Annex II

Technical Specification

ITER_D_UJ3YQ5 v2.2 dated 30th May 2017

For

Assistance to EMC support 2017
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1 Purpose
The Electrical Design Handbook (EDH) part 4 for Electromagnetic compatibility (EMC) is the basis for the designs of all ITER systems. A Contractor is required to provide support to the Electrical Engineering Division during the design of the electrical systems. The expert will be in charge of evaluating the reports provided by the Electrical Engineering Division and making recommendations to address the identified issues.

The objective of this Contract is to support ITER in defining the designs of the systems for the EMC and Earthing, in compliance with the EDH-part 4-EMC and EDH-part 5-Earthing and related international standard related to Nuclear safety. The different ITER systems are reaching a maturity level to be procured and installed, therefore an external support is required to help providing the most appropriate and cost effective design for each system.

2 Scope
The expert shall evaluate the current EMC designs of ITER facility, including electrical systems, building constructions, and provide guidelines for the implementation of such systems to ensure their compliance with the EDH- part 4-EMC and EDH-part 5-Earthing.

3 Definitions
EDH: Electrical Design Handbook
EMC: Electromagnetic compatibility
SRD: System Requirement Document
DDD: Design Description Document
ICD: Interface Control Document

4 References
ITER_D_4B523E EDH-part 4 Electromagnetic_Compatibility
ITER_D_4B7ZDG EDH-part 5 Earthing_and_Lightning
ITER_D_98UL4W ITER_DC magfield_test_method

5 Estimated Duration
The original duration was up to Sep 01 2019
Additional work is required over the next 36 month period.

6 Work Description
The Contractor shall use its knowledge and experience on EMC acquired in the private industry to evaluate the documentation/sample provided by the EMC Responsible Officer, for the different systems and facilities on ITER site.

7 Responsibilities
The contractor provides technical support to ITER subsystem.
- Provide support to the Electrical Engineering Division during the design of the
Electrical systems.

- Evaluate the reports provided by the Electrical Engineering Division and make recommendations to address the identified issues.
- Support ITER in defining the designs of the systems for the EMC and Earthing, in compliance with the EDH-Part 4-EMC and EDH-Part 5-Earthing.
- Help to provide the most appropriate and cost effective design for each system.
- Evaluate the current EMC designs of the systems.
- Guidelines for the implementation of such systems to ensure their compliance with EDH-Part 4-EMC and EDH-Part 5-Earthing.
- Provide support of cable qualification testing (section 7.1), including many electrical items: resistance, capacitance, crosstalk, transfer impedance and so on.
- Provide support of potential EMC qualification testing for electrical systems of Electrical Engineering Division (about 3 systems per year).
- Provide technical support on ITER EMC lab facility setup. It includes all emission and immunity testing to be done in ITER site, especially for ITER DC magnetic field testing.
- Provide on-site support on EMC/Earthing performance verification for ITER facility (at least once a quarter), including shielding effectiveness testing (building, cable tray, cubicle etc) (Section 7.2), system grounding verification (Junction Box, cubicle etc), lightning protection evaluation and so on. All the travel expenses are in charge of the supplier.
- Man power: 1 person, 2 working days every month during 3 years. Response within 5 working days once any request from ITER (including on-site support).

7.1 Electrical test

7.1.1 Testing items

There are 4 items to be tested for all configures below:

- Electrical Resistance
- Electrical Capacitance
- Transfer Impedance(up to 150MHz)
- Crosstalk(1KHz-50MHz)

7.1.2 Testing configure

<table>
<thead>
<tr>
<th>Configure No.</th>
<th>Cables</th>
<th>Connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T20226LC AXON</td>
<td>1m w/ con</td>
</tr>
<tr>
<td>2</td>
<td>T24026LC AXON</td>
<td>1m w/ con</td>
</tr>
<tr>
<td>3</td>
<td>T20426LC SAB</td>
<td>1m w/ con</td>
</tr>
<tr>
<td>4</td>
<td>TN0224LC SAB</td>
<td>1m w/ con</td>
</tr>
<tr>
<td>5</td>
<td>matrix of T20226LC &amp; T24026LC</td>
<td>w/con</td>
</tr>
<tr>
<td>6</td>
<td>matrix of T20426LC &amp; T24026LC</td>
<td>w/con</td>
</tr>
<tr>
<td>7</td>
<td>T20226LC, T20426LC &amp; T24026LC to JB with BNC on the ends</td>
<td>w/con</td>
</tr>
</tbody>
</table>

7.1.3 Assembly to be provided

- Assembly 1
Run Electrical testing separately for TN0224LC, T20226LC and T20426LC.

- Assembly 2

Run Electrical testing for T24026LC.

- Assembly 3
Run Electrical testing separately for matrix of T20226LC & T24026LC and matrix of T20426LC & T24026LC.

- Assembly 4

Run Electrical testing for the whole matrix.

7.2 Shielding test
On-site testing: All measurements will be carried out on the ITER construction site. This is to measure the shielding effectiveness in the frequency range of a lightning strike or extending to 1GHz.

- Shielding effectiveness of metallic buildings decking
- Shielding effectiveness of concrete wall
Off-site testing: All measurements will be carried out on outside lab according to IEC61587-3. This is to verify the shielding performance of equipment to be used in ITER site.

- Shielding effectiveness of cubicle (3 samples)
- Shielding effectiveness of cable tray (3 samples)
- Shielding effectiveness of Junction Box (3 samples)

8 List of deliverables and due dates

- Quarterly/yearly phase reports including all the recommendations on documents reviewed during that period.
- Separate test/evaluation/technical report within one month based on document/sample provided by ITER.

9 Acceptance Criteria

Approval of the regular and separate reports in IDM.

10 Specific requirements and conditions

Here list 5 key criteria which are allocated an appropriate number of points, the points totalling 100. This will be the basis of the selection and award process for the technical evaluation.

- DC magnetic test facility setup report, 20 points
- Cable electrical testing and report, 20 points
- Building Cubicle/cable tray/junction box shielding effectiveness testing and report, 20 points
- ITER facility Lightening/Earthing evaluation report 20 points
- Equipment EMC qualification testing and report, 20 points

11 Work Monitoring / Meeting Schedule

Kickoff whenever IO request supplier for support, quarterly in general. Supplier delivers schedule plan within one week. For onsite support, it shall be done within 2 weeks after kickoff.
Supplier delivers report within one month after kickoff.

12 Delivery time breakdown

- 1st phase by Sep 01 2017, 1st phase reports including all the recommendations on documents reviewed during that period.
- 2nd phase by Sep 01 2018, 2nd phase reports including all the recommendations on documents reviewed during that period.
- A final report at the end of the contract including recommendations on all ITER systems reviewed during the contract.

13 Quality Assurance (QA) requirements

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 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 [20].