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**Technical Specifications (In-Cash Procurement)**

# Technical Specification Diagnostics systems Design Update

This document describes the specific technical needs of the Diagnostics Division with particular reference to Integration work, including activities and follow up activities as appropriate.

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# 1 Purpose

This document describes the specific technical needs of the **Diagnostics Division with particular reference to Integration work, including activities and follow up activities as appropriate.**

# 2 Scope

The objective of this contract is to work with the Diagnostics team in the evaluation and establishment of diagnostics systems, especially in updating the Diagnostic and IVVS systems.

Some examples are given below as illustration for the Deliverables under Section 8.

**A7,AD,AE,AF,AH,AI flux loops**

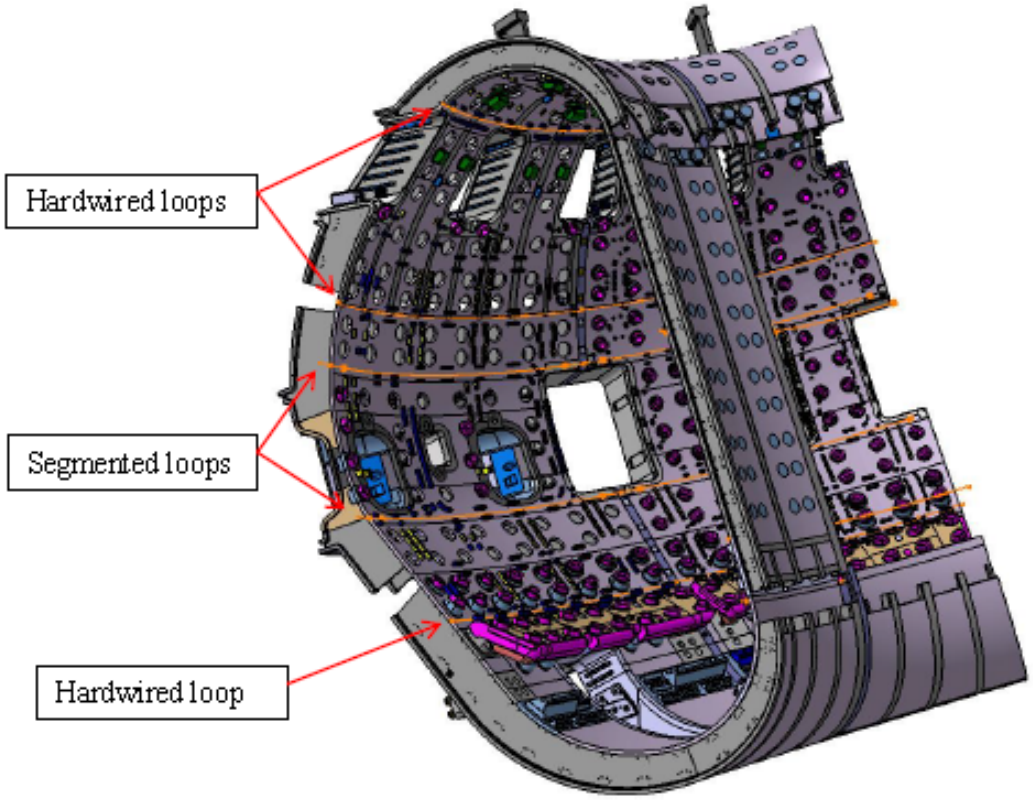



*Figure 12: Catia screenshot with 55.AE Continuous Flux Loops labelled for the outboard region (loops shown in orange)*

## B3 MFC ExV Components & Detectors

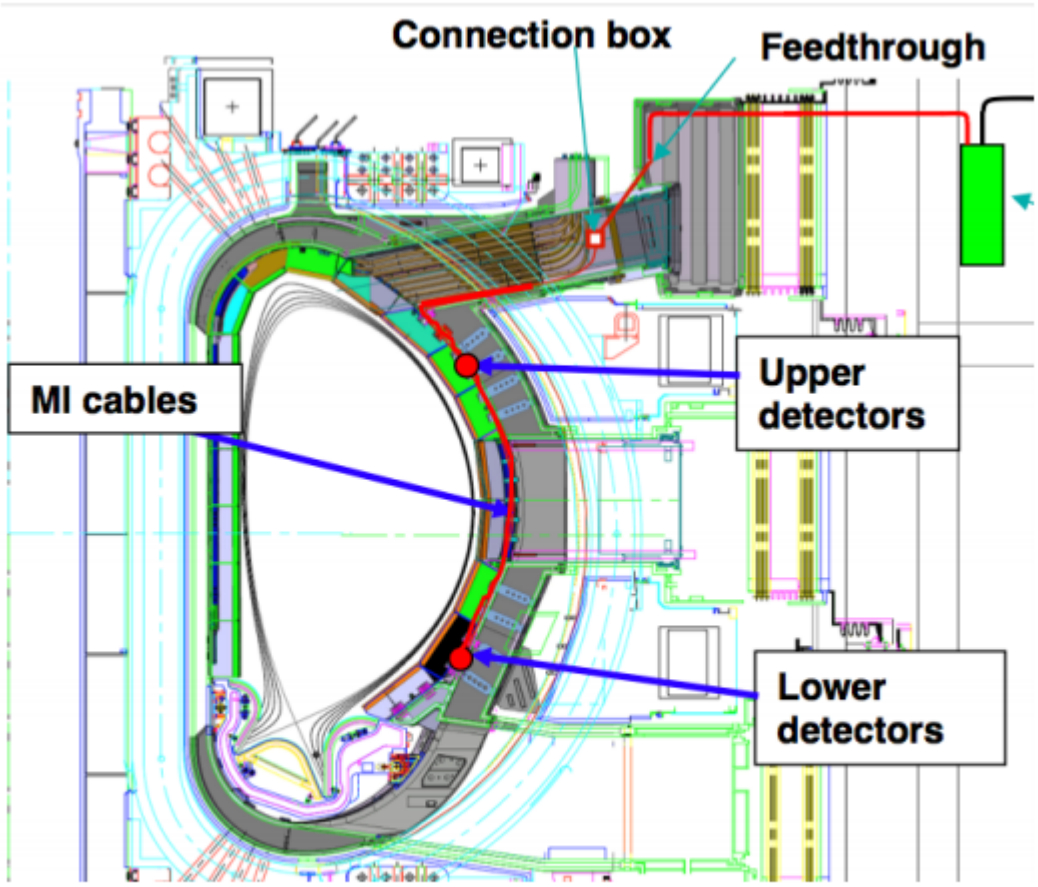



Fig.5.1.1. Location of the MFC systems.

## B8 NAS : Irradiation Ends design development, clashes resolution

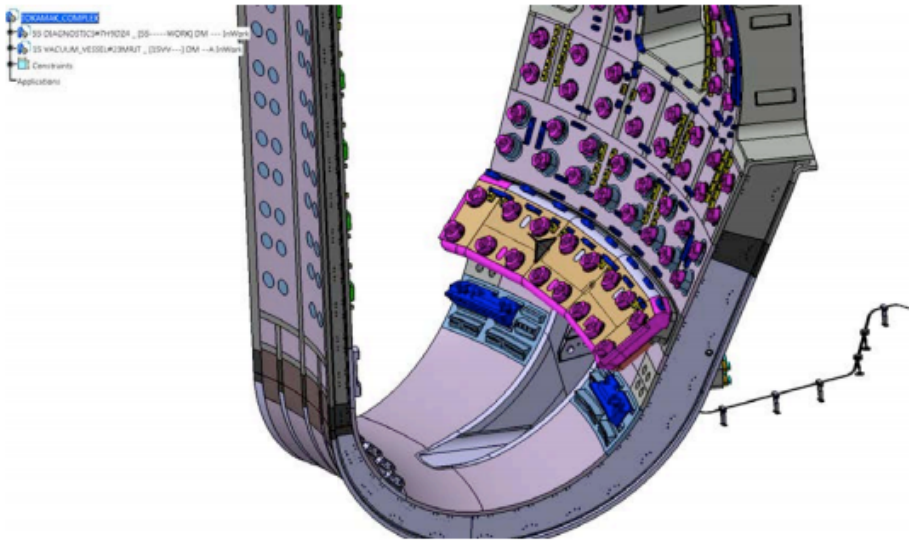


**Figure 9.2.4. Routing of transfer line in Sector #5 and #8**

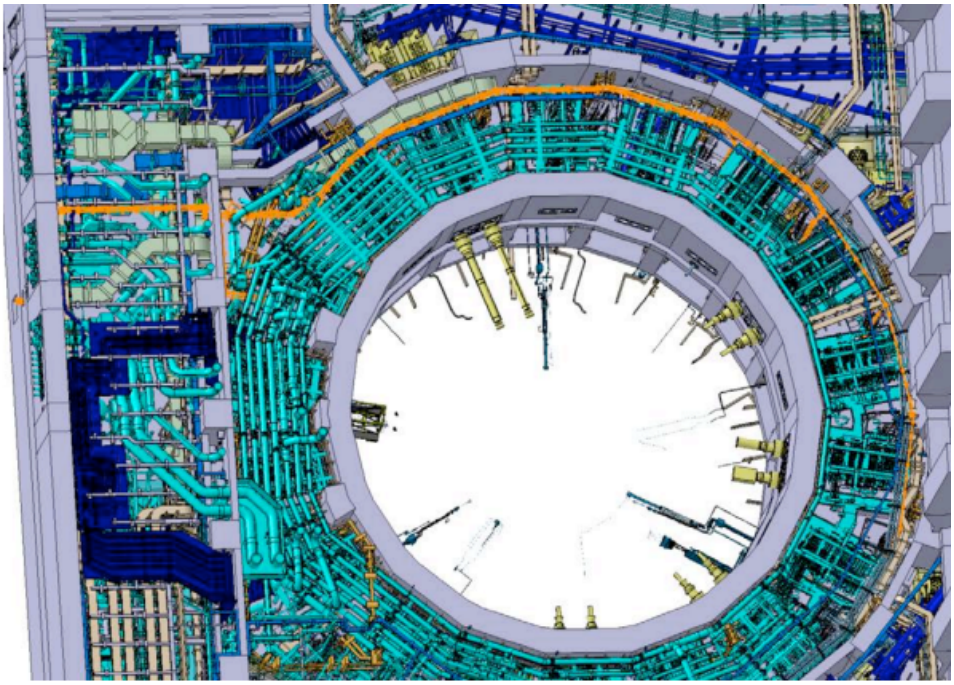


**Figure 9.4.2. Gallery transfer line**

## G4 – Residual Gas Analyzers

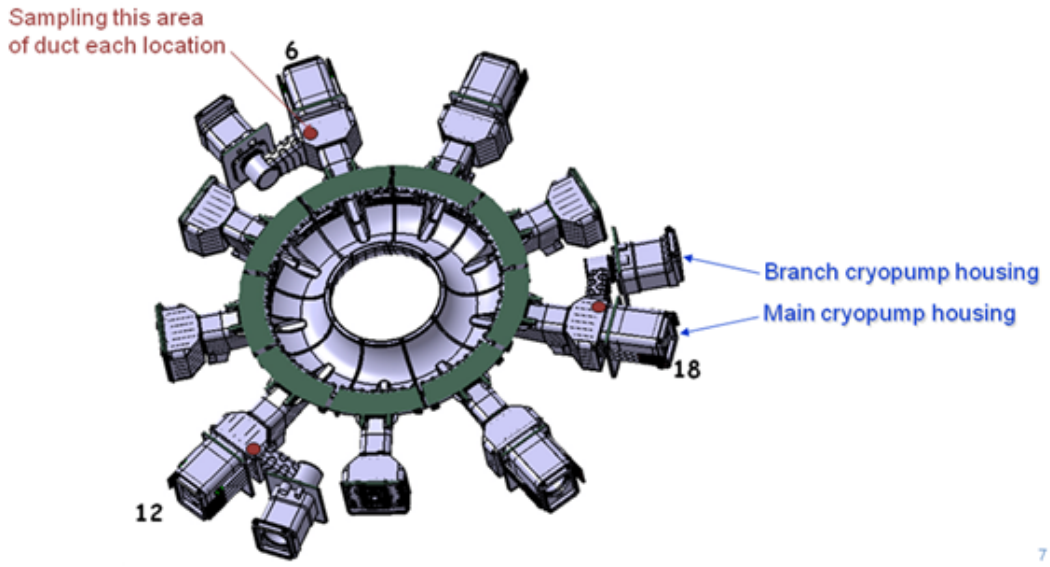
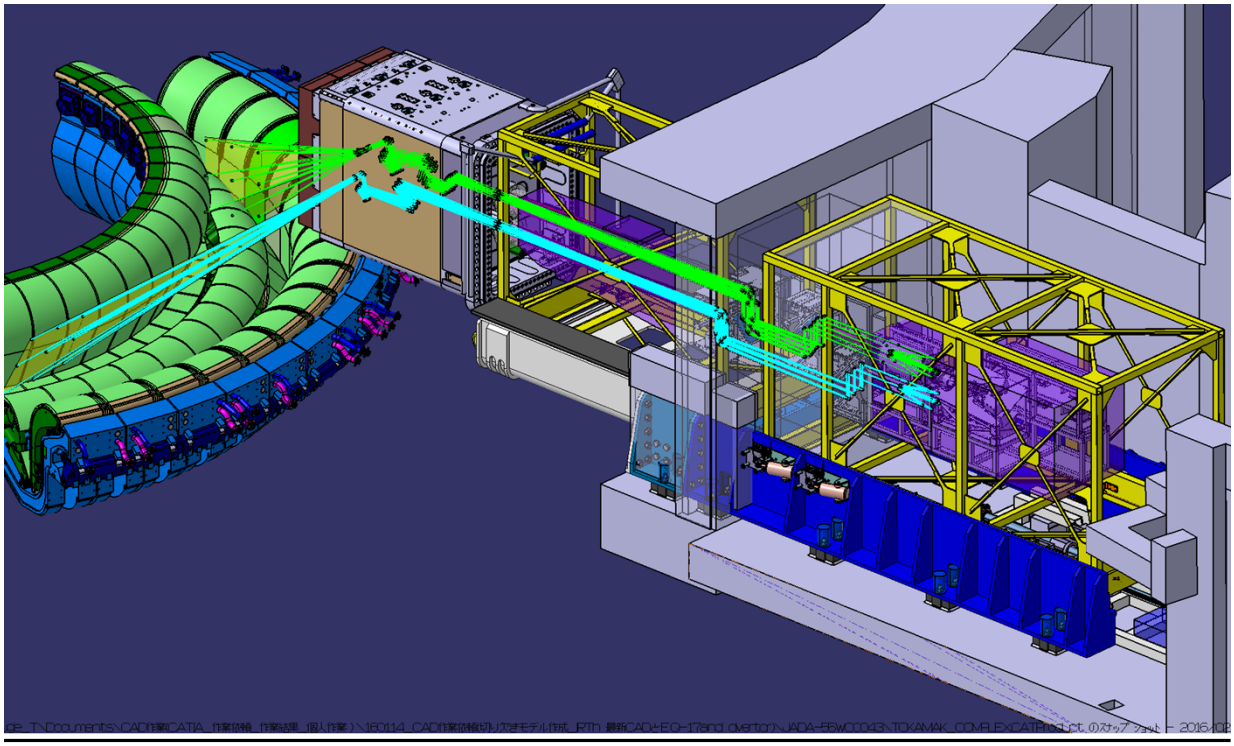



**Figure 1 – Picture showing the sampling points for the three Divertor DRGAs.**

## G6 Divertor IR Thermography



## G7 Langmuir Probes

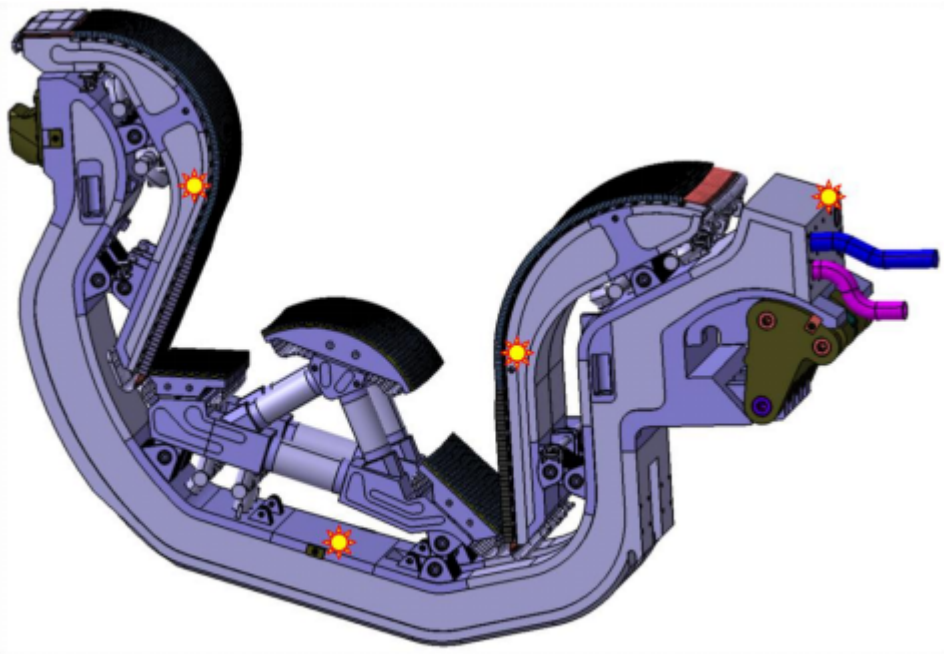


*Figure 6.18. Location of the ground reference points on the divertor cassette.*

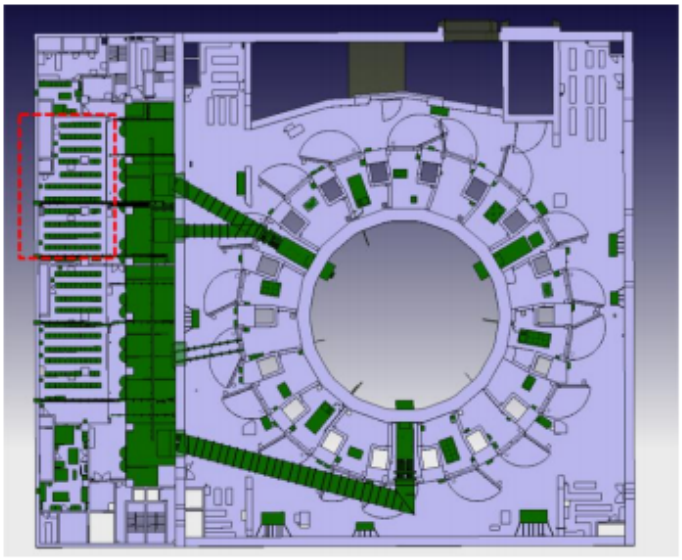


*Figure 6.20: Schematic view of layout in diagnostic hall showing the room allocation for the Langmuir probe cubicles.*

# 3 Definitions

IO: ITER Organization

DA: Domestic Agency

IO-TRO: ITER Organization technical Responsible Officer.

For a complete list of ITER abbreviations see: ITER Abbreviations (ITER_D_2MU6W5).

# 4 References

Links inserted in text.

# 5 Estimated Duration

The duration of the services is 1 year from the contract start date.

# 6 Work Description

The work involves technical expertise in the integration of diagnostics equipment inside and outside the vacuum vessel, the portplugs, the divertor as well as the cryostat and ex-vessel areas such as the port interspace area, the port-cells and galleries.

The main point of the work is:

- Work on specific mechanical diagnostic designs as detailed in the Deliverable plan. For specific background information, see illustrations in scope section.

Additional further general aspects of the work are:

- Control and integration of design of equipment (or parts of equipment) performed by external companies and other parts of IO impacting on diagnostic scope

- Assessing the impact of designs and design alterations as they impact on the integration of the diagnostics in work area and corresponding Diagnostics requirements

- Contribution to the preparation of data for CAD exchange to facilitate the provision of data to IO and external agencies.

- Ensure design compliance with the ITER requirements and with the Diagnostics system requirements.

- Ensuring that the ENOVIA representation of the CAD data of diagnostics in area of work is up to date and conforming to ITER CAD requirements

- Support of developments of alternatives to conflicting designs

- Support of Design reviews of diagnostics in designated areas

Re-prioritisation of the tasks depending on ITER Project requirements within the current scope may be needed and will be discussed and agreed between the IO RO and the Contractor.

The work is to be performed on ITER site.

# 7 Responsibilities

## 7.1 Contractor's Responsibilities

In order to successfully perform the tasks in these Technical Specifications, the Contractor shall:

• Strictly implement the IO procedures, instructions and use templates;

• Provide experienced and trained resources to perform the tasks;

• Contractor's personnel shall possess the qualifications, professional competence and experience to carry out services in accordance with IO rules and procedures;

• Contractor's personnel shall be bound by the rules and regulations governing the IO ethics, safety and security IO rules.

## 7.2 IO's Responsibilities

The IO shall:

• Nominate the Responsible Officer to manage the Contract;

• Organise a monthly meeting(s) on work performed;

• Provide offices at IO premises.

# 8 List of deliverables and due dates

| | **Description** | Target Date (Months) |
|---|---|---|
| D01 | **Work Plan Ref: IO1229.301480** | TO +2 |

| | | |
|---|---|---|
| | 2D drawing of all AE connector boxes, A7 junction boxes and A7 connector boxes shall be produced, plus 2D Drawings for A7, AD, AE, AF, AH, AI | |
| D02 | **Work Plan Ref: IO1229.301480**<br>Preparation of mock-up activities- Production of draft design for the flux loop mockup | TO +4 |
| D03 | **Work Plan Ref: IO1229.301480**<br>Support for tools definition - Reference design for the tools to be used for the flux loops assembly shall be prepared. | TO +5 |
| D04 | **Work Plan Ref: IO1229.301480**<br>Flux loops have interfaces with most of the systems attached to the Vacuum vessel (ELM coils, VS coils, blanket manifold, waveguides, looms, MFC, NAS, in-vessel coils, blanket supports, …).All these interfaces and in particular clearances require careful check and monitoring.<br>Regular checks of interfaces in relation to A7, AD, AE, AF, AH, AI | TO +6 |
| D05A | **Work Plan Ref: JA551.335000**<br>B3.MFC Ex-Vessel Components and Detectors.<br>Detectors configuration model has to be updated to host 3 detector units with actual dimensions. Supporting elements of detector housing, which are attached to the vessel, have to be redesigned to follow the curvature of the vessel. Once done a CMAF report has to be prepared and followed for approval. CCM Update, CMAF | TO +7 |
| D05B | **Work Plan Ref: JA551.175000**<br>B3 MFC InV Components , Study of alternative clamps in VV, CCM Update, CMAF<br>B3.MFC In-Vessel Components and Detectors.<br>Cable clamps configuration model has to be updated to host 3 cables and be attached to the vessel with a single boss. Clamp cooling features have to be studied and implemented in the model. Once done a CMAF report has to be prepared and followed for approval. | TO +7 |
| D05C | **Work Plan Ref: EU55.07.230030**<br>B7 Radial gamma ray spectrometer, Interface Management CCM Update, CMAF<br>B7 Radial gamma ray spectrometer, Interface Management.<br>Interfacing points (supports, SVS connections, water connections, electrical connections, etc.) have to be developed and implemented in 3d model. Once done a CMAF report has to be prepared and followed for approval. | TO +7 |
| D06A | **Work Plan Ref: KO55N.059940**<br>B8 NAS : Irradiation Ends design development, clashes resolution, Blanket cut-outs, routing b11 to b14 and inside b14, DM/CM<br>B8 NAS Irradiation ends design in the vessel has to be evolved | TO +8 |

| | | |
|---|---|---|
| | following KODA proposal. In-vessel tubes routing has to be revised considering the tolerances analysis. Ex-vessel routing of NAS transfer tubes has to be revised following a deviation request raised by KODA. Once done a CMAF report has to be prepared and followed for approval. | |
| D06B | **Work Plan Ref: KO55N.0810**<br>B8 NAS : NAS (1) - IV, EV, EP11 Transfer line<br>B8 NAS Irradiation ends design in equatorial and upper port plugs has to be evolved following KODA proposal. In-port-plug tubes routing has to be revised and integrated. Feedthrough design has to be updated. Once done a CMAF report has to be prepared and followed for approval. | TO +8 |
| D07 | **Work Plan Ref: JA552.421320**<br>E4 DIM : Preparation for SIRs and PDR<br>CMM Update, CMAF Interface Management<br>E4 DIM: Update of design integration and interfaces in UP#1, EP#1 and LP#2 as well as in Diagnostic and Tritium Building.<br>Prepare space reservations for fibre routings. | TO +9 |
| D08 | **Work Plan Ref: JA552.421320**<br>E4 DIM : Preparation for SIRs and PDR<br>CMM Update, CMAF Interface Management<br>E4 DIM: Update of design integration and interfaces in UP#1, EP#1 and LP#2 as well as in Diagnostic and Tritium Building.<br>Prepare space reservations for fibre routings. | TO +10 |
| D09 | **Work Plan Ref: IO.1229.00000380**<br>EE Hard X-Ray Monitor : FDR Preparation<br>Update of DM/CM CMAF<br>- Updating CCM and DM in accordance with the design proposed for the FDR phase<br>- Scoping studies for possible addition of system components during the FDR design phase<br>- Periodic review of the CM/DM models of the system for interface check and possible clashes removal work<br>- Participation in CAD model review meeting and follow-up for the CMAF approval | TO +11 |
| D10A | **Work Plan Ref: IO.1228.012315**<br>G4 RGA : Interface Management & Documents Management<br>CMM update, CMAF<br>- Interface Management<br>o Identification of mechanical support points<br>o Resolve clashes with other diagnostic systems as they arise<br>o Check Access and Maintainability or RGA components | TO + 12 |

| | | |
|---|---|---|
| | - Configuration Model Updates<br>o due to changes in Port Cell layout coming from Port Integrator<br>o following RGA diagnostic developments (agreed updates to DM) | |
| D10B | **Working Plan Ref: JA552.321320**<br>G6 IR Thermography, Interface Management<br>CMM update , CMAF<br>- Interface Management<br>o Identification of support points within modular diagnostic shield module (DSM)<br>o Resolve clashes with shutter mechanism in the DSM<br>o Check assembly sequence for shielding removal and maintenance access<br>- Configuration Model update<br>o as needed following agreed updates to DM<br>o in line with DSM redesign implemented by Port Integrator<br>o Unify shielding models from individual diagnostics | TO + 12 |
| D10C | **Working Plan Ref: CN55G7012000**<br>G7 Langmuir Probes : Interface Management & Documents Management<br>Update CAD models in response to interface development, 3D and 2D drawings. Preparation and management of DETs, DRs, etc. | TO + 12 |

# 9 Acceptance Criteria

These criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of monthly progress reports.

Report and Document Review criteria:

Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the selected candidate for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents.

The Approver can name one or more Reviewers(s) in the area of the report's expertise.

The Reviewer(s) can ask modifications to the report in which case the selected candidate must submit a new version.

The acceptance of the document by the Approver is the acceptance criterion.

# 10 Specific requirements and conditions

- CAD experience with CATIA 5 and ENOVIA;
- Experience with mechanical designs for applications similar to ITER tokamak environment;
- Knowledge of ITER diagnostic systems would be an advantage;
- Experience of working in an international environment;
- Capability to work in English language;
- Able to works with partners and host to define critical needs;
- Ability to align work priorities with overall project schedule;
- Good technical writing skills;
- Attention to detail;
- Good inter-personal skills;
- Ability to be consistent and work well under pressure.

# 11 Work Monitoring / Meeting Schedule

**Meetings and Progress Reports**

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning. It is expected that Progress Meeting will be held weekly or bi-weekly or as needed, via videoconference.

The main purpose of the Progress Meetings is to allow the ITER Organization/Diagnostics Division and the Contractor Technical Responsible Officers to:

a) Allow early detection and correction of issues that may cause delays;
b) Review the completed and planned activities and assess the progress made;
c) Permit fast and consensual resolution of unexpected problems;
d) Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request additional meetings to address specific issues to be resolved.

It is expected that on occasion the Contractor will be required to make a presentation to Topical Technical Meetings either by videoconference or in person

For all Progress Meetings, a document (the Progress Meeting Report) describing tasks done, results obtained, blocking points and action items must be written by the Contractor. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

# 12 Delivery time breakdown

See Section 8 “List Deliverables section and due dates”.

# 13 Quality Assurance (QA) requirements

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in ITER Procurement Quality Requirements (ITER_D_22MFG4).

Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities (see Procurement Requirements for Producing a Quality Plan (ITER_D_22MFMW)).

Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO prior to its use, in accordance with Quality Assurance for ITER Safety Codes (ITER_D_258LKL).

# 14 CAD Design Requirements (if applicable)

For the contracts where CAD design tasks are involved, the following shall apply:

The Supplier shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.

The Supplier shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual (2F6FTX), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings 2DWU2M).

The reference scheme is for the Supplier to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the ITER GNJX6A - Specification for CAD data production in ITER Contracts.). This implies the usage of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet (249WUL) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Supplier with regards to the CAD collaboration requirement shall be incurred by the Supplier.

# 15 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 (“Installation Nucléaire de Base”).

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012 [20].