

**DEPARTMENT OF ELECTRICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY, KANPUR
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Enquiry No. EE/NNAIK/ET/17/01/2012

Enquiry Date: 17/01/12

Closing Date: 24/1/12

Contact Person: Dr Naren Naik (nnaik@iitk.ac.in)

The following items are required for configuring a tomographic imaging instrumentation with criteria of mutual compatibility and functional integration, and additional LabVIEW based operability and programmable parameters by IEEE488 bus implementation protocol. Vendors of proven technical expertise in the technology of the following items are hereby invited to submit their quotations for any or all of the items below in response to this indent. The items are:

1. PXI Controller

- a. Processor: 2.66 GHz dual-core Intel Core i7-620M processor (3.33 GHz maximum in single-core, Turbo Boost mode)
- b. Hard disk: 120 GB, 7200 rpm high-performance hard-drive standard
- c. RAM: 2 GB (1 x 2 GB DIMM) dual-channel 1066 MHz DDR3 RAM standard
- d. Two 10/100/1000BASE-TX (Gigabit) Ethernet, 4 Hi-Speed USB, ExpressCard/34, GPIB, serial, and other

2. PXI Chassis

- a. Number of Slots: 8 (1 Controller slot and 7 PXI slots)
- b. System Bandwidth: 132 MB/s
- c. AC Power Supply, 500W total available power
- d. Low 43 dBA acoustic emissions

3. Dynamic Signal Acquisition PXI Module

- a. Two simultaneously updated analog outputs at up to 204.8 kS/s
- b. Two simultaneously sampled analog inputs at up to 204.8 kS/s
- c. Software-configurable AC/DC coupling, IEPE conditioning
- d. 24-bit resolution ADCs and DACs with 118 dB dynamic range
- e. Variable antialiasing and anti-imaging filters
- f. Six gain settings for input ranges from ± 316 mV to 42.4 V
- g. I/O Connector: SMB female , BNC connectors
- h. Triggering: Digital , Analog

- i. Minimum Voltage Range Sensitivity: 37.7 nV
- j. BNC Male (plug) to BNC Male (plug) cables, 2m, 4 pack to be supplied with DSA module

4. PXI Switch/Matrix Module

- a. 4x128, 8x64, dual 4x64, and dual 8x32 (1-wire) matrix configurations
- b. 2,000 crosspoints/s
- c. Up to 60 VDC/60 Vp or 500 mA
- d. 512-crosspoint matrix switching in a single 3U PXI slot
- e. 10 MHz bandwidth
- f. Relay Type: Reed
- g. Thermal EMF: 50 μ V
- h. Maximum Switching Power: 10W
- i. Appropriate Terminal Block should be supplied with the PXI Module
- j. MCX Plug to MCX Plug

5. PXI Digitizer

- a. Number of Channels: 2
- b. Resolution: 8 bits
- c. Simultaneous sampling at 2 GS/s
- d. Random Interleaved Sampling rate: 20 GS/s
- e. Bandwidth: 300 MHz
- f. Input impedance: 50 Ohm, 1 MOhm
- g. On-board memory: 8 MB/channel (8 Mega-samples/channel)
- h. Maximum Voltage: -5 V, 5 V
- i. Minimum Voltage: -50 mV, 50 mV
- j. Minimum Voltage Range sensitivity: 390 μ V
- k. I/O Connector: SMB Male, BNC Connectors
- l. Triggering: Analog, Digital

6. AC and DC Current Source and Arbitrary Function Generator

The following instruments are required for the setup:

1. Range: 2 nA – 100 mA
2. Output Resistance: greater than 10^{14} Ω
3. Output Capacitance: less than 10 pF
4. Voltage Limit (Compliance): Bipolar range; minimum 0.1 V, maximum 105 V. Should be programmable in steps.

5. Maximum Output Power: greater than 10 W, for four quadrant source or sink operation.
6. Guard Output Accuracy: as high as possible.
7. Program Memory: at least 64,000 data points.
8. Maximum Trigger Rate: 1000 samples/s
9. Waveform's output: Sine, square, ramp and other user-programmable arbitrary waveforms.
10. Frequency range: 1 mHz – 100 kHz.
11. Accuracy: Better than or equal to 100 ppm.
12. Sample Refresh Rate: 10 Mega-samples/s.
13. Amplitude: Range – minimum 4 pA, maximum 200 mA peak-to-peak into loads up to $10^{12} \Omega$.
14. Amplitude Resolution: 16 bits including sign.
15. Output Sine Wave Amplitude Flatness: less than 1 dB up to 100 kHz.
16. Output Square Wave Amplitude Overshoot: not exceeding 2.5 %.
17. Output Square Wave Variable Duty Cycle: with 0.01 % programming resolution, minimum 1 μ s pulse duration.
18. Output Square Wave RMS Jitter: not more than 0.1 % of period.
19. Output Ramp Wave Linearity: less than 0.1 % of peak output up to 10 kHz for 20 mA range.
20. Output Arbitrary Waveform Characteristics:
 - a. Minimum length: 2 k sample points.
 - b. Maximum length: 64 k sample points.
 - c. RMS Jitter: 0.1 % of period.
21. Programmable Parameters: by IEEE488 bus implementation.

7. Programmable Current to Voltage Converter

The following instruments are required for the setup:

1. Current to Voltage Conversion Gain Setting Range: minimum 10^4 V/A, maximum 10^{11} V/A.
2. DC Input Resistance Range: less than 0.6Ω at minimum gain, to less than $100 \text{ k}\Omega$ at maximum gain.
3. Input Voltage Burden: less than $200 \mu\text{V}$ for input currents up to $100 \mu\text{A}$, and less than 10 mV for inputs exceeding $100 \mu\text{A}$.
4. Input Maximum Overload: must be limited at 10 mA .
5. Voltage Output Range: $\pm 10 \text{ V}$.
6. Output Impedance: less than 100Ω for frequency range DC to 175 kHz .
7. Low Pass Filter: programmable range $10 \mu\text{s} - 300 \text{ ms}$.
8. Low Pass Filter Attenuation: 12 dB/octave .
9. Noise RMS: 90 nA at gain 10^4 V/A , and 1.2 fA at gain 10^{11} V/A .
10. Temperature Coefficient: $20 \mu\text{V}/^\circ\text{C}$.
11. Programmable Parameters: by IEEE488 bus implementation.

8. PXI Precision SMU

- a. $\pm 100 \text{ V}$, four-quadrant output at up to 2 W
- b. 10 pA measurement resolution on the $10 \mu\text{A}$ range
- c. Update Rate: 4.2 kS/s
- d. Resolution: 24 bits
- e. Ch-Earth Ground Isolation
- f. Typical sensitivity better than 100 pA at rates up to 1 kHz
- g. Remote (4-wire) sense capability
- h. External guard terminals
- i. Onboard hardware sequencing engine and PXI triggering capability

9. PXI DMM and LCR Meter

- a. Measurements of voltages and currents up $\pm 300 \text{ VDC}$ and $\pm 1 \text{ ADC}$
- b. Measurement rates -- $6\frac{1}{2}$ digits at 100 S/s , $5\frac{1}{2}$ digits at 3 kS/s
- c. 1.8 MS/s isolated, high-voltage waveform acquisition
- d. 10 to 23 -bit flexible resolution
- e. Input Impedance: 10 GOhm , 10 MOhm , 1 MOhm
- f. Minimum Voltage Range Sensitivity: 100 nV
- g. Minimum Inductance Range Sensitivity: 1 nH
- h. Minimum Capacitance Range Sensitivity: 0.05 pF

- i. Minimum Current Range Sensitivity: 10 nA
- j. Minimum Resistance Range Sensitivity: 100 μ Ohm

Please send your offer (in an original signed in sealed envelope with an advance intimation of the same by e-mail to Dr Naren Naik at the address mentioned below) for any or all of the above items mentioning the following:

1. Cost of the item with technical specifications in detail.
2. Warranty period.
3. Delivery time.
4. Educational discount applicable considering end use for research and teaching.
5. Payment terms (please mention the cost and actual applicable freight separately).
6. Proprietary Certificate, if applicable.
7. Any other relevant details .

A reply latest by 24 January 2012 is requested and the offer may be sent to:

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