

 IIT PALAKKAD	भारतीय प्रौद्योगिकी संस्थान पालक्काड Indian Institute of Technology Palakkad अहलिआ एकीकृत कैम्पस, कोज़िपारा Ahalia Integrated Campus, Kozhipara पालक्काड- 678557 Palakkad – 678 557	दूरभाषसंख्या/ Phone no: 04923 – 226 300/590/586 ईमेल/ Email : purchase@iitpkd.ac.in
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Prof. Job Kurian
Registrar i/c

Date : 28.11.2017

Open Tender No: IITPKD/CIF/SS/077/2017

Due Date: 19.12.2017 @ 3.00 PM

Dear Sir/Madam,

On behalf of the **Indian Institute of Technology, Temporary campus, Palakkad**, Quotations are invited for “ **Vector Network Analyzer, Signal Analyzer and Analog Microwave Signal Generator** ”. The Specifications are given in the Annexure.

Pre-bid meeting – The pre-bid meeting is scheduled to be held on 08.12.2017 at 12 PM at Conference Room, Academic Block, IIT Palakkad.

Technical bid Opening: The Technical bid will be opened on 20.12.2017 at 10 AM at Conference Room, Academic Block, IIT Palakkad.

Instructions to the Bidder

- (i) **Preparation of Bids:** - The tenders should be submitted **under two-bid system (i.e.) Technical bid and Financial bid in separate envelopes**. 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 covers and sealed. Both sealed covers should be put into a bigger cover. **Bids must either be spiral bound / stapled together. No loose sheets will be accepted. All pages must be numbered.**
- (ii) 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 on or before the due date stipulated above.**
- (iii) **Delivery of the tender:** - The tender shall be sent to the below-mentioned address either by post or by courier so as to reach this office before the due date and time specified in the Schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. **The tender box is kept in the office of the Academic Block, IIT Palakkad, Ahalia Integrated Campus, Kozhipara, Palakkad-678 557.**

(iv) Opening of the tender: - The offer/Bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and will be examined by a technical committee which will decide the suitability of the bid as per our specifications and requirements. The bidders will be invited for opening of Technical bids. **The Bidder's representative should carry authorization letter from their company empowering them to participate in the Pre-bid and tender opening meetings.** In respect of opening of financial bid, those bidders who are technically qualified only will be called.

(v) Prices: - The price should be quoted in nett per unit (after breakup) and must include all packing and delivery charges indicated separately for each item. **The price indicated should be CIF/CIP Kochi.** The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. The price should be quoted without custom duty. **The custom duty will be paid at concessional rate against duty exemption certificate.**

(vi) Agency Commission: - Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. **Terms of Delivery:** - The item should be supplied to our Institute as per Purchase order. The installation and commissioning should be completed as specified **by us in the attached schedule.**

(vii) Acceptance & Rejection: IIT Palakkad reserves the full right to accept / reject any tender at **any** stage without assigning any reason.

Yours sincerely,

Registrar, IIT Palakkad

SCHEDULE

Important Conditions:

- 1) The due date for the submission of the tender is **19.12.2017 @ 3.00 PM**
- 2) The offers / bids should be submitted in two-bids systems (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes (separately), transportation, packing & forwarding charges, installation, guarantee, payment terms, pricing terms etc. The Technical bid and financial bid should be put in separate covers **superscribed clearly as "Technical Bid" and "Financial bid"** and sealed. Both the sealed covers should be put in a bigger cover. Open Tender for **"Vector Network Analyzer, Signal Analyzer and Analog Microwave Signal Generator"** should be written on the left side of the Outer bigger cover and sealed.
- 3) **EMD: -EMD should be at 2% (two percent) of the tender value quoted by the bidder.** The EMD should be enclosed with the financial bid which will not be opened for Technical evaluation. Enclosing the EMD in the Technical bid will automatically **DISQUALIFY** the tenderer. EMD should be in the form of DD in favour of **"Indian Institute of Technology Palakkad" and payable at Palakkad"**. The tender without EMD would be considered as UNSOLICITED and will be REJECTED. Photo/FAX copies of the Demand Draft/Banker's pay orders will not be accepted. No interest will be paid for the EMD and the EMD will be refunded to the successful bidder on receipt of Performance Security.
- 4) **Performance Security:-** The successful bidder will be asked to submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD or FD Receipt from the commercial bank or Bank Guarantee from any nationalized bank of India. **Only after submission of Performance Security, Purchase Order/Work Order will be released / L.C will be opened.**
- 5) **Performance Security in the form of Bank Guarantee:-** In case the successful bidder is a foreign company and wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.
- 6) The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

If an Indian agent is involved, the following documents must be enclosed:

- Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
 - Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
- 7) The offer/bids should be sent only for **a system or equipment** that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.
 - 8) Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.
 - 9) Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.
- 10) Validity:** Validity of Quotation not less than 90 days from the due date of tender.
- 11) Delivery Schedule:-** The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
- 12) Risk Purchase Clause:-** In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.
- 13) Payment:-** No Advance payment will be made for Indigenous purchase. 100% Payment after supply and successful installation and commissioning and certification by the end user. In case of import supplies the payment will be made only through **100% Letter of Credit i.e. (50% payment will be released against shipping documents and 50% after successful installation and meeting acceptance criteria wherever the installation is being done).** **Advance payment may be considered on submission of Bank Guarantee equal to the amount of advance payment.**
- 14) On-site Installation:** - The equipment or machinery has to be installed and commissioned by the successful bidder within 15 to 20 days from the date of receipt of the **item at site of IIT Palakkad.**

- 15) Warranty/Guarantee:** - The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately. (For more details please refer our Technical Specifications).
- 16) Late offer:** - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.
- 17) Loading and unloading charges will be borne by the bidder/Supplier.**
- 18) Acceptance and Rejection:** - I.I.T. Palakkad has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.
- 19) Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**
- 20) Disputes and Jurisdiction:** - Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Palakkad in Kerala.
- 21) All Amendments, time extension, clarifications etc., will be uploaded on the institute website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.**

Acknowledgement:- It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE**

Vector Network Analyzer, Signal Analyzer and Analog Microwave Signal Generator for Centralized Instrumentation Facility

Part A	Vector Network Analyzer
Part B	Signal Analyzer
Part C	Analog Microwave Signal Generator

The bidder may quote for one or more parts (Part A, Part B and Part C) mentioned on page 6. Technical and Financial bid for each part must be enclosed in separate envelopes. EMD for each part should be enclosed in the respective financial bid. All the financial and technical bids must be put in one big envelope and delivered to the purchase section. The evaluation will be done for each part separately and purchase order will be given to the technically qualified bidder, who quotes the lowest price for the respective part. For each of the parts the technical evaluation will be done based on the mandatory requirements for that part mentioned in the specifications.

IMPORTANT: Enclosing EMD or mentioning value of EMD in technical bid will lead to immediate disqualification.

Vendor should quote for following number of training hours:

Part A 15 hours

Part B 12 hours

Part C 12 hours

Quantity - 1

Technical Specifications of Vector Network Analyzer

S. No	Parameter	Specification
System Related Specifications		
1	Frequency range of operation	10 MHz (or less) to 40 GHz (or more)
2	Number of ports	4 with bias tees on all ports
3	Port connector type	2.92 mm or 2.4 mm (male or female), 50 ohm with direct generator receiver access on all ports
4	Number of independent sources	2
5	System dynamic range (IF bandwidth=10Hz)	>100 dB for 250 MHz to 40 GHz
6	Number of measurement points	1 to ≥20,000
7	System IF bandwidth range	Mandatory 1 Hz to 1 MHz
8	Directivity	>33 dB for 250 MHz to 40 GHz
9	Source match	>30 dB for 250 MHz to 40 GHz
10	Load match	>33 dB for 250 MHz to 40 GHz
11	Reflection tracking	<0.2 dB for 250 MHz to 40 GHz
12	Transmission tracking	<0.2 dB for 250 MHz to 40 GHz
13	Supply voltage	230 V +/-10V, and 50 Hz

Test Port Output		
14	Frequency stability	<1 ppm 0°C to 40°C (or higher temperature)
15	Frequency resolution	1 Hz or better
16	Output power range	-85 to 4 dBm (or more) for 100 MHz to 40 GHz
17	Power resolution	<0.02 dB
Test Port Input		
18	Maximum test port input level	>10 dBm (Receiver attenuator must be available on all ports for protecting the mixers from going in to compression)
19	Damage level	>25 dBm and DC >30V
20	Test port noise floor	<-100 dBm for 250 MHz to 40 GHz
21	Trace Noise magnitude with 1 kHz IFBW	<0.05 dBrms for 250 MHz to 40 GHz
22	Trace noise phase with 1 kHz IFBW	<1.0 deg rms for 250 MHz to 40 GHz
Additional Features		
23	Display	Colour, LCD or LED
24	Calibration kit	Manual 2.4 or 2.9 mm calibration kit with standards for both male and female connectors as well as torque wrenches for 2.4 or 2.92 mm connector
25	Spares	<ul style="list-style-type: none"> • VNA connector to 2.92/3.5 mm male connectors (2 nos.) • VNA connector to 2.92/3.5 mm female connectors (2 nos.) • VNA connector to SMA (2 nos.)
26	Measurement Capabilities	<p>1) Measurement of all S parameters both phase and magnitude, Y/Z parameters, Wave Quantities, Impedance, Ratio's should be provided</p> <p>2) Measurement capability (hardware and software) for mixer measurements like conversion loss, matching & isolation measurements. Power meter for source Power and receiver Power calibration has to be quoted.</p>
27	Calibration	Through Open Short Match, Power Calibration with power sensor, Unknown Through Open Short Match, Through Reflect Line, Through Reflect Match and calibration techniques for 4 port measurements should be supported with VNA
28	Sweep Type	Linear and Log frequency, CW, time, Power, Segmented sweep
29	Display Formats	dB mag, Phase, Smith, Polar, Unwrapped phase, Inverted smith, real , Imaginary, Linear Magnitude
30	Test port cables	Single Set of test port cables to be supplied for 4 ports. Test port cables should be for 2.4 or 2.9 mm with matching connectors for VNA. Insertion loss should be less than 3.5 dB at 40GHz. Returns loss of each cable >15 dB
31	Material Measurement Upgradable Capability	22) Vendor must quote solid material measurement Software and Hardware capability for measuring intrinsic electromagnetic properties of dielectric and

		<p>magnetic materials in a variety of formats: ϵ_r', ϵ_r'', μ_r', μ_r''. Results are displayed as a function of frequency.</p> <p>23) Supported frequency range 8-16 GHz</p> <p>24) Material holder and calibration kit</p> <p>The software should be able to control the VNA and should guide the steps of cal and measurement based on the type of material holder and plot the result.</p> <p>The software should be able to run within the analyzer.</p> <p>The software should support algorithms like NRW, NIST, Polynomial fit to convert S parameter to material properties.</p>
32	Source, Receiver Attenuator & Bias Tees	<p>(iv) Internal Source attenuator of at least 60 dB & Receiver Attenuator of at least 35 dB</p> <p>(v) Attenuator steps of at least 5 dB</p>
33	Pulsed S Parameters	Must be upgradeable to pulsed S parameters in future
34	Acceptance Criteria	<p>Inspect on arrival of components and all accessories ordered.</p> <p>Demonstration of functionality</p> <p>i) K-band component i.e., band pass filter and low noise amplifier S-parameters measurement demonstration with accuracy of 2% in comparison to the corresponding datasheet values.</p> <p>ii) K-band mixer conversion losses and S-parameters.</p> <p>iii) Software and Hardware setup for measuring intrinsic electromagnetic properties of dielectric and magnetic materials in a variety of formats: ϵ_r', ϵ_r'', μ_r', μ_r'' for frequency 10-16 GHz.</p> <p>iv) Vendor should arrange for the components for demonstration of functionalities demonstration (i), (ii) and samples for functionalities demonstration (iii) as well as training.</p>
35	Optional	<p>i) System IF bandwidth range - 1 Hz to 10 MHz (or more)</p> <p>ii) Display - Scope for connecting to external monitor</p> <p>iii) Scope for upgradability to operation to V-band in future</p>

Quantity: 1

Detailed technical specifications for Signal Analyzer

S. No.	Feature	Requirement
1	Maximum supported frequency	≥ 40 GHz
2	Minimum supported frequency (DC coupled)	≤ 10 Hz
3	Aging rate	≤ 1 ppm
4	RF input connector	2.4 mm or 2.92 mm (male or female)
5	Frequency resolution	≤ 2 Hz
6	Temperature Stability	≤ 2 ppm for 0 to 50 °C
7	Phase noise (for offset ≥ 10 KHz)	≤ -110 dBc/Hz
8	Resolution bandwidth	1 Hz to 5 MHz (or more)
9	Video bandwidth	1 Hz to 5 MHz (or more)
10	Analysis bandwidth	≥ 40 MHz for whole bandwidth and Upgradeable 160 MHz in future
11	Triggering	External, RF burst and timer
12	Inbuilt input RF attenuator	0 to 70 dB
13	Attenuator step size	1 or 2 dB
14	Maximum input power	23 dBm or more
15	Preamplifier gain	≥ 20 dB
16	Amplitude accuracy	≤ 0.85 dB
17	Dynamic range	≥ 110 dB
18	Voltage standing wave ratio (VSWR)	≤ 2 dB
19	Spur free dynamic range (SFDR)	Better than 60 dBc
20	Display average noise level (DANL)	≤ -150 dBm for (1 MHz to 40 GHz)
21	Compression point, 1dB	≥ 3 dBm
22	Probe power	$\geq (+/-)12.5$ V at 150 mA
23	External trigger connector	BNC female
24	Trace detection	≥ 4 traces simultaneously with trace statistics

25	Pulse measurements	Timing, amplitude, frequency, phase and power statistics Should be able to plot spectrum , pulse envelope, Phase within the pulse, FM within the pulse and list out the pulse paramaters like pulse width, duty cycle, Pulse to pulse phase, Pulse to pulse frequency, peak a plitude, etc
26	Supported modulation types	FSK, MSK, PSK, QAM and OQPSK Should be able to capture, demodulate and display constellation, modulation error parameters, spectrum, EVM time, EVM spectrum etc.
27	IQ samples record length	>=4 MSamples
28	Interfaces	USB, Ethernet
29	Optional software or hardware	Hardware or software support for Pulse analysis Hardware or software support for Phase noise analysis
30	Measurement features	Phase noise Noise figure measurement and plotting Should be capable of showing the spectrum and time domain envelope of RADAR signals. Should be able to measure and list rise time, fall time, PRI, PRF, duty cycle, peak power, average power, pulse to pulse phase, pulse to pulse frequency, detect and list the modulation within the pulse like FM.
31	Supply voltage	230 V +/-10V, and 50 Hz
32	Acceptance Criteria	Inspect on arrival of components and all accessories ordered. Demonstration of functionality i) Ku-band VCO spectrum analysis with accuracy of 2% in comparison to corresponding datasheet values. ii) Noise figure measurement of low noise amplifier at K band iii) Vendor should arrange for the VCO iv) phase noise measurement demonstration

Microwave Analog Signal Generator

Quantity – 1

Detailed technical specifications

Sl no	Parameter	Specifications
Frequency Parameters		
1	Frequency Range	100 kHz (or less) to 40 GHz (or more)
2	Frequency Resolution	≤0.001 Hz
3	Temperature Drift	< 2 x 10 ⁻⁶ from 20 to 30 °C
4	Aging	< 1 x 10 ⁻⁶ /year
Amplitude Specifications and Signal Purity		
5	Power Level @ RF	Mandatory -110 dBm (or less) to + 8 dBm (or more)
6	Power Resolution	0.01dB or better
7	Amplitude Accuracy	Mandatory ≤ 2 dB for -110 dBm (or less) to + 8 dBm (or more)
8	Phase Noise, 1 GHz Carrier @ 20KHz offset	≤ -120 dBc/Hz (From 20 to 30 °C, measured at +10 dBm)
9	Phase Noise, 40 GHz Carrier @ 20KHz offset	≤ -90 dBc/Hz (From 20 to 30 °C, measured at +10 dBm)
10	Harmonics	< -30 dBc @ 1GHz (+15 to +35 °C, at +10 dBm)
11	Harmonics	< -30 dBc @ 20 GHz (+15 to +35 °C, at +10 dBm)
12	Output Connector Type	2.4 or 2.92 mm male or female, 50 Ω
13	VSWR	≤ 1.9
14	Modulation Source	Internal & External
15	Standard internal analog modulation source	Sine, square, triangle
	Modulation for both internal and external	AM, FM, PM, Pulse
Frequency modulation		
16	Modulation source	External and internal
Phase modulation		
17	Modulation source	External and internal
Amplitude modulation		
18	Modulation source	External and internal
Narrow pulse modulation		
19	Rise/fall times (Tr, Tf)	< 15 ns
	Minimum pulse width	≈ 20 ns
Internal pulse generator		
20	Pulse period	40 ns (or less) to 42 s (or more)
21	Resolution	10 ns

Pulse train generator (Optional)		
21	Pulse width and pulse spacing	20 ns (or less) to 5 ms (or more)
Various Details		
22	Interface	USB, LAN
23	Operating Temperature	+5°C (or less) to +40°C (or more)
24	Warranty	3 years
25	Power requirements	230 ± 10 VAC, 50 Hz
26	Acceptance Criteria	<p>Inspect on arrival of components and all accessories ordered.</p> <p>Demonstration of functionality</p> <p>i) Generate pulse of various widths and demonstrate the corresponding spectrum characteristics</p> <p>ii) Generate signal and feed to LNA at K-band and check the output power</p> <p>iii) Transmit signal and analyse the received signal</p> <p>iv) Vendor should arrange for the LNA.</p>
27	Optional	i) Pulse train generator

Who can participate in the bid?

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

1. The bidder should be either an Original Equipment Manufacturer (OEM) of microwave test and measurement equipment (vector network analyser, signal analyser and microwave signal generator etc) or should be an authorized representative (provide documentary proof) of an OEM.
2. The bidder should be a company registered under the Companies Act, 1956/2013 OR a Limited Liability Partnership /a registered partnership firm OR a sole-proprietorship entity. Appropriate Registration incorporation certificate must be submitted.
3. The 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.
4. The bidder must also have a service center in Karnataka/Tamil Nadu/ Telangana/Andhra Pradesh or Kerala. Certificate of registration for the centers to be provided. Details about scope of service activities provided by the service centres must be provided. The contact details of the service engineers must be provided.
5. The bidder must be in existence in the business of microwave test and measurement equipment (vector network analyser, signal analyser and microwave signal generator etc) or allied fields for a minimum period of 5 previous financial years (before or since 01 April 2012). Documentary evidences of experience must be provided.
6. The bidder should have implemented orders of microwave test and measurement equipment (vector network analyser/signal analyser/microwave signal generator etc) worth exceeding INR 1.5 crore during previous three financial years (01 April 2014 – 31 March 2017). Copies of the most recent purchase orders and certificates of successful implementation must be included. Copies of financial statements or evidence of turnover must be furnished.
7. The bidder should have documentary evidence of having supplied at least 2 No. of microwave test and measurement equipment (vector network analyser or signal analyser or microwave signal generator etc) to a Centrally Funded Technical Institution (e.g., IIT, NIT, IISc, IISER, etc.) in the last three and half years (01 April 2014 – 31Oct 2017). The bidder must provide a certificate of satisfactory performance of the supplied equipment from the institute to which they have recently supplied. Contact details of the faculty-in-charge of the installed setup must also be provided.
8. The bidder must provide detailed specification of each equipment/item. Model numbers, data sheets and brochures must be included for each quoted equipment/accessories/item. Specifications corresponding to quoted model number must be available publicly via OEM's website for scrutiny. If not, bid can be disqualified on technical grounds.
- 9. Compliance sheet for the technical specification and OEM Brochure have to be attached along with the Technical bid. Vendor has to fill the compliance sheet and mention page number or reference number in OEM brochure. Unfilled / partially filled sheets lead to disqualification.**
- 10. Service and warranty for a minimum period of three years for the equipment must be provided. AMC for additional three years must be quoted separately.**