



Science & Technology Facilities Council

Rutherford Appleton Laboratory

<p>MARI Instrument Neutron Guide Specification</p>	<p>Document Ref: ISIS-TS1-MARI-SP-0001</p>
<p>Project: MARI – TS1 – GUIDE PROJECT</p>	<p>Date: 20/05/2016</p>
<p>Author: Simon Waller</p>	<p><b>ISSUED</b> Version 1.0</p>



The document will be controlled by the ISIS document change procedures.

## Document Location

The source of the document will be found on the project SharePoint:

<http://www.facilities.rl.ac.uk/isis/projects/ts1/MARlguideupgrade/default.aspx>

## Revision History

Revision date	Previous revision date	Summary of Changes	Changes marked

## Approvals

This document has the following approvals:

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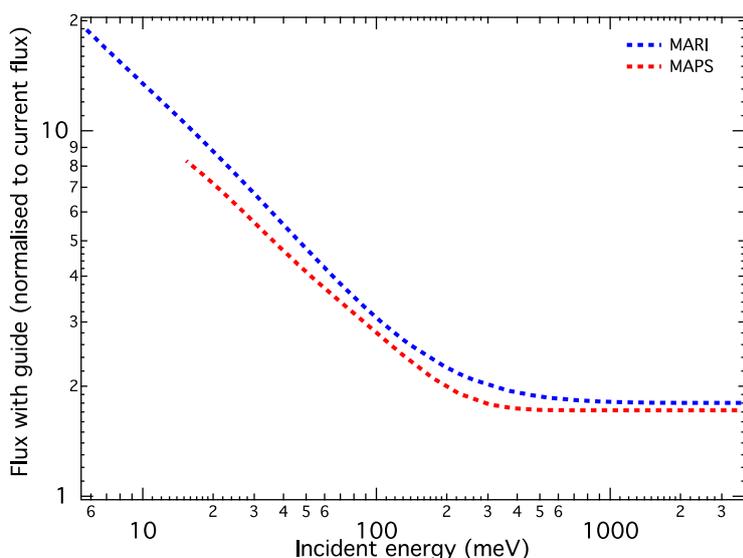
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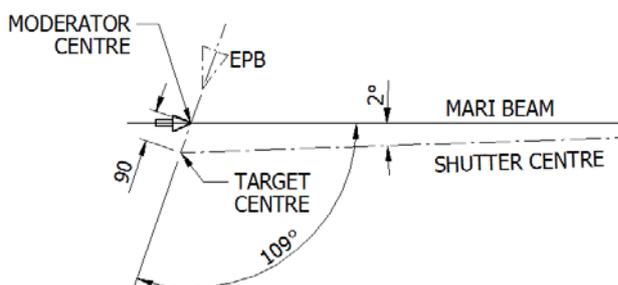
## 1 Introduction

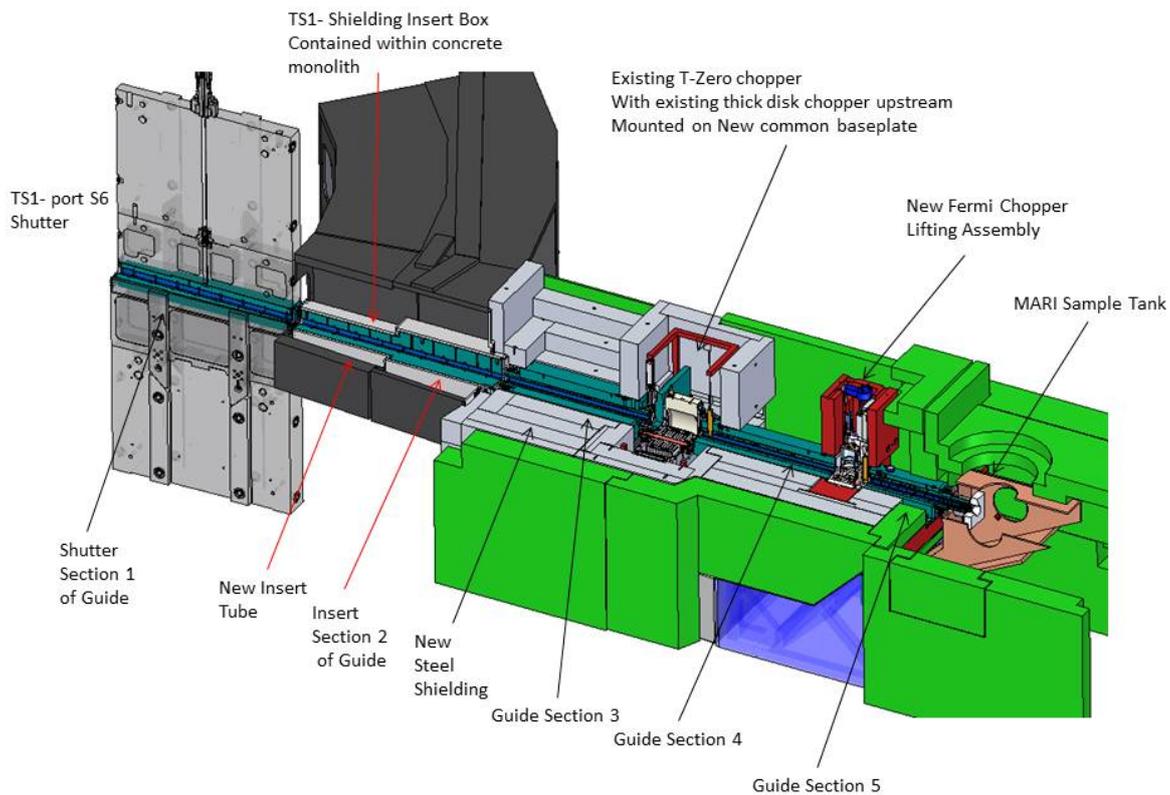
The MARI spectrometer is now over 25 years old. Despite its age, the configuration of the instrument with a 4m secondary flight path, continuous detector coverage and a view of the TS1 110 K liquid methane moderator give the instrument a unique capability for certain science problems that remains unmatched even at the new generation of short pulse spallation sources – particularly in the area of wide-angle lattice dynamics measurements on powder and polycrystalline samples. The single biggest issue facing the MARI user community is the manner in which the incident flux of the instrument constrains the science program. The most straightforward way to extend the science program is to increase the incident flux of MARI by installing a straight  $m=3$  supermirror neutron guide. The calculated increase in flux as a function of incident wavelength is shown in Fig 1.



*Fig. 1 Results from neutronic simulations showing the incident flux gain factor as a function of wavelength for MARI (and the MAPS spectrometer for comparison) both with  $m=3$  supermirror guides installed. The guide gains are very similar (as expected) with MARI stretching farther than MAPS into the cold neutron region below 20 meV*

At a standard running configuration of 4%  $\Delta E/E_i$  energy resolution at the elastic line the thermal incident neutron flux on MARI (between 20 and 150 meV) is around 3000-4000 neutrons / cm<sup>2</sup> / s. This is around a factor of 20 less flux than is available on MERLIN (at a lower resolution of  $\sim 5\%$   $\Delta E/E_i$ ). This – combined with a much reduced detector coverage of a factor of 5 – renders the sensitivity of MARI around a factor of 100 less than MERLIN (across the entire detector). This upgrade on MARI will increase the thermal flux by a factor of 10 (perhaps rising to  $\sim 20$  assuming predicted gains from the new methane moderator on an upgraded TS1), bringing the flux on MARI into line with modern direct time-of-flight spectrometers, such as ARCS at the SNS. Additionally, the replacement of the MARI disc chopper will allow operation with repetition-rate-multiplication as is currently employed on LET and MERLIN (but not on ARCS or any other instrument at the SNS). The existing MARI instrument is installed on port S6 on TS-1. It views the lower methane moderator which is positioned 90mm upstream of Target centre along EPB at an angle of 109 degrees (horizontal) from the nominal EPB axis. (See attached geometry sketch).





## Basic layout of MARI Guide & Chopper project

### 1.1 Requirements Overviews

We require a fixed price and delivery for the design, manufacture, supply, Installation, testing and alignment of approximately 8.6m of super mirror  $m=3$  guide (Sections 1 to 5) this will include surrounding shielding and vacuum vessels including all components as described in the attached drawings and specification.

All of these components are required to be delivered to Rutherford Appleton Laboratory by 24<sup>th</sup> March 2017.

Final Installation and alignment is planned to take place in August of 2017.

### General Description of complete guide

The overall guide is approximately 8.6m of super mirror coated glass with a reflectivity of  $m=3$  comprising of 5 sections.

The guide geometry will be square in section, tapering with internal dimensions of 90x90mm at upstream end (1660.4mm from moderator centre) to 45x45 mm at sample position which is 11700mm from moderator centre.

All of the guide elements will be designed to operate under vacuum and comprise of the following sections:

1. Section 1 - Approximately 2m of tapered guide (Float glass), contained in steel shielding, incorporating B4C sintered masks and bars, all of which will be inserted into the beam line shutter.
2. Section 2 - Approximately 2.379m of tapered m=3 guide (Boro-float glass), contained in steel shielding, incorporating B4C sintered masks and bars, all of which will be inserted into the beam line insert tube.
3. Section 3 - Approximately 1.593 m of tapered m=3 guide (Boro-float glass), contained in steel shielding, incorporating B4C sintered masks and bars + internal and external inclinometers, all of which will be housed inside an external steel or stainless steel vacuum tube.
4. Section 4 - Approximately 1.499m of tapered m=3 guide (Boro-float glass), contained in steel shielding, incorporating B4C sintered masks and bars + internal and external inclinometers, all of which will be housed inside an external steel or stainless steel vacuum tube.
5. Section 5 - Approximately 1.106m of tapered m=3 guide (Boro-float glass), contained in steel shielding, incorporating B4C sintered masks and bars + internal and external inclinometers, with lateral B4C crispy mix panels, all of which will be housed inside an external steel or stainless steel vacuum tube.

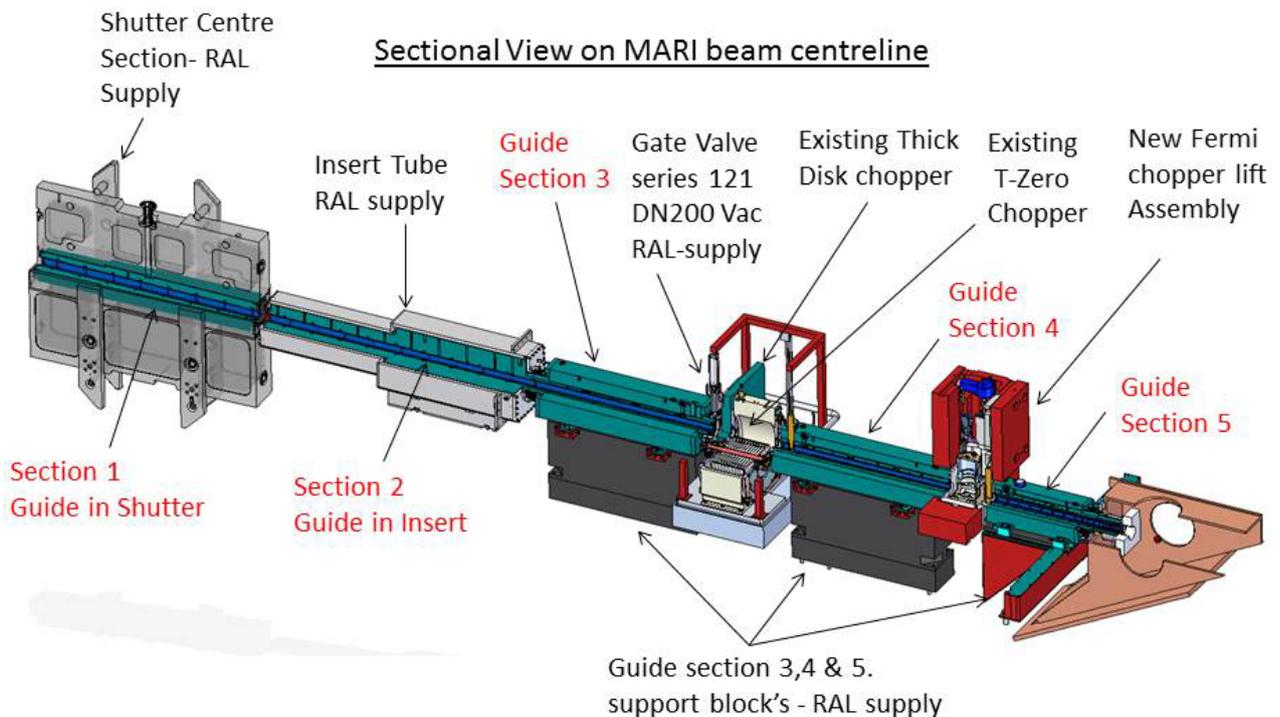


Image of the MARI guide including beam line components.

The scope of supply for Guide, Sections 1 to 5 is:-

- The Neutron float or boro-float tapered Glass Guides with m=3 coatings.
- The design and supply of the inner localised shielding around each guide including B4C sintered bars & masks, additional intermediate mask frames where reqd. (made from S-Dough), Inclinator mounts, Inclinator boards and alignment systems.
- The design and supply of steel / stainless steel vacuum containment vessels, with adjuster systems to position Inner guide assembly and all vacuum fittings, electrical feed through and seals including bellows and anti-compression struts plus external Inclinator mounting positions and tracker alignment nests.
- Guide containment vessel supports and fine pitch alignment features to facilitate final alignment of guide sections.
- The design and supply of the insert tube adapter plate.
- Installation and alignment of equipment supplied.
- A complete set of relevant documentation as detailed within this document which must be written in English.
- Attending Initial kick off meeting at RAL site in Oxfordshire UK.

## **2 Definitions within this document**

STFC - Science and Technology Facility Council

RAL – Rutherford Appleton Laboratory, Chilton, UK

Bidder – Company who offers a tender return

Supplier – Company who is awarded the contract

Tender – The response from the company to this specification

Commencement of contract – The date when the contract is signed.

UKSBS – United Kingdom Shared Business Services Ltd – Procurement Agents acting for and on behalf of STFC

## **3 Description of the Equipment**

The Bidder shall describe the equipment to be supplied in sufficient detail using, 3D models / 2D drawings and written text for STFC to understand the method of construction, alignment, adjustment and clamping to be used in its assembly and during Installation onto MARI Instrument at RAL.

Description of equipment requirement is addressed and assessed in RFP question AW6.3

### **3.1 Programme of Work**

The Bidder shall produce a detailed programme to cover the entire project of design, manufacture and testing of the neutron guide and its associated components, showing all significant tasks. The programme shall include milestones listed in section 4.5 of this document, and is addressed and assessed in RFP question AW6.7.

### 3.2 Outline test document

The Bidder shall provide an outline test document detailing the testing including methods that are intended to be carried out to prove the performance to the technical requirements of this document. The tests as a minimum shall include the following.

- Substrate flatness and neutron reflectivity of a guide sample from each sputtered batch. Results to be approved by STFC before shipment.
- Documented evidence of the alignment of the assembled guide within its localised shielding after final assembly at RAL.

Outline test document requirement is addressed and assessed in RFP document question AW6.5

### 3.3 Quotation

The Bidder shall provide a quotation for the supply of Guide Sections 1 to 5 to include the following:

- a. Design and manufacture.
- b. Delivery.
- c. Assembly & alignment of glass guide sections into their housings 1 to 5 at RAL site. (If not pre-assembled and aligned before delivery – this should be made clear).
- d. Final Installation & alignment of Glass guide Sections 3 to 5 onto Instrument at RAL site. (Guide sections 1 & 2 will be installed by RAL staff having been pre-aligned at supplier's site).
- e. Proof of alignment.

Please ensure prices quoted are itemised in RFP document AW5.2 Price Schedule, as any prices not in AW5.2 shall not be considered.

All the contractual and technical documentation shall be provided electronically and in English.

### 3.4 List of Included Items

The Bidder shall detail all items which will be supplied.

Note – This item should be addressed in your response to AW6.2

### 3.5 List of Excluded Items

The Bidder shall detail items which are not part of their supply.

Note – This item should be addressed in your response to AW6.2

### 3.6 Compliance List

The Bidder shall produce a compliance list indicating compliance or non-compliance with the specification.

Note – This item should be addressed in your response to AW6.2

### 3.7 Statement of Reflectivity

The bidder shall provide a statement of minimum guaranteed percentage reflectivity for **m=3** Guide coatings.

This item should be addressed and assessed in AW6.4

### 3.8 Reference List

References should be provided in accordance with RFP question SEL 5.10

### **3.9 Outline Quality Assurance Plan**

The Bidder shall provide as an attachment, full details of the quality management procedures that will be applied for this contract and project, as a minimum providing a Quality Plan, named quality manager, Q.A. system detailing; manufacturing and inspection of equipment, monitoring systems, control and reporting methods.

Please detail any relevant accreditation or international standards and how these will be applied to the project.

This item should be addressed and assessed in AW6.8

## **4 Contract Technical Liaison**

The Supplier shall assign a single person to be responsible for the technical execution of the Contract and its follow-up throughout the duration of the Contract. This will be the person who will report on progress, performance and act as a central point of contact for STFC.

### **4.1 Deviations from this Requirement Specification**

If, after the Contract is placed, the Supplier discovers that he has misinterpreted this Requirement Specification, this will not be accepted as an excuse for deviation from it and the Supplier shall deliver equipment in conformity with this Requirement Specification at no extra cost to STFC.

During execution of the Contract, all deviations from this Requirement Specification, the tender, or any other subsequent contractual agreement, proposed by the Supplier, shall be submitted to STFC in writing for the latter's approval.

STFC reserves the right to modify this Requirement Specification during execution of the Contract.

The consequences of such modifications shall be mutually agreed between STFC and the Supplier.

The Supplier shall not unreasonably withhold their agreement to such modifications which shall take the form of formal amendments to the contract, to be issued only by UK SBS Ltd Procurement staff.

### **4.2 Evaluation of tender replies**

The tender returns shall be evaluated using Emptoris Government tendering rules.

### **4.3 General Responsibilities**

The contract shall include all mechanical and electrical calculations and the design of the equipment.

The Supplier shall be responsible for the detailed design, construction, testing documentation and delivery of the guide. All design rights shall remain the exclusive property of STFC.

The supplier shall provide throughout the contract suitable environments for manufacture, assembly and testing of the equipment.

All the contractual and technical documentation shall be provided in written English.

### **4.4 Safety**

Health and Safety is an integral part of the design process and this will be the responsibility of the Supplier who at all times must comply with all current local legislation.

The equipment does not require to be CE marked, but it must comply with the Supply of Machinery (Safety) Regulations 1992.

## 4.5 Programme of work

The Supplier shall produce a detailed programme to cover Guide Sections 1 to 5 with surrounding steel shielding and vacuum tubes to include: Design, manufacture and testing of the guide, showing all significant tasks. The programme shall include the following milestones:

- Commencement of Contract
- Concept design review for Guide Sections 1 to 5.
- Detailed design review for Guide Sections 1 to 5.
- Completion of glass guide manufacture and coating.
- Completion of guide testing (at supplier site)
- Completion of steel shielding, Sintered Boron Carbide Shielding & vacuum tubes.
- Completion of each Section of guide – (at supplier site)
- Completion of delivery of each section of guide to STFC preferably by DEC 2016
- Final assembly and alignment of guide sections 3 to 5 onto the support steel shielding at RAL site – (Duration only required as Installation date is not yet finalised).

A full delivery schedule shall be agreed within two weeks from the commencement of the contract. STFC will need 2 working weeks from submission of the concept design and detailed design information to approve. This should be allowed for in the plan.

The approval of the concept and detailed design by STFC shall not relieve the supplier of any responsibility for meeting the final specifications of the contract.

**IMPORTANT** – It is a mandatory requirement that the supplier **MUST** provide a regular progress update report as requested within RFP Question AW6.10

As a minimum this report should list:

Project status–Red/Amber/Green.

Issues log.

Milestones list with status.

List of components / activities with status.

STFC reserves the right to inspect the manufacturing base, or any other location (including subcontractors) where any part of the contract is carried out, at any time throughout the duration of the contract. STFC or STFC representatives also reserve the right to take photographs during these times.

## 4.6 Design reviews

Initial kick off meeting to take place at RAL (At supplier's expense).

Design reviews will take place at RAL the data to be reviewed will be in the form of 3D solid models supplied in a STEP format.

Should there be significant issues raised through these reviews, it may be necessary to repeat the reviews. This decision will be by mutual agreement between STFC and the supplier.

Any outcome of the design reviews shall not relieve the supplier from the responsibility of delivering to the specification or the contracted delivery date.

#### **4.7 Guarantee**

The guide shall be guaranteed by the supplier for all faults relating to defective components, manufacturing or design. The preferred minimum period of warranty would be a minimum of 36 months following the commencement of its operational life (Installation) or 6 months after delivery, whichever is sooner.

All costs of rectification will be borne solely by the supplier. This requirement is addressed and assessed as part of RFP Question AW6.9.

#### **4.8 Drawings**

A complete set of 'as built' two-dimensional detailed engineering drawings shall be included as documentation of the engineering design of the guide assembly and of all the sub-components. This shall include one paper copy set of drawings produced from the original CAD format. Drawings shall also be provided as electronic copies in .dwg and .dxf formats. If a 3D model is used, then a 3D model shall also be provided. STFC operates Solid Edge as its 3D CAD system, compatible files are acceptable.

#### **4.9 Design Calculations**

All design calculations such as stress, thermal; etc should be documented and supplied. These documents should be referenced by the drawings.

#### **4.10 Manuals**

The supplier shall provide one hard copy along with an electronic copy of manuals with the equipment before acceptance by STFC. The manuals should be sufficient to support the level of training given within the commissioning period. It should cover all aspects of the equipment's use and operation and routine maintenance. The manual should also cover the expected de-commissioning and disposal route for the equipment at end of life. All manuals shall be written in English.

#### **4.11 Additional Items**

Please supply costs for any other items that may be required. Prices for these items should be listed separately from the guide prices but still included in AW5.2 Price Schedule.

#### **4.12 Qualifications, Inspections and Tests**

The supplier must supply details of the testing procedures to be carried out to meet the specification requirements.

Documented test results are to be provided before the equipment is shipped and shall be written in English.

### 4.13 Delivery

The Guide and all its ancillary equipment are to be delivered to STFC. The address is as follows.

ISIS Facility  
 Science and Technology Facilities Council  
 Rutherford Appleton Laboratory  
 Harwell Oxford  
 OX11 0QX  
 UK

The delivery should be notified to the STFC contact in sufficient time such that acceptance of the delivery can be organized. This should be a minimum of 1 week notice.

### 4.14 Delivery date

Delivery of guide sections 1 to 5 are required by 24<sup>th</sup> March 2017 - Refer to RFP question AW6.6.

### 4.15 Persons Technically Responsible At STFC-Post contract award.

Name	Tel-Fax	Email
Simon Waller <i>Project Manager</i>	Tel: +44 (0)1235 778390	<a href="mailto:simon.waller@stfc.ac.uk">simon.waller@stfc.ac.uk</a>
Tatiana Guidi <i>Instrument Scientist</i>	Tel: +44 (0)1235 446584	<a href="mailto:Tatiana.guidi@stfc.ac.uk">Tatiana.guidi@stfc.ac.uk</a>

## 5 Technical Requirements

### 5.1 Guide Overview and Layouts

The guide geometry will be square in section, tapering with internal dimensions of 90x90mm at upstream end (1660.4mm from moderator centre) to 45x45 mm at sample position which is 11700mm from moderator centre.

The following drawings show the total requirements for the Guide supply, including; dimensions, geometry, shielding and vacuum tubes:-

SI-2530-806 – MARI guide layout.

SI-2530-806\_01 – MARI guide shutter 1.

SI-2530-806\_02 – MARI guide Insert 2.

SI-2530-806\_03 – MARI guide section 3.

SI-2530-806\_04 – MARI guide section 4.

SI-2530-806\_05 – MARI guide section 5.

## 5.2 Generic Guide Specification

### 5.2.1 Mirror coatings

All internal surfaces of the entire length of guide are to be coated with **m = 3** Ni/Ti super-mirror or equivalent.

### 5.2.2 Reflectivity

The supplier must state and demonstrate typical reflectivity achieved with **m=3** super-mirror coatings. An acceptable reflectivity is 85% at m=3; the minimum value is 80%.

To avoid degradation of the super mirror, internal stresses are to be minimised by a suitable manufacturing or annealing process.

### 5.2.3 Glass flatness / profile tolerance

The glass must be selected based on flatness and surface roughness to meet the final required mirror reflectivity and performance standards.

The expected flatness/profile tolerance is to be stated explicitly by the contractor in their tender response. Test procedures to be used are to be included in the tender response. Documented test results are to be provided.

### 5.2.4 Vacuum Requirements

The MARI guide must operate under vacuum along its entire length.

#### Guide section 1 – Shutter Guide

The shutter body forms the vacuum chamber for guide section 1 along with 2x windows 0.5mm thick – all of these items will be supplied by RAL.

Vacuum connection to shutter is responsibility of RAL, but guide steel shielding supplied by guide manufacturer must have vent holes to aid evacuation.

#### Guide section 2 – Insert Guide

The Insert vacuum box forms the vacuum chamber for guide section 2, it has a window 0.5mm thick on its upstream end, both of these items are to be supplied by RAL.

The downstream end of the Insert box is closed off using an adaptor flange, RAL will supply a drawing of this flange to show interface details of connection with insert box, but the guide manufacturer will be required to supply flange.

Vacuum connection will be via guide section 3.

#### Guide section 3 & 4

The guide in sections 3 & 4 are to be supplied within leak tested steel (Zn plated) or stainless steel vacuum vessels with a leak rate of less than  $1 \times 10^{-5}$  mbar.l/sec. The vacuum containment and materials used and the construction of the guide must be compatible with the vacuum specified.

Guide section 3 will have a gate valve attached to its downstream end with a 0.5mm thick window attached to it, the gate valve and window will be supplied by RAL.

Guide section 4 will require windows at each end 0.5/0.6mm thick, these are to be manufactured from Aluminium Alloy grade 2014-t6 and are to be supplied by the guide manufacturer.

Both guide sections 3 & 4 will require vacuum connections (Refer to Drg SI-2530-806 for details)

#### Guide section 5

The guide in sections 5 is to be supplied within a leak tested steel (Zn plated) or stainless steel vacuum vessels with a leak rate of less than  $1 \times 10^{-6}$  mbar.l/sec (As it forms part of the main MARI sample tank). The vacuum containment and materials used and the construction of the guide must be compatible with the high vacuum specified.

Guide section 5 will require a window (0.5/0.6mm thick) at upstream end only; this window is to be manufactured from Aluminium alloy grade 2014-t6 and is to be supplied by guide manufacturer.

#### General vacuum requirements for all guide sections:-

All internal and external surfaces shall be cleaned, dried and rendered free from contamination including cutting fluid, grease, swarf and any other substance that may impair the ability to establish and maintain the required vacuum and neutron performance.

There shall be no trapped volumes in the assembly and any screws or bolts locating in blind holes must be vented.

The vacuum vessels must be of similar construction and size to those shown on drawing SI-2530-806. Any dimensions changed by the Supplier must be notified to and approved by STFC.

Standard ISO vacuum fittings should be used where possible and it is recommended that sections of guide are separated by stainless steel edge welded bellows where shown (Bellows must be capable of being compressed to view meeting ends of glass guide sections to aid alignment and removal.

Rubber vacuum seals used are to be manufactured from "VITON".

Where bellows are fitted – anti compression posts should be designed and installed to prevent axial vacuum loadings between guide sections.

### **5.2.5 Guide Support and Adjustment**

The vacuum vessel should incorporate a system to support, adjust & clamp the inner guide and steel to achieve alignment of guide to specified tolerances.

Windows and ports for viewing the optical alignment of the inner guide and steel should be incorporated into the vessel if required.

To ease verification of alignment at a later date, 3x 1.5 inch Tracker ball nests should be mounted flush into top faces of vessels.(see reference drawing )

Alignment data from supplier should be supplied to demonstrate the relationship of internal glass guide to external tracker ball nest positions.

The vacuum vessel should also have a mechanism to adjust the alignment of the guide system (+/- 10mm in X,Y,Z directions) this mechanism should have the precision to achieve alignment tolerances specified in this document.

The adjuster bases, also to be supplied by guide manufacturer (see drawing SI-2530-806) will be screwed to large steel blocks which will be provided, levelled and surveyed into position by ISIS.

To allow the design of the appropriate biological shielding an early notification of the vessels external geometry and viewing, adjustment and mounting positions is required.

### 5.2.6 Glass Guide Section Dimensions and Materials

Guide section 1 must be manufactured from float glass, due to the potential for radiation damage in service. The thickness of the glass is to be 3mm for all sections of guide.

Guide section 2 to 5 must be manufactured from borated glass for its shielding properties.

The thickness of the glass is to be 3mm for all sections of guide.

There should be a minimum of glue used on the glass to achieve assembly of glass elements into tubes; glue is only permissible in areas away from mirror surfaces on exterior of glass.

(We are concerned that strong spurious scattering from the hydrogen in the glue would give rise to increased background).

The faces of the glass should join at the corners with e.g. a lapped joint.

Guide tubes should be securely positioned and clamped within internal shielding by being pushed together by the B4C bars.

Dimensions of guides and associated equipment must conform to MARI guide layout drawings ref: SI-2530-806. Any dimensional deviation from this must be approved by STFC.

### 5.2.7 Vacuum Vessels

Internal guide/steel shielding for Guide sections 3, 4 & 5 are to be encased in fully welded and leak tested Steel Zn plated or stainless steel vacuum vessels. Vacuum vessels must conform to dimensions given on Drawing SI-2530-806.

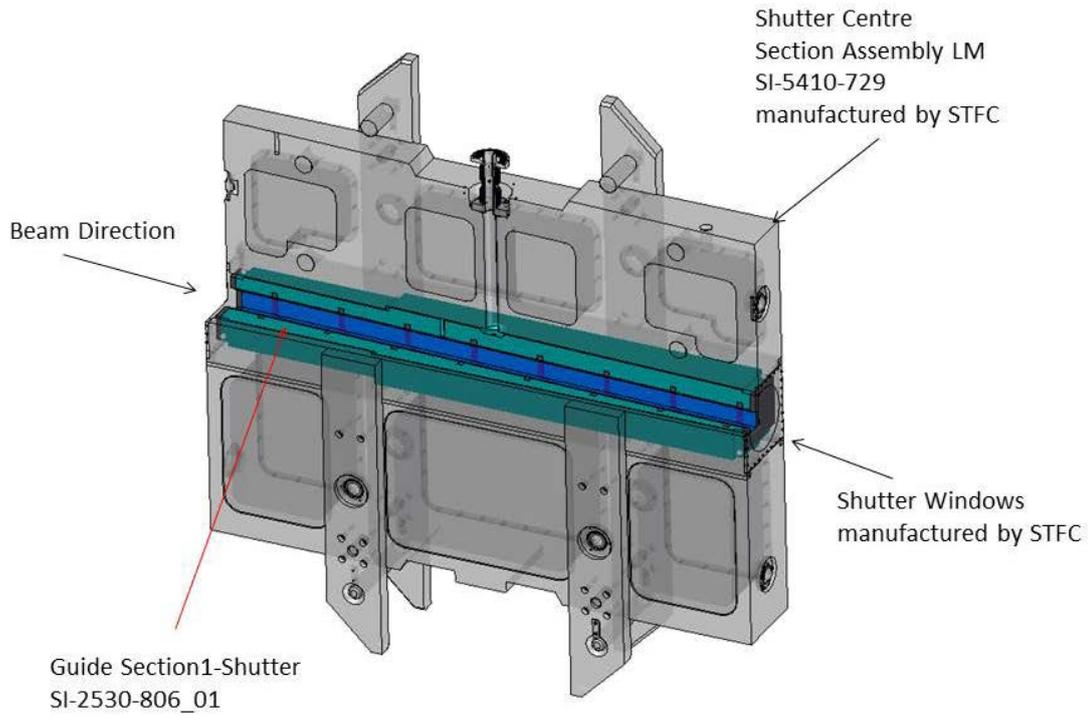
Tapped holes should be provided for metric collared eyebolts to BS4278:1984; allowing for craneage of individual guide sections, (size of tapped holes to be commensurate with loads being lifted) All lifting aids should be removable to enable close fitting of external shielding.

The design should be such that individual guide vessels (and the glass assemblies contained within) can be removed without the need to remove or re-align neighbouring vessels. Therefore gaps between glass sections are to be provided, the dimension of which should be approved by STFC.

## 5.3 Guide Interfaces

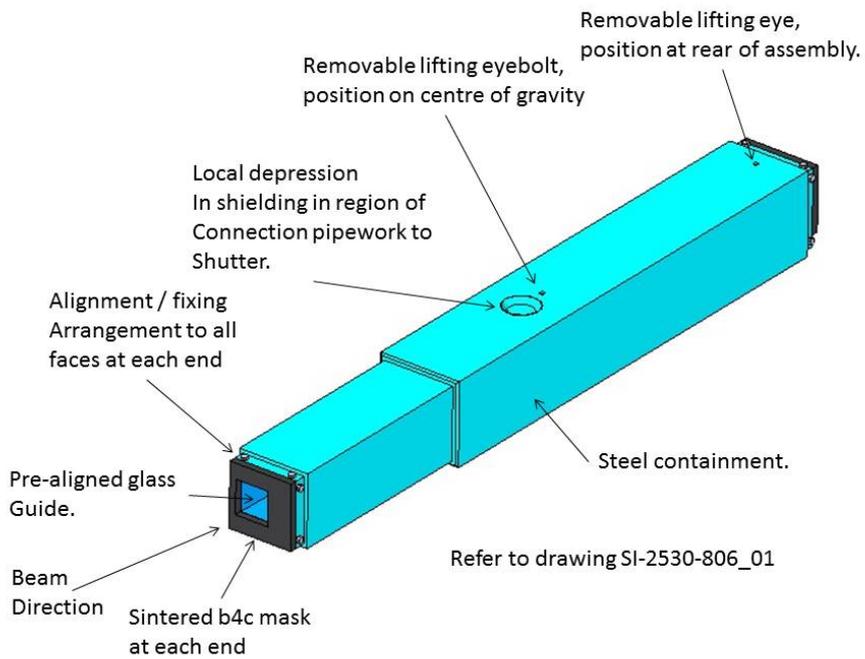
### 5.3.1 Guide Section 1 – Shutter.

It is a requirement that guide section 1 is aligned into a shutter assembly (see below). The Shutter will have vacuum windows and the guide section will operate under vacuum.

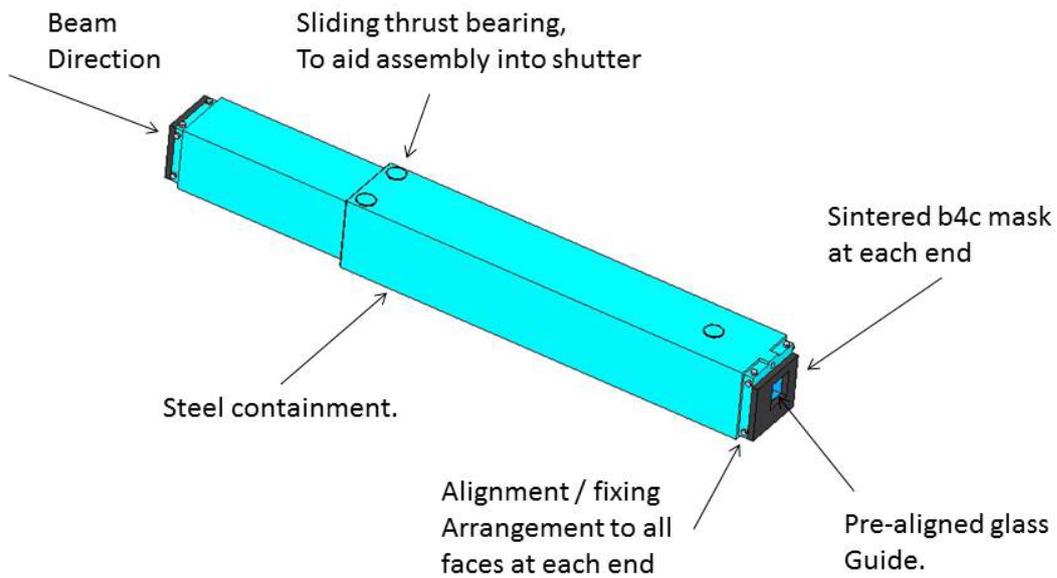


### Shutter concept shown with guide section 1 Inserted

Details of guide section 1 are shown in SI-2530-806\_01 and the following views:-



View on underside of Guide Section 1 - Insert



Refer to drawing SI-2530-806\_01

Guide section 1 is to be supplied pre-assembled with steel containment & internal sintered B4C shielding; the glass must be internally aligned and clamped.

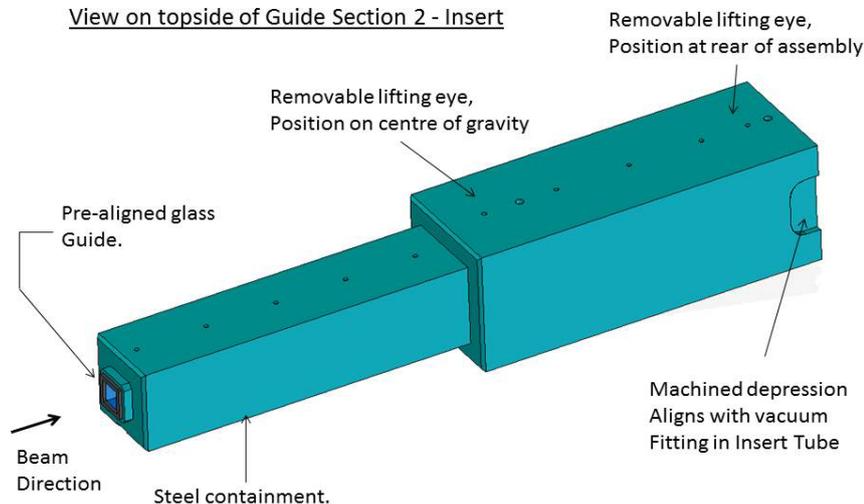
This assembly will require features for alignment and fixing within the shutter (see drg SI-5410-729). Tapped holes for using removable collared eye-bolts to BS4278 are required to enable assembly to be safely lifted by crane and slid into bore of shutter on STFC site.

The Guide section 1 - should be aligned within the shutter and fixed so as not to become misaligned during installation and normal operation of the shutter.

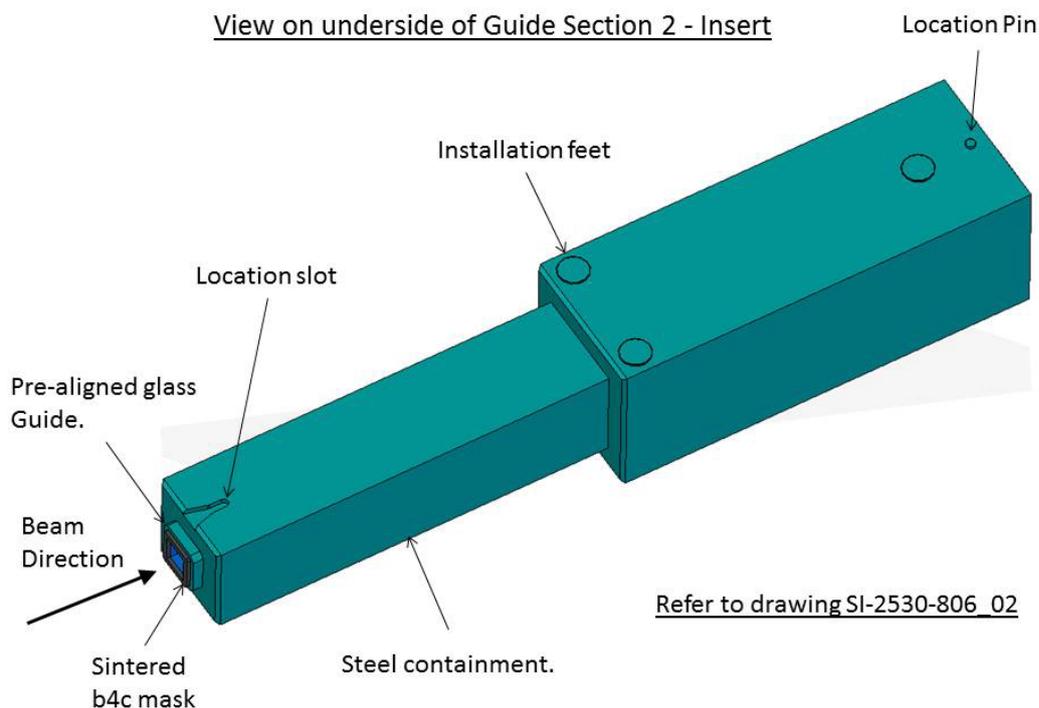
**5.3.2 Guide Section 2 - Insert.**

Guide section 2 is to be supplied with surrounding steel shielding and location features. It is to be supplied as a single rigid component with lifting features so that it can be slid horizontally into a pre aligned vacuum vessel located within the target station's shielding wall. The guide is to be accurately pre-aligned within its steel shielding relative to its location pin, slot and feet such that when installed into its Pre-aligned vacuum vessel the guide is correctly located and aligned.

View on topside of Guide Section 2 - Insert



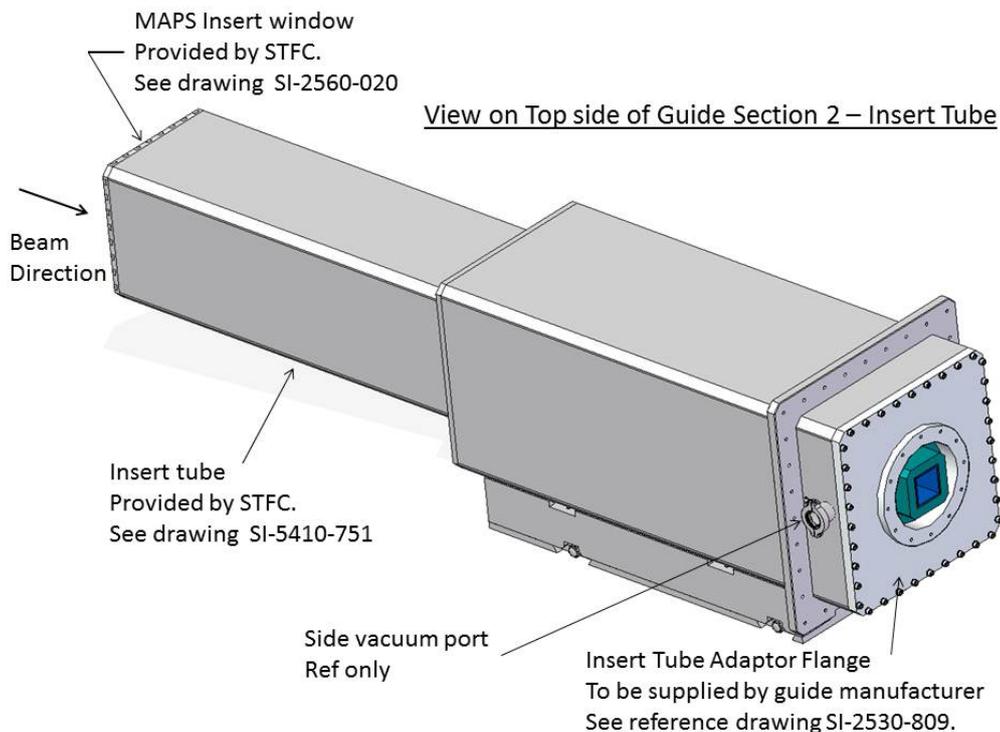
Refer to drawing SI-2530-806\_02



**Note- alignment of internal glass to external Pin/slot is critical.**

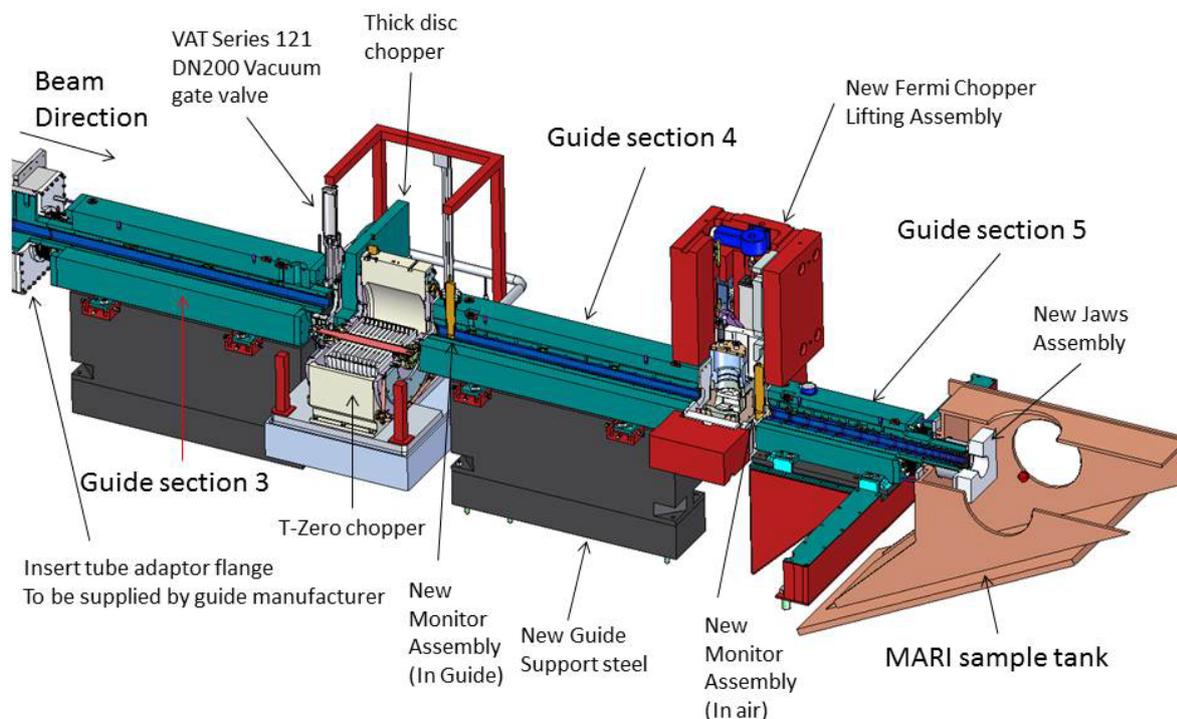
The insert steel shielding described may be assembled from a number of steel components. The components are to be close fitting and assembled such that mating shielding components have stepped interfaces to prevent radiation shine paths along the length of the insert. The shielding is to include a sintered B4C mask 19mm thick at the guide entrance.

Details of the insert tube which will be supplied, installed and aligned by STFC are contained in drawing SI-5410-751 and shown below. The insert adapter flange is required as part of this tender a suggested design is given in SI-2530-808.



Details of the shielding geometry, location features & guide alignment are all contained in drawing SI-2530-860\_02 Guide Sections 3, 4 & 5.

Sectional view showing guide sections 3,4 & 5.



### Guide Section 3

Guide section 3 will be under vacuum from one of two KF40 port in downstream end of vac box, it will interface with a 490mm square Insert Tube Adaptor Flange that is to be supplied as part of this tender (the design should be approved by STFC and be similar to drawing SI-2558-195).

The vacuum flange will mate with the STFC supplied insert vacuum vessel (Drawing SI-5410-751).

This is to connect to the main shielded guide section 3 through a flexible bellows with the provision of anti-compression legs.

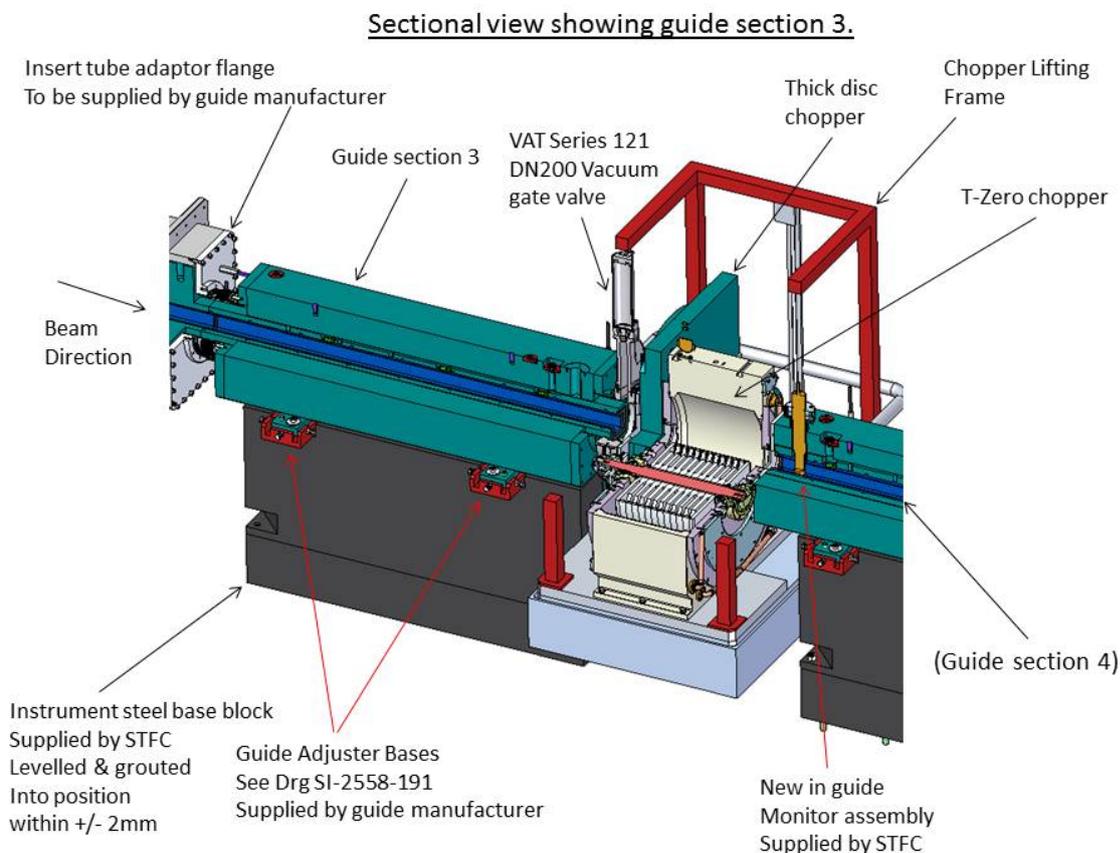
Features of guide section 3:

- 2x KF40 vac flanges.
- Internal inclinometer boards mounted to each glass guide tube assy.
- 1x Inclinometer wiring feed through port, inclusive of feed through flange.
- 1x external Inclinometer.
- 3x flush mounted survey nest positions.
- 2x removable lifting eye positions.

The downstream flange of guide vacuum chamber will support a VAT vacuum gate valve: series 121 DN200 ([www.vatvalve.com](http://www.vatvalve.com)) followed by a window, both of these items will be supplied by STFC.

The guide section should withstand the load of this valve & window estimated mass of 12Kg without creating misalignment of the guide.

Guide supports and adjustment features on outer vacuum housing are to be included in the supply these are to be used for final alignment of guide and hence should be capable of fine adjustment. STFC and the supplier will jointly determine the interface arrangements between the guide supports and the instruments steel base blocks.



## Guide Section 4

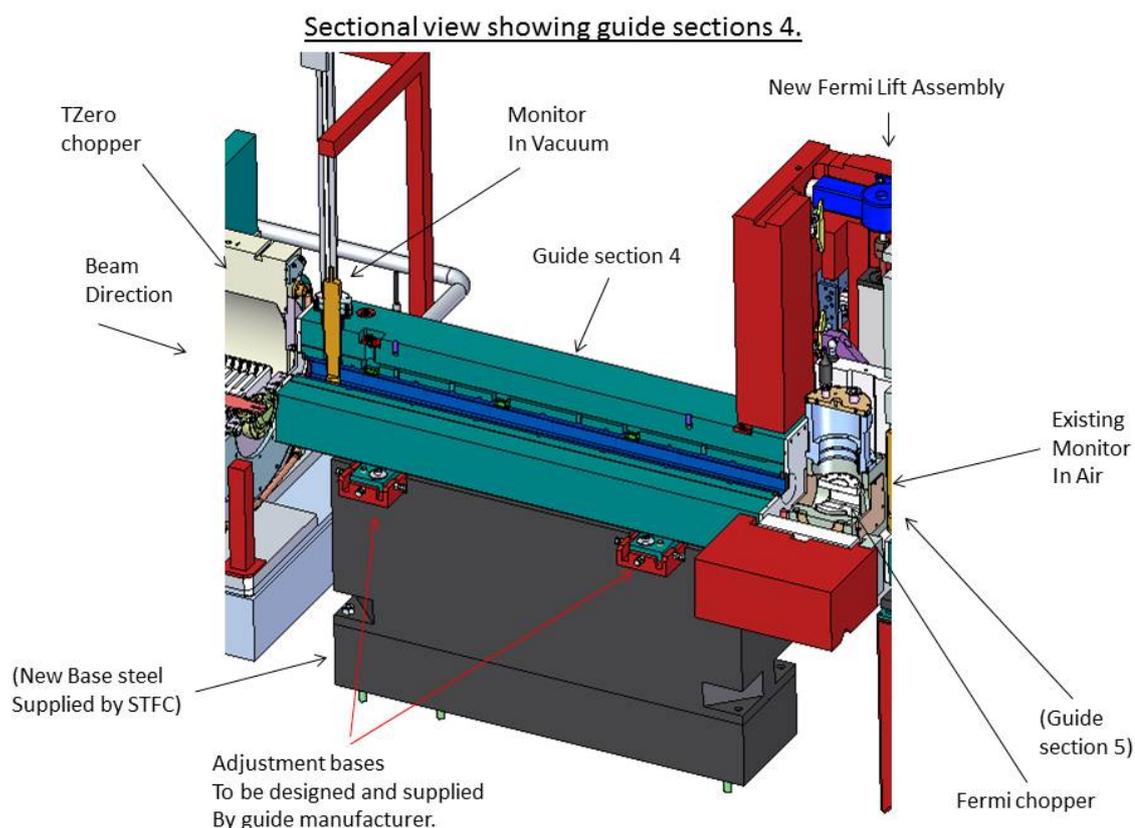
Guide section 4 will be independent of adjacent guide sections; it will be under vacuum, connected via kf40 ports in chopper end of vacuum housing.

Both windows are to be supplied as part of this tender (the design should be approved by STFC and be similar to that shown on drawing SI-2530-806\_04.

Features of guide section 3:

- 1x Monitor port with associated holes in glass.
- 2x KF40 vac flanges.
- Internal inclinometer boards mounted to each glass guide tube assy.
- 1x Inclinometer wiring feed through port inclusive of feed through flange.
- 1x external Inclinometer.
- 3x flush mounted survey nest positions.
- 2x removable lifting eye positions.

Guide supports and adjustment features on outer vacuum housing are to be included in the supply these are to be used for final alignment of guide and hence should be capable of fine adjustment. STFC and the supplier will jointly determine the interface arrangements between the guide supports and the instruments steel base blocks.



### Guide Section 5

Guide section 5 which will be under vacuum & connected to the MARI sample tank via bellows, (provision of anti-compression struts is required) and bolted to the new Jaws mounting tube.

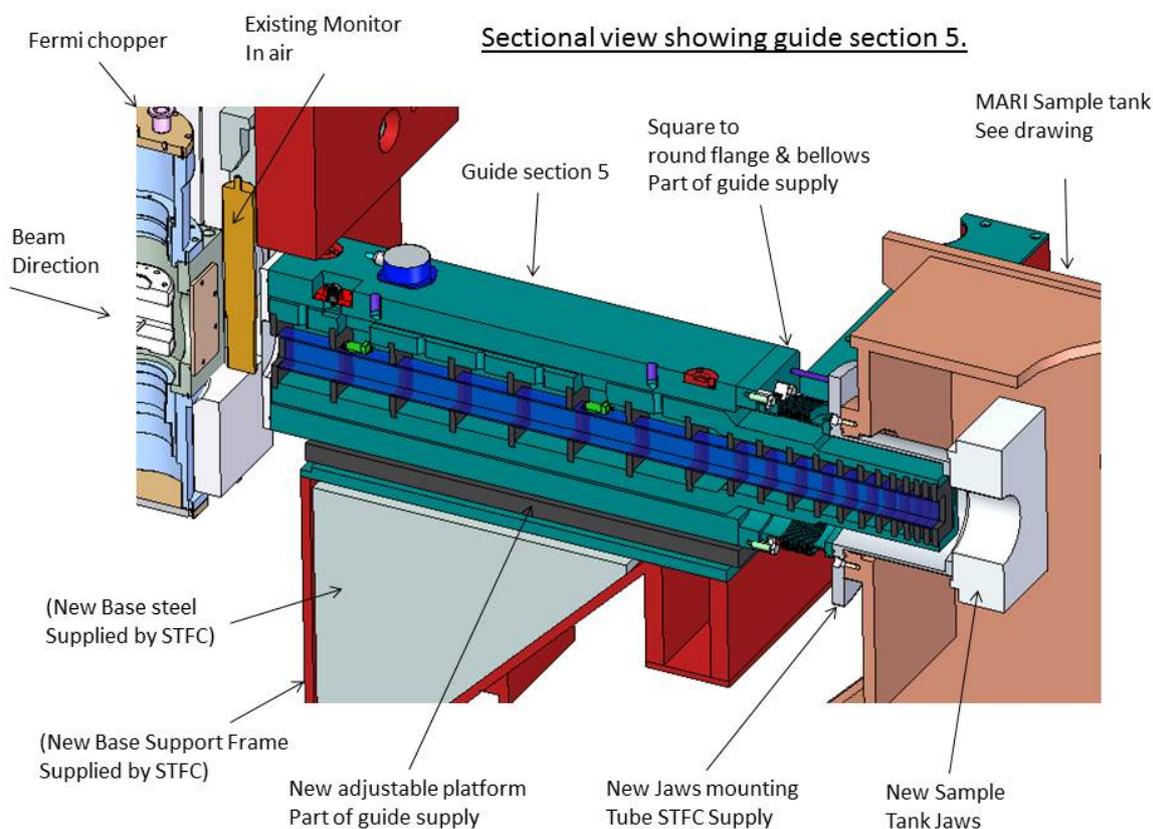
The guide will penetrate into sample tank as shown in diagram below.

The guide will be bolted to an adjustable platform, the design will allow for the fine adjustment/alignment and the removal of guide from sample tank.

The design of Guide section 5 should be approved by STFC and be similar to that shown on drawing SI-2530-806\_05.

Features of Guide section 3

- 1x Monitor port with associated holes in glass.
- Internal inclinometer boards mounted to each glass guide tube assy.
- 1x Inclinometer wiring feed through port inclusive of feed through flange.
- 1x external Inclinometer.
- 3x flush mounted survey nest positions.
- 2x removable lifting eye positions.



### **5.3.3 Installation and alignment**

#### Shutter guide section 1 – SI-2530-806\_01

To be supplied pre-aligned within its steel shielding; it is proposed that it will be installed by STFC with guidance from the Supplier.

#### Insert guide sections 2 - SI-2530-806\_02

To be supplied pre-aligned to its location features; it is proposed that it will be installed by STFC with guidance from the Supplier.

**Guide sections 3 to 5 - SI-2530-806\_03 to 806\_05**

The Supplier will be responsible for installing and aligning the guide outside of the bulk target station shielding (guide sections 3 - 5) and must specify the duration of installation in the tender return.

The guide is to be installed to within a positional tolerance of  $\varnothing$  0.1mm of the required position relative to the experiment halls laser tracker survey nest network.

The alignment of the guide sections with respect to one another should be 0.1mrad or better and carried out using external feet.

The final survey alignment results achieved on installation are to be documented and supplied to STFC.

The Supplier must supply all equipment required for the installation of the guide (and vessel) including all vacuum fittings to ensure the guide can be vacuum tested after installation.

STFC may be able to supply some equipment to aid in the installation although this must be agreed prior to the installation.

The supplier will be responsible for any damage to the supplied equipment up to the point of acceptance by STFC after installation.

**5.3.4 Additional Items**

The supplier should list costs for any other items or services that may be required in the tender document and should be separated from the costs so that a fair comparison can be made.

**6 Reference Drawings**Drawings:

Drawing	Title	Revision	Date Issued	Status
SI-2530-806	MARI Guide Layout	A		
SI-2530-806_01	Guide Shutter 1	A		
SI-2530-806_02	Guide Insert 2	A		
SI-2530-806_03	Guide section 3	A		
SI-2530-806_04	Guide section 4	A		
SI-2530-806_05	Guide section 5	A		
SI-2558-195	Insert tube adaptor plate	A		
SI-5410-729	Guide Shutter Centre Section LM	A		
SI-5410-751	Insert Vacuum Box	C		
SI-2560-020	Insert window assembly	A		