

Atomic physics and plasma impurity emission modelling in support of diagnostic

Technical Specifications

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1 Abstract

This document describes technical needs of Diagnostics, especially on Spectroscopic and Radiated power systems.

2 Background and Objectives

ITER is a major new device that is under construction at Cadarache, near Marseille, France. This device will study the potential of controlled nuclear fusion to provide energy for mankind. To study the behaviour of this device, a set of monitoring systems (called Diagnostics) is required. These will provide all the information required to understand the performance of the device.

3 Scope of Work

The proper evaluation of many diagnostics, in particular spectroscopic and radiated power systems, relies on a model of the expected electromagnetic behaviour of ITER. The multi-parameter nature of forward predicting the emission from expected ITER plasmas, eg predictions of plasma performance during ramp-up, at phase changes and non-optimal steady-state conditions, is a significant undertaking. The plasma model employed for the CDRs to date considered the approved 15MA plasma conditions at the start of burn and the diagnostics were designed such that the instrument response was not marginal at these conditions. However a more relevant set of models should be in place for the PDRs. This modelling is relevant for a number of diagnostic systems and IO has a strong interest in ensuring its consistency.

4 Estimated Duration

The initial duration of this contract will be 3 years. In addition there will be an option to extend the contract for a further two years being two one year options.

We estimate that the services will be required for approximately 60 working days each year, 50 days on site at ITER in Cadarache, and 10 days off site at the contractors home/office. It is envisaged that the On/Site days will required one week per month spread over each year.

5 Work Description

1. Resolve chits with significant atomic physics or impurity transport issues arising from CDRs in order to progress the PAs.
2. Advise on the selection of transitions, and their intensities, appropriate for ITER diagnostics.
3. Analysis of scenarios relevant to ITER and prediction of impurity profiles.
4. Prepare atomic data and modelling for spectroscopy CDRs
5. Generate a relevant/reliable set of target plasma scenarios covering all phases to allow assessment of performance of systems.

- 6. Attend CDR/PDF/FDR and provide presentations/materials as required.
- 7. Provide an assessment of aspects of reports from DAs related to spectroscopy.
- 8. Provide advice and training as required by IO.

6 Responsibilities (including customs and other logistics)

When applicable.

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

Subtask	Deliverable	Dates
1	Progress report	At the end of each month
2	Final report	End of contract

8 Acceptance Criteria (including rules and criteria)

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

- 1) Expert CV 60%
- 2) Price 40%

9 Specific requirements and conditions

The staff proposed by the bidder to carry out the work described in Section 5 must have proven experience in following areas:

- At least 3 years of relevant experience in Experimental Physics and diagnostic systems and especially those mentioned above;
- Experience in the project initiation, management, design, installation and operation of diagnostic systems on magnetic fusion devices;
- Ability to work effectively in a multi-cultural environment , ability to work in a team and to promote team spirit.

Skills

Knowledge and experience working with appropriate software tools to meet the technical requirements, for example IDL (Interactive Data Language) or MATLAB;

Knowledge of special codes for the Active spectroscopy field would be a big benefit.

- Experience with formal project management system;
- Excellent presentational skills;
- Project planning tools.



Information Technology

IT hardware and services will be provided by the ITER Organization.

Meetings and progress reports

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning.

The main purpose of the Progress Meetings is to allow the ITER Organization/Diagnostics Division and the Contractor Technical Responsible Officers to:

- a) Allow early detection and correction of issues that may cause delays;
- b) Review the completed and planned activities and assess the progress made;
- c) Permit fast and consensual resolution of unexpected problems;
- d) Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request additional meetings to address specific issues to be resolved.

For all Progress Meetings, a document describing tasks done, results obtained, blocking points must be written by the engineer. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

Every 3 months, the Contractor shall submit to ITER Organization a Progress Report to be issued five working days before the each Progress Meeting so that the report can be reviewed prior to, and discussed at, that Meeting.

The quarterly Progress Report shall illustrate the progress against the baseline work plan and indicate variances that should be used for trending. Performance indicators suitable to measure the progress of the work as compared to the approved work plan shall also be reported in the Monthly Progress Report.

10 Payment schedule / Cost and delivery time breakdown

Interim monthly payments upon the submission of IO approved timesheets.

11 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 \(258LKL\)](#).

12 References / Terminology and Acronyms