

 IIT PALAKKAD	भारतीय प्रौद्योगिकी संस्थान पालक्काड Indian Institute of Technology Palakkad अहलिआ एकीकृत कैम्पस, कोज़िहपारा Ahalia Integrated Campus, Kozhipara पालक्काड- 678557 Palakkad – 678 557	दूरभाषसंख्या/ Phone no: 04923 – 226300/ 590/ 586 ईमेल/ Email : purchase@iitpkd.ac.in
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Ref No: IITPKD/ELE/SS/047/2017

Date: 25.10.2017

Due Date of the tender: 09.11.2017 @ 3 PM

TENDER FOR INVITING QUOTATIONS

Dear Sirs,

On Behalf of Indian Institute of Technology Palakkad quotations are invited for **“Microwave Components and Equipment for Microwave Laboratory”** confirming to the specification in the Annexure.

- 1. Preparation of Bids:** - The tenders should be submitted **under two-bid system** (i.e.) Technical bid and Financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. No prices should be included in technical bid. Financial Bid should indicate item – wise prices for the items mentioned in the technical bid. The technical and the financial bids should be put in separate cover and sealed. Both sealed covers should be put into a bigger cover.
- 2. The Quotations** duly sealed and superscribed on the envelope **with the reference No. and due date, should be addressed to the undersigned so as to reach him on or before the due date stipulated above. Fax and Email quotation are not acceptable.**
- 3. The price** should be quoted per unit and packing and delivery charges should be indicated separately. The offer/bids should be exclusive of Taxes and Duties, which will be paid by the purchaser as applicable. However the percentage and of taxes and duties as on date should be clearly indicated.
- 4. The Quotations** should be valid for **sixty days** from the due date and the period of delivery required should also be clearly indicated.
- 5. If the item** is under DGS&D Rate contract No. and the price must be mentioned. It may also please be indicated whether the supply can be made direct to us at the Rate contract price (Please note that we are not Direct Demanding Officers). If so please send copy of the RC.
- 6. Local Firms:** Quotations should be for free delivery to this Institute. If Quotations for Ex-Godown delivery charges should be indicated separately.
- 7. Outside Palakkad:** Quotations should be for **F.O.R. at IIT Palakkad**. If F.O.R. consignor station, freight charges by passenger train / lorry transport must be indicated. If Ex-Godown, packing, forwarding and freight charges must be indicated.

8. Goods shall not be supplied without an official supply order.
9. **Custom Duty:** Custom Duty which will be paid at a concessional rate against duty exemption certificate.
10. **Payment:** Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later. No advance payment will be made. The Tenderer have to furnish the bank details along with tender like Account No, Account Name, IFSC Code, Bank address etc.
11. **Submission of Bids:** Quotation should be sent to the following address “**The Registrar, Indian Institute of Technology Palakkad, Ahalia Integrated Campus, Kozhipara, Palakkad -678 557, Kerala**”, Phone No: **04923 226 586/590**, Email: purchase@iitpkd.ac.in.
12. **Delivery Period:** The quotation should indicate clearly when delivery and installation to be made.
13. **Delay in Supply or Liquidate damages:** If the supplier fails to deliver the stores within the time specified in the purchase order, the purchaser will recover from the supplier as liquidated damages a sum of one- half of one percent (0.5%) of the P.O value of the undelivered stores for each calendar week of delay. The total liquidated damages shall not exceed five percent (5%) of the P.O price of the unit or units so delayed. Stores will be deemed to have been delivered only when all their component parts are also delivered. If certain components are not delivered in time, the stores will be considered as delayed until such time as the missing parts are delivered.
14. **Late offer:** The quotation received after due date will not be considered. Please ensure that your offer is sent well in advance to reach the Institute by the due date.
15. **Loading and unloading charges will be borne by the supplier.**
16. **Warranty:** Three years from the date of installation should be indicated clearly.
17. **Acceptance and Rejection:** IIT Palakkad has the right to accept the whole or any parts of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

Yours faithfully,

Encl: Specifications

Registrar, IIT Palakkad

Microwave Components for Microwave Laboratory

This tender deals with the following two main items:

A. Supply of microwave instrumentation for C and X-band and accessories as per the plans provided in this document.

B. Supply, installation and commissioning of the microwave instrumentation and accessories.

A. Details of Microwave Instrumentation to be Bought

Each set should have the components and equipment for conducting the following experiments

1. X-band experiments

Study of GUNN Diode characteristics.

Study of directional coupler characteristics.

Study of radiation pattern of horn antennas.

Study of S-parameter measurements of isolators, circulators, E-plane tee, H-plane tee, magic tee, attenuation and power measurement.

2. C-band experiments

Study of low pass filter, band pass filter, band stop filter, ring resonator, branch line coupler, hybrid ring coupler, parallel-coupled line coupler, power divider, microstrip transmission line, amplifier, patch antennas.

Note to vendor quoting: Anything that has been missed in this document and is required for the above mentioned experiments can quoted as optional.

Who can participate?

Only those bidders fulfilling the following criteria should respond to the tender.

1. Bidder should be either an Original Equipment Manufacturer (OEM) of microwave instruments/allied systems OR an authorised dealer having purchase and support agreement with such an OEM.

2. The bidder should be a company registered under the Companies Act, 1956/2013 OR a Limited Liability Partnership (LLP) OR a registered partnership firm OR a sole proprietorship entity. Appropriate Registration/ incorporation certificate to be submitted. Bidder must have a registered office in Karnataka/Tamil Nadu/ Telangana/Andhra Pradesh/Maharashtra, or Kerala. Certificate of registration for the offices to be provided.

3. Bidder must also have a service center in Karnataka/Tamil Nadu/Telangana/Andhra Pradesh/Maharashtra, or Kerala. Certificate of registration for the centers to be provided.

4. Bidder must be in existence in the business of supply/manufacture of microwave equipment/allied systems for a minimum period of 3 previous financial years (i.e., before or since 01-April-2014). Documentary evidence of experience must be provided.

5. The bidder should have implemented orders of microwave equipment/allied systems worth exceeding INR 5 lakhs during previous two financial years (April 1, 2015 – March 31, 2017). Purchase orders and certificates of successful implementation must be included. Copies of financial statements or evidence of turnover must be furnished. IIT Palakkad reserves the right to determine if the field is allied or not and its decision will be final.

6. The bidder should provide documentary evidence of having supplied and installed microwave instruments/allied systems at a Centrally Funded Technical Institution (like IIT, NIT, IISc). Bidder must provide a certificate of satisfactory performance of the installed setup. Contact details of faculty-in-charge of installed setup must also be provided.

7. Compliance sheet for the specification & OEM Brochure has to be attached along with Technical bid. Vendor has to fill the compliance sheet and mention page number or reference number in OEM brochure. Unfilled / partial filled sheets lead to disqualification.

C BAND SOURCE, DETECTOR AND ACCESSORIES

Part A

SI No	Description	Specification		Quantity
		Parameter	Details	
1	C Band Source	Frequency Range	4.7 to 5.2 GHz	02
		Power Output	1 to 2 dBm	
		Tune Voltage	0 to 10 volts	
		Supply current	20 to 27 mA	
		Tune port leakage current	10 uA	
		Harmonics (2nd, 3rd)	-15 dBc, -25 dBc	
2	Shottky Detector	Minimum Detection level	- 40 dB	02
		Biassing Voltage of Shottky Diode	+ 3 V	
3	Coupler			01
4	Active Filter			02
5	Universal Test Jig	To be used to hold microstrip test		02

		components. Should contain 6 SMA connectors to connect the various ports of DUT according to the components.		
6	50- Ohm Termination			03
7	Attenuator, 6 dB			02
8	Stands			02
9	Connecting Cable SMA to SMA			06
10	SMA to BNC			03
11	Cable Power Supply to Detector biasing			02

Part B

Microstrip components:

SI No	Description	Specification		Quantity
1	Low Pass Filter	Parameter	Details	02
		Cut off frequency	4.8 to 5.2 GHz	
		Insertion Loss	< 3.2 dB	
		Return Loss	>14.5 dB	
2	Band Pass Filter	Parameter	Details	02
		The center frequency	~5 GHz	
		Insertion Loss	< 1.2 dB	
		Return Loss	> 19 dB	
		Bandwidth	~0.5 GHz	

3	Band Stop Filter	Parameter	Details	02
		Cut off frequency	4.8 to 5.2 GHz	
		Insertion Loss	> 8 dB	
		Return Loss	> 38 dB	
		Bandwidth	~1 GHz	
4	Ring Resonator	Parameter	Details	02
		Resonance frequency	4.8 to 5.2 GHz	
		Insertion Loss	< 3.5 dB	
		Return Loss	>14.8 dB	
5	Branch Line Coupler	Parameter	Details	02
		Operating frequency	4.8 to 5.2 GHz	
		Insertion Loss (At Through port)	< 3.5 dB	
		Coupling	< 3.5 dB	
		Isolation	> 18 dB	
		Directivity	> 16 dB	
		Return Loss (Through)	> 23 dB	
6	Hybrid Ring (Rat Race) Coupler:	Parameter	Details	02
		Operating frequency	4.8 to 5.2 GHz	

		Insertion Loss (At Through port)	< 4 dB	
		Coupling	< 3.5 dB	
		Isolation	> 15 dB	
		Directivity	> 23 dB	
		Return Loss (Through)	> 23 dB	
7	Parallel Coupled Line Coupler	Parameter	Details	02
		Operating frequency	4.8 to 5.2 GHz	
		Insertion Loss (At Through port)	< 1.5 dB	
		Coupling	< 3 dB	
		Isolation	> 21 dB	
		Directivity	> 10 dB	
		Return Loss (Through):	> 18 dB	
8	Power Divider (without chip resistor)	Operating frequency	4.8 to 5.2 GHz	02
		Insertion loss in both outputs	<3.5 dB	
		Isolation	>6 dB	
		Return loss	>23 dB	
9	Power Divider (with chip resistor)	Operating frequency	4.8 to 5.2 GHz	02
		Insertion loss in both outputs	< 3.5 dB	
		Isolation	>28 dB	

		Return loss	>33 dB	
10	Patch Antenna-I	Operating frequency:	4.8 to 5.2 GHz	02
		Feeding type:	Transformer fed	
		Return Loss	>12 dB	
11	Patch Antenna-II	Operating frequency:	4.8 to 5.2 GHz	02
		Feeding type:	Inset fed	
		Return Loss	>7 dB	
12	Amplifier	Operating frequency:	4.8 to 5.2 GHz	02
		Gain:	>4 dB	
		Return Loss:	>11 dB	
13	Micro strip transmission line			02

X-BAND: 8.2 – 12.4 GHz

SI No	Description	Specification		Quantity
1	Klystron Supply with AM and FM	Parameter	Details	03
		Output Voltage Range	195-400 V Continuously variable	
		Output Current	<46 mA	
		Output Regulation	Better than 0.5% for ±10 % variation in Mains supply voltage	
		Output Ripple	Less than 5 mV rms (on load)	

		Input Voltage	230 V +10 %, 50 Hz. A.C	
	Repeller Supply	Voltage Regulation	-10V to -300 VDC Continuously variable with respect to Klystron Cathode	
	Heater Supply	6.3 V (Regulated)		
	Modulation: Square Wave	Frequency Range	500 Hz- 1.7 KHz	
		Amplitude & Frequency continuously variable.		
	Modulation: Saw Tooth	Frequency Range	50 Hz – 196 Hz	
		Peak to peak Amplitude & Frequency continuously variable.		
2	Klystron mount with Klystron Tube	Frequency Range	8.2 to 12.4 GHz	04
		Klystron oscillator type	Reflex	
		Power Output	< 0.4W	
		Type	Wave guide	
3	Isolator	Frequency Range	8.2 to 12.4 GHz	05
		VSWR	< 1.2	
		Insertion loss	<3.5 dB	
		Isolation	>20 dB	
		Type	Wave guide	
4	Variable Attenuator	Frequency Range	8.2 to 12.4 GHz	04
		VSWR	<1.15	

		Max. Attenuation	20dB	
		Type	Continuous	
5	Frequency Meter (Direct Reading)	Frequency Range	8.2 to 12.4 GHz	03
		Calibration Accuracy	± 2 %	
		Calibration Increment	10 MHz	
		VSWR	<1.05	
6	Detector Mount, Tunable	Frequency Range	8.2 to 12.4 GHz	04
		Detector	IN 23 or Equivalent	
		Output Connector	BNC (Female)	
7	Slotted Section with Probe carriage	Frequency Range	8.2 to 12.4 GHz	01
		Residual VSWR	1.05	
		Slope	±0.2 dB	
		Type	Waveguide	
8	Tunable Probe for Slotted Section	Frequency Range	8.2 to 12.4 GHz	01
		Detector	IN 23 or equivalent	
		Output Connector	BNC (Female)	
		Type	Tunable	
9	Matched Termination	Frequency Range	8.2 to 12.4 GHz	03

		VSWR	<1.05	
		Avg. Power	2 watt	
		Type	Waveguide; Fixed	
		Flange	UG-39/U	
10	BNC – BNC Cables			07
11	Frequency Meter (Micrometer type)			01
12	Gunn Power Supply, Digital Display suitable for Gunn Oscillator and Pin Modulator.	Variable Voltage Range	0 to 12 Volts	02
		Current	<1 Amp	
		Regulation	0.2 % for ± 10 % variations in the Mains Supply voltage.	
		Ripple	1 mV rms	
		Modulation Frequency	1 KHz ± 10 %	
		Modulation Amplitude	0 – 10 volt peak to peak.	
		Output Connector	BNC (F) for Gunn Oscillator & TNC (F) Pin Modulator.	
13	Gunn Oscillator	Freq Range	8.2 to 12.4 Ghz	02
		Pushing Factor	8 MHz/V	
		Bias Voltage	10 V	
		Nominal Power output	10 mW	

		Temp Coefficient	+0.2 MHz / °C	
		Frequency Adjustment	Micrometer type	
14	Pin Modulator	Freq range	8.2 to 12.4 GHz	02
		Bias voltage	0 to 10 V peak to peak	
		Output Connection	TNC (F)	
15	Multi Hole Directional Coupler 10 dB	Coupling	10 ± 0.6 dB	02
		Directivity	>35	
		VSWR (Main line)	<1.2	
16	Magic Tee	Freq Range	8.2 to 12.4 GHz	02
17	E-Plane Tee	Freq Range	8.2 to 12.4 GHz	02
18	H-Plane Tee	Freq Range	8.2 to 12.4 GHz	02
19	T-Circulator	VSWR	<1.2 dB	01
		Min Insertion loss	0.4 dB	
		Isolation	>20 dB	
20	Fixed Attenuator	Attenuation value	16 dB	01
		VSWR	<1.08	
		Avg. Power	2 W	
		Accuracy	±0.5 dB	
21	(VSWR) METER	Sensitivity	0.2 uV at 200 ohms for full scale deflection	03

		Noise	At least 5 dB below full scale at rated sensitivity and maximum bandwidth input terminated in 100 ohms and 500 ohms for crystal low and high respectively.	
		Calibration	Square law, meter indicates SWR	
		dB Range	70 dB, input attenuator provides 60 dB in 10 dB steps	
		Accuracy	+0.2 dB per 10 dB steps.	
		Scale Selector	Normal Expand and 0.5 dB	
		Meter Scale	SWR 1-4, SWR 3-10, expanded SWR 1-1.3, dB 0-10 expanded dB 0-2.	
		Gain Control	Adjusts the reference level, variable range 0-10 dB approx	
		Recorder Output	Socket provided for recording having 1V for full scale deflection, internal resistance of 1000 ohms or less.	
		Input Connector	BNC (F)	
		Frequency	1000 Hz $\pm 10\%$	
		Power	230 volts A.C $\pm 10\%$, 50 Hz	
22	TNC to TNC cable for			01

	Pin Modulator		
23	Radiation Pattern Turn Table includes 360 degree radiation pattern		1 set
24	Pyramidal Horn Antenna		02
25	Accessories	Cooling fans, Nuts and bolts, Wave guide Stands and cables	Appropriate number

B. Supply, Installation and Commissioning

The transportation, unloading, unpacking, installation and commissioning of the trainer kits will be done by the vendor. One IIT Palakkad engineers will be trained by the vendor for a period of two days for operation, maintenance and service of the trainer kits during installation.

Additional Specifications

The bidder should ensure that the microwave instruments should be covered by warranty of at least 3 years. Appropriate number of spares for components used in the microwave instruments must be supplied by vendor to service the microwave instruments within 3 working days.