



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY  
MATERIALS MANAGEMENT DIVISION**

PR NO. 1000051490

RfX No. 6100002624

**Noise Analyzer and Pulse Waveform Generator -1 Unit each  
Technical Specifications**

Sr. No.	Description	Value / Range	Technical Compliance (YES / NO)	Additional Information (if any)
<b>1. Noise Analyzer</b>				
1.A	<b>Hardware</b>			
1.A.1	Measurement Capabilities	1.A.1. a) 1/f Noise 1.A.1. b) Random Telegraph Noise (RTN)		
1.A.2	Measurement Frequency Range	0.03 Hz to 100 MHz		
1.A.3	Maximum Bias Voltage	200 V		
1.A.4	Maximum Bias Current	0.1 A		
1.A.5	Minimum Measurable Current	30 pA		
1.A.6	Minimum Noise Density	$1 \times 10^{-28} \text{ A}^2/\text{Hz}$		
1.A.7	Low-Noise Amplifier Type	Voltage Amplifier		
1.A.8	Full-Band Amplifier Noise Floor	$0.56 \text{ nV}/\sqrt{\text{Hz}}$		
1.A.9	Resistor values (RSOURCE/ RLOAD)	10 $\Omega$ to 100 M $\Omega$		
1.A.10	Number of Resistors (RSOURCE/RLOAD)	23 / 23		
1.A.11	Minimum RTN Sampling Interval	2 ns		
1.A.12	Maximum RTN Points	16,777,216 ( $2^{24}$ )		
1.A.13	Device Types Supported	FETs, BJTs, Diodes, Resistors, and Circuits		
1.A.14	Interface for connecting Source Measurement Units for DC-IV			
1.A.15	Parallel measurement at multiple frequencies to save time			
1.B	<b>Software</b>			
1.B.1	Enables automated characterization of semiconductor devices			
1.B.2	Automation & Integration	1.B.2.a) Turnkey drivers for over 50 instruments. 1.B.2.b) Automated wafer prober control for probers from reputed manufacturers. 1.B.2.c) Integrated wafer map synchronization. 1.B.2.d) Guided system calibration procedures.		

1.B.3	Measurement Capabilities	1.B.3.a) DC-IV, 1/f noise, RTN 1.B.3.b) Supports low frequency noise analyzer module for DC, 1/f noise, and RTN measurements. 1.B.3.c) Flexible hardware averaging for throughput vs. accuracy trade-offs.		
1.B.4	Programming & Customization	1.B.4.a) Python 3 and PEL support for custom measurement routines. 1.B.4.b) Extensive library of example algorithms. 1.B.4.c) Data export to ASCII or SQL formats. 1.B.4.d) Compatible with ICCAP and MBP modelling platforms.		
1.C	<b>Installation &amp; Training</b>	1.C. a) At least 1 day for assembly and installation 1.C. b) At least 1 day for comprehensive training		
1.D	<b>Warranty</b>	1.D.a) One year for hardware support 1.D.b) One year for software support		
1.E	<b>Acceptance Criteria</b>			
1.E.1	Installation and Qualification	Installation and on-site qualification of the system by the OEM (Original Equipment Manufacturer).		
1.E.2	Training	1.E.2.a) On-site operational training for two engineers, covering system operation, maintenance, and basic troubleshooting. 1.E.2.b) Training shall be provided by the OEM authorized/certified skilled personnel.		
1.E.3	Tool Performance Verification	1.E.3.a) Data on standard reference factory devices is repeated on-site with a repeatability error of 5-10 % w.r.t factory data. 1.E.3.b) The vendor also demonstrates measurement on a user-provided device on-site within the specs of the tool. 1.E.3.c) The vendor also demonstrates accurate measurements for various features of the purchased tools on-site.		

1.E.4	Site Acceptance Test (SAT)	The system must undergo SAT at the IITB site, replicating the factory acceptance test parameters as per following.		
1.E.4.a)	SAT for Noise Analyzer	<p>The vendor demonstrates automated and manual 1/f noise measurements and RTN measurements on standard MOSFETs, diodes, and circuit devices (provided by vendor/OEM) across complete frequency range along with DC-IV through integration with parametric analyzer.</p> <p>Vendor demonstrates complete automation capabilities of the software valid up to the scope of pre-installed system. To verify repeatability, the vendor performs the measurements on the standard devices on-site and shows that the data matches factory data with an error of &lt;5-10 %. The vendor also demonstrates measurements on a user-provided device on-site within the specs of the tool.</p>		

**2. Pulse Waveform Generator**

2.A	<b>Mainframe</b>			
2.A.1	Should have at least 10 slots for Parametric Analyzer measurement units			
2.A.2	Should have convenient user interface with windows operating system and inbuilt touch screen 15 inch display			
2.A.3	Should have capability to sweep the source using the scroll knob on the instrument enabling real time device characterization			
2.A.4	Built in Memory should be available			
2.A.5	The instrument software/firmware should have both offline and online capability			
2.A.6	The software/firmware should be capable to control the instrument from external PC			
2.A.7	Interface for remote control	USB, GPIB, LAN		
2.A.8	Should have readymade setups for most commonly used setups	<p>Should at least include</p> <p>2.A.8.a) Id-Vg, Id-Vd, HFCV at multiple frequencies, QSCV for CMOS</p> <p>2.A.8.b) Reliability tests like NBTI/PBTI</p>		

2.A.9	Included units and cables	<p>2.A.9.a) 4x source measurement units with specifications as mentioned in point 2.A.7.</p> <p>2.A.9.b) 2x 2-channel integrated waveform generation module/measurement units with specifications as mentioned in point 2.A.8.</p> <p>2.A.9.c) At least 3m long cables with 3-lug Triax termination (floating guard) for connection to probe station.</p> <p>2.A.9.d) Synchronization cable for synchronization between waveform generation modules.</p>		
2.A.10	Ground Unit	A separate ground unit should be available with at least 4 A sink current.		
2.A.11	Mainframe & chassis should be compatible with existing medium power/high resolution source measurement units and multi-frequency capacitance measurement units. Integration of these existing units in the mainframe should be considered along with calibration.			
2.A.12	Upgradability	<p>2.A.12.a) Should allow upgrading with more measurement units if empty slots are available.</p> <p>2.A.12.b) Must be upgradable to 10 kV and 1500 A or more in future using the same mainframe.</p>		
2.B	<b>Source measurement units Specifications</b>			
2.B.1	Maximum voltage range and resolution	$\pm 100$ V with measure resolution of 100 $\mu$ V with at least 20 mA of current at 100 V		
2.B.2	Maximum current range and resolution	100 mA with measure resolution of 100 nA		
2.B.3	Minimum current range and resolution	10 pA with measure resolution of 1 fA		
2.B.4	Pulse width range for pulsed measurement	500 $\mu$ s to 2 s		
2.B.5	Maximum Guard Capacitance	<1000 pF		
2.C	<b>Integrated waveform generation module/measurement units Specifications</b>			
2.C.1	Capable of doing PBTI and NBTI reliability measurements			
2.C.2	Capable of generating any waveform patterns using internal arbitrary linear waveform generator			
2.C.3	No. of channels	2		
2.C.4	Voltage force range	Up to 10 V with 0 Ohm source		
2.C.5	Waveform Timing Resolution	10 ns minimum		
2.C.6	Minimum pulse width	100 ns		

2.C.7	Minimum current range	1 uA		
2.C.8	Minimum current resolution	2 nA		
2.C.9	Sampling Rate	200 MSa/s		
2.D	<b>Overall Warranty</b>	1 year		
2.E	<b>Acceptance Criteria</b>			
2.E.1	Installation and Qualification	Installation and on-site qualification of the system by the OEM (Original Equipment Manufacturer).		
2.E.2	Training	2.E.2.a) On-site operational training for two engineers, covering system operation, maintenance, and basic troubleshooting. 2.E.2.b) Training shall be provided by the OEM authorized/certified skilled personnel.		
2.E.3	Tool Performance Verification	2.E.3.a) Data on standard reference factory devices is repeated on-site with a repeatability error of 5-10 % w.r.t factory data. 2.E.3.b) The vendor also demonstrates measurement on a user-provided device on-site within the specs of the tool. 2.E.3.c) The vendor also demonstrates accurate measurements for various features of the purchased tools on-site.		
2.E.4	Site Acceptance Test (SAT)	The system must undergo SAT at the IITB site, replicating the factory acceptance test parameters as per following.		
2.E.4. a)	SAT no. 1 for Pulse Waveform Generator	The vendor/OEM transfers a source measurement unit and a capacitance measurement unit from the installed parametric analyzer to the new parametric analyzer and performs calibration on both systems. The vendor demonstrates the change/improvement in performance of the calibrated and transferred units using both standard devices (provided by vendor/OEM) and user-provided devices.		

<p>2.E.4. b)</p>	<p>SAT no. 2 for Pulse Waveform Generator</p>	<p>The vendor demonstrates the noise floor of the parametric analyzer and source measurement units is of the order of the measurement resolution or better. The vendor demonstrates all the application tests in the software library on standard devices (provided by vendor/OEM) with stable and reliable measurements. To verify repeatability, the vendor performs the measurements on the standard devices on-site and shows that the data matches factory data with an error of &lt;5-10 %. The vendor also demonstrates measurements on a user-provided device on-site within the specs of the tool.</p>		
<p>2.E.4. c)</p>	<p>SAT no. 3 for Pulse Waveform Generator</p>	<p>The vendor demonstrates generation of arbitrary waveform patterns including standard AC and DC pulse trains, along with high-speed IV measurements. The vendor demonstrates 1/f noise and RTN measurements, with comparison to the measurements from noise analyzer. The vendor performs BTI reliability tests on standard MOSFETs and stability tests on standard memory devices (provided by vendor/OEM). To verify repeatability, the vendor performs the measurements on the standard devices on-site and shows that the data matches factory data with an error of &lt;5-10 %. The vendor also demonstrates measurements on a user-provided device on-site within the specs of the tool.</p>		