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EOI सूचना सं.: सैक / EOI-2/ 2016-17
EOI Notice No.: SAC /EOI-2 /2016-17

भारत के राष्ट्रपति के लिए और उनकी ओर से, वरि. प्रधान, क्रय एवं भंडार, अंतरिक्ष उपयोग केंद्र, अहमदाबाद, इच्छुक भारतीय विक्रेता से अभिरूचि की अभिव्यक्ति (ईओआई) आमंत्रित करते हैं।

For and on behalf of the President of India, Sr. Head, Purchase & Stores, Space Applications Centre, Ahmedabad invites Expression of Interest (EOI) from interested vendors.

क्र. सं. Sr.No	निविदा नं. Tender No.	संक्षिप्त विवरण Brief Description	नियत तिथि (अपराह्न 3 बजे तक) Due on (Up to 3 pm)
1	SAC/EOI-2/B1/2016-17	Brushless DC Motor	01/08/2016
2	SAC/EOI-2/C3/2016-17	Differential Scanning Calorimeter Setup	27/07/2016
3	SAC/EOI-2/D1/2016-17	Network Infrastructure for CCTV Surveillance System	01/08/2016
4	SAC/EOI-2/D2/2016-17	Completely Maskless UV LED Based Direct Imaging System for High End PCBs/MLBs Applications	20/07/2016
5	SAC/EOI-2/D3/2016-17	High Speed CNC Drilling and Routing Machine for DSB,PCB and MLB Fabrication	25/07/2016

विस्तृत तकनीकी दस्तावेज इसरो वेबसाइट www.isro.gov.in और www.sac.gov.in पर उपलब्ध है जिसमें विनिर्देश, विक्रेता की पूर्व अपेक्षाओं का उल्लेख है और इसे वेबसाइट से डाउनलोड किया जा सकता है।

The detailed technical document including specifications, pre-requisites that a vendor should possess etc. is available on ISRO website www.isro.gov.in and www.sac.gov.in and the same can be downloaded from the website.

कृपया अपने विस्तृत प्रत्युत्तर मोहरबंद लिफाफे में नियत तिथि तक या इससे पूर्व अधोहस्ताक्षरी को भेजें।

Please submit detailed response to the undersigned on or before due date in sealed cover.

इस ईओआई के समक्ष यदि कोई शुद्धिपत्र हो उसे वेबसाइट पर प्रकाशित किया जाएगा।

Corrigendum if any against these EOI will be published in website.

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निविदा सूचना सं.: सैक/EOI-2
Tender Notice No.: SAC/EOI-2

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1.	SAC/EOI-2/B1/2016-17	Brushless DC Motor	01/08/2016



**Expression of Interest
Document
for the Procurement
of
Brushless DC motor with
electronically commutation
for the space applications**

भू एवं चंद्र नीतभार यांत्रिकी प्रभाग Geo and Lunar Payloads Mechanical
Division

प्रकाशिकी नीतभार यांत्रिकी समूह Optical Payload Mechanical Group

यांत्रिकी अभियांत्रिकी प्रणाली क्षेत्र Mechanical Engineering Systems Area

अंतरिक्ष उपयोग केंद्र Space Applications Centre

भारतीय अंतरिक्ष अनुसंधान संगठन Indian Space Research Organization

अहमदाबाद Ahmedabad – 380015

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1.0 Introduction:

Space applications center (SAC) is developing on board blackbody calibration mechanism –in **Geo-Imaging Satellite. GISAT** is a next generation imaging satellite in geostationary orbit which will scan the field without any scanning mirror, unlike INSAT-3D payloads. Entire satellite will be imparted the bi-directional scanning motion. This change greatly will affect the thermo-mechanical design aspects. For the calibration of the LWIR Channel black body calibration mechanism is proposed.

2.0 Scope:

Scope of these document is to identify potential vendors for the development of brushless DC motor for the space applications. This includes development of brushless DC motor, gear, ball screw, hall sensor and spindle. This needs very precise control of motion for the entire life span and able to survive launch load and thermo- vacuum.

3.0 Specifications: Brushless DC (BLDC) motor with electronically commutation for space applications

PART No.: -1:- BLDC motor with hall sensor, with gear head, metric spindle and ball screw for space application in on-board spacecraft.

Specifications for Part No.1

Section-1 Mechanical, electrical and interface specification

(D=Design, A= analysis, T= Testing/Measurement)

Sr. No	Parameter	Unit	Specification Value	Verification type	Verification level
BLDC motor (Values at nominal voltage and 25°C)					
1	Nominal voltage	v	<= 24	T	
2	No load speed	rpm	13000 ± 1000	T	
3	No load Current	mA	56 ± 5%	T	
4	Nominal speed	rpm	11500 ± 1000	T	
5	Nominal torque (max. continuous torque)	mNm	> 50	T	
6	Nominal current (max. continuous current)	A	< 2.0	T	
7	Stall torque	mNm	> 400	T	
8	Starting current	A	13.4 ± 0.5A	T	
9	Max. efficiency	%	>85%	A	
Characteristics					
10	Torque constant	mNm/A	30 or higher	A	
11	Speed constant	rpm/V	250 or better	A	
12	Speed/torque gradient	rpm/mNm	25 or better	A	
13	Mechanical time constant	ms	2 or better	A	
14	Commutation method	-	Electronically	T	
15	Terminal resistance phase to phase	Ω	3.59	T	
16	Terminal inductance phase to phase	mH	0.357	T	
17	Rotor inertia	g*cm ²	7 or better	T	
Thermal data					
18	Thermal time constant of winding	S	>2.5	A,T	
19	Thermal time constant of motor	S	>500	D	
20	Ambient temperature	°C	-40 to 65	T	
21	Maximum permissible winding temperature	°C	+240		

22	Thermal resistance housing-ambient	K/W	10		
23	Thermal resistance winding-housing	K/W	0.48		
24	Weight of motor	Grms	<200	T	
Ball Bearing					
25	Type of threading		Right hand threading	T	
26	Type of Ball re-circulation system		need to be specified by vendor during quotation		
27	Ball to ball contact simulation		need to be specified by vendor during quotation		
28	Sealing into ball screw		need to be specified by vendor during quotation		
29	Lubricant into ball screw		need to be specified by vendor during quotation		
GEAR, SPINDLE AND NUT					
30	Spindle size		M6 X 2	T	
31	Spindle material		Stainless steel or other space qualified	T	
32	Thread type		Metric	T	
33	Spindle length	mm	160 ± 2 (To be finalized at ordering stage)	T	
34	Nut		Standard with outside threading need to be specified by vendor during quotation		
35	Nut material		100CR6, hardened or other space qualified	T	
36	Axial play	mm	~0.02	T	
37	Planetary gearhead		Straight teeth		
38	Bearing		Ball bearing / thrust roller bearing		
39	Radial play, 5mm from flange	mm	<0.05	T	
40	Maximum axial load (static)	N	> = 450	T	
41	Maximum radial load , at 15mm from flange	N	> = 160		
42	Reduction		5.4:1		
43	Reduction absolute		~27/5		
44	Maximum feed velocity	mm/sec	> 40	T	
45	Maximum feed force (Continuous)	N	> 100		
46	Maximum feed force (intermittent)	N	> 250		

47	Number of stages		1		
48	Max. efficiency gearhead incl. spindle	%	> 75%		
49	Mechanical positioning accuracy	mm	~ 0.05		
50	Gear head length	mm	38 ± 5		
51	Weight of the spindle with ball screw	Grams	<130	T	
52	Spindle should have bearing mounting arrangement (refer fig -1)				
Hall sensors details					
53	No of hall sensors		3 and 120 +/-10 degree apart		
54	No of phases		3		
55	No of pole pairs		1		
56	Hall sensor voltage		< 12V		
57	Connectivity of hall sensor		26 gauge multistrand Teflon wire with colour coding		
58	Connectivity of winding		26 gauge multistrand Teflon wire with colour coding		
59	Hall sensor radiation test data		Desired >100KRad(Si) SEU < 1E10-8 bits per day		
60	Motor physical dimension and mounting provision		Refer section 3.1		
61	Environmental condition		Refer section 3.2		
62	Mechanical Interface, life of motor, material and lubrication		Refer section 3.3		

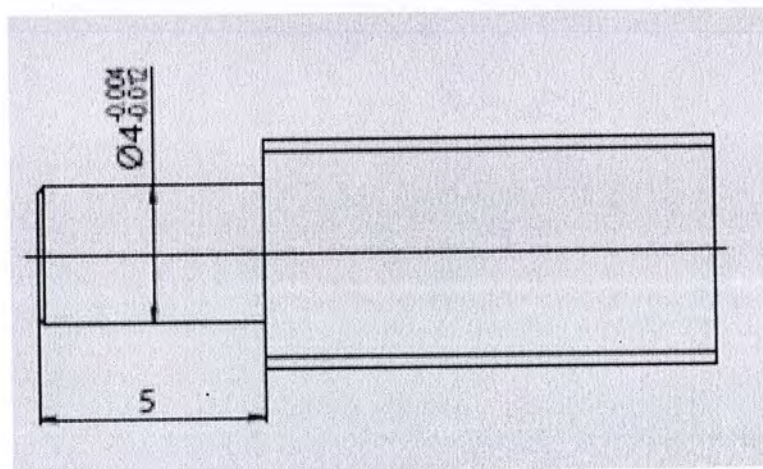


Fig. - 1 Spindle end detail

3.1 Motor Physical Dimensions and Mounting Provisions:

Dimensional details of motor with spindle and ball screw shall be provided by the manufacturer in the form of engineering drawings. The motor assembly shall have proper provisions to enable adequate mechanical mounting, in the form of flanges/holes (shall be detailed in the drawings). The mounting motor assembly shall be such that proper support is provided to withstand the mechanical stresses during satellite transport, launch and deployment, ensuring reliable operation throughout its life. However, mounting configurations shall be proposed by the manufacturer and shall be mutually agreed upon.

3.2 Environmental Conditions:

3.2.1 The units shall be capable of withstanding the following environmental conditions:

Storage and Non-operating Environment:

- a) Non operative Temperature: -40 to 100°C
- b) Vacuum Ambient to 1E-6 torr or better

Operating Environment:

- a) Operative Temperature -40 to +65°C
- b) Vacuum Ambient to 1E-6 torr
- c) Relative Humidity (during Lab use) Better than 50% @ 25±3°C

3.2.2 Vibration / Shock:

The unit shall be designed and fabricated to meet the vibration (sine and random) and mechanical shock specifications as per below:

Sinusoidal Vibration Test Specifications:

On all the three axis:

Frequency (Hz)	Amplitude
	Qualification
5 - 18	9.2 mm (0 to P)
18 - 70	12 g
70 - 100	5 g

Acceptance levels are 0.7 times of above levels.

Sweep rate : 2 Octave/min. for Qualification
: 4 Octaves/min. for Acceptance

Number of sweeps : 1

Tolerances are as follows

Acceleration : + 10%
Frequency : + 1 Hz upto 50 Hz
 + 2 Hz above 50 Hz
Sweep rate : 10%

Note: Sine Vibration test shall be preceded and followed by a resonance search test to establish the integrity of the structure. Frequency shift from pre to post runs will not be more than ± 3 to 4 Hz.

Random Vibration Test Specifications:

On all the three axis:

Frequency	PSD (g ² /Hz)
	Qualification
20 – 100	+ 3 dB/Oct
100 – 700	0.1
700 – 2000	-3 dB/Oct
Overall 'g' RMS	11.8
Duration	2 Minutes

Acceptance levels are -3dB of above levels with the duration of 1Minute.

Tolerances: PSD : + 3 dB
 'g' rms : + 10%

Duration : + 10%

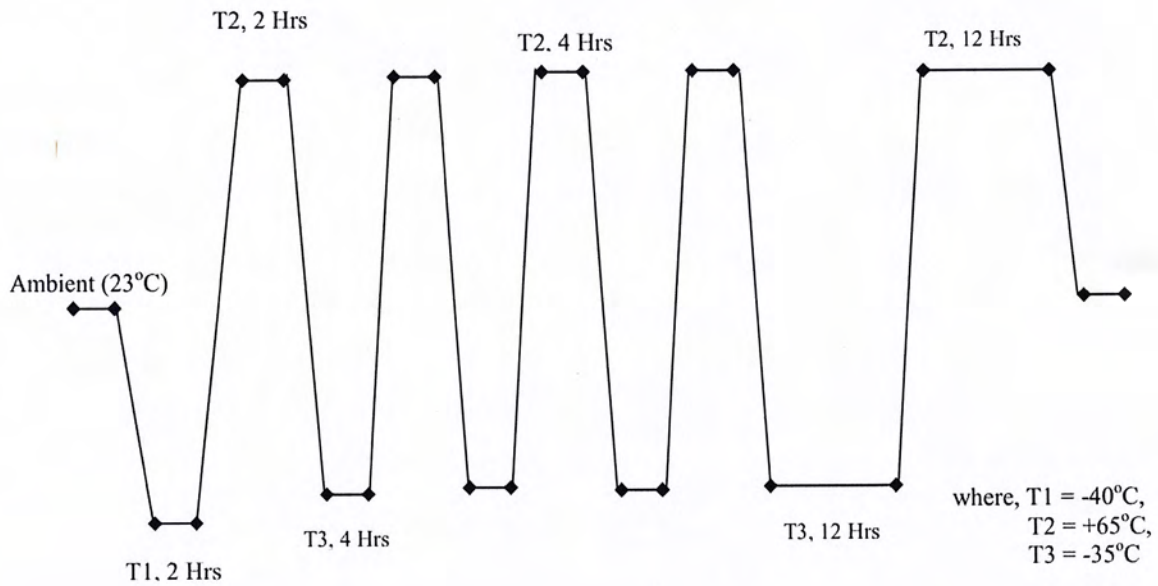
Note: Random Vibration test shall be preceded and followed by a resonance search test to establish the integrity of the structure. Frequency shift from pre to post runs will not be more than ± 3 to 4 Hz.

Mechanical Shock Test

All three axes	
Freq.(Hz)	SRS (g)
100 - 600	15 dB/Oct
600 - 4000	900
4000 - 10000	-6 dB/Oct
No. of Shocks	2 per axis

No. of Shocks per Axis : 2

3.2.3 Thermo-vacuum cycle: Unit has to undergo following thermos- vacuum cycle



3.3 Mechanical Interface, life of motor, material and lubrication:

The connection between Motor and Gear head are robust enough to sustain thermal & mechanical loads stated above

Mounting flange material at Gear head is Stainless steel - The motor/gearhead interfaces (material stainless steel) are threaded and subsequently laser welded.

- Life of motor :

Continuous operation at rated speed = 30 second for every 7min interval for 15 years of operation.

Cumulative operation at rated speed = 8000 hours minimum in ambient

- Material & Lubrication:

Bearing of Stainless steel material Lubrication with Braycote 601 EF grease or other space grade.

4.0 General Guidelines to vendor:

1. Point by point compliance to the specification and functional requirements, values of the parameter/ specification with reference to product datasheet, make and model no. and any other relevant information to be supplied.
2. All required accessories and associated software for operation and to perform above mentioned functions, should be pointed out.
3. Response to EOI should be given directly by the manufacturer or their authorized indian representative (Authorization certificate to be enclosed).
4. Service and spares support should be available for minimum 10 years.
5. The requirement is only for new development/items.
6. Warranty duration/optional extended warranty duration available with the item to be mentioned.
7. Warranty and post warranty services should be available.
8. Vendor may submit functional block diagram of test set-up / Instrument explaining working principle and measurement methodology used for measurement.
9. Installation and training / demonstration at site should be available from vendor.

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निविदा सूचना सं.: सैक/EOI-2
Tender Notice No.: SAC/EOI-2

क्र. सं. Sr.No	निविदा नं. Tender No.	संक्षिप्त विवरण Brief Description	नियत तिथि (अपराह्न 3 बजे तक) Due on (Up to 3 pm)
2.	SAC/EOI-2/C3/2016-17	Differential Scanning Calorimeter Setup	27/07/2016



Request for
EXPRESSION OF INTEREST
For
Differential Scanning Calorimeter setup
at
SAC-Ahmedabad

SPACE APPLICATIONS CENTRE
INDIAN SPACE RESEARCH ORGANISATION
GOVERNMENT OF INDIA
AHMEDABAD - 380015
INDIA



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3.	Specifications: Overall requirement	2
4.	General guidelines to the vendor	3



1. Introduction:

Space Applications Centre (SAC) is setting up Differential Scanning Calorimeter setup for characterization of diffusion of element/gases inside closed glass enclosure developed at in-house facility. Expression Of Interest (EOI) is invited from interested parties for establishing/providing setup at SAC. The proposed setup shall be compatible for future upgrades & shall be a turnkey solution to make the complete integrated setup.

SAC reserves the right to create a list of competent vendors based on vendors' response to this EOI and only these identified vendors shall be eligible to participate in the final indent.

2. Description of the experiment setup:

If a glass bulb filled with element/gases is main source of spectral lines in a device, the life of device may be limited due to diffusion of elements/gases into the glass walls. Based on literature survey it is known that the element consumption characteristics vary with time. Accordingly the average lifetime of the element within glass enclosure is depended upon the quantity of element inside the enclosure.

Calorimetric technique is used to find the elemental content in the glass enclosure. Approach is to measure periodically the mass of free, un-diffused metallic element in a glass enclosure to determine the mass of element that has not been consumed during the operation.

Element that would be diffused into the glass's wall will not undergo a phase transition, and consequently do not contribute. The total amount of element that has been consumed by the glass after operating for a particular time is equal to the difference between the initially measured vs the mass left in the glass.

The offered solution shall have capability of characterization and extraction of measurement based using proposed setup. Both linear and non-linear models are to be covered under the scope. The vendor may be required to demonstrate complete system as a part of technical evaluation of offer with in India (preferably on site i.e. at SAC, Ahmedabad).

3. Specifications

Sr.No.	Parameter	Specifications
1	DSC type	Double-furnace design
2	Measurement principle	Power-compensation
3	Furnace material	90% platinum alloy
4	Furnace diameter	≥ 9 mm (Preferable 13 mm)
5	Furnace height	≥ 6 mm (Preferable 20 mm)
6	Temperature sensors	Distributed, platinum resistance thermometers
7	Software	To collect the data on the PC
8	Cooling accessories	To maintain minimum up to 0°C
Calorimetric Performance		
9	Dynamic range	± 1300 mW
10	Accuracy	$< \pm 0.2\%$
11	Precision	$< \pm 0.03\%$
Temperature Performance		
12	Range	0 °C to 300 °C
13	Accuracy	± 0.1 °C
14	Precision	± 0.05 °C
15	Programmable temperature scanning rate	0.01 to 10 °C/min

Sr.No.	Supporting accessories
1	High pressure cell kit
2	Cooling accessories (operating at 230VAC, 50 Hz nominal)
3	Standard sample pan crimper press
4	Aluminum pan & cover
5	UPS, N2 cylinder with regulator

Sr.No.	Optional
1	Data acquisition system with Display
2	Precise Weighing instrument



4. GENERAL GUIDELINES TO THE VENDOR

- Vendor is requested to acknowledge the receipt of this EOI and his willingness/ability to respond against EOI.
- Vendor is requested to examine the EOI thoroughly and offer compliance/non-compliance point by point. In case of non-compliance, the deviation from the specified parameter shall be furnished and for complied parameters the vendor specification (better or same) shall be provided.
- Vendor should provide point by point compliance to the requirements along with reference to the corresponding page number of the data sheet/product literature. Specifications for which no data is available in data sheet, vendor has to provide certificate of compliance along with measurement results to satisfy the technical requirement.
- Response to EOI should be supplied either directly by the manufacturer or their authorized Indian representatives (authorization certificate to be enclosed).
- Operation, programming, calibration and service manual must be provided with the instruments.
- Warranty and post warranty service should preferably be available in India.
- Service and spares support should be available for minimum 5 years after satisfactory installation.
- All required accessories and associated software for operation and to perform above mentioned functions, should be pointed out.
- Installation and training/demonstration at site for minimum three days should be provided for the setup.
- Technical support for one year for complete system including device modeling flow.
- The requirement is for only new equipment.
- Vendor may submit block diagrams for the test setup/instrument explaining working principle & working measurement methodology of set up. The block diagram can show the accessories/ options etc. needed for measurements.

~END~

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3.	SAC/EOI-2/D1/2016-17	Network Infrastructure for CCTV Surveillance System	01/08/2016

Request for Expression of Interest (EOI)
For
Network infrastructure for CCTV surveillance system



Space Applications Centre
Indian Space Research Organization (ISRO)
Ahmedabad 380015

1.0 Introduction

Space Applications Centre (SAC-ISRO) Ahmedabad has two campuses (SAC main campus, SAC Bopal campus) and Vikramnagar housing colony. Geographically, these campuses are scattered within nine kilometer range. SAC is already having established OFC based 1G network (ring topology) for 40 IP based cameras at SAC main campus and for 13 IP based cameras at SAC Bopal campus.

SAC proposed to establish 1G/10G (required links) network for IP based CCTV surveillance system in above mentioned campuses for additional coverage area & to meet additional future requirement by rate contract. New network should be compatible, to be integrated seamless with existing network and should also be scalable to meet future requirements.

1.1 Geographically details of campuses:

- SAC main campus: Area : 85 Acres , Approximately 90 buildings
- SAC Bopal campus : This is further distributed in three campuses :
 1. Technical area: 15 Acres, Approximately 6 buildings
 2. Hostel area 12 Acres, Approximately 5 buildings
 3. New campus : 39 Acres, Approximately 8 buildings
- Vikramnagar colony : Area : 2.0 Acres, Approximately 3 buildings

1.2 Existing Network Details:

SAC existing CCTV network are scatted across perimeter compound wall & few buildings. 40 nos. IP based network cameras are connected with Single Mode (SM) fiber 1 Gbps network connectivity as per route map figure.1.

Existing CCTV network at Bopal technical is scatted across perimeter compound wall. 13 nos. of IP based network cameras with Single Mode fiber with 1 Gbps network connectivity as per route map figure-2. There is no CCTV network at remaining campuses.

2.0 OBJECT OF THE PRAPOSED PROJECT "TO ESTABLISH NETWORK INFRASTRUCTURE FOR CCTV SURVELLIANCE SYSTEM

2.1 Objectives. Key objectives of this project are as follows: -

To establish independent Network at each campus as per CCTV configuration mentioned below and should be integrated across the campus also.

2.2 CCTV camera:

- i SAC campus : To support live viewing /control of 550 nos. (apprDx.) of IP based CCTV camera having resolution of 2 megapixels. Out of 550 nos. of camera 450 nos. are indoor & 100 nos. are outdoor

- ii SAC Bopal Technical area: To support live viewing /control of 55 nos.(apprx
- iii x) of IP based CCTV camera having resolution of 2 megapixels. Out of 55 nos. are 40 nos are indoor and 15 nos. are out door
- iv SAC Hostel area: It is optional item for future requirement.
- v New campus : It is optional item for future requirement
- vi SAC hosing colony - Vikramnagar: To support live viewing / control of 10 nos. of IP based CCTV camera having resolution of 2 megapixels. All cameras are out door.

2.3 Viewing/storage facility:

- i. Viewing should be possible for within each campus at minimum five locations
- ii. Storage should be possible for within each campus at minimum two locations.
- iii. Viewing can also be possible for each other campus if connectivity between campus is provided by SAC.

2.4 Hardware/software support

- i. Network should support ONVIF based Video Management Software (VMS) and / or other equivalent VMS.
- ii. Network should support other required equipment like servers, workstations, storage for 90 days, etc. of CCTV system.

The purpose of this EoI is to solicit high quality and competitive proposals for Establishment of Network . This EoI document provides basic technical specifications about the system and requirements. The manufacturer / vendor should provide proposal with detailed specifications and configurations and shall include following detail.

- Expression of Interest for establishment of Network
- Detailed technical proposal with respect to specifications as per given below
- Item wise Compliance as per given below
- Assurance from OEM for spares/services support for suggested network components for minimum seven years.
- Vendor's infrastructure like administrative/Technical manpower strength with qualification, experience for similar work & support from OEM.
- Additional technical features / information if any

It may be noted that "SAC reserves right to identify qualified vendors based on outcome of EoI". SAC reserve the rights to procure partial or complete solution of the EOI. Rights to decide appropriate solution and qualified vendors for the given proposal are also reserved with SAC.

3.0 Scope of work:

3.1 Supply and installation of following network components to establish 1G/10 G network for all the campuses mentioned above on TURN Key basis.

- i. 12 core single mode Optical Fiber Cable
- ii. CAT6 UTP Cable
- iii. Electrical power cable whenever required
- iv. Network Components (Active & passive)

3.2 Laying of OFC shall be enclosed in 2" HDPE Pipe in one of the three ways as mentioned below as per site conditions and SAC requirements.

- i. Manual digging
OFC shall be laid underground at a depth of one meter. This shall include excavation of duct, laying of HDPE pipe and putting OFC inside, to supply & put half round RCC plates on top for protection of the cable, refilling of the duct and leveling with same material (hard/soft) which was earlier. Metal route markers shall be installed at every 50 meter.
- ii. Manual and Machine Horizontal Directional Drilling (HDD)
HDD shall be preferred to avoid excavation of roads and soil while crossing the road and to avoid damage of other services on road as well as non-feasibility of manual digging. Vendor shall carry out manual/machine HDD as per length of excavation required. The depth of HDD shall be 1.5 to 5 meter. HDPE pipe shall be laid through HDD and OFC shall be pushed later in the pipe.
- iii. Pre-cast RCC loop chambers for manhole with cover shall be installed wherever required. These chambers shall be visible and easily accessible in the event of any fault. During pulling of OFC through HDD route, spare cable loop shall be kept of appropriate length in loop chambers to meet future requirements for maintenance of OFC link.
- iv. Laying in existing Trench/Duct

3.3 Laying of UTP cable

The laying of UTP cable should be indoor and outdoor as per site conditions in an optimized way to minimize the length of the cable being used and also minimize the requirement of quantum of active/passive components. The complete indoor network will be configured for a throughput of 100/1000 Mbps with structured cabling conforming to structured **Cat-6 specifications** as applicable. UTP cabling to be provided for the switch & camera where distance is less than 100 meter. UTP shall be laid in ISI conduit/ PVC pipe/flexible pipe/GI pipe as per site condition. Cables shall be dressed and terminated in accordance with the manufacturer's recommendations and/or best industry practices.

3.4 Installation & Commissioning of Network components

- i Vendor shall installed & commissioned network components as per industry standard practice and demonstrate the performance as per OEM's rated specifications.
- ii Vendor shall install necessary protection device with active components to protect against voltage fluctuation and electrical thomb.
- iii Vendor shall integrate & interface in such way to meet the object of project as per Para 2.
- iv **Vendor shall also responsible for to provide 230V AC (230V) to active components** □□ Laying of power cable from nearest physically electrical point whenever required.
- v Performance Test for 1G0/10-G network and integration of Network in all campuses
- vi Rate contract to meet future expansion for three years
- vii Maintenance support for three years, spares/service support guarantee for at least seven years.
- viii Vendor shall provide seamless connectivity between the proposed network as well as the existing CCTV LAN at each campuses.
- ix Vendor shall offer all the items required for the said project for successful integration and completion of the TURNKEY project.

4.0 Requirement Specifications

Following are the minimum required specifications of each deliverable item for proposed solution/infrastructure. Vendors should confirm compliance against each specification with supporting document. If vendor feels that any of specification is inadequate, they can add on with technical justifications and supporting document.

1. Specifications of Core Switch

<u>SN</u>	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) With supportive document/literature</u>	<u>Deviation (If Any)</u>
1.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		
1.2	Switch Ports	Minimum 8 nos. non-blocking SFP+ ports and 8 Nos of non-blocking 1000 Base-T Ports		
1.3	System Switching Capacity	Minimum 176 Gbps or more Modular Architecture with support for advanced features like virtual stacking, IPv6, non-blocking wire-speed architecture. Should optionally support 40G interface in future on the same chassis. It should be architected to support real time applications like voice, video, data.		
1.4	Forwarding rate	Forwarding rate should be Minimum 116 Mpps		
1.5	Power Characteristics	Redundant and hot-swappable power supplies and Fan Modules		
1.6	Layer 2 and Layer 3 Features	Should Support minimum 4094 VLANs. Should support minimum 4094 IP interfaces, VLAN Double Tagging, IEEE 802.1Q VLAN, IP v4: IGMP v1, v2 and v3. IPV4: Static Routing IP v6: Static Routing Should have option to add support for advanced routing protocols like OSPF, BGP, etc in future		
1.7	Security	a. Private VLANs, providing security and port isolation of multiple customers using the Same VLAN. b. 802.3x support c. MAC - based Authentication d. Web-based Authentication e. Dynamic VLAN Assignment f. DHCP Snooping g. ACL, NAC support h. BPDU Protection i. STP		
1.8	Management	a.GUI b.Out of band 10/100/1000 Ethernet management port and console management port, Both on the front panel (for ease of access) are preferred. c.Port mirroring d.SSH and SNMP for secure management e.RADIUS Support		
1.9	Authentication	a. RMON b. Broadcast Forwarding to allow the switch broadcast packets to reach across subnets.		

1.10	Electrical Approvals and Compliances	EMC: FCC, VCCI		
1.11	Safety	Certification: CB/UL/CUL/TUV		
1.12	Accessories	Mounting hardware including connecting cables with Indian Standard plug tops.		

2. Specifications of Distribution Switch.

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
2.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		
2.2	Switch Ports	Minimum 16 nos. of non-blocking 1G SFP ports, 2 nos. non-blocking 10/100/1000BASE-T ports and minimum 2X10G SFP+ non-blocking Ports		
2.3	Switching capacity	Should have Resilient Stacking Architecture. It should have non-blocking wire-speed architecture with switching backplane of 76 Gbps or more, Forwarding rate of minimum 54 Mpps		
2.4	Power Supply	Should support optional redundant power supply		
2.5	Layer 2 and Layer 3 Features	Supports minimum 4094 VLANs, Supports minimum 4094 IP interfaces, VLAN Double Tagging, IEEE 802.1Q VLAN, IP v4: IGMP v1, v2 and v3, IPV4: Static Routing IP v6: Static Routing support minimum 16K MAC Addresses		
2.6	Power supply	Should support optional redundant power supply		
2.7	Security	a. Private VLANs, providing security and port isolation of multiple customers using the same VLAN b. 802.3x support c. MAC-based Authentication d. Web-based Authentication e. Dynamic VLAN Assignment f. DHCP Snooping g. ACL, NAC support h. BPDU Protection i. STP j. QoS		
2.8	Features:	a. SNMPv1,v2 /RMON/BOOTP/Telnet/Web b. Network management protocols c. Port trunking d. Spanning tree, Priority tags e. VLAN Tagging f. Flow controls g. MAC Based Network Access control		
2.9	Management	a. GUI b. Out of band 10/100/1000 Ethernet management port		

		and console management port, both on the front panel (for ease of access) are preferred. c. Port mirroring d. SNMP e. RADIUS Support		
2.10	Authentication	a. RMON b. Broadcast Forwarding.		
2.11	Electrical Approvals and compliances	EMC: FCC, VCCI		
2.12	Safety	Certification: CB/UL/cUL/TUV		
2.13	Accessories	Mounting hardware including connecting cables with Indian Standard plug tops.		

3. Specifications of Access Switch – 24 Port.

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
3.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		
3.2	Switch Ports	Minimum 16 interfaces of 10/100/1000 base TX PoE+. Minimum 2x 1Gig SFP uplinks.		
3.3	Switching capacity	Should have Resilient Stacking Architecture with support for minimum 4 switches in single stack. It should have non-blocking wire-speed architecture, Should support IEEE 802.3af & IEEE 802.3at standards. Non-blocking switching backplane of 36 Gbps or more, 9k Jumbo frames, forwarding rate of 25 Mpps or higher		
3.4	Layer 2 and Layer 3 Features	Supports minimum 4094 VLANs, Supports minimum 4094 IP interfaces, VLAN Double Tagging, IEEE 802.1Q VLAN, 802.1s and 802.1w, Sub 100 ms re-convergence for mesh or ring architecture, IP v4: IGMP v1, v2 and v3, IPV4: Static Routing IP v6: Static Routing support minimum 16K MAC Addresses		
3.5	PoE Power Budget	Minimum 190 Watts		
3.6	Power supply:	230 V/ ac 50Hz Internal power supply		
3.7	Security	a. Private VLANs, providing security and port isolation of multiple customers using the same VLAN b. 802.3x support c. MAC-based Authentication d. Web-based Authentication e. Dynamic VLAN Assignment f. DHCP Snooping g. ACL, NAC support h. BPDU Protection		

		i. STP, QoS		
3.8	Features:	a. SNMPv1,v2 /RMON/BOOTP/Telnet/Web b. Network management protocols c. Port trunking d. Spanning tree, Priority tags e. VLAN Tagging f. Flow controls g. MAC Based Network Access control		
3.9	Management	a. GUI b. Out of band 10/100/1000 Ethernet management port and console management port, both on the front panel (for ease of access) are preferred. c. Port mirroring d. SNMP e. RADIUS Support		
3.10	Authentication	a. RMON b. Broadcast Forwarding.		
3.11	Electrical Approvals and Compliances	EMC: FCC class A, VCCI class A		
3.12	Safety	Certification: UL, cUL, TUV		
3.13	Accessories	Mounting hardware including connecting cables with Indian Standard plug tops.		

4. Specifications of Access Switch – 8 & 16 Port.

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
4.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		
4.2	Switch Ports	Minimum 8 interfaces of 1G PoE+ ports Minimum 2 interface of 1G SFP		
4.3	Switching capacity	It should have non-blocking wire-speed architecture, Should support IEEE 802.3af & IEEE 802.3at standards. Should have forwarding bandwidth of 20 Gbps or higher and forwarding rate of 13 Mpps or higher		
4.4	Layer 2 Features	Supports minimum 1K VLANs, VLAN Double Tagging		
4.5	PoE Power Budget	Minimum 72 Watts		
4.6	Power supply:	230 V/ ac 50Hz Internal power supply		
4.7	Security	a. Private VLANs, providing security and port isolation of multiple customers using the same VLAN b. 802.3x support c. MAC-based Authentication d. Web-based Authentication e. STP		

4.8	Features:	a. SNMP v2 &v3/ RMON/BOOTP/Telnet/Web b. Network management protocols c. Port trunking d. Spanning tree, Priority tags e. VLAN Tagging f. MAC Based Network Access control		
4.9	Management	a. GUI b. Command-Line Interface for configuration d. Port mirroring e. SNMP management		
4.10	Authentication	a. RMON b. Broadcast Forwarding.		
4.11	Electrical Approvals and Compliances	EMC: FCC class A, VCCI class A		
4.12	Safety	Certification: UL, TUV		
4.13	Accessories	Mounting hardware including connecting cables with Indian Standard plug tops.		
4.14	Standards	IEEE 802.1s, IEEE 802.1w, IEEE 802.3x, IEEE 802.3af IEEE 802.3ah, IEEE 802.1D, IEEE 802.1Q, IEEE 802.3u IEEE 802.3ab, IEEE 802.3z, RMON I & II standards		

5. Industrial Grade 10/100/1000G Ethernet Switch

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No)</u> (If _____ non-compliance, deviation to be specified)	<u>Deviation (If Any)</u>
5.1	Make:	Alcatel/Allied Telesis/CISCO/Extreme/Moxa/Lantech		
5.2	Switch Ports	Minimum 8 interfaces of 1G RJ45 ports with at least 4 Ports supporting PoE Minimum 2 interface of 1G SFP		
5.3	Switching capacity	It should have non-blocking wire-speed architecture, Should have forwarding bandwidth of 20 Gbps or higher and forwarding rate of 13 Mpps or higher		
5.4	Layer 2 Features	Supports minimum 255 VLANs, VLAN Double Tagging		
5.5	Protection Class	IP 30		
5.6	Power supply:	230V AC 50Hz Internal power supply. (If required, appropriate power adaptor should be supply along with switch)		
5.7	Security	a. Private VLANs, providing security and port isolation of multiple customers using the same VLAN b. 802.3x support c. MAC-based Authentication		

		d. Web-based Authentication e. STP f. DHCP Snooping		
5.8	Features:	a. SNMP v2 & v3/ RMON/BOOTP/Telnet/Web b. Network management protocols c. Port trunking d. Spanning tree, Priority tags e. VLAN Tagging f. MAC Based Network Access control		
5.9	Management	a. GUI b. Command-Line Interface for configuration d. Port mirroring e. SNMP management f. SSH and SNMP for secure management		
5.10	Authentication	a. RMON b. Broadcast Forwarding.		
5.11	Safety	Certification: UL, TUV		
5.12	Operating temperature	Operating temperature -40°C to +75°C		

6. Single mode 10GSFP + LC LR Transceiver

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No)</u> <u>(If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
6.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		
6.2	Connector types	LC		
6.3	Standards supported	802.3 Clause 52		
6.4	Connections supported	10GBase-LR		
6.5	Fiber Type	SMF		
6.6	Wavelength	1310 nm		
6.7	Optical Power Output	-8.2 to 0.5 dBm		
6.8	Receiver Sensitivity	-12.6 dBm		
6.9	Transmission Distance	~ 10 km		
6.10	Operating Temperature	0°C to 45°C		
6.11	Digital Diagnostic	Supported		

7. Single mode 1G SFP LC LX Transceiver as per the specifications

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No)</u> <u>(If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
7.1	Make:	Alcatel/Allied Telesis/Brocade/CISCO/Extreme/HP		

7.2	Connector types	LC		
7.3	Standards supported	802.3z, SFP MSA		
7.4	Connections supported	1000Base-LX		
7.5	Fiber Type	SMF		
7.6	Wavelength	1310 nm		
7.7	Optical Power Output	-9.5 to -3 dBm		
7.8	Receiver Sensitivity	-20 dBm		
7.9	Transmission Distance	~10 km		
7.10	Operating Temperature	0 °C to 45 °C		

8. Single mode 1G SFP LC LX Industrial Transceiver as per the specifications

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
8.1	Make:	Alcatel/Allied Telesis/CISCO/Extreme/Lantech/Moxa		
8.2	Connector types	LC		
8.3	Standards supported	802.3z, SFP MSA		
8.4	Connections supported	1000Base-LX		
8.5	Fiber Type	SMF		
8.6	Wavelength	1310 nm		
8.7	Optical Power Output	-9.5 to -3 dBm		
8.8	Receiver Sensitivity	-20 dBm		
8.9	Transmission Distance	~10 km		
8.10	Operating Temperature	0 °C to 60 °C		

9. Specifications of 12 Core Single Mode Outdoor Optic Fiber Cable.

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
9.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
9.2	Attenuation @1310nm	<=0.36 dB/km		
9.3	Attenuation @ 1550nm)max(≤0.22db/km		
9.4	Tensile rating	1200N		
9.5	Cable Type	Uni tube Cable with Corrugated Steel Armoured		

9.6	Fibre Type	Single Mode, 9/125 micron primary coated buffers		
9.7	No. of cores	12		
9.8	Armour	Corrugated Steel Tape Armour Outer Sheath (HDPE) Water Blocking Gel.		
9.9	Cable Construction Type	BELLCORE GR 20 / IEC 794-1		
9.10	Diameter	3+0.2		
9.11	Jacketing Material	HDPE		
9.12	Clad Diameter)um(125		
9.13	Nominal Thickness	2.1mm		
9.14	Strength Members	Water Blocking E-Glass		
9.15	Armouring MS Tape Thickness	> 0.15		
9.16	Minimum Installation Bend Radius	200mm		
9.17	Minimum Service Bend Radius	160mm		
9.18	Maximum Crush resistance:	3000N		
9.19	Operating Temperature	Deg. C 20 to +70		
9.20	Cable Weight)Nominal(100 Kg/Km		
9.21	Cable Diameter	9.0 + - 0.5 mm		
9.22	ROHS compliant:	Yes		

10. Specifications of LIU for OFC Termination – 24 Cores.

	Specifications	Features	<u>Compliance (Yes/No)</u> <u>(If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
10.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
10.2	Form Factor	Should be 1U 19 inch rack mountable.		
10.3	LIU Features	Fiber optic LIU should include with LIU Box itself, Adapter Panel and Adapters as per requirement.		
		Have sufficient slots for accommodate Simplex/duplex 24/12 number SC adapters individually.		

		Aluminum base material for light mounting.		
		Should have Splice Tray & Cable Spool provision inside LIU.		
		Accessory kit consists of cable ties; mounting ear screw earthing and spiral wrap tube.		
		Panel cover should be slide out for easy maintenance.		
		Removable Rear & Front cover for better access to interior of LIU.		
		Should have Rubber fiber slotted bracket built-in, metal splice shelf to protect the fibers.		
		Should capable of storing up to 3 meters of 900 µm tight buffered fiber per adapter.		
10.4	Adapter Plate Features	Plate made from Cold rolled steel materials.		
		Suitable for SC adapters		
10.5	Adapter Features	All SC adaptors should be Simplex or Duplex type. Adapters should have compact design & high precision, which perform well under various circumstances & maintain good plug retention strength.		
		Should have Telcordia, TIA/EIA and IEC compliance.		
		The sleeves are basically recommended zirconia split type, the phosphor bronze split		
		Insertion Loss should be ≤ 0.20dB for Zirconia Sleeve		

11. Specifications of SC-SC Fiber Patch Cord for Single Mode Fiber.

	Specifications	Features	<u>Compliance (Yes/No)</u> (If _____ non-compliance, deviation to be specified)	<u>Deviation (If Any)</u>
11.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
11.2	Features	Fiber optic patch cord with two core fiber cable terminated with SC connectors at both ends.		
		The terminated connectors in assemblies are designed to and are compatible with industry standards (EIA/TIA, IEC, ANSI, NTT and Telcordia).		
		Should be 100% inspected for optical characteristics & fiber end face finish.		
		Patch cord should be 3 meters duplex		

11.3	Performance Characteristics	Should have Corning single-mode G652D, G657A, G657B optic fiber.		
		Typical Insertion Loss should be $\leq 0.2\text{dB}$, Max. 0.3dB .		
		Return Loss should be $\text{PC} \geq 45\text{dB}$, $\text{UPC} \geq 50\text{dB}$, $\text{APC} \geq 60\text{dB}$		
11.4	Mechanical Characteristics	Should have Ceramic Connector Ferrule.		
		Apex Offset should be $< 50\mu\text{m}$.		
		Fiber height should be $\pm 100\text{nm}$.		
		Repeatability should be $\leq 0.2\text{dB}$, 1,000 times mating cycles.		
		Working Temperature should be -40 degree celcius to $+ 85$ degree celcius.		

12. Specifications of SC-LC Fiber Patch Cord for Single Mode Fiber.

	Specifications	Features	Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)	Deviation (If Any)
12.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
12.2	Features	Fiber optic patch cord with two core fiber cable terminated with LC connector at one end and SC connector at other end.		
		The terminated connectors in assemblies are designed to and are compatible with industry standards (EIA/TIA, IEC, ANSI, NTT and Telcordia).		
		Should be 100% inspected for optical characteristics & fiber end face finish.		
		Patch cord should be 3 meters duplex		
12.3	Performance Characteristics	Should have Corning single-mode G652D, G657A, G657B optic fiber.		
		Typical Insertion Loss should be $\leq 0.2\text{dB}$, Max. 0.3dB .		
		Return Loss should be $\text{PC} \geq 45\text{dB}$, $\text{UPC} \geq 50\text{dB}$, $\text{APC} \geq 60\text{dB}$		
12.4	Mechanical Characteristics	Should have Ceramic Connector Ferrule.		
		Apex Offset should be $< 50\mu\text{m}$.		
		Fiber height should be $\pm 100\text{nm}$.		
		Repeatability should be $\leq 0.2\text{dB}$, 1,000 times mating cycles.		
		Working Temperature should be -40 degree celcius to $+ 85$ degree celcius.		

13. Specifications of Cat-6 UTP Cable.

	Specifications	Features	Compliance (Yes/No) (If _____ non-compliance,	Deviation (If Any)

			<u>deviation to be specified)</u>	
13.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
13.2	Performance Category	Category 6 UTP Cable , TIA / EIA 568-B		
13.3	Cable type	Simplex		
13.4	Wire/Cable Type	Twisted Pair		
13.5	Conductors	23 AWG solid bare copper		
13.6	Cable Outer Diameter	7.20]0.283[)mm]in[(
13.7	Insulation	High Density Polyethylene		
13.8	Temperature range	-20 □ C to + 70 □ C.		
13.9	Frequency	Minimum 250 MHz		
13.10	Packing	Box of 305 meters		
13.11	Delay Skew	45ns MAX.		
13.12	Pulling force	14kg		
13.13	Bend Radius	< 28mm at - 20 □C ± 1 □C.		
13.14	Resistance unbalance	5%Max		
13.15	Mutual Capacitance	< 5.6 NF MAX /100 Mtr.		
13.16	Conductor Resistance	≤ 9.38 Ω/100m		

14. Cat 6 I/O

	Specifications	Features	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
14.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
14.2	Features	Category 6 I/O jacks are RJ45, 8 position 8 contact socket.		
14.3		Category 6 I/O jacks are suitable for 22-26 AWG stranded and solid wire.		
14.4		Category 6 I/O jacks are compatible with both 110 & Krone punch down tools.		
14.5		The Category 6 I/O jacks shall be backward compatible with Category 5e, 5 and 3 cords and cables.		
14.6		It supports IEC 60603-7-4 and compliance with ANSI/TIA/EIA 568 C.2 standard.		
14.7		The Category 6 I/O jacks shall be of a universal design supporting T568 A & B wiring.		

14.8		The Category 6 I/O jacks shall be installed at 90 degree angle in Face Plate and Patch Panel.		
14.9	Performance Characteristics	Insertion force should be 20N maximum (IEC 60603-7-4).		
14.10		Retention strength should be 7.7 Kg between jack and plug.		
14.11		Current rating should be 1.5A.		
14.12		Operating Temperature should be -10° Celsius to 60° Celsius.		
14.13		Life of Jack should be 750 cycles minimum (ISO/IEC 11801, IEC 60603-7-4).		

15. 24 Port Patch Panel – Unloaded

	Specifications	Features	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
15.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
15.2	Features	Category 6 Patch Panel should be 24 Port 1U Size unloaded.		
15.3		Mounts in standard 19 inch racks.		
15.4		Patch panel suitable for Category 6 Information Outlet		
15.5		Panel material should have PC + Glass Fiber, UL 94V-0, Black Color.		
15.6		Support bar material should have PC + Glass Fiber, UL 94V-0, Black Color		

16. Single Port Faceplate

	Specifications	Features	<u>Compliance (Yes/No) (If non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
16.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
16.2	Features	Face Plate should able to terminate at least one I/O jack.		
16.3		The face plates should have inbuilt shutter for protection against dust.		
16.4		Should be able to support variety of jacks – UTP, STP, Fiber, Coax etc.		
16.5		Screw and screw hole covers to be supplied with face plate.		
16.6		Should have transparent plastic window plate for labels writing.		
16.7		Face plate material should be ABS, UL94-HB, with white color.		

17. Specifications of Cat-6 UTP Patch Cord. (1 MTR,2MTR,5MTR)

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
17.1	Make:	AMP/Clipsal/Belden/Molex/Finolex		
17.2	Conductor	24 AWG, multi-strands		
17.3	Conductor Metal	Bare Copper		
17.4	Length Type	1 m / 2 m		
17.5	Heat Resistance	60 °C min (temperature limited)		
17.6	Certifications	UL Listed, ETL/3P Verified, RoHS Compliant		
17.7	Type	1G, Category 6 TIA/EIA-568-B		
17.8	Warranty	25-year component warranty		
17.9	Category	Category 6		
17.10	Housing	high density polyethylene.		
17.11	Insulation	Flame Retardant Polyethylene		

18. 42 U Rack Specification

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
18.1	Make:	APW/Rittal/Valrack/Netrack		
18.2	Rack Height	42 U		
18.3	Standard for compliance	Conforming to DIN41494 and current industry practices		
18.4	Construction	<ol style="list-style-type: none"> 1. made out of powder coated M S 2. bottom should be vented 3. Fully perforated and dual perforated glass doors with vented side trims for front to back air flow 4. Compatible for the mounting of all types of 19" equipment 		
18.5	Accessories	<ol style="list-style-type: none"> 1. Cooling fans (4 x 90 cfm) 2. cable management and mounting accessories 3. AC mains channel 4. caster wheels with brake - 2 pairs 5. Cable Manager, 1U, 19" 6. ROD Loops – 4Nos, 7. Equipment shelf 8. with angles – 2 nos 		

		<ul style="list-style-type: none"> 9. Earth continuity kit 10. Hardware Mounting Kit Packet of 20 – 2Nos 11. PDU Octagonal Socket 6 x 5/15 Amp with 16 Amp 12. MCB - 2Nos 	
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19. 19" - 9 U Rack Specification

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
19.1	Make:	APW/Rittal/Valrack/Netrack		
19.2	Rack Height	9 U		
19.3	Standard for compliance	Conforming to DIN41494 and current industry practices		
19.4	Construction	<ul style="list-style-type: none"> 1. made out of powder coated MS 2. Wall Mounted enclosure 3. Adjustable mounting depth up to 17" by 2 front vertical rackmount rails 4. Ventilated front doors with vented side panels for increased air flow 5. Locking, removable side panels 6. Fully assemble for quick installation 		
19.5	Accessories	<ul style="list-style-type: none"> 1. Cooling fans (4 x 90 cfm) 2. cable management and mounting accessories 3. AC mains channel 4. Cable Manager, 1U, 19" 5. ROD Loops – 4Nos, 6. Equipment shelf 7. with angles – 2 nos 8. Earth continuity kit 9. Hardware Mounting Kit Packet of 20 – 2Nos 10. PDU Octagonal Socket 6 x 5/15 Amp with 16 Amp 11. MCB - 2Nos 		

20. Pole for mounting camera

	<u>Specifications</u>	<u>Features</u>	<u>Compliance (Yes/No) (If _____ non-compliance, deviation to be specified)</u>	<u>Deviation (If Any)</u>
20.1	Material	Aluminium / MS/ Glass Reinforced Plastic coated GI Pole		
20.2	Wind loads for design	Capable to withstand wind loads as per IS 875		

20.3	Metal protection treatment	HOT DIP Galvanized confirming BSEN ISO 1461 and two or more layers of epoxy coating Accessibility option for installation and maintenance of cameras Protective measures from lightning		
20.4	Height	7m		
20.5	Additional points	For the Camera Towers/Poles, Height may vary according to the locations		

5.0 Vendor selection criteria :

- i. Vendor shall have experience for establishing similar size network vendor should provide complete details of such installation carried out in last three years. Details should include client name, address and installed infrastructure.
- ii. Vendor should have registered office or service support center within 40 Kilometer radius from SAC
- iii. Vendor should be OEM or authorized dealer/distributor of OEM for the offered active & passive Network components.
- iv. Vendor shall able to provide support for future maintenance. Vendor shall provide detail of required infrastcture like admistratve/Technical manpower strength with qualification,experience for similar work & support from OEM.

6.0 Proposed Network architecture plan: Vendor may suggest various architecture lay out plan for proposed network along with the proposal. Proposed network plan should be seamlessly integration existing network with proposed network.

7.0 General terms and conditions:

- i Vendor shall specify the detail scope / list of supply for deliverables with detail features/functions along with technical literature/data sheet
- ii Along with proposal vendor has to provide detailed requirements which are required to be arranged by the SAC.
- iii Eol should be from either OEM or their representative/Dealer/Distributor. same should attach authorization letter from OEM.
- iv Vendor will be required to make a presentation of proposed solution at SAC

8.0 List of Deliverables

8.1 Expected Bill of Material given below for **One Time Procurement.**

Table-1

<u>SN</u>	<u>Description</u>	<u>Minimu m Qty</u>	<u>Make & Model</u>	<u>Boucher Ser Number</u>	<u>Deviati on if any</u>
<u>ACTIVE COPMONENTS</u>					
1 <u>Core Switch</u>					
1.1	Stackable Layer 3 Switch, 24x10/100/1000T + 4xSFP+ slots, internal Dual AC PSU as per ref 1	04 Nos			
2 <u>Distribution Switch</u>					
2.1	Layer 2 Stackable Distribution Switch as per the specifications as per ref 2	10 Nos.			
3 <u>Access Switch</u>					
3.1	Layer 2 Access Switches with 24 Ports as per the specifications as per ref 3	52 Nos.			
3.2	Layer 2 Access Switches with 8/16 Ports as per the specifications as per ref 4	50 Nos.			
3.3	Layer 2 Industrial Grade Access Switch as per the specifications as per ref 5	4 Nos.			
3.4	Single mode 10GSFP + LC LR Transceiver as per the specifications as per ref. 6.	42 Nos.			
3.5	Single mode 1G SFP LC LR Transceiver as per ref. 7	200 Nos.			
3.6	Single mode 1G SFP LC LX Industrial Transceiver as per ref. 8	10 Nos.			
3.7	Any other component required in above category to realized project	To be suggested			
<u>PASSIVE COPMONENTS</u>					
1 <u>Fiber Components</u>					
1.1	12 Core Single Mode 9/125 Micron, Armored Outdoor Cable as per ref 9.	5000 Mtr			
1.2	24 Port Fiber LIU loaded with required Single Mode Fiber Pigtailes with SC Connector, adapter plates and SC adaptors as per the specifications as per ref 10.	35 Nos			
1.3	Patch Cord SC-SC as per the specifications as per ref 11.	200 Nos.			
1.4	Patch Cord SC-LC as per the specifications as per ref 12.	300 Nos.			
1.5	Any other component required in above category to realized project				
2 <u>UTP Components</u>					
2.1	Cat 6 UTP cable as per ref 13	3000 Mtr.			
2.2	Cat 6 I/O - Camera end as per ref 14	600 Nos			

2.3	24 Port Patch Panel- Unloaded as per ref 15	80 Nos			
2.4	Cat 6 I/O - Jack Panel Side	550 Nos			
2.5	Single Port Faceplate as per ref 16	550 Nos			
2.6	PVC Back Box	550 Nos			
2.7	Patch Cord - 1mtr as per ref 17	550 Nos			
2.8	Patch Cord - 2mtr as per ref 17	550 Nos			
2.9	Patch Cord - 5mtr as per ref 17	1000 Nos			
2.10	Any other component required in above category to realized project				
3 <u>Network Rack / Pole / Junction Box</u>					
3.1	42U Rack - 800mm W X 1000mm D with standard accessories as per ref 18	3 Nos			
3.2	19"- 9U Rack - 600mm W X 500mm D with standard accessories as per ref 19	80 Nos			
3.3	Weatherproof Junction box with pole mount clamp	50 Nos			
3.4	Pole for Mounting CCTV camera as per ref 20	50 Nos			
3.5	3 Core 1.5 Sq. mm armored power cable for outdoor CCTV	3000 Mtr.			
3.6	Any other component required in above category to realized project				
4 <u>LABOUR, SERVICE & INSTALLATION</u>					
4.1	Road Boring for crossing	1500 Mtr.			
4.2	Hard Soil digging with resurfacing	5000 Mtr.			
4.3	Soft Soil digging and refilling	6000 Mtr.			
4.4	Labor Charges for laying of cable (OFC/UTP/Power) with suitable pipe as per site requirement,	11000 Mtr			
4.5	Installation of Pole with RCC Foundation(3*2*3 ft)	15 Nos.			
4.6	Installation & commissioning for entire project				
4.7	Any additional item required to realize the project (If Required)				
4.8	Fiber Splicing with splicing kit				
4.9	Any other service required in above category to realized project				

**All active components will be of the same OEM.
All passive components will be of the same OEM.**

8.2 Expected Bill of Material given below for Rate contract & valid for Three years.

Table-2

<u>SN</u>	<u>Description</u>	<u>Qty</u>
<u>ACTIVE COPMONENTS</u>		
1 <u>Core Switch</u>		
1.1	Stackable Layer 3 Switch, 24x10/100/1000T + 4xSFP+ slots, internal Dual AC PSU as per ref 1	Per Unit
2 <u>Distribution Switch</u>		
2.2	Layer 2 Stackable Distribution Switch as per the specifications as per ref 2	Per Unit
3 <u>Access Switch</u>		
3.1	Layer 2 Access Switches with 24 Ports as per the specifications as per ref 3	Per Unit
3.2	Layer 2 Access Switches with 8/16 Ports as per the specifications as per ref 4	Per Unit
3.3	Layer 2 Industrial Grade Access Switch as per the specifications as per ref 5	Per Unit
3.4	Single mode 10GSFP + LC LR Transceiver as per the specifications as per ref. 6.	Per Unit
3.5	Single mode 1G SFP LC LR Transceiver as per ref. 7	Per Unit
3.6	Single mode 1G SFP LC LX Industrial Transceiver as per ref. 8	Per Unit
3.7	Any other component required in above category to realized project	To be suggested
<u>PASSIVE COPMONENTS</u>		
1 <u>Fiber Components</u>		
1.1	12 Core Single Mode 9/125 Micron, Armored Outdoor Cable as per ref 9.	Per Unit
1.2	24 Port Fiber LIU loaded with required Single Mode Fiber Pigtails with SC Connector, adapter plates and SC adaptors as per the specifications as per ref 10.	Per Unit
1.3	Patch Cord SC-SC as per the specifications as per ref 11.	Per Unit
1.4	Patch Cord SC-LC as per the specifications as per ref 12.	Per Unit
1.5	Any other component required in above category to realized project	To be suggested
2 <u>UTP Components</u>		
2.1	Cat 6 UTP cable as per ref 13	□□□ □□□□
2.2	Cat 6 I/O - Camera end as per ref 14	□□□ □□□□

2.3	24 Port Patch Panel- Unloaded as per ref 15	Per Unit
2.4	Cat 6 I/O - Jack Panel Side	Per Unit
2.5	Single Port Faceplate as per ref 16	Per Unit
2.6	PVC Back Box	Per Unit
2.7	Patch Cord - 1mtr as per ref 17	Per Unit
2.8	Patch Cord - 2mtr as per ref 17	Per Unit
2.9	Patch Cord - 5mtr as per ref 17	Per Unit
2.10	Any other component required in above category to realized project	To be suggested
3 <u>Network Rack / Pole / Junction Box</u>		
3.1	42U Rack - 800mm W X 1000mm D with standard accessories as per ref 18	Per Unit
3.2	19"- 9U Rack - 600mm W X 500mm D with standard accessories as per ref 19	Per Unit
3.3	Weatherproof Junction box with pole mount clamp	Per Unit
3.4	Pole for Mounting CCTV camera as per ref 20	Per Unit
3.5	3 Core 1.5 Sq. mm armored power cable for outdoor CCTV	Per Mtr
3.6	Any other component required in above category to realized project	To be suggested
4 <u>LABOUR, SERVICE & INSTALLATION</u>		
4.1	Road Boring for crossing	Per Mtr.
4.2	Hard Soil digging with resurfacing	Per Mtr.
4.3	Soft Soil digging and refilling	Per Mtr
4.4	Labor Charges for laying of cable (OFC/UTP/Power) with suitable pipe as per site requirement,	Per Mtr
4.5	Installation of Pole with RCC Foundation(3*2*3 ft)	Per unit.
4.6	Any additional item required to realize the project (If Required)	
4.7	Fiber Splicing with splicing kit	Per Unit
4.8	Any other service required in above category to realized project	To be suggested

**All active components will be of the same OEM.
All passive components will be of the same OEM.**

Figure-1

EXISTING CCTV OFC NETWORK LAYOUT : SAC CAMPUS

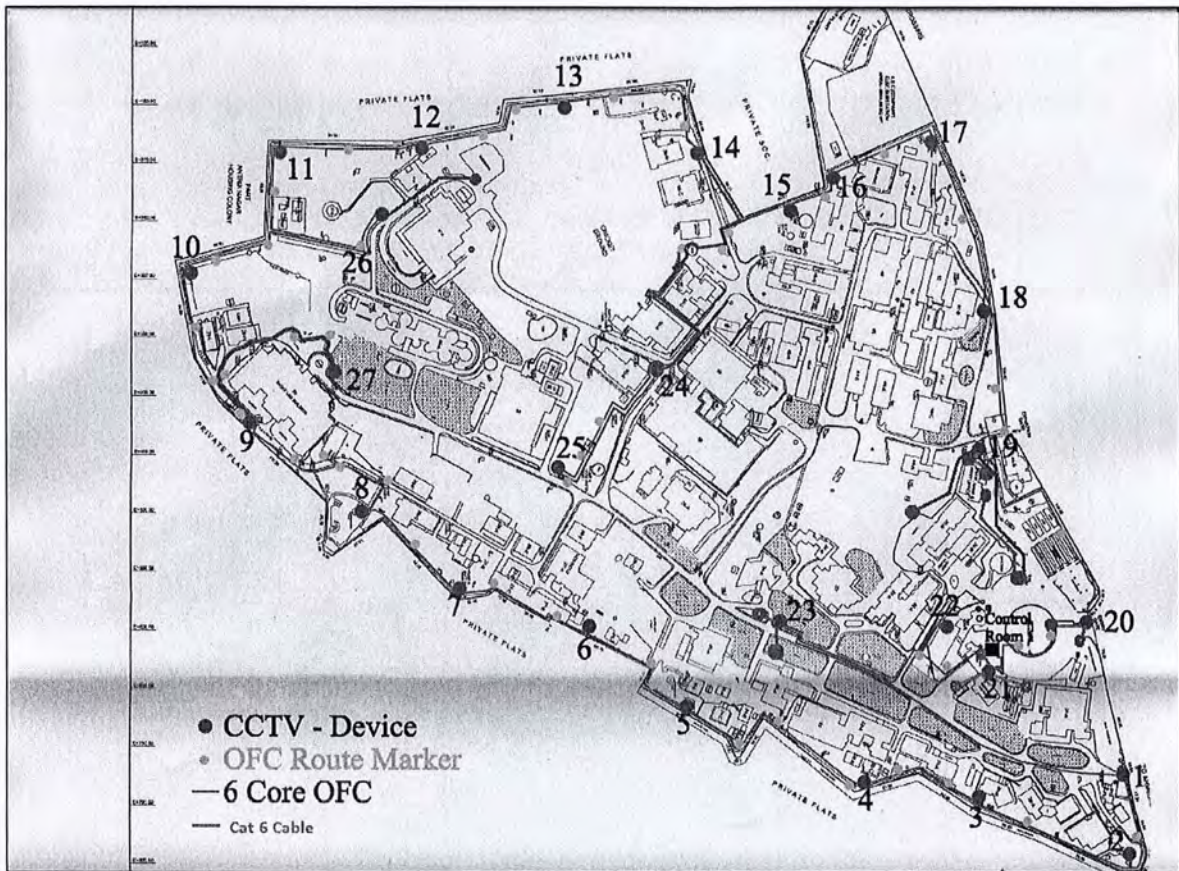
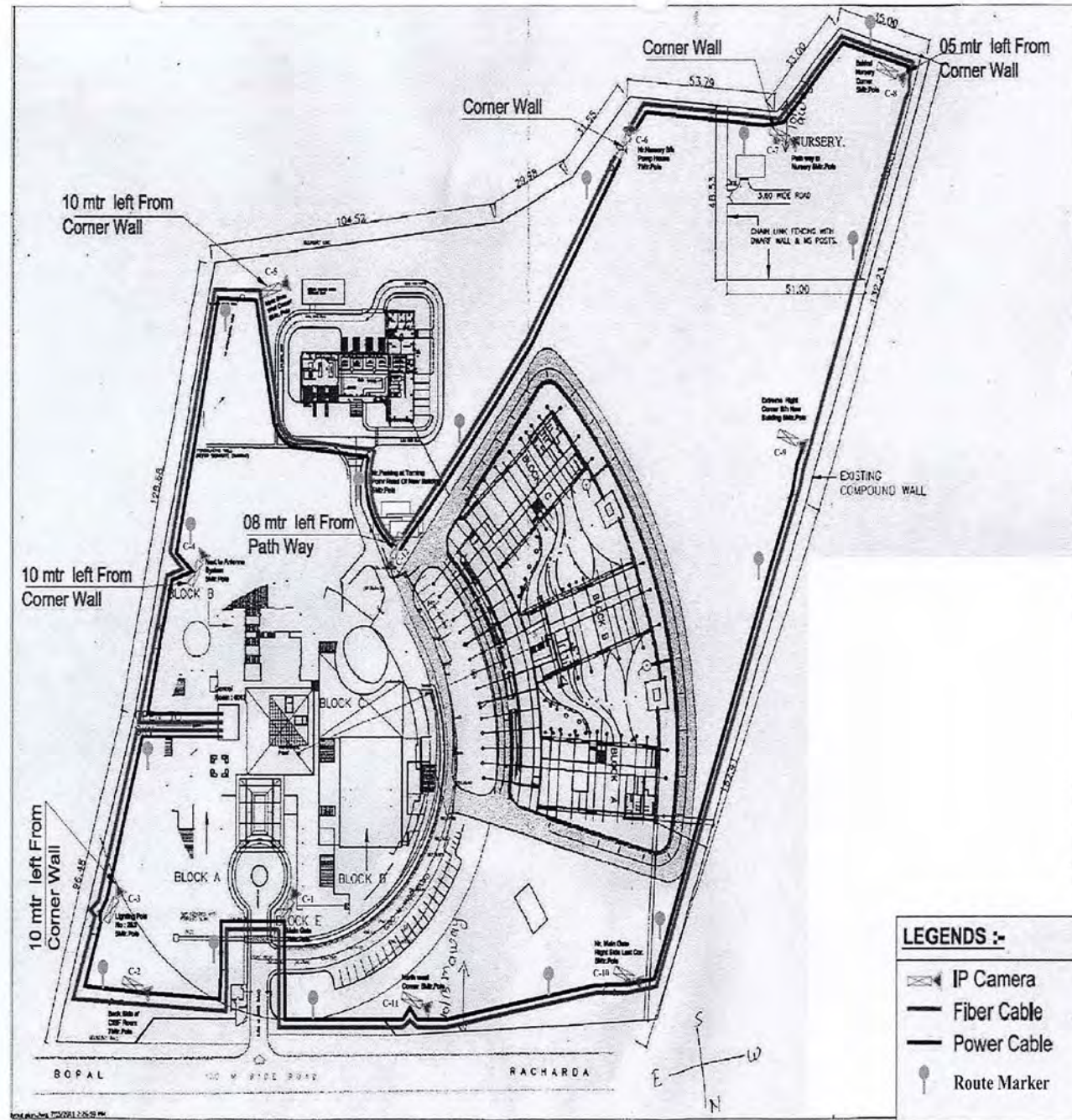


Figure-2

EXISTING CCTV OFC NETWORK LAYOUT : BOPAL TECHNICAL AREA



LEGENDS :-

	IP Camera
	Fiber Cable
	Power Cable
	Route Marker

भारत सरकार
अंतरिक्ष विभाग
अंतरिक्ष उपयोग केंद्र(इसरो)
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Fax No. : +91-79 – 2691 5835 / 02 /48
Email: publictender@sac.isro.gov.in

निविदा सूचना सं.: सैक/EOI-2
Tender Notice No.: SAC/EOI-2

क्र. सं. Sr.No	निविदा नं. Tender No.	संक्षिप्त विवरण Brief Description	नियत तिथि (अपराह्न 3 बजे तक) Due on (Up to 3 pm)
4.	SAC/EOI-2/D2/2016-17	Completely Maskless UV LED Based Direct Imaging System for High End PCBs/MLBs Applications	20/07/2016

Request for Expression of Interest (REOI)
For
Completely Maskless
UV LED based Direct Imaging System
For
High End PCBs / MLBs
Applications

SPACE APPLICATIONS CENTRE
Indian Space Research Organization (ISRO)
AHMEDABAD

CONTENT

- 1.0.0 Introduction
- 2.0.0 System specifications
- 3.0.0 Other system requirements
 - 3.1.0 System performance checking and pre-dispatch inspection
 - 3.2.0 Electrical requirement:
 - 3.3.0 Warranty
 - 3.4.0 Installation and training
 - 3.5.0 Annual maintenance contract
 - 3.6.0 Operation and maintenance manual
 - 3.7.0 Qualified bidder
 - 3.8.0 Assurance of services
 - 3.9.0 Installation layout plan
- 4.0.0 General terms and conditions
- 5.0.0 Compliance table

1.0.0 Introduction:

Space Applications Centre (SAC) of Indian Space Research Organization (ISRO), Government of India, is responsible for design and development of satellite payloads for various remote sensing, communication and navigation applications. These payloads contain high speed digital, RF and mixed-signal Printed Circuit Boards (PCBs). SAC invites Expression of Interest (EoI) from capable manufactures / vendors for supplying "Completely Maskless UV LED based Direct Imaging System for High End PCBs / MLBs Applications". Completely mask less UV LED based direct imaging system for high end PCBs / MLBs applications under this scope of supply is intended for exposing of Fine-line internal and external layer circuits using UV LED for proto type applications. It should substitute the entire photolithography system including photo plotter and exposure unit and enables the production of PCBs /MLBs with constant and short throughput-times. The system should be compatible for processing both dry / liquid film Photo resist used for the fabrication of high reliability PCBs / MLBs.

The purpose of this EoI is to solicit high quality and competitive proposals for supply of the system. This EoI document provides basic technical specifications about the system and requirements. The manufacturer / vendor should provide proposal with detailed specifications and configurations and shall include following detail.

- Expression of Interest for supply of the system/equipment
- Detailed technical proposal with respect to specifications given in 2.0.0 and 3.0.0.
- Compliance of understanding the EoI document (5.0.0)
- Additional technical features / informations if any

It may be noted that "SAC reserves right to identify qualified vendors based on outcome of EoI".

2.0.0 System specifications:

2.1.0 Light Source: UV LED light source, dual wavelength 365nm and 405nm.

2.2.0 Exposure: Single sided

2.3.0 Exposure area: 20" x 24" or higher Party can also provide the details to produce large panels maximum (PCB size) 2.4 meter length by imaging a panel in segments (24" x 18" x number of segments) with the ability to pass a panel through the machine from front to back or side to side. Party should provide the information on software and mechanical structuring for holding the panel both sides in EoI. Stitching accuracy should be ≤ 15 microns or better.

2.4.0 Minimum panel size: 4" x 4"

2.5.0 Laminate thickness: 0.050 mm – 5 mm or better

2.6.0 System should be able to image inner layers, outer layers, flex and rigid flex board.

- 2.7.0 System should support exposure on the FR4, Polyimide, PTFE, Ceramic and other PCB substrates.
- 2.8.0 System should be compatible with all regular UV sensitive dry film and liquid photoresists.
- 2.9.0 LED power and scan speed shall be user selectable.
- 2.10.0 Minimum structure size / feature size: 25 μm or better
- 2.11.0 Edge roughness: $\pm 2.5 \mu\text{m}$ or better
- 2.12.0 Positional accuracy: $\pm 12.5 \mu\text{m}$ or better
- 2.13.0 Alignment / registration accuracy with respect to drilled board: $\pm 12.5 \mu\text{m}$ or better
- 2.14.0 Registration accuracy front to back: $\pm 12.5 \mu\text{m}$ or better
- 2.15.0 Depth of focus: system should have depth of focus $\pm 150 \mu\text{m}$ or better for uniform exposure.
- 2.16.0 Loading / Unloading of panel to the system: Manual loading / unloading
- 2.17.0 Panel / substrate holding: Vacuum holding preferably with programmable vacuum table to avoid the use of filler sheet to prevent the leakage of vacuum level.
- 2.18.0 Alignment targets: surface pads / hole. Alignment of image with the coated panel shall be done by the surface pads / hole or by any other method but accuracy requirements mentioned above should meet.
- 2.19.0 For optimization of the production process, System should be able to supports linear nonlinear, localized scaling on the panel. Scaling compensation should be manual or auto or multipoint method. Localized error correction should be possible.
- 2.20.0 Input data format: System should be compatible with input data format like extended Gerber RS274-X, DXF and standard. mmm files. Party can also mention the additional format that machine accepts for operation.
- 2.21.0 Exposure system should automatically adjust to the panel thickness through automatic focusing.
- 2.22.0 System should have CCD camera for optical alignment, auto focusing camera preferred for locating targets for different thicknesses.
- 2.23.0 System should have integrated calibration system or provision for auto and manual calibration to meet machine performance and accuracy.
- 2.24.0 System should have temperature and humidity indicator or can track log. Non permissible / out of range temperature and humidity values shall be alerted.
- 2.25.0 System should be provided with visible or audible alarms for any malfunctioning with an error message.
- 2.26.0 Machine should be constructed on high mass granite base to minimize the vibration.

- 2.27.0 Total enclosure should be dust proof, with localized HEPA filter system to maintain the positive pressure while operation and hence system should work without specialized clean room.
- 2.28.0 System should have dedicated high end data/job preparation station with 21" or higher touch screen monitor, keypad, mouse and work station. System should work through both touch screen and keypad-mouse.
For data processing, latest version of computer should be provided along with system with preloaded licensed version of windows, Microsoft office and anti-virus software. Computer should have hard disk 1 TB or higher, RAM 4GB DDR3 1066 MHz OR BETTER, High speed processor, Monitor 24" or higher TFT Color monitor, graphics card should be compatible for handling complex job and high layer count PCBs.
- 2.29.0 System should have state of an art data processing software capable of handling complex data. Software should have perpetual license.
- 2.30.0 System should ensure uniform exposure of features and scaled data throughout the panel.
- 2.31.0 Provision of data input through DVD/CD combo drive, USB and through network.
- 2.32.0 Event logging system includes the tracks jobs, scale data, database recipe for different kinds of photo resist etc.
- 2.33.0 System should be provided with mechanism or sensor or light integration tool to track the output power to the substrate.
- 2.34.0 For data processing, latest version of computer should be provided along with system with preloaded licensed version of windows and anti-virus software.

3.0.0 Other terms and conditions:

- 3.1.0 **System performance checking and pre-dispatch inspection:** System performance will be checked with respect to serial no. 2.0.0. Performance test report shall be provided before the dispatch of the machine. Performance test report should positional accuracy, repeatability, positional accuracy, edge roughness, registration accuracy front to back. Alternatively, Pre dispatch inspection of the machine will be done by the SAC engineers at party's premises for the verification / witnessing of all functions under the system performance checking.
Party has to demonstrate accuracy requirements mentioned above on job as per data provided by the SAC. Required material shall be arranged by the party.
- 3.2.0 **Electrical requirement:** single phase 230 V AC + / - 1 % 50 Hz or 3 phase 415V + / - 5 % V AC 50 Hz Suitable rating cable having approximate length 10 meters should be provided to connect the unit with control cabinet and control cabinet to mains provides by SAC.
- 3.3.0 **Warranty:** Warranty for the machine (comprehensive warranty with spares and service) shall be one year from the successful installation and commissioning of the system at our premises. For LED light source minimum three years' replacement warranty form the date of installation.
- 3.4.0 **Installation and training:** Party has to install the machine free of cost at our premises and demonstrate all functioning as per RFP. Party has to train our personnel (after successful

installation commissioning) for the functioning, operation and maintenance of the machine for the 5 working days Free of cost.

- 3.5.0 Annual maintenance contract:** Party has to agree and undertake the Annual maintenance contract after completion of the 1 year warranty period for the period of 3 years (2nd, 3rd, 4th), considering 2 visits per year (3 working days each) and break down visit as and when required. Party shall attend the machine within 72 hours for break down call. Optionally Party can also provide the details on comprehensive AMC with spares and service for the period of three years i.e. 3rd, 4th and 5th year after completion of standard one-year warranty as per 3.3.0.
- 3.6.0 Operation and maintenance manual:** 2 sets of Operation and maintenance manual including all electrical wiring diagram, mechanical drawings, trouble-shooting guide are to be provided along with machine (English version) .
- 3.7.0 Qualified bidder:** In Eol party should provide complete details of the users of proposed model like name of the user, address. Contact number, Model no., specifications etc. SAC may contact them for verification and if required send a team to visit.
- 3.8.0 Assurance of services:** Party has to ensure spares and technical service support for the quoted model for 10 years.
- 3.9.0 Installation layout plan:** Weight and dimensions of main unit and layout plan for installation shall be submitted along with technical bid. Environmental condition, floor level condition and vibrational level condition shall be provided.
- 4.0.0 General terms and conditions:**
 - 4.1.0** The equipment should have compliance to Euro Standards (CE) or NIMA or any other international standards
 - 4.2.0** Party shall specify the detail scope / list of supply for hardware and software with detail features/functions along with quotation
 - 4.3.0** Original catalogues (in English only) & photographs of the system must be enclosed.
 - 4.4.0** The party shall also bring out categorically any other additional features/functions of the machine.
 - 4.5.0** If any point is not being complied, then party shall bring it out categorically.
 - 4.6.0** Party shall provide the list of necessary tools and tackles, which shall be supplied along with machine for day-to-day work / maintenance.
 - 4.7.0** Along with quotation party has to provide detailed requirements which are required to be arranged by the SAC for the machine installation and commissioning.
 - 4.8.0** Eol should be from either machine manufacturer or their representative. Representative should attach authorization letter from principle/ manufacturer.

5.0.0 COMPLIANCE TABLE

SR. NO.	System specifications :	Party's comments (provide technical details, supporting documents and specify the values)
	Make and model no.:	
5.1.0	Light Source: UV LED light source, dual wavelength 365nm and 405nm.	
5.2.0	Exposure: Single sided	
5.3.0	Exposure area: 20" x 24" or higher Party can also provide the details to produce large panels maximum (PCB size) 2.4 meter length by imaging a panel in segments (24" x 18" x number of segments) with the ability to pass a panel through the machine from front to back or side to side. Party should provide the information on software and mechanical structuring for holding the panel both sides in Eol. Stitching accuracy should be less than ≤ 15 microns or better	
5.4.0	Minimum panel size: 4" x 4"	
5.5.0	Laminate thickness: 0.050 mm – 5 mm or better	
5.6.0	System should be able to image inner layers, outer layers, flex and rigid flex board.	
5.7.0	System should support exposure on the FR4, Polyimide, PTFE, Ceramic and other PCB substrates.	
5.8.0	System should be compatible with all regular UV sensitive dry film and liquid photoresists.	
5.9.0	LED power and scan speed shall be user selectable.	
5.10.0	Minimum structure size / feature size: 25 μ m or better	
5.11.0	Edge roughness: ± 2.5 μ m or better	
5.12.0	Positional accuracy: ± 12.5 μ m or better	
5.13.0	Alignment / registration accuracy with respect to drilled board: ± 12.5 μ m or better	
5.14.0	Registration accuracy front to back: ± 12.5 μ m or better	
5.15.0	Depth of focus: system should have depth of focus ± 150 μ m or better for uniform exposure.	
5.16.0	Loading / Unloading of panel to the system: Manual loading / unloading.	
5.17.0	Panel / substrate holding: Vacuum holding preferably with programmable vacuum table to avoid the use of filler sheet to prevent the leakage of vacuum level.	
5.18.0	Alignment targets: surface pads / hole. Alignment of image with the coated panel shall be done by the surface pads / hole or by any other method but accuracy requirements mentioned above should meet.	
5.19.0	For optimization of the production process, System should be able to supports linear nonlinear, localized scaling on the panel. Scaling compensation should be manual or auto	

	or multipoint method. Localized error correction should be possible.	
5.20.0	Input data format: System should be compatible with input data format like extended Gerber RS274-X, DXF and standard. mmm files. Party can also mention the additional format that machine accepts for operation.	
5.21.0	Exposure system should automatically adjust to the panel thickness through automatic focusing.	
5.22.0	System should have CCD camera for optical alignment, auto focusing camera preferred for locating targets for different thicknesses.	
5.23.0	System should have integrated calibration system or provision for auto and manual calibration to meet machine performance and accuracy.	
5.24.0	System should have temperature and humidity indicator or can track log. Non permissible / out of range temperature and humidity values shall be alerted.	
5.25.0	System should be provided with visible or audible alarms for any malfunctioning with an error message.	
5.26.0	Machine should be constructed on high mass granite base to minimize the vibration.	
5.27.0	Total enclosure should be dust proof, with localized HEPA filter system to maintain the positive pressure while operation and hence system should work without specialized clean room.	
5.28.0	System should have dedicated high end data/job preparation station with 21" or higher touch screen monitor, keypad, mouse and work station. System should work through both touch screen and keypad-mouse. For data processing, latest version of computer should be provided along with system with preloaded licensed version of windows, Microsoft office and anti-virus software. Computer should have hard disk 1 TB or higher, RAM 4GB DDR3 1066 MHz OR BETTER, High speed processor, monitor 24" or higher TFT Color monitor, graphics card should be compatible for handling complex job and high layer count PCBs.	
5.29.0	System should have state of an art data processing software capable of handling complex data. Software should have perpetual license.	
5.30.0	System should ensure uniform exposure of features and scaled data throughout the panel.	
5.31.0	Provision of data input through DVD/CD combo drive, USB and through network.	
5.32.0	Event logging system includes the tracks jobs, scale data, database recipe for different kinds of photo resist etc.	
5.33.0	System should be provided with mechanism or sensor or light integration tool to track the output power to the substrate.	
5.34.0	For data processing, latest version of computer should be provided along with system with preloaded licensed version of windows and anti-virus software.	

5.1.0	Other terms and conditions:	
5.1.1	System performance checking and pre-dispatch inspection: System performance will be checked with respect to serial no. 2.0.0. Performance test report shall be provided before the dispatch of the machine. Performance test report should positional accuracy, repeatability, positional accuracy, edge roughness, registration accuracy front to back. Alternatively, Pre dispatch inspection of the machine will be done by the SAC engineers at party's premises for the verification / witnessing of all functions under the system performance checking. Party has to demonstrate accuracy requirements mentioned above on job as per data provided by the SAC. Required material shall be arranged by the party.	
5.1.2	Electrical requirement: single phase 230 V AC + / - 1 % 50 Hz or 3 phase 415V + / - 5 % V AC 50 Hz Suitable rating cable having approximate length 10 meters should be provided to connect the unit with control cabinet and control cabinet to mains provides by SAC.	
5.1.3	Warranty: Warranty for the machine (comprehensive warranty with spares and service) shall be one year from the successful installation and commissioning of the system at our premises. For LED light source minimum three years' replacement warranty form the date of installation.	
5.1.4	Installation and training: Party has to install the machine free of cost at our premises and demonstrate all functioning as per RFP. Party has to train our personnel (after successful installation commissioning) for the functioning, operation and maintenance of the machine for the 5 working days Free of cost.	
5.1.5	Annual maintenance contract: Party has to agree and undertake the Annual maintenance contract after completion of the 1 year warranty period for the period of 3 years (2 nd , 3 rd ,4 th), considering 2 visits per year (3 working days each) and break down visit as and when required. Party shall attend the machine within 72 hours for break down call. Optionally Party can also provide the details on comprehensive AMC with spares and service for the period of three years i.e. 3 rd , 4 th and 5 th year after completion of standard one-year warranty as per 3.3.0.	
5.1.6	Operation and maintenance manual: 2 sets of Operation and maintenance manual including all electrical wiring diagram, mechanical drawings, trouble-shooting guide are to be provided along with machine (English version) .	
5.1.7	Qualified bidder: Party who has supplied such system for fine line applications to meet the requirements mentioned in RFP will only qualify to bid. For that party has to provide complete details like name of the user, address. Contact	

	number, Model no., specifications etc. SAC may contact them for verification and if required send a team to visit.	
5.1.8	Assurance of services: Party should have strong service network and shall provide the details of work experience of the person involved in servicing and maintaining such systems in India. Party shall also provide the references of their existing service contract. Party has to ensure spares and technical service support for the quoted model for 10 years.	
5.1.9	Quotation of the spares: Party has to quote necessary spares required for 3 years trouble free operation after warranty period.	
5.1.10	Installation layout plan: Weight and dimensions of main unit and layout plan for installation shall be submitted along with technical bid. Environmental condition, floor level condition and vibrational level condition shall be provided.	

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निविदा सूचना सं.: सैक/EOI-2
Tender Notice No.: SAC/EOI-2

क्र. सं. Sr.No	निविदा नं. Tender No.	संक्षिप्त विवरण Brief Description	नियत तिथि (अपराह्न 3 बजे तक) Due on (Up to 3 pm)
5.	SAC/EOI-2/D3/2016-17	High Speed CNC Drilling and Routing Machine for DSB PCB and MLB Fabrication	25/07/2016

Request for Expression of Interest (REOI)
For
For High Speed CNC Drilling and Routing machine
For
DSB PCB and MLB Fabrication

SPACE APPLICATIONS CENTRE
Indian Space Research Organization (ISRO)
AHMEDABAD

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- 3.7.0 Assurance of services
- 3.8.0 Installation layout plan

4.0.0 General terms and conditions.

5.0.0. Compliance statement

1.0.0 Introduction:

Space Applications Centre (SAC) of Indian Space Research Organization (ISRO), Government of India, is responsible for design and development of satellite payloads for various remote sensing, communication and navigation applications. These payloads contain high speed digital, RF and mixed-signal Printed Circuit Boards (PCBs), high layer count multilayer boards. SAC invites Expression of Interest (Eoi) from capable manufactures / vendors for supplying "High Speed CNC Drilling and Routing Machine for PCB and MLB Fabrication". The high speed CNC drilling and routing machine under this Eoi is intended for micro drilling and routing, regular drilling, depth control drilling & routing, optimization of drilling position and new target hole drilling based on the correction factors And Optical inner layer registration (x – ray functionality) with dedicated camera for MLB drilling.

The purpose of this Eoi is to solicit high quality and competitive proposals for supply of the system. This Eoi document provides basic technical specifications about the system and requirements. The manufacturer / vendor should provide proposal with detailed specifications and configurations and shall include following detail.

- Expression of Interest for supply of the system/equipment
- Compliance of understanding the Eoi document
- Detailed technical proposal with respect to specifications given in 2.0.0 and 3.0.0.
- Additional technical features / informations if any

It may be noted that "SAC reserves right to identify qualified vendors based on outcome of Eoi".

2.0.0 Specifications:

2.1.0 Working mechanism and Spindle type

2.1.1 Two Spindle One Station CNC Drilling Machine, both spindles shall work with automatic switch over according to programme / tool diameter.

2.1.2 One shall be Air bearing spindle for micro hole drilling with RPM range
Minimum RPM \leq 30000 & Maximum RPM \geq 250000

2.1.3 Second shall be Ceramic ball bearing spindle / air bearing with RPM range.
Minimum RPM \leq 10000 & Maximum RPM \geq 60000

This spindle should be capable of drilling and routing of metal embedded PCBs or 1 mm copper claded laminate/ substrate.

2.1.4 Machine shall be compatible for Drill diameter from 0.05 mm to 6.3mm

2.1.5 Machine shall be compatible for router diameter from 0.6 mm to 4 mm

2.2.0 PCB Holding mechanism and panel size.

- 2.2.1 Mushroom holding mechanism to hold panes tightly to take care of Warpage.
- 2.2.2 Prism slot mechanism for holding panel while drilling and routing operation.
- 2.2.3 Panel clamping tool diameter: 3 mm or above.
- 2.2.4 Tool plate (PCB holding plate) planarity: ± 25 micron or better.
- 2.2.5 Maximum Panel size: 24" x 24" or larger
- 2.2.6 Minimum panel size: 4" x 4" or smaller

2.3.0 Machine accuracy

- 2.3.1 Positioning accuracy (X/Y axis) : $\leq \pm 4 \mu\text{m}$ (specify the standard followed for accuracy such as ISO/VDI/NMTBA/JIS or any other)
- 2.3.2 Drilling accuracy (X/Y axis): $\leq \pm 18 \mu\text{m}$
- 2.3.3 Repeatability of positioning: $\leq \pm 3 \mu\text{m}$ (specify the standard followed for accuracy such as ISO/VDI/NMTBA/JIS or any other)
- 2.3.4 Depth accuracy for blind hole drilling with air bearing spindle (Z axis): $\leq \pm 15 \mu\text{m}$
- 2.3.5 Depth accuracy for routing (Z axis) with ceramic bearing / air bearing spindle with second measuring system: $\leq \pm 50 \mu\text{m}$

2.4.0 Base, Feed drive and measuring system.

- 2.4.1 Granite base high accuracy and long durability. (specify the flatness of granite)
- 2.4.2 Linear motor drive in x, y and z-axis
- 2.4.3 X and Y axis positioning speed $\geq 50\text{m/min}$
- 2.4.4 Z axis positioning speed $\geq 25\text{m/min}$
- 2.4.5 Linear measuring system for X , Y and z axis with resolution ≤ 1.0 micron.
- 2.4.6 Second measuring system for routing spindle and depth control routing shall be provided.

2.5.0 Control system:

- 2.5.1 The machine should operate with PC based PLC to fulfil the technical specifications.
- 2.5.2 For interfacing, high end industrial latest PC with preloaded windows 8 or 16 or equivalent platform and antivirus software (all licence version), DVD writer, USB ports, 1 TB hard disk, 17" LCD monitor and keypad and mouse.
- 2.5.3 CPU shall be equipped with data interface card for uploading and downloading CAD files with machine.
- 2.5.4 CNC software and controller shall have following features.
 - Graphical operator menu with pull down menus.
 - Different access levels by password function
 - All machine functions selectable by soft keys.
 - Provision to download error messages and error file.
 - Trouble management with diagnosis functions and operator help.

2.6.0 Tooling system, pressure foot and routing option:

- 2.6.1 Should support ring less tools having shank diameter: 3.175 mm
- 2.6.2 2 x 100 tool magazine.
- 2.6.3 Tool change automatic and manual.

2.6.4 Pressure foot shall be compatible with high accuracy micro drilling, regular drilling and routing. Separate pressure foot shall be provided for different applications. For routing application pressure foot shall be provided with brush.

2.7.0 Process Monitoring:

- 2.7.1 Laser measuring system for tool length, run out and diameter.
- 2.7.2 Contact bit detection system for quick drill and real time broken bit detection.
- 2.7.3 Blind via hole drilling for micro and standard drilling by CBD function.

2.8.0 On board CCD camera and optical inner layer registration with compatible software.

- 2.8.1 On board high-resolution CCD camera required for position correction for drilling and Routing.
- 2.8.2 System shall operate on entire panel area.
- 2.8.3 Optical inner layer registration (x – ray functionality) with dedicated camera for MLB drilling.

2.9.0 Software compatibility:

- 2.9.1 System should be compatible with the Excellon – II and other industry standard formats.

2.10.0 Following standard compatible accessories with proper attachment with machine to be supplied.

- 2.10.1 Spindle cooling system
- 2.10.2 Exhaust system with proper hose
- 2.10.3 Air buffer tank and air filter system.

2.11.0 Safety:

- 2.11.1 Complete equipment should meet the international safety regulations in all respect.
- 2.11.2 Auto checking of all critical machine parameters at machine start up to ensure proper functioning of machine.
- 2.11.3 Emergency stop button at relevant positions.
- 2.11.4 Machine interlock for hardware and software malfunction.
- 2.11.5 Machine interlock for low vacuum and low compressed air.

3.0.0 Other Requirements:

3.1.0 System performance checking and pre-dispatch inspection: System performance will be checked with respect to serial no. 2.0.0. Performance test report shall be provided before the dispatch of the machine. Performance test report should include the drilling and routing accuracy, positional accuracy, repeatability. Alternatively, Pre dispatch inspection of the machine will be done by the SAC engineers at party's premises for the verification / witnessing of all functions including drilling and routing accuracy, positional accuracy, repeatability and system performance checking.

Party has to demonstrate accuracy requirements mentioned above on job as per drilling and routing data provided by the SAC. Required Laminates, drill bits and router shall be arranged by the party.

- 3.2.0 Electrical requirement:** Three phase 415V AC + / - 10%, 50 Hz.
- 3.3.0 Warranty:** Warranty for the machine (comprehensive warranty with spares and service) shall be two years from the successful installation and commissioning of the system at our premises. Party has to quote per year for the extended comprehensive warranty for the third, fourth and fifth years in addition to standard two years warranty.
- 3.4.0 Installation and training:** Party has to install the machine free of cost at our premises and demonstrate all functioning as per specifications. Party has to train our personnel (after successful installation and commissioning) for the functioning, operation and maintenance of the machine for the 7 working days free of cost.
- 3.5.0 Annual maintenance contract:** Party has to agree and undertake the Annual maintenance contract after completion of the 2 years warranty period for the period of 3 years (3rd ,4th and 5th year), considering 2 visits per year (2 working days each) and break down visit as and when required. Party shall attend the machine within 72 hours for break down call.
- 3.6.0 Operation and maintenance manual:** 2 sets of Operation and maintenance manual including all electrical wiring diagram, mechanical drawings, trouble-shooting guide are to be provided along with machine (English version) .
- 3.7.0. Assurance of services:** Party has to ensure spares and technical service support for the quoted model for 10 years.
- 3.8.0 Installation layout plan:** Weight and dimensions of main unit and layout plan for installation and environmental conditions shall be submitted along EoI.
- 4.0.0 General terms and conditions:**
- 4.1.0** The equipment should have compliance to Euro Standards (CE) or NIMA or any other international standards
- 4.2.0** Party shall specify the detail scope / list of supply for hardware and software with detail features/functions along with quotation
- 4.3.0** Complete information should be enclosed to describe every part and mechanisms including optional items offered.
- 4.4.0** Original catalogues (in English only) & photographs of the system must be enclosed.
- 4.5.0** The party shall also bring out categorically any other additional features/functions of the machine.
- 4.6.0** Party shall provide the list of necessary tools and tackles, which shall be supplied along with machine for day-to-day work / maintenance.
- 4.7.0** EoI should be from either machine manufacturer or their Indian representative. Indian representative should attach authorization letter from principle/ manufacturer.

5.0.0. Compliance statement:

SR. NO.	Specifications:	Party's comments (provide the value and details wherever applicable)
Make		
Model		
2.1.0	WORKING MECHANISM AND SPINDLE TYPE.	
2.1.1	Two Spindle One Station CNC Drilling Machine, both spindles shall work with automatic switch over according to programme / tool diameter.	
2.1.2	One shall be Air bearing spindle for micro hole drilling with RPM range- Minimum RPM \leq 30000 & Maximum RPM \geq 250000	
2.1.3	Second shall be Ceramic ball bearing spindle / air bearing with RPM range. Minimum RPM \leq 10000 & Maximum RPM \geq 60000 This spindle should be capable of drilling and routing of metal embedded PCBs or 1 mm copper claded laminate/ substrate.	
2.1.4	Machine shall be compatible for Drill diameter from 0.05 mm to 6.3mm.	
2.1.5	Machine shall be compatible for router diameter from 0.6 mm to 4 mm.	
2.2.0	PCB HOLDING MECHANISM AND PANEL SIZE.	
2.2.1	Mushroom holding mechanism to hold panes tightly to take care of Warpage.	
2.2.2	Prism slot mechanism for holding panel while drilling and routing operation.	
2.2.3	Panel clamping tool diameter: 3 mm or above.	
2.2.4	Tool plate (PCB holding plate) planarity: \pm 25 micron of better.	
2.2.5	Maximum Panel size: 24" x 24" or larger	
2.2.6	Minimum panel size: 4" x 4" or smaller	
2.3.0	Machine accuracy	
2.3.1	Positioning accuracy (X/Y axis) : $\leq \pm 4 \mu\text{m}$ (specify the standard followed for accuracy such as ISO/VDI/NMTBA/JIS or any other)	
2.3.2	Drilling accuracy (X/Y axis): $\leq \pm 18 \mu\text{m}$	

2.3.3	Repeatability of positioning: $\leq \pm 3 \mu\text{m}$ (specify the standard followed for accuracy such as ISO/VDI/NMTBA/JIS or any other)	
2.3.4	Depth accuracy for blind hole drilling with air bearing spindle (Z axis): $\leq \pm 15 \mu\text{m}$	
2.3.5	Depth accuracy for routing (Z axis) with ceramic bearing / air bearing spindle with second measuring system: $\leq \pm 50 \mu\text{m}$	
2.4.0	Base, Feed drive and measuring system.	
2.4.1	Granite base high accuracy and long durability. (specify the flatness of granite)	
2.4.2	Linear motor drive in x, y and z-axis	
2.4.3	X and Y axis positioning speed $\geq 50\text{m/min}$	
2.4.4	Z axis positioning speed $\geq 25\text{m/min}$	
2.4.5	Linear measuring system for X, Y and z axis with resolution ≤ 1.0 micron.	
2.4.6	Second measuring system for routing spindle and depth control routing shall be provided.	
2.5.0	Control system:	
2.5.1	The machine should operate with PC based PLC to fulfil the technical specifications.	
2.5.2	For interfacing, high end industrial latest PC with preloaded windows 8 or 16 or equivalent platform and antivirus software (all licence version), DVD writer, USB ports, 1 TB hard disk, 17" LCD monitor and keypad and mouse.	
2.5.3	CPU shall be equipped with data interface card for uploading and downloading CAD files with machine.	
2.5.4	CNC software and controller shall have following features. Graphical operator menu with pull down menus. Different access levels by password function All machine functions selectable by soft keys. Provision to download error messages and error file.Trouble management with diagnosis functions and operator help.	
2.6.0	Tooling system, pressure foot and routing option:	
2.6.1	Should support ring less tools having shank diameter: 3.175 mm	
2.6.2	2 x 100 tool magazine.	
2.6.3	Tool change automatic and manual.	
2.6.4	Pressure foot shall be compatible with high accuracy micro drilling, regular drilling and routing. Separate pressure foot shall be provided for	

	different applications. For routing application pressure foot shall be provided with brush.	
2.7.0	Process Monitoring:	
2.7.1	Laser measuring system for tool length, run out and diameter.	
2.7.2	Contact bit detection system for quick drill and real time broken bit detection.	
2.7.3	Blind via hole drilling for micro and standard drilling by CBD function.	
2.8.0	On board CCD camera and optical inner layer registration with compatible software.	
2.8.1	On board high-resolution CCD camera required for position correction for drilling and Routing.	
2.8.2	System shall operate on entire panel area.	
2.8.3	Optical inner layer registration (x – ray functionality) with dedicated camera for MLB drilling.	
2.9.0	Software compatibility:	
2.9.1	System should be compatible with the Excellon-II and other industry standard formats.	
2.10.0	Following standard compatible accessories with proper attachment with machine to be supplied.	
2.10.1	Spindle cooling system	
2.10.2	Exhaust system with proper hose	
2.10.3	Air buffer tank and air filter system.	
2.11.0	Safety:	
2.11.1	Complete equipment should meet the international safety regulations in all respect.	
2.11.2	Auto checking of all critical machine parameters at machine start up to ensure proper functioning of machine.	
2.11.3	Emergency stop button at relevant positions.	
2.11.4	Machine interlock for hardware and software malfunction.	
2.11.5	Machine interlock for low vacuum and low compressed air.	
3.0.0	Other Requirements:	

3.1.0	<p>System performance checking and pre-dispatch inspection: System performance will be checked with respect to serial no. 2.0.0. Performance test report shall be provided before the dispatch of the machine. Performance test report should include the drilling and routing accuracy, positional accuracy, repeatability. Alternatively, Pre dispatch inspection of the machine will be done by the SAC engineers at party's premises for the verification / witnessing of all functions including drilling and routing accuracy, positional accuracy, repeatability and system performance checking.</p> <p>Party has to demonstrate accuracy requirements mentioned above on job as per drilling and routing data provided by the SAC. Required Laminates, drill bits and router shall be arranged by the party.</p>	
3.2.0	<p>Electrical requirement: Three phase 415V AC + / - 10%, 50 Hz.</p>	
3.3.0	<p>Warranty: Warranty for the machine (comprehensive warranty with spares and service) shall be two years from the successful installation and commissioning of the system at our premises. Party has to quote per year for the extended comprehensive warranty for the third, fourth and fifth years in addition to standard two years warranty.</p>	
3.4.0	<p>Installation and training: Party has to install the machine free of cost at our premises and demonstrate all functioning as per specifications. Party has to train our personnel (after successful installation and commissioning) for the functioning, operation and maintenance of the machine for the 7 working days free of cost.</p>	
3.5.0	<p>Annual maintenance contract: Party has to agree and undertake the Annual maintenance contract after completion of the 2 years warranty period for the period of 3 years (3rd ,4th and 5th year), considering 2 visits per year (2 working days each) and break down visit as and when required. Party shall attend the machine within 72 hours for break down call.</p>	

3.6.0	Operation and maintenance manual: 2 sets of Operation and maintenance manual including all electrical wiring diagram, mechanical drawings, trouble-shooting guide are to be provided along with machine (English version) .	
3.7.0	Assurance of services: Party has to ensure spares and technical service support for the quoted model for 10 years.	
3.8.0	Installation layout plan: Weight and dimensions of main unit and layout plan for installation and environmental conditions shall be submitted along Eol.	

PARTY HAS TO PROVIDE FOLLOWING MACHINE REQUIREMENTS ALONG WITH THE Eol.

1. Input air pressure and quality
2. Environmental condition
3. Fork lift requirements
4. Machine floor load requirements
5. Floor level requirements
6. Machine dimensions

NOTE: Any special requirement other than above required for the machine installation and operation shall also be provided along with the Eol.