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Fusion Diagnostics Optical and Optoelectronics Engineering Consultancy

Technical Specifications

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1 Abstract

This document describes technical needs of **Fusion Diagnostics Optical Design Consultancy,** including activities and follow up activities.

2 Background and Objectives

ITER is a major new device under construction in Cadarache, Provence, France. This device will study the Fusion concept on a scale previously unequalled on earth. The ITER Organization (IO), which consists of the Central Team (IO-CT) located in Cadarache and Domestic Agencies (IO-DA) located with the 7 partners (China, EU, India, Japan, Korea, Russia and US), is bringing together people from all over the world to be part of this unique project and to contribute to building the ITER device which requires the best people from many disciplines. The work environment is flexible and dynamic with opportunities to work closely with many people and cultures from around the world. The device will study the potential of controlled nuclear fusion to provide energy for the future of mankind.

In order to study the behaviour of this device, a set of monitoring systems (called Diagnostics) are required. These systems will provide the information required to understand and control the performance of the device. Many of these systems are based on optical effects and as a result light is required to be injected in the tokamak and/or collected from the tokamak and transported to an area where it can be sampled and analysed.

The work described below is related to the support to IO-CT team in the specification, design and analysis of diagnostics in the field of optics, optomechanics and optoelectronics. For diagnostics within the scope of IO-CT this implies the feasibility study, analyse and specification of optical/optomechanic and optoelectronic components to achieve the measurement requirements of the related diagnostic. This implies also the review of reports related to optical, optomechanical and optoelectronic study, design and analysis provided by the IO-DA's or IO-CT within the IO-DA's or IO-CT scopes.

3 Scope of Work

The objective of this contract is to provide the Diagnostic Team with design, engineering, analysis and review support in the fields of optics, optomechanics and optoelectronics, both to support the In-kind Procurements as well as the in-house diagnostic development. The work would be carried out both at the IO-site and at the contractor site. More than one person may be considered to fulfil the total requirements of this contract.

4 Estimated Duration

The duration shall be 12 months.

5 Work Description

The tasks to be performed fall within the following categories:

Task category number	Task category description
1	Provide feasibility studies and analysis in the fields of optics, optomechanics and optoelectronics for diagnostics within the IO-CT scope
2	Provide specifications in the fields of optics, optomechanics and optoelectronics for diagnostics within the IO-CT scope
3	Provide cost estimations *of optical, optomechanical and optoelectronic systems for* diagnostics within the IO-CT scope
4	Provide design in the fields of optics, optomechanics and optoelectronics for diagnostics within the IO-CT scope
5	Provide review of reports related to optical, optomechanical and optoelectronic study, design and analysis provided by the IO-DA's or IO-CT within the IO-DA's or IO-CT scopes

These tasks will be performed for the following diagnostics systems, referred to here as Work Packages (WP):

Work package number	Work Package description
1	The related diagnostics include EP VIS/IR (PBS 55.G1)
2	UP VIS/IR (PBS 55.GA)
3	In-vessel viewing system, IVVS (PBS 57)
4	In Vessel Lighting (PBS 55.GL)
5	temporary first plasma Vis/IR system and in Vessel lighting in EP 16
6	Spectroscopic mirror-cleaning endpoint detection system

6 List of deliverables and due dates

D#	Description	Due Dates
D01	1st progress report related to the Design of the temporary first plasma Vis/IR system in EP 16 (Task category 4 for WP5).	T_0 + 1m
D02	1st progress report related to the Design of the temporary VIS IR (55.G1.99) Mock up (Task category 4 for WP4).	T_0 + 2m
D03	1st progress report related to the Design of the in-vessel lighting (55.GL) – first plasma version (Task category 4 for WP4)	T_0 + 3m
D04	2nd progress report related to the Design of the in-vessel lighting (55.GL) – first plasma version (Task category 4 for WP4)	T_0 + 4m
D05	Progress report related to the Study of the usability of VisIR (55.G1) for leak-detection distinguishing between H-alpha and D-Alpha in a glow discharge (Task category 1 for WP1).	T_0 + 5m
D06	Progress report related to the Concept of a design and prototyping for simple spectroscopic mirror-cleaning endpoint detection system (Task category 1 and 4 for WP6).	T_0 + 6m
D07	Progress report related to the Concept of development and	T_0 + 7m

	prototyping of calibration tool to be onboard of IVVS for UP VisIR and EP VisIR (Task category 1, 4, 5 for WP2 and WP3).	
D08	2nd progress report related to the Design of the temporary first plasma Vis/IR system in EP 16 (Task category 4 for WP5).	T_0 + 8m
D09	2nd progress report related to the Design of the temporary VIS IR (55.G1.99) Mock up (Task category 4 for WP4).	T_0 + 9m
D10	1st progress report related to the Design of the in vessel lighting – final version (Task category 4 for WP4).	T_0 + 10m
D11	3rd progress report related to the Design of the temporary first plasma Vis/IR system in EP 16 (Task category 4 for WP5).	T_0 + 11m
D12	2nd progress report related to the Design of the in vessel lighting – final version (Task category 4 for WP4).	T_0 + 12m

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 (IO-TRO);
- Organise a monthly meeting(s) on work performed;
- Provide offices at IO premises.
- Grant the access to the IDM as Author to the contractor, in order to upload documentations.

8 Acceptance Criteria

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

- The deliverables will be in the form of reports as indicated in section 6 "List of Deliverables and due dates".
- The deliverables will be posted in the Contractor's dedicated folder in IDM.
- The IO-TRO 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.

9 Specific requirements and conditions

To carry out the work described in this document, the Contractor must have proven experience, as appropriate, in the following:

- proven experience in optoelectronics;
- experience with optical systems in the field of nuclear installations comparable to ITER;
- experience with experience with diagnostic systems comparable to those of ITER;
- experience with plasma or high energy physics devices;
- experience with the technical follow-up of CAD activities;
- experience in project management
- experience with vacuum-compatible materials and processes;

10 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 monthly, either on the IO site or via videoconference. Progress meetings will involve C-TROs and the IO-TRO. External experts will be invited to discuss technical matters. The C-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.

11 Payment schedule / Cost and delivery time breakdown

The deliverables are expected as defined in section 6 “List of Deliverables and due dates”.
Interim payments will be made upon satisfactory completion and IO approval of deliverable reports uploaded onto IDM and upon submission of a valid invoice.

12 Quality Assurance (QA) requirement

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).

13 References / Terminology and Acronyms

C-R: Contractor Responsible. See Contract specifications for definition of duty.
C-TRO: Contractor Task Responsible Officer. Carrying out the contract tasks. See Contract specifications for definition of duty.
IO-CT: ITER Organization (Central Team)
IO-DA: Domestic Agency
IO-TRO: ITER Organization Technical Responsible Officer. See Contract specifications for definition of duty.
PPD: Port Plug and Diagnostics Engineering Division

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

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)).