Request for the Proposal

of

Fabrication, Assembly, Test and Supply of a Complete PSMT Phase 1 Test Bed Setup

To

IIA Bangalore.

Indian Institute of Astrophysics,
Block II, Koramangala, Bangalore 560034.

1. *IIA and site location*

The Indian institute of Astrophysics (IIA) is an autonomous organization under the Department of Science and Technology, Government of India, with headquarters at koramangala, Bangalore. The institute conducts research in astrophysics and allied subjects. Indian institute of Astrophysics is coming up with segmented mirror telescope of 8m diameter in Leh Ladakh.

Indian Institute of Astrophysics, Bangalore operates Indian Astronomical Observatory, at Hanle in the Ladakh region of Jammu and Kashmir, India. Hanle is situated at about 270 Km's from Leh, at an altitude of 4,500M above sea level.

2. *Nature of the work*

The Vendor is expected to fabricate, assemble, test and deliver the PSMT Phase 1 testbed setup as per the technical specification and drawings. IIA shall provide all the drawings, specifications, and any other required details for this purpose. The vendor has to provide a list of suppliers from whom the bought out items are being planned to be procured and confirm the availability of the required quantity from the vendor and include the same in the quotation.

3. *Objectives of this document:*

This document gives the details of overall scope, specifications of the proposed fabrication, assembly, testing and deliver the PSMT Phase 1 Test Bed Setup as per the technical specification, drawings and delivery schedule. The details are provided here such that the vendors who wish to participate in the proposed production activities may provide their techno-commercial bids for the proposed scope of work contract.

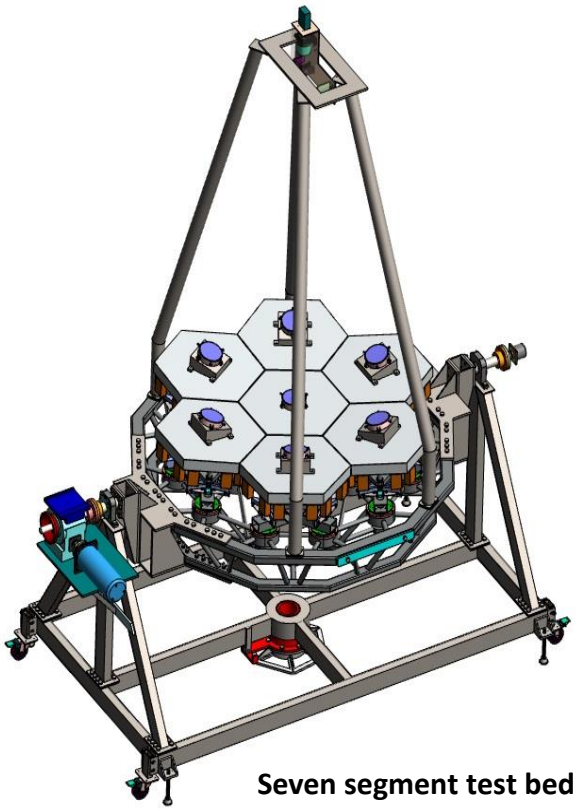
It is proposed to invite techno commercial bids from competent establishments or industries engaged in the area of precision mechanical engineering activities to undertake production responsibility for realization of above PSMT phase I, test bed setup.

The award of the contract shall be subject to the recommendation of the committee consisting of IIA staff members who shall inspect / visit the site / location of the successful tenderer to physically verify the establishment facility of the firm and information / records furnished along with the tender document.

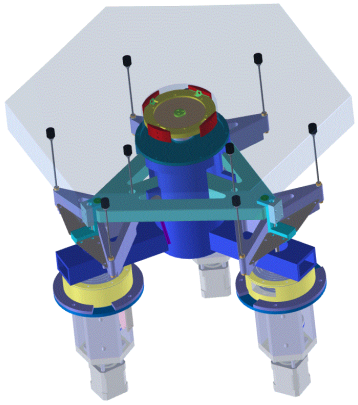
The Institute reserves the right to reject any or all tenders, wholly or partly or close the tender at any stage prior to award of contract without assigning any reason whatsoever.

4. ***The brief description the PSMT Phase 1 Test Bed:***

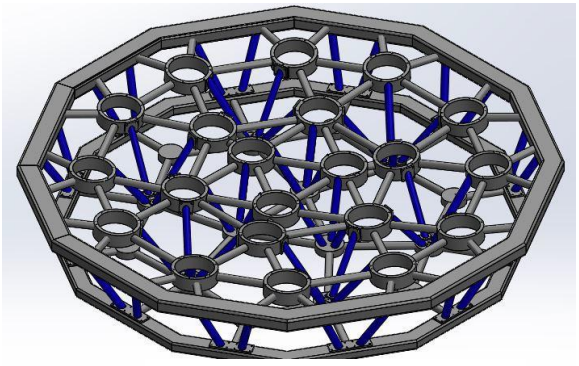
Prototype segmented mirror telescope (PSMT) is a technology demonstrator small telescope being developed at Indian Institute of Astrophysics Bangalore. The PSMT development activities is divided into two phases. In the first phase a seven segments laboratory test bed will be developed, whereas, in the second phase the full-fledged telescope will be realized. The laboratory setup will have a segmented primary mirror made of 7 mirror segments. Each segment will be placed on an indigenously designed segment support and driven by three actuators. Sides of these segments will be populated with



Seven segment test bed



Single Segment mounted on SSA



The Primary Mirror Cell

Figure 1*:* Mechanical model of the PSMT phase-I, which is a seven segment laboratory setup to test control of the segmented primary mirror.

Inductive edge sensors. To understand the effect of the variable gravity on the mirror control, the segmented primary mirror (PM) will be mounted on the motorized mount which will allow PM to swing about the elevation axis in the elevation direction (see the Figure 1). The most critical part of the test bed is the space frame based mirror cell which will host all seven mirror segments mounted on precision segment support assembly (SSA). The mirror cell is designed with tight tolerances so that once all 7 segments are installed then they should work like a single monolithic mirror with very minimal adjustment through actuators. As per the design CG of the parts which rotate about the elevation axis goes through elevation axis and while manufacturing

different components one need to make sure that they are as per the specification as well as right kind of material is used. The break is designed to lock the system whenever it is not in use. In the laboratory setup, instead of using full size mirror segment of the large ROC, we plan to make use of small circular mirror which will be installed on the top of the hexagonal aluminum flat mimicking the mirror segments. A Shack-Hartman (SH) based alignment and phasing device will be mounted at the prime focus of the primary mirror of the test bed. The performance of the primary mirror control (M1CS) will be judged based on the optical feedback received from the SH.

5. Eligibility Criteria for the vendors:

4.1. Vendor shall have reputed background for at least eight years in doing heavy mechanical fabrication of MS welded structures, thin walled structure of similar nature and have exposure to drive mechanism assemblies. The drive mechanism consists of motor, reduction unit, couplings, bearings, shaft etc.

4.2. The vendor should have proven technical expertise and ample experience in the field of Manufacture Assembly and integration of mechanical assemblies. The vendors should have necessary infrastructure, professional manpower and in –house/access to metrology facility to carry out the job using CNC Machines/techniques. Vendor must enclose relevant information in the form of work orders etc.to support his technical competence for this job

4.3. This being a developmental activity, the works progress at factory requires frequent interaction between IIA engineers and the vendor at manufacturing site. Due to the above reason, the vendor shall have executed similar works and also should have their manufacturing facility at Bangalore for smooth execution of work. This will be an advantage for IIA to visit the manufacturing facility frequently & to avoid mistakes that may be committed during fabrication by the manufacturer. Frequent visits to the shop floor during manufacturing is highly essential to verify the interface of various sub-assemblies of the system such as segment support assembly, connecting truss assembly interface between secondary and the primary mirror cell, drive assembly, encoder assembly etc. with the test bed setup.

4.4. In-house expertise of AutoCAD modelling, drafting facility for review of fabrication drawings or 3Dmodels.

4.5. Crane facility and shop floor area for Assembly and testing shall be available within the vendor's premises.

4.6. Availability of NDT weld inspection facilities like di-penetration test etc.

4.7. In addition to manufacturing facility, the Bidder should have good Inspection facility so that all the parameters like Geometrical & dimensional accuracies of fabricated components has to be measured and recorded in inspection reports. Details of measuring instruments such as Profile Projector, 3D CMM, Surface roughness tester, etc., Inspection tools like dial gauges, sprit levels, micrometers, Vernier, feeler

gauges etc. shall be available within the vendors premises. If this is not available in-house, the vendor should be able to arrange with any other sub- contractor facility which shall be made accessible to IIA engineers for witnessing any of the activities related to this contract. Independent component level inspection reports shall be furnished to IIA and as per the directions of Engineer-in charge.

4.8. PSMT Phase 1 Test Bed Setup drawings contains close geometrical and dimensional accuracies which will be used to integrate the Segment support assembly. Fabrication involves CNC milling, CNC turning, CNC drilling and General Inspection including measurement with height master, 2D measurements with optical comparator, form and roughness measurement etc.

4.9. Vendor shall have experience in Machining Materials & components having dimensional accuracies in the range between 5 microns to 50 microns, Geometrical accuracies like Flatness, Parallelism, and Perpendicularity in the range between 10 microns to 50 microns and the Positional accuracies in the range between 5 microns to 20 microns.

4.10. Vendor must comply with all the above mentioned criteria. Non-compliance of any of the criteria will entail for rejection of the offer summarily. IIA reserves the right to verify / evaluate the claims made by the vendor independently.

4.11. Latest executed at-least two jobs of value not less than Rs. 20 lakhs in last 5 years of similar nature of technically challenging projects details may be furnished with completion certificate from the employer.

4.12. While fabricating PSMT rotating structure (Part no.6), the coordinates of holes on PMC top frame sub assembly (Part No: 6-01-01) has to be fabricated using CNC machine only including maintaining of interfaces.

6. ***Inspection of vendor's factory and works completed:***

5.1 As a part of evaluation criteria, the IIA will inspect the works of the manufacturer before placing the purchase order through its staff, consultant for authentication of the various technical parameters being claimed by the vendor's factory/site. However, not providing full cooperation in this regard will disqualify the vendor and his offer will be rejected summarily.

5.2 As and when required, the engineers of IIA shall be allowed to inspect the ongoing works at the factory for intermediate checking.

5.3 Manufacturer will furnish the inspection reports of all the materials, parts, subassemblies &assemblies to IIA during the course of manufacture.

5.4 Manufacturer shall provide necessary facilities, instruments and tooling for the quality surveillance and inspection of components, assemblies and alignments during inspection.

7. ***Time of Completion:***

Vendor should identify the milestones for completing the entire job and should send a list of it with time schedule along with the bid.

8. ***Acceptance Criteria and test plans in the Factory and on site at IIA:***

- *The finished components/assembly shall meet the drawing specifications, Quality assurance plan and work instructions.*
- *All the geometric dimensions are to be within the tolerance as per drawing dimensions.*
- *Components shall be free from scratches and dents.*
- *Components shall be free from burrs and sharp edges.*
- *Satisfactory shop assembly of the parts of the test bed setup shall be carried out at the vendors place.*

9. ***Load test after fabricating the PSMT Rotating structure at Fabrication Site:***

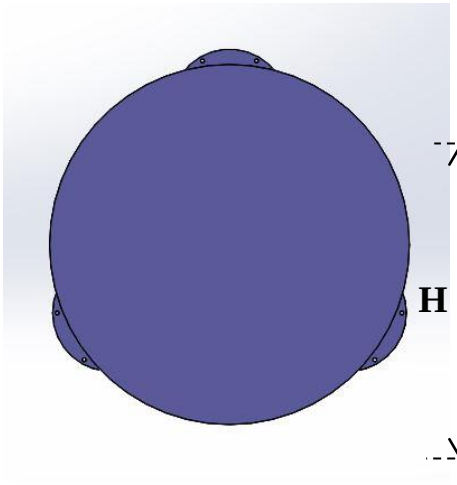


Fig 1.Test Load Top View

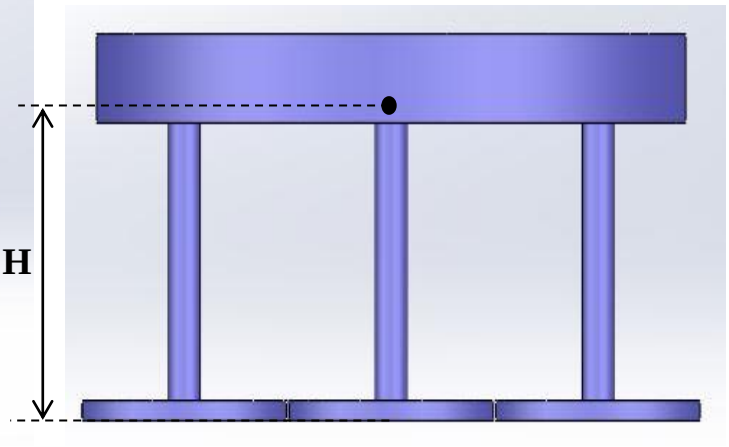


Fig 2. Test Load Front View

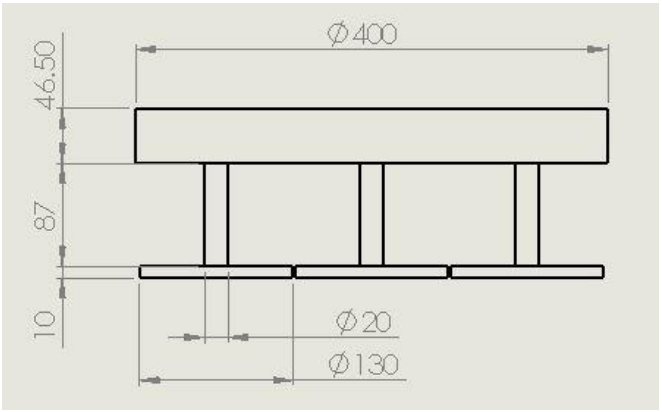


Fig 3. Dimensions of Test Load

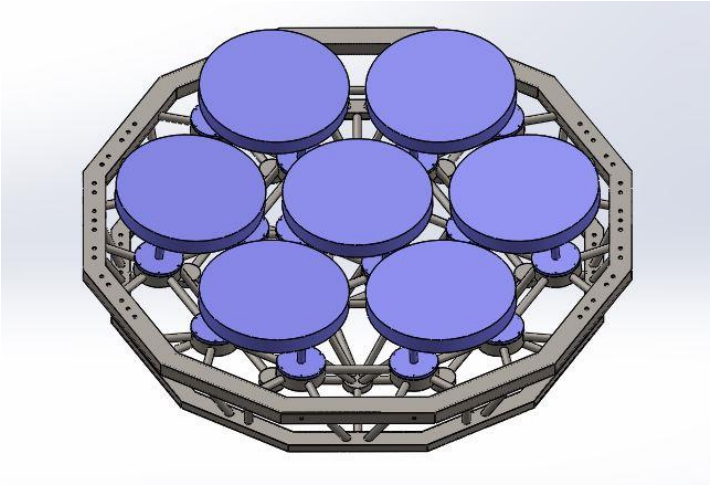


Fig 4. Load Test Setup

Each test load weighs = 50Kg,
Cg of each test load H = 112mm
Total test load needed = 7 No's

a. *Load and CG have to be simulated and connected to the PMC interface as per the sketch 1, 2 and 3 shown here*
b. *Proper assembly of PSMT Rotating Structure has to be ensured and free rotation of PMC has to be demonstrated driving through the motor-reduction unit drive under the following condition,*
    - *With load.*
    - *Without load.*

The shape of the test loads can be changed, if it helps the vendor, as long as the mass, CG and fixing interfaces are maintained for the test load. The load can be retained by the vendor for himself after completion of load test and it is not a part of delivery to IIA

10.Free Supply items from IIA:

IIA will provide only stepper motor (Part No: 9-03) & encoder (Part No: 22) during final assembly and integration stage to the vendor. Vendor shall match the interface of the supplied item to the corresponding part.

11.Technical specification:

a. Scope & Specifications:

Manufacture, Assembly, integration, testing and Supply of Phase 1 Test Bed Setup as per the attached technical specification and drawings.

b. The scope of work:

Vendor shall strictly follow/adhere to the standard and notes specified in the drawing and shall be responsible for the following:

1. *Procurement of all the raw materials required for fabrication of PSMT Phase 1 Test Bed Setup as per the drawing,*

    a. *Realization of necessary fixtures required during manufacturing/assembly stage.*

    b. *Procurement of all fasteners required for the assembly as per IS standards.*

    c. *Safe packing and transportation of complete PSMT Phase I, test bed setup to IIA.*

2. *The supplier shall draw a manufacturing programme and shall submit the same to IIA for information. This programme shall include the following.*

    i. *Identification of various stages of manufacturing processes, manufacturing process flow for critical components.*
    ii. *Providing details about inspection process, machines etc. required for generating inspection reports.*

    iii. *Mention of outsourcing of specific components which need to be outsourced due to non-availability of facility.*
    iv. *Delivery schedule considering all the aspects.*

3. *In addition to the above, following documents are to be submitted.*
   Stage wise dimensional inspection reports for components.

4. *All the dimensions specified in the drawing are of finished dimensions, any operations like Stress relief or heat treatment, etc. shall be carried out leaving sufficient allowance for machining after these operations to maintain the final dimensions and geometric tolerances.*

5. *Stress relieving shall be carried out where ever required as per the ASME Code.*

6. *All the components after deburring to be cleaned (By petroleum based solvent) and assembled at factory for the testing. After the acceptance, the complete assembly of PSMT phase I test bed setup, it shall be properly covered with polythene sheets and then packed suitably and ensure safe transportation and supply to IIA.*

7. *The PSMT Phase 1 Test Bed Setup built shall be powder coated as specified by IIA as per the standards after necessary acceptance of IIA.*

8. *In case any defect in material and assembly is found at a later stage, it has to be rectified by the vendor without any additional cost. Vendor shall accommodate any small/minor changes in the requirement if it arises after placement of PO without any extra claim.*

9. *All dimensions of the components to be as per the drawings supplied by IIA. Any deviations/nonconformance at any steps of manufacture should be*

reported to IIA and a clearance to be obtained for further action.

12. Contact details:

For technical clarifications:

- *P. M. M. Kemkar IIA, Bangalore. pmmk@iiap.res.in*
- *Govinda. K.V, IIA Bangalore. govinda.kv@iiap.res.in*

Administrative clarifications:

- *Vishnu Vardhan IIA, Bangalore: vishnu.vardhan @iiap.res.in*

Annexure – 'A'
(Assembly and Part drawings)

Note: 3D drawings in solid works (Part No: 6) of PSMT rotating structure shall be supplied to the fabricator. These parts have to be fabricated as per the 3 D drawings. The location of holes are given in table for reference also in the attached drawings. For all the remaining components, 2d drawings may be used for fabrication. ***Refer the attached drawings.***

Table 1: parts to be fabricated by Vendor:

Part No	Description	Quantity
1	Base frame sub-assembly	1
2	A-structure	2
3	Bearing Housing	2
5	Bearing Cover	2
6	PSMT Rotating Structure	1
8	Caster Wheel Sub-Assembly	4
9	Reduction Unit Holding Assembly	1
10	Azimuth Base Top Part	1
11	Azimuth Base Bottom Part	1
18	Jack	4

Table 2: list of standard items to be procured by Vendor:

Part No	Description	Brand or Equivalent	Material	Quantity
4	Deep Groove ball Bearing	SKF-61908		2
6-11	M10 X 85mmHex Head	STD	HTS	10
7	M10 X25mm Hex Head	STD	HTS	100
8-03	Caster Wheel			4
9-04	Reduction unit	Elecon 2 ¼ SNU		1
9-10	M6X 25mm Hex Head	STD	HTS	4
10-06	M4 X 20mm Hex Head	STD	HTS	4
10-07	M4 X 35mm Hex Head	STD	HTS	3
13	coupling Stepper Motor	Fenner coupling BC1		1
14	coupling Reduction Unit	Fenner coupling BC1		1
15	coupling Reduction Unit output	Fenner coupling BC2A		1
16	coupling frame input	Fenner coupling BC2A		1
16	Deep Groove ball bearing	SKF-61926		1
17	Thrust bearing	SKF-51120		1
19	M4 X 12mm Hex Head	STD	HTS	19
20	M10 X 55mmHex Head	STD	HTS	30
21	M10 X 65mmHex Head	STD	HTS	34
24	Coupling Encoder	Ruland_fsmr38-20-10-a		1

8-03: Caster Wheel:
Type: Swivel
Wheel Diameter: 4 inch
Minimum Load Capacity: 500 Kg
Wheel material: Polyurethane or Nylon.

Table 3: Website addresses:

Part No	Description	Web address
4	Deep Groove ball Bearing- SKF 61908	https://www.skf.com/uk/products/rolling-bearings/ball-bearings/deep-groove-ball-bearings/productid-61908
9-04	Reduction unit	https://www.elecon.com/power-transmission/worm-gearboxes/worm-gear-small-series
12	coupling Stepper Motor BC1	https://www.steelofab.net/bush-type-flexible-couplings.html
13	coupling Reduction Unit BC1	https://www.steelofab.net/bush-type-flexible-couplings.html
14	coupling Reduction Unit output BC2A	https://www.steelofab.net/bush-type-flexible-couplings.html
15	coupling frame input BC2A	https://www.steelofab.net/bush-type-flexible-couplings.html
16	Deep Groove ball bearing - SKF 61926	https://www.skf.com/uk/products/rolling-bearings/ball-bearings/deep-groove-ball-bearings/productid-61926
17	Thrust bearing - SKF 51120	https://www.skf.com/uk/products/rolling-bearings/ball-bearings/thrust-ball-bearings/productid-51120
24	Coupling Encoder	https://www.ruland.com/fsmr38-20-10-a.html

Table 4: list of items will be supplied by IIA for assembly of fixture:

Part No	Description	Quantity
9-03	Stepper motor	1
12-06	Encoder	1