CALL FOR TENDER

FABRICATION OF SEGMENTS 2,3 and 4 OF ESS-BILBAO RFQ LINAC. TECHNICAL DESCRIPTION (ENGLISH VERSION)

Expediente: 141/20

ESSB-RFQU-VN90-06

CONTENTS

Acrónimos

RFQ	Radio Frequency Quadrupole
ESS	European Spallation Source
Linac	Linear Accelerator
ISHP	Ion Source Hydrogen Positive
LEBT	Low Energy Beam Transport
MEBT	Medium Energy Beam Transport
DTL	Drift Tubes Linac
FETS (RAL)	Front End Test Stand (Rutherford-Appleton Laboratory)
TDR	Technical Design Report

0. ABSTRACT AND DISCLAIMER

This tender refers to the machining and assembly of segments 2, 3 and 4 of the device named RFQ. This device is a linear accelerator (LINAC) that has been designed during past years by ESS-Bilbao. The LINAC will be part of ESS-Bilbao accelerator installed in Zamudio (Bizkaia, Spain).

DISCLAIMER:

The English version of the Technical Specifications Document is provided in good faith as a courtesy to international bidders. To the best of our knowledge, there are no differences between the technical specifications in this document and the ones in the document in Spanish. In any case, the Spanish document is the only one with legally bounding attributes.

1. INTRODUCTION

1.1 Introduction to ESS Bilbao

Consorcio ESS-Bilbao (ESS-Bilbao Consortium) is an strategical center for neutron technologies, supported by the Spanish Ministry for Science and Innovation and the Autonomous Community of the Basque Country. ESS-Bilbao provides knowledge and added value through the in-kind contributions to the European Spallation Source, ESS.

The ESS-Bilbao Consortium has also the objective, as described on its foundational documents, of becoming an independent research center devoted to developments in Science and Technology in the field of particles accelerators. To fulfill this objective, besides its main activity of supplying the Spanish in-kind contribution to ESS project, ESS-Bilbao Consortium develops a program aimed to fulfill the design, fabrication and operation of a proton linac in its Zamudio facilities. For this purpose, the fabrication of the RFQ device was tendered.

1.2 Introduction to the RFQ

The RFQ (for Radio Frequency Quadrupole) is a proton accelerator that is part of the linac chain planned for ESS-Bilbao. Particles, once produced in the ISHP ion source, and after being transported and measured in a Low Energy Beam Transport (LEBT) line, will be accelerated from a kinetic energy of 45 keV up to 3 MeV. This acceleration is done in the RFQ device.

High intensity proton or light-ion linacs always include an RFQ in the mentioned energy range, as a preliminary stage before acceleration by other cavities such as DTLs or superconducting cavities, as is the case, for example, of ESS, FETS (RAL) or LINAC4-CERN linacs.

ESS-Bilbao RFQ was designed by a local team of researchers and engineers. The design is summarized in a TDR document and in several technical and scientific publications available in ESS-Bilbao web page. Design has been submitted to reviews by panels of international experts before the fabrication was approved by ESS-Bilbao Steering Committee and Council. The RFQ, once finished, will be installed after the ion source and the LEBT, already fabricated and in operation, in the ESS-Bilbao facilities at the Technology Park in Zamudio (Bizkaia, Spain).

The ESS-Bilbao RFQ has a length of about 3 meters. It is the union of four segments (each one of around 800 mm in length). A picture of the whole device can be seen in Fig. 1. Each of the four segments is itself an assembly of other four components, named vanes. All is fabricated in Oxygen-free grade copper.

The first of the four segments has been already fabricated (ESS-Bilbao file 216/15). The fabrication of segments 2 to 4 will be executed according to the technical drawings made by ESS-Bilbao that will be supplied at the beginning of the contract. This tender documents includes examples of these technical drawings that contains enough information so that each tenderer can quantify the work to do and elaborate an offer. The raw material, as OFHC Copper blocks, will be provided by ESS-Bilbao.

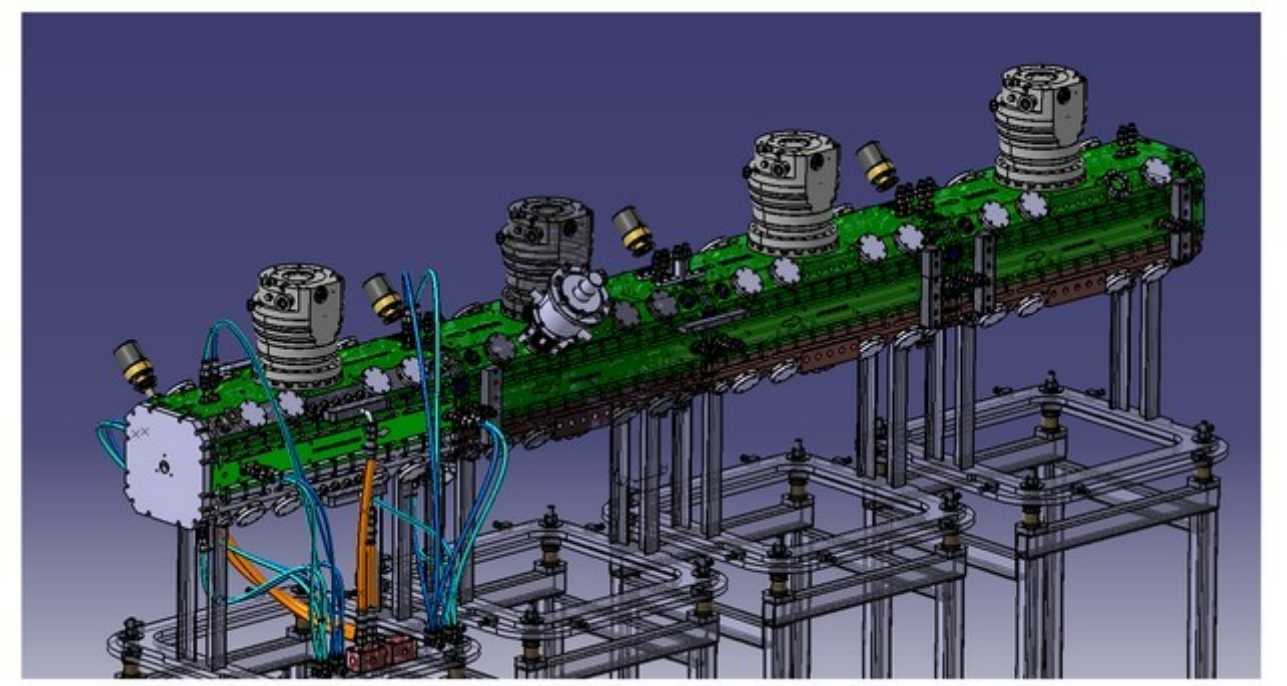


Figure 1: Picture of the RFQ assembly, where the four segments can be seen. Also, some details of other elements (support, vacuum pumps, cooling pipes) that are not part of this tender are shown for illustration purposes.

2. SCOPE OF THIS TENDER

The scope of this tender is the **machining of the vanes** corresponding to the segments 2, 3 and 4 of ESS-Bilbao RFQ, its **assembly and fixation** using bolts and screws, the **dimensional measurements** (during intermediate states and of the final state of each vane and of the final assembly of each segment) and the **machining of the mechanical elements** to ensure the repeatability of the segments assembly. Each segment is build by assembling four vanes (two major vanes and two minor vanes), so in total twelve (12) vanes has to be machined.

The tenderer must **propose a fabrication procedure** (that, at least, has to include the fabrication process and process control points) starting from the copper blocks provided by ESS-Bilbao. The fabrication process has to ensure the fulfillment of specifications. The procedure has to include (apart from the final measurements) an **intermediate stage dimensional measurements** of the plane faces external to each segment, that will be used as reference for the alignment and assembly of the segments. Also, the cooling channels need a **welding** for the channel plugs, that will be carried out by Electron Beam Welding or similar. The tenderer will propose a welding procedure for this.

The fabrication will be carried out according to the technical drawings that ESS-Bilbao will provide to the supplier. The raw material (copper blocks of adequate size) will also be provided by ESS-Bilbao. The description of the elements to be made, as well as a selection of example technical drawings that are considered enough so that the tenderer can elaborate an offer, are described in section 3 “Technical requirements”.

In the technical drawings there is described a tentative fabrication process. This procedure is based on the experience gained during the fabrication of the first RFQ segment, and it is provided as a suggestion to the tenderer. It will be part of tasks to be done by each tenderer to propose a full fabrication procedure that includes all stages and their details (like thermal treatment, for example), starting from the copper blocks up to the final assembled segments. The final technical drawings that will be used for fabrication will include these procedure details, so final drawings can be different to the example ones offered during tendering. The procedure stage corresponding to the intermediate dimensional measurement of the reference plane faces of each piece is a milestone that has to be included in the proposed fabrication procedure.

2.1 Deliverables

Contract deliverables are listed here:

1. The **twelve (12) vanes machined** from copper, according to the final approved technical drawings, fulfilling all their technical characteristics (tolerances, dimensions, holes with Helicoil, …) according to each individual vane drawing and the segment assembly drawing.
2. **A quality plan (PQP) for the project.**
3. **A detailed execution planning.**
4. **Cleaning procedure.**
5. **A welding dossier for the cooling channels plugs welding.**
6. **Material certification 3.1, in case it is needed** (purchasing of additional raw material).
7. **Metrology reports for the final state of each individual element** (vane), including all the measurements pointed out in the drawings for this purpose. The accept or rejection of the pieces will be substantiated on these measurements, maybe together with additional measurements done by ESS-Bilbao in a certified organization.
8. During the fabrication of each element (vane) an i**ntermediate metrology report** will be provided. The intermediate fabrication stage for this will be one when the external plane faces of each segment are machined. This is required to assure the adequate flatness and parallelism of the plane faces used as reference for assembly and alignment of the segments.

9. After the machining of the vanes, an **assembly of each segment** will be done. A new **dimensional measurement** of this assembly will be carried out, showing that the four vane tips are within specifications.

2.2 Tasks to be done by the supplier

The tasks to be done by the supplier are:

- Analysis of the technical drawings proved by ESS-Bilbao, with the aim of ensuring the adequate understanding of the requirements and the special characteristics of an RFQ (modulation, tolerances, agreed fabrication procedure…).

- Fabrication of the individual elements (vanes) that made up the three segments. In total, 12 pieces (all of them different) will be machined, as described in Section 3.

- Dimensional measurement during the intermediate fabrication stage (after roughing and squaring stages) of the measurements pointed out in the corresponding page of the technical drawing for each piece. The fabrication procedure of each piece will not continue until the explicit written approval by ESS-Bilbao of each measurement report.

- Measurement of the final state of the pieces. All the measurements pointed out as “required” in the approved technical drawings have to be included in the report. A report for each of the pieces has to be provided by the supplier.

- Hydraulic tests on the cooling channels, and corresponding reports.

- Assembly of each of the three segments from their corresponding four vanes; assembly and fixation of the segments. Measurement of the assembly, showing in a report that the four vane tips distances are within specifications.

- Machining of the final elements (dowel pins or similar) on the final (verified and approved) assembly, so that the assembly can be repeated afterwards with the same relative distances.

- Delivery of the fabricated pieces to ESS-Bilbao facilities in Zamudio (Bizkaia, Spain). This will be done once the pieces have been validated and approved by ESS-Bilbao, based on the measurement reports. The delivery will be done in the order described in Section 3.

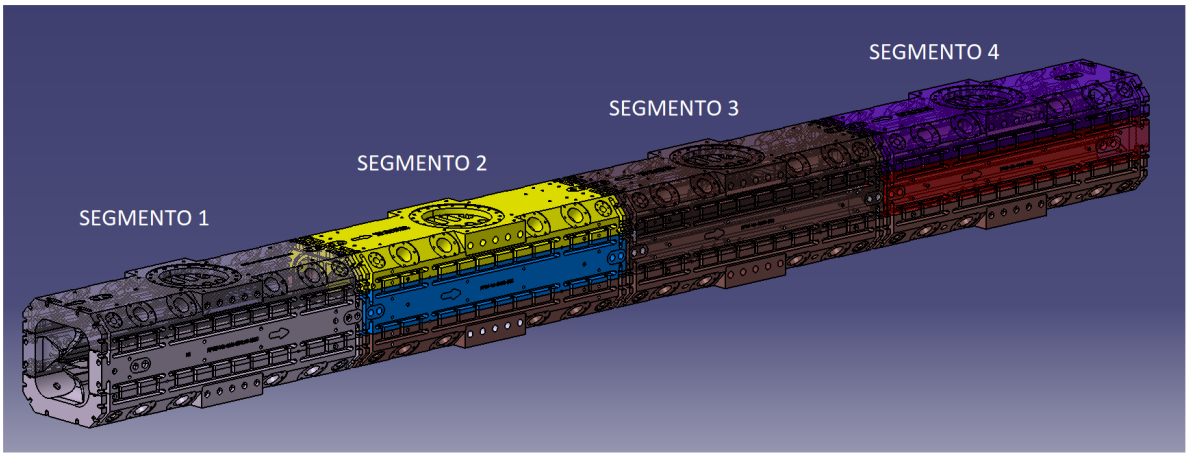
3. TECHNICAL SPECIFICATIONS

3.1 Elements to be machined

The elements to be machined within the present contract can be seen in Figure 2 and are specified in the Table 1. In total, 12 different pieces will be machined. The code naming of the pieces has for digits with the format S00X, where S digit corresponds to the segment (2, 3 or 4). Each of the 12 pieces is different from each other, but all of them can be grouped in the following categories for classification:

- Major vanes for intermediate segments:
Pieces number 2001, 2002, 3001 y 3002 (4 pieces in total, all different from each other)
- Minor vanes for intermediate segments:
Pieces number 2003, 2004, 3003 y 3004 (4 pieces in total, all different from each other)
- Major vanes for rear segment:
Pieces 4001 y 4002 (2 pieces in total, both different from each other)
- Minor vanes for rear segment:
Pieces 4003 y 4004 (2 pieces in total, both different from each other).

In all the contacts between vanes, the flat face for the lower position vane includes always the machining of a channel for the vacuum polymeric gasket. This channel is not included in the face of the upper positioned vane. This detail makes all vanes different, and will be perfectly detailed in the the technical drawings that will be issued for each individual piece.



Tipos de pieza			
Pieza grande sin quilla	Pieza pequeña sin quilla	Pieza grande con quilla	Pieza pequeña con quilla
2001, 2002, 3001 y 3002	2003, 2004, 3003 y 3004	4001 y 4002	4003 y 4004
Ofertar con plano RFQU-VN-2002-ESS.xx	Ofertar con plano RFQU-VN-2003-ESS.xx	Ofertar con plano RFQU-VN-4002-ESS.xx	Ofertar con plano RFQU-VN-4003-ESS.xx

Figure 2: Picture showing the different vane to be machined (vanes for segments 2, 3 and 4), together with segment 1 that is already fabricated.

Table 1: Code name of each of the drawings for the twelve (12) pieces to machine, pointing out (background color yellow, blue and red) the example ("tipo") drawings that are provided in this tender (see section 3.2) in order for the tenderer to elaborate the economical offer.

Conjunto	Pieza	Planos 2D licitacion		Materia prima	Unidades a fabricar
Segmento 1	1001	No aplica		No aplica	N/a
	1002				N/a
	1003				N/a
	1004				N/a
Segmento 2	2001	RFQU-VN-2001-ESS.xx	Tipo 2002	Disponible	1
	2002	RFQU-VN-2002-ESS.xx	Disponible	Disponible	1
	2003	RFQU-VN-2003-ESS.xx	Disponible	Disponible	1
	2004	RFQU-VN-2004-ESS.xx	Tipo 2003	Disponible	1
Segmento 3	3001	RFQU-VN-3001-ESS.xx	Tipo 2002	Disponible	1
	3002	RFQU-VN-3002-ESS.xx	Tipo 2002	Disponible	1
	3003	RFQU-VN-3003-ESS.xx	Tipo 2003	Disponible	1
	3004	RFQU-VN-3004-ESS.xx	Tipo 2003	Disponible	1
Segmento 4	4001	RFQU-VN-4001-ESS.xx	Tipo 4002	Disponible	1
	4002	RFQU-VN-4002-ESS.xx	Disponible	Disponible	1
	4003	RFQU-VN-4003-ESS.xx	Disponible	Disponible	1
	4004	RFQU-VN-4004-ESS.xx	Tipo 4003	Disponible	1

3.2 Drawings provided in order to elaborate the tender

In the present document for technical specifications, and with the only aim that the interested companies can quantify the cost of the fabrication of the elements that are in the scope of the contract, several example drawings are provided. These drawings are representative elements of each vane category specified in Section 3.1, together with an assembly drawing for one of the segments. The selected pieces are the ones with blue, yellow or red colors in Figure 2. Within each of the families, each piece is different because of the inclusion or not of the channel for the vacuum gasket.

To be more specific, in this tender document are attached (see Annex 1) drawings for the following pieces:

- Drawing RFQU-VN-2002-ESS.02 (4 different vanes will be fabricated similar to this).
- Drawing RFQU-VN-2003-ESS.02 (4 different vanes will be fabricated similar to this).
- Drawing RFQU-VN-4002-ESS.02 (2 different vanes will be fabricated similar to this).
- Drawing RFQU-VN-4003-ESS.02 (2 different vanes will be fabricated similar to this).
- Drawing RFQU-VN-2000-ESS.03 (assembly for segment 2).

The last two digits of these coding (see section 3.3) correspond to the version number of each drawing. The drawings provided in the final tender can be different to the ones listed above.

3.3 Drawings that will be provided at the start of the contract

At the beginning of the contract the technical drawings for all the vanes to be machined will be provided. An assembly of each of the segments (assembly of two major and two minor vanes) will also be provided. The drawings will include a pages with the measurements to be done in the intermediate fabrication stage for the control of flat reference faces.

Together with the drawings, each piece will have a 3D CAD file that will have the same naming and that will match the corresponding drawing in all details. The CAD file will include details that cannot appear in the

drawings due to technical reasons, in particular the modulation curve for each of the vanes, which is the most critical element of an RFQ. The required tolerances for the modulation are described in the drawings and are explained in section 3.5.

The drawings will have the following code naming: RFQU-VN-YYYY-ESS.xx. The RFQU stands for RFQ project, the VN for vanes; the four digits YYYY identify each piece. The drawing name includes a version number (xx). It will be the supplier responsibility to be sure that all the machining operations are carried out according to the most updated version of the drawings, that will be officially provided by ESS-Bilbao during project time according to the agreed procedure between ESS-Bilbao and the supplier.

Before starting the fabrication, ESS-Bilbao has to confirm that the drawings are in their most updated version and the supplier has to confirm that they can execute the fabrication according to these drawings.

3.3.1 Proposed fabrication plan

The tenderer, as part of their technical proposal, will have to review the fabrication procedure and could propose an alternative procedure to the one suggested in the drawings. The external characteristics of the vanes and their holding or fixing elements can be changed, provided that the internal geometry and the critical tolerances pointed out in the drawings are fully fulfilled. In any case, the proposal should be approved by ESS-Bilbao and included in an updated version of the drawings and CAD files before they can be carried out.

3.4 Raw material

The raw material for the fabrication of the 12 pieces will be provided by ESS-Bilbao. These are 12 blocks of hot rolled OFHC Copper, of ASTM grade B248 C10100 (ISO Cu-OFE), with a maximum oxygen content of 5 ppms. The blocks have the following sizes:

- Blocks for major vanes: 140 x 270 x 830 mm
- Blocks for minor vanes: 140 x 115 x 830 mm

In the case that, during the fabrication process, it is needed to purchase more raw material, whatever the reason for this, the purchasing will be done by the supplier, that will purchase it in the market, at their own expenses, ensuring a certification EN10204 3.1 according to the material specification provided by ESS-Bilbao.

Any material purchased should be adequately received to ensure the fulfillment of cited Material Specification, and this step will be documented in a reception report that will be attached to the 3.1 certification.

The tracking of all materials should be total and guaranteed at all times.

3.5 Geometric tolerances

All the geometric dimensions with a required tolerance are so specified in the drawings. In case of discrepancies, the tolerance figures that appear in the drawings are the ones to fulfill.

The tolerance in the modulation (vane tip) appears in the drawings as required tolerance of 0.020 mm. This value refers both to the maximum deviation in the modulation curve measured along the vane tip, and to the transverse section shape of the tip, as it is described in the next paragraphs.

An example of a modulation curve is shown in Figure 3 (curve for segment 2 major vanes). The spatial variation of the vane tips follows a very precise trajectory, that is adequately defined in the corresponding CAD files. The required tolerance of 0.020 mm for these curves implies that the fabricated profile has to be within a range of +0.010 mm and -0.010 mm around the design curve, as is shown in Figure 4.

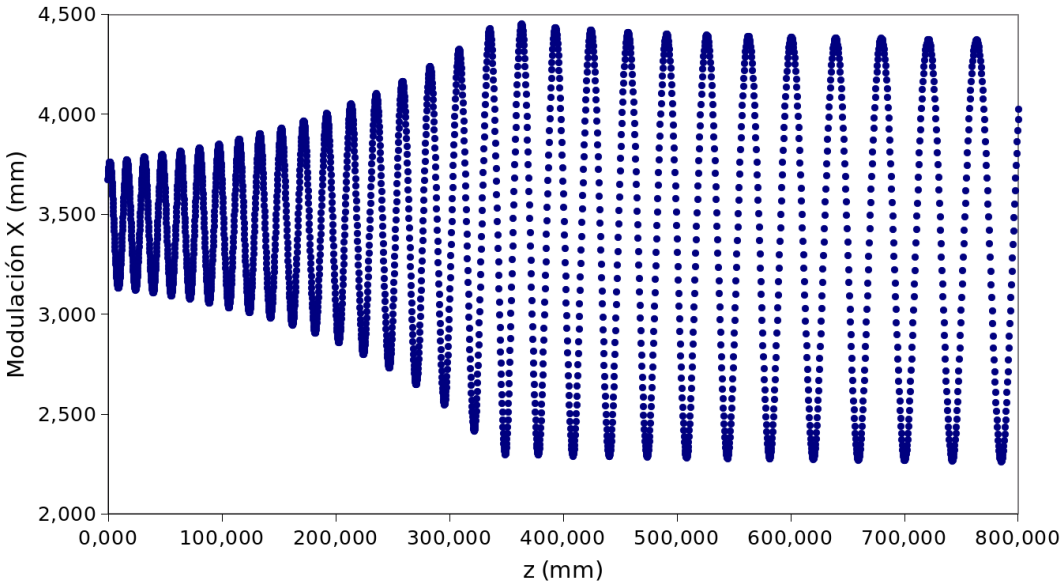


Figure 3: Example of modulation (segment 2, positive X).

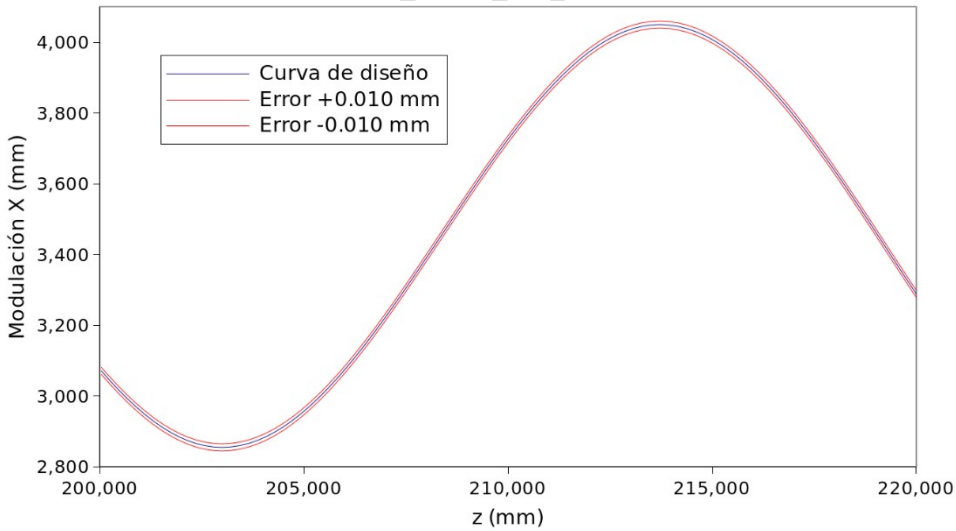


Figure 4: Longitudinal tolerance for the modulation.

The cross section of the tip of each of the vanes has to be also within a (-0.010 mm, +0.010 mm) range around the semicircular designed cross section.

Also, a geometric tolerance on the assembly of the four segments is also requested. This tolerance, as can be seen in 5: Vane tips cross-section tolerances for individual vanes (left) and for the assembly (right)., has a value of ±0.030 mm in the assembly, and will be demonstrated by a metrology measurement of the

assembly of each segment. For this reason, the measurement will only be done in the front and rear extremes of the modulation, within the reach of the measuring device.

In the above mentioned measurements, it will be shown that the deviation of the vane tips of the assembly, with respect to the design geometry, will be within a ±0.030 mm range.

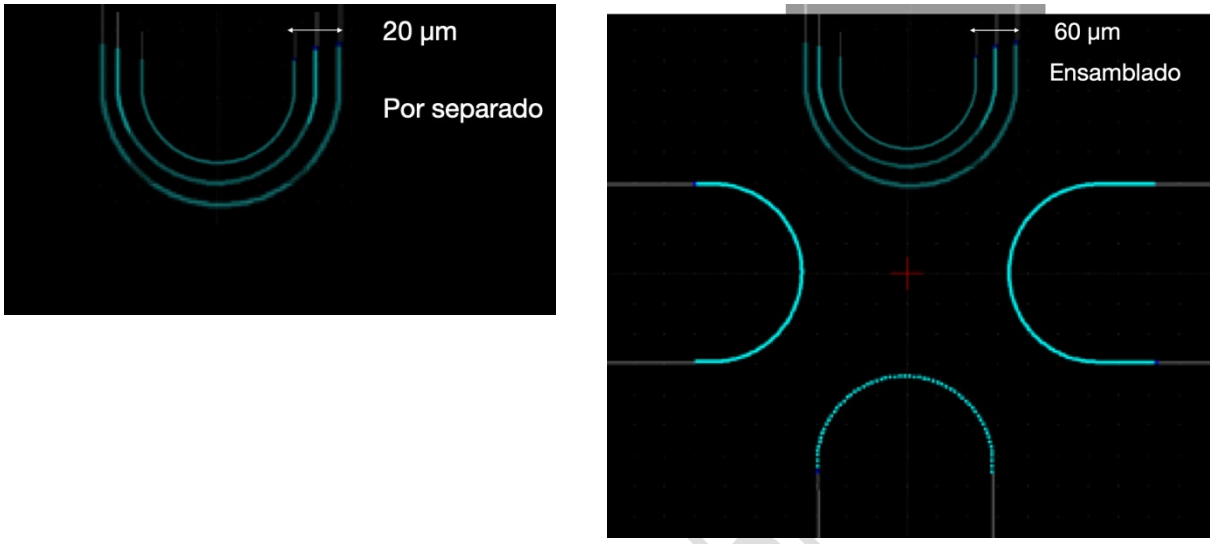


Figure 5: Vane tips cross-section tolerances for individual vanes (left) and for the assembly (right).

3.6 Order for the delivery of pieces

The supplier will fabricate the vanes in the order that best suits them (according to the fabrication procedure), but the pieces delivered to ESS-Bilbao should follow the order described below:

1- Segment 2 pieces (2001 a 2004)
2- Segment 2 pieces (3001 a 3004)
3- Segment 2 pieces (4001 a 4004)

3.7 Facilities and equipment to use during the contract

The tenderer will describe in the offer which equipment and facilities are proposed to be used for the machining and measuring of the elements. Also, it will be clearly specified which facilities are owned by the tenderer and which ones correspond to subcontractors.

3.7 Weldings

For the welding of the plugs of the cooling channels, a welding plan should be provided. This include a welding dossier including a welding map with the details of all the welding to be done, the selected welding method (EBW or other), the welding procedure (WPS), the certification that supports it (WPQR certification) and the qualification of the operators to execute it.

- The WPS have to follow the standard EN 15609
- The WPQRs have to be qualified according to EN 15611 (if they can be justified with demonstrated experience) or according to EN 15614-6 o EN 15614-11
- Weldings will, in any case, will be done in a high vacuum environment (10E-05 mbar)

After the welding are done, the following inspections will be carried out:

- Visual inspection (photograph) of the finished welding, for the three welding/vane.
- Visual inspection (photograph) of the welding after the surface machining, only for the external welding.
- Pressure test (at 20 bar) for the three weldings.

In the case of using a welding material addition, a certified EN10204 3.1, with adequate tracking, will be provided. The facilities and equipment used for welding will be up to date in maintenance operations, in order to avoid the contamination of the materials during the welding.

No other or temporal weldings will be done in the vanes, except after an explicit agreement from ESS-Bilbao.

All weldings should withstand the pressure test at 20 bar described in section 4.1.2.

3.8 Other considerations about fabrication and finishing of the pieces

During machining only halogen-free and silicone-free machining coolants will be used, in order to avoid contamination. The tenderer will propose the machining coolant to be used, and the same one will be used for all the vanes.

The finished pieces will be cleaned to a state where they are ready for assembly. All surfaces will be delivered free of contamination, greases, cutting chips, hydro carbides or any other substance that could alter the capacity for high vacuum of the segments. The tenderer will provide, as part of the offer, a detailed cleaning procedure, adequate for their fabrication facilities. The procedure, including the cleaning chemicals to be used, are part of information to provide during the tender process.

After cleaning, each individual piece will be stored in a clean space free of dust and isolated form external ambiance, avoiding corrosion or oxidation of surfaces by ambient humidity.

4. TESTS AND VERIFICATION

4.1 Tests to be run by the supplier

Before running the tests, the supplier will provide an inspection plan that include inspection points and acceptation thresholds. This plan will be sent to ESS-Bilbao for approval and insertion of warning (W) and halt (H) points.

ESS-Bilbao keeps the right to be present, or to be represented by an external organization (selected by ESS-Bilbao) in order to track the tests preformed by the supplier or their subcontractors. The supplier should notify with at least 10 working days time the proposed date for each of the tests specified in the inspection plan as W or H.

The supplier will provide all the tools and means required for the tests needed to verify the technical specifications. These tests are described in the following sections.

4.1.1 Metrology, dimensional control

Each of the 12 individual pieces (vanes) will have a corresponding metrology report, elaborated by a certified agent, according to a procedure previously agreed and approved by ESS-Bilbao. The measurement of the required geometric entities, as specified in the drawings, will be part of the report. An additional measurement, with the corresponding report, will be done in the intermediate fabrication stage where the external flat surfaces are finished. This report will be approved by ESS-Bilbao before the fabrication procedure of the piece can be carried on. Finally, a measurement of the assembly of each segment will be done after the assembly, so the four vane tips are shown to be within the 0.030 mm tolerance range. Once this report is approved, the machining of the last elements (dowel pins or similar) will be carried out.

Metrology reports will include the measurement values and also the measurement files, both the raw files and “best fit” curves.

The calibration of measuring equipment used for testing will be shown according to ISO 17025.

4.1.2 Hydraulic tests

Each one of the cooling circuits will be pressurized up to 20 bar to test for leakages. After one hour, pressure should be reduced less than 2% (0.4 bar) compared to the starting one. After the tests, each channel has to be emptied and dried using nitrogen. The test will be carried out according to a EN13445-complain procedure, and the tests will be documented with a report that will be part of the deliverable records.

4.2 Tests to be done by ESS-Bilbao

ESS-Bilbao keeps the right of repeating any of the above mentioned tests before accepting the products. These accepting tests could be carried out at most in a 2 months time after reception in ESS-Bilbao.

The supplier will be informed of any test that is does not fulfill requirement. In this case, and at the supplier expenses, the supplier could send an inspector to cross-check ESS-Bilbao findings. The tests that are shown to be in no agreement to the requirements will be sent to the supplier for repairing or replacement.

Non-compliance

Any deviation from the technical requirements presented in this document, or in any other project document approved by ESS-Bilbao, will be immediately documented in a “Non-Compliance Document” according to the supplier quality system, and will be sent to ESS-Bilbao together with a proposed contingency plan to be approved by ESS-Bilbao.

5. CONTRACT RUNNING

5.1 Project timetable and deliverables

As part of the technical proposal, the tenderer will send a project plan. The milestones pointed out in the next table could be optimized by the tenderer, according to that is written in the "Annex 8 of the Administrative Terms Document".

Milestone	Delivery time	Deliverable	Percentage of contract value (%)
H0. Contract signing and kick-off meeting	T0		0
H1. Critical Design Review (CDR)	T0+1 month	Approval of the technical documentation required before fabrication can start: • Cleaning procedure • Project Plan (Detailed timetable, PPI, approved final drawings) • Quality plan • Testing procedure • Risks evaluation	30
H2.1 Acceptance of intermediate metrology reports number 1 to 4.	T0 +8 months		5
H2.2 Acceptance of the final metrology reports (vanes and assembly) and testing reports (cooling channels) for Segment 2 vanes	T0 +10 months		5
H2.3 Delivery of the vanes for segment 2 (2001 to 2004) to ESS-Bilbao facilities in Zamudio	T0 +12 months	Segment 2 pieces (2001 to 2004)	0
H2.4 Reception and acceptance by ESS-Bilbao of the pieces for segment 2 (2001 a 2004).	T0 + 14 months		10
H3.1 Acceptance of intermediate metrology reports number 5 a 8	T0 +10 months		5
H3.2. Acceptance of the final metrology reports (vanes and assembly) and testing reports (cooling channels) for Segment 3 vanes	T0 +12 months		5
H3.3 Delivery of the vanes for segment 3 (3001 to 3004) to ESS-Bilbao facilities in Zamudio	T0 + 14 months	Segment 3 pieces (3001 to 3004)	0
H3.4. Reception and acceptance by ESS-Bilbao of the pieces for segment 3 (3001 a 3004).	T0 + 16 months		10
H4.1 Acceptance of intermediate	T0 + 14		5

metrology reports number 9 a 12	months		
H4.2. Acceptance of the final metrology reports (vanes and assembly) and testing reports (cooling channels) for Segment 4 vanes	T0 + 16 months		5
H4.3 Delivery of the vanes for segment 4 (4001 to 4004) to ESS-Bilbao facilities in Zamudio	T0 + 18 months	Segment 4 pieces (4001 to 4004)	0
H4.4 Reception and acceptance by ESS-Bilbao of the pieces for segment 4 (4001 a 4004).	T0 + 20 months		20
TOTAL			100

5.2 Contract tracking

During the first two weeks after the signing of the contract, a Kick-Off meeting will be held at ESS-Bilbao facilities (or by remote connection technology). In this meeting, the supplier will designate a person as "Dedicated Engineer" for the project and for the communications with ESS-Bilbao. The technical and progress tracking meetings timetable will be agreed between the parts during this meeting. A Kick-Off meeting act will be written after agreement.

The supplier will send a progress report to ESS-Bilbao on a monthly basis during the contract and up to its ending. Depending on the project status, this report should include, at least, a list of activities performed and of the milestones achieved from the previous reports. Also, any delay or technical issue that could affect the pieces or the project planning will be included, together with the proposed solutions to cope with them and an updated timetable and list of milestones.

The supplier will inform ESS-Bilbao immediately and in written format of any remarkable issue during the fabrication process. The supplier will point out corrections actions in order to reduce the impact or delays in the deliverables of such issues.

During the project time, the supplier should inform, as soon as possible, of the detected risks or worries relative to the non-fulfillment of any of the technical specifications, including an explanation of why the specifications will not be fulfilled. These reports do not imply that the supplier is free from their responsibility in the fulfillment of the contract details nor the compliance with the timetable. The delays in the delivery of the vanes will have the consequences so legally established, according to the "Administrative Specifications Document".

ESS-Bilbao keeps the right to visit the supplier or their subcontractors facilities at any time. The visits could include any aspect or the contract as described in the activities program and the testing.

5.3 General rules and Quality assessment

The supplier will establish, and follow accordingly, a plan to ensure the quality aspects of the contract according to ISO 9001 or equivalent, for the fabrication and testing of the segments, including inspections and tests.

The acceptance or approval by ESS-Bilbao of any procedure or test does not imply that the supplier do not need to comply with the terms and specifications of the contract, according to what it is stated in the Tender Documents, nor any other obligation according to the Spanish Law for Public Contracts (Ley de Contratos del Sector Público).

5.4 Storage, transport, packaging and delivery.

The supplier is the responsible for the storing, packaging and transport to ESS-Bilbao facilities. The supplier will ensure that all the pieces are stored in an area that will not alter their state (avoiding oxidation or any kind of damage during manipulation). All the transport operations and pieces movement during the contract execution will be at the supplier expenses. This includes the transport of the initial copper blocks from Zamudio to the supplier facilities, the transport of intermediate states between possible subcontractors and the transport and delivery of the final pieces to ESS-Bilbao in Zamudio (Bizkaia, Spain).

The supplier will ensure that the elements are delivered with no damage due to transport, that will include an adequate insurance (at the supplier expenses) for the transport.

In the external side of the packages the following information will be clear:

a) Contact person
b) Delivery address
c) Contract number
d) Sizes and weight of the components

6. ANNEX:

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Technical drawings