Engineering support in ITER EC Launchers Technical Specifications

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Table of Contents

1 Abstract

This document describes technical needs for "Engineering Support to the ITER Electron Cyclotron Launchers", which aims at supporting the EC team in engineering tasks and coordination of the launcher development program for the final designs of the equatorial (EL) and upper (UL) launchers (see Figure 1) of the EC system.

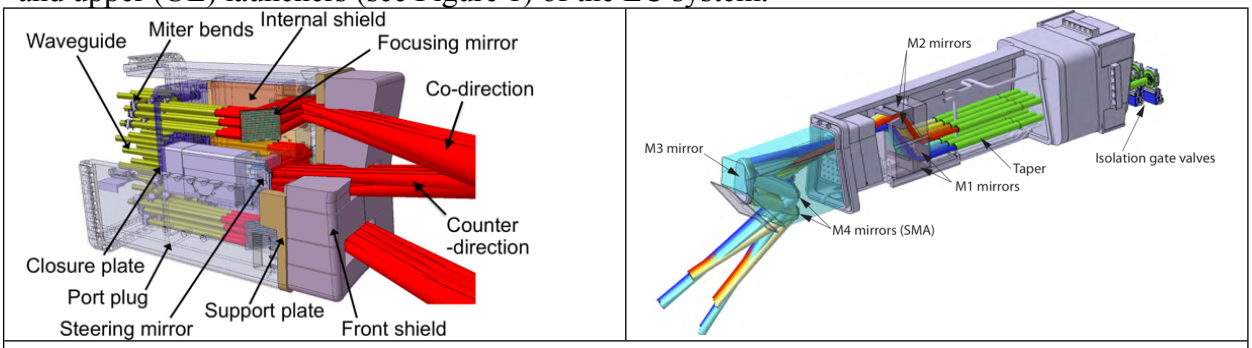

Figure 1: The two launchers of the EC system: the equatorial (left) and upper (right).

2 Background and Objectives

The EC system is to inject up to 20MW of microwave power at 170GHz into the ITER device for localized heating and current drive applications. The system consists of 12 high voltage power supply sets, 24 high power microwave sources (or gyrotrons), 24 transmission lines (TL) and the two types of launching antennas (or launchers).
The system is being designed and procured in collaboration between the ITER Organization (IO) and five Domestic Agencies (DAs): Europe, India, Japan, Russia and United States. In general, the EC section's responsibility is to define the functional requirements, develop the conceptual design, oversee the development of the final designs, develop the launcher build-to-print designs, ensure compliance with ITER required standards, manage sub-systems integration and associated documentation.
These activities are performed by a team of ˜6 engineers and scientists, which form the EC section. The team size is insufficient to handle all of the activities associated with the EC system development, in particular the launcher design developments. Te objective of this task is to provide support to the EC section with respect to advancing the launcher designs to final design stage. The competencies to achieve this task requires an individual that is organized, has a good mechanical engineering background, competencies extending to other engineering fields (nuclear, hydraulic, thermal, electro-magnetic) and a good ability in evaluating designs for reliability and robustness. Thus the engineer fulfilling this task must be capable of "thinking outside the box".

3 Scope of Work

This engineering support scope includes the preparation of the EC Equatorial and Upper Launchers technical documentation, engineering support in thermal, mechanical (static and dynamic) and electro-magnetic analysis, implementation of development for critical components, together with the DAs, industry and laboratories, follow-up manufacturing contracts and support to the preparation of the Procurement Arrangements.

4 Estimated Duration

The total duration of the services could be up to 2 years based at ITER offices.

5 Work Description

- Contribute to the preparation of detailed technical specifications and associated quality management documents for the EC Equatorial and Upper Launchers, in collaboration with the IO Technical Responsible Officers (TROs) and the respective DAs;
- Support in drafting and revising baseline documentation associated with the EC launchers system, this includes subsystem design description, load specifications, compliance matrix, etc;
- Provide support in transfer of technical information between IO and associated DAs;
- Support the implementation of development for critical components, together with the DAs, industry and laboratories;
- Organize technical meetings (e.g. design reviews, progress meeting, etc), preparing reports and minutes as required;
- Provide engineering support in thermal-mechanical and electro-magnetic analysis, which includes providing support such as finite element analysis and analytical modelling;
- Assess the results of engineering analyses, designs and (manufacturing) drawings produced by suppliers;
- Contribute to the definition of testing and qualification programs (according to technical needs and QA requirements); witness testing of components in preparation of the PAs.
- Provide support in the Launcher CAD related tasks
- Contribute to the provision of cost estimates and developing detailed work plans in his/her area of responsibilities;
- Follow-up manufacturing contracts including overseeing of hardware procurement, assembly, installation and testing, monitoring of progress, proposals for remedial action, approval of designs, and attendance of tests;
- Provide support for the preparation of the Procurement Arrangements (PA) with the associated DAs;
- Provide support for the monitoring of the contractual activities, for their reporting internal to IO as well as to external bodies, as required
- Prepare and provide the required inputs for preparation of the IO project schedules and its regular maintenance and updating in cooperation with the EC section and IO Schedulers;

6 Responsibilities (including customs and other logistics)

7 List of deliverables and due dates (proposed or required by ITER)

The deliverables will be in two forms:

• Weekly Summary of Activities: A document of approximately one page in length summarizing the previous week activities of the Engineer, which is integrated into the weekly EC activity summary, which is loaded on IDM;

• Monthly progress reports: A document that lists the Engineer's month objectives, those that have been accomplished, those carried over to the following month and any additional activities accomplished or performed. This report is to be loaded on IDM and reviewed by the EC section leader.

In addition, the Engineer will provide several documents, drawings and diagrams with in the work scope. Each of these documents will be described in the monthly progress reports.

8 Acceptance Criteria (including rules and criteria)

The selection will be done taking into account the following criteria:

1) Expert CV	70%
2) Price	30%

Note that the Tenderer is requested to include in the CV, a demonstration of the candidates ability to think creatively in solving complicated, non-standard problems (i.e. "think outside the box", see http://en.wikipedia.org/wiki/Thinking_outside_the_box).

9 Specific requirements and conditions

The required resource is one mechanical engineer (or equivalent) with at least 5 years of working experience in mechanical and or applicable R&D development activities.

The contracted Engineer shall have experience in the following activities:
Essential Selection Criteria University degree in Mechanical Engineering or equivalent;

- Proven working experience in two or more of the following fields:
  - Engineering of mm-wave components and systems (design and testing)
  - Mechanical design
  - Material Engineering, manufacturing, forming and joining techniques (especially welding and brazing processes)
  - Advanced materials, coatings and ceramics technologies
  - Robotics, remote handing and remote sensing
  - Vacuum methodologies, technologies and/or vacuum plant engineering
  - High heat flux components and heat transfer system design, fabrication and testing
  - Application of Quality Assurance systems and international codes & standards
  - Component and system testing
- Experience in the preparation and/or evaluation of technical bids;
- Experience in follow-up of procurement contracts, including monitoring of schedule, quality control procedures and final acceptance tests;
- Experience in technical writing (English reports summarizing analysis, design requirements, test results, etc.)
- Good analytical capabilities, communication skills, organizational skills and ability to work under pressure;
- Willingness to travel and work away from the office; Good command of both written and spoken English (the working language of the ITER Project).

Advantageous Selection Criteria:

- Proven professional experience of at least 5 years in one or more of the areas listed above;
- Demonstration of the candidates ability to "think outside the box"
- Experience in the preparation of technical specifications for complex mechanical systems involving several, and important, interfaces with external components;
- Familiarity with computerized engineering analysis tools for Computer-aided design (e.g. CATIA);
- Familiarity with RCC MR and/or ASME.
- Familiarity with computerized engineering analysis tools for structural, thermo-mechanical and thermo-hydraulic analysis (e.g. ANSYS);

- Knowledge of scientific and engineering aspects of the ITER project and of related activities;
- Experience in the design, analysis and integration of systems and components for fusion devices;
- Familiarity with working in multinational and/or distributed teams;
- Experience applying formal codes and standards to engineering projects;
- Working experience in a European or international setting.

10 Work Monitoring / Meeting Schedule

The work will be coordinated by the EC section leader and technical responsible officers of the sub-systems forming the EC system. The Engineer will be provided with a revised work scope on a weekly and/or monthly basis, following the general work plan of the EC system development. The Engineer will provide the in-formal weekly summary of activities and the monthly formal report as outlined in section 3 of this task description.
The Engineer will be asked to participate in the weekly EC section meetings as well as the relevant divisional and technical meetings. Progress reports will be in the form of the weekly and monthly reports as described in section 3 of this task description.

11 Payment schedule / Cost and delivery time breakdown

Interim monthly payments.

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 document ITER Procurement Quality Requirements (22MFG4)
Prior to commencement of the task, a Quality Plan Quality Plan (22MFMW) 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.
Prior to commencement of any manufacturing, a Manufacturing & Inspection Plan Manufacturing and Inspection Plan (22MDZD) must be approved by ITER who will mark up any planned interventions.
Deviations and Non-conformities will follow the procedure detailed in IO document MQP Deviations and Non Conformities (22F53X)
Prior to delivery of any manufactured items to the IO Site, a Release Note must be signed MQP Contractors Release Note (22F52F).
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, it should fulfil IO document on Quality Assurance for ITER Safety Codes Quality Assurance for ITER Safety Codes (258LKL).

13 References / Terminology and Acronyms

None