

Technical Specifications (In-Cash Procurement)

CFE - VUV and XRay diagnostics management

This document describes technical needs for work on the design and progression of the diagnostics and especially the five Passive Spectroscopy Systems on ITER.

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1 Purpose

This document describes technical needs for an expert specialist in engineering of Diagnostics. Specifically the technical needs of the Diagnostics Division are working on the design and progress of the diagnostics, especially the five Passive Spectroscopy Systems on ITER.

2 Scope

This work involves the support to the ITER Diagnostic Team in the progress of the diagnostics design for the X-Ray and Vacuum Ultraviolet Spectroscopy systems on ITER. The work is expected to be carried out in close liaison with the IO-TRO and the Diagnostic Designer involved.

3 Definitions

VUV – Vacuum Ultra Violet

XRCS - X-Ray Crystal Spectroscopy

IDM - ITER Document Management

PDR – Preliminary Design Review

FDR – Final Design Review

SIC - Safety Important Component

PIA - Protection Important Activity

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 this work shall be 12 months from the starting date of the Contract. It is anticipated that the required work will be 80% of full-time equivalent. Services shall be provided approximately 25% at the IO work site (1 day per week). Due to the COVID-19 pandemic, by agreement with IO, some workload may be done remotely (teleworking).

6 Work Description

ITER will be equipped with a suite of five passive spectroscopic diagnostics, located in the upper and equatorial ports of its vacuum vessel. These five subsystems cover Vacuum UltraViolet (VUV) to soft X-Ray wavelength ranges. Their purpose is to monitor line and continuum radiation of the main, edge and divertor plasmas, and to measure impurity species.

Techniques used include neutron shielding, grating spectrometers, grazing incidence optics, crystal optics, and photon detectors such as hybrid-pixel silicon sensors and Back Illuminated CCDs.

Vacuum UltraViolet systems

There are three distinct Vacuum UltraViolet systems provided by the Korean Domestic Agency for Core, Edge and Divertor plasmas respectively:

- The 55.E3 VUV Core Survey in the Equatorial Port #11 (**First Plasma Diagnostic**);
- The 55.EG VUV Divertor also in the Equatorial Port #11 (Figure 1);
- The 55.EH VUV Edge Imaging in the Upper Port #18 (Figure 2).

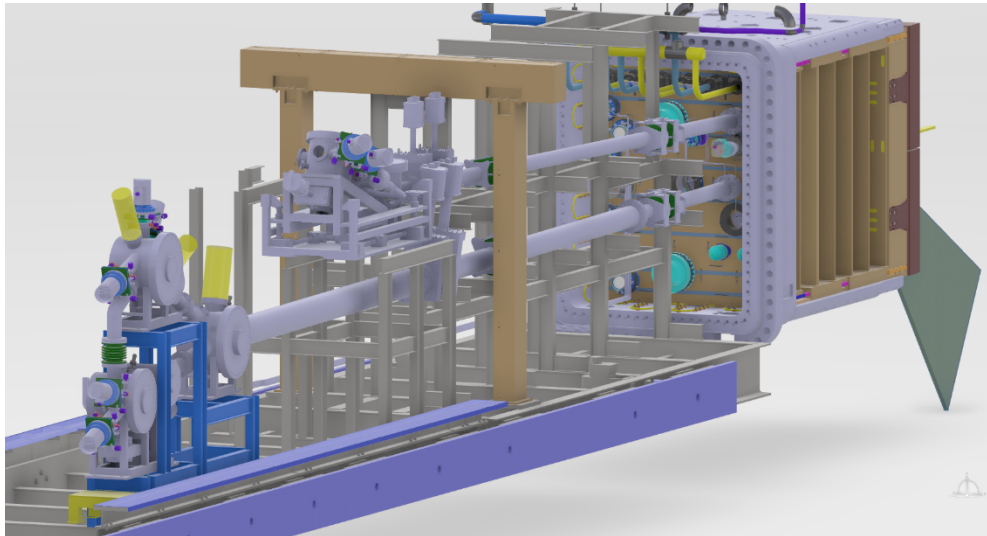


Figure 1: VUV Core Survey and Divertor in the Equatorial Port Cell #11

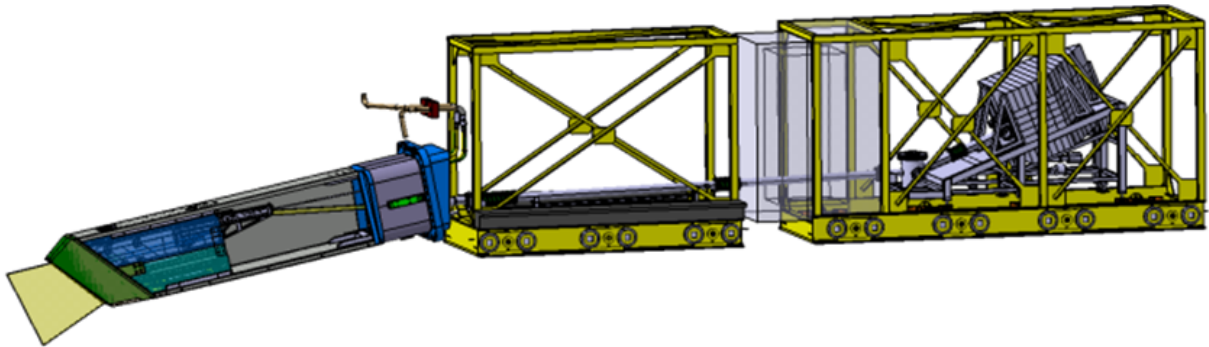


Figure 2: VUV Edge Imaging in Upper Port #18

Soft X-Ray systems

There are two distinct X-Ray systems provided by the Indian Domestic Agency for Core and Edge plasmas respectively:

- 55.ED X-Ray Crystal Spectroscopy (XRCS) Survey in Equatorial Port #11 (**First Plasma Diagnostic**) (Figure 3);
- 55.EI X-Ray Crystal Spectroscopy Edge in Upper Port #09 (Figure 4).

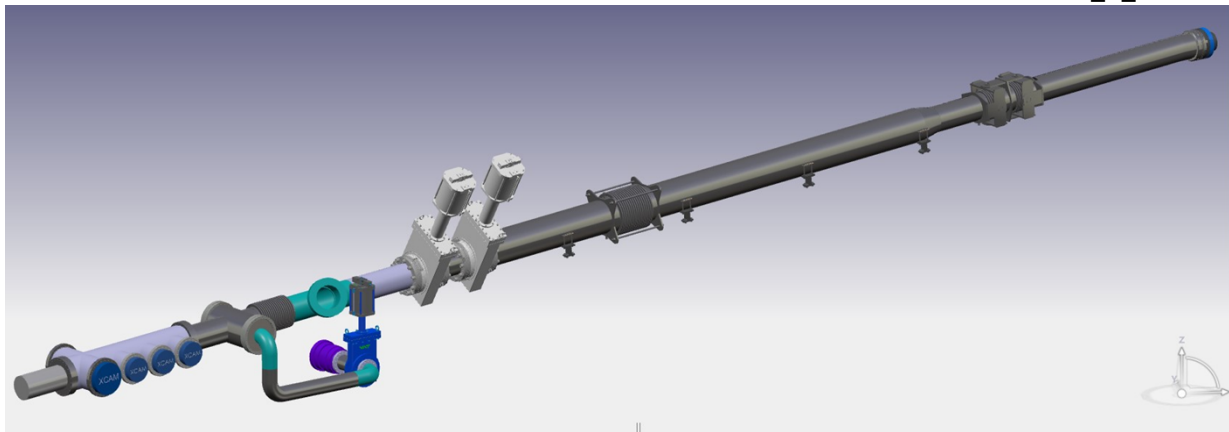


Figure 3: XRCS Survey in Equatorial Port #11

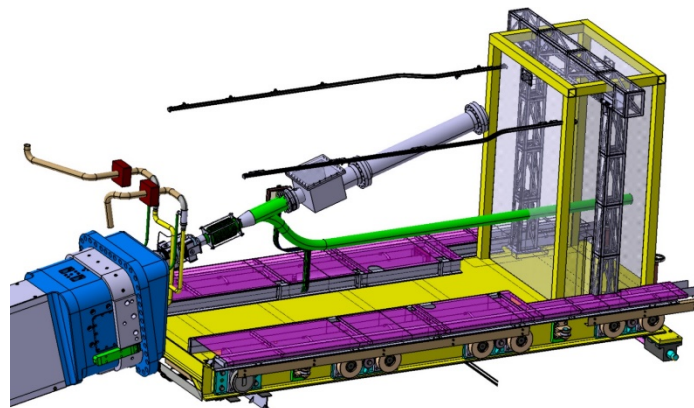


Figure 4: XRCS Edge in Upper Port #09

6.1 Objective

The objective of this Contract is to support and assist the Diagnostics Technical Responsible Officers in the preparation of the passive diagnostic systems for ITER construction, in particular:

- Oversee the design and progression of these 5 diagnostics;
- Close work with the Korean and Indian ITER Domestic Agencies in the specification and realisation of these various systems;
- Work with the Division Head or his appointed experts in all matters related to the diagnostic systems for ITER construction;
- Provide expertise, on passive spectroscopic diagnostics;
- Monitor and manage various technical aspects of these systems;
- Develop the design of interfaces of diagnostics with the main tokamak components;
- Develop detailed project implementation plans for all related work, and monitor and control all related activities;
- Effectively interface with other ITER Organization Departments and with ITER Domestic Agencies as necessary to achieve successful implementation;
- Work on the development of appropriate documentation as needed;
- Assessment of the design and analysis performed at Preliminary or Final Design Phase;
- Resolution of the outstanding issues proposed during the Design Phase;

- Development of essential technology, processes, tooling or innovative design features that require “proving”;
- Executing appropriate test programs to justify any technical risk items;
- Execution of Final Design of the system;
- Remote handling compatibility assessment the components;
- Requirement compliance checking;
- Interface compliance checking;
- Management of deviations;
- Production of the design review documents;
- Design Review organization (PDR or FDR);
- Supporting closure of the Design Review Chits.

6.2 Detailed Actions and estimated work load

- Within the duration of this Contract, several formal ITER Design Reviews are planned. For each Design Review, numerous documents (around 50 per system) need to be identified, updated, uploaded and reviewed before approval. Each document will be stored in the ITER Document Management system (IDM) and connected to the ITER Document Database (PLM). **This task represents 50% of the full time equivalent.**
- Monthly progress meetings will be held to manage the work on the five passive spectroscopy systems. In addition, if necessary, additional meetings to address specific issues to be resolved may be requested. These monthly meetings will follow good project management practices (agenda, minutes, actions list, etc). Each report will be stored in the ITER IDM system to ensure traceability of the work done. **This task represents 15% of the full time equivalent.**
- An active participation of the task assignee is required to the General Domestic Agency Monthly Meeting (GDAMM) with tracking and updating the action list. The review of the Monthly Progress Report (MPR) provided by the Diagnostics Designer is also in the fields of this work. **This task represents 10% of the full time equivalent.**
- As ITER is classified as an INB (Installation Nucléaire de Base), the Quality Assurance and the Safety of this project is mandatory. These five diagnostics have many Safety Important Components (SIC) and many Protection Important Activities (PIA). One of the tasks will be to regularly (at least twice a year) update the Surveillance Plan Annexes and validate with the concerned Diagnostics Designer the propagation of the Quality and Safety rule over all the sub-contractors. **This task represents 5% of the full time equivalent.**

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;
- Provide monthly schedule updates for the tasks being worked on by the Contractor;
- 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 rules.

7.2 IO's Responsibilities

The IO shall:

- Nominate a Responsible Officer to manage the Contract;
- Organise a monthly meeting(s) on work performed;
- Provide offices at IO premises;
- Review documents in a timely fashion.

8 List of deliverables and due dates

#	Deliverables	Date
D#01	Quality Plan Prior to commencement of the task, a Quality Plan will be submitted for IO approval.	T0* + 01 month
D#02	Preliminary Design Review for the XRCS Survey – 55.ED / I&C Support and assist Diagnostic TRO where appropriate as listed in section 5.1. Oversee the PDR of 55.ED XRCS Survey I&C according to the schedule. Deliver interim report comprising: <ul style="list-style-type: none"> a) record of activities performed, b) status, outlook and issues, c) links to relevant documents including: <ul style="list-style-type: none"> - Minutes and actions of progress meetings - Notification of PDR of 55.ED XRCS / I&C - PDR Final panel Report & Minutes of 55.ED XRCS / I&C - PDR chit resolution plan for 55.ED XRCS / I&C 	T0 + 04 months

D#03	<p>Preliminary Design Review for the XRCS Edge – 55.EI</p> <p>Support and assist Diagnostic TRO where appropriate as listed in section 5.1. Oversee the PDR of 55.EI XRCS Edge according to the schedule.</p> <p>Deliver interim report comprising:</p> <ol style="list-style-type: none"> record of activities performed, status, outlook and issues, links to relevant documents including: <ul style="list-style-type: none"> Minutes and actions of progress meetings Notification of PDR of 55.EI Edge PDR Final panel Report & Minutes of 55.EI Edge PDR chit resolution plan for 55.EI Edge 	T0 + 05 months
D#04	<p>Manufacturing Readiness Review for the VUV Core Survey – 55.E3</p> <p>Support and assist Diagnostic TRO where appropriate as listed in section 5.1. Oversee the MRR of 55.E3 VUV Core Survey according to the schedule.</p> <p>Deliver interim report comprising:</p> <ol style="list-style-type: none"> record of activities performed, status, outlook and issues, links to relevant documents including: <ul style="list-style-type: none"> Minutes and actions of progress meetings Notification of MRR of 55.E3 VUV core survey MRR Final panel Report & Minutes of 55.E3 VUV core survey MRR chit resolution plan for 55.E3 VUV core survey 	T0 + 07 months
D#05	<p>Final Design Review for the VUV Divertor – 55.EG</p> <p>Support and assist Diagnostic TRO where appropriate as listed in section 5.1. Oversee the FDR of 55.EG VUV Divertor according to the schedule.</p> <p>Deliver interim report comprising:</p> <ol style="list-style-type: none"> record of activities performed, status, outlook and issues, links to relevant documents including: <ul style="list-style-type: none"> Minutes and actions of progress meetings Notification of FDR of 55.EG VUV Divertor FDR Final panel Report & Minutes of 55.EG VUV Divertor FDR chit resolution plan for 55.EG VUV Divertor 	T0 + 09 months

D#06	<p>Final Design Review for the XRCS Survey– 55.ED</p> <p>Support and assist Diagnostic TRO where appropriate as listed in section 5.1. Oversee the FDR of 55.ED XRCS Survey according to the schedule.</p> <p>Deliver interim report comprising:</p> <ul style="list-style-type: none"> a) record of activities performed, b) status, outlook and issues, c) links to relevant documents including: <ul style="list-style-type: none"> - Minutes and actions of progress meetings - Notification of FDR of 55.ED XRCS Survey - FDR Final panel Report & Minutes FDR of 55.ED XRCS Survey - FDR chit resolution plan for 55.ED XRCS Survey 	T0 + 10 months
D#07	<p>Final summary report.</p> <p>This document will summarise all the Technical Progress Meetings done during this contract with the Indian and the Korean Domestic Agencies.</p>	T0 + 12 months

T0: Kick off Meeting date, to take place within a month after the signature of the contract by both parties

9 Acceptance Criteria

All the documents shall comply with the Design Review Procedure ([ITER_D_2832CF](#)) according to Template and ITER System Design Process Working Instruction ([ITER_D_4CK4MT](#)). The deliverables will be posted in the Contractor's dedicated folder in IDM, and the acceptance by the IO will be recorded by their approval by the designated IO TRO. These criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of reports as indicated in section 8, Table of deliverables.

10 Specific requirements and conditions

Technical Competencies and Demonstrated Experience in:

- Development of VUV and X-Ray systems and diagnostics systems in general;
- Work in technical development environment with at least ten years' experience;
- Interface management (identifying, resolving and maintaining technical and functional interfaces): Resolving complex and challenging technical issues;
- Project management (planning/measuring progress of project work, managing risks and costs): Identifying issues and delays in projects, development of recovery plans and cost, scope and schedule negotiations with international stakeholders.

Language requirements:

- Proven ability to work in English language, both orally and in writing;

- Proven technical writing skills;

Additional Skills:

- Knowledge and experience working with appropriate software tools to meet the technical requirements, for example IDL (Interactive Data Language) or MATLAB;
- Knowledge of special codes for the passive spectroscopy field would be a big benefit.

Information Technology

ITER Organization will provide IT hardware and services.

11 Work Monitoring / Meeting Schedule

Work is monitored through reports (see List of Deliverables section).

To review progress, technical issues, interfaces and schedule, the ITER Organization will hold Progress Meetings. In addition, formal exchange of documents transmitted by emails will be used to provide detailed information on the progress of the work.

The main purpose of the Progress Meetings is to enable the ITER Organization, the Diagnostics Division and the Technical Responsible Officers to:

- Early detect and correct issues that may cause delays;
- Review completed and planned activities and assess progress;
- Enable rapid and consensual resolution of unexpected problems;
- 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;
- Some visit to the Domestic Agency shall be requested to address specific issues (one travel per year and per DA).

For all Progress Meetings, a document describing tasks done, results obtained, blocking points must be submitted. 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 ([ITER_D_SBSTBM](#))

This task is PIC and PIA.