



SUMMARY

Call For Tender IO/22/CFT/10023865/ERA

Quarter ICRH Antenna Prototype manufacturing & Final series production

Background

The ITER Organization (IO) is bringing together people from all over the world to be part of this unique project and to contribute to building the ITER device which requires the best people from many disciplines. Its aim is to confine and study the behaviour of plasma in conditions and dimensions approaching those required for a fusion reactor.

The Ion Cyclotron Resonance Heating (ICRH) Antenna (see figure 1) developed for ITER is designed to launch 20 MW of Radio Frequency (RF) power to the plasma of the ITER machine at frequencies in the range of 40 to 55 MHz. Two ICRH antennas are used to provide RF power to the ITER plasma. The preliminary ICRH Antenna design has been optimized for structural performances and Radio Frequency physic. The final design requires the production of the manufacturing design and a validation of the manufacturing sequences.

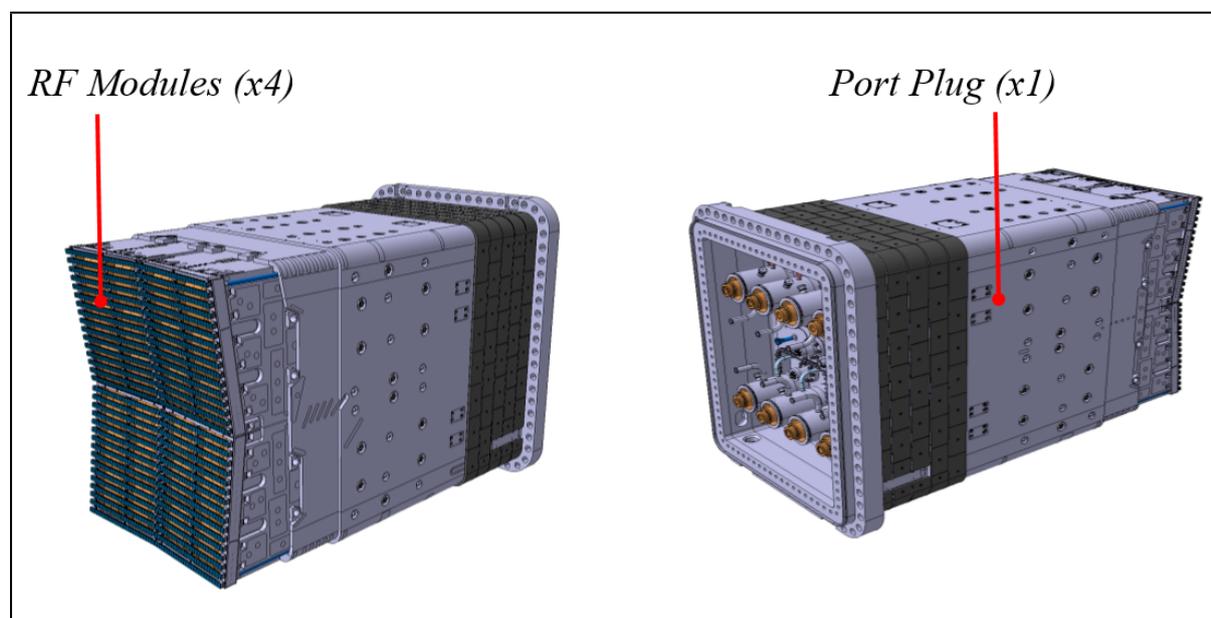


Figure 1: One ITER IC Antenna overview

Scope of work

The ITER Organization Heating and Current Drive Division requires the quarter antenna manufacturing design production (phase 1), and the production of pre-prototypes (phase 2, see Figure 2 showing a pre prototype) as firm part of the project. As options, it is required to manufacture a full-scale quarter of ICRH Antenna prototype (one RF module and a quarter of IC Port Plug, see Figure 3), followed by the production of two fully assembled final antennas.

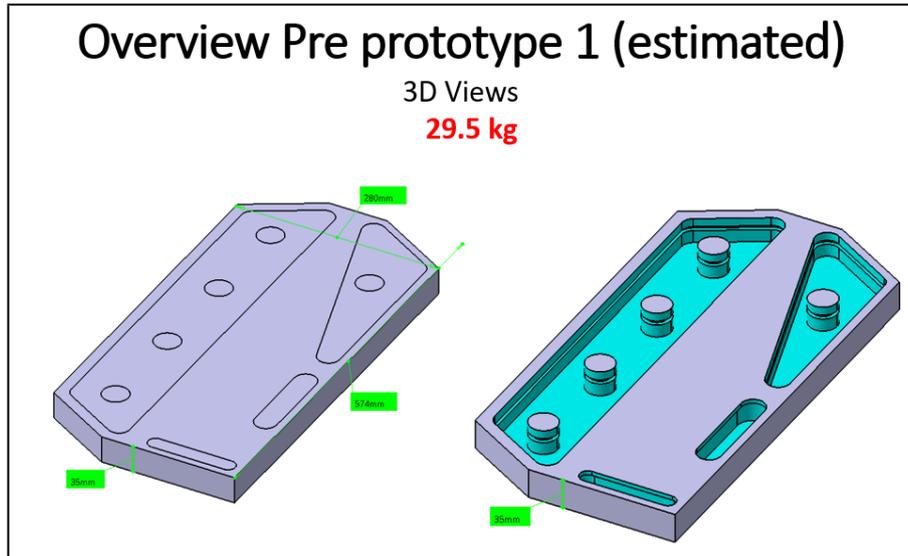


Figure 2: Pre prototype for welding & NDT trials

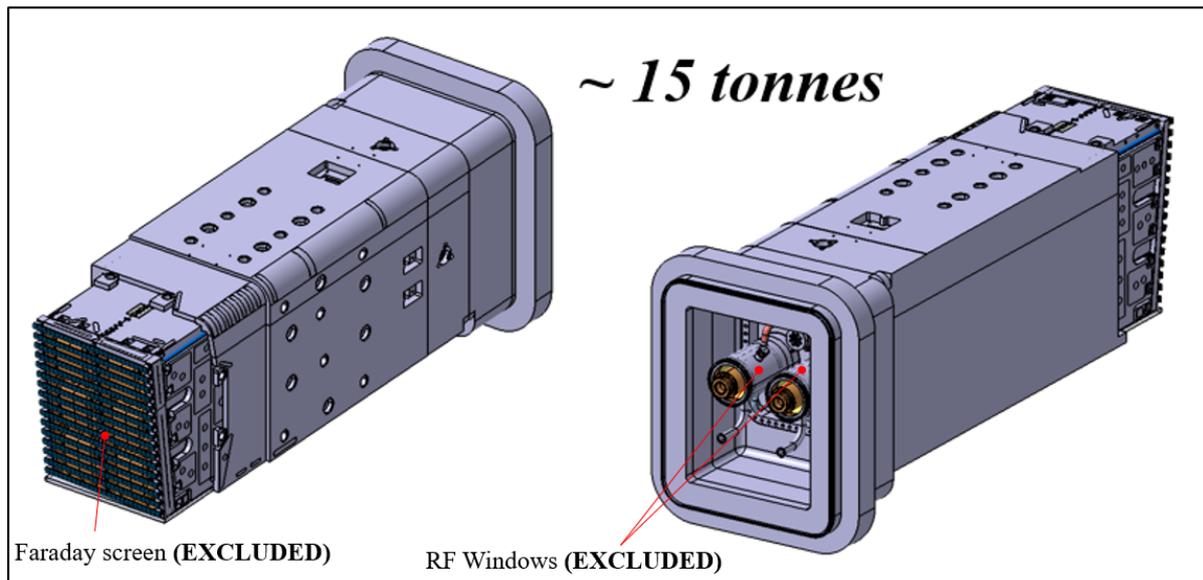


Figure 3: Preliminary quarter of IC Antenna prototype

The results of the quarter Antenna prototype manufacturing will be used as an input of the IC Antenna Final Design Review. It is foreseen to capitalise the knowledge acquired during the manufacturing phase, and procurement of final IC Antennas (two port plugs, and eight RF modules, basic weight and dimension are shown in Figure 4 and Figure 5) is planned, based on the successful completion of the prototype campaign. The manufacturing of the Antenna Faraday Screens (4 by antenna) and RF Windows (8 front windows by Antenna) are therefore excluded from the scope of work. These components will be provided by IO to the supplier at

the beginning of the final antenna assembly phase (phase 5), in order to be assembled with the other part of the Antennas.

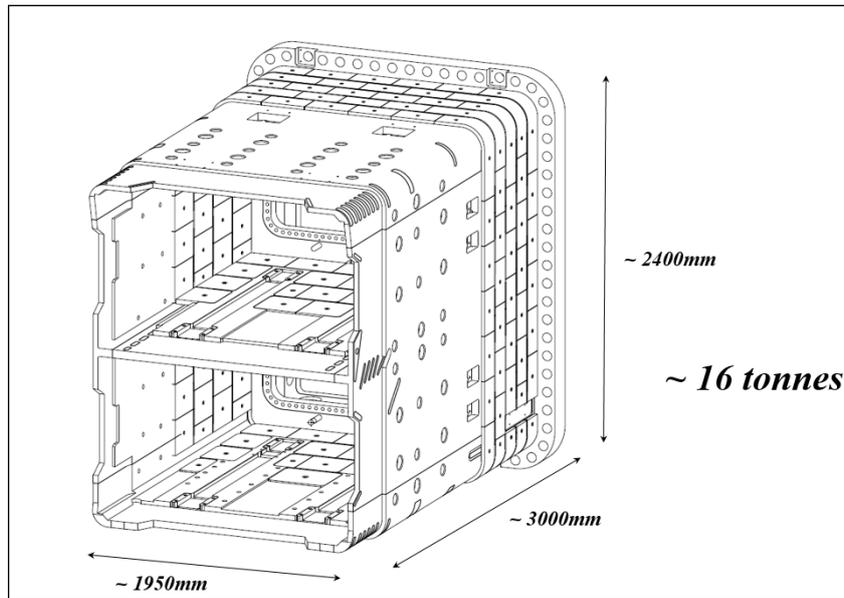


Figure 4: Port Plug main dimensions and weight

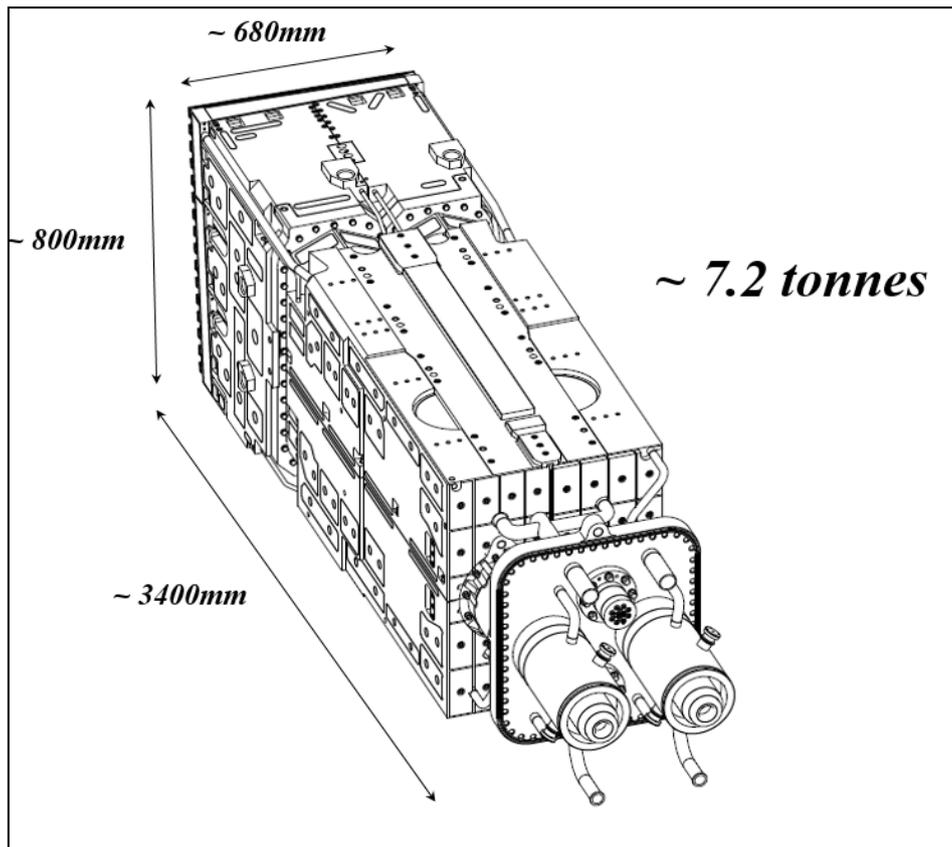


Figure 5: RF module main dimensions and weight

The scope of work is broken down in several Phases:

- **Phase 1:** corresponds to the Quarter Antenna manufacturing design production, starting from the CAD models and 2D drawing provided as input data.

- **Phase 2:** corresponds to the pre prototyping phase, including specific mock ups to be designed and manufactured, in order to demonstrate the suitability of the welding, manufacturing, and inspection of specific crucial areas of the design.
- **[OPTION] Phase 3:** corresponds to the full scale quarter Antenna prototype manufacturing in order to qualify the overall manufacturing sequence and finalize the complete manufacturing and inspection set up, in order to be ready for the series procurement
- **[OPTION] Phase 4:** corresponds to the IC Antenna series production, based on the successful completion of the phase 3. This phase covers the manufacturing of the full set of RF modules and port plug required for ITER operation.
- **[OPTION] Phase 5:** correspond to the full assembly of the IC Antenna components and the delivery to the IO site.

Options release are conditional to the success of the previous phases.

The IC Antennas are part of the tritium confinement system and therefore all related activities will be subject to strict Quality Assurance processes. The QA program will be implemented accordingly over the different phases of work.

The work specifically requires the services of experienced manufacturers in joining and machining techniques, in accordance with nuclear codes recommendation as well as an experience in the assembly of large and heavy mechanical components. The supplier will provide evidence of his ability to tackle technical challenges such as fabrication and assembly of complex features.

The scope of work includes the methods and testing capabilities listed in the following fields:

- Manufacturing design, comprising drawing production and tolerance evaluation (3D CAD model and 2D drawings following ISO GPS standards) using CATIA V5
- Design of pre prototype mock ups, required to validate specific areas
- Welding / E-beam Welding / copper coating
- Raw material procurement
- Machining (Milling, Cutting, Drilling, Spark erosion...) Austenitic Stainless Steel (304 or 316L(N)), Inconel, copper and other metallic alloys.
- Material qualification and tests (filler material for welding/brazing, base material...)
- Testing of components (such outgassing tests, hydrostatic tests...)
- Permanent or temporary assembly of mechanical components
- Producing the technical documentation required such as manufacturing sequences, WPS, WPQR... in accordance with the nuclear code.
- Non-destructive tests (NDT) and examination such as vacuum leak tests (hot/cold leak rate in the range of $10^{-10} Pa.m^3.s^{-1}$), volumetric examination, dye penetrant testing...
- Implementation of series manufacturing methods and processes
- Management of technical and contractual data

Duration of services

The Contract is scheduled to come into force in the 2nd quarter of 2023 for an estimated duration of:

- 12 months for phase 1 & 2
- 14 months for phase 3
- 44 months for phase 4
- 12 months for phase 5

Procurement Time table

A tentative timetable is outlined as follows:

| | |
|---|-------------------|
| Call for Nomination release | 21 July 2022 |
| Receipt of nominations | 2 September 2022 |
| Issuance of Pre-qualification Application | 5 September 2022 |
| Submission of Prequalification Application | 26 September 2022 |
| Notification of Prequalification results | 24 October 2022 |
| Launch of Call for Tender | 10 November 2022 |
| Clarification questions related to this Call for Tender | 5 December 2022 |
| Response to Questions from ITER Organization | 12 December 2022 |
| Tender Submission Date: | 3 January 2023 |
| Estimated Contract Award Date: | May 2023 |
| Estimated Contract Start Date: | June 2023 |

Experience

The acceptance criteria for the selection process of the tenderer are listed below:

- Past experience in design of complex, heavy components requiring various engineering expertise
- Past experience in the manufacturing design production, including tolerance control
- Past experience in joining techniques, including TIG (manual and automatic), bore welding and E beam / laser welding
- Expertise in the machining of heavy mechanical components, as well as in machining of component with high accuracy
- Expertise in the metallic assemblies
- Expertise in Non Destructive Examination of welded assembly
- Expertise in manufacturing, control and management of component for High vacuum application
- Machining facilities, as well as capacity of handling large and heavy components
- Access to test equipment and facility (hydrostatic test, outgassing test...)
- Experience in the management of component for Nuclear application
- Quality Management

Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization. The consortium cannot be modified later without the approval of the ITER Organization.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Bidders' (individual or consortium) must comply with the selection criteria. IO reserves the right to disregard duplicated references and may exclude such legal entities from the tender procedure.

Reference

Further information on the ITER organisation procurement can be found at:

<http://www.iter.org/org/team/adm/proc/generalinfo>