INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai 400076.

PR No. 1000049255 **Rfx No. 6100002321**

Technical Specifications of Signal Analyser and Signal Generator

SECTION- A (Features and Specifications of the equipment to be purchased)

Item - 1: Signal Analyser [Qty-1]

S. No.	Parameter	Technical Specifications	Technical Compliance (Yes / No)	Additional Information (if any)
1	Frequency range	9 kHz to 43.5 GHz or better		
2	No. of sweep points	25000 or better		
3	Aging Rate:	±1 × 10–7/ year or better		
4	Temp characteristics	±1 × 10–7 or better (0°C to 50°C)		
5	**Bandwidth:**			
	a) Analysis BW	120 MHz or better		
	b) Resolution Bandwidth:	1 Hz to 10 MHz or better		
	c) Video Bandwidth:	1 Hz to 10 MHz or better		
6	Phase Noise @ 1 GHz (typical)	1 kHz Offset: –116 dBc/Hz or better 10 kHz Offset: –122 dBc/Hz or better 100 kHz Offset: -122 dBc/ Hz or better 1 MHz Offset: –135 dBc/Hz or better 10 MHz offset: -148 dBc/ Hz or better		
7	TOI (Third Order Intercept) of Instrument	up to 40 GHz: +12 dBm or better		

8	Sweep Time	1 ms to 1000s (Span ≥ 300 Hz) or better 1 µs to 1000s (Span: 0 Hz) or better		
9	Detector	Normal, Positive Peak, Negative Peak, sample, RMS, Average		
10	Pre-amplifier	Frequency range up to 40 GHz or more		
11	Trigger	Free run, Video, External, periodic time		
12	Level Measurement Range- Maximum Input Level	DANL to +30 dBm		
13	Total measurement uncertainty or deviation	f = 10 GHz: ±2 dB or lesser f = 25 GHz: ±3 dB or lesser f = 43.5 GHz: ±3.5 dB or lesser		
14	DANL [Pre-amplifier OFF]	f = 10 GHz: –148 dBm or better f = 25 GHz: –142 dBm or better f = 34 GHz: –140 dBm or better f = 40 GHz: –136 dBm or better f = 43.5 GHz: –136 dBm or better		
15	DANL [Pre-amplifier ON]	f = 10 GHz: –162 dBm or better f = 20 GHz: –160 dBm or better f = 40 GHz: –155 dBm or better f = 43.5 GHz: –148 dBm or better		
16	Input Connector	2.92/2.4mm male, SMA, BNC 50 Ohm or equivalent		
17	Input VSWR [for >10dB input attenuation] up to 40 GHz	≤ 2.2 (typ.)		
18	Attenuator Range	0 to 60 dB at least 2 dB steps or better		
19	External Reference Input	10 MHz or better		
20	Reference Output	up to 10 MHz		
21	Phase Noise Measurement	Frequency Range: 10 MHz to upper frequency range Offset Frequency: 10 Hz to 10 MHz - Marker Mode should be available		

		- Ability to perform phase noise (close-in and far-out) analysis of free-running frequency sources and signal jitter analysis		
22	Vector Signal Analysis software	BPSK, QPSK, O-QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2FSK, 4FSK, 2ASK, 4ASK, MSK, 16APSK, 32APSK or more options		
23	Noise Figure Measurement	Measurement method of Y Factor with Noise Source should be available till max. 40 GHz		
24	Noise Source	ENR: 10 to 17 dB or better VSWR : up to 1.6 - Necessary adapters should be provided for 2.92 mm and SMA compatibility		
25	Accessories	Accessories, whichever is applicable for the external interfacing including 2.4mm/ SMA/ 2.92 mm cables [1 mtr], 2.92 mm port adapter [with male/female output], should be included in the quote. **Instrument dust cover and rubber caps for all the connectors should also be provided.**		
26	Firmware updates	Should be provided free-of-cost during the equipment lifetime		
27	Operating Temperature Range	Operating: 0° to +50°C		
28	Power	Mains input 230 V AC, 50 Hz (nominal). Provide Indian standard mains cord		
29	EMC	Should be complied with all the necessary EMC standards		
30	Data Storage	SSD 64 GB or more		
31	Interfaces	LAN: 10/100/1000BASE-T GPIB: 24-pin Amphenol female USB: 7 ports, type A plug External monitor: DVI-D, DisplayPort or HDMI		
32	Instrument type	Bench top Instrument with internal PC and Windows 10 or better		
33	Display	8 - 12 inches or more Color display		

34	Manuals	Programming manual, Operating Manual & Service Manuals [Softcopy and/ or hardcopy]		
35	Calibration certificate	Calibration Certificate with Test Data should be provided.		
36	Warranty	1-year warranty for the entire setup. The manufacturer should provide the certificate for the genuineness of the warranty and service centers in India. **At least one more free-of-cost, post-installation NABL accredited calibration should be done within 3 years duration.**		

Item-2: Signal Generator- 40 GHz [Qty. 1]

S. No.	Parameters	Technical Specifications	Technical Compliance (Yes / No)	Additional Information (if any)
1	Frequency Range	9 kHz to 40 GHz or better		
2	Minimum Output Power Level range: (80 MHz to 10 GHz) (10 GHz to 40 GHz)	 -120 dBm to 17 dBm or higher -120 dBm to 14 dBm or higher		
3	Output Power level accuracy	Within ± 1.5 dB or better		
4	Frequency Resolution	≤ 0.001 Hz		
5	Power Resolution	≤ 0.01 dB		
6	Spectral Performance: Harmonics @+10dBm or higher (200 kHz ≤ Freq. ≤ 2 GHz or better)	≤ -28 dBc		
7	Spectral Performance: Harmonics @+10dBm or higher (2 GHz ≤ Freq. ≤ 40 GHz)	≤ -50 dBc		
8	Spectral Performance: SSB Phase Noise at 10 kHz Offset @100 MHz	≤ -128 dBc		
9	Spectral Performance: SSB Phase Noise at 10 kHz Offset @1 GHz	≤ -128 dBc		

10	Spectral Performance: SSB Phase Noise at 10 kHz Offset @10 GHz	≤ -108 dBc		
11	Spectral Performance: SSB Phase Noise at 10 kHz Offset @20 GHz	≤ -105 dBc		
12	Spectral Performance: SSB Phase Noise at 10 kHz Offset @40 GHz	≤ -98 dBc		
13	Non- Harmonics	≤ -50 dBc over all frequency ranges		
14	Internal Reference Oscillator: Time base Aging	Aging Rate: ≤ 5 x 10^{-7} / year		
15	Output impedance	50 Ohm (nominal)		
16	Internal Reference Oscillator: Time base reference Freq.	10 MHz (Input / Output) required		
Modulation schemes [Additional Features]				
17	Amplitude Modulation (AM), modulation source	Internal & external		
18	Frequency range for Amplitude modulation	DC to 50 kHz (nominal) or better		
19	Frequency Modulation (FM), modulation source	Internal & external		
20	Frequency range for Frequency modulation	DC to 7 MHz or better		
21	FM Maximum deviation	100 MHz, wide band		
22	Phase Modulation (PM), modulation source	Internal & external		
23	Frequency range for Phase modulation	DC to 7 MHz or better		
24	Phase Deviation range for Phase modulation	0-640 rad or better		
25	Frequency range of Internal Modulation Generator (LF)	0.1 Hz to 10 MHz or better for sinusoidal 0.1 Hz to 1 MHz or better for triangle, ramps or trapezoid		
26	Resolution of frequency setting for Internal Modulation Generator (LF)	At least 0.1 Hz		
27	Pulse Modulation, modulation source	Internal & external		
28	Pulse signal generation with min. pulse width duration	At least 100-150 ns with 10-15 ns or better rise/ fall time for > 2 GHz frequency		

29	Pulse Repetition Frequency (PRF) range	DC to 10 MHz or better		
30	Computer interface	Remote control interface using GPIB, USB and/ or LAN		
31	Firmware updates	Should be provided free-of-cost during the equipment lifetime		
32	Accessories	Accessories required for the external interfacing including SMA/ 2.92 mm cables [1 mtr], 2.92 mm port saver adapter [with male/female output] should be included in the quote. **Dust cover should also be provided with Instrument.**		
33	Display	At least 5" color display, with touch screen		
34	Operating temp range	0°C To 50°C		
35	Manuals	Calibration certificate, programming manual, Operating Manual & Service Manuals [Softcopy and/ or hardcopy]		
36	Input Power	Mains input 230 V AC, 50 Hz (nominal). Provide Indian standard mains cord		
37	Warranty	3 years warranty, (if standard warranty is 1 year, then it is mandatory to quote for additional 2 years warranty) for the entire setup The manufacturer should provide the certificate for the genuineness of the warranty and service centers in India. **At least one more free-of-cost post-installation NABL accredited calibration should be done within warranty period**		

SECTION – B (Additional requirements from the prospective supplier)

1) Tenderers should provide:

a) Complete technical specifications, make, model of each equipment, necessary parts and accessories of the equipment as mentioned in the tender document.

b) Soft copy of the technical brochures and website reference of the same must be included in the bid.

c) A local service/ maintenance center with the availability of the spares in India. A declaration from the manufacturer stating that the service support/ spares will be made available for the equipment for at least 5 years from the date of installation.

d) A copy of the Authorization Certificate issued by the Original Equipment Manufacturer (OEM). The certificate must be up-to-date. A letter in the official letterhead of the OEM declaring the Indian supplier as their authorized agency to bid containing the official Tender enquiry number must be included with the technical bid.

2) The tenderer should have a minimum 03 (three) years of experience in supplying and successful installation of the equipment of similar specifications and should provide references (installation sites) from premier Institutes in India or abroad (preferably [not mandatory] Government Organizations in India).

3) The tenderer should provide at least 3 nos. of soft copies of PO (not older than 3 years) of similar or higher specification supplied within India (at least ONE from premier Government Institution or Government organization or PSU in India).

4) A duly signed detailed User List (at least 3 nos.) with the concerned person's valid contact details in India where the instrument is still in the operational condition must be provided.

5) A duly signed separate compliance sheet of the specification (at every point) mentioned in the technical part (Section-A of the document) along with the deviation (if any). **This compliance sheet will not be considered as the technical specification of the instrument.**

6) Each bidder has to mandatorily quote for all the items as mentioned in the tender document. **Partial Submission of bid is not permitted. Bidders should apply for all items and accessories.**

7) Only New Equipment is to be Quoted (No Quote for Refurbished equipment). All the equipment should be supplied with the necessary accessories, starter-kit to start using the equipment.

8) If the Technical committee member feels that offline demonstration is necessary in line with the technical specification then vendor will have to give offline demonstration of the quoted model with all the options and accessories which will be informed in advance.

9) Tenderers should state categorically whether they have fully trained technical staff with certification from OEM for installation/ training of the equipment. Free-of-cost, on-site satisfactory installation/ commissioning and handover of the equipment should be completed within 7-days from the date of receipt of the material at the Institute premises or within the time as may be extended by IIT Bombay.

10) After-sales service support for repair/ replacement of non-functional parts should be available in India (including all services under warranty).

11) Manufacturer should have NABL Accredited Service and Calibration Centre in India to provide service during warranty period and after-sales.

12) Warranty will commence from the date of the satisfactory installation of the equipment and the tenderer should give the warranty declaration.

13) Please note that the equipment and accessories have to be supplied and installed at IIT Bombay by the same tenderer to ensure guaranteed operation, technical support/service during warranty period and after-sales calibration/ repairs/ maintenance.

14) All the necessary consumables, tools/ accessories of the equipment should be supplied at the time of delivery and should be available in India for future maintenance/ procurement.