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Statement of Work (SOW) for ICH 50-ohm Stub Tuner and Triple-Stub Tuner Design, Prototypes Fabrication, and Production

Abstract or description:

This SOW applies to the procurement of the design-built, prototypes fabrication, production, and delivery of the ICH 50-ohm Stub Tuner and Triple-Stub Tuner.

Workflow Role	Name	Date	Status
Author	Gouzy-Portaix, Sophie	15 Jan 2026	Signed
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Approver	Hardy, Ben	28 Jan 2026	Approved

Change Log

Version	State	Date	Version Change Description
v2.0	Published	28 Jan 2026	r2.0 changes: 1) Section 1.2: "(production units A)" was added after "twenty-four (24) 50-ohm Stub, "(production units B)" was added after "eight (8) Triple-Stub Tuners". 2) Section 3.2: reference [19] was deleted, reference [20] became reference [19], reference [21] became reference [20], reference [22] became reference [21], reference [23] became reference [22]. 3) Beginning of Section 4: four pragraphs were added. 4) Sections 4.2.10, 4.2.15.6.4, 4.3.10, 4.3.15.6.4, 4.3.16.6.4 were deleted. 5) The VSWR and scattering parameters tests were combined in one test instead of two tests: "and scattering parameters" was added after "VSWR" in Sections 4.2.9, 4.2.14.6.3, 4.3.9, 4.3.14.6.3, 4.3.15.6.3. 6) Deliverables 17 and 38 were deleted as the VSWR and scattering parameters tests were combined in one test instead of two tests.
v1.0	Superseded	28 Jan 2026	

Table of Contents

1. INTRODUCTION

1.1 Background

ITER is an international collaborative research project with a programmatic goal of demonstrating the scientific and technological feasibility of fusion energy for peaceful purposes. The European Union is the host party for the ITER facility, which is being constructed in Cadarache, France. The US contribution to ITER is managed by the US ITER Project Office (USIPO), which is hosted by Oak Ridge National Laboratory (ORNL) under contract with UT-Battelle (hereinafter referred to as the "Company"), and located in Oak Ridge, Tennessee. Responsibility for operating the completed ITER facility will belong to the ITER Organization (IO).

The USIPO has designed the gas- and water-cooled coaxial transmission lines for the ITER Ion Cyclotron Heating and Current Drive (ICH&CD) System. These lines are designed to carry up to 6 MW each of continuous wave (CW) power in a network connecting four (4) radio frequency (RF) power sources to the tuning and matching systems of one ion cyclotron (IC) antenna. These lines are required to transfer this power with high reliability.

50-ohm Stub Tuners and Triple-Stub Tuners are required as part of the matching and pre-matching sections of the ITER ICH&CD System. These stubs facilitate matching the radio frequency (RF) sources to the antennas under various plasma conditions. The matching system uses 50-ohm Stub Tuners, while the pre-matching system uses Triple-Stub Tuners. The difference is in the diameter of the inner conductor.

1.2 Presentation of the ICH 50-ohm Stub Tuner and Triple-Stub Tuner

The ITER ICH&CD System includes 301.5-mm-diameter transmission line components.

Development of these components will involve design, the manufacture, testing, evaluation, final acceptance of one (1) prototype 50-ohm Stub Tuner and one (1) prototype Triple-Stub Tuner, and the production of twenty-four (24) 50-ohm Stub Tuners (production units A) and eight (8) Triple-Stub Tuners (production units B).

The 50-ohm Stub Tuner and the Triple-Stub Tuner are represented in Figure 1 below.

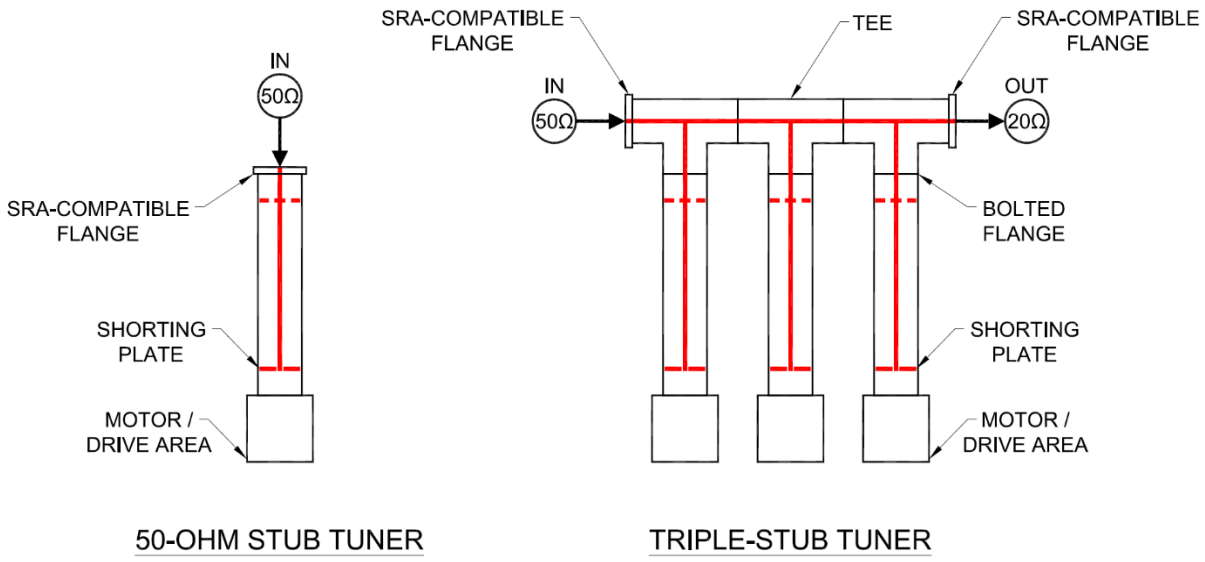

Figure 1: ICH 50-ohm Stub Tuner and Triple-Stub tuner

2. SCOPE

This Statement of Work (SOW) applies to the design of one (1) prototype 50-ohm Stub Tuner (Part 1 of this SOW), design of one (1) prototype Triple-Stub Tuner (Part 1 of this SOW), optional fabrication of one (1) prototype 50-ohm Stub Tuner (Part 2 of this SOW), optional fabrication of one (1) prototype Triple-Stub Tuner (Part 2 of this SOW), optional production of twenty-four (24) 50-ohm Stub Tuners (Part 3 of this SOW), and optional production of eight (8) Triple-Stub Tuners (Part 3 of this SOW) for the ITER ICH&CD System. Part 1 of the procurement begins with preparation of a Design Package for the prototype 50-ohm Stub Tuner, a Design Package for the prototype Triple-Stub Tuner and concludes with a Design Review for the prototype 50-ohm Stub Tuner and a Design Review for the prototype Triple-Stub Tuner. Parts 2 and 3 of the procurement for prototypes fabrication and final production are optional activities and may be awarded at the Company's discretion.

During operation, the 50-ohm Stub Tuners and Triple-Stub Tuners will operate as shown in Figure 1. An RF source that can generate up to 6 MW of power in the operating frequency range (40-55 MHz) will drive the 50-ohm Stub Tuners and Triple-Stub Tuners. Pulse lengths can be up to 3600 s.

The Seller is expected to demonstrate that the proposed design will meet the technical requirements through the two (2) Design Packages presented at the Part 1 design review (Section 4.1.8). The Seller will also prepare and submit, as part of each Design Package, a Design Compliance Matrix (DCM) for the requirements in Technical Specification [1] for the prototype 50-ohm Stub Tuner, and a Design Compliance Matrix (DCM) for the requirements in Technical Specification [2] for the prototype Triple-Stub Tuner. The Design Compliance Matrix (DCM) of each Design Package will be the key deliverable to be used by the Company for design evaluation and approval.

After Company approval of the two (2) Preliminary Design Packages proposed in Part 1, the Company may elect to have the Seller proceed to Part 2 for the manufacture, inspection, testing,

packaging, and shipping of one (1) prototype 50-ohm Stub Tuner and one (1) prototype Triple-Stub Tuner. Qualification and factory acceptance testing of the prototype units will be performed by the Seller. Once the prototypes pass these tests, they will be shipped to ORNL. After Company approval of the two (2) Final Design Packages proposed in Part 1, after successful qualification and acceptance testing of the prototype units, the Company may elect to have the Seller proceed to Part 3 for the manufacture, inspection, testing, packaging, and shipping of twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners. Factory acceptance testing of the twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners will be performed by the Seller. Once the twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners pass these tests, they will be shipped to IO.

For the prototypes:

- The Seller is responsible for the shipment from the Seller's facility to ORNL.
- The Seller is responsible for the selection of the transporter.
- The Seller is responsible for packaging and loading onto a transporter's conveyance (e.g. truck, van, trailer, vessel, ocean container, air freight container, rail car).

For the production units:

- The Company is responsible for the shipment from the Seller's facility to IO.
- The Company is responsible for the selection of the transporter.
- The Seller is responsible for packaging and loading onto the Company's Logistics Service Provider (LSP) conveyance (e.g. truck, van, trailer, vessel, ocean container, air freight container, rail car).

3. APPLICABLE DOCUMENTS

3.1 References

Reference documents are provided to supplement this SOW to the extent involved in defining tasks in this SOW. These documents include technical specifications, ITER design handbooks, procedures, and forms. National and international standards are to be provided by the Seller.

Note: Document and drawing references in this SOW, in the *Technical Specification for ICH 50-ohm Stub Tuner* [1] and in the *Technical Specification for ICH Triple-Stub Tuner* [2] will be identified and controlled in the document *Current References List (CRL) for the Procurement of ICH 50-ohm Stub Tuner and Triple-Stub Tuner,* EDRM 808c8eb6.

3.2 Reference Documents

[1] Technical Specification for ICH 50-ohm Stub Tuner, EDRM 808c8eb5

[2] Technical Specification for ICH Triple-Stub Tuner, EDRM 8091c66f

[3] Quality Plan Template for Suppliers and Subcontractors, EDRM 8043657d

[4] Requirements for Producing a Quality Plan, ITER_D_22MFMW

[5] Design Readiness Review Procedure, EDRM 8041072c

[6] Design Review Procedure, ITER_D_2832CF

[7] Design Analyses and Calculations Procedure, EDRM 803f35ae

[8] Working Instruction and Template for a DCM, ITER_D_4GNQEZ

[9] Design and Analyses Calculation Template, EDRM 8040e7d2

[10] Inspection Plan (IP) Template, EDRM 80411682

[11] Requirements for Producing an Inspection Plan, ITER_D_22MDZD

[12] Manufacturing Readiness Review (MRR) Procedure, EDRM 804a455c

[13] Manufacturing Dossier Guide, EDRM 803f3d28

[14] Manufacturing Dossier Template, EDRM 804105ba

[15] Contractor Release Note Form, EDRM 803f4967

[16] Contractor Release Note Procedure, EDRM 8041191f

[17] Non-Conformance Report Form, EDRM 8043b412

[18] Nonconformance Reports Procedure, EDRM 803f913f

[19] Deviation Request Form, EDRM 803f59df

[20] Deviation Request Procedure, EDRM 803fee84

[21] ASTM SI10, American National Standard for Metric Practice

[22] Transportation Clauses for Procurement - Guide, EDRM 8043ea05

4. PERFORMANCE REQUIREMENTS

All work under this SOW is to be performed at the Seller's Company-approved facility. If work under this SOW is to be performed at a lower-tier subcontractor's facility, Company approval is required prior to the beginning of such work.

The Seller shall provide all shop facilities, fabrication machines, qualified shop personnel, management personnel, materials, inspection services, testing services, cleaning services, packaging services, required suppliers/subcontractors, software, hardware, and office space for completing this scope of work.

After Company approval of the Preliminary Design Package proposed in Part 1 and after successful qualification and factory acceptance testing of the prototype 50-ohm Stub Tuner, the Seller shall ship to ORNL:

- one (1) prototype 50-ohm Stub Tuner, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.2.1 – 4.2.14 of this SOW.

After Company approval of the Preliminary Design Package proposed in Part 1 and after successful qualification and factory acceptance testing of the prototype Triple-Stub Tuner, the Seller shall ship to ORNL:

- one (1) prototype Triple-Stub Tuner, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.2.1 – 4.2.14 of this SOW.

After Company approval of the Final Design Package proposed in Part 1 and after successful factory acceptance testing of the twenty-four (24) 50-ohm Stub Tuners, the Seller shall ship to IO:

- twenty-four (24) 50-ohm Stub Tuners, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.3.1 – 4.3.16 of this SOW.

After Company approval of the Final Design Package proposed in Part 1 and after successful factory acceptance testing of eight (8) Triple-Stub Tuners, the Seller shall ship to IO:

- eight (8) Triple-Stub Tuners, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.3.1 – 4.3.16 of this SOW.

4.1 Part 1 − Detailed Design

4.1.1 Task 1.1: Communications Protocol

The Seller shall designate an official Point of Contact (POC) to interface with the Company's Technical Project Officer (TPO) for discussions, clarification or other technical issues. The POC designation shall be in the form of an e-mail sent to the Company's TPO with a copy to the Company's Procurement Officer. The POC designation shall be completed within five (5) working days after Award of Contract (AOC).

4.1.2 Task 1.2: Project Kickoff Meeting

A project kickoff meeting for Part 1 of this SOW will be scheduled at a mutually agreed date, time, and location as soon as practical after AOC. The primary purpose for the kickoff meeting is to confirm that the project participants understand the terms and conditions of the subcontract, the SOW, the Technical Specifications [1] and [2], and drawings, the quality assurance requirements, and the work activities involved with each task.

The Seller shall prepare written kickoff meeting minutes, including the agreed itemization of the two (2) Design Package contents, and submit them to the Company's TPO for review within three (3) working days after the meeting.

4.1.3 Task 1.3: Preparation of Quality Plan (QP) for Part 1

The Seller shall prepare a Quality Plan (QP) specifically for Part 1 of this SOW in accordance with the requirements and guidelines in *Quality Plan Template for Suppliers and Subcontractors* [3] and *Requirements for Producing a Quality Plan* [4].

The QP for Part 1 shall include design specific details, existing Seller's procedures for design and analysis, design review, etc.

The QP for Part 1 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after AOC. Company approval may take two (2) to four (4) weeks.

Work on Part 1 of this SOW may not begin until the Seller receives notice from the Company's TPO that the QP for Part 1 has been approved by the Company.

Any revised QP for Part 1 during work for Part 1 is subject to the same approval procedure as the original QP for Part 1.

Unless otherwise directed by the Company's TPO, in case of a QP revision during work for Part 1, work should continue in accordance with the current approved QP for Part 1 until the revised QP for Part 1 is accepted.

Approval of the QP for Part 1 by the Company represents a hold point. Design, procurement, or manufacturing operations shall not commence until the hold point is released. Return of the signed QP for Part 1 by the Company's TPO to the Seller's POC constitutes a hold point release.

The requirement for a QP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors unless the requirement is waived in writing on a case-by-case basis by the Company. Examples not requiring a QP:

1) Commercial off-the-shelf (COTS) items (not modified for ITER)
2) R&D activities
3) Supply of services (that are not quality related services)
4) Subcontractor working under the Seller's quality program

Basis and method of flow down criteria for special processes (ex. welding, NDE, testing, etc.) shall be identified by the Seller.

The QP for Part 1 shall include conditions for special non-conformance requirements per Section 5.4.

4.1.4 Task 1.4: Preparation of Project Schedule for Part 1, Part 2 and Part 3

The Seller shall prepare a project schedule for Part 1, Part 2 and Part 3 of this SOW. The project schedule shall identify the planned activities of the design and fabrication of one (1) prototype 50-ohm Stub Tuner and one (1) prototype Triple-Stub Tuner, and production of twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners to meet the schedule defined in this section. At minimum, the schedule shall identify planned activities such as major design activities, material procurements, manufacturing steps, fabrication, cleaning, measurement, inspection, assembly, testing, packaging and delivery of one (1) prototype 50-ohm Stub Tuner, one (1) prototype Triple-Stub Tuner, twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners.

The project schedule shall be used to track progress towards completion of each contract milestone. For each contract milestone, the start and end dates for work activities included in that milestone will be given along with reporting the percent complete for that milestone.

The project schedule for Part 1, Part 2 and Part 3 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after AOC. Company approval may take one (1) to two (2) weeks.

The project schedule for Part 1, Part 2 and Part 3 of this SOW shall identify the critical path for completion of Part 1, Part 2 and Part 3 of this SOW.

Subcontract deliverables described in Sections 6.1, 6.2, 6.3 for Part 1, Part 2 and Part 3 of this SOW shall be identified in the project schedule.

The project schedule for Part 1, Part 2 and Part 3 of this SOW shall be updated throughout the work process.

At a minimum, schedule updates must be submitted to the Company's TPO with the monthly report in accordance with Section 6.4.

4.1.5 Task 1.5: Preparation of Preliminary Design Packages and Final Design Packages

The Seller shall produce:

- a Preliminary Design Package and a Final Design Package for the 50-ohm Stub Tuner that meet or exceed the design requirements as specified in the Technical Specification [1], in [5] and [6], and

- a Preliminary Design Package and a Final Design Package for the Triple-Stub Tuner that meet or exceed the design requirements as specified in the Technical Specification [2], in [5] and [6],

which shall include the following:

1. The Seller shall provide two (2) Design Package Contents Lists, one (1) for the 50-ohm Stub Tuner, one (1) for the Triple-Stub Tuner and send them to the Company's TPO for comment at least five (5) working days prior to the project kickoff meeting. The two (2) Design Package Contents Lists will be approved as part of the kickoff meeting minutes in accordance with the process. Each document identified in the approved Design Package Contents List shall be included in the Preliminary Design Package and Final Design Package.
2. Design evolution shall include reviews at the preliminary and final design maturity levels.
3. The Seller shall produce calculations to demonstrate that the design meets the electrical, mechanical, and thermal performance of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner, as specified in the Technical Specifications [1] and [2], using numerical and/or analytical methods as needed.

The Seller shall submit the two (2) Preliminary Design Packages and two (2) Final Design Packages to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks for each Preliminary Design Package and each Final Design Package.

Design calculations shall comply with the requirements of the *Design Analyses and Calculations Procedure* [7].

The following types of documentation as well as any other related documents that serve as the design basis for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner shall be included as part of each Preliminary Design Package and each Final Design Package:

- Completed Design Compliance Matrix (DCM) (see [8])
- Mechanical and RF/electrical designs
- Performance calculations
- Completed Design and Analyses Calculations (DAC) (see [7] and [9]), and associated reports
- 3D CAD models and 2D CAD drawings
- Manufacturing and/or construction drawings
- Technical Specifications
- Material Specifications
- Bills of material
- Procedures for special processes (welding, joining etc.)
- Deviation Requests (DRs)
- Material Approval Requests
- Native files for all document deliverables of the Design Package
- Qualification and Factory Acceptance Test (FAT) Plan for the prototypes
- Factory Acceptance Test (FAT) Plan for production units

In this SOW, the First Article 50-ohm Stub Tuner and the twenty-three (23) 50-ohm Stub Tuners are referred to as “production units A”. In this SOW, the First Article Triple-Stub Tuner and the seven (7) Triple-Stub Tuners are referred to as “production units B”.

4.1.6 Task 1.6: Assembly Procedure

The Seller shall prepare one (1) Assembly Procedure that defines the sequential operations necessary to build a 50-ohm Stub Tuner assembly and a Triple-Stub Tuner assembly meeting the approved design, which shall include the following:

- Prerequisite operations/conditions
- Consumable parts
- Assembly diagrams
- 2D Assembly drawings
- Sequential steps

- Special tooling
- Required materials and special processes (welding, joining etc.)
- Torques/sequence
- Test/acceptance criteria as appropriate for each step of the assembly procedure

The Assembly Procedure shall be submitted to the Company's TPO for review and approval.

Company approval may take one (1) to two (2) weeks.

4.1.7 Task 1.7: Maintenance Procedure

The Seller shall prepare one (1) Maintenance Procedure that defines the operations/frequency necessary to maintain the 50-ohm Stub Tuner assembly and Triple-Stub Tuner assembly in safe operating condition, which shall include the following:

- Prerequisite operations/conditions
- Consumable parts
- Spares/critical spares
- Tooling and fixturing
- Test/acceptance criteria as appropriate for each step of the maintenance operation
- Return-to-service criteria

The Maintenance Procedure shall be submitted to the Company's TPO for review and approval.

Company approval may take one (1) to two (2) weeks.

4.1.8 Task 1.8: Preliminary Design Review and Final Design Review

4.1.8.1 Definitions

These definitions are extracted from [6]:

- Preliminary Design Review meeting

  ''A formal design review meeting conducted during the development phase of the design to monitor the progress of the design and to assure that the requirements are properly defined, verified and properly documented in the sub-system requirement specification (sub-SRD); the layout and interfaces have been fixed; a design concept that meets those requirements has been developed and supporting analyses and R&D are being carried out; outstanding design, construction and operation risks are identified and mitigated; and a firm basis exists to proceed with final (detailed) design.''

- Final Design Review meeting

  ''A formal design review meeting conducted to assure that the detailed design solution is

complete, verified and properly documented in lower level requirement specifications (product specification), according to the planned maturity.
The detailed criteria for passing design gates for each design document are given in Appendix 1 of [6]''.

4.1.8.2 Design Review Meetings

A Preliminary Design Review meeting will be held after submission of the two (2) detailed Preliminary Design Packages completed in Task 1.5. The purpose of this meeting is for the Seller to present their preliminary design solution and to demonstrate that it meets the design requirements. The Seller shall prepare written meeting minutes for this meeting and submit them to the Company's TPO for review within three (3) working days after the meeting.

A Final Design Review meeting will be held after submission of the two (2) detailed Final Design Packages completed in Task 1.5. The purpose of this meeting is for the Seller to present their final design solution and to demonstrate that it meets the design requirements. The Seller shall prepare written meeting minutes for this meeting and submit them to the Company's TPO for review within three (3) working days after the meeting.

The Preliminary Design Review and Final Design Review will be scheduled by the Company's TPO.

The Preliminary Design Review must be completed before *Part 2 – Option: Prototypes Fabrication and Delivery*.

The Final Design Review must be completed before *Part 3 – Option: Production and Delivery*.

4.1.9 Seller's Deliverables for Part 1 − Detailed Design

Seller's deliverables for *Part 1 − Detailed Design* are listed in Section 6.1.

4.2 Part 2 − Option: Prototypes Fabrication and Delivery

After Company approval of the two (2) Preliminary Design Packages submitted in Part 1, and after Company acceptance to proceed with Part 2, the Seller shall deliver a prototype 50-ohm Stub Tuner, a prototype Triple-Stub Tuner, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.2.1 – 4.2.14.

If the option to proceed with Part 2 is exercised, the Company's Procurement Officer will contractually authorize the fabrication work of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner.

4.2.1 Task 2.1: Preparation of Quality Plan (QP) for Part 2

Prior to beginning fabrication of the two (2) prototypes, the Seller shall prepare a Quality Plan (QP) specifically for Part 2 of this SOW in accordance with the requirements and guidelines in *Quality Plan Template for Suppliers and Subcontractors* [3] and *Requirements for Producing a Quality Plan* [4].

The QP for Part 2 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after Company approval of the two (2) Preliminary Design Packages submitted in Part 1. Company approval may take two (2) to four (4) weeks.

Work on Part 2 of this SOW may not begin until the Seller receives notice from the Company's TPO that the QP for Part 2 has been approved by the Company.

Any revised QP for Part 2 during work for Part 2 is subject to the same approval procedure as the original QP for Part 2.

Unless otherwise directed by the Company's TPO, in case of a QP revision during work for Part 2, work should continue in accordance with the current approved QP for Part 2 until the revised QP for Part 2 is accepted.

Approval of the QP for Part 2 by the Company represents a hold point. Design, procurement, or manufacturing operations shall not commence until the hold point is released. Return of the signed QP for Part 2 by the Company's TPO to the Seller's POC constitutes a hold point release.

The requirement for a QP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors unless the requirement is waived in writing on a case-by-case basis by the Company. Examples not requiring a QP:

1) Commercial off-the-shelf (COTS) items (not modified for ITER)
2) R&D activities
3) Supply of services (that are not quality related services)
4) Subcontractor working under the Seller's quality program

Basis and method of flow down criteria for special processes (ex. welding, NDE, testing, etc.) shall be identified by the Seller.

The QP for Part 2 shall include conditions for special non-conformance requirements per Section 5.4.

4.2.2 Task 2.2: Update of Project Schedule for Part 2 and Part 3

The Seller shall update the project schedule to reflect the work scope in Part 2 and Part 3 of this SOW.

The updated project schedule for Part 2 and Part 3 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after Company acceptance to proceed with Part 2. Company approval may take one (1) to two (2) weeks.

The project schedule for Part 2 and Part 3 of this SOW shall be updated throughout the work process.

At a minimum, updates must be submitted to the Company's TPO with the monthly report in accordance with Section 6.4.

4.2.3 Task 2.3: Preparation of Cleaning Procedure

The Seller shall prepare one (1) Cleaning Procedure for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2].

The Cleaning Procedure shall be submitted to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Cleaning Procedure shall include evidence that all cleaning requirements of [1] and [2] are clearly satisfied. No manufacturing of prototype components may begin prior to Company approval of this document.

4.2.4 Task 2.4: Preparation of Dimensional Measurement Plan

The Seller shall prepare one (1) Dimensional Measurement Plan for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2], and their referenced documents and shall submit the plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Dimensional Measurement Plan shall describe how all dimensional acceptance criteria will be verified, including a description of how dimensions will be measured. The plan shall include evidence that all dimensional requirements of [1] and [2], and their referenced documents are to be measured.

The Dimensional Measurement Plan shall address measurement uncertainty in determining conformance to the dimensions and tolerances shown on the Company drawings.

The Dimensional Measurement Plan must be approved by the Company before dimensional measurement activities occur.

4.2.5 Task 2.5: Preparation of Visual Inspection Plan

The Seller shall prepare one (1) Visual Inspection Plan for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Visual Inspection Plan must be approved by the Company before visual inspection activities occur.

The plan shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.2.6 Task 2.6: Preparation of Welding and Joining Procedures

The Seller shall prepare a qualified welding procedure specification (WPS), and associated documentation in accordance with the requirements of the Technical Specifications [1] and [2] for required welding operations and shall submit the procedure to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks. Approval of the WPS, and associated documentation for each welding activity must be approved by the Company before welding activities occur.

The Seller shall also prepare procedures for all other joining operations proposed to be used and shall submit the procedures to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks. Approval of the joining procedures, and associated documentation for each joining activity must be approved by the Company before joining activities occur.

4.2.7 Task 2.7: Preparation of Pressure Test Procedure

The Seller shall prepare one (1) assembly-level pressure test procedure for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The pressure test procedure must be approved by the Company before pressure testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.2.8 Task 2.8: Preparation of Hydrostatic Test Procedure

The Seller shall prepare one (1) hydrostatic test procedure for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The hydrostatic test procedure must be approved by the Company before hydrostatic testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.2.9 Task 2.9: Preparation of Voltage Standing Wave Ratio (VSWR) and Scattering Parameters Test Procedure

The Seller shall prepare one (1) VSWR and scattering parameters test procedure for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The VSWR and scattering parameters test procedure must be approved by the Company before VSWR and scattering parameters testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.2.10 Task 2.10: Preparation of Inspection Plan (IP) for Part 2

Prior to beginning fabrication of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner, the Seller shall prepare one (1) Inspection Plan (IP) specifically for Part 2 of this SOW, for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements and guidelines in *Inspection Plan (IP) Template* [10] and *Requirements for Producing an Inspection Plan* [11].

The Seller shall submit the IP for Part 2 of this SOW to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks.

The Company may add intervention points as deemed necessary to accurately monitor the processes of Part 2 of this SOW and to conform to ITER requirements.

The IP shall clearly identify who is performing each intervention point (the Seller, the Company, IO, etc.).

Intervention points marked on the IP must be signed off and dated by the person performing the intervention (the Seller, the Company, IO, etc.). No new approval of the IP is required after the intervention points marked on the IP have been signed off.

Compliance with the IP shall be checked and recorded as work progresses.

The identification of records generated during the performance of the particular operation (e.g. inspection report, test report, non-conformance report, etc.) must be recorded on the IP.

For welding operations identified in the IP, the Seller and its suppliers/subcontractors may create a separate Weld Inspection Record to document individual weld records rather than list each welding operation in the IP.

Work on Part 2 of this SOW may not begin until the Seller receives notice from the Company's TPO that the IP for Part 2 has been approved by the Company.

Any revised IP for Part 2 during work for Part 2 is subject to the same approval procedure as the original IP for Part 2.

Unless otherwise directed by the Company's TPO, in case of an IP revision during work for Part 2, work should continue in accordance with the current approved IP for Part 2 until the revised IP for Part 2 is accepted.

The requirement for an IP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors unless the requirement is waived in writing on a case-by-case basis by the Company. Examples not requiring an IP:

1) Commercial off-the-shelf (COTS) items (not modified for ITER)
2) R&D activities
3) Supply of services (that are not quality related services)
4) Subcontractor working under the Seller's quality program

The IP for Part 2 will list the sequence of operations encompassing the whole scope of the Part 2 of the SOW, Sections 4.2.1 – 4.2.14.

All inspection operations performed by the Seller for Part 2 should be sufficiently detailed on the IP. These operations shall be listed with sign off verification in the IP and/or in the Seller's traveler. Seller's travelers are to be referenced in the IP.

The Seller shall notify the Company, in writing, ten (10) working days in advance of all tests, hold points, and witness points.

4.2.11 Task 2.11: Manufacturing Readiness Review (MRR)

The Seller shall participate in a MRR [12] to confirm the Seller's readiness to produce the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner. This review will ensure that the Seller understands the technical requirements, recognizes the hazards associated with manufacturing, has properly planned the manufacturing operations (including personnel, suppliers/subcontractors, and equipment), has fully qualified each manufacturing activity, and has a fully integrated quality assurance program prior to beginning manufacturing operations. Manufacturing activities may not begin until the Company approves the MRR and the TPO has authorized the start of manufacturing. The Seller's responsibility relative to the MRR is to supply the documents requested in this SOW, provide records and evidence demonstrating each manufacturing activity has been fully qualified, and to revise these documents as necessary based on TPO feedback from the MRR.

The Seller shall include the MRR approval as the first line in the IP for prototypes fabrication (IP of Part 2; Section 4.2.10) to include fabrication activities. This is not required for IPs covering the purchase of long-lead materials and Commercial off-the-shelf (COTS) hardware, which can begin before the MRR with TPO approval. Where implementation of an IP before the MRR will be sought, this will be identified in the Seller's Quality Plan.

4.2.12 Task 2.12: Design of Packaging

The Seller shall design packaging in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the proposed packaging design to the Company's TPO for review and approval. Company approval may take two (2) to three (3) weeks.

The packaging design must be approved by the Company before packaging activities occur.

The packaging design must consider shipping by Sealand container. The Seller shall address in the packaging design how the packaging is to be loaded and stacked into a Sealand container giving consideration to the most efficient and complete use of space in a container. The Seller shall also address in the packaging design how the packaging is to be loaded and stacked into a truck or in a container loaded on a truck. For example, smaller packages may require palletizing, long packaging may require forklift access on all four sides, packaging may require stacking for efficient loading of the Sealand container and efficient use of space. The packaging is required to be water resistant to protect the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner from water damage if the crate is left out in the rain. This does not require the crate to be watertight when submersed.

Upon approval of the packaging design, the Seller shall fabricate packaging in a manner that facilitates movement, loading, and unloading by fork truck or crane. Any lifting fixtures or related hardware required to move, load, or unload the equipment shall be considered part of the equipment. All components necessary for equipment assembly shall be packed in a separate crate.

The Seller's proposed packaging design documentation shall, as a minimum, include drawings, calculations, and/or descriptions as evidence that all packaging requirements in [1] and [2] are clearly satisfied. The Seller shall include a generalized loading plan describing how their packaging shall be loaded, stacked and/or arranged in a Sealand container or on a truck or in a container loaded on a truck, and include a listing of equipment needed for loading and unloading., e.g., standard forklift, forklift with extra-long forks, crane etc. If the Seller proposes a non-standard Sealand container, this

must also be identified in the plan. Standard Sealand containers have external dimensions of 8' wide x 8.5' high and 20' or 40' long.

The packaging design documentation shall provide a drawing of the crate with the prototypes or their components inside the crate, dimensions of the crate, the location of the acceleration monitors/accelerometers inside the crate and the items that are used in the crate such as foam or wooden parts, etc.

Completion of Task 2.12 is not required for the MRR in Task 2.11. The packaging design must be approved by the Company at least 3 months prior to the use of that packaging.

4.2.13 Task 2.13: Storage Plan

The Seller shall prepare a Storage Plan that will show how the equipment will be protected from exposure to heat, rain and snow during transport or storage outdoors. Provisions for ensuring that all water is drained and blown dry from the equipment prior to movement to prevent damage due to freezing shall be identified and implemented.

The Seller shall submit the Storage Plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Storage Plan must be approved by the Company before storage activities occur.

4.2.14 Task 2.14: Prototypes

4.2.14.1 Fabricate the Prototypes

After the Company's TPO issues direction to proceed with the prototypes, the Seller shall begin fabrication activities for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the approved design in Part 1 (Section 4.1.8) of this SOW, the requirements stated in this SOW, the Technical Specifications [1] and [2], and the approved IP of Part 2 of this SOW (see Section 4.2.10).

The Seller shall ensure that manufacturing processes achieve the physical characteristics, dimensions, and tolerances in accordance with the Technical Specifications [1] and [2], and shall include these processes in the IP of Part 2 of this SOW (see Section 4.2.10).

The Seller shall ensure that all equipment is supplied unpainted.

4.2.14.2 Clean the Prototypes

The Seller shall clean the prototypes components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved cleaning procedure. Results of tests required by the cleaning procedure shall be recorded and provided to the Company.

4.2.14.3 Inspect the Prototypes

The Seller shall visually inspect all prototypes components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved visual inspection procedure. The Seller shall record results of inspections and shall provide a visual inspection report to the Company.

4.2.14.4 Measure the Prototypes

The Seller shall perform a complete (100%) dimensional inspection on the prototypes components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved Dimensional Measurement Plan. The Seller shall record measurements and shall provide a dimensional measurement report for each unit to the Company.

4.2.14.5 Assemble the Prototypes

The Seller shall perform the final assembly of the prototypes components in accordance with the requirements in [1] and [2], and the referenced drawing(s).

4.2.14.6 Qualification and Factory Acceptance Tests (FATs) for the Prototypes

After the final assembly of the prototypes components, the Seller shall perform the tests described in the Qualification and Factory Acceptance Test (FAT) Plan prepared as part of each Design Package (see Section 4.1.5), and associated approved test procedures prepared in Sections 4.2.7 – 4.2.9. The Seller shall record results of all tests and shall provide a test report to the Company for review and approval. Company approval may take one (1) to two (2) weeks.

At a minimum, the tests to be performed for each prototype are the pressure test, the hydrostatic test, and the VSWR and scattering parameters test.

4.2.14.6.1 Pressure Test for the Prototypes

After the final assembly of the prototypes components, the Seller shall perform pressure testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved pressure test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.2.14.6.2 Hydrostatic Test for the Prototypes

After fabrication of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner, the Seller shall perform hydrostatic testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved hydrostatic test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.2.14.6.3 VSWR and Scattering Parameters Test for the Prototypes

After fabrication of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner, the Seller shall perform VSWR and scattering parameters testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved VSWR and scattering parameters test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.2.14.7 Package and Prepare for Delivery of the Prototypes

The Seller shall package the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved packaging design. The Seller shall prepare the packaged assembly for shipment in accordance with the requirements and instructions in Section 7.1, *Transportation Arrangements*.

4.2.14.8 Labeling of the Prototypes

The prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner shall be labeled as specified in [1] and [2], and the drawings referenced therein.

All reports, material certifications, and other reportable results shall identify the prototype50-ohm Stub Tuner and prototype Triple-Stub Tuner and/or their subcomponents by serial number, if applicable.

4.2.14.9 Documentation Requirements for the Prototypes

The Seller shall provide the documentation specified in this section.

4.2.14.9.1 Material Certifications for the Prototypes

Material certifications compliant with the requirements in [1] and [2] shall be provided. Where Certificates of Conformity are allowed, they must be from the manufacturer. Certificates of Conformity created by resellers or distributors are not acceptable, except by approved deviation requests.

4.2.14.9.2 Visual Inspection and Dimensional Measurement Reports for the Prototypes

Visual inspection and dimensional measurement reports shall include all drawing dimensions, surface finish, and workmanship requirements, as applicable.

At a minimum, each entry must include the drawing number, sheet, zone, nominal dimension or requirement, actual measurement, the Seller ID for the measuring or test equipment used, and whether the article meets or fails the referenced requirement.

4.2.14.9.3 Welding Documentation for the Prototypes

The Seller shall use qualified welders for fabrication and shall qualify each welder in accordance with [1] and [2]. The Seller shall submit to the Company all welding records, including welding procedure specifications, welding procedure qualification, and welder certification records.

4.2.14.9.4 Test Reports for the Prototypes

At a minimum, each test report entry must include the drawing number, the Seller ID and calibration status for the measuring or test equipment used, name(s) and qualification(s) of personnel performing the test, allowable values, test parameters, recorded results, and whether the article meets or fails the referenced requirement. Each test report shall include the part number and serial number of the prototype units.

4.2.14.9.5 Operation and Maintenance Manual for the Prototypes

The Seller shall prepare an operation and maintenance manual that as a minimum includes installation instructions, preventive maintenance procedures and schedule, repair, parts diagram, inspection procedures and schedule, operation, and storage and handling requirements for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner. The Seller shall submit the

operation and maintenance manual to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

4.2.14.9.6 Prototypes Manufacturing Dossier

The Seller shall prepare one (1) electronic version of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner Manufacturing Dossier in accordance with the guidance in *Manufacturing Dossier Guide* [13] and *Manufacturing Dossier Template* [14]. The prototypes Manufacturing Dossier shall be submitted to the Company's TPO for review and approval. Company approval may take two (2) to six (6) weeks.

The Seller shall not proceed to *Part 3 − Option: Production and Delivery* until authorization is given by the Company.

4.2.14.9.7 Contractor Release Note (CRN) for the Prototypes

Prior to final packaging for shipment of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner to ORNL, the Seller shall conduct a quality review to verify that all applicable requirements of this SOW have been met. The results of this review shall be documented in the Contractor Release Note (CRN), which shall be submitted to the Company's TPO for review and approval before the assembly is packaged in preparation for shipment. Company approval may take two (2) to six (6) weeks.

The Seller shall prepare the CRN in accordance with *Contractor Release Note Form* [15], completed in accordance with *Contractor Release Note Procedure* [16].

4.2.15 Seller's Deliverables for Part 2 − Option: Prototypes Fabrication and Delivery

Seller's deliverables for *Part 2 − Option: Prototypes Fabrication and Delivery* are listed in Section 6.2.

4.3 Part 3 − Option: Production and Delivery

After Company approval of the two (2) Final Design Packages submitted in Part 1, after successful qualification and acceptance testing of the prototype units, and after Company acceptance to proceed with Part 3, the Seller shall deliver twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners, and associated documentation in accordance with the task descriptions and requirements identified in Sections 4.3.1 – 4.3.16.

If the option to proceed with Part 3 is exercised, the Company's Procurement Officer will contractually authorize the production work of the twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners.

4.3.1 Task 3.1: Preparation of Quality Plan (QP) for Part 3

Prior to beginning fabrication of the twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners, the Seller shall update the Quality Plan (QP) specifically for Part 3 of this SOW in accordance with the requirements and guidelines in *Quality Plan Template for Suppliers and Subcontractors* [3] and *Requirements for Producing a Quality Plan* [4].

The QP for Part 3 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after Company acceptance to proceed with Part 3. Company approval may take two (2) to four (4) weeks.

Work on Part 3 of this SOW may not begin until the Seller receives notice from the Company's TPO that the QP for Part 3 has been approved by the Company.

Any revised QP for Part 3 during work for Part 3 is subject to the same approval procedure as the original QP for Part 3.

Unless otherwise directed by the Company's TPO, in case of a QP revision during work for Part 3, work should continue in accordance with the current approved QP for Part 3 until the revised QP for Part 3 is accepted.

Approval of the QP for Part 3 by the Company represents a hold point. Design, procurement, or manufacturing operations shall not commence until the hold point is released. Return of the signed QP for Part 3 by the Company's TPO to the Seller's POC constitutes a hold point release.

The requirement for a QP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors unless the requirement is waived in writing on a case-by-case basis by the Company. Examples not requiring a QP:

1) Commercial off-the-shelf (COTS) items (not modified for ITER)
2) R&D activities
3) Supply of services (that are not quality related services)
4) Subcontractor working under the Seller's quality program

Basis and method of flow down criteria for special processes (ex. welding, NDE, testing, etc.) shall be identified by the Seller.

The QP for Part 3 shall include conditions for special non-conformance requirements per Section 5.4.

4.3.2 Task 3.2: Update of Project Schedule for Part 3

The Seller shall update the project schedule to reflect the work scope in Part 3 of this SOW.

The updated project schedule for Part 3 of this SOW shall be submitted to the Company's TPO for review and approval within two (2) weeks after Company acceptance to proceed with Part 3. Company approval may take one (1) to two (2) weeks.

The project schedule for Part 3 of this SOW shall be updated throughout the work process.

At a minimum, updates must be submitted to the Company's TPO with the monthly report in accordance with Section 6.4.

4.3.3 Task 3.3: Preparation of Cleaning Procedure

The Seller shall prepare one (1) Cleaning Procedure for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2].

The Cleaning Procedure shall be submitted to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Cleaning Procedure shall include evidence that all cleaning requirements of [1] and [2] are clearly satisfied. No manufacturing of component production units may begin prior to Company approval of this document.

4.3.4 Task 3.4: Preparation of Dimensional Measurement Plan

The Seller shall prepare one (1) Dimensional Measurement Plan for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2], and their referenced documents and shall submit the plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Dimensional Measurement Plan shall describe how all dimensional acceptance criteria will be verified, including a description of how dimensions will be measured. The plan shall include evidence that all dimensional requirements of [1] and [2], and their referenced documents are to be measured.

The Dimensional Measurement Plan shall address measurement uncertainty in determining conformance to the dimensions and tolerances shown on the Company and Seller's drawings.

The Dimensional Measurement Plan must be approved by the Company before dimensional measurement activities occur.

4.3.5 Task 3.5: Preparation of Visual Inspection Plan

The Seller shall prepare one (1) Visual Inspection Plan for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Visual Inspection Plan must be approved by the Company before visual inspection activities occur.

The plan shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.3.6 Task 3.6: Preparation of Welding and Joining Procedures

The Seller shall prepare a qualified welding procedure specification (WPS), and associated documentation in accordance with the requirements of the Technical Specifications [1] and [2] for required welding operations and shall submit the procedure to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks. Approval of the WPS, and associated documentation for each welding activity must be approved by the Company before welding activities occur.

The Seller shall also prepare procedures for all other joining operations proposed to be used and shall submit the procedures to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks. Approval of the joining procedures, and associated documentation for each joining activity must be approved by the Company before joining activities occur.

4.3.7 Task 3.7: Preparation of Pressure Test Procedure

The Seller shall prepare one (1) assembly-level pressure test procedure for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The pressure test procedure must be approved by the Company before pressure testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.3.8 Task 3.8: Preparation of Hydrostatic Test Procedure

The Seller shall prepare one (1) hydrostatic test procedure for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The hydrostatic test procedure must be approved by the Company before hydrostatic testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.3.9 Task 3.9: Preparation of Voltage Standing Wave Ratio (VSWR) and Scattering Parameters Test Procedure

The Seller shall prepare one (1) VSWR and scattering parameters test procedure for the 50-ohm Stub Tuners and Triple-Stub Tuners in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the procedure to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The VSWR and scattering parameters test procedure must be approved by the Company before VSWR and scattering parameters testing activities occur.

The procedure shall include evidence that all requirements of [1] and [2] are clearly satisfied.

4.3.10 Task 3.10: Preparation of Inspection Plans (IPs) for Part 3

Prior to beginning fabrication of the 50-ohm Stub Tuners and Triple-Stub Tuners, the Seller shall prepare four (4) Inspection Plans (IPs) specifically for Part 3 of this SOW, one (1) IP for the First Article 50-ohm Stub Tuner, one (1) IP for the First Article Triple-Stub Tuner, one (1) IP for the twenty-three (23) 50-ohm Stub Tuners, and one (1) IP for the for the seven (7) Triple-Stub Tuners in accordance with the requirements and guidelines in *Inspection Plan (IP) Template* [10] and *Requirements for Producing an Inspection Plan* [11].

The Seller shall submit the IPs for Part 3 of this SOW to the Company's TPO for review and approval. Company approval may take two (2) to four (4) weeks.

The Company may add intervention points as deemed necessary to accurately monitor the processes of Part 3 of this SOW and to conform to ITER requirements.

The IP shall clearly identify who is performing each intervention point (the Seller, the Company, IO, etc.).

Intervention points marked on the IP must be signed off and dated by the person performing the intervention (the Seller, the Company, IO, etc.). No new approval of the IP is required after the intervention points marked on the IP have been signed off.

Compliance with the IP shall be checked and recorded as work progresses.

The identification of records generated during the performance of the particular operation (e.g. inspection report, test report, non-conformance report, etc.) must be recorded on the IP.

For welding operations identified in the IP, the Seller and its suppliers/subcontractors may create a separate Weld Inspection Record to document individual weld records rather than list each welding operation in the IP.

Work on Part 3 of this SOW may not begin until the Seller receives notice from the Company's TPO that the IP for Part 3 has been approved by the Company.

Any revised IP for Part 3 during work for Part 3 is subject to the same approval procedure as the original IP for Part 3.

Unless otherwise directed by the Company's TPO, in case of an IP revision during work for Part 3, work should continue in accordance with the current approved IP for Part 3 until the revised IP for Part 3 is accepted.

The requirement for an IP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors unless the requirement is waived in writing on a case-by-case basis by the Company. Examples not requiring an IP:

1) Commercial off-the-shelf (COTS) items (not modified for ITER)
2) R&D activities
3) Supply of services (that are not quality related services)
4) Subcontractor working under the Seller's quality program

The IP for Part 3 will list the sequence of operations encompassing the whole scope of the Part 3 of the SOW, Sections 4.3.1 – 4.3.16.

All inspection operations performed by the Seller for Part 3 should be sufficiently detailed on the IP. These operations shall be listed with sign off verification in the IP and/or in the Seller's traveler. Seller's travelers are to be referenced in the IP.

The Seller shall notify the Company, in writing, ten (10) working days in advance of all tests, hold points, and witness points.

4.3.11 Task 3.11: Manufacturing Readiness Review (MRR)

The Seller shall participate in a MRR [12] to confirm the Seller's readiness to produce twenty-four (24) 50-ohm Stub Tuners and eight (8) Triple-Stub Tuners. This review will ensure that the Seller

understands the technical requirements, recognizes the hazards associated with manufacturing, has properly planned the manufacturing operations (including personnel, suppliers/subcontractors, and equipment), has fully qualified each manufacturing activity, and has a fully integrated quality assurance program prior to beginning manufacturing operations. Manufacturing activities may not begin until the Company approves the MRR and the TPO has authorized the start of manufacturing. The Seller's responsibility relative to the MRR is to supply the documents requested in this SOW, provide records and evidence demonstrating each manufacturing activity has been fully qualified, and to revise these documents as necessary based on TPO feedback from the MRR.

The Seller shall include the MRR approval as the first line in the IP for production (IP of Part 3; Section 4.3.10) to include fabrication activities. This is not required for IPs covering the purchase of long-lead materials and Commercial off-the-shelf (COTS) hardware, which can begin before the MRR with TPO approval. Where implementation of an IP before the MRR will be sought, this will be identified in the Seller's Quality Plan.

4.3.12 Task 3.12: Design of Packaging

The Seller shall design packaging specific to each component type in accordance with the requirements of the Technical Specifications [1] and [2], and shall submit the proposed packaging design to the Company’s TPO for review and approval. Company approval may take two (2) to three (3) weeks.

The packaging design must be approved by the Company before packaging activities occur.

The packaging design must consider shipping by Sealand container(s). The Seller shall address in the packaging design how the packaging is to be loaded and stacked into a Sealand container giving consideration to the most efficient and complete use of space in a container. The Seller shall also address in the packaging design how the packaging is to be loaded and stacked into a truck or in a container loaded on a truck. For example, smaller packages may require palletizing, long packaging may require forklift access on all four sides, packaging may require stacking for efficient loading of the Sealand container and efficient use of space. The packaging is required to be water resistant to protect the 50-ohm Stub Tuners and Triple-Stub Tuners from water damage if the crate is left out in the rain. This does not require the crate to be watertight when submersed.

Upon approval of the packaging design, the Seller shall fabricate packaging in a manner that facilitates movement, loading, and unloading by fork truck or crane. Any lifting fixtures or related hardware required to move, load, or unload the equipment shall be considered part of the equipment. All components necessary for equipment assembly shall be packed in a separate crate.

The Seller’s proposed packaging design documentation shall, as a minimum, include drawings, calculations, and/or descriptions as evidence that all packaging requirements in [1] and [2] are clearly satisfied. The Seller shall include a generalized loading plan describing how their packaging shall be loaded, stacked and/or arranged in a Sealand container or on a truck or in a container loaded on a truck, and include a listing of equipment needed for loading and unloading., e.g., standard forklift, forklift with extra-long forks, crane etc. If the Seller proposes a non-standard Sealand container, this must also be identified in the plan. Standard Sealand containers have external dimensions of 8' wide x 8.5' high and 20' or 40' long.

The packaging design documentation shall provide a drawing of the crate with the 50-ohm Stub Tuners and Triple-Stub Tuners or their components inside the crate, dimensions of the crate, the location of the acceleration monitors/accelerometers inside the crate and the items that are used in the crate such as foam or wooden parts, etc.

Completion of Task 3.12 is not required for the MRR in Task 3.11. The packaging design must be approved by the Company at least 3 months prior to the use of that packaging.

4.3.13 Task 3.13: Storage Plan

The Seller shall prepare a Storage Plan that will show how the equipment will be protected from exposure to heat, rain and snow during transport or storage outdoors. Provisions for ensuring that all water is drained and blown dry from the equipment prior to movement to prevent damage due to freezing shall be identified and implemented.

The Seller shall submit the Storage Plan to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

The Storage Plan must be approved by the Company before storage activities occur.

4.3.14 Task 3.14: First Articles

4.3.14.1 Fabricate the First Articles

After the Company's TPO issues direction to proceed with the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner, the Seller shall begin fabrication activities for the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner in accordance with the requirements stated in this SOW, the Technical Specifications [1] and [2], and the approved IP of Part 3 of this SOW (see Section 4.3.10).

The Seller shall ensure that manufacturing processes achieve the physical characteristics, dimensions, and tolerances in accordance with the Technical Specifications [1] and [2], and shall include these processes in the IP of Part 3 of this SOW (see Section 4.3.10).

The Seller shall ensure that all equipment is supplied unpainted.

4.3.14.2 Clean the First Articles

The Seller shall clean the First Article 50-ohm Stub Tuner components and the First Article Triple-Stub Tuner components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved cleaning procedure. Results of tests required by the cleaning procedure shall be recorded and provided to the Company.

4.3.14.3 Inspect the First Articles

The Seller shall visually inspect the First Article 50-ohm Stub Tuner components and the First Article Triple-Stub Tuner components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved visual inspection procedure. The Seller shall record results of inspections and shall provide a visual inspection report for each unit to the Company.

4.3.14.4 Measure the First Articles

The Seller shall perform a complete (100%) dimensional inspection on the First Article 50-ohm Stub Tuner components and the First Article Triple-Stub Tuner components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved Dimensional Measurement Plan. The Seller shall record measurements and shall provide a dimensional measurement report for each unit to the Company.

4.3.14.5 Assemble the First Articles

The Seller shall perform the final assembly of First Article 50-ohm Stub Tuner components and the First Article Triple-Stub Tuner components in accordance with the requirements in [1] and [2], and the referenced drawing(s).

4.3.14.6 Factory Acceptance Tests (FATs) for the First Articles

After the final assembly of the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner, the Seller shall perform the tests described in the Factory Acceptance Test (FAT) Plan prepared as part of each Design Package (see Section 4.1.5), and associated approved test procedures prepared in Sections 4.3.7 – 4.3.9. The Seller shall record results of all tests and shall provide a test report to the Company for review and approval. Company approval may take one (1) to two (2) weeks.

At a minimum, the tests to be performed for each First Article are the pressure test, the hydrostatic test, and the VSWR and scattering parameters test.

4.3.14.6.1 Pressure Test for the First Articles

After the final assembly of the First Article 50-ohm Stub Tuner components and the First Article Triple-Stub Tuner components, the Seller shall perform pressure testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved pressure test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.14.6.2 Hydrostatic Test for the First Articles

After fabrication of the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner, the Seller shall perform hydrostatic testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved hydrostatic test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.14.6.3 VSWR and Scattering Parameters Test for the First Articles

After fabrication of the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner, the Seller shall perform VSWR and scattering parameters testing in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved VSWR and scattering parameters test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.14.7 Package and Prepare for Delivery of the First Articles

The Seller shall package the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved packaging design. The Seller shall prepare the packaged assembly for shipment in accordance with the requirements and instructions in Section 7.1, Transportation Arrangements.

4.3.14.8 Labeling of the First Articles

The First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner shall be labeled as specified in [1] and [2], and the drawings referenced therein.

All reports, material certifications, and other reportable results shall identify the First Article 50-ohm Stub Tuner and the First Article Triple-Stub Tuner, and/or its subcomponents by serial number, if applicable.

4.3.14.9 First Articles Manufacturing Dossiers

The Seller shall prepare one (1) electronic version of the First Article 50-ohm Stub Tuner Manufacturing Dossier and one (1) electronic version of the First Article Triple-Stub Tuner Manufacturing Dossier in accordance with the guidance in *Manufacturing Dossier Guide* [13] and *Manufacturing Dossier Template* [14]. The two (2) First Article Manufacturing Dossiers shall be submitted to the Company's TPO for review and approval. Company approval may take two (2) to six (6) weeks.

The Seller shall not proceed to Task 3.15 until authorization is given by the Company.

After approval of the First Article 50-ohm Stub Tuner Manufacturing Dossier, the First Article 50-ohm Stub Tuner becomes the first production unit A. After approval of the First Article Triple-Stub Tuner Manufacturing Dossier, the First Article Triple-Stub Tuner becomes the first production unit B.

4.3.15 Task 3.15: 23 Production Units A and 7 Production Units B

4.3.15.1 Fabricate the 23 Production Units A and 7 Production Units B

After the Company's TPO issues direction to proceed with the twenty-three (23) production units A and the seven (7) production units B, the Seller shall begin fabrication activities for the twenty-three (23) production units A and the seven (7) production units B in accordance with the requirements stated in this SOW, the Technical Specifications [1] and [2], and the approved IP of Part 3 of this SOW (see Section 4.3.10).

The Seller shall ensure that manufacturing processes achieve the physical characteristics, dimensions, and tolerances in accordance with the Technical Specifications [1] and [2], and shall include these processes in the IP of Part 3 of this SOW (see Section 4.3.10).

The Seller shall ensure that all equipment is supplied unpainted.

4.3.15.2 Clean the 23 Production Units A and 7 Production Units B

The Seller shall clean each production unit's components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved cleaning procedure. Results of tests required by the cleaning procedure shall be recorded and provided to the Company.

4.3.15.3 Inspect the 23 Production Units A and 7 Production Units B

The Seller shall visually inspect each production unit's components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved visual inspection procedure. The Seller shall record results of inspections and shall provide a visual inspection report for each unit to the Company.

4.3.15.4 Measure the 23 Production Units A and 7 Production Units B

The Seller shall perform a complete (100%) dimensional inspection on each production unit's components in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved Dimensional Measurement Plan. The Seller shall record measurements and shall provide a dimensional measurement report for each unit to the Company.

4.3.15.5 Assemble the 23 Production Units A and 7 Production Units B

The Seller shall perform the final assembly of each production unit's components in accordance with the requirements in [1] and [2], and the referenced drawing(s).

4.3.15.6 Factory Acceptance Tests (FATs) for the 23 Production Units A and 7 Production Units B

After the final assembly of the twenty-three (23) production units A and seven (7) production units B, the Seller shall perform the tests described in the Factory Acceptance Test (FAT) Plan prepared as part of each Design Package (see Section 4.1.5), and associated approved test procedures prepared in Sections 4.3.7 – 4.3.9. The Seller shall record results of all tests and shall provide a test report to the Company for review and approval. Company approval may take one (1) to two (2) weeks.

At a minimum, the tests to be performed for each of the twenty-three (23) production units A and each of the seven (7) production units B are the pressure test, the hydrostatic test, and the VSWR and scattering parameters test.

4.3.15.6.1 Pressure Test for the 23 Production Units A and 7 Production Units B

After the final assembly of each production unit's components, the Seller shall perform pressure testing for each production unit A and each production unit B in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved pressure test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.15.6.2 Hydrostatic Test for the 23 Production Units A and 7 Production Units B

After fabrication of the twenty-three (23) production units A and seven (7) production units B, the Seller shall perform hydrostatic testing for each production unit A and each production unit B in

accordance with the requirements in [1] and [2], referenced drawing(s), and the approved hydrostatic test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.15.6.3 VSWR and Scattering Parameters Test for the 23 Production Units A and 7 Production Units B

After fabrication of the twenty-three (23) production units A and seven (7) production units B, the Seller shall perform VSWR and scattering parameters testing for each production unit A and each production unit B in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved VSWR and scattering parameters test procedure. The Seller shall record test results and shall provide a test report to the Company.

4.3.15.7 Package and Prepare for Delivery of the 23 Production Units A and 7 Production Units B

The Seller shall package the twenty-three (23) production units A and seven (7) production units B in accordance with the requirements in [1] and [2], referenced drawing(s), and the approved packaging design. The Seller shall prepare the packaged assembly for shipment in accordance with the requirements and instructions in Section 7.1, Transportation Arrangements.

4.3.15.8 Labeling of the 23 Production Units A and 7 Production Units B

The twenty-three (23) production units A and the seven (7) production units B shall be labeled as specified in [1] and [2], and the drawings referenced therein.

All reports, material certifications, and other reportable results shall identify each production unit and/or its subcomponents by serial number, if applicable.

4.3.16 Documentation Requirements for the 2 First Articles, 23 Production Units A and 7 Production Units B

The Seller shall provide the documentation specified in this section.

4.3.16.1 Material Certifications for the 2 First Articles, 23 Production Units A and 7 Production Units B

Material certifications compliant with the requirements in [1] and [2] shall be provided. Where Certificates of Conformity are allowed, they must be from the manufacturer. Certificates of Conformity created by resellers or distributors are not acceptable, except by approved deviation requests.

4.3.16.2 Visual Inspection and Dimensional Measurement Reports for the 2 First Articles, 23 Production Units A and 7 Production Units B

Visual inspection and dimensional measurement reports shall include all drawing dimensions, surface finish, and workmanship requirements, as applicable.

At a minimum, each entry must include the drawing number, sheet, zone, nominal dimension or requirement, actual measurement, the Seller ID for the measuring or test equipment used, and whether the article meets or fails the referenced requirement.

4.3.16.3 Welding Documentation for the 2 First Articles, 23 Production Units A and 7 Production Units B

The Seller shall use qualified welders for fabrication and shall qualify each welder in accordance with [1] and [2]. The Seller shall submit to the Company all welding records, including welding procedure specifications, welding procedure qualification, and welder certification records.

4.3.16.4 Test Reports for the 2 First Articles, 23 Production Units A and 7 Production Units B

At a minimum, each test report entry must include the drawing number, the Seller ID and calibration status for the measuring or test equipment used, name(s) and qualification(s) of personnel performing the test, allowable values, test parameters, recorded results, and whether the article meets or fails the referenced requirement. Each test report shall include the part number and serial number of the First Article 50-ohm Stub Tuner, First Article Triple-Stub Tuner, twenty-three (23) 50-ohm Stub Tuners and seven (7) Triple-Stub Tuners.

4.3.16.5 Final Drawings

Any design changes made during the fabrication of the production units A and B must be updated on revised final drawings.

4.3.16.6 Operation and Maintenance Manual for the 2 First Articles, 23 Production Units A and 7 Production Units B

The Seller shall prepare an operation and maintenance manual that as a minimum includes installation instructions, preventive maintenance procedures and schedule, repair, parts diagram, inspection procedures and schedule, operation, and storage and handling requirements for the production units A and B. The Seller shall submit the operation and maintenance manual to the Company's TPO for review and approval. Company approval may take one (1) to two (2) weeks.

4.3.16.7 Manufacturing Dossiers for the 23 Production Units A and 7 Production Units B

The Seller shall prepare one (1) electronic version of the Manufacturing Dossier of the twenty-three (23) production units A and one (1) electronic version of the Manufacturing Dossier of the seven (7) production units B in accordance with the guidance in *Manufacturing Dossier Guide* [13] and *Manufacturing Dossier Template* [14]. The Manufacturing Dossier of the twenty-three (23) production units A and the Manufacturing Dossier of the seven (7) production units B shall be submitted to the Company's TPO for review and approval. Company approval may take two (2) to six (6) weeks.

For the Manufacturing Dossier of the twenty-three (23) production units A, the Manufacturing Dossier can be prepared for multiple (a batch) of production units A. The Company's TPO approval is required for submitting multiple production units A in one Manufacturing dossier. At the beginning of

each Manufacturing Dossier, the specified production units A length(s), and the actual/measured production units A length(s) shall be reported.

For the Manufacturing Dossier of the seven (7) production units B, the Manufacturing Dossier can be prepared for multiple (a batch) of production units B. The Company's TPO approval is required for submitting multiple production units B in one Manufacturing dossier. At the beginning of each Manufacturing Dossier, the specified production units B length(s), and the actual/measured production units B length(s) shall be reported.

4.3.16.8 Contractor Release Notes (CRNs) for the 2 First Articles, 23 Production Units A and 7 Production Units B

Prior to final packaging for shipment of the production units A (First Article 50-ohm Stub Tuner and twenty-three (23) 50-ohm Stub Tuners) to IO, the Seller shall conduct a quality review to verify that all applicable requirements of this SOW have been met. The results of this review shall be documented in the CRN for production units A, which shall be submitted to the Company's TPO for review and approval before the assembly is packaged in preparation for shipment. Company approval may take two (2) to six (6) weeks. The CRN shall list the specified production units A length(s), and the actual/measured production units A length(s). A CRN can be prepared for multiple (a batch) of production units A with the Company's TPO approval.

Prior to final packaging for shipment of the production units B (First Article Triple-Stub Tuner and seven (7) Triple-Stub Tuners) to IO, the Seller shall conduct a quality review to verify that all applicable requirements of this SOW have been met. The results of this review shall be documented in the CRN for production units B, which shall be submitted to the Company's TPO for review and approval before the assembly is packaged in preparation for shipment. Company approval may take two (2) to six (6) weeks. The CRN shall list the specified production units B length(s), and the actual/measured production units B length(s). A CRN can be prepared for multiple (a batch) of production units B with the Company's TPO approval.

The Seller shall prepare the CRNs in accordance with *Contractor Release Note Form* [15], completed in accordance with *Contractor Release Note Procedure* [16].

4.3.17 Seller's Deliverables for Part 3 − Option: Production and Delivery

Seller's deliverables for *Part 3 − Option: Production and Delivery* are listed in Section 6.3.

5. QUALITY ASSURANCE

The quality of work performed under this SOW will be controlled by the Seller assigning the appropriate, knowledgeable, and qualified personnel and suppliers/subcontractors to this task, providing appropriate facilities and manufacturing equipment, and following a rigorous quality assurance plan.

5.1 Quality Assurance (QA) Program

The Seller and key suppliers/subcontractors are to have Quality Assurance (QA) programs that meet or exceed the requirements of ISO 9000 (or Company-approved equivalent).

The QA program shall be implemented as provided in the Company-approved QP (prepared per Tasks 1.3, 2.1 and 3.1 respectively in Sections 4.1.3, 4.2.1 and 4.3.1), sufficient to ensure that the quality of items produced or services provided will meet all the requirements as stated in this SOW and in the Technical Specifications [1] and [2].

5.2 Access for Source Surveillance Inspections

As part of the Company's QA program, source surveillance activities may be conducted at the Seller's facility or any suppliers/subcontractors' Seller facility that the Company determines necessary to ensure that quality objectives are met.

Representatives of IO may accompany the Company inspectors as observers.

IO representatives may be U.S. citizens or foreign nationals.

Such surveillance may include auditing and monitoring of CAD software, preparation of drawings and documents, performance of studies, inspection and tests, weld and welder qualification, and all other manufacturing steps.

The Seller is to provide the Company representatives access to all data and operating areas pertinent to this subcontract to assure that items or services are being furnished in accordance with specified requirements.

Source surveillance by the Company representative does not constitute product acceptance by the Company and will in no way relieve the Seller of the responsibility to furnish acceptable deliverables.

5.3 Test and Inspection

Testing and inspection requirements are addressed in the Technical Specifications [1] and [2].

The Seller shall notify the Company's TPO twenty-one (21) working days prior to start of Qualification and Factory Acceptance Tests (FATs) identified in Sections 4.2.14.6, 4.3.14.6 and 4.3.15.6. The Seller shall make reasonable effort to sequence Qualification and Factory Acceptance Tests to minimize overall test schedule duration (i.e. not partitioned over multiple weeks).

The Company has the right to witness all tests and inspections.

Calibration records shall be available for all measurement tools, and all measurements shall be taken with tools that have current calibration certifications.

5.4 Non-Conformance Report (NCR)

Note: The issuance and approval of a non-conformance report (NCR) in no way limits or affects the warranty provision of the subcontract.

The Company expects to receive equipment items, components, materials, and documentation that conform to all codes, standards, specifications, and procedures identified in the subcontract.

When a non-conformance is identified, the Seller is to:

i. Identify and segregate when practical, the non-conforming item,

ii. Stop any further work on the item until disposition is provided by the Company, and

iii. Record and report the occurrence to the Company in an NCR.

Identifying the need for an NCR will begin with a written notification (an email stating the discovery date and non-conformance identified, a Company non-conformance report (NCR) partially filled out, or a Seller internal NCR form) of the discovered non-conformance by the Seller to the Company's TPO, Company's Procurement Officer and Company's Quality Assurance Representative. This must be done by the identifier (Seller) as soon as possible but no later than five (5) working days from the discovery of the non-conforming condition.

The NCR is to contain or refer to all relevant material available to enable an informed decision on the definite course of action to be taken.

NCRs are to be submitted on the *Non-Conformance Report Form* [17], completed per the *Nonconformance Reports Procedure* [18].

NCRs shall be submitted to the Company's TPO for review and approval. Company approval may take two (2) to three (3) weeks.

An approved NCR does not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

The Seller must report all out-of-tolerance dimensions and out-of-tolerance features to the Company.

5.5 Deviation Request (DR)

Note: The issuance and approval of a deviation request (DR) in no way limits or affects the warranty provision of the subcontract.

The Seller may propose deviations from the specifications, drawings, or other technical requirements of this procurement.

Where time is a consideration, the Seller may communicate the proposed deviation directly to the Company's TPO, with a copy to the Company's Procurement Officer.

The request is to identify the affected items, drawing/specification number and revision number, a description of the proposed deviation, and the justification for it.

The Company's TPO will evaluate the technical aspects and recommend approval/disapproval to the Company's Procurement Officer, who will communicate approval or disapproval to the Seller.

DRs are to be submitted on the *Deviation Request Form* [19], completed per the *Deviation Request Procedure* [20].

DRs shall be submitted to the Company's TPO for review and approval. Company approval may take two (2) to three (3) weeks.

An approved DR does not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

5.6 Inspector Safety

To ensure the safety of Company and/or IO or regulatory representatives who visit the Seller's facilities, the Seller shall provide relevant information about their facility safety procedures including, for example, safety glasses, hearing and respiratory protection, emergency preparedness, rally point, and general safety rules; and shall review typical workplace hazards with the representative(s) upon their arrival.

5.7 Material Identification and Control

The Seller must ensure through their QA Program that materials under this scope of work maintain positive identification for items/parts ordered through manufacturing. Raw materials, in-process components, and final assemblies shall be identified and labeled. The Seller's Quality Assurance program shall also maintain consistent identification of non-conformance items/parts so that the material and NCR process status is clearly identified. This applies to items/parts ordered by the Seller and those under the Seller's suppliers and subcontractors.

The Seller shall define appropriate methods for process control with material identification and status from receipt inspection through final assembly, so identification and traceability are maintained. In example, these methods could include work orders, work routers, or work travelers.

5.8 Receipt Inspection from the Seller

The Company may require some documentation from the Seller that provides evidence regarding the receipt inspection of each individual item/part received by the Seller and by the Seller's suppliers and subcontractors for this contract.

6. DELIVERABLES

The Seller shall provide the following deliverables in accordance with the Project Schedule. The format for documents and deliverables shall conform to the requirements provided in Section 6.5:

6.1 Seller's Deliverables for Part 1 − Detailed Design

Deliverables	Section	Title of the deliverable	Due
1	4.1.5	Design Package Contents List for the 50-ohm Stub Tuner	Due at least five (5) working days prior to the project kickoff meeting
		Design Package Contents List for the Triple-Stub Tuner	
2	4.1.3	Quality Plan (QP) for Part 1 for the 50-ohm Stub Tuner and the Triple-Stub Tuner	Due within two (2) weeks after AOC
3	4.1.4	Project Schedule for Part 1, Part 2 and Part 3	Due within two (2) weeks after AOC

4	4.1.5 4.1.8	Preliminary Design Package for the 50-ohm Stub Tuner with associated documentation including Preliminary Design Review Minutes and Presentations Preliminary Design Package for the Triple-Stub Tuner with associated documentation including Preliminary Design Review Minutes and Presentations	• Due before *Part 2 – Option: Prototypes Fabrication and Delivery* • Due by November 2026
5	4.1.6	Assembly Procedure for the 50-ohm Stub Tuner and Triple-Stub Tuner	Due before the Preliminary Design Review Meeting
6	4.1.7	Maintenance Procedure (including service life calculation) for the 50-ohm Stub Tuner and Triple-Stub Tuner	Due before the Preliminary Design Review Meeting
7	4.1.5 4.1.8	Final Design Package for the 50-ohm Stub Tuner with associated documentation including Final Design Review Minutes and Presentations Final Design Package for the Triple-Stub Tuner with associated documentation including Final Design Review Minutes and Presentations	• Due before *Part 3 – Option: Production and Delivery* • Due by October 2027

6.2 Seller's Deliverables for Part 2 − Option: Prototypes Fabrication and Delivery

Deliverables	Section	Title of the deliverable	Due
8	4.2.1	Quality Plan (QP) for Part 2 for the two prototypes	Due within two (2) weeks after authorization to proceed with Part 2
9	4.2.2	Update of Project Schedule for Part 2 and Part 3	Due within two (2) weeks after authorization to proceed with Part 2
10	4.2.3	Cleaning Procedure for the two prototypes	Due before the start of prototypes fabrication work
11	4.2.4	Dimensional Measurement Plan for the two prototypes	Due before the start of prototypes fabrication work
12	4.2.5	Visual Inspection Plan for the two prototypes	Due before the start of prototypes fabrication work
13	4.2.6	Welding and Joining Procedures for the two prototypes	Due before the prototypes welding activities occur
14	4.2.7	Pressure Test Procedure for the two prototypes	Due before the prototypes testing activities occur
15	4.2.8	Hydrostatic Test Procedure for the two prototypes	Due before the prototypes testing activities occur

16	4.2.9	VSWR and Scattering Parameters Test Procedure for the two prototypes	Due before the prototypes testing activities occur
17	4.2.10	Inspection Plan (IP) for Part 2 for the two prototypes, including all supporting documentation	Due before the start of prototypes fabrication work
18	4.2.10	Signed Inspection Plan (IP) for Part 2 for the two prototypes, including all supporting documentation	Due before the submission of the Prototypes Manufacturing Dossier for Company approval
19	4.2.11	Manufacturing Readiness Review (MRR) for the two prototypes	To be scheduled by Company's TPO before the start of prototypes fabrication work
20	4.2.12	Design of Packaging for the two prototypes	Due at least 3 months before the prototypes packaging activities occur
21	4.2.13	Storage Plan for the two prototypes	Due at least 3 months before the prototypes shipment
22	7.1.2.1	Pre-Shipment Deliverable Package No. 1	Due no later than twelve (12) weeks prior to planned date of the prototypes shipment
23	7.1.2.2	Pre-Shipment Deliverable Package No. 2	Due no later than eight (8) weeks prior to planned date of the prototypes shipment
24	7.1.2.3	Pre-Shipment Deliverable Package No. 3	Due no later than two (2) weeks prior to planned date of the prototypes shipment
25	7.1.2.4	Pre-Shipment Deliverable Package No. 4	Due no later than one (1) week prior to planned date of the prototypes shipment
26	4.2.14	Prototype 50-ohm Stub Tuner with associated documentation Prototype Triple-Stub Tuner with associated documentation	Shipped by June 2027
27	6.4	Periodic Communication and Reporting for the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner	Due before *Part 3 – Option: Production and Delivery*

6.3 Seller's Deliverables for Part 3 − Option: Production and Delivery

Deliverables	Section	Title of the deliverable	Due
28	4.3.1	Quality Plan (QP) for Part 3 for production units A and B	Due within two (2) weeks after authorization to proceed with Part 3
29	4.3.2	Update of Project Schedule for Part 3	Due within two (2) weeks after authorization to proceed with Part 3
30	4.3.3	Cleaning Procedure for production units A and B	Due before the start of production work of production units A and B
31	4.3.4	Dimensional Measurement Plan for production units A and B	Due before the start of production work of production units A and B

32	4.3.5	Visual Inspection Plan for production units A and B	Due before the start of production work of production units A and B
33	4.3.6	Welding and Joining Procedures for production units A and B	Due before the welding activities occur for production units A and B
34	4.3.7	Pressure Test Procedure for production units A and B	Due before the testing activities occur for production units A and B
35	4.3.8	Hydrostatic Test Procedure for production units A and B	Due before the testing activities occur for production units A and B
36	4.3.9	VSWR and Scattering Parameters Test Procedure for production units A and B	Due before the testing activities occur for production units A and B
37	4.3.10	Inspection Plan (IP) for the First Article 50-ohm Stub Tuner of Part 3, including all supporting documentation	Due before the start of production work of the First Article 50-ohm Stub Tuner
38	4.3.10	Inspection Plan (IP) for the First Article Triple-Stub Tuner of Part 3, including all supporting documentation	Due before the start of production work of the First Article Triple-Stub Tuner
39	4.3.10	Signed Inspection Plan (IP) for the First Article 50-ohm Stub Tuner of Part 3, including all supporting documentation	Due before the submission of the First Article 50-ohm Stub Tuner Manufacturing Dossier for Company approval
40	4.3.10	Signed Inspection Plan (IP) for the First Article Triple-Stub Tuner of Part 3, including all supporting documentation	Due before the submission of the First Article Triple-Stub Tuner Manufacturing Dossier for Company approval
41	4.3.10	Inspection Plan (IP) for the twenty-three (23) production units A of Part 3, including all supporting documentation	Due before the start of production work of the twenty-three (23) production units A
42	4.3.10	Inspection Plan (IP) for the seven (7) production units B of Part 3, including all supporting documentation	Due before the start of production work of the seven (7) production units B
43	4.3.10	Signed Inspection Plan (IP) for the twenty-three (23) production units A of Part 3, including all supporting documentation	Due before the submission of the Manufacturing Dossier of the twenty-three (23) production units A for Company approval
44	4.3.10	Signed Inspection Plan (IP) for the seven (7) production units B of Part 3, including all supporting documentation	Due before the submission of the Manufacturing Dossier of the seven (7) production units B for Company approval
45	4.3.11	Manufacturing Readiness Review (MRR) for production units A and B	To be scheduled by Company's TPO before start of production work of production units A and B
46	4.3.12	Design of Packaging for production units A and B	Due at least 3 months before the production units packaging activities occur for production units A and B
47	4.3.13	Storage Plan for production units A and B	Due at least 3 months before the shipment of production units A and B

48	7.1.2.1	Pre-Shipment Deliverable Package No. 1	Due no later than twelve (12) weeks prior to planned date of the shipment of production units A and B
49	7.1.2.2	Pre-Shipment Deliverable Package No. 2	Due no later than eight (8) weeks prior to planned date of the shipment of production units A and B
50	7.1.2.3	Pre-Shipment Deliverable Package No. 3	Due no later than two (2) weeks prior to planned date of the shipment of production units A and B
51	7.1.2.4	Pre-Shipment Deliverable Package No. 4	Due no later than one (1) week prior to planned date of the shipment of production units A and B
52	4.3.14 4.3.15 4.3.16	Eight (8) Triple-Stub Tuners (production units B) with associated documentation	Shipped by December 2030
53	6.4	Periodic Communication and Reporting for the eight (8) Triple-Stub Tuners (production units B)	Due before the end of contract
54	4.3.14 4.3.15 4.3.16	Twenty-four (24) 50-ohm Stub Tuners (production units A) with associated documentation	Shipped by January 2032
55	6.4	Periodic Communication and Reporting for the twenty-four (24) 50-ohm Stub Tuners (production units A)	Due before the end of contract

6.4 Periodic Communication

The Seller shall participate in a weekly phone conference to be held with the Company's TPO to discuss any technical issues and schedule, personnel, and any other items pertinent to the work activities. The weekly phone conference will serve as a mechanism to get early visibility of problems and issues arising during the performance of this subcontract.

The Seller shall prepare and issue conference call minutes to the Company's TPO within two (2) working days after the weekly phone conference.

The Seller shall provide a written monthly status report containing an updated schedule and data to support the generation of the Company's Project monthly report.

Monthly report data shall include actual schedule progress, milestones reached, corrective actions needed, display of the present critical path for the Seller's work, and a brief narrative describing the status of work, significant accomplishments, actual and potential problems and risk mitigations or corrective actions.

The monthly report shall be submitted to the Company's TPO on the twentieth (20) calendar day of the month. If the twentieth (20) calendar day falls on a weekend or holiday of the country in which the Seller is located, the monthly report may be submitted on the first working day after the twentieth (20) calendar day.

The period of the monthly report shall be from the twenty-first (21) calendar day of the previous month until the twentieth (20) calendar day of the month the report is done. The period of the first monthly report shall be from the start of the AOC until the twentieth (20) calendar day of the month the report is done.

At the project kickoff meeting, the Seller shall propose a new calendar day to send the monthly report. The same conditions mentioned above to submit the monthly report shall apply when a calendar day falls on a weekend or holiday of the country in which the Seller is located.

On the twentieth (20) calendar day of the month, the Seller shall send to the Company's PO the % of cost completed for deliverables 7, 27, 54 and 56. If the twentieth (20) calendar day falls on a weekend or holiday of the country in which the Seller is located, the Seller may send the % of cost completed on the first working day after the twentieth (20) calendar day.

6.5 Format for Documents and Deliverables

Electronic distribution will be the standard method of transmitting all deliverables including quality plans, reports, meeting minutes, drawings, general correspondence etc.

All documents are to be identified by contract number and provided in a searchable PDF format.

All documentation must reference the part number (drawing number) and serial number associated with the data.

All documents are to use metric units as specified in *ASTM SI10, American National Standard for Metric Practice* [21].

Documents (including drawings) are not to bear any stamp (e.g., proprietary, confidential, business sensitive, etc.) that requires the document to be protected by the Company unless the document relates to intellectual property that the Seller disclosed on the Background Intellectual Property form submitted with the proposal.

Revisions of documents submitted to the Company's TPO for approval are to clearly identify substantive (non-editorial) changes made in the revision. The Seller's identification of the changes may be addressed in the document or in a summary accompanying the document (e.g., e-mail, letter, transmittal form).

Reports are to contain narratives, spreadsheets, calculations, illustrations, and drawings where necessary to supplement the text and improve understanding.

Reports and other narrative documents are to have a cover sheet stating the document number, document title, issue date, and subcontract number, as well as having a place to identify authors, checker, and approval signatures as required. Signatures must be electronic or digital.

All reports and narrative documents are to begin with an executive summary briefly describing the contents and conclusions of the document.

Manufacturing Dossiers are to include a table of contents.

Narrative documents are to be transmitted to the Company's TPO as the native file with an accompanying searchable PDF file for review and acceptance or approval.

Documentation created and delivered for this scope of work will become part of the official Company Document Management System (EDRM) and potentially the IO Document Management System (IDM).

Models and drawings created by the Seller and sent to the Company are to be created using electronic CAD software and provided to the Company in either STEP or IGES format and a PDF file. Any required signatures are to be electronically applied to the PDF file and physically to any hard copy.

Oral presentations are to use PowerPoint software.

7. TRANSPORTATION ARRANGEMENTS

The Seller is responsible for packaging, storage, and loading of all hardware/equipment covered by this SOW. The Company's TPO will specify where the prototypes and production units A and B shall be shipped or delivered. If shipping to destination within the United States, shipping arrangements will be jointly determined by the Company's TPO and the Seller. Reference [22] refers to version 2.0 in this SOW and in the *Current References List (CRL) for the Procurement of ICH 50-ohm Stub Tuner and Triple-Stub Tuner,* EDRM 808c8eb6.

7.1 Transportation Arrangements

See Section *1. Introduction* of [22].

7.1.1 Loading

See Section *2.1 Loading* of [22].

7.1.2 Pre-shipment Documentation

NOTE:	All shipment documentation must be completed in the English language.

The Seller shall provide information and documentation required for international shipment in accordance with the following schedule (see deliverables 22, 23, 24, 25 in Section 6.2 and deliverables 48, 49, 50, 51 in Section 6.3):

7.1.2.1 Pre-Shipment Deliverable Package No. 1

See Section *2.2.1 Pre-Shipment Deliverable Package No. 1* of [22] except for:

Pre-Shipment Deliverable Package #1 shall be provided no later than twelve (12) weeks prior to planned date of shipment.

7.1.2.2 Pre-Shipment Deliverable Package No. 2

A. Pre-Shipment Deliverable Package #2 shall be provided no later than eight (8) weeks prior to planned date of shipment.

B. Pre-Shipment Deliverable Package #2 is to contain the following items:

- Written confirmation of the date goods will be ready for shipment or submit revised shipment date for approval.
- Contact information for Seller's Shipping/Logistics coordinator
- Fabrication value of goods (for insurance purposes – should not include destination site support services)
- Transport drawings with sufficient detail to facilitate lifting/lashing/stowage and approval of the operators (e.g., steamship line, air carrier).
- The following business documents (in English language):
  1. Pro-forma/commercial invoice on Seller's letterhead listing, at a minimum:
     - Subcontract number
     - Description and quantity of goods
     - Value of goods
     - Incoterm 2010 rule
     - Schedule B number (for U.S. exports) or Harmonized System code
     - Country of origin
     - Export control determinations (e.g., "ECCN: EAR99, No Export Control License required")
     - **Consignees:**

NOTE:	If shipped to Oak Ridge National Laboratory (ORNL) or to ITER Organization (IO), use the addresses below.

The Seller shall arrange the shipping of the prototype 50-ohm Stub Tuner and prototype Triple-Stub Tuner to Oak Ridge National Laboratory (ORNL) in one shipment.

The ORNL address is shown below:

Oak Ridge National Laboratory
Attn: Mike Morrow
Bldg. 7625
1 Bethel Valley Road
Oak Ridge, TN 37830
USA

Contact: Mike Morrow
E-mail: morrowmciii@ornl.gov

The Seller shall arrange the shipping of the twenty-four (24) production units A (50-ohm Stub Tuners) to ITER Organization (IO) in one shipment. The First Article production unit A shall not be shipped prior to the shipment of the twenty-three (23) production units A.

The Seller shall arrange the shipping of the eight (8) production units B (Triple-Stub Tuners) to ITER Organization (IO) in one shipment. The First Article production unit B shall not be shipped prior to the shipment of the seven (7) production units B.

The IO address is shown below:

ITER Organization
Attn: Yanchun Qiao
Route de Vinon sur Verdon, CS 90 046
13067 St. Paul lez Durance CEDEX
FRANCE

Contact: Yanchun Qiao
Tel :+33-4-42-17-62-57; Cell: +33-6-26-31-29-96
E-mail: Yanchun.Qiao@iter.org

- **Duty Free Declaration**

  Shipments on behalf of the ITER International Fusion Energy Organization ("ITER Organization") for its official use are eligible to duty-free customs clearance under the Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, done in Paris on 21 November 2006 and ratified, accepted, and approved by the People's Republic of China, EURATOM (for the European Union and Switzerland), the Republic of India, Japan, the Republic of Korea and the Russian Federation. DIPLOMATIC SHIPMENT on behalf of the ITER Organization. FOR DUTY-FREE CUSTOMS CLEARANCE.

- **Consignor** (Seller's name, address, and contact information)

2. Itemized packing list on Seller's letterhead detailing the following at a minimum for each package:
   - Subcontract Number
   - Package number (sequential number assigned to each package)
   - Package type (e.g., wooden crate, item on pallet, etc.)
   - IO Part Number(s) (PNIs) (if applicable)
   - Seller's 50-ohm Stub Tuners' part numbers and serial numbers

- Seller's Triple-Stub Tuners' part numbers and serial numbers
- Item Description
- Quantity of each item
- Gross Weight (kg)
- Net Weight (kg)
- Dimensions (cm)
- Volume (m^3)
- Special Handling Instructions
- Storage Instructions (e.g., indoor, conditioned space)
- **Declaration of Integrity**

  The undersigned hereby certifies that the components and package(s) described on this Packing List meet the contractual requirements with the exception of any approved deviations and non-conformance reports specified in the associated documentation.

NOTE:	The invoice, packing list and other documents, where appropriate, must be acceptable to the importing country's Customs agency. The LSP will review submitted documents and request amendments where required. If amendments are requested, Seller must update and submit revised documents within seven (7) working days.

3. Export Control License(s) or other authorization documents if required.

7.1.2.3 Pre-shipment Deliverable Package No. 3

See Section *2.2.3 Pre-Shipment Deliverable Package No. 3* of [22].

7.1.2.4 Pre-shipment Deliverable Package No. 4

See Section *2.2.4 Pre-Shipment Deliverable Package No. 4* of [22].

7.1.3 Package/Crate Marking

See Section *2.3 Package Marking* of [22].

7.1.4 Deviations from Planned Date of Shipment

See Section *3. Deviations from Planned Date of Shipment* of [22].

7.1.5 Storage of Finished Products

See Section *4. Storage of Finished Products* of [22].