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Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex - France

Technical Summary

Manufacturing and Integration of ITER Organization In-Port Plug Components for EPP 8 & 17 and for UPP 4, 5 & 6

IO/21/CFT/70000705/LLU

1. Purpose

The purpose of this Contract is for the procurement and integration of IO InPort Plug components and sub-assemblies for the Equatorial Port Plug Assemblies # 8 & 17 and Upper Port Plug Assemblies # 4, 5 & 6. An additional EPPA (#2) could be purchased, which will be confirmed later.

The scope of this contract does not cover the supply of Diagnostic First Walls, Inter-Space Support Structures and Port Cells Support structures of IO Ports, which are covered under a separate contract. The detailed scope of work is detailed in Section 3.0 below.

It is proposed to establish a Framework Contract for this procurement.

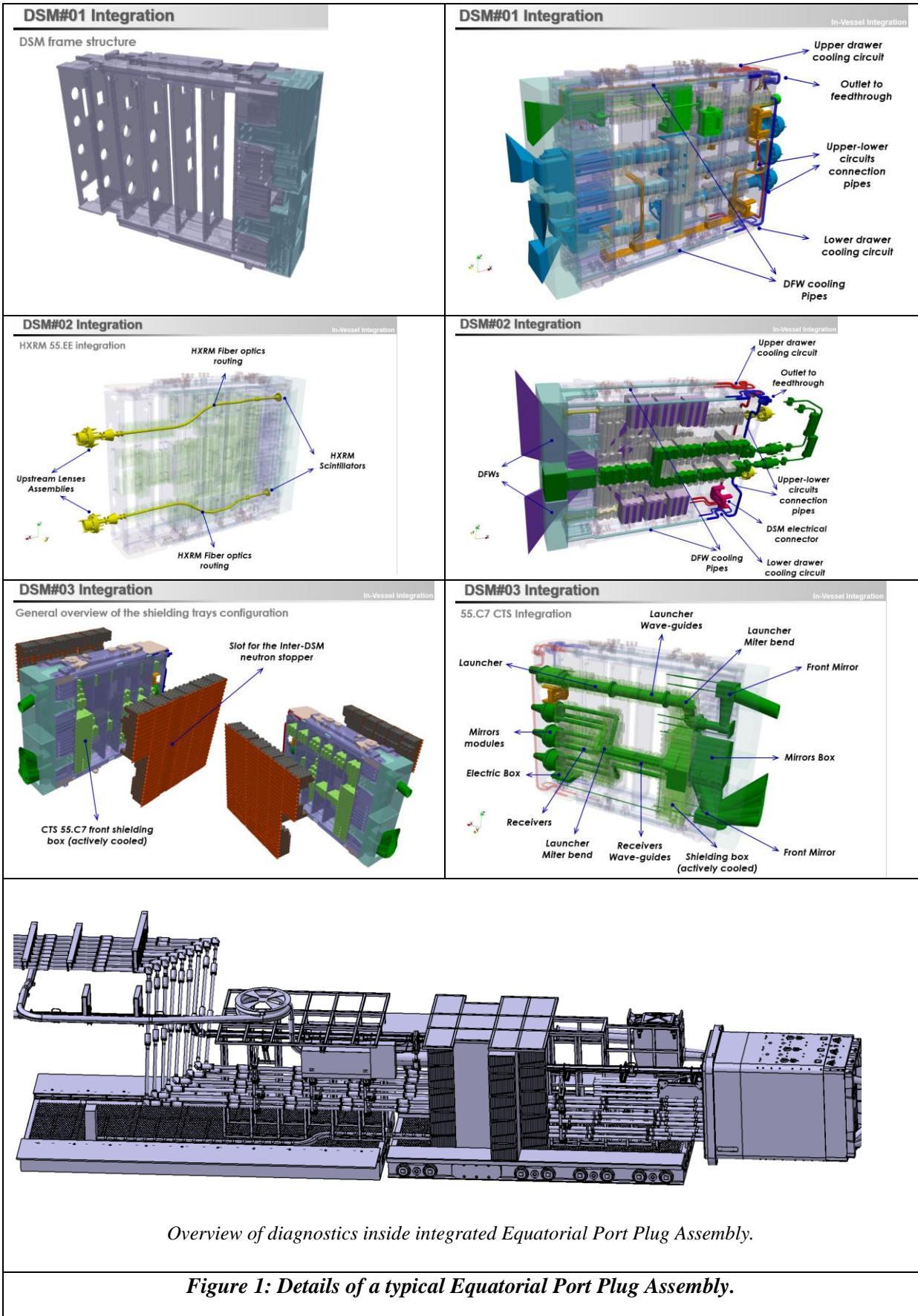
2. Background

Diagnostics are a critical part of the operation of ITER. They provide the means to observe, control and sustain the plasma performance over long timescales. ITER will operate with a plasma current in the region of 15 MA and toroidal fields of 5 T. The pulse lengths will be in the region of 500s typically and will extend up to several thousand seconds during more advanced operation. A key objective of this device is $Q=10$ operation. This means that a typical fusion power of 500 MW will be provided for 50 MW input.

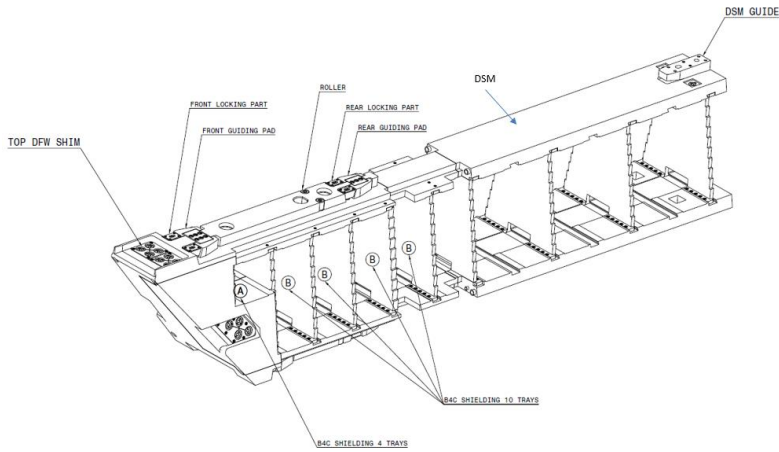
Many diagnostics, as well as systems like DMS and GDC, shall be integrated into ports and their infrastructure, which hold these diagnostics in place. Figures 1 & 2 in pages 2 & 3 give an overview of the typical Integrated Diagnostic Port Plug Assemblies in ITER.

There are 25 diagnostic ports in ITER Tokamak hosting diagnostic systems. Each of the equatorial and upper diagnostic ports consist of the Port Plug Structure with three integrated Diagnostic Shield Modules and Diagnostic First Walls, Interspace Support Structure and Port Cell Support Structure. Each port hosts one or more tenants (diagnostics, Glow Discharge Cleaning, Disruption Mitigation System) and services (water, gas, electrical). The in-port plug components will be assembled at Port Integrator's sites at DAs or at IO.

These Diagnostic Port Plugs serve as common platforms for a variety of diagnostics systems. Diagnostic equipment and shielding are integrated together into cassettes known as "Diagnostic Shielding Modules" (DSM) which, in turn, are attached to the Port Plug structure that is part of the ITER VV confinement barrier. Refer to Figures 1 and 2 for the details of a typical Equatorial Port Plug Assembly and Upper Port Plug Assemblies respectively.



Details of a typical Upper Port Plug



ITEM	DESIGNATION	QUANTITY	WEIGHT (kg)
1	LEFT DIAGNOSTIC FIRST WALL	1	1306
2	DFW TOP-LEFT TAB	1	5.9
3	DFW MIDDLE-LEFT TAB	1	7.5
4	DFW BOTTOM-LEFT TAB	1	5.9
5	PORT PLUG BOTTOM PLATE	1	1226
6	PORT PLUG LEFT PLATE	1	1442
7	DSM BOTTOM FRAME SUPPORT	2	8
8	PORT PLUG END PLATE	1	553
9	LEFT SHIELD COVER PLATE	1	60
10	DIW10 FLANGE	1	--
11	ELECTRICAL FEEDTHROUGH	1	20
12	PORT PLUG MOUNTING FLANGE	1	3118
13	RIGHT SHIELD COVER PLATE	1	60
14	DSM GUIDE	2	15.5
15	DSM TOP FRAME SUPPORT	2	4
16	DIAGNOSTIC SHIELD MODULE	1	4309
17	PORT PLUG TOP PLATE	1	692
18	PORT PLUG RIGHT PLATE	1	1439
19	DFW BOTTOM-RIGHT TAB	1	5.8
20	DFW MIDDLE-RIGHT TAB	1	7.5
21	DFW TOP-RIGHT TAB	1	5.6
22	RIGHT DIAGNOSTIC FIRST WALL	1	1306
23	WATER PIPES CONNECTOR	2	7
24	WATER FEEDTHROUGH	2	15
25	LEVI ELECTRICAL FEEDTHROUGH	--	--
B4C SHIELDING TRAYS			--
TOTAL MASS **			17.981

EXPLODED DETAILS FOR UP04, 05 & 06

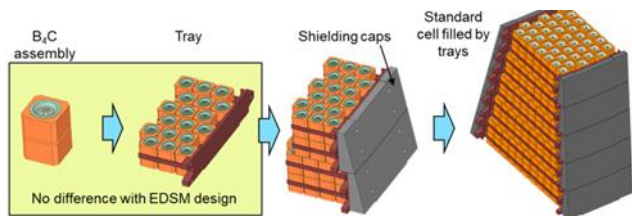
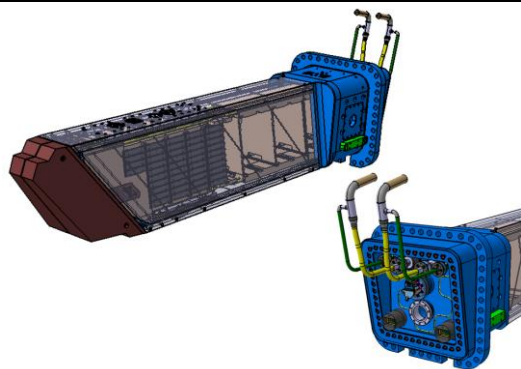
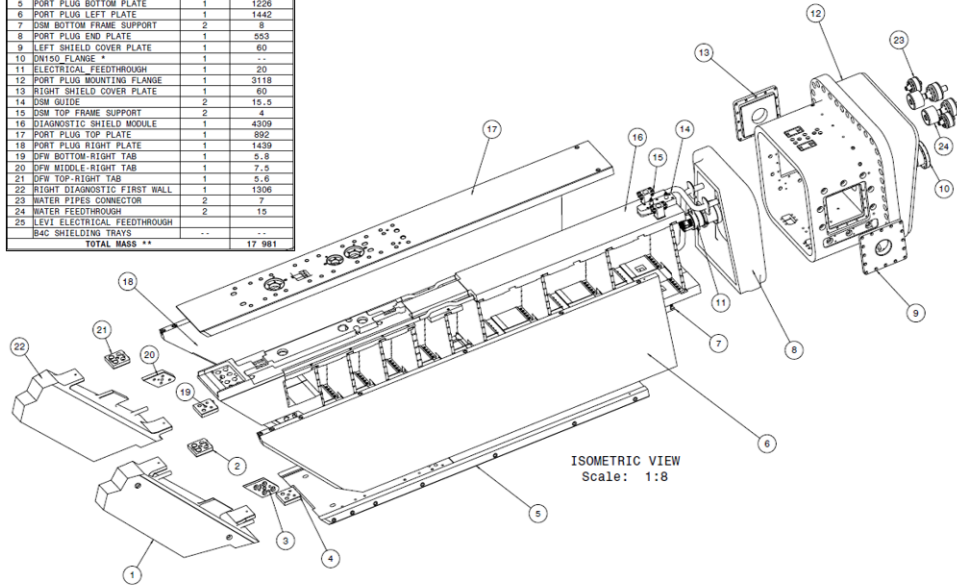


Figure 2: Details of a typical Upper Port Plug Assembly.

3. Scope of work

3.1 This contract shall cover the supply of In-Port components and sub-assemblies and Site integration for the Equatorial Port Plug Assemblies # 8 & 17 and Upper Port Plug Assemblies 4, 5 & 6. An additional EPPA (#2) could be purchased, which will be confirmed later.

The scope of this contract does not cover the supply of Diagnostic First Walls, Inter-Space Support and Port Cells Support structures of IO Ports, which are covered under separate contracts.

The detailed scope of work for the subject contract is detailed below.

3.2 The scope of work includes as a minimum the following:

- a. Manufacturing design of all the components, sub-assemblies and assemblies of the InPort Plugs indicated in 3.1 above
- b. Material Procurement for all the components, other than those which are supplied by IO.
- c. Manufacturing and assembly of the In-Port Plugs components and sub-assemblies that includes, but not limited to,
 - i. DSM frames and backfilling blocks,
 - ii. Configuration of shielding trays
 - iii. Installation of diagnostics and common components (windows, feedthroughs, DSM services for water, electricity, vacuum etc.)
 - iv. Assembly of trays and backfilling blocks
 - v. Assembly of the whole Port Plug components
- d. Manufacture of the components using established fabrication techniques under required Quality Systems with duly qualified personnel. All diagnostic equipment shall be manufactured under a quality assurance plan, and with quality control, that shall follow the *ITER Management and Quality Programme (MQP)* or the ITER approved quality assurance program of the DAs.
- e. The supplier will be provided with the integration design, material procurement specification requirements and the details of the generic Port Plug structure.
- f. Following will be supplied by IO and procurement is not in the scope of the Supplier
 - i. All the diagnostics
 - ii. B4C Shielding Blocks
 - iii. LEVI (electrical service components such as feedthrough, connector, cables)
 - iv. Windows
- g. The Factory Acceptance Tests (including dimensional, pressure, flow, draining/drying, vacuum compatibility, electrical tests, that shall include signal validation and hot/cold He leak testing).
- h. All diagnostic components and assemblies shall be put together in a suitable clean room conditions.
- i. Shipment to Port Integrator's premises.

- j. All onsite welding shall undergo leak tests, where necessary, and NDE on-site as required by the applicable codes and Standards.
- k. Integration of the Port Plugs in the Tokamak

4. Timetable :

Issue Call for Nomination to DAs	Mid of June 2021
Issue Pre-Qualification Application	Mid of July 2021
Submission date for Pre-Qualification	Mid of September 2021
Issue Call for Tender	Beginning of 2022
Submission of Tenders	Mid of March 2022
Contract Start date	July/August 2022

5. Required Competences

Experience in Tokamaks is highly appreciated, and knowledge and experience in design for the following selected activities in nuclear environment is requested. The candidate company and its personnel shall have adequate experience for the work as detailed below.

- Expertise in concept, design, realisation, interface definition and documentation for complex mechanical and nuclear systems,
- Vacuum/ confinement barriers specification and development for nuclear environment,
- Expertise in Human and Organizational Factors definition and assessment,
- Expertise in RAMI and technical risks assessment of complex integrated systems,
- Expertise in fusion plasma diagnostic development and integration,
- Expertise in electromagnetic, neutronic, thermal-hydraulic and structural analysis of complex mechanical and nuclear systems,
- Integrated project organization and implementation,
- Mechanical design engineering,
- Expertise in Remote Handling and maintenance,
- Expertise in manufacturing of nuclear components following international nuclear codes and standards,
- Interface management in complex mechanical, fusion and/or nuclear systems,
- Design engineering (with the aid of CATIA V5).
- Precision stainless steel construction and fabrication,
- Machining of heavy stainless steel components including gun-drilling,
- Welding stainless steel (manual and automatic);TIG, PAW, EBW (advisable),
- Non-Destructive Testing and examination (Visual, die-penetrant, X-Ray and UT),
- Capability to conduct acceptance testing of final components (Pressure, draining/drying, flow, hot/cold helium leak testing),
- Manufacturing under international pressure vessel codes and standards,
- Manufacturing under stringent cleaning requirements (vacuum and ultra-high vacuum components).
- Experience and expertise in the assembly and integration of multi-disciplinary speciality equipment which include electrical, electronic, optical, mechanical components.

6. Duration of services

The Contract will be carried out over an initial firm period of four (4) years and an optional period of two (2) years. The Contract is scheduled to come into force in October 2022.

7. Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally established grouping or a grouping, which has been constituted informally for a specific tender procedure.

All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.

8. Reference

Further information on the ITER Organization procurement can be found at:

<http://www.iter.org/org/team/adm/proc>