

Annex II

Technical Specifications

Diagnostics Divertor Erosion Monitor

ITER_D_QZ29YZ v1.3



Divertor Erosion Monitor
of
ITER Diagnostics Components

Technical Specifications



Table of Contents

1	PURPOSE	3
2	SCOPE	3
3	ESTIMATED DURATION	3
4	WORK DESCRIPTION.....	4
5	LIST OF DELIVERABLES AND DUE DATES	4
6	ACCEPTANCE CRITERIA.....	5
7	SPECIFIC REQUIREMENTS AND CONDITIONS.....	5
8	WORK MONITORING / MEETING SCHEDULE	5
9	DELIVERY TIME BREAKDOWN.....	6
10	QUALITY ASSURANCE (QA) REQUIREMENTS	6
11	CAD DESIGN REQUIREMENTS (IF APPLICABLE)	6
12	SAFETY REQUIREMENTS	7

1 Purpose

This document describes technical needs of ITER/TED/PPD Division, with particular reference to the Physics and engineering of Divertor Erosion Monitor diagnostic, its instrumentation and related follow-up activities. This expertise is essential to advance Diagnostic designs and PAs over the required timescale.

2 Scope

ITER is a major new device that is under construction in Cadarache in Provence, France. This device will study the Fusion concept on a scale previously unequalled on earth.

To study the behaviour of this device, a set of monitoring systems (called diagnostics) are required. They will provide all the information to show and understand the performance of the device.

The work described below is related to requirements definition, system scoping and space allocation, system design, R&D definition and follow-up for procurement preparations. Work will start at the functional specification level and hence significant experience in the fusion field is required to allow an optimum system to be specified.

In particular, the study of plasma wall interaction and erosion and re-deposition especially at the Divertor targets is of paramount importance to the functioning of the device. The level of importance of this is highlighted by the fact that the monitoring of erosion and deposition is related to the dust production and tritium retention in the machine which are related to the safety case of the machine.

The scope of this contract is to

- Support the Diagnostics team in the evaluation and establishment of diagnostics for monitoring of erosion at the divertor targets
- Specification and commissioning of R&D tasks
- Evaluation of diagnostic reports for accuracy and provide expert advice on these reports.
- Contribution to Design reviews,
- Help in preparation of direct procurement activities.

3 Estimated Duration

The duration of the contract is up to 12 months from the starting date. The company should maintain a presence 1/3 of the time (equally spaced) on site.

4 Work Description

- Support the Diagnostics team in the evaluation and establishment of diagnostics for monitoring of erosion and deposition at the divertor region,
- Provide direction and instruction on engineering of diagnostic solutions of diagnostics for monitoring of erosion and deposition
- Contribute to the Optical, Opto-mechanical and Mechanical design of the system
- Contribute to the generating the specifications for subcomponents like lasers, optics, detectors, shutters, reference points etc.
- Help in identifying the interfaces and classification for the designed system
- Help in carrying out Functional, Load, Structural integrity, Neutronics, Risk and Safety, RAMI analysis
- Contribution to formal Design reviews,
- Evaluation of diagnostic reports for accuracy and provide expert advice on these reports.
- Specification and commissioning of R&D tasks
- Assist on the planning of the diagnostic schedule and estimate the cost
- Preparation of direct procurement activities
- **Provide all necessary documentation required to complete the work**

5 List of deliverables and due dates

Number	Deliverable	Dates*
D01	CDR Chit 1 resolution report (all parts related to optical, Opto-mechanical & mechanical design). Each of the 5 chits must be developed as a separate chapter. The deliverable must be supported by an appendix with the records of all meetings required to close each deliverable.	T0 + 1 m
D02	Generation of R&D preparation document	T0 + 3 m
D03	Design of the Optical Box under the dome. This deliverable to include the following parts: 1. Functional, Risk and Safety Analysis 2. Optical design, 3. Mechanical design, 4. Optomechanical design, 5. Tolerance analysis	T0 + 6m
D04	Analysis of the Optical Box under the dome. This deliverable to include the following parts: 1. Estimated radiation load. 2. Estimated thermal load, 3. Estimated EM load, 4. Estimated seismic load. 5. Identification of structurally loaded points 6. Analysis Plan	T0 + 9m
D05	Design of the Reference points. This deliverable to include the following parts: 1. Mechanical design 2. Tolerance analysis	T0 + 2 m



D06	Analysis of the Reference points. This deliverable to include the following parts: 1. Estimated radiation load. 2. Estimated thermal load, 3. Estimated EM load, 4. Estimated seismic load.	T0 + 5 m
D07	Final report	T0 + 12m

6 Acceptance Criteria

These criteria shall be the basis of acceptance by IO following the successful completion of the services.

Reports and document Review criteria.

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.

7 Specific requirements and conditions

- Demonstrated experience working on fusion system and in particular in design and analysis of in-vessel diagnostics (more than 3 years)
- Demonstrated experience in designing laser based diagnostics systems (minimum 5 years)
- Demonstrated experience in interferometric systems will be an added advantage
- Demonstrated experience in working with design of imaging systems (minimum 5 years)
- Demonstrated experience in optical design using ray tracing codes like Zemax or equivalent (minimum 5 years)
- Demonstrated experience in CAD software like CATIA (minimum 5 years)
- Demonstrated practical experience in general Engineering Support (minimum 10 years)
- Demonstrated experience in Mechanical design and analysis equipment (minimum 10 years).

8 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.

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 asses 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.

For all Progress Meetings, a document describing tasks done, results obtained, blocking points must be written by the engineer. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

9 Delivery time breakdown

See Section 5

10 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 \(ITER_D_258LKL\)](#).

11 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.

12 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].