Local Tender Notification from Indian Original Equipment Manufacturer (OEM) for procuring "Controller System" at Electrical Communication Department (ECE), Indian Institute of Science, Bangalore

01 April 2022

This is a request for local tender quotations from Indian Original Equipment Manufacturer (OEM) or their Indian authorised distributor meant to purchase the "Controller System" for Research purposes.

Your quotation should indicate the terms and conditions of the quotation, delivery schedule, entry tax, payment terms, warranty coverage etc. The quotation should be submitted in two parts: Part I (Technical bid) and Part II (Commercial bid), and both should be submitted in separate sealed envelopes. The vendor should demonstrate the manufacture of the product within India. The Technical bid should be the same as the Commercial bid, except that the prices must not be shown in the technical bid. The Technical bid should have an itemised compliance report of all specifications indicated below. Prices quoted should include delivery of the items to the site and installation. The price must be in INR and should consist of the appropriate GST.

The last day for submitting the bid is 11th April 2022. The offer should be valid for at least 60 days from the last date of submission of quotes. Technical specifications for the Controller system, accessories and others are given below:

| Controller System | CPU Intel® Xeon® Processor E3-1515M v5 Cache 8 MB SmartCache Dual-Channel DDR4-2133 (PC-17000) 8 GB standard, 32 GB maximum Storage 512 GB (or greater) solid-state, NVME Video 1 DisplayPort 1.1, 1 DisplayPort 1.2 Ethernet 1 i219 port 1 i210 port, 1588, 10/100/1000 Base T PXI Express 4 Link Configuration x4, x4, x4, x4 PXI Express 2 Link Configuration x8, x8 GPIB (IEEE 488 Controller) 1 mini-GPIB Serial Port (RS-232) 1 DB-9 Thunderbolt 3 Ports 2 Type-C Hi-Speed USB (2.0) Ports 4 Type-A SuperSpeed USB (3.0) Ports 2 Type-A PXI Trigger Bus Input/Output 1 SMB Installed Operating System Windows 10 Professional for Embedded Systems Electrical: Voltage (V) Current (Amps) Typical Current (Amps) Maximum +3.3 V 3.75 A 4.25 A +5 V 2.0 A 2.5 A +12 V 6.0 A 7.6 A -12 V 0 A 0 A +5 V Aux 0.75 A 0.8 A Physical: Board dimensions Four-wide 3U PXI Express module Slot requirements One system slot plus three controller expansion slots Compatibility Fully compatible with PXI Express Specification 1.0 Operating Environment: Ambient temperature range 0 °C to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Storage Environment:
Ambient temperature range -40 °C to 71 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.) Relative humidity range 5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Shock and Vibration:
Operating shock 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.) Random vibration Operating 5 Hz to 500 Hz, 0.3 grms (with solid-state hard drive) Nonoperating 5 Hz to 500 Hz, 2.4 grms (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Both Signal Generator and Analyser uses same software workflow making it easy to work across instruments for research and benchmarking purpose.
Supplied systems ensure future scalability. It should support Multiple software workflows possible. Easy to develop algorithms in LabVIEW, as well as integrating existing IPs from other environments, to target VSA & VSG hardware.
Supports 10 MHz to 6.6 GHz with 50 MHz analysis bandwidth Wide instantaneous bandwidth and supports RF list mode, which increases multiband measurement speed with fast and deterministic changes in configuration
Can be used as spectrum analyser or vector signal analyser, making it ideal platform for research and test applications.
can perform measurements for a broad range of communications standards such as GSM, EDGE, WCDMA, WiMAX, LTE, Bluetooth, WLAN
and also provides a low-cost solution to high-performance RF measurements. Current 2-channel phase-coherent MIMO configuration can be scaled to 4-channel within single chassis

Frequency
Frequency range 10 MHz to 6.6 GHz Tuning resolution 533 nHz

Equalized Bandwidth
Tuned Frequency Equalized Bandwidth
10 MHz to <120 MHz 10 MHz
120 MHz to <330 MHz 20 MHz
330 MHz to 6.6 GHz 50 MHz

Resolution Bandwidth
3 dB bandwidth Fully adjustable (<1 Hz to 10 MHz)

Window
60 dB : 3 dB Ratio Flat Top 2.5, maximum 7-term Blackman-Harris 4.1, maximum

Internal Frequency Reference
Frequency 10 MHz
Temperature stability ±1 × 10^-6, maximum (15 °C to 35 °C)
Aging per year ±5 × 10^-6, maximum
Initial achievable accuracy ±3 × 10^-6, maximum
<table>
<thead>
<tr>
<th>External Frequency Reference Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency 10 MHz ($\pm 10 \times 10^{-6}$) Peak-to-peak amplitude 0.2 V to 1.5 V into 50 Ω Input impedance 50 Ω Lock time to external reference 1 s, maximum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spectral Purity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase Noise</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuned Frequency Noise Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MHz $&lt;-125$ dBc/Hz</td>
</tr>
<tr>
<td>500 MHz $&lt;-112$ dBc/Hz</td>
</tr>
<tr>
<td>1 GHz $&lt;-105$ dBc/Hz</td>
</tr>
<tr>
<td>2 GHz $&lt;-98$ dBc/Hz</td>
</tr>
<tr>
<td>3 GHz $&lt;-95$ dBc/Hz 4 GHz $&lt;-93$ dBc/Hz 5 GHz $&lt;-90$ dBc/Hz 6.6 GHz $&lt;-90$ dBc/Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amplitude Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude range Average Noise Level to $+30$ dBm RF input attenuation 0 dB to 50 dB in 1 dB steps, nominal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Noise Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency 23 °C ± 5 °C 0 °C to 55 °C 10 MHz to $&lt;-155$ dBm/Hz; $&lt;-157$ dBm/Hz, typical $&lt;-154$ dBm/Hz; $&lt;-156$ dBm/Hz, typical 30 MHz to $&lt;-159$ dBm/Hz; $&lt;-163$ dBm/Hz, typical $&lt;-158$ dBm/Hz; $&lt;-162$ dBm/Hz, typical</td>
</tr>
<tr>
<td>120 MHz to $&lt;-155$ dBm/Hz; $&lt;-158$ dBm/Hz, typical $&lt;-154$ dBm/Hz; $&lt;-157$ dBm/Hz, typical 3.0 GHz to $&lt;-153$ dBm/Hz; $&lt;-156$ dBm/Hz, typical $&lt;-152$ dBm/Hz; $&lt;-155$ dBm/Hz, typical 5.0 GHz to 6.6 GHz $&lt;-151$ dBm/Hz; $&lt;-154$ dBm/Hz, typical $&lt;-150$ dBm/Hz; $&lt;-153$ dBm/Hz, typical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IF Rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuned Frequency Interference Frequency Level 10 MHz to $&lt;-75$ dBc 120 MHz to $&lt;-52$ dBc 330 MHz to 6.6 GHz 187.5 MHz $&lt;-52$ dBc Conditions: $-30$ dBm input signal; $-30$ dBm reference level; 0 dB attenuation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Input-Related Spurs (Residual Spurs)5</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 6.6 GHz $&lt;-100$ dBm, typical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sideband Spurs7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Sideband Spurs, $&gt;1$ kHz to $\leq$100 kHz Offset Tuned Frequency Level 10 MHz to $&lt;-65$ dBc 3.3 GHz to 6.6 GHz $&lt;-50$ dBc Conditions: 0 dBm input level; 0 dBm reference level; automatic attenuation settings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typical Sideband Spurs, $&gt;100$ kHz Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to $&lt;-75$ dBc 50 MHz to $&lt;-70$ dBc 3.3 GHz to 6.6 GHz $&lt;-65$ dBc Conditions: 0 dBm input level; 0 dBm reference level; automatic attenuation settings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical10 IF Amplitude Flatness, 23 °C ± 5 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuned Frequency Bandwidth Amplitude Flatness</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to $&lt;75$ MHz 5 Hz $\pm 0.25$ dB 10 MHz $\pm 0.3$ dB 75 MHz to $&lt;120$ MHz 5 MHz $\pm 0.4$ dB</td>
</tr>
<tr>
<td>10 MHz $\pm 0.6$ dB</td>
</tr>
<tr>
<td>120 MHz to $&lt;140$ MHz 5 MHz $\pm 0.45$ dB 10 MHz $\pm 0.65$ dB 20 MHz $\pm 0.9$ dB</td>
</tr>
</tbody>
</table>
4

RF Configuration List Mode Tuning Time
Nominal RF Configuration List Mode Tuning Time
Accuracy Tuning Time 15 0.1 × 10^-6 of final frequency, 0.1 dB of final amplitude 450 μs
0.01 × 10^-6 of final frequency, 0.1 dB of final amplitude 600 μs
Frequency Settling Time 16
Nominal Frequency Settling Time
Accuracy Frequency Settling Time 17 0.1 × 10^-6 of final frequency 1.5 ms
0.01 × 10^-6 of final frequency 6.5 ms
Amplitude Settling Time 18
Nominal amplitude settling time
Reference level step size 19 All
Accuracy 0.1 dB of final amplitude Amplitude settling time 20 50 μs, 5 ms

Input and Output Characteristics
IF/Baseband Resolution 16 bits System IF frequency range 187.5 MHz ± 25 MHz or 53 MHz ± 10 MHz
Sample rate 150 MS/s Digital downconverter (OSP) bandwidth Adjustable between 60 MHz and 0.9 kHz using 150 MS Sample clock timebase. Onboard memory 64 MB, 256 MB

85 MHz to 6.6 GHz frequency range
100 MHz instantaneous bandwidth
Current 2-channel phase-coherent MIMO configuration can be scaled to 4-channel within single chassis
Vector Signal Generators offer custom and standard modulation, as well as the ability to generate communications standards formats such as GPS, WCDMA, DVB-H, and more
They support quadrature digital up conversion, which reduces waveform download and signal generation time, as well as stream-to-disk capabilities.
The power and flexibility of Vector Signal Generators make them ideal for use in scientific research, communications, consumer electronics, aerospace/defense, and semiconductor test applications

Frequency Characteristics
Device Frequency Range
Frequency Range
50 MHz to 1.3 GHz 781261-0x 50 MHz to 3.3 GHz 781262-0x 50 MHz to 6.6 GHz 781263-0x
Bandwidth
Modulation bandwidth 1 (3 dB double sideband) >100 MHz
Tuning Resolution (PXIe-5650/5651/5652)
≤1.3 GHz 1 Hz >1.3 GHz to 3.3 GHz 2 Hz
>3.3 GHz to 6.6 GHz 4 Hz
Frequency Settling Time 2,3
Low Loop Bandwidth
Frequency Settling Time Median Tuning Speed (ms) Maximum Tuning Speed (ms) ≤0.1 × 10-6 of final frequency 1.5 6.5 ≤0.01 × 10-6 of final frequency 6.5 13

High Loop Bandwidth
Frequency Settling Time Median Tuning Speed (ms) Maximum Tuning Speed (ms) ≤1.0 × 10-6 of final frequency 0.2 1.0 ≤0.1 × 10-6 of final frequency 0.3 2.0 ≤0.01 × 10-6 of final frequency 1.0 10.0

Internal Frequency Reference (PXIe-5650/5651/5652)
Frequency 10 MHz Initial accuracy ±3 × 10-6 Temperature stability (15 °C to 35 °C) ±1 × 10-6, maximum Aging per year ±5 × 10-6, maximum

Internal Reference Output (PXIe-5650/5651/5652 REF IN/OUT and REF OUT2 Connectors)
Frequency 10 MHz Amplitude 1 Vpk-pk into 50 Ω Output impedance 50 Ω Coupling AC

External Reference Input (PXIe-5650/5651/5652 REF IN Connector)
Frequency 10 MHz ±10 ppm Amplitude 0.2 Vpk-pk to 1.5 Vpk-pk into 50 Ω Input impedance 50 Ω Lock time to external reference

External Reference Input (PXIe-5450/5451) Frequency 10 MHz Amplitude 1.0 Vpk-pk to 5.0 Vpk-pk into 50 Ω, nominal Input impedance 50 Ω Coupling AC

External Reference Output (PXIe-5450/5451) Frequency 10 MHz 10 MHz Reference Clock out 0.7 Vpk-pk into 50 Ω, nominal Output impedance 50 Ω Coupling AC

Spectral Purity
Single Sideband Phase Noise at 10 kHz Offset Frequency Phase Noise (dBc/Hz) 100 MHz <-125, typical 500 MHz <-111 1 GHz <-105 2 GHz <-98 3 GHz <-95 4 GHz <-93 5 GHz <-90 6.6 GHz <-90

Local Oscillator Feedthrough (Uncompensated)
< 3.3 GHz -100 dBm, typical
>3.3 GHz -100 dBm, typical

Baseband Linearity-Related Spurs (0 dBm RF OUT) 85 MHz to 250 MHz -51 dBc
> 250 MHz to 6.6 GHz -56 dBc

RF Output Characteristics
Power Range
Output Noise floor to +10 dBm, maximum PXIe-5673E resolution 0.1 dB, minimum
PXIe-5611 1 dB, typical PXIe-5673E amplitude settling time12

Voltage Standing Wave Ratio (VSWR)14
< -10 dBm output amplitude < 1.92:1, nominal
+10 dBm output amplitude < 2.2:1, nominal

Pulse Modulation
Rise time < 5 ns, typical
Fall time < 5 ns, typical
Pulse repetition frequency 50 MHz, maximum Pulse delay (PLS MOD to RF OUT Connector) 10 ns, typical Logic level 3.3 VTTL, nominal
PLS MOD input impedance 1 kΩ, nominal

On/Off Ratio
<1GHz >50 dBc, typical <3GHz >43 dBc, typical
≤6.6 GHz >30 dBC, typical

**Electrical**

AC Input
Input rating1: 100 to 240 VAC, 50/60 Hz, 15 - 7.5 A, 100 to 120 VAC, 440 Hz, 15 A
Operating voltage range2: 90 to 264 VAC
Nominal input frequency: 50 Hz/60 Hz/400 Hz
Operating frequency range4: 47 to 440 Hz
Efficiency: 85% typical

Over-current protection
Internal fuse in line
Main power disconnect
The AC power cable provides main power disconnect. Do not position the equipment so that it is difficult to disconnect the power cord. The front-panel power switch causes the internal chassis power supply to provide DC power to the PXI Express backplane. With the Timing and Synchronization upgrade, you also can use the rear-panel 15-pin connector and inhibit mode switch to control the internal chassis power supply.

**Protective Earth Terminal Wiring**

Grounding wire 2.1 mm² (14 AWG)
Ring lug #8
Protective earth terminal torque 1.13 N ⋅ m (10 lb ⋅ in.)

**DC Output**

DC output characteristics of the 
Voltage Rail
Maximum Current, Single Power Supply
Maximum Current, Dual Power Supplies
Load Regulation
Maximum Ripple and Noise (20 MHz BW)

+5V_AUX 4.2 A 4.2 A ±5% 50 mVpp +12 V 75 A 122 A ±5% 100 mVpp +5 V 21.5 A 21.5 A ±5% 50 mVpp +3.3 V 60 A 60 A ±5% 50 mVpp -12 V 1.3 A 1.3 A ±5% 50 mVpp

Maximum total available power, PXIe-1095 Single AC/DC power supply (786300-01) 900 W Dual AC/DC power supplies 1644 W

**Backplane Slot Current Capacity**

Slot +5 V V (I/O) +3.3 V +12 V -12 V 5 VAUX System Controller
Slot 15 A - 15 A 30 A - 3 A System Timing Slot - - 9 A 6 A - 1 A
Slot +5 V V (I/O) +3.3 V +12 V -12 V 5 VAUX PXI Express
Peripheral Slot - - 9 A 6 A - 1 A Hybrid Peripheral Slot with PXI-5
Peripheral - - 9 A 6 A - 1 A Hybrid Peripheral Slot with PXI-1
Peripheral 6 A 5 A 6 A 1 A 1 A –

Over-current protection
All outputs protected from short circuit and overload with automatic recovery

Over-voltage protection
+12 V, +5 V, and +3.3 V clamped at 20 to 30% above nominal output voltage

Power supply MTTR Replacement in under 1 minute

**Chassis Cooling**

Module cooling
Forced air circulation (positive pressurization)
through three 210 CFM fans
Module slot airflow direction
Bottom of module to top of module
Module intake
Rear of chassis
Module exhaust
Top of chassis
Slot cooling capacity 82 W
Secondary cooling


Minimum chassis cooling clearances: Above 44.45 mm (1.75 in.). Rear: 101.60 mm (4.00 in.). Sides: 44.45 mm (1.75 in.).

Environmental:
- Maximum altitude: 4,600 m (15,000 ft.), 570 mbar (at 25 °C ambient, high fan mode). Pollution Degree: 2.

Operating Environment:
- Ambient temperature range: When all modules require ≤58 W cooling capacity per slot, 0 °C to 55 °C (IEC 60068-2-1 and IEC 60068-2-2.5). Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit. When any module requires >58 W cooling capacity per slot, 0 °C to 40 °C (IEC 60068-2-1 and IEC 60068-2-2.5). Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 4 high temperature limit. Relative humidity range: 10% to 90%, non-condensing.

Storage Environment:

Shock and Vibration:
- Operational shock: 30 g peak, half-sine, 11 ms pulse (IEC-60068-2-27.). Meets MIL-PRF-28800F Class 2 limits. Operational random vibration: 5 to 500 Hz, 0.3 grms. Non-operating vibration: 5 to 500 Hz, 2.4 grms (IEC 60068-2-64.). Non-operating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.

Acoustic Emissions:
- Sound Pressure Level (at Operator Position): (Tested in accordance with ISO 7779. Meets MIL-PRF-28800F requirements.) 38 W Profile Auto fan (up to 30 °C ambient): 37.7 dBA. High fan: 56.6 dBA. 58 W/82 W Profile Auto fan (up to 30 °C ambient): 52.1 dBA. High fan: 66.2 dBA.
- Sound Power Level: 38 W Profile Auto fan (up to 30 °C ambient): 50.1 dBA. High fan: 67.8 dBA. 58 W/82 W Profile Auto fan (up to 30 °C ambient): 63.8 dBA. High fan: 78.0 dBA.

System Synchronization Clocks:
- Accuracy with OCXO (Timing and Synchronization option): ±80 ppb max within 1 year of calibration adjustment. Within 0 °C to 55 °C operating temperature range (after 24 hours of operation); ±50 ppb/year long-term stability (after 72 hours of operation). Maximum
The participating firms must quote all-inclusive delivery prices in INR, and the entire shipment must be insured from the manufacturer's warehouse to the installation site at IISc.

Important: Please note that the system should match all technical specifications listed above and be shown to be manufactured within India.

The documents may be addressed to,

The Chairman,
Electrical communication Department
Indian Institute of Science,
Bangalore 560012.

The last date for submission of bids is 11th April 2022.

For Further enquiries contact,
Dr Sudhan Majhi
Associate Professor
ECE Dept.
IISc Bangalore -560012
smajhi@iisc.ac.in