

## Technical Specifications (In-Cash Procurement)

# CFE – Update of interfaces and opto-mechanical layout of in-vessel lighting 55.GL

This document describes technical needs of Fusion Diagnostics Optical Design Expert, in support of the In Vessel Lighting system, PBS 55.GL. The system will be installed in equatorial and upper ports and will illuminate in-vessel components (first wall and the divertor), and will capture images of inside of the vessel between plasma pulses. The purpose of this contract is to update the interfaces and the opto-mechanical layout of 55.GL, impacted by the integration of the Disruption ...

# **Call for Expertise on Fusion Diagnostics Optical and Optoelectronics Engineering for 55.GL In Vessel Lighting**

## **Technical Specifications**

## Table of Contents

<b>1</b>	<b>Purpose.....</b>	<b>3</b>
<b>2</b>	<b>Scope.....</b>	<b>3</b>
<b>3</b>	<b>Definitions.....</b>	<b>3</b>
<b>4</b>	<b>References.....</b>	<b>3</b>
<b>5</b>	<b>Duration.....</b>	<b>3</b>
<b>6</b>	<b>Work Description.....</b>	<b>3</b>
<b>7</b>	<b>List of deliverables and due dates .....</b>	<b>5</b>
<b>8</b>	<b>Responsibilities.....</b>	<b>5</b>
<b>8.1</b>	<b>Contractor’s Responsibilities.....</b>	<b>5</b>
<b>8.2</b>	<b>IO’s Responsibilities .....</b>	<b>5</b>
<b>9</b>	<b>Acceptance Criteria .....</b>	<b>5</b>
<b>10</b>	<b>Specific requirements and conditions .....</b>	<b>6</b>
<b>11</b>	<b>Work Monitoring and Control Points .....</b>	<b>6</b>
<b>12</b>	<b>Delivery Time Breakdown .....</b>	<b>6</b>
<b>13</b>	<b>Quality Assurance (QA) requirement.....</b>	<b>6</b>
<b>14</b>	<b>CAD Design Requirements (if applicable).....</b>	<b>7</b>
<b>15</b>	<b>Safety requirements .....</b>	<b>7</b>

## 1 Purpose

This document describes technical needs of Fusion Diagnostics Optical Design Expert, in support of the In Vessel Lighting system, PBS 55.GL. The system will be installed in equatorial and upper ports and will illuminate in-vessel components (first wall and the divertor), and will capture images of inside of the vessel between plasma pulses. The purpose of this contract is to update the interfaces and the opto-mechanical layout of 55.GL, impacted by the integration of the Disruption Mitigation System in the equatorial port 17 and in the upper ports hosting 55.GL.

## 2 Scope

The scope of work involves the update of interfaces and opto-mechanical layout of 55.GL in the diagnostic ports impacted by the integration of the DMS. The scope includes also the update of technical documents related to interfaces and the layout of 55.GL, as well as the performance assessment to verify the impact of these interface and design changes on the 55.GL measurement performance. Further details are included in Section 6.

## 3 Definitions

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER\\_D\\_2MU6W5\)](#).

## 4 References

References are inserted throughout the text.

## 5 Duration

The duration shall be 12 months.

## 6 Work Description

The 55.GL diagnostic system uses the optical paths of the equatorial and upper visible and infrared systems (55.G1 and 55.GA) to illuminate the vessel and to collect images of the first wall and the divertor between plasma pulses. The system comprise optical assemblies located in the port cells, and delivering in the 55.G1/GA optical paths and toward the vacuum vessel the light emitted by lasers.

In the equatorial port (EP) 17, the integration of the DMS required modifications of the space envelope for other diagnostics in this port. This had a knock-on effect, and resulted into reduced width of the space allocation for 55.GL in the port cell of EP 17. This reduced width prohibits the integration of the design of 55.GL, developed previously for EP 12, and necessitates modifications of the opto-mechanical layout of 55.GL and the corresponding interfaces with the port cell support structure. This updated interface is aimed to be propagated to 55.GL in the first plasma port EP 12 to avoid design variants. Similarly, in the upper ports, the integration of the DMS required modifications of the design of 55.GA (which provides light transfer infrastructure for 55.GL) and necessitates the corresponding update of 55.GL location, interfaces and opt-mechanical layout in the port cell.

The work within the current contract will comprise support in following areas:

- (1) Update of mechanical interfaces of 55.GL.
- (2) Update of functional interfaces of 55.GL.
- (3) Update of mechanical layout of 55.GL.
- (4) Update of optical layout of 55.GL.
- (5) Update of diagrams of 55.GL.
- (6) Performance assessment of 55.GL.
- (7) Design justification (e.g. manufacturability assessment, technical description of components and sub-assemblies, proposals for mockups and prototypes) related to validation the interface and design changes.

The progress on each of these areas will be summarized in a Progress Report. Each Progress Report constitute a deliverables (D1-D6) and will report tangible progress in one or more areas above.

This work involves the many areas for which the Contractor will be requested to generate documents:

- Meeting notes for IO meetings called by interfacing systems and review bodies;
- Technical input in support of project change requests and other actions;
- Draft and/or update interface sheets;
- Draft assembly procedures;
- Draft manufacturability assessments;
- Draft performance assessments;
- Input documents, presentations, meeting notes related to Port integrator meetings;
- Input documents, presentations, meeting notes related to Interface and Integration (vessel, building and ports) meetings;
- Technical review notes for technical documents in IO IDM. Several technical documents per month may need to be reviewed;
- Input documents, presentations, meeting notes related to Monthly meetings
- Implementation reports for IO-related actions from Monthly meetings;
- Implementation reports for Chit resolution from IO design reviews; Amended and reviewed sections of IO schedule;
- Draft prototype and mock-ups technical specifications
- Guidance notes for execution of technical activities;
- Updated and re-evaluated loads, including nuclear loads and other engineering specifications;
- Contributions to design workshops on specific topics (e.g. diagnostic maintenance, neutronics, hazard identification);

The contractor may be requested to provide support in the areas above for other ITER operational diagnostics (55.Gx).

## 7 List of deliverables and due dates

D1	Progress report #1 on areas 1-7 from section 6	T0 + 2 months
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D2	Progress report #2 on areas 1-7 from section 6	T0 + 4 months
D3	Progress report #3 on areas 1-7 from section 6	T0 + 6 months
D4	Progress report #4 on areas 1-7 from section 6	T0 + 8 months
D5	Progress report #5 on areas 1-7 from section 6	T0 + 10 months
D6	Progress report #6 on areas 1-7 from section 6	T0 + 12 months

## 8 Responsibilities

### 8.1 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.

### 8.2 IO's Responsibilities

The IO shall

- Nominate the Responsible Officer (RO) to manage the Contract;
- Provide offices at IO premises;

## 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 RO. 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 7, Table of deliverables.

## 10 Specific requirements and conditions

- Experience in optics and opto-electronics;

- Experience with optical systems in the field of nuclear installations comparable to ITER;
- 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 system diagrams
- Experience with vacuum-compatible materials and processes;

Travel to the DAs or other sites may be required to carry out the work.

## 11 Work Monitoring and Control Points

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. Work progress will be monitored through Deliverable documents. Progress Meetings will be called by the ITER Organization or the Contract TRO. They will be held as needed and at least once per month.

## 12 Delivery Time Breakdown

See Section 7 “List Deliverables section 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.

## 13 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 \(ITER\\_D\\_258LKL\)](#).

## 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 \(AW6JSB v1.0\)](#)).