

Technical Specifications (In-Cash Procurement)

CFE - Integration Engineering Support for the 55.E5 XRCS Core

The purpose of this call is to acquire integration engineering support for the ITER 55.E5 XRCS (X-Ray Crystal Spectrometer) Core. The XRCS Core diagnostic – as a result of the impact the Disruption Mitigation System (DMS) project – was relocated to equatorial port 2 where it integrates together with two DMS systems. The design modification and engineering analysis of the XRCS Core will be carried out by an off-site contractor. However, to coordinate and guide this design and analysis effort as ...

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1 Purpose

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2 Scope

The scope of the work consists of coordinating the design and integration of the 55.E5 XRCS Core diagnostic into equatorial port 2.

3 Definitions

CAD:	Computer Aided Design
CATIA:	CAD software package (by Dassault Systems) used by IO
CIXS:	Core Imaging X-ray Spectroscopy
CM:	Configuration Model (CAD model for outer space envelop of a component of system)
C-TRO:	Contrator Technical Responsible Officer: responsible for technical content of the contract
C-RO:	Contrator Responsible Officer: responsible for the contract administration (can be the same person as the C-TRO)
DDD:	Design Description Document
DMS:	Disruption Mitigation System
HOPG:	Highly Oriented Pyrolytic Graphite
IO:	ITER Organization
IO-TRO:	ITER Organization Technical Responsible Officer: responsible for technical content of the contract
IO-RO:	ITER Organization Responsible Officer: responsible for the contract administration (can be the same person as the IO-TRO)
IS:	Interface Sheet
PDR:	Preliminary Design Review
PIA:	Protection Important Activity (activity – e.g. analysis – critical for nuclear safety)
PIC:	Protection Important Component (component critical for nuclear safety)
RCC-MR:	Design and Construction Rules for Mechanical Components of Nuclear Installations
SLS:	System Load Specification
StIR:	Structural Integrity Report
XRCS:	X-Ray Crystal Spectrometer

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER_D_2MU6W5\)](#).

4 References

Links inserted in text.

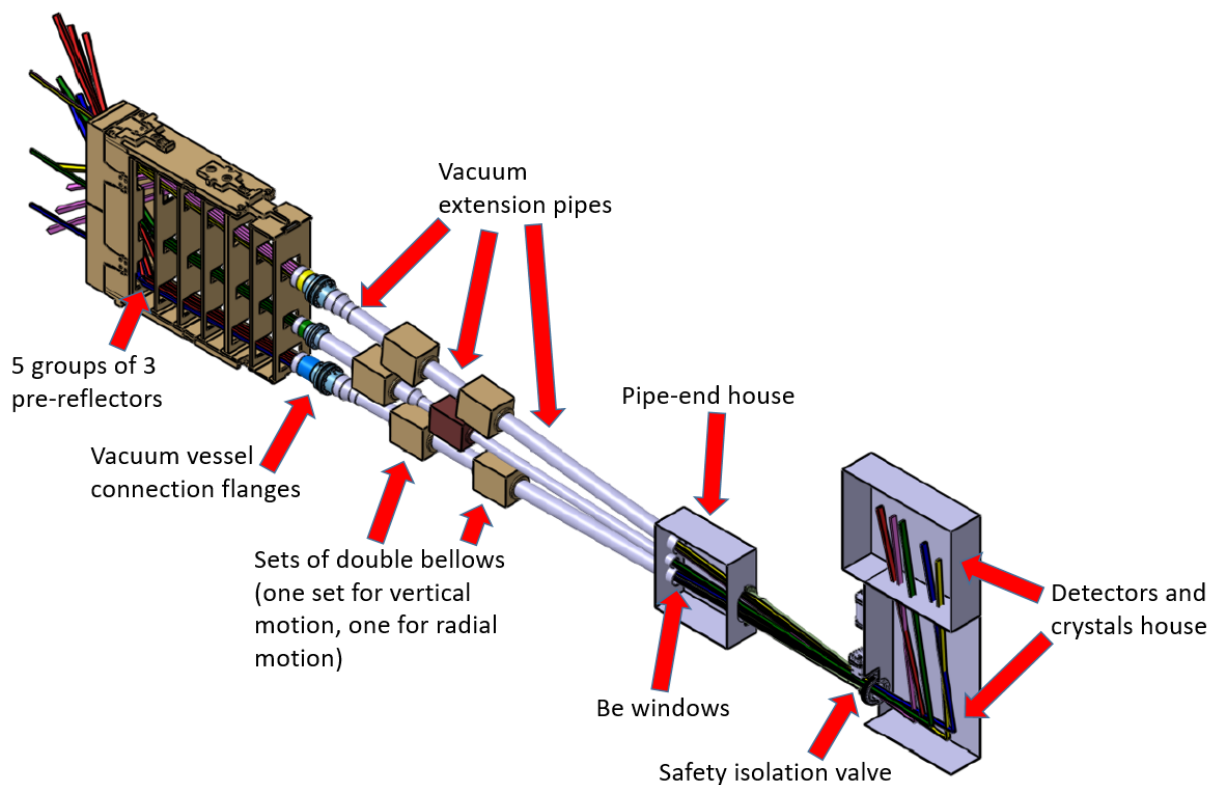
5 Estimated Duration

The duration shall be for 12 months. No work shall commence prior to the date of final signature of the Contract. Services shall be carried out at the IO worksite.

6 Work Description

The 55.E5 XRCS (X-Ray Crystal Spectrometer) Core diagnostic (formerly known as the Core Imaging X-ray Spectroscopy or CIXS) was move to a different location due to a reorganisation of diagnostics and the disruption mitigation system at ITER. This resulted in a design modification that was conceptually worked out and consisted of:

1. The inclusion of special X-ray pre-reflectors (highly oriented pyrolytic graphite or HOPG) inside the port plug
2. Repositioning the spectrometer units to behind the bioshield, resulting in the need for vacuum extensions and housing across the interspace. These vacuum extensions and housings are Protection Important Components (PIC).



This conceptual layout – shown in the figure above – will be detailed out to a preliminary design level and assessed for its structural integrity by another external contractor. This work will, however, be carried out off-site.

To ensure the detailed design and analysis is carried out efficiently and coordinated with the integration of the diagnostic in equatorial port 2, this activities under this call for expertise shall include:

- Communicating with the equatorial port 2 integration and DMS design teams to understand the integration constraints of all parties and converge on integration solutions acceptable to all.

- Preparation, in collaboration with the equatorial port 2 port integrator, the integration Configuration Models (CM) of the XRCS Core system (based on the detailed design) and of the Interface Sheet (IS) between equatorial port 2 and the XRCS core system.
- Identifying maintenance and assembly strategies as well as their impact on both the diagnostic design and integration.
- Proposing design options and design changes to the CAD design contractor. These proposals shall be based on engineering experience and take into account integration constraints, expected behaviour under electro-magnetic, thermal and seismic loads, maintenance and assembly.
- Reviewing/assessing detailed CAD designs and design reports by CAD contractor
- Coordinating and reviewing the structural analyses on the XRCS Core design. This includes retrieving the correct load inputs (in collaboration with the equatorial port 2 port integrator), identifying the critical analyses needed and prioritizing the analyses accordingly, reviewing the analysis reports and analysis models from the analysis contractor (this would include spot checks by rerunning some of the analyses).
- Supporting the creating of baseline documentation such as:
 - System Design description document (DDD) (and component design descriptions referenced therein)
 - System Load Specification (SLS)
 - System Structural Integrity Report (StIR)
 - Maintenance and Inspection Plan
 - Assembly Plan
 - Remote Handling Compatibility Assessment
- Supporting the XRCS Core PDR (e.g. presenting presentations, preparing technical input data package, closure of actions on issues/chits raised)
- Organizing and recording technical meetings and writing bi-monthly progress reports that describe the work carried out over the preceding 2 months and refer to technical reports or presentations of work in progress.

The latter progress reports will be the deliverables linked to the invoicing as defined in section 8.

The work described above is expected to be carried out by a single engineer who is expected to be stationed at the ITER side throughout the execution of the contract. This to ensure efficient communication with the IO-RO for XRCS Core and the IO RO for equatorial port 2 integration.

7 Responsibilities

7.1 Contractor's Responsibilities

In order to successfully perform the tasks in this Technical Specification, 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;
- Nominate a Responsible Officer to manage the Contract (the C-RO);

- Nominate a Technical Responsible contact person for the Contract (C-TRO – can the same person as the C-RO, but looks after technical matters rather than contractual matters).

7.2 IO's Responsibilities

The IO shall:

- Nominate the Responsible Officer to manage the Contract (the IO-RO);
- Nominate a Technical Responsible contact person for the Contract (IO-TRO – can the same person as the IO-RO, but looks after technical matters rather than contractual matters).
- 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	55.E5 – Progress Report on Integration engineering #01	T0 + 2 months
D2	55.E5 – Progress Report on Integration engineering #02	T0 + 4 months
D3	55.E5 – Progress Report on Integration engineering #03	T0 + 6 months
D4	55.E5 – Progress Report on Integration engineering #04	T0 + 8 months
D5	55.E5 – Progress Report on Integration engineering #05	T0 + 10 months
D6	55.E5 – Progress Report on Integration engineering #06	T0 + 12 months

* T0 corresponds to the date of signature of the contract.

9 Acceptance Criteria

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

The supplier shall:

- Have experience in design and analysis of structural components exposed to following conditions: both vacuum and atmospheric pressure, shock/shaking loads of several G, thermal loads up to 240 degrees Celsius, gamma and neutron irradiation
- Have experience in maintenance of components in a irradiated environment
- Have experience with using CATIA software for (re)viewing models (experience in design in CATIA is not explicitly required)
- Have experience with thermo-mechanical and structural analysis using ANSYS software
- Have experience with appropriate industrial and nuclear codes (e.g. RCC-MR, ASME VIII Div 2, ASME III, RCC-MR)
- Have experience in working in a multi-national, multi-lingual environment

11 Work Monitoring / Meeting Schedule

The work will be managed by means of Progress Meetings and through the formal exchange of documents and transmitted by emails which provide detailed progress.

Progress Meetings will be called by the ITER Organization or the C-TRO. They will be held as needed and at least bi-monthly, either on the IO site or via videoconference. Progress meetings will involve C-TRO(s) and the IO-TRO. External experts will be invited – if needed – to discuss technical matters. The C-RO and IO-RO will be invited in case of contractual discussions.

For all Progress Meetings, minutes, including action items, shall be written by the C-TRO and be stored in the ITER IDM in order to ensure traceability (see also Deliverable D7 in section 8).

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 ([PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012 \(AW6JSB v1.0\)](#)).

Compliance with [Defined requirements for PBS 55 - Diagnostics \(NPEVB6 v1.3\)](#) or its flowed down requirements in [SRD-55 \(Diagnostics\) from DOORS \(28B39L v5.2\)](#) is mandatory.

Some tasks in this contract could be PIA. The supplier must comply with the all requirements expressed in “[Provisions for implementation of the generic safety requirements by the external actors/intervenors \(SBSTBM v2.2\)](#)”