TECHNICAL SPECIFICATIONS

FOR THE DESIGNING, MANUFACTURING, PACKING, DELIVERY AND INSTALLATION OF LEAD SAFETY HUTCHES AND TRANSFER PIPE SHIELDING FOR THE BEATS BEAMLINE AT SESAME

Tender Ref.: BEATS/T/20/03

1 Contents

2 Introduction

The Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME) is an independent laboratory located in Allan in the Balqa governorate of Jordan, created under the auspices of UNESCO on 30 May 2002.

The facility is constructed by a Consortium made of Bahrain, Egypt, Israel, Jordan, Pakistan, and Turkey and is operated under the supervision of a permanent Council composed by Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority, and Turkey.

SESAME is composed of:

- A 22.5 MeV microtron,
- A 800 MeV booster synchrotron, with a repetition rate of 1 Hz,
- A 2.5 GeV, 400 mA electron storage ring, with a circumference of 133.2 m,
- Beamlines utilizing radiation extracted by the storage ring through bending magnet (BM) and insertion device (ID) sources.

To date, three beamlines are operative at SESAME: IR, XAFS/XRF and Material Science. Two new beamlines dedicated to hard X-ray tomography and soft X-ray spectroscopy are under construction.

3 General description

The present call for tenders concerns the construction of the new beamline BEATS being funded through the European project the project Beamline for Tomography at SESAME (BEATS).

A schematic layout of the BEATS beamline is shown in drawing 93.01.1000 (Version A and Version B). The drawing is attached as annex to this specification.

The beamline will have a 3T 3-pole-wiggler as insertion device located on a short straight section of the SESAME storage ring. The Front End will comprise photon absorbers and stoppers, a fixed mask, a window separating the machine and the beamline vacuum, attenuators and the primary slits The maximum divergence of the beamline as defined by the fixed mask will be 1.8 mrad (h) by 0.4 mrad (v). The main optical component of BEATS will be a Double Multilayer Monochromator (DMM) placed outside of the SESAME storage ring tunnel in a dedicated optics hutch, allowing to select the photon energy between 8 and 50 keV. The total length of the beamline will be approximately 45 m, with a shielded transfer pipe connecting and bringing the X-ray beam from the optics hutch to a 9-m-long experimental hutch hosting sample and detector stages.

The beamline will be operated in monochromatic as well as pink beam modes. During operation of SESAME, the BEATS hutches and beam transfer pipe sections will provide radiation protection to users and all persons in the main hall. The main workplace will be in an unshielded control cabin located on the right-hand side of the experimental hutch.

3.1 General scope

The scope of this specification includes:

- Design, supply, and installation of an Optics Hutch (OH) in the SESAME experimental hall.
- Design, supply, and installation of an Experiment Hutch (EH) in the SESAME service area.
- Design, supply, and installation of approximately 16 m of vacuum pipe shielding, from OH to EH (including supports, flange boxes, etc).

Unless otherwise explained, the works include the supply and installation of the material, products and equipment, as well as the commissioning and warranties described in the call for tender document.

3.2 Location of the beamline in the SESAME facility

The position of the BEATS beamline in the SESAME experimental hall and service area is shown in Figure 1. By making use of SESAME's experimental hall and of two rooms of the adjacent service area it is possible to accommodate a beamline with a maximum length of 45 m. The modifications to the service area of the SESAME building required to make room for BEATS consist of:

- Dismantlement of toilets and adjacent laboratory.
- Dismantlement of false ceiling, mechanical parts, electrical pipes and of 3 walls.
- Reinforcement of the floor as described in 3.4.

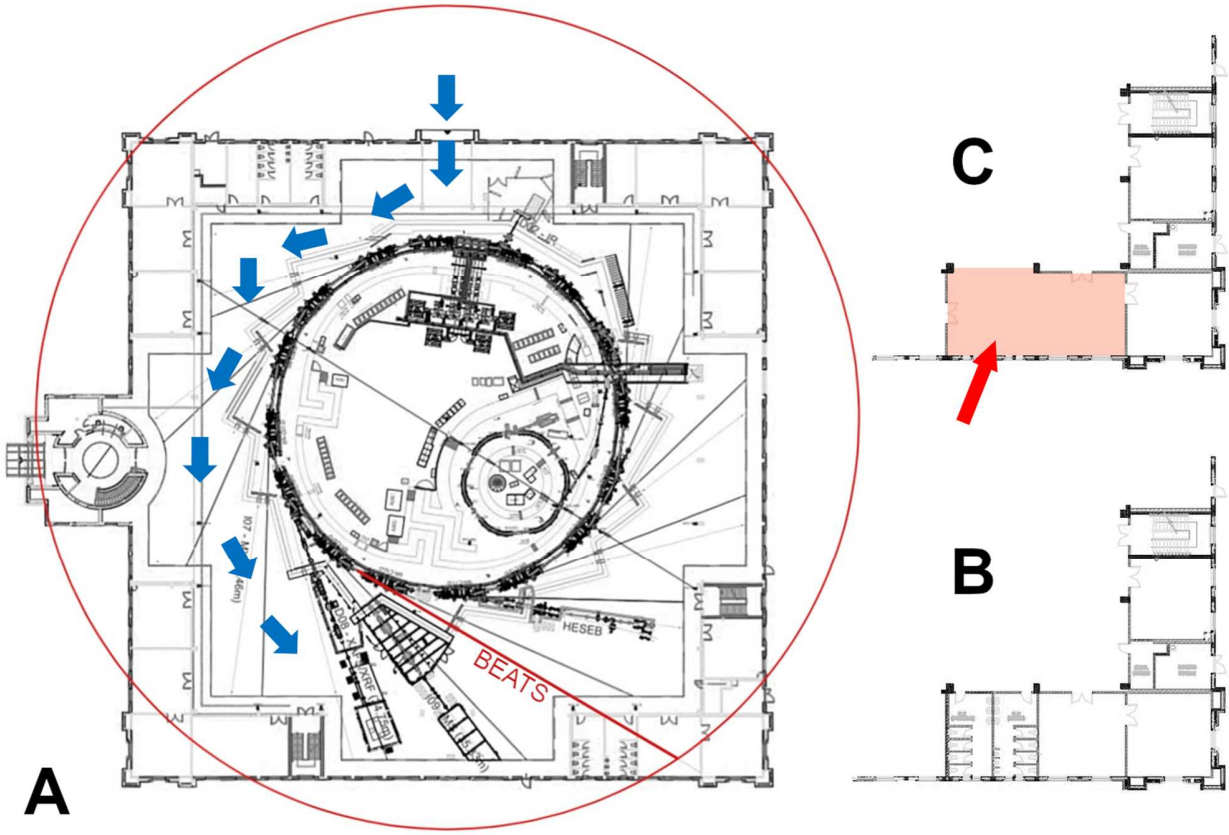

Figure 1: A: Floor plan of the SESAME facility showing the location of BEATS. The red circle indicates the end point of a 45 m long beamline. Arrows indicate the site entrance and route for displacement of materials and components in the SESAME facility. B: Detail of the SESAME facility floor plan at the location of the BEATS experimental hutch (service area). C: Sketch of the

modifications to the SESAME service area building required to host the infrastructure of BEATS. The floor reinforcement area is shown in orange.

3.3 Geometry of the SESAME experimental hall floor

The floor of the experimental hall is 22 cm of reinforced concrete, covered by a 8-cm-thick reinforced concrete layer. Creating trenches or large holes in the floor is strictly forbidden but drilled holes up to 20 mm in diameter and 200 mm in depth are permitted. The depth of the drilled holes can vary and must ensure the optimal fixation of the wall hutches to the floor. The floor can have local flatness deviations as large as ±10 mm over 5 m in the construction area. A survey of the existing flatness of the experimental hall floor will be provided to the contractor at the beginning of the design phase. The contractor is invited to visit SESAME or contact its staff during the early design phase to discuss and agree on the aspects of the floor survey.

3.4 Geometry and modifications to the SESAME service area floor

The slab of the service area, where the BEATS experimental hutch will be installed, is different from the slab of the experimental hall. The floor of the service area hosting the BEATS EH will be reinforced in the following way:

- Excavation of at least 30 cm and removal of the previous slab over the two rooms hosting the BEATS EH (area indicated by arrow and highlighted in orange in Figure 1C).
- Preparation of a new, 30-cm-thick slab in reinforced concrete with the following specifications: bottom layer of 22 cm heavily reinforced concrete (25 N/mm^2); top layer of 8 cm reinforced screed concrete (25 N/mm^2) mechanically polished.

Please note that steel reinforcing is likely to be encountered on any place and may require special drilling (steel) locally.

Accurate surveys of the floor flatness and of the ceiling height at the position of the BEATS EH will be performed and provided to the supplier of the hutches after completion of the floor reinforcement works. During the design phase, the contractor is strongly invited to visit the SESAME site or contact the BEATS staff to discuss requirements and specifications to be met for the reinforcement of the service area floor.

The temperature in the experimental hall and service area varies in the range 22 to 28 ºC from winter to summer.

3.5 Handling

For hutch erection, the SESAME 8 tons crane will be available. However, the experimental hall crane cannot be used for erection of the BEATS EH, since this must be installed under the ceiling of the service area. An electrical forklift (2 tons) will be available for the erection of the BEATS EH. The timescales for the use of the crane and of the forklift must be agreed with SESAME before work starts on site and coordinated with other works going on at the time of the assembly. The contractor shall supply any special equipment for the positioning of the panels during hutch erection.

The contractor is requested to provide a time schedule for the assembly.

In the quotation, the contractor shall describe a detailed description of how the hutch structure and panels will be erected, including type of equipment that will be used.

A report with drawings showing handling proposals must be provided with the quotation.

The individual panel weight must be clearly indicated on all panels.

3.6 Site access

Access to the SESAME site is subject to site entrance regulations and the contractor will be obliged to comply with these regulations.

The displacement of parts and equipment from the service entrance to the installation area must be considered carefully. The service entrance (3.8 m width × 3.8 m height) is located on the south side of the SESAME building and is indicated by blue arrows on the top of in Figure 1A. From the service entrance, all items will have to be displaced through the SESAME experimental hall following the route indicated by blue arrows in in Figure 1A. The narrowest passage between a pillar and the storage ring wall along this route is 3.6 m. Finally, large items will be displaced over the existing XRF and MS beamlines to the BEATS installation area using the SESAME 8 tons crane. The maximum height available for this is 4 m, defined by the distance between the tunnel ceiling and the maximum hook height.

The contractor will be responsible for the provision to his/her employees of all tools necessary to carry out work on site.

The contractor will have to provide a detailed plan of the work on site.

3.7 Electrical supply

Electrical boxes are installed by SESAME in the vicinity of the working area, and can be used for hutch installation purposes. It fit with the following types of sockets:

- P17 16 Amp. 2P+E 230V, 50Hz
- P17 32 Amp. 4p+E 400V, 50Hz
- EU/Germany standard socket type 2P+E 16 Amp or similar. 230V, 50Hz

3.8 Compressed air

The network of compressed air is available in the experiment hall. The nominal pressure is 8 bars.

3.9 Working area – working conditions

Work generating vibrations shall be planned with SESAME. The production of dust or smoke (grinding, welding, brazing...) shall be carried out outside the experimental hall if possible. Inside work shall be authorized by SESAME. The assembly areas shall be kept permanently clean and tidy during the period of works. Noise production in assembly areas must be minimized.

3.10 Safety on site

The contractor must respect the SESAME safety policy during the work at the SESAME (see Safety Policy at SESAME in the annex).

The contractor must also comply with all related parts of Jordanian Labor Law and its Amendments No.8 of the Year 1996, specially chapter 9 and chapter 10 while at SESAME site.

The contractor will write a full and detailed health and safety plan in accordance with the prevention of any foreseen type of occupational risks involved with work at the SESAME site. The safety plan should consider risks for both the contractor's and SESAME staff members.

SESAME's safety officer will be entitled to ask the contractor to stick and to comply with the approved health and safety plan.

The safety plan must be submitted for the written approval of the SESAME's safety officer before starting the installation on site.

The contractor is requested to contact the safety officer, or the staff designated by SESAME during the installation period for any inquiry on safety and health, including the coordination of work on the designated area.

The contractor will be responsible for his/her staff and for the staff of any sub-contractor working on site to respect the approved health and safety plan.

The contractor will be responsible for providing his/her staff with necessary personnel protection equipment while working at the SESAME site.

SESAME is responsible to give to the contractor all the specific required documentation about safety, health, and security aspects at the SESAME site (e.g. the emergency plan, access protocol, evacuation plan, etc.). All documentation will be provided to the contractor before the start of the installation on site.

3.11 Language on site

During work on the SESAME site, at least one member of the contractor's staff present shall be able to communicate in English.

4 Scope of the Call for Tenders

4.1 Specifications

This specification covers the i) design, ii) supply of drawings (manufacturing, assembly and as-built) and of iii) catalogue of components, iv) materials (including the lead) as well as v) manufacture, vi) inspection, vii) assembly, and viii) testing of all components included in this document. It refers to all sections of this present document, together with its appendixes and all drawings.

4.2 Offer breakdown

Separate prices shall be given for each item listed, in accordance with the detailed price-breakdown proforma (see annex CFT BEATS hutches - Price breakdown).

Tenderers are requested to fill a detailed weight-breakdown proforma (see annex CFT BEATS hutches - Weight breakdown) together with the offer.

4.3 Comments on specifications

Tenderers may comment upon this specification and make minor alternative technical and financial proposals to SESAME within the same quotation made for this specification.

Departures from the agreed specification after the contract is placed shall only be allowed with written permission of SESAME.

The ESRF design standard (given in the standard hutches design drawings) shall be used for all hutch designs.

4.4 Clarifications

During the period for submitting offers, bidders can contact SESAME in writing. All enquires will be subject to a written answer at the earliest possible opportunity. All questions and doubts will be published in the contractor's profile indicated in the ATC.

All questions must be addressed systemically by e-mail to the following address:

Majeda Salama (SESAME procurement and tendering manager)

e-mail: procurement@sesame.org.jo

5 Time schedule

The contract is divided in two phases: **Phase I**: **design** and **Phase II: manufacture and installation**.

The design phase is to be completed within max. 5 weeks of start of contract. A Preliminary Design Review (PDR) meeting will take place via videoconference at this time. A Final Design Review (FDR), videoconference meeting will take place not later than 10 weeks after the start of contract. The installation phase should be completed within 8 months after the FDR meeting.

According to the previous, the contract timeline is composed of the following milestones:

Milestone	**Months after signature of contract**
PHASE I: design	
Start of contract	0
Kick-off meeting	0
Preliminary Design Review (PDR)	1.2
Final Design Review (FDR)	2.5
PHASE II: manufacture and installation	
End of installation	10.5

6 Deliverables

6.1 Design phase

The following items shall be delivered to SESAME at least two weeks before the FDR meeting:

- A time and manpower schedule of all activities covered by the contract.
- A description and time schedule of the installation procedure at the SESAME site.
- The quality assurance documents for all activities covered by the contract.
- The list of operations to be performed in the factory prior to delivery of the units to SESAME.

- A report containing lists and detailed descriptions of components, materials and suppliers or subcontractors.
- A complete list of the quantities of components, materials, etc. to be purchased by the Contractor to build the hutch.
- All drawings used in the manufacturing of the shielded hutches in printed and electronic in 2D and 3D forms saved under “dwg” and “step” extensions.
- Calculation notes on the mechanical stability of the hutch structure and the load on the experimental hall and service area floor.

6.2 Manufacture and installation phases

The works on the beamline shall be delivered and installed according to the present specification and respecting the time and manpower schedule delivered by the contractor within the design phase. The delivery refers to:

- Shielded Optics Hutch, BEATS-OH
- Shielded Experimental Hutch, BEATS-EH
- Shielding Hard X-Ray Pipe, BEATS-TP

The delivery must proceed in three steps:

- Following the supply and installation, a technical visit is made with SESAME technical and radioprotection groups to identify any kind of reservation (light-test).
- Release reservations: all the reservations have been repaired and a new technical visit is made with SESAME technical and radioprotection groups in order to confirm it (light-test).
- Radiation test: final test, done by the SESAME radio protection group (with the synchrotron beam) to identify any radiation leak.

The installation of all transfer pipe sections will be coordinated with the contractor, in order to perform the installation of the vacuum transfer pipe concomitantly with the installation of shielding support elements. A detailed description of the procedure, including time schedule and tentative dates should be delivered to SESAME within the design phase (see section 6.1).

In addition, a set of test certificates and inspection reports should be delivered as required by this specification at the conclusion of the installation phase.

The manufacture and installation phase shall not start without written approval from SESAME, covering both engineering and radiation safety aspects.

SESAME will supply, install and align all the pipes and other beamline vacuum components.

7 Responsibilities and ownership

7.1 Responsibility

The supplier is responsible for:

- The detailed design of the hutches and transfer pipe shielding, based on the ESRF principle drawings provided,

- The supply, to the SESAME site, of all materials and components necessary to the construction of the hutches and the transfer pipe shielding,
- The assembly of the hutches and transfer pipe shielding, on the SESAME site, in accordance with the present specification,
- Control, inspection and testing,
- The cleaning of the site during and after assembly.

It also includes the supply of all tools required for the work at SESAME.

7.2 Ownership

All drawings and documents produced for this contract shall be the property of SESAME and SESAME shall have the free use of them.

8 General requirements

8.1 Radiation tightness

Radiation tightness at the joints of the panel structure, doors, windows, chicanes, penetrations, junctions between the hutch and the concrete floor slab and walls, and junctions between the roof and the walls of the hutches, is the most important aspect of this work, and must receive the Contractor's special attention. The methods of manufacturing shall be adapted such that the result conforms to specifications. The manufacturing tolerances shall in no way give rise to leaks. The SESAME safety group will carry out radiation tests during commissioning of the beamline. A contractor representative may be present during these tests.

SESAME will not be in a position to carry out radiation tests with synchrotron beam at nominal currents until the storage ring is fully operational, the BEATS source is installed, and the beamline optics and safety devices are installed. Therefore, in the offer the contractor is expected to consider the possibility to undertake modifications and repairs at its expense if any radiation leak is found during official radiation tests conducted at nominal beam current.

Lead lining on the concrete floor and walls must be installed to protect from scattered radiation between concrete and hutch panels. The minimum lining width is 200 mm.

8.2 Design and construction

This information is proprietary to SESAME and cannot be made available to third parties nor used by the contractor without express, written permission of SESAME. When appropriate, alternative designs can be used if approved by SESAME.

Chapter 9 indicates specific requirements of each component of the specification.

8.2.1 Materials

8.2.1.1 Lead

All lead (Pb) parts produced shall have a minimum density of 11.3 g/cm3. They shall be free of visible cracks and holes and free of grease, oil or any other slippery substance. lead glass windows must have an equivalent lead thickness at least equal to the specified wall thickness.

The contractor shall provide certification that the Pb shielding as well as the lead glass used for the construction of the hutches meet the above specifications.

The given lead thickness values are minimum thicknesses.

Attention shall be paid by the Contractor to all lead parts assemblies, to guarantee full contact between pieces. The lead parts shall not be damaged, hammered or otherwise spoiled before or during assembly.

It is strictly forbidden to perform welds not clearly indicated on the drawings approved by SESAME during the design phase.

The Contractor shall inform SESAME of any welds which will not be easily accessible after assembly as they SESAME may require them to be checked with ultrasound or by some other accurate measurements before assembly in the presence of a SESAME representative in order to guarantee the minimum specified lead thickness.

8.2.1.2 Steel

All steel and welding materials shall have minimum yield strength of 230 MPa.

All steel parts shall have the following corrosion protection: frames of wall panels and roof elements, roof frame and ground frame shall be cleaned, sand-blasted and coated with zinc primer.

8.2.1.3 Glue

The contractor shall provide SESAME with the specification of any glue used for the construction of the hutches, as it is to be radiation resistant. A quality control procedure for bonding lead and steel shall be defined, to achieve long-term stability of the bond in a radiation environment.

8.2.1.4 Painting

All lead panels and wall components must have a primary layer of painting followed by an epoxy layer as the final layer of paint. The color of the final layer (epoxy) should be chosen in agreement with SESAME.

8.2.2 Installation

The drilling of holes in the floor of the SESAME building as well as in the concrete shielding wall of the SESAME storage ring must be authorized by SESAME. Holes in the storage ring concrete shielding wall can be performed to support lead lining elements and steel pillars. The depth of these holes must be clearly specified and will be verified by SESAME during the design phase. For the support of lead lining elements, holes in the storage ring concrete shielding wall shall be performed as far as possible from the nominal height of the electron trajectory (1400 mm). Similarly, for support steel pillars in the optics hutch, holes can be performed on the floor and close to the hutch roof.

8.2.3 Assembly

The contractor shall deliver pre-fabricated items to SESAME and shall assemble them on site. All lead/steel panel units intended for walls and roofs shall be made in single pieces, with neither welding nor assembly on site.

8.2.4 Provisions for Alignment

The contractor should keep in mind that alignment markers will be installed by SESAME close to the beam trajectory on the concrete floor. Holding plates for alignment purposes may be installed inside the hutches by SESAME on the back and front walls of the hutches above the beam trajectory at a height of approximately 2 m from the floor.

8.2.5 Support provisions

The hutch structure should be able to carry the loads coming from the cabling and the piping attached to it. The contractor should provide support for media hoses and cable trays inside and outside of the shielded hutches, using 'Jordahl JM K 48/26 C-rails or equivalent. Service support provisions inside the hutch shall extend from floor to roof and be attached every 1m. The design of support provisions will be discussed during the PDR meeting and approved by SESAME during the FDR meeting.

Supply, assembly and installation of the service supports and the media rail is in the scope on this call for tenders. Trays and pipes are out of the scope of this call for tenders.

8.2.6 Provisions for PSS systems on doors and user chicanes

All hutches doors and users chicanes must a be equipped with a suitable mounting bracket ready to fix the PSS devices on it. The devices will be fixed by SESAME staff after the installation of the hutches. The required PSS devices on the doors and users chicanes are the following:

- All hutches doors will have a set of PSS devices; Magnetic Lock (outside), Electro-Mechanical lock (inside) and Magnetic Position Sensor (inside). For double doors, each side will be considered as a single door and it will have this assembly of devices. The model number and drawings for all these devices are attached.
- For users' chicane, each side will have a Magnetic Position Sensor and Electro-mechanical lock (the same models in the attachment).

9 Specific requirements

The bidder is asked to make an offer for at least one of the two following versions of the BEATS optics hutch: OHA and OHB. The list of all attached drawings if provided in APPENDIX 2 – List of drawings.

Hutch dimensions and floor areas given are from floor to outer lead roof, or outer lead walls, including steel lining sheets, if not specified differently.

In case of a discrepancy between this specification and any one of the attached drawings, this specification shall govern.

9.1 BEATS optics hutch – Version A (OHA)

9.1.1 Size and hutch shielding

The BEATS OH Version A (OHA) is shown in drawing 93.01.9008. The hutch has a height of 3000 mm measured from the interior of the hutch and consists of 3 main walls: the outer wall (OHA-O) has a length of 6600 mm, the BEATS backwall (OHA-B) has a length of 2400 mm, and the bending magnet (BM) beamline backwall (OHA-C) a length of 3610 mm. The angle between OHA-O and OHA-B is 90 degrees. The inner angle between OHA-B and OHA-C is 170 degrees. OHA-C connects OHA-B to the shielding wall of the storage ring tunnel and is divided in two sections: a first section, close to the BEATS beamline and connected to OHA-B, with 30 mm minimum lead thickness shielding possible scattered radiation from the ID beamline (BEATS), and the remaining section of the wall up to the storage ring concrete wall with a minimum lead thickness of 6 mm. The size and shielding of the BEATS OHA walls are:

Item	Name on 93.01.9008	Size (length × height)	Lead thickness
Sidewall	OHA-O	6600 mm × 3010 mm	10 mm
Backwall	OHA-B	2400 mm × 3010 mm	60 mm
Backwall	OHA-C	3610 mm × 3010 mm	
Section 1		1300 mm × 3010 mm	30 mm
Section 2		2310 mm × 3010 mm	6 mm

9.1.2 Local shielding

The wall penetration on OHA-B for the transfer pipe (TP) shall be fitted with the diameter of a CF150 flange (203 mm). The transfer pipe height at the exit from OHA-B is 1440 mm.

The following additional shielding elements must be installed:

#	Shielding element	Name	Qty	Height (mm)	Width (mm)	Thickness (mm)	Material
1	Tunnel-to-OHA guillotine	OHA_guill	1	500	500	50	Pb
2	OHA-B-to-TP guillotine	OHA-B_guill	1	400	400	65	Pb
3	OHA-B central reinforcement	OHA-B_cR	1	1000	1000	50	Pb
4a	OHA-B neutron central shield	OHA-B_Poly_TL	1	1000	1000	100	Polyethylene
						5	Pb
4b	Extension of OHA-B neutron shield over the TP collar	OHA-B_Poly_TL	1	Along the first 155 mm of TP		50	Polyethylene
						5	Pb

The 50-mm-thick bremsstrahlung reinforcement of wall OHA-B must have a surface of at least 1 m × 1 m centered around the nominal beam height of 1400 mm. The reinforcement must be integrated into the panel structure of wall OHA-B and supported with a steel frame following the ESRF reference design 00.67.0600. The diameter of the central hole on the guillotine (OHA-B_guill) and of the reinforcement (OHA-B_cR) must fit the outer diameter of a CF150 pipe (152 mm) and must be located at the transfer pipe exit height of 1440 mm from floor. The design must assure complete absence of radiation leaks.

9.1.3 Doors, chicanes and other components

OHA must be equipped with the following components:

Component	Name	Qty	Ref. Design	Lead thickness (mm)
Electrical chicane (wall OHA-O)	OHA-EC1; OHA-EC2	2	ESRF 00.67.0200	10
Fluids chicane (wall OHA-O)	OHA-FC1	1	ESRF 00.67.0202	10
Ventilation entrance chicane (wall OHA-R)	OHA-VCI	1	ESRF 00.67.0204	5
Double door without window (wall OHA-O)	OHA-D1	1	ESRF 00.67.0304	10
Double door without window: the door must have a total width of 120cm. The right half of the door must have a width of 100cm. The left side of the door must have a reduced width of ~20 cm. (wall OHA-C)	OHA-D2	1		6

9.1.4 Hutch roof and support structure

The roof of the BEATS OHA (OHA-R) has a total surface of approximately 31 m^2 and must have a minimum lead thickness of 5 mm. The roof weight must be transmitted to the floor slab through pillars correctly dimensioned. The BEATS OHA-R has to be removable. The steel support structure of OHA-R can include steel poles inside the hutch area. The position of such steel poles must not interfere with the optical and beamline elements present inside OHA and particularly with the BEATS monochromator chamber and support. The position of the BEATS beamline components inside OHA is illustrated in drawing 93.01.100. The position of eventual steel support poles inside OHA must be agreed with SESAME during the design phase.

9.2 BEATS optics hutch – Version B (OHB)

9.2.1 Size and shielding

The BEATS OH Version B (OHB) is shown in drawing 93.01.9001. The hutch has a height of 3000 mm measured from the interior of the hutch and consists of 3 main walls: the outer and inner walls (OHB-O and OHB-I, respectively) have a length of 7100 mm, while the backwall (OHB-B) has a length of 2210 mm. The roof of the BEATS OHB (OHA-R) has a total surface of approximately 15.7 m^2 and must have a minimum lead thickness of 5 mm. The size and shielding of the BEATS OHB walls and roof are:

ITEM	Name on 93.01.9001	Size (length × height)	Shielding thickness
Sidewall	OHB-O	7100 mm × 3010 mm	10 mm Pb
Inner wall	OHB-I	7100 mm × 3010 mm	15 mm Pb
			50 mm Polyethylene
Backwall	OHB-B	2210 mm × 3010 mm	60 mm Pb
Roof	OHB-R	7100 mm × 2210 mm	5 mm Pb

9.2.2 Local shielding

The inner wall OHB-I must be covered with a 50-mm-thick neutron shielding in Polyethylene. Apart from the neutron shield on OHB-I, the local shielding elements required are identical to those of OHA: the wall penetration on OHB-B for the TP shall be fitted with the diameter of a CF150 flange (203 mm). The central holes on the guillotine (OHB-B_guill) and on the central photon reinforcement must be 152mm in diameter. The transfer pipe height at the exit from OHB-B is 1440 mm. Local reinforcements on the OHB-B shall be centered at the nominal beam height of 1400 mm.

#	Shielding element	Name	Qty	Height (mm)	Width (mm)	Thickness (mm)	Material
1	Tunnel-to-OHB guillotine	OHB_guill	1	500	500	50	Pb
2	OHB-B-to-TP guillotine	OHB-B_guill	1	400	400	65	Pb
3	OHB-B central reinforcement	OHB-B_cR	1	1000	1000	50	Pb
4a	OHB-B neutron central shield	OHB-B_Poly_TL	1	1000	1000	100	Polyethylene
						5	Pb
4b	Extension of OHB-B neutron shield over the TP collar	OHB-B_Poly_TL	1	Along the first 155 mm of TP		50	Polyethylene
						5	Pb

9.2.3 Doors, chicanes and other components

OHB must be equipped with the following components:

Component	Name	Qty	Ref. Design	Lead thickness
Electrical chicane (wall OHB-O)	OHB-EC1	1	ESRF 00.67.0200	10 mm
Fluids chicane (wall OHB-O)	OHB-FC1	1	ESRF 00.67.0202	10 mm
Ventilation entrance chicane (wall OHB-R)	OHB-VCI	1	ESRF 00.67.0204	5 mm
Double door without window (wall OHB-O)	OHB-D1	1	ESRF 00.67.0304	10 mm

9.3 BEATS experimental hutch (EH)

9.3.1 Size and shielding

A drawing of the BEATS EH is given in 93.01.9002. The size and lead shielding thicknesses of the BEATS EH walls and roof are:

ITEM	Name on 93.01.9002	Size (length × height)	Lead thickness
Frontwall	EH-F	2800 mm × 2950 mm	20 mm
Outer sidewall	EH-O	9000 mm × 2950 mm	20 mm
Inner sidewall	EH-I	9000 mm × 2950 mm	20 mm
Backwall	EH-B	2800 mm × 2950 mm	60 mm
Roof	EH-R	9000 mm × 2800 mm	20 mm

EH must be installed in the service area below the concrete floor of the offices building and has therefore a limited height of 2950 mm.

9.3.2 Local shielding

The wall penetration on EH-F for the transfer pipe shall be fitted with the diameter of a CF flange (outer CF200 flange diameter is 254 mm). The transfer pipe height at the entrance on EH-F is 1440 mm.

The following additional shielding elements must be installed:

#	Shielding element	Qty	Height (mm)	Width (mm)	Thickness (mm)	Material
1	Exp hall-to-TP guillotine	1	460	420	20	Pb
2	TP-to-EH guillotine	1	400	400	20	Pb
3	EH-B beamstop	1	200	200	120	W
4	EH-B neutron central reinforcement on outer side	1	1000	1000	50	Polyethylene
					5	Pb
5	EH-B central reinforcement after neutron shield	1	400	400	50	Pb

The beam entrance hole on the front wall of EH (EH-F) must be reinforced with guillotines from both sides. On the outer side, a 460 mm × 420 mm guillotine (Exp hall-to-TP guillotine) shall surround the transfer pipe. Inside the EH, a 400 mm × 400 mm guillotine (TP-to-EH guillotine) shall surround the transfer pipe entrance. Both Exp hall-to-TP guillotine and TP-to-EH guillotine shall be centered around the nominal beam height of 1400 mm from floor.

A 200 mm × 200 mm × 120 mm (height × width × thickness) tungsten beamstop must installed inside EH on EH-B at the nominal beam height of 1400 mm.

On the outer side of EH-B, a central 50-mm-thick neutron shielding in polyethylene with a surface of 1 m × 1 m must be installed at the nominal beam height of 1400 mm. The neutron reinforcement is followed by a 400 mm × 400 mm rectangular screen with minimum lead thickness of 50 mm. The surface of the polyethylene layer which is not in contact with the lead screen must be covered with a 5-mm-thick lead wrapping.

The design of all reinforcements and of the beam stop shall guarantee support and mechanical stability of all elements on both sides of EH-B.

9.3.3 Doors and chicanes

The BEATS EH must be equipped with the following components:

Component	Name	Qty	Ref. Design	Lead thickness [mm]
Electrical chicane (walls EH-F and EH-O)	EH-EC1; EH-EC2	2	ESRF 00.67.0200	20
Fluids chicane (walls EH-F and EH-I)	EH-FC1; EH-FC2	2	ESRF 00.67.0202	20
User experiment electrical chicane (wall EH-O)	EH-UC	1	ESRF 00.67.0207	20
Ventilation entrance chicane (wall EH-I)	EH-VCI	1	ESRF 00.67.0204	20

Ventilation chicane (wall EH-I)	EH-VCO	1	ESRF 00.67.0204	20
Double door with window (wall EH-O)	EH-D	1	ESRF 00.67.0304	20

9.3.4 Hutch roof and support structure

The roof of the BEATS EH (EH-R) has a total surface of 25.2 m^2 and must have a minimum lead thickness of 20 mm. Loads coming from the roof should be transmitted to the floor slab through pillars correctly dimensioned. The BEATS EH will be installed in the service area under the concrete first floor of the office building. The nominal height of the concrete ceiling is 3 m, and **the BEATS EH-R should be installed as close as possible to the ceiling to exploit the full height available.** The bidder can propose a modification of the height of the BEATS EH. The final decision on the BEATS EH-R height should be agreed with SESAME.

9.3.5 Internal crane

A overhead crane with load capacity of 1 ton must be installed inside EH. The vertical movement must be electrical/motorized (400V L-L, 50Hz), while the X/Z translation along the hutch must be manual. The crane is to be suspended from the wall structure and must be able to move on rails along the entire length of EH. In order to maximize the height of the hook, the travelling part of the crane should be raised using special adapter plates on the suspension trolleys. The maximum hook height should be at least 2.5 m.

9.4 Long vacuum transfer pipe (TP) shielding

A lead shielding for the vacuum transfer pipe connecting OH and EH must be provided. The shielding must be installed on a mechanical support with adjustable height (the nominal height is 1440 mm) over the entire TP length. The vacuum pipe to be shielded is ~16-m-long and is composed of two consecutive sections with different diameter:

- A 8-m-long CF150 section followed by
- A 8-m-long CF200 section.

The lead shielding must consider enough space around the transfer pipe to host a CF200 flange.

A design of support structure and transfer pipe lead shielding is proposed in drawing 93.01.9003 (for OH Version A) and 93.01.9006 (for OH Version B). The bidder can propose a different design for the TP shielding, provided that the minimum lead thickness and radiation tightness requirements are respected. The design of the TP shielding must be approved by SESAME.

Radiation-tight connections to the OH and EH must be provided.

The minimum lead thickness for the TP shielding is 20 mm over the entire pipe length.

10 Quality control

The contractor shall certify the operation under a quality assurance system that complies with the ISO 9002 or an equivalent national standard.

The manufacturing phase shall not begin without written approval of SESAME, covering both engineering and radiation safety aspects.

SESAME reserves the right to visit the contractor, upon reasonable prior notice, to review progress of the manufacturing process.

The contractor shall notify SESAME immediately for review and approval of any design changes, fabrication discrepancies, changes in documented schedules or other commitments according to this specification and all terms of the purchase order.

11 Inspection and testing

With the exclusion of radiation tests, the contractor shall provide all the equipment, funds and personnel for carrying out the required tests.

11.1 Factory or Pre-delivery inspection

A detailed description of parts shall be sent to SESAME prior to the delivery to the SESAME site. This includes reports on the steel and lead parts according to the following inspections:

- Visual inspection,
- Dimensional check,
- For lead parts, measurement of the lead density.

The report will be sent to SESAME for approval by the consignee/Project Manager. These parts shall be dispatched only after the approval of SESAME.

All parts pre-assembled or manufactured at the contractor’s or sub-contractor’s factory may be subject to an inspection by a member of SESAME or of the BEATS consortium. The date of the inspection should be agreed between SESAME and the supplier.

11.2 Inspection at the SESAME site

The following sequence shall be performed on the hutches and on the transfer pipe shielding components:

- Visual inspection, and light-test at the end of the construction,
- Dimensional check,
- Functionality checks (doors, removable roof, chicanes...).

The date of the radiation tests as described in the above, will be decided by SESAME, according to its own time schedule. These tests are carried out several weeks after the end of the contractor's installation period.

Therefore and as described in section 8, the contractor might be asked to make modifications several weeks after completion of the installation works at the SESAME site.

12 Packaging and transport

The contractor is responsible for the packing and shipping to the SESAME site of all parts necessary for the assembly of the hutches. Adequate packing and protection must be provided to prevent damage during transport. The maximum weight of each individual case is 1500 kg. SESAME shall be notified prior to shipping of any piece exceeding this weight.

The shipping address for all items of this Call for Tender is:

SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) Next to Princess Rahma University College, Allan 19252, Jordan

Besides the shipping address, the following is to be displayed clearly on the outside of the packaging:

- The SESAME contract number
- The weight of the loaded package
- Support points for transportation and lifting, as well as the location of the center of gravity.
- Reference to a document giving the complete and detailed description of the goods. This document shall be sent separately to SESAME, before the dispatch of the goods.

13 Warranty

The warranty period shall be two years after site acceptance.

APPENDIX 1 – Annexes

Annex I: CFT BEATS hutches - Lead weight breakdown

Annex II: CFT BEATS hutches - Price breakdown

Annex III: Safety Policy at SESAME

APPENDIX 2 – List of drawings

Drawing name	Description
93011000 - version_A_and_B	BEATS general layout
93019008	BEATS optics hutch – Version A
93019001	BEATS optics hutch – Version B
93019002	BEATS experimental hutch
93019003	BEATS transfer line shielding with support – Version A
93019006	BEATS transfer line shielding with support – Version B
SESAME building floor plan	SESAME building floor plan
00670001	ESRF hutches standard 00.67.0001
	00.67.0200 - Electrical chicane built with panel
	00.67.0202 - Fluids chicane built with panel
	00.67.0204 - Ventilation chicane
	00.67.0207 - User experiment chicane
	00.67.0300 - Single door
	00.67.0304 - Double door
	00.67.0402 - Window in panel wall
	00.67.0500 - Roof panel
	00.67.0600 - Bremsstrahlung wall integrated in back wall
	00.67.0602 - Bremsstrahlung wall
	00.67.0603 - Bremsstrahlung wall
	00.67.0700 - Tunnel
	00.67.0702 - Tube support for TP
Door Devices - Electro-Mechanical Lock	PSS systems
Door Devices - Magnetic Lock	PSS systems
Door Devices - Magnetic Position Sensor	PSS systems

APPENDIX 3 – Quality Warranty and the Statutory Warranty for Defects