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

# Analysis and integration of the Visible Spectroscopy Reference system (55.E6 VSRS)

Technical Specifications

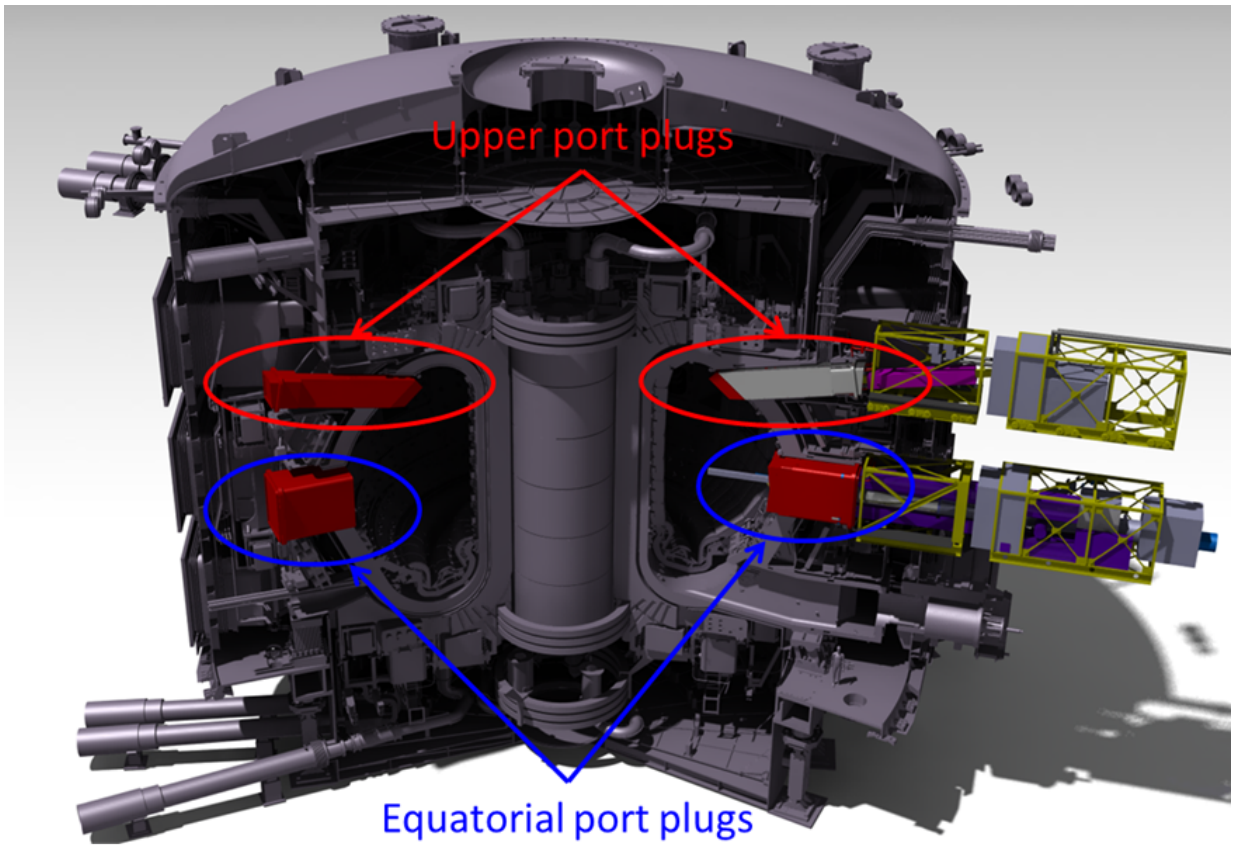
# Table of Contents

# 1 Purpose

This document describes technical needs for the analysis and integration of the Visible Spectroscopy Reference system (55.E6 VSRS) in the equatorial port 8 design, with particular emphasis in the areas of diagnostic integration within ports cell area.

# 2 Scope

The work described below is related to the design of the equipment of the diagnostic itself and the equipment required to physically implement and compliment the 55.E6 VSRS diagnostic in ITER, e.g. port plug and similar structures.




# 3 Definitions

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

# 4 References

Acronyms:

- C-R: Contractor Responsible. See Contract specifications for definition of duty.
- C-TRO: Contractor Task Responsible Officer. See Contract specifications for definition of duty.
- IO-RO: ITER Organization Responsible Officer. See Contract specifications for definition of duty.

- IO-TRO: ITER Organization Task Responsible Officer. See Contract specifications for definition of duty

# 5 Estimated Duration

The duration of the services is 24 months from the contract start date.

Services to be provided mainly (60%) at the IO work site. Travel to the supplier sites may be required to carry out the work.

# 6 Work Description

The objective of this engineering contract is in the diagnostic design and the analysis of the diagnostic design, with particular emphasis in the areas of mechanical, thermo-hydraulic and electromagnetic analysis.

- Delivering Mechanical and Thermo-Hydraulic design of diagnostic components, especially optical systems.
- Mechanical (static/dynamic/linear/non-linear), Thermo- Hydraulic and Electromagnetic analysis of General diagnostics, diagnostics port plugs, diagnostics port plug structures and diagnostics windows assemblies.
- Analysis referring to the definition of loads (Mechanical, Thermo- Hydraulic and Electromagnetic analysis) to be included in Load Specifications of diagnostic components.
- Perform, collate and check the analytical and numerical calculations supporting diagnostic design in the area of Mechanical, Thermo-Hydraulics and Electromagnetics.
- Code assessment and structural integrity evaluation following appropriate Codes and Standards (nuclear/non-nuclear) against diagnostic designs, examples of such codes would be such like RCC-MR and ASME codes.
- Perform independent verifications of structural integrity reports of nuclear equipment.
- Load specifications for diagnostic components production.
- Provide appropriate Structural Analysis, Technical Analysis and Structural Integrity Reports in a suitable format as per IO templates.
- Fulfil its mission in the design engineering and analysis area.

# 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

| D # | Description | Due Dates |
|---|---|---|
| D1 | Document describing a description of the CDR level opto-mechanical design of the 55.E6 Visible Spectroscopy Reference System (VSRS) that will be designed in according to the Design Plan (see section 14 on CAD design requirements). It will also provide a justification for the design choices made.<br>This document will serve as input for the CDR-level Design Description Document (DDD). | T0 + 3 months |
| D2 | Document describing the preliminary assessment of the typical loads on diagnostic components of the 55.E6 VSRS from external sources (EM loading, thermal, seismic); as well as from interfacing loads within equatorial port 8. This will serve as input for the CDR-level System Load Specification (SLS) document. | T0 + 5 months |
| D3 | Document describing the Remote Handling design features and tasks of the 55.E6 VSRS. This will serve as input for the CDR-level Remote Handling Compatibility Assessment (RHCA), Plant Definition Form(s) (PDF) and Task Definition Form(s) (TDF). | T0 + 7 months |
| D4 | Document describing the thermomechanical analysis of the 55.E6 VSRS and assessment of the impact on the diagnostic performance, in accordance with the preliminary system load specification (SLS). This will serve as (partial) input to the CDR-level System Performance Assessment.<br>This report needs to have a clear description of the model and the mesh used for these analyses. It also needs to have a clear description of the boundary conditions that apply to the model and the assumptions made in order to perform the analysis. | T0 + 9 months |

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|---|---|---|
| D5 | CDR-level Structural Integrity report for the 55.E6 VSRS summarising all the loads (ex. Seismic, heating, electromagnetic etc) and more particularly the stress induced by all these loads and load combinations, in accordance with the preliminary CDR-level system load specification (SLS).<br>This report needs to have a clear description of the model and the mesh used for these analyses. It also needs to have a clear description of the boundary conditions that apply to the model and the assumptions made in order to perform the analysis.<br>A table with all the loads used and the stress induced by each case need to be provided to IO for this diagnostic | T0 + 11 months |
| D6 | Updated document describing a description of the PDR level opto-mechanical design of the 55.E6 Visible Spectroscopy Reference System (VSRS) that will be designed in according to the Design Plan (see section 14 on CAD design requirements). It will also provide a justification for the design choices made.<br>This document will serve as input for the PDR-level Design Description Document (DDD). | T0 + 14 months |
| D7 | Updated document describing the assessment of the detailed loads on PDR-level diagnostic components of the 55.E6 VSRS from external sources (EM loading, thermal, seismic); as well as from interfacing loads within equatorial port 8. This will serve as input for the PDR-level System Load Specification (SLS) document. | T0 + 16 months |
| D8 | Updated document describing the detailed Remote Handling design features and tasks of the 55.E6 VSRS. This will serve as input for the PDR-level Remote Handling Compatibility Assessment (RHCA), Plant Definition Form(s) (PDF) and Task Definition Form(s) (TDF). | T0 +18 months |
| D9 | Updated document describing the thermomechanical analysis of the 55.E6 VSRS and assessment of the impact on the diagnostic performance, in accordance with the detailed system load specification (SLS). This will serve as (partial) input to the PDR-level System Performance Assessment.<br>This report needs to have a clear description of the model and the mesh used for these analyses. It also needs to have a clear description of the boundary conditions that apply to the model and the assumptions made in order to perform the analysis. | T0 + 21 months |

| | | |
|---|---|---|
| D10 | PDR-level Structural Integrity report for the 55.E6 VSRS summarising all the loads (ex. Seismic, heating, electromagnetic etc) and more particularly the stress induced by all these loads and load combinations, in accordance with the detailed PDR-level system load specification (SLS).<br>This report needs to have a clear description of the model and the mesh used for these analyses. It also needs to have a clear description of the boundary conditions that apply to the model and the assumptions made in order to perform the analysis.<br>A table with all the loads used and the stress induced by each case need to be provided to IO for this diagnostic | T0 + 24 months |
| D11 | Monthly progress reports during the full contract duration. | Every month |

# 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 as indicated in section 8, table of deliverables and further detailed below:

- Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor 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 Contractor must submit a new version.
- The acceptance of the document by the Approver is the acceptance criterion.

# 10 Specific requirements and conditions

- Experience in the design and analysis of tokamak systems
- Experience with structural, thermo-hydraulic and electromagnetic analysis (both analytic and computational) of mechanical systems
- Appropriate industrial codes (e.g. ASME VIII Div 2, ASME III, RCCMR)
- Experience with CATIA V5

# 11 Work Monitoring / Meeting Schedule

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails and JIRA task 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 biweekly or as needed, via videoconference. Progress meetings will involve C-R, CTROs, IO-RO and IO-TROs.

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, additional meetings to address specific issues to be resolved may be requested by the ITER Organization.

It is expected that on occasion a presentation to Topical Technical Meetings either by videoconference or in person may be required.

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 – Deliverables and Due Date

# 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].