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NOTICE INVITING TENDER (NIT)
FOR SUPPLY & INSTALLATION OF EQUIPMENTS AND COMPONENTS FOR RF & MICROWAVE LAB

FOR

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT
NIT MIZORAM, AIZAWL

RF & MICROWAVE LAB

Last Date for Submission of Tender : 30/12/2014 upto 2:00 PM
Opening of the Tender : 30/12/2014 at 3:30 PM

राष्ट्रीय प्रौद्योगिकी संस्थान, मिजोरम
NATIONAL INSTITUTE OF TECHNOLOGY, MIZORAM
(An Institute of National Importance under Ministry of HRD, Govt. of India)
CHALTLANG, AIZAWL, MIZORAM – 796012

Phone/Fax: 0389-2341699 / 0389-2341236 / 0389-2341774 Email: nit_mizoram@nitmz.ac.in

No.NIT-MZ/D-98/2014/3928(A)
Date: 01 DEC 2014

NOTICE INVITING TENDER (NIT)

National Institute of Technology-Mizoram is one of the ten new NITs established by Ministry of Human Recourse development, Government of India, New Delhi in the year 2010 at Aizawl, Mizoram to impart education, training and research in Science, Technology and Management leading to award of B.Tech., M. Tech., MBA and Ph. D degrees. This institute if fully financed and governed by Ministry of Human Recourse Development, Government of India.

Sealed Tenders are invited from eligible Manufacturers/Developers or their Authorized Dealers for supply & installation of equipments and components as per details at **ANNEXURE-IV, in Two Bids** to reach the undersigned on or before .....30/12/2014 upto 2:00 pm Date/ Time for opening of Tech. Bids: 30/12/2014 at 3:30 pm After evaluation of Technical Bids, Financial Bids of the successful bidders will be opened on later date which will be notified in the institute website.

Venue of Bid Opening : NIT, MIZORAM, AIZAWL

Sl No.	Reference No.	Name of Item	Quantity	EMD (Rs.) in the form of DD drawn at SBI only (Refundable)	Tender Document Fee (Rs.) in the form of DD drawn at SBI only. (Non-Refundable)
01.	NIT-MZ/D-98/2014/ 3928 Date: 1/12/14	**Supply & Installation of Equipments and components for RF & Microwave Lab on turnkey basis to be installed at NIT, Mizoram, Aizawl**	**One Package**	@2%	2,000.00

Note: Demand Draft must be in favor of **"Director, NIT Mizoram"** payable at Aizawl.

1). Last date & Time for Submission: **30/12/2014 upto 2:00 PM**
(2) Date/Time for Opening of Tech. Bids: **30/12/2014 at 3:30 PM**

After evaluation of technical bids, financial bids of the successful bidders will be opened on a later date which will be notified in the Institute website. Venue of Bid Opening at NIT, MIZORAM, AIZAWL

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BID INSTRUCTION

01. Quotations will have to be submitted in TWO Bids i.e. Technical Bid and Financial Bids and must be kept separately in two sealed envelopes specifically mentioning "Technical Bid" and "Financial Bid" on the cover of the envelopes. Further these two sealed Bids must be kept inside one big sealed envelope before submitting it.

The address of the firm submitting the quotation and the Officer to whom the quotation is addressed must appear distinctly on sealed covers. Further, on sealed cover, the following are to be written:

QUOTATION FOR SUPPLY & INSTALLATION OF EQUIPMENTS & COMPONENTS OF RF & MICROWAVE LAB OF ELECTRONICS & COMMUNICATION DEPARTMENT, NIT MIZORAM, AIZAWL, NIQ REF NO. NIT-MZ/D-98/2014/3928**, DATE...** 01/12/2014

02 Submission of Compliance Certificate: Duly filled and signed Compliance Certificates (as per formats at **Annexure I(A & B)** are must with the Technical bid.

03. Bid not transferable: The bid documents are not transferable and the seal and signature of the authorized official of the firm's must appear on all the papers and envelopes submitted.

QUALIFICATION REQUIREMENTS

1. The Bidder should be an Original Equipment Manufacturer (OEM) Or a firm of reputation having sufficient expertise and experience in the subject tender with sound warranty / service support capability and authorization from Manufacturer/Distributor.

2. The Bidder has to quote for all the items in the RF & Microwave Lab of Electronics & Communication Department, Bidders who do not Quote for all the items are subject to be disqualified.

3. The bidder should have Experience of executing at least 1(one) Single Work Order of similar items successfully within last 3(Three) Financial Years. The attested Copy of the Purchase Order Copy should be attached along with the Technical Bid.

4. That, the Bidder will assume total responsibility in supply, installation and for the fault-free operation and maintenance during warranty period.

5. Performance Statement for the last 3 years have to be attached along with the technical bid Mentioning the customer name & address, Order No. & Date and execution time.

6. Bidders who do not meet the criteria given above are subject to be disqualified, if they have made untrue or false representation in the forms, statements and attachments submitted in proof of the qualification requirements or have a record of poor performance, not properly completing the contract, inordinate delays in completion or financial failure, etc.

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NIT TERMS & CONDITIONS:

01. Rates: Rates quoted in the **Price Bid** should be **on DOOR DELIVERY NIT Mizoram basis,** as per details below:

Sl. No.	Particulars	Rate
I	Basic Price (per unit) including Packing, Forwarding, Freight, Insurance, Installation & demonstration charges inclusive	
II	Taxes (pl. give break up)	
III	Grand Total for the item on door delivery at NIT Mizoram	

Note: Vague terms like "packing, forwarding, transportation etc. extra" without mentioning the specific amount will not be accepted. Such offers shall be treated as incomplete and rejected. Bidders shall indicate their rates in clear / visible figures as well as in words and shall not alter / overwrite / make cutting in the quotation. In case of mismatch, the rates written in words will prevail.

02. **Validity of Quotation:** Quoted rates must be valid for **90 days** from the date of quotation.

03. **Warranty:** The quoted equipment and components must be warranted for a minimum of 1(One) Year or period specified against the item.

04. **Literature a must**: All the quotations for all the Major Items must be supported by the printed technical leaflet/literature and the specifications mentioned in the quotation must be reflected/ supported by such printed technical leaflet/literature. The model and specifications quoted should **invariably be highlighted** in the leaflet/literature for easy reference.

05. **After Sales Service:** Vendors should clearly state the available nearest after sales service facilities in the region, without which their offers will be rejected.

06. **Dealership Certificate:** Dealers or Agents quoting on behalf of Manufacturer/Distributor must enclose valid dealership certificate.

07. **Manufacturer's Certificate:** Manufacturer's certificate to prove that the products are genuine.

08. **Earnest Money:**
Refundable earnest money deposit (EMD) @2% of the Quoted Value through demand draft drawn in favour of "The Director ,National Institute of Technology Mizoram", payable at Aizawl, will have to accompany the technical Bid. The EMD of unsuccessful bidders shall be returned after award of contract. EMD of the successful bidder will be released on submission of the Performance Bank Guarantee. Offers received without Earnest Money or valid Certificate shall be summarily rejected.

09. **Performance Bank Guarantee (PBG):** In case of items with order value of Rupees five lakhs (INR 5,00,000/-) and above, the successful bidder shall furnish an unconditional PBG (as per format at **Annexure II**) for 5% of the Purchase Order value from a scheduled Bank of India, after receiving the purchase order**.** Where the PBG is obtained by a foreign bank, it shall be got confirmed by a Schedule Indian bank and shall be governed by Indian Laws and be subject to the jurisdiction of courts at Aizawl. The PBG will be kept till the Warranty Period and The PBG shall guarantee that,

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(a) The Vendor guarantees satisfactory operation of the Equipment & components against poor workmanship, bad quality of materials used, faulty designs and poor performance.
(b) The Vendor shall, at his own cost, rectify the defects/replace the items supplied, for defects identified during the period of guarantee.
(c) This guarantee shall be operative from the date of installation till 120 days after the warranty period.

10. **Delivery:**
    a) Time Limit: Maximum within 12 Weeks from the date of issue of this purchase order.
    b) Safe Delivery: All aspects of safe delivery shall be the exclusive responsibility of the vendor. At the destination site, the package will be opened only in the presence of NIT user/representative and vendor's representative. The intact condition of the package and the seal/indicators for not being tempered with, shall form the basis for certifying the receipt in good condition.
    c) Insurance: The supplier is to establish 'All Risk Transit Insurance' coverage till door delivery at NIT Mizoram.
    d) Part Delivery: Acceptance of part delivery shall be a prerogative of the institute.
    e) Penalty for delay in delivery: The date of delivery should be strictly adhered to otherwise the Director, NIT Mizoram reserves the right not to accept delivery in part or full.

11. **Genuine Pricing**: Vendor is to ensure that quoted price for the particular item is not more than the price quoted to any other customer in India, particularly to IITs/NITs and other Government Organization.

12. **Conditional tenders not acceptable:** All the terms and conditions mentioned herein must be strictly adhered to by all the vendors. Conditional tenders shall not be accepted on any ground and shall be rejected straightway. Conditions mentioned in the tender bids submitted by vendors will not be binding on NIT Mizoram.

13. **Road Permit:** NIT, Mizoram will provide Road Permit to the Vendors of outside Mizoram.

14. **VAT deduction at source:** In case of supply within Mizoram, VAT deduction at source, as per Order/ notification of the Govt. of Mizoram will be applicable.

15. **Late and delayed tender**: Late and delayed tender will not be considered. In case any unscheduled holiday occurs on the prescribed closing/opening date the next working day shall be the prescribed date of closing/opening.

16. **Payment**:
    100% payment within 30(thirty) days from date of delivery, Satisfactory installation, acceptance and Training

17. **Payment for Imported Goods:** By an irrevocable letter of Credit at CIF/CIP Kolkata value negotiable through any overseas branch of State Bank of India/any Schedule Bank of India.

Note: Please note LoC will not be opened unless and until Letter of Acknowledgement in original is received at NIT, Aizawl, Mizoram, directly from the principal (Even in case of firms having subsidiary office in India).

18. **ADDITIONAL TERM FOR IMPORTED GOODS**
    Following term besides the fore mentioned terms will be applicable in case of foreign purchases:

    Rates: Prices quoted must be for destination including freight and insurance charges inclusive of free delivery up to the door of department/centre NIT, Mizoram premises, as per details below:

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Sl. No.	Particulars	Rate
I	Basic Price (per unit) including Packing, Forwarding, Freight, Insurance, Installation & demonstration charges inclusive	
II	Custom Duty (Approximate)	
III	Grand Total for the item on door delivery at NIT Mizoram	

19. **Maintenance & Service Contract**: An agreement is to be made between the Institute & the Manufacturer/Distributor/Dealer for providing Maintenance & service after expiry of the Warranty Period (preferably from the Manufacturer) within 30 days from the day of complaint. Maintenance and service charges will be paid as per the terms of the agreement for the same.

20. **Enquiry during the course of evaluation not allowed**: No enquiry from the bidder(s) shall be entertained during the course of evaluation of the tender till final decision is conveyed to the successful bidder(s). However, the Purchase Committee or its authorized representative may make enquiries/seek clarification from the bidders. In such a case, the bidder must extend full co-operation. The bidders may also be asked to arrange demonstration of the offered items, in a short period of notice.

21. The acceptance of the quotation will rest solely with the Director, NIT Mizoram, who in the interest of the Institute is not bound to accept the lowest quotation and reserves the right to himself to reject or partially accept any or all the quotations received without assigning any reasons.

22. **Force Majeure**:
    If the performance of the obligation of either party is rendered commercially impossible by any of the events hereafter mentioned that party shall be under no obligation to perform the agreement under order after giving notice of 15 days from the date of such an event in writing to the other party, and the events referred to are as follows:
    i. Any law, statute or ordinance, order action or regulations of the Government of India,
    ii. Any kind of natural disaster, and
    iii. Strikes, acts of the Public enemy, war, insurrections, riots, lockouts, sabotage.

23. **Applicable Law**:
    (a) The contract shall be governed by the laws and procedures established by Govt. of India and subject to exclusive jurisdiction of Competent Court and Forum in Aizawl / India only.
    (b) Any dispute arising out of this purchase shall be referred to the Director NIT Mizoram, and if either of the parties hereto is dissatisfied with the decision, the dispute shall be referred to the decision of an Arbitrator, who should be acceptable to both the parties, to be appointed by the Director of the Institute. The decision of such Arbitrator shall be final and binding on both the parties.

24. **Training:**
    The vendor will provide free training at NIT Mizoram after Successful installation of the Machines/equipments.

Encl.: **ANNEXURE-I, ANNEXURE-II, ANNEXURE-III & ANNEXURE-IV**

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DEPUTY REGISTRAR
NATIONAL INSTITUTE OF TECHNOLOGY, MIZORAM

Deputy Registrar (Admn.)
National Institute of Technology
Mizoram
राष्ट्रीय प्रौद्योगिकी संस्थान
मिजोरम

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Annexure –I

A. COMPLIANCE CERTIFICATE FOR NIT TERMS
(To be enclosed in the Technical bid)

Sl. No.	NIT Terms and Conditions	Yes/No	Page No.
01	**Rate** quoted as per instruction		
02	**AMC rate** after warranty provided		
03	**Validity** of quoted rate for 90 days agreed		
04	**EMD** submitted (appropriate certificate enclosed)		
05	**PBG** term agreed		
06	**Payment** term agreed		
07	**Delivery terms** agreed		
08	**Warranty period** agreed		
09	**Literature:** Printed Literature provided		
10	**Dealership** / distributorship certificate (in case of dealers/agents) provided		
11	**Sales Service**: address of after Sales Service centre in India (for imported goods)/ in the region provided		
12	**Manufacturer** certificate provided		
13	**ISO / ISI** certification provided		
14	**Applicable law** terms agreed		
15	**Attested copies of the Purchase Order of similar items from other NITs/IITs or reputed Institute should be provided**		

Signature with Seal:

Vendor: M/s.....

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B. COMPLIANCE CERTIFICATE FOR SPECIFICATIONS
(One for each item must to be enclosed in the Technical bid)

Item Sl. No.			
Specifications as per Annexure-IV		Quoted Item Specs.*	Complied (Yes/No)
Parameter	Specification		

Signature with Seal:.....

Vendor: M/s.....

*** Vendor must quote the parameter specification of the quoted product in this column and not just copy the specification from the tender call document. Failure to do so will lead to rejection of the tender.**

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Annexure -II

PERFORMANCE BANK GUARANTEE

To

The Director
National Institute of Technology Mizoram

WHEREAS ..... (Name of Supplier) hereinafter called "the Supplier" has undertaken, in pursuance of Contract No..... dated,..... 20... to supply..... ..... (Description of Goods and Services) hereinafter called "the order".

AND WHEREAS it has been stipulated by you in the said order that the Supplier shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with the Supplier's performance obligations in accordance with the order.

AND WHEREAS we have agreed to give the Supplier a Guarantee:
THEREFORE WE hereby affirm that we are Guarantors and responsible to you, on behalf of the Supplier, up to a total of .... (Amount of the Guarantee in Words and Figures) and we undertake to pay you, upon your first written demand declaring the Supplier to be in default under the order and without cavil or argument, any sum or sums within the limit of ..... (Amount of Guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the .....day of.....20.....

Signature and Seal of Guarantors
.....
.....
.....
Date.....20....
Address:.....
.....
.....

All correspondence with reference to this guarantee shall be made at the following address:

National Institute of Technology Mizoram, Chaltlang, Aizawl, Mizoram, India-796012

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Annexure -III

MANUFACTURERS'/ DISTRIBUTOR'S AUTHORIZATION FORM

No. Dated _____

The Director
National Institute of Technology
Aizawl-796012, Mizoram

Dear Sir:
We, ... who are established and reputable Manufacturers/distributors of.....having factories/office at ..... (address of factory/office) do hereby certify that..... ..... (Name of the Authorised Dealer) is our authorized dealer to quote against your tender enquiry no .....,**Last Date of Submission is: .....**

Yours faithfully,

(Name)
(Name of Manufacturer/Distributor)

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Annexure -IV

TECHNICAL SPECIFICATION FOR EQUIPMENTS AND COMPONENTS FOR RF & MICROWAVE LAB

Sl No.	Equipments	Specifications	Qty
1.	**Spectrum Analyzer** **(9KHz-26.5 GHz)**	**The Instrument should have following Features:** a) Large High Resolution Display with output connector for external Monitor. b) Should have Spectrum Analysis with W CDMA etc. demodulation applications. c) One Button Measurement for Adjacent Channel Power, Occupied Bandwidth, Harmonics Distortion, CCDF, TOI, Burst Power, Spurious Emission, Spectrum Emission Mask, Peaks Table. d) Should have optional MATLAB Driver support. e) Optional Vector Signal Analysis Software should run in this Instrument & different PC. f) Optional Time gated Spectrum Analysis should be available. g) Capability to run Vector Signal Analysis for analyzing different digitally modulated Signals. h) Capability to Perform Signal Analysis remotely through LAN. **Frequency Range** : 9 KHz to 26.5 GHz. **Frequency reference aging** : $\pm 1*10^{-6}$ per year. **Sweep Time** : Span = 0 Hz 1 µs to 6000 s, Span ≥ 10 Hz 1 ms to 4000 s **Resolution Bandwidth** : 1 Hz to 3 MHz (10 % steps), 4, 5, 6, 8MHz **Displayed Average Noise Level**:1.5 to 6 GHz: –143 dBm (Preamp off) (Not Typical Data) –158 dBm (Preamp On) **Maximum Safe Input Level** : + 30 dBm **Analysis bandwidth** : 10 MHz. **Measurement Speed** : 11 mSec Multi format Modulation Analysis (Mandatory Optional) : **Vector Modulation Analysis software (Should have 1+15 user License) can be** Measure more than 70 signal standards and modulation types Like. • **Cellular communications:** LTE, W-CDMA HSPA+, GSM/ EDGE Evolution, cdma2000R, TD-SCDMA • **Wireless connectivity:** 802.11a/b/g, 802.11n, 802.16,OFDMA, WiMAX™, BluetoothR, Zigbee, UWB, RFID • **Aerospace, defense and satellite applications:** FSK, BPSK, QPSK, QAM, StarQAM, APSK, VSB • Also supports MIMO and multichannel test • This Software can be run on Instrument as well as Computer. • This Software can be interfaced with MATLAB, SystemVueetc Software • Should have greater clarity with 20:20 trace/marker capabilities • Analyze analog and digital baseband; IF, RF and microwave; and narrowband to ultra-wideband, SISO, MIMO **Interface** : GPIB, USB, LAN & LXI Class C compliant **Accessories** : Standard Mouse & Optional Keyboard. **Operating System**: Windows XP or Windows 7 **Storage** : Removable solid state drive 80 GB	01 No.

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2.	**Spectrum Analyzer** **10Hz-44 GHz**	**Frequency** :10 Hz to 44 GHz **Frequency Resolution** :2 Hz **Counter Frequency Resolution**:0.001 Hz **Aging Rate** :± 1 x 10^6 / year **Frequency Span (FFT and Swept mode):**zero span, 10Hz to maximum frequency of instrument **Sweep Time** Span = 0 Hz :1us to 6000s Span >= 10 Hz :1ms to 4000s **Triggering Options**: Free run, line, video, external 1, external 2, RF Burst, Periodic timer. **Sweep Points (full range)** :1 to 40001 **Resolution Bandwidth** :1 Hz to 3 MHz (10% steps), 4, 5,6,8 MHz **Analysis Bandwidth** : 25 MHz **Bandwidth Accuracy (RBW)** :≤ ±2% minimum for all range **Video Bandwidth** :1 Hz to 3 MHz (10% steps), 4,5, 6,8 MHz and wide open **Maximum safe input level range**: +30 dBm **I/P VSWR** :<1.2:1 (Nominal) **DANL (Noise Floor)**:-151 dBm (1 MHz to 2.1 GHz) (No Preamp condition) -149 dBm (1-10 MHz, 2.1 – 3.6GHz) - 144 (3.6 to 8.4 GHz) - 147 dBm (8.3 to 13.6 GHz) **One - button power measurements**: Channel Power, Occupiebandwidth, Power Statistics CCDF, Spurious Emission, Spectrum Emission Mask **Phase Noise Measurement**: Measurement modes–Spectrum Monitor, IQ Waveform, Log Plot, Spot frequency **Vector Signal Analysis demodulators**: AM/FM/PM/ FSK-2,4,8,16 level, MSK, EDGE, **Software should run on this platform**: QAM – 16, 32,64,128,256,512,1024 APSK, VSB -8 and 16 For demodulation (Mandatory Option) **Vector Signal Analysis Display Formats** : Polar diagrams – constellation and vector, I-Q versus time– IorQ only, Eye diagram Trellis diagram, EVM, Errorstable,Symbol Table. Upto 6 displays Simultaneously **Multiformat Modulation Analysis (Optional)** : **Vector Modulation Analysis can be** Measure more than 75 signalstandards and modulation types Like -- • **Cellular communications:** LTE, W-CDMA HSPA+, GSM/ EDGE Evolution, cdma2000R, TD-SCDMA • **Wireless connectivity:** 802.11a/b/g, 802.11n, 802.16, OFDMA,WiMAX™, BluetoothR, Zigbee, UWB, RFID • **Aerospace, defense and satellite applications:** FSK, BPSK, QPSK, QAM, StarQAM, APSK, VSB • Also supports MIMO and multichannel test • This Software can be run on Instrument as well as Server/Computer. • This Software can be interfaced with MATLAB, SystemVueetc Softwa • Should have greater clarity with 20:20 trace/marker capabilities • Analyze analog and digital baseband; IF, RF and microwave; and narrowband to ultra-wideband, SISO, MIMO **Interface** : GPIB, USB, LAN, for optional Keyboard, Mouse. **Operating System**: Windows XP or Windows 7 **Storage** : Removeable solid state drive 80 GB **Connectivity** :GPIB, LAN, USB, VGA out **RF Input Connector**: Type N (female), 50 Ohm	01 No.

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		Probe power : +15 Vdc, 150 mA max, -12.6 Vdc, 150 mA max	
3.	**Vector Network Analyzer (Calibration kit, preferably electronic, should be provided)**	**The Instrument should have following specifications:** a. Wide frequency coverage, Wide dynamic range, Powerful analysis and error correction b. S-parameter measurements c. Time-domain analysis (optional) d. Impedance characterization in signal pattern/TDR, TDT e. Up to 20,001 point measurement with low-pass or band-pass mode selection f. Network Analyzer can be interfaced with Advanced Design System (ADS), MATLAB Software. g. Dielectric and magnetic properties measurement with materials measurement software option should be available which can be upgradable in future. h. Flexible port configuration meets multiple measurement needs i. Instrument should support the coaxial and waveguide calibration kits. j. Advanced characterization of amplifiers with S- Parameter, Gain compression measurement capability k. Advanced characterization of mixers (optional) l. Connectivity with Open Windows® OS, through USB, LAN, GPIB & XGA Vid output **Frequency Range**: 10 MHz. to 43 GHz. (Upgradable upto 50 GHz) **Dynamic Range**: 120 dB @ 8.5 GHz – 12.5 GHz **Low trace noise** :< 0.003 dBrms at 1 kHz IFBW @ 500 MHz -40 GHz **Test Port Output Power**: - 90 dBm to +30 dBm. **Crosstalk** : ≤ - 105 dB @ 2 GHz - 20 GHz **Reflection Tracking** : ± 0.008 Upto 20 GHz **Measurement Channels** :Up to 4 independent measurement channels, WithEach channel having a Display Window. **Measurement Parameters**: S 11 , S 21 , S 12 , S 22 , with conversion ToReflection impedance, transmissionimpedance,Reflection & transmission admittance. **Display Formats**: Smith Chart, Polar, SWR, Real, Imaginar, Phase,Group Delay, Magnitude (Log andLinear) etc. **Data Markers** : Smith Chart format should have Marker formats likeR + j X and G + j B etc. **Sweep Type** : Linear, Segment, Power and Log Sweep. **Trace Math** : Vector Addition, subtraction, multiplication or Division of measured Complex Values and Memory Data. **Storage** : Storage of Instrument States , Calibration Data & Trace data on internal 4 GB Hard Disk Drive. **Interface** : USB 2.0, GPIB, LAN – LXI Class C **STANDARD COMPONENTS REQUIRED WITH VNA** 1. Microstrip Line 2. High Impedance – Low Impedance Type Low Pass Filter3.Symmetrical Stub Line Type Sharp Cut-off Low Pass Filter 4. 4-Resonator Parallel Coupled Band Pass Filter 5.Stub Line Band stop Filter 6. Parallel Coupled Directional Coupler 7. Rat Race Hybrid Coupler 8. Ring Resonator with coupling gap 9. Ring Resonator without coupling gap 10. Microstrip Rectangular Patch Antenna. 11. 2x2 Microstrip Planar Antenna Array 12. Printed Dipole Antenna 13.Printed Yagi Antenna	01 No.

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4.	**Signal Generator 9KHz-40 GHz**	**Frequency range** :9 KHz to 40 GHz **Resolution** : 0.001 Hz **Frequency switching speed** :≤ 5 ms, typical **Aging rate** :± 1 x 10^{-7} / Year **Sweep modes** :Step sweep , List sweep , arbitrary list of frequency and amplitude steps **Dwell time** :100 µs to 100 s **Number of points** :2 to 65535 (step sweep) :1 to 3201 (list sweep) **Settable range** :+19 to – 20 dBm with 0.01 dB resolution **Max output power** :+18 dBm **Absolute level accuracy in CW mode** :± 0.6 dB input +10 to –10 dBm at upto 2 GHz **Harmonics (CW mode)** :< – 55 dBc : 2 to 20 GHz at + 10 dBm **Sub harmonics** :–67 dBc : up to 10 GHz **SSB Phase Noise** :≤ –90 dBc/Hz upto 20 GHz, CW at 20 KHz offset. Modulations **Amplitude modulation** Maximum Depth :100% Depth Resolution :0.1% of depth AM depth error @1 KHz rate and < 80% depth :< 3% at 5 MHz ≤ f ≤ 40 GHz Frequency response :30% depth, 3 dB BW DC/10 Hz to 100 KHz at 4– 40 GHz **Frequency Modulation** Max deviation :N x 10 MHz Modulation frequency response @ 100 KHz rate :1 dB bandwidth DC/5 Hz to 3 MHz, nominal :3 dB bandwidth DC/1 Hz to 7 MHz, nominal **Phase Modulation** Maximum deviation :N × 5 radians, N × 0.5 radians at High Bandwidth mod Frequency response :Normal bandwidth (3 dB) DC to 1 MHz, nominal High-bandwidth mode (3 dB) DC to 4 MHz, nominal **Pulse Modulation (Optional)** Rise/fall times :< 10 ns; 7 ns, typical Minimum pulse width ALC on/off :≥ 1 µs / ≥ 20 ns Repetition frequency ALC on/off :10 Hz to 500 kHz/DC to 10 MHz **Dual Function Generator (optional feature)** :Sine, triangle, square, pos ramp, neg ramp, pulse Interface :GPIB IEEE-488.2, 1987 with listen and talk LAN 1000BaseT LAN interface, LXI Class C compliant USB Version 2.0	01 No.

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		Memory :8 GB **Output Connector** :Precision 2.4 mm male **Calibration Cycle** :36 Months **Power** :220 or 240 VAC, 50 or 60 Hz	
5.	**Signal Generator 9KHz-3 GHz**	The Instrument should have following features: • Large Colour Display. • Instrument should be controllable from PC through USB Port along with Software. • Facility for Simultaneous Modulation and Optional up-gradation to I/Q Modulation input. **Frequency Range** : 9 KHz. to 3 GHz. **Frequency Resolution** : 0.1 Hz. **Sweep Range** : 9 KHz. To 3 GHz. With dwell time of 10 ms to 1 secboth Amplitude and Frequency Sweep are required. **Aging Rate** : ± 1 x 10^{-6} / year. **Spectral Purity** : a) Harmonics < - 30 dBc. b) SSB Phase Noise < - 95 dBc/Hz **Output Range** : + 13 to - 127 dBm **Reversal power protection** : 30 V DC / + 36 dBm **VSWR** : < 1.6 **Output Amplitude Resolution** : 0.1 dB. With accuracy of < ± 1 db **Frequency Modulation** : Peak deviation 20 Hz. to 100 KHz. **Phase Modulation** : Peak Deviation 0 to 10 radians. **Amplitude Modulation** : Range 0 to 100 % with resolution of 0.1 % **Pulse Modulation** : On / OFF Ratio ≥ 40 dB a) Pulse Width 100 µs to 1 sec and b) Period 200 µs to 2 Sec c) Rise/Fall Time < 3 µs **Modulation Source** : Internal and external for AM, FM, PM Internal for ϕM **Data Storage** : Internal 16 MB **Interface** : USB	01 No.
6.	**Power meter (Calibration kit, preferably electronic, should be**	**The Instrument should have following features :** a) Measurement Speed should be fast. b) High resolution LCD Display. c) Ten Instrument set ups can be saved and recalled.	01 No.

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	provided)	d) Menu Driven in nature. e) Duty Cycle Values may be entered for calculation of Peak Power. f) Standard and USB Power Sensor can be Plug-in g) Optional Battery can be added h) Instrument should be LXI class C compliance (Web Browsing Capability). **Frequency Range**: 9 KHz. to 110 GHz. (Dependant on Sensor) **No. of Channel** : One **Power Range** : - 70 dbm. to + 44 dbm (100 picowatt to 25 watt) dependant on Sensor Chosen . **Measurement Speed** : 400 readings / second with E – Series Sensors. **Display Units**: Watts or dbm, relative percent or db. **Display Resolution**: Selectable upto 0.001 db in log. mode **Accuracy (Absolute)**: ± 0.02 dB Logarithmic, ± 0.5% Linear. **Measurement Noise**: < 700 pwatt (sensor dependant) **Zero / Cal zero**: Fully automatic digital zero corrects for residual offset. **Cal. factor**: Fully automatic sensor frequency response calibration. **Save / Recall**: Save & Recall upto 10 Instrument states. **Power Sensor: a) 50 MHz – 24 GHz. USB Sensor** **Power Range : – 50 to + 30 dBm.** **b) 10 MHz – 26.5 GHz Thermocouple Sensor** **Power Range : - 35 to + 20 dBm** **Interface** : GPIB, USB 2.0 and 10/100BaseT LAN with LXI Class C	
7.	**Frequency counter**	**The instruments should have the following features:** 1) Measurement of Frequency, Frequency ratio, Period, Minimum/maximum/peak-to-peak input voltage, RF signal strength. 1) LXI-C/Ethernet LAN, USB, GPIB Interface should be available. 1) Optional battery should be available 1) Automatic limit testing - Displays PASS/ FAIL message based on user defined Hi/ Lo limit values. 1) Datalog trend plot&Cumulative histogram of measurements should be displayed. 1) Built-in math analysis and statistics 1) High speed automated test capability. **Frequency Range** : dc to 350MHz. **Added High Frequency** : 100 MHz to 15 GHz inChannel 2. **Frequency Resolution** : 10 digits/sec **Stability** : ± 1 ppm for 1- year **Speed (frequency and time interval)**: Up to 75,000 and 90,000 readings/sec **Sensitivity (Ch. 1)** : 20 mV_{Pk}upto 100 MHz range	01 No.

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		Sensitivity (Ch. 2) : 10 mV_{rms} Upto 6 GHz Range **Gate Time** : 1 ms to 1000 s in 10 µs steps **Trigger Source** : Internal, external, bus, manual **Memory** : 75 Mbytes (up to 5 M readings) **Display** : 4.3" Color TFT WQVGA (480 x 272), LED backlight **Interface** : USB, GPIB, LAN with LXI Class C (web Browsing Capability) **Power** : 220 – 240 VAC, 50 Hz.	
8.	**Antenna & Propagation Training Kit**	**Transmitter:** Freq Range: 2MHz-4GHz; Max output power to antenna port: 3mW; o/p impedance: 50ohm **Receiver:** Freq. Range: 50MHz-3GHz (with built-in RF detector), 2MHz-4GHz (with RF Analyzer); RF i/p level: -60dBm-0dBm (with built-in RF detector), -127dBm-27dBm (with RF Analyzer);PC-based controlled rotator (0 to 359 degrees); Variable step size: 1 to 30 degrees/step **Hardware kit:** • The kit shall have two separate modules – a transmitter and receiver module. • The operating frequency range of the transmitter and receiver is from 50MHz to 3GHz • The receiver module must have a built-in PC-based controlled rotator with resolution of 1 degree per step. • The receiver module must also have a built-in RF detector operating from 50MHz to 3GHz with input level range from -60 dBm to 0 dBm. • The kit shall come with a Windows-based antenna radiation plotting software that can control the rotator and perform the radiation pattern plotting automatically. • The signal measured shall be able to be saved, retrieved for post-measurement analysis by the software and MS Excel. • The software shall allow user to choose either using a network analyzer or the built-in RF detector to perform the radiation pattern measurement. 8. The kit shall include at least the following antenna pairs: - 433 MHz dipole and monopole - 915MHz dipole (with one dipole length-adjustable antenna), Monopole and spiral - 2.4 GHz dipole, monopole, microstrip patch, ceramic and Yagi-Uda antennas - 915 MHz & 2.4 GHz dual-band	01 No.

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		9. The training kit shall be certified with CE certification	
9.	**Time domain oscilloscope**	**The Instrument should have following Features:** • Oscilloscope should have Optional I^2C/SPI serial trigger and decode • Oscilloscope should have Optional RS-232/UART serial decode and trigger. • Oscilloscope should have capability of Digital Demodulation of Standard and Custom Digitally Modulated Signals with Vector Signal Analysis Software. • Oscilloscope should have optional Protocol Analysis Capability • Oscilloscope should have Zone Qualify Triggering • Oscilloscope should have Optional CAN, LIN and FlexRay triggering and decode. • Oscilloscope should Ability to Trigger on 125 ps Pulse Width. • Oscilloscope should have optional Capability to InfiniiScan event identification and EZJIT (Jitter) analysis. • Oscilloscope should have built in windows XP and touch screen facility. • Instrument should have built in XGA Video output and LAN, USB Connectivity • Bandwidth can be upgradable to 13 GHz. **Bandwidth** :12 GHz (Upgradable to 13 GHz). **No of Channels** : 4 **Input Impedance** : 50 Ω **Vertical Resolution** : 8 bit, ≥ 12 bit in average mode. **Maximum Input Voltage** : ± 5 V **Waveform update rate** : 400,000 Waveforms/s **Vertical Sensitivity** : 1 mV/div – 1 V/div **Memory** : 20 Mpts on 4 channels **Max. Real Time Sampling Rate** : 40 GSa/s (4 channels simultaneously) **Noise Floor** : 435 µV at 5 mV/div **Main Time base Range** : 5ps/div – 20 s/div. **Jitter Pattern Length** : PRBS 23 **Horizontal Resolution** : 1ps **Minimum Glitch Detection** : 125 ps. **Operating Temperature** : 5 ºC to 40 ºC **Multi-format Modulation** : Vector Modulation Analysis can be performed on analysis (Optional) Oscilloscope **Display** : 12.1-inch colour XGA TFT-LCD with touch screen with 256- level intensity-graded display **Accessories** : Necessary probes and accessories will be supplied	01 No.

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		along with Oscilloscope.	
10	Co-axial Adapter (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; VSWR: 1.25; Connector: N-Type (F); Waveguide: RG-52/U; Flange: UG-39/U	30
11	Co-axial Adapter (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; VSWR: 1.25; Connector: SMA(F); Waveguide: RG-53/U; Flange: UG-595/U	05
12	Bend Flange 8.2-12.4 GHz (for E planes)	Freq. Range: 8.2-12.4 GHz; VSWR: 1.05; Waveguide: RG-52/U; Flange: UG-39/U (for E and H planes separately)	06
13	Bend Flange 8.2-12.4 GHz (for H planes)	Freq. Range: 8.2-12.4 GHz; VSWR: 1.05; Waveguide: RG-52/U; Flange: UG-39/U (for E and H planes separately)	06
14	Bend Flange (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; VSWR: 1.06; Waveguide: RG-53/U; Flange: UG-595/U	02
15	Detector Mounts (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; Crystal: IN-21; Output Connector: BNC(F); Waveguide: RG-52/U; Flange: UG-39/U	06
16	Detector Mounts (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; Crystal: IN-23; Output Connector: BNC(F); Waveguide: RG-52/U; Flange: UG-39/U	02
17	Directional Couplers (3dB)	Freq. Range: 8.2-12.4 GHz; Coupling: 3±0.6dB; Directivity: 35; VSWR (Main Line): 1.12; VSWR (Auxillary Line): 1.2	06
18	Directional Couplers (10 dB)	Freq. Range: 8.2-12.4 GHz; Coupling:10±0.6dB; Directivity: 35; VSWR (Main Line): 1.12; . VSWR (Auxillary Line): 1.2	06
19	Directional Couplers (20dB)	Freq. Range: 8.2-12.4 GHz; Coupling: 20±0.8dB; Directivity: 35; VSWR (Main Line): 1.12; VSWR (Auxillary Line): 1.2	06
20	Directional Couplers (3dB)	Freq. Range: 18-26.5 GHz; Coupling: 3±0.5dB; Directivity: 35; VSWR (Main Line): 1.12; VSWR (Auxillary Line): 1.2	02
21	Directional Couplers (10 dB)	Freq. Range: 18-26.5 GHz; Coupling:10±0.5dB; Directivity: 35;	02

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		VSWR (Main Line): 1.12; VSWR (Auxillary Line): 1.2	
22	Directional Couplers (20dB)	Freq. Range: 18-26.5 GHz; Coupling: 20±0.6dB; Directivity: 35; VSWR (Main Line): 1.12; VSWR (Auxillary Line): 1.2	02
23	Phase Shifter (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; VSWR: 1.3; Calibration Accuracy: ±2.5^0; Waveguide: RG-52/U; Flange: UG-39/U	06
24	Phase Shifter (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; VSWR: 1.4; Calibration Accuracy: ±2.6^0; Waveguide: RG-53/U; Flange: UG-595/U	02
25	Waveguide Horn Antenna (2.6-3.95 GHz)	Freq. Range: 2.6-3.95 GHz; VSWR: 1.2; Gain: 15; Type: Pyramidal; Waveguide: RG-48/U; Flange: UG-33/U	04
26	Waveguide Horn Antenna (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; VSWR: 1.2; Gain: 16; Type: Pyramidal; Waveguide: RG-52/U; Flange: UG-39/U	04
27	Waveguide Horn Antenna (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; VSWR: 1.2; Gain: 20; Type: Pyramidal; Waveguide: RG-53/U; Flange: UG-595/U	04
28	Slotted Line (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; Residual VSWR: 1.01; Slope: ±0.2dB; Waveguide: RG-52AJ; Flange: UG-39/U	04
29	Slotted Line (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; Residual VSWR: 1.02; Slope: ±0.2dB; Waveguide: RG-53/U; Flange: UG-595/U	02
30	Termination (2.6-3.95 GHz)	Freq. Range: 2.6-3.95 GHz; Max VSWR: 1.02; Avg Power: 5W; Type: Fixed; Waveguide: RG-48/U; Flange: UG-53/U	04
31	Termination (8.2-12.4 GHz)	Freq. Range: 8.2-12.4 GHz; Max VSWR: 1.02; Avg Power: 2W; Type: Fixed; Waveguide: RG-52/U; Flange: UG-39/U	06

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32	Termination (18-26.5 GHz)	Freq. Range: 18-26.5 GHz; Max VSWR: 1.02; Avg Power: 1W; Type: Fixed; Waveguide: RG-53/U; Flange: UG-595/U	02
33	Frequency Meter	Freq. Range: 8.2-12.4 GHz; 26Micrometer Type	02
34	Waveguide Detector Mounts (Tunable)	Freq. Range: 8.2 to 12.4 GHz; Output connector: BNC type; Waveguide type: WR90; Flange type : UG/U 39; Detector: IN23	06
35	Waveguide Stands	X-band	40
36	Magic Tee (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06
37	Magic Tee (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U;	02
38	H-Plane Tee (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06
39	H-Plane Tee (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U;	02
40	E-Plane Tee (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06
41	E-Plane Tee (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U;	02
42	Rectangular Waveguide (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06 (1 ft)
43	Rectangular Waveguide (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U;	02 (1 ft)
44	Circular Waveguide (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06
45	Circular Waveguide (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U;	02
46	Isolator (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39; Max VSWR: 1.15; Min Isolation: 25 dB; Min insertion loss: 0.4 dB	06
47	Isolator	Freq. Range: 18 to 26.5 GHz;	02

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	(18 to 26.5 GHz)	Waveguide type: RG-53/U; Flange type : UG-595/U; Max VSWR: 1.15; Min Isolation: 25 dB; Min insertion loss: 0.4 dB	
48	Circulator (T-type) (8.2 to 12.4 GHz)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39; Max VSWR: 1.20; Min Isolation: 20 dB; Min insertion loss: 0.4 dB	06
49	Circulator (T-type) (18 to 26.5 GHz)	Freq. Range: 18 to 26.5 GHz; Waveguide type: RG-53/U; Flange type : UG-595/U; Max VSWR: 1.15; Min Isolation: 25 dB; Min insertion loss: 0.4 dB	02
50	Attenuator (variable)	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39;	06
51	Bias Tee	Freq. Range: 10 KHz –12.4 GHz, Curent: 750 mA, Voltage 25V, Bias Tee Broadband	04
52	Co-axial cable (BNC- BNC) (0.5 m)	X-band	06
53	Co-axial cable (BNC- BNC) (1 m)	X-band	06
54	Connector	BNC(M),BNC(F) SMA(M),SMA(F) TNC(M),TNC(F) N-type(M),N-type(F)	2 sets
55	Reflex Klystron Microwave test bench	X-band	1
56	Gunn Oscillator	Freq. Range: 8.2 to 12.4 GHz; Waveguide type: WR90; Flange type : UG/U 39; Power output 8 dBm+/-2 dBm; output return loss: 6 dB XG-11	6
57	Gunn Power supply	Multiple output programmable linear DC power supply; Output channel-3; Voltage/Current rating= 18 V/3A *2, 6 V/5A *1	2
58	PIN modulator	Frequency Range: 8.2 to 12.4 GHz; Max RF power (w)=1; Waveguide type: WR90; Flange type : UG/U 39; Max VSWR: 1.30	2
59	Microwave Amplifier	Frequency Range: 10 MHz - 26.5 GHz; Small signal gain: 20 dB min; Small signal gain flatness: ±5 dB max 0.01-5GHz; ±3 dB max 5-26.5GHz; Output power (at P max): +18dBm typ 0.01-10Ghz; +16dBm typ 10-20Ghz; +14dBm typ 20-26.5Ghz;	4

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		Output power (at 1dB compression): +18dBm typ 0.01-10Ghz; +16dBm typ 10-20Ghz; +14dBm typ 20-26.5Ghz; Noise figure: <13dB typ 0.01-0.1Ghz; <8dB typ 0.1-18Ghz; <13dB typ 18-26.5Ghz; Input SWR: 2.6:1; Output SWR: 2.8:1 0.01-18GHz; 3.2:1 18-26.5GHz; Non-harmonically related spurious: -65 dBc typ; Rise Time: 400 ps typ; Reverse Isolation (typ): -65 dB; Power dissipation: 6W; Survival input power: +23 dBm max; Impedance: 50Ω.	

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