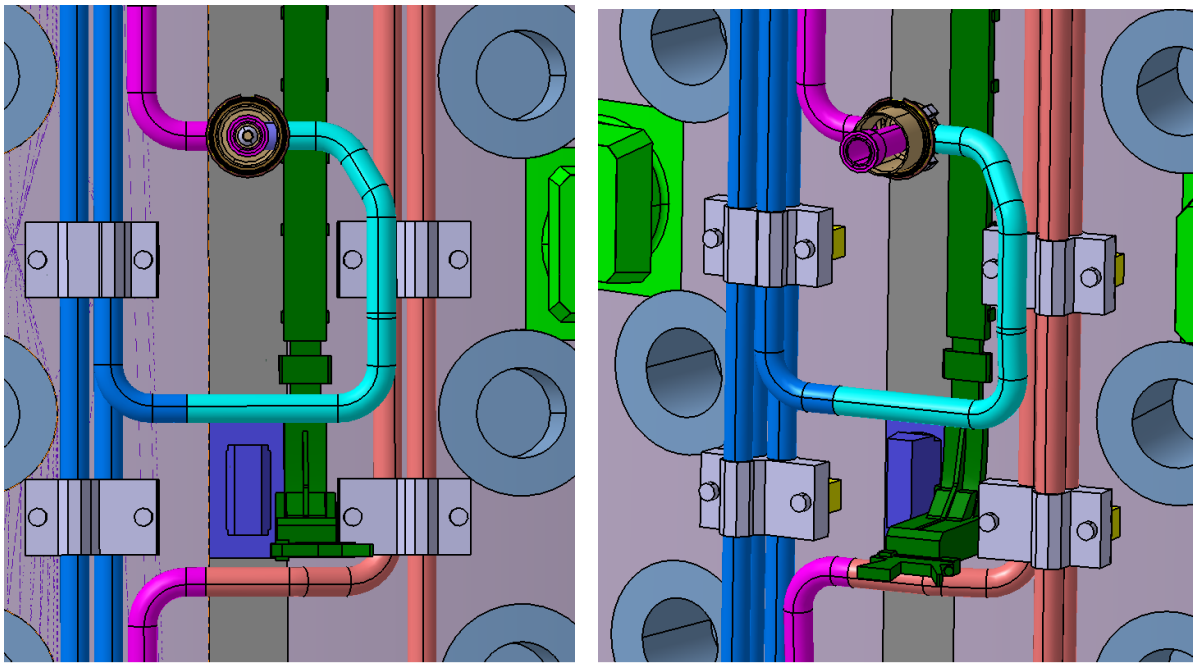


Figure 7 Overview of Blanket Manifolds and PPR located in gap 6 near Antenna area (Blanket Modules are removed for better view, for illustration only)

5.3 CMM reference

The 3D Models (Detailed and Configuration) at their frozen status are available in Project Database (ENOVIA V5®), according to [8] & [9].

6 Schedule

Action number	Action	Responsibility	Date
6.1	Generate IS 16-55-104 (Preparation for **Manifold FDR in Dec. 2015**)	PBS 16/ 55.F3	Nov. 2015 (Done)
6.2	Update IS 16-55-104 (Correction on installation sequence)	PBS 16/ 55. F3	Dec. 2015 (Done)
6.3	Update IS-16-55-104 (Revision may be required before **PDR of PBS 55.F3** scheduled in Jun. 2018)	PBS 16/ 55.F3	Jun. 2018