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Technical Specifications (In-Cash Procurement)

Call for Expertise_ ECH subsystems support design and manufacturing

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1 Purpose

This Technical Specification defines the skills and capabilities required in a mechanical engineer expert candidate to provide technical support for the mechanical design and manufacturing of the different subsystems of the Electron Cyclotron (EC) System.

2 Scope

2.1 Background

The EC system aims at delivering up to 20MW for plasma heating and current drive (H&CD) applications, with a capability of an additional 20 MW by future upgrade (40 MW in total). In order to achieve 20MW of delivered power, the EC system has an installed power of 24MW.

The EC system is comprised of seven main sub-systems:

- High Voltage Power Supplies (HV),
- High Power Microwave Sources (RF),
- Evacuated Transmission Lines (TL),
- Ex-vessel Waveguides (EW),
- Equatorial Launcher (EL),
- Upper Launchers (UL),
- EC Control system (CS).

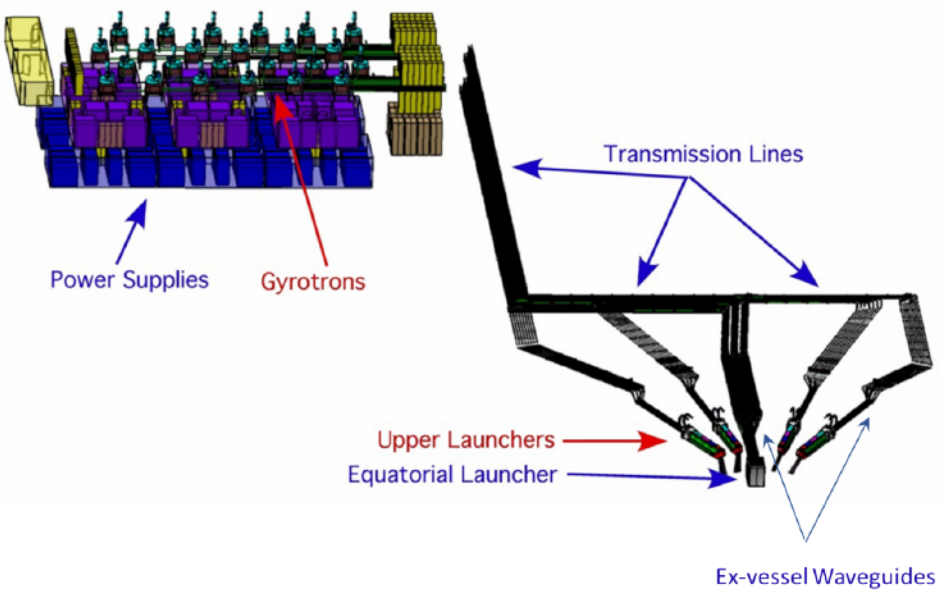

Figure 1: EC system main subsystems

The EC system is equipped with four upper launchers (UL) of 8 MW microwave power input capable each with the main aim to provide NTM control and assist in the plasma breakdown and burnthough. It also contributes, together with the equatorial launcher (EL), to provide pure heating. The EC system is equipped with on EL able to inject up to 24MW microwave power mainly for central heating and current drive.

The four ULs are installed in upper ports 12, 13, 15 and 16 being, the last one used for first plasma. The EL is installed in equatorial port 14. See figure below.

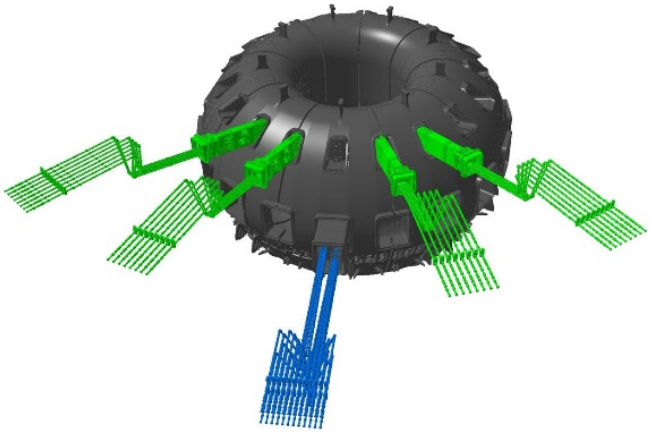

Figure 2: Location of EC launchers: UL12, 13, 15, 16 and EL14

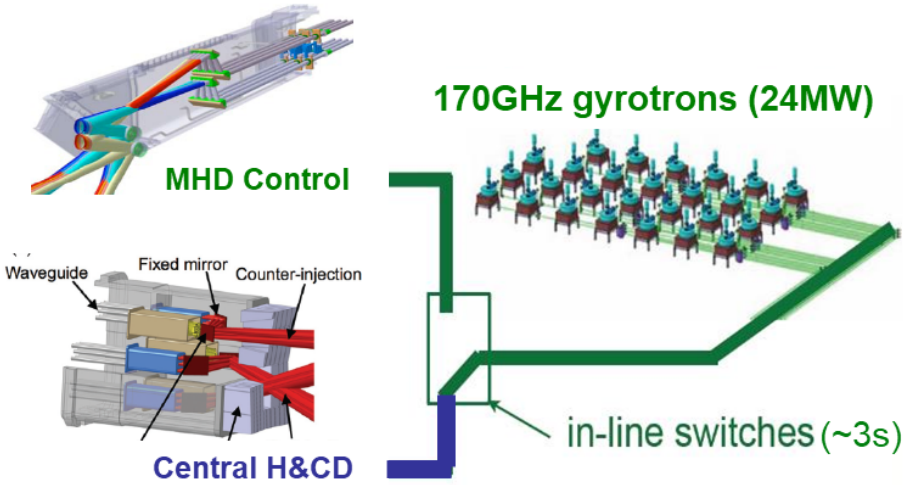

Figure 3: Overall view of power injection and functionality of EC launchers

The last portion of waveguides connecting to the launchers and forming part of the first confinement barrier mainly forms the Ex-Vessel Waveguides system. This system includes a series of RF components and the corresponding ancillaries. Being part of the first confinement barrier most of the EW components are PIC classified as SIC-1.

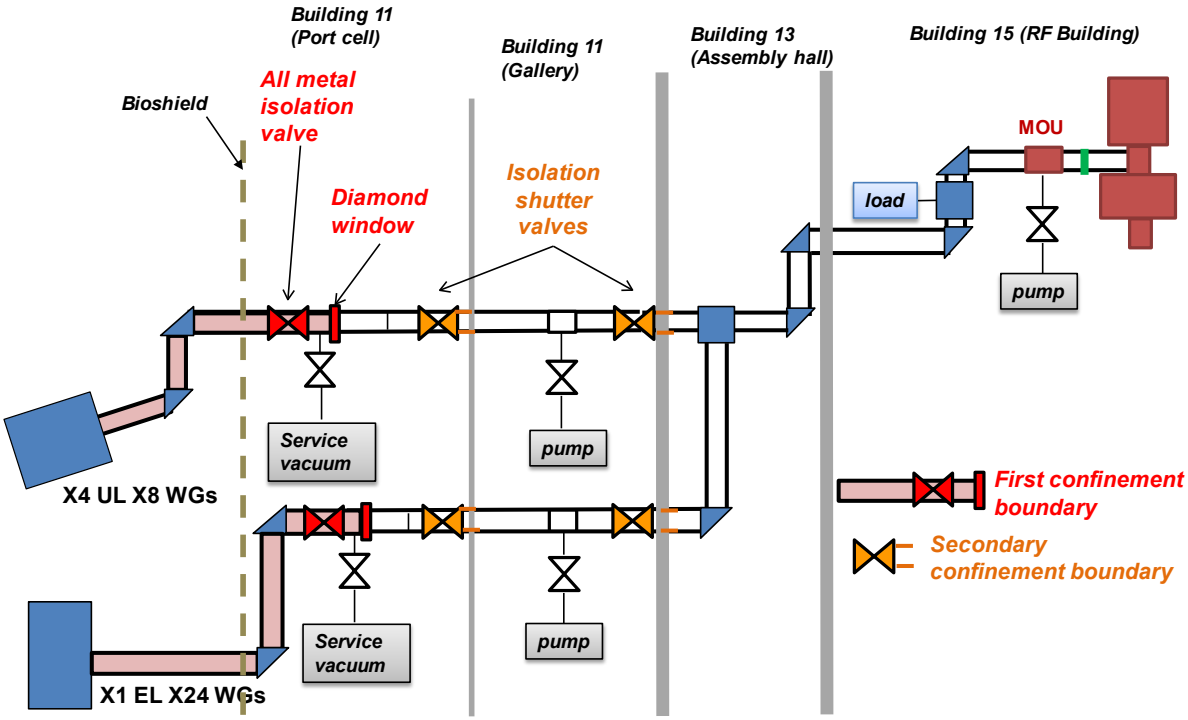

Figure 4: Overall layout and confinement strategy. First confinement barrier formed by EW system is highlighted in red. *Note that there are two miter bends that form part of first confinement barrier (from port plug up to the diamond window), and therefore SIC-1. They are represented in blue in the figure.*

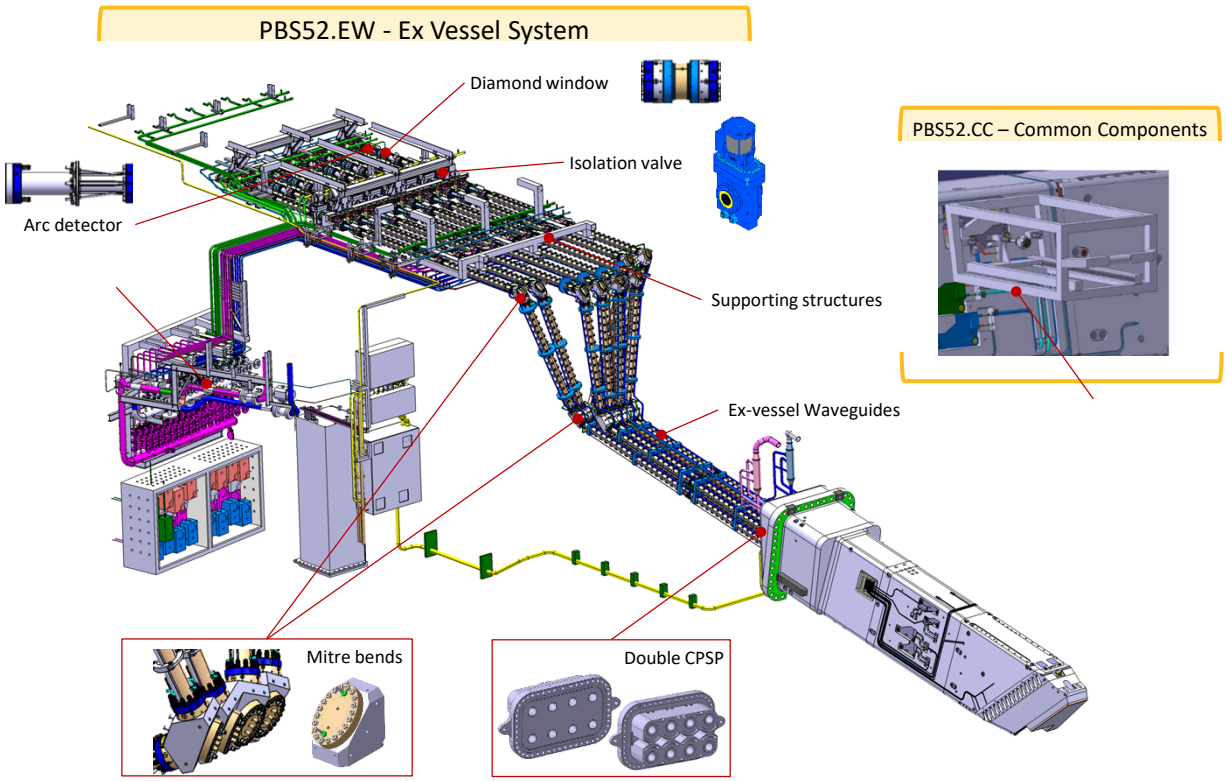

Figure 5: Overall architecture of EW and UL systems

2.2 Scope of work

The work involves supporting the ITER Electron Cyclotron (EC) System Team in activities related to the design of the systems, contribute to the generation of functional requirements documents, contribute to the management of the interface, contribute to the technical monitoring of the design progression and verification of the final design of launchers and transmission lines Provide dedicated expertise for manufacturing and vacuum compatibility. The candidate is also intended to:

- Work with CAD designers on the development of final design components bringing preliminary designs to final designs.

- Provide structural assessment (stress evaluation and code compliance) according to nuclear codes (ASME III, RCC-MR) and conventional codes (ASMEVIII, EN-13445)

- Provide manufacturing and welding assessments according to nuclear codes (ASME III, RCC-MR) and conventional codes (ASMEVIII, EN-13445)

- Participate in design reviews.

3 Definitions

The list of acronyms used in this document are defined in Table 3.1. For a complete list of ITER abbreviations see: ITER Abbreviations (2MU6W5).

Table 3.1: Definition of acronyms used in this document.

CAD	Computer-Aided Design		PBS 52.EW	Ex-vessel Waveguides system
CRO	Contract Responsible Officer		PC	Port Cell
DA	Domestic Agency		PCR	Project Change Request
DCIF	Design Collaboration Implementation Form		P&ID	Piping and Instrumentation Diagram
EC	Electron Cyclotron			
EW	Ex-Vessel Waveguides		PIA	Protection Important Activity
FP	First Plasma		PIC	Protection Important Component
EWP	Engineering Work Package		QA	Quality Assurance
I&C	Instrumentation and Control		QARO	Quality Assurance Responsible Officer
IO	ITER Organization		QC	Quality control
KOM	Kick Off Meeting		RF	Radio Frequency
MIP	Manufacturing and Inspection Plan		SIC	Safety Important Class
MQP	Management Quality Procedures		TL	Transmission Line
NDT	Non-Destructive Testing		TRO	Technical Responsible Officer
PV	Pressure Vessel			
PBS	Plant Breakdown Structure			
PBS52	EC System			
PBS 52.UL	Upper Launcher system			
PBS 52.EL	Equatorial Launcher system			

4 References

[01] SRD-52 (ECH&CD) from DOORS (28B365 v5.4)
[02] Baseline Progress Status - ELECTRON CYCLOTRON (ECH) (9357KX v4.0)

5 Estimated Duration

The duration of the Contract is up to 1 year. The contract would be subject to conformity with performance and quality of deliverables as per section 8. All work to be performed in collaboration with relevant TROs, involved parties and relevant departments. The work can be developed off-site. The contractor shall be able to attend meetings on-site as needed (estimated frequency once to twice a week).

6 Work Description

The work description assigned to the candidate appointed may be summarized as:

- Verification of mechanical design configuration of EC components and arriving at an acceptable design solution.
- Supports the EC system Technical Responsible Officers (TROs) with the final design of their subsystems including participation to design reviews (presenting design solutions, analysis, etc).
- Supports the EC system TROs in assessing the design solutions and review design documentation from all the involved parties (e.g. DA or suppliers).
- Supports the EC system TROs in reviewing manufacturing documentation from all the involved parties (e.g DA or suppliers) and assessment of manufacturing feasibility.
- Provides support to the integration of the EC system and associated interface management documentation.
- Contributes to the documentation preparation and review for design and manufacturing reviews.
- Cooperates to the development of on-site assembly process for EC system and then for its documentation.
- Manages the documentation in accordance with the ITER process (IDM and PLM).
- Prepare and review of technical specifications.

7 Responsibilities

7.1 Contractor Responsibilities

The Contractor shall appoint a single Contact Responsible Officer (CRO) for all matters of the contract.

In order to successfully perform the tasks in these Technical Specifications, the Contractor shall:

- Provide suitably experienced and trained resources (an Engineer) to complete all aspects of deliverables and associated documentation;
- Strictly implement the IO procedures, instructions and use IO templates, where provided;
- Organise work in an efficient way according to the workload, commitments and objectives;
- Report to the TRO any issues during the performance of the Contract which require IO intervention or decision including potential delays in the submission of deliverables;
- 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;

- The Contractor acknowledges that all input information provided to perform the task remain property of IO and shall not be disclosed or used for any other activity than the one specified in this specification;
- The Contractor shall be in charge of the training and coaching of all its resources;
- The Contractor shall work in accordance with the QA plan accepted by IO;
- The Contractor shall perform the activities according to this specification taking into account all relevant additional documents and IO processes into account (hand books, export control, intellectual properties…);
- The Contractor shall use the ITER software platforms, for the management of all the documents, which are produced during the execution of this contract.

7.2 IO Responsibilities

The IO shall:

- Appoint a TRO for the Contract, who will be the point of contact for all technical matters, and a Procurement Responsible Officer (PRO) for all contractual and commercial matters.
- Organise periodic meetings with the Contractor on work performed.
- IO shall make available to the Contractor all technical data and documents which the Contractor requires to carry out its obligations pursuant to this specification in a timely manner. Should not all the needed input be available, the Contractor shall advise IO representative of the potential impact on the delivery of the Work Packages, to agree and define all the correction actions to take in place.

8 List of deliverables and due dates

The deliverables associated to this task are the activities reports generated in a monthly basis, describing the QC and manufacturing follow-up activities performed with reference to the records and evidences generated. The list of deliverable packages is described in Table 8.1.

Note: Content of deliverables and time schedules could be modified as a function of the project needs by mutual agreement between the IO and the Contractor.

Table 8.1: List of deliverable packages and their estimated due date.

D01	Monthly activities report #01	T0 + 1 months
D02	Monthly activities report #02	T0 + 2 months
D03	Monthly activities report #02	T0 + 3 months
D04	Monthly activities report #04	T0 + 4 months
D05	Monthly activities report #05	T0 + 5 months
D06	Monthly activities report #02	T0 + 6 months
D07	Monthly activities report #07	T0 + 7 months

D08	Monthly activities report #08	T0 + 8 months
D09	Monthly activities report #02	T0 + 9 months
D10	Monthly activities report #10	T0 + 10 months
D11	Monthly activities report #11	T0 + 11 months
D12	Monthly activities report #12	T0 + 12 months

T0: is considered the initial day when the resources as available in Iter premises to start the work.

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.

Language

The official language of the ITER project is English. Therefore, all documentation relevant to this contract shall be in English.

Format of deliverables

The contractor shall submit all deliverables to the ITER Organization in the following format:

- All reports shall be provided in native electronic format (MS Word, Excel, PNG, JPEG (high resolution), MS PowerPoint, MS Project or other), as well as in PDF format.
- The electronic version of all input data files for the execution of the supporting engineering analysis (CAD & FEM software) performed by means of software applications.
- For all deliverables submitted in electronic format the contractor shall ensure that the release of the software used to produce the deliverable shall be the same as that adopted by the ITER Organization.

The deliverables and their format shall also take into account any specific rules and guidelines specified by the ITER Organization in writing during the execution of the contract.

10 Specific requirements and conditions

The Contractor is expected to assign one professional to this project, for the entire duration of this contract. Software and all data produced during the contract shall remain property of the ITER Organisation.

All work is to be performed in collaboration with relevant TROs, involved parties and relevant departments. The work can be developed off site. The contractor shall be able to attend meetings on-site as needed (estimated frequency once a week).

The Contractor's proposed profile shall meet the following requirements:

- MSc. In mechanical engineering or equivalent degree, Qualification as European / International Welding Engineer is an advantage;
- Sufficient experience (more than 8 years) to deliver the scope of work with independent autonomy;
- Experience in Mechanical Engineering of complex system in different phases (design, manufacturing, assembly and integration) including the implementation of different codes and standards;
- Experience working with CAD (2D and 3D) models for verification of design soundness and requirements implementation;
- Experience in management of ENOVIA environment is a requirement;
- Designing as per codes and standards (for example: RCC-MR, SDC-IC, ASME, EN, ASTM);
- Expertise in manufacturing as per codes and standards (for example: RCC-MR, SDC-IC, ASME, EN, ASTM);
- Experience in NDT related jobs;
- Fabrication / Dimensional Inspection of metallic components, sub-systems and systems;
- Experience in management of deviations and non-conformances in the manufacturing of mechanical equipment;
- Experience in Factory Acceptance Testing (including leak test) of PV and mechanical equipment;
- Experience on manufacturing QC in the nuclear industry is advisable;
- Knowledge of the nuclear French regulatory framework is advisable;
- Follow up of projects: Project manager; PMP and control suppliers in international projects;
- Capability to work in English language, both verbally and written.

To be considered as an advantage the following:

- Experience in large international projects (ability to work in multi-cultural Environment);
- Experience working on the ITER project and more specifically in the EC systems or similar in PC environment;
- Contracted company is able to provide specific expertise and guidance on optical design.

11 Work Monitoring / Meeting Schedule

The work monitoring will be performed by the deliverable packages of table 8.1, periodic meetings with the TRO and participation in project meetings to report as requested.

12 Delivery time breakdown

The delivery schedule is specified in Table 8.1.

13 Quality Assurance (QA) requirements

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system. Alternatively the contractor may opt to follow the IO QA processes. In this case, the requirement to prepare a Quality Plan is not applicable. Specific training shall be provided by IO.

Documentation developed as the result of this Contract shall be retained by Contractor for a minimum of 5 years.

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, it should fulfil IO document on Quality Assurance for ITER Safety Codes (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”).

Components and activities intended for ITER Basic Nuclear Installation shall observe French Regulation in application of 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 (AW6JSB).