



**राष्ट्रीय प्रौद्योगिकी संस्थान सिक्किम**  
**NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM**  
(An Institution of National Importance Under MHRD, Govt. of India)

Ref: 169/NITS/Antenna & Wave Propagation Lab/TEQIP-III/2019

Date: 06.05.2019

**CORRIGENDUM**

The last date for submission of Tender against Package No.: TEQIP-III/2019/ntst/89, Dated: 9<sup>th</sup> April 2019 at Dept. of Electronics and Communication Engineering, **Equipment for Antenna and Microwave Engineering Laboratory** has been extended till 31<sup>st</sup> May 2019. Technical specification has been updated.

Accordingly, the revised date, time and other changes are as under:

<i>Revised Information</i>	
<b>Tender Closing Date &amp; Time</b>	31 <sup>st</sup> May 2019 at 17:00
<b>Technical Bid Opening Date &amp; Time</b>	Will be notified to the Vendor
<b>Specification</b>	Updated

All other terms & conditions remain same as per the tender document.

The bidders are advised to go through the updated Tender Document before bidding for the same.

  
06/05/19  
**Nodal Officer Procurement**  
**TEQIP-III**

Nodal Officer (Procurement)  
TEQIP-III  
National Institute of Technology Sikkim



# National Institute of Technology Sikkim

Barfung Block, Ravangla, South Sikkim Pin Code-737139

## INVITATION LETTER

Package Code: TEQIP-III/2019/ntst/89

Current Date: 06-May-2019

Package Name: NITS/TEQIP-III/ECE/01

Method: Shopping Goods

### Sub: INVITATION LETTER FOR NITS/TEQIP-III/ECE/01

Dear Sir,

1. You are invited to submit your most competitive quotation for the following goods with item wise detailed specifications given at Annexure I,

Sr. No	Item Name	Quantity	Place of Delivery	Installation Requirement (if any)
1	Equipment for Antenna and Microwave Engineering Laboratory	1	NIT Sikkim, Ravangla, South Sikkim 737139	Required

2. Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme [TEQIP]-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.
3. **Quotation**
  - 3.1 The contract shall be for the full quantity as described above.
  - 3.2 Corrections, if any, shall be made by crossing out, initialling, dating and re writing.
  - 3.3 All duties and other levies payable by the supplier under the contract shall be included in the unit Price.
  - 3.4 Applicable taxes shall be quoted separately for all items.
  - 3.5 The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
  - 3.6 The Prices should be quoted in Indian Rupees only.
4. Each bidder shall submit only one quotation.
5. Quotation shall remain valid for a period not less than **45** days after the last date of quotation submission.
6. Evaluation of Quotations: The Purchaser will evaluate and compare the quotations determined to be Substantially responsive i.e. which



- 6.1 are properly signed; and
- 6.2 Confirm to the terms and conditions, and specifications.
7. The Quotations would be evaluated for all items together.
8. Award of contract The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.
- 8.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of Contract.
- 8.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be Incorporated in the purchase order.
9. Payment shall be made in Indian Rupees as follows:
- Satisfactory Delivery & Installation - 10% of total cost**  
**Satisfactory Acceptance - 90% of total cost**
10. Liquidated Damages will be applied as per the below:  
Liquidated Damages Per Day Min % : 0  
Liquidated Damages Max % : 10
11. All supplied items are under warranty of 24 months from the date of successful acceptance of items and AMC/Others is NA.
12. You are requested to provide your offer latest by 17:00 hours on 31-May-2019.
13. Detailed specifications of the items are at Annexure I.
14. Training Clause (if any) Yes
15. Testing/Installation Clause (if any) Yes
16. Performance Security shall be applicable: 0%
17. Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly indicating the model quoted for.
18. Sealed quotation to be submitted/ delivered at the address mentioned below, **National Institute of Technology Sikkim, Barfung Block, Ravangla, South Sikkim Pin Code- 737139**
19. We look forward to receiving your quotation and thank you for your interest in this project.

  
06/05/19  
Dr. Achintesh N Biswas

Nodal Officer (Procurement)

Nodal Officer (Procurement)  
TEQIP-III  
National Institute of Technology Sikkim

  
06/05/19

**Annexure I**

<b><u>Sl.No.</u></b>	<b><u>Item Name</u></b>	<b><u>Specifications</u></b>
01.	<b>ANTENNA MEASUREMENT SYSTEM</b>	<p>The Antenna Measurement System should have the facility to test 30 different Types of Antenna as listed and provision to conduct 3 Batches</p> <p>A) The Antenna Measurement with Data Acquisition System having the facility to be controlled, set parameters and acquire data from the system using software based on LABVIEW.</p> <ol style="list-style-type: none"><li>1. The Frequency of the RF Source should be PLL Synthesized and should generate 100MHz to 3GHz <b>3Nos.</b></li><li>2. The System should also be able to work in the Stand alone mode using Membrane Key pad and 128x64 Graphic LCD Display with backlit and PC Control mode</li><li>3. The Controller should be designed using ARM processor.</li><li>4. The Transmitter and Motorized Receiver Stand should be made of special material which is inert to EM frequency and should have engraved height and angle scale on it with spirit level at the base.- <b>3 Nos</b></li><li>5. Universal plug and fix Antenna mounts should be provided to hold the all types of antenna assembly in vertical and horizontal orientation for co and cross polarization.- <b>3 Nos</b></li><li>6. Stepper Motor provided with the system for rotation of Antenna should have minimum 2Kg torque and minimum Step Angle of 1.8 Degree and 5.4 Degree</li><li>7. The Source should have the facility to program the Frequency with a resolution of 1MHz</li><li>8. The RF Detector should be a Logarithmic Detector with Frequency range of 100MHz to 8 GHz.</li><li>9. The Radiation pattern of the Antenna under test should be plotted on the PC Screen in Cartesian and Polar Graph.</li><li>10. Horizontal and Vertical Markers to be provided for measurements like Antenna Gain, FBR, Antenna Resolution, HPBW, BWFN</li><li>11. Built in Experimental Set-up to be embedded inside the controller</li></ol> <p>The same system should be able to demonstrate and measure various parameters of the Wired Antenna, Microstrip Antenna, Aperture Antenna, Array Antenna and Reflector Antenna.</p> <p><b>List of Standard 30 Antenna Supplied with the setup</b></p> <p><b>Wire Antenna</b></p> <ol style="list-style-type: none"><li>1. Monopole Plane base ground</li><li>2. Dipole (2nos.)</li><li>3. Folded Dipole</li><li>4. Vee Dipole</li><li>5. Rectangular Loop</li><li>6. Helical</li><li>7. Monopole- Wire</li><li>8. Yagi Uda</li><li>9. 3 Lamda/2 Linear dipole</li><li>10. Log Periodic Antenna</li><li>11. Circular Loop</li><li>12. Rhombus Antenna</li></ol> <p><b>Microstrip Antenna</b></p> <ol style="list-style-type: none"><li>1. Planar Dipole</li><li>2. Planar Monopole</li></ol>

  
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		<ol style="list-style-type: none"> <li>3. CMSA</li> <li>4. TMSA</li> <li>5. 2X1 ARRAY</li> <li>6. Annular ring</li> <li>7. Chip Antenna</li> <li>8. RMSA –shorting pin</li> <li>9. RMSA- shorting plate</li> <li>10. RMSA- Circular Polarized</li> <li>11. RMSA-Dual Stub and Slot loaded</li> <li>12. Insert Foot</li> </ol> <p><b>Aperture Antenna</b></p> <ol style="list-style-type: none"> <li>1. E- Horn</li> <li>2. Open ended Waveguide Rectangular</li> </ol> <p><b>Array Antenna</b></p> <ol style="list-style-type: none"> <li>1. Broadside Array</li> <li>2. Collinear Array</li> <li>3. End Fire</li> </ol> <p><b>Reflector Antenna</b></p> <ol style="list-style-type: none"> <li>1. Parabolic Reflector</li> </ol> <p><b>List of Deliverables:</b></p> <ol style="list-style-type: none"> <li>1. Antenna Source and Detector with Stepper Motor Controller Module- 3 Nos</li> <li>2. Antenna Transmitter and Motorised Receiver Stand – 3 Sets</li> <li>3. Universal Mount , RF Cables and Accessories – 3 Sets</li> <li>4. Antenna Set consisting of 30 Antennas- 1 Set</li> <li>5. Software on CD – 1Set</li> <li>6. Manuals 3 Sets</li> <li>7. Accessories – 1 Set</li> </ol>
2	<b>Microwave Integrated Circuits with RF Generator and Detector</b>	<p><b>MICROWAVE INTEGRATED CIRCUITS MEASUREMENT SYSTEM WITH RF GENERATOR and DETECTOR</b></p> <p>This System should consist of Passive Component Board consisting of Filter section (LPF,HPF,BPF,BSF),Coupler section (Branch line, Coupled line, Rat Race), Tee and Pi Attenuator section, Circulator-Isolator, Power Divider, Ring Resonator and Transmission Line Section with Terminations and Loads.</p> <p>Two dedicated Active circuits Board provided with Amplifier, Mixer, VCO and PIN Diode Phase Shifter, Schottky Diode Detector, PIN Diode Modulator, PIN Diode SPST and SPDT Switch and PIN Diode Variable Attenuator.</p> <p>This System should be integrated with the RF Generator and Detector for Measurements</p> <p><b>SPECIFICATIONS</b></p> <p><b>RF Generator &amp; Generator with external Directional Coupler</b></p> <p>Source: Frequency:100 MHz to 3 GHz, Frequency resolution:1MHz, Frequency Generation Modes: Single tone , frequency sweep, frequency hopping, Frequency sweep for <math>\leq 3.8</math> sec, full span , Power Sweep 0to 20 dB, Frequency offset:<math>\pm 100</math>Hz,Power max:+3dBm,Power min:30dBm, Power variation:<math>\pm 0.5</math>dB, Power resolution:0.5 dB, Power sweep mode :3.9 sec, AM Modulation Range: 100MHZ to 2.8GHz, FM Modulation Range: 300 MHz to 1 GHz, PSK Modulation Range: 100 MHz to 1 GHz, Operating mode: Single, CW, hopping ,</p>

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		<p>Detector: Dynamic range:-50 dBm to 10 dBm , RF Detector sensitivity:-60dB, Interface :USB-B plug, Impedance :50 ohm, Display: LCD , 128 x 64 graphic display, Key Pad: Membrane Type,</p> <p>Software: User friendly GUI to display the stored results and plot the same.</p> <p>Inbuilt Cable calibration facility to be provided and measurements facility and plotting the VSWR, Return Loss, S21 of DUT</p> <p><b>External Directional coupler</b> to be provided with following specification: Wideband 500 MHz to 3 GHz ,Insertion loss = 0.5dB,Coupling = 10dB</p> <p><b>MIC Communication System: 01 Set consisting of 3 Boards- Passive Component Board, Active Component Source Board and Active Component Detector Board.</b></p> <p><b>MMIC Amplifier</b> Frequency: 100 MHz to 3GHz , Gain:15 dB @ 2GHz (Typical)</p> <p><b>VCO Frequency</b> : 1600 MHz 3200MHz , <b>Power Output</b> : 8 dBm (typical)</p> <p><b>Frequency Mixer</b> RF / LO Frequency: 1600 MHz to 3200 MHz ,LO Power : +7 dBm</p> <p><b>Micro strip Filters</b> <b>LPF</b> Frequency Range : 100 MHz to 2 GHz (3dB cut-off +/- 50 MHz) <b>HPF</b> Frequency Range : 1.9 GHz (3dB cut-off +/- 50 MHz) <b>BPF</b> Center Frequency : 2 GHz (+/- 50 MHz), Bandwidth : ~ 300 MHz @ 3 dB <b>BSF</b> Center Frequency :1.8 GHz (+/- 50 MHz ), Bandwidth : ~ 850 MHz @ 3 dB</p> <p><b>Attenuators</b> Tee Attenuator: 10 dB &amp; Pi Attenuator : 5 dB</p> <p><b>Couplers : Coupled Line Directional Coupler</b> Center Frequency : 2 GHz (+/- 50 MHz) Coupling : 13 dB</p> <p><b>Branchline Coupler</b> Center Frequency : 2.45 GHz (+/- 50 MHz )</p> <p><b>Rat Race Coupler</b> Center Frequency : 2.45 GHz (+/- 50 MHz)</p> <p><b>Ring Resonator</b> Center Frequency : 2.45 GHz (+/- 50 MHz)</p> <p><b>Power Divider</b> Frequency : 500 MHz to 3 GHz</p> <p><b>Transmission Line Terminations / Loads:</b> OPEN Termination, SHORT Termination, MATCHED Load, MISMATCHED Load</p> <p><b>Pin Diode Switch</b> SPST Switch Frequency : 1GHz to 2.5 GHz SPDT Switch Frequency : 1GHz to 2.5 GHz</p> <p><b>Pin Diode Variable Attenuator:</b> Frequency :1.5 GHz to 2.5 GHz, Attenuation range: 7 dB to 17 dB</p> <p><b>Schottky Diode Detector</b> Frequency : 2.4 GHz</p>
3	<b>Radar Training System</b>	<p>The Radar Training System should consist of 2 Modules. The First Module should cover the concept of Pulsed Radar using the Simulation Software and the Second Module should cover the concept of Doppler Radar supplied along with the Hardware.</p> <p>The Pulsed Radar Simulation Software should be supplied with <b>10 User Site License</b> that should be installed in our PC which should be node-locked and</p>

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		<p>perpetual. The Simulation Software should be designed to introduce the fundamentals of PULSE RADAR technology with emphasis on design environments concepts. The design frequency range should be up to 30 GHz and should have a PPI Screen and Sector PPI Screen as Display.</p> <p>The radar software should consist of</p> <ol style="list-style-type: none"> <li>1. Antenna section (cut parabolic, parabolic) with facility to calculate the Gain and Beam Factor.</li> <li>2. Transmitter section should have facility to change the Radar Frequency, Pulse width, PRF and Peak Power. Calculation of the Range resolution and Pulse energy should be possible.</li> <li>3. Receiver section should have the facility to change the Rx Noise Figure, BW , SNR and the Scan Rate. Calculation of Hits per Scan, Gain and Max. Range should be possible.</li> <li>4. Radar environment: Software should have the facility to simulate various Radar Environment like Jammer, Clutters like Surface , Volume and Rain, Losses like RF Link Loss, Matched Filter Loss and CFAR Loss, RCS- should have libraries of various objects like Aeroplane, Ship, man, bicycle etc The Software should have dedicated animations windows for target detection, slant range, stealth aircraft, and effect of clutters..</li> </ol> <p><b>SIMULATION SOFTWARE PARAMETERS</b></p> <table> <tr> <td>Frequency</td><td>:</td><td>50MHz ~ 30GHz</td></tr> <tr> <td>Pulse width</td><td>:</td><td>0.1us ~ 100us</td></tr> <tr> <td>PRF</td><td>:</td><td>1KHz ~ 1MHz</td></tr> <tr> <td>Display formats</td><td>:</td><td>PPI</td></tr> <tr> <td>Number of ranges</td><td>:</td><td>Four variable</td></tr> <tr> <td>Maximum range</td><td>:</td><td>Dynamic</td></tr> <tr> <td>Display options</td><td>:</td><td>Range markers</td></tr> <tr> <td>Receiver noise factor</td><td>:</td><td>1 ~ 50</td></tr> <tr> <td>Receiver temperature</td><td>:</td><td>150 ~ 400 Kelvin</td></tr> <tr> <td>Peak power</td><td>:</td><td>1mW ~ 1MW (-30 ~ +60dBW)</td></tr> <tr> <td>Antenna type</td><td>:</td><td>Parabola, Cut Parabolic</td></tr> <tr> <td>Antenna dimensions</td><td>:</td><td>0.5m ~ 60m</td></tr> <tr> <td>Scan width</td><td>:</td><td>1 ~ 120 degrees in azimuth</td></tr> <tr> <td>Scan type</td><td>:</td><td>Electronic</td></tr> <tr> <td>Scan speed</td><td>:</td><td>100 rpm</td></tr> <tr> <td>Plumbing loss</td><td>:</td><td>User defined</td></tr> <tr> <td>Switch loss</td><td>:</td><td>User defined</td></tr> <tr> <td>RCS (m2)</td><td>:</td><td>0.0001 ~ 100</td></tr> <tr> <td>Noise jammer / repeater</td><td>:</td><td>CW noise</td></tr> <tr> <td>Noise Effective radiated power</td><td>:</td><td>1m W ~ 1KW</td></tr> <tr> <td>Bandwidth</td><td>:</td><td>10KHz ~ 2GHz</td></tr> <tr> <td>Bearing</td><td>:</td><td>-60 ~ +60 degrees in Azimuth</td></tr> </table> <p>The 2<sup>nd</sup> Module should be a Doppler Radar with 16bit radar data acquisition System with PC connectivity via USB. Should have the facility to Display and log doppler signals, Signal views in frequency and time domain, to view signal on test points on front plate as well as in software windows</p> <p><b>HARDWARE SPECIFICATION:</b></p>	Frequency	:	50MHz ~ 30GHz	Pulse width	:	0.1us ~ 100us	PRF	:	1KHz ~ 1MHz	Display formats	:	PPI	Number of ranges	:	Four variable	Maximum range	:	Dynamic	Display options	:	Range markers	Receiver noise factor	:	1 ~ 50	Receiver temperature	:	150 ~ 400 Kelvin	Peak power	:	1mW ~ 1MW (-30 ~ +60dBW)	Antenna type	:	Parabola, Cut Parabolic	Antenna dimensions	:	0.5m ~ 60m	Scan width	:	1 ~ 120 degrees in azimuth	Scan type	:	Electronic	Scan speed	:	100 rpm	Plumbing loss	:	User defined	Switch loss	:	User defined	RCS (m2)	:	0.0001 ~ 100	Noise jammer / repeater	:	CW noise	Noise Effective radiated power	:	1m W ~ 1KW	Bandwidth	:	10KHz ~ 2GHz	Bearing	:	-60 ~ +60 degrees in Azimuth
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		<p><b>Microwave Transceiver</b></p> <p>Type : Integrated transmitter and receiver with dual 4 patch antenna</p> <p>Operating frequency : 24GHz (K-Band)</p> <p>Single balanced mixer : 50MHz bandwidth</p> <p>EIRP output power : 15dBm</p> <p>Beam aperture : <math>80^{\circ} / 34^{\circ}</math></p> <p><b>Software</b></p> <p>Graphically configurable frequency and peak detection</p> <p>Time domain display(scope) with trigger and filter functions</p> <p>Real time capture and display of signal at background along with current acquired signal</p> <p>Speed display : Display in km/Hr, m/s, KHz</p> <p>Volts/div : 20mV/div ~ 3V/div</p> <p>Display : Peak to peak level display</p> <p>Time Base : 0.5mS/div ~ 10ms/div(real time)</p> <p>Trigger : Manual</p> <p>Storage mode : Streaming to standard save files</p> <p>FFT : Real time with cursor measurement</p> <p>FFT Power spectrum display from 5Hz ~ 20 KHz</p>
4	<b>Motorised Transmission Line Trainer</b>	<p>Motorized transmission Line Trainer should have facility for Minima and Maxima Measurement for various load condition as well as various frequencies. Probe / Sensing motion along the transmission line having standard hardening Ball screw arrangement. Software/Panel mode operation.</p> <p><b>SPECIFICATIONS</b></p> <p>Frequency 300MHz ~ 1500MHz</p> <p>Source type • PLL Synthesizer</p> <p>Power +9dbm</p> <p>Resolution 150KHz</p> <p>Characteristics impedance • 50 ohm</p> <p>Power handling capacity +30dBm</p> <p>Detector type Dual Log type</p> <p>Output array storage 580 points on self memory</p> <p>Operational Mode PC &amp; Panel mode ( Controlling / Driving / Data plotting)</p> <p>Length of transmission line 60CM. Motorized</p> <p>Sensing probe resolution 1mm/5mm/10mm</p> <p>Probe output dbm/dbuV/mV</p> <p>Experimental Mode Standing wave insertion loss(S21) ,Return loss (S11), Pulse mode ,Directional coupler</p> <p>Software</p> <p>Compatible to Windows 98, Windows 7 &amp; Windows vista Graphs</p> <p>Incident voltage , Reflected voltage, Standing wave, Smith chart , Graph comparison facility</p> <p>Load OPEN, SHORT, MATCH, MISMATCH</p>

*Signature*  
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		Connector SMA female, (Jack)
5	<b>Co-axial Transmission Line Trainer</b>	<b>Transmission line</b> <ul style="list-style-type: none"> <li>• Coaxial Cable 100m (25m x 4)</li> </ul> <b>Impedance matching</b> <ul style="list-style-type: none"> <li>• 0 W ~ 100 W variable load (quantity 2), 1Ω fixed load</li> </ul> <b>Interconnections</b> <ul style="list-style-type: none"> <li>• 2mm socket on all input / output connections</li> </ul> 2 MHz Function Generator and 100MHz Digital Storage Oscilloscope to be provided along with the system


  
06/03/19

**FORMAT FOR QUOTATION SUBMISSION**  
(In letterhead of the supplier with seal)

Date: \_\_\_\_\_  
To: \_\_\_\_\_  
\_\_\_\_\_

Sl. No.	Description of goods \ (with full Specifications)	Qty.	Unit	Quoted Unit rate in Rs. (Including Ex-Factory price, excise duty, packing and forwarding, transportation, insurance, other local costs incidental to delivery and warranty/ guaranty commitments)	Total Price (A)	Sales tax and other taxes payable	
						In %	In figures (B)
<b>Total Cost</b>							

Gross Total Cost (A+B): Rs. \_\_\_\_\_ (Amount in figures)

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ amount in words) within the period specified in the Invitation for Quotations.  
We confirm that the normal commercial warranty/ guaratee of \_\_\_\_\_ months shall apply to the offered terms and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.  
We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery

Signature of Supplier  
Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Contact No. \_\_\_\_\_