Annexure-A

Part A.1: Technical Specifications – Vector network analyzer (VNA)

S. No.	Parameter	Required Specifications
1	Frequency Range	100 KHz to 26.5 GHz
2	Frequency resolution	1 mHz or better
3	Number of Ports	2 or more
4	Measurements Capability	i) Full 2-Port S-Parameters ii) Measurement Capabilities - VSWR, return loss, Smith Chart, Insertion Loss/Gain, Group Delay iii) Phase matching measurements iv) Amplitude matching measurements v) Z-Parameters, Y-Parameters vi) Wave quantities, Wave Ratios vii) Sweep type - Linear, Log, Power, CW, Segmented viii) Stability factor
5	DC Voltage Inputs	i) 2 Ports or more with BNC Female Connector at Front/Rear Panel of VNA ii) Voltage Range: ±20 V, ±3 V, ±0.3 V iii) Measurement Accuracy: 2 % of reading ± 0.02 V iv) Input impedance: 1 Mohm or Better
6	Connector type	ruggedized 3.5 mm Male,50 Ohms
7	Output Power	100 KHz to 10 GHz: +7 dBm 10 GHz to 20 GHz: +5 dBm 20 GHz to 26.5 GHz: 0 dBm
8	Minimum settable power	-30 dBm full frequency range
9	Aging Rate	± 1 ppm/year
10	Temperature Drift (+5 to 40 °C)	± 1 ppm
11	Initial Calibration accuracy	± 0.5 ppm
12	IFBW	1 Hz to 1 MHz
13	Number of measurement points	1 to 1,00,001
14	Acquisition Time Per Point,1 MHz Measurement Bandwidth in CW Mode	3 us or better
15	Dynamic Range 10 MHz to 26.5 GHz	110 dB or better
16	Harmonics	-25 dBc typ

17	Trace Noise Magnitude (10 kHz IF BW) 10 MHz to 26.5 GHz	0.006 dB or better
18	Trace Noise Phase (10 kHz IF BW) 10 MHz to 26.5 GHz	0.05° or better
19	Power level linearity (source power ≥ – 30 dBm)	≤ 1 dB below 20 GHz ≤ 2 dB above 20 GHz
20	Maximum Nominal Input level	+10 dBm or better
21	Raw Load Match 10 MHz to 26.5 GHz	> 15 dB
22	Interfaces	USB, LAN, HDMI, Display Port
23	Damage input power level	> +27dBm RF, 30 VDC
24	Reference Frequency	Ref In: 1 MHz to 20 MHz -10 dBm to +10 dBm Ref Out: 10 MHz +5 dBm to 10 dBm
25	Internal Bias Tee	BNC Female 30 V, 250 mA
26	Display	12.1" Touch screen colour display
27	Operating System	Windows Based
28	Supply Voltage	230V AC, 50 Hz
29	Control languages	SCPI; Automatic recording of SCPI commands is preferable so that it simplifies automation procedures
30	Accessories Required	1) Phase Stable Cable Assy compatible to VNA on one side and 3.5 mm(M) on other side with return loss < 14 dB & Cable loss < 1.6 dB for each port 2) 3.5 mm Female (SOLT) Mechanical Calibration Kit
31	Warranty	01 Year (minimum)
32	Future Upgradable	Mixer Measurements, Time Domain Analysis

Part A.2: Technical Specifications – Vector signal generator (VSG)

Sl.No	Parameter	Specifications
1	Frequency Range	10 MHz to 12.5 GHz
2	Frequency Resolution	0.001 Hz
3	Frequency Settling time	< 1 ms in List mode
4	Output power level	-120 dBm to +18 dBm
5	Level Accuracy	≤ 1.2 dB

6	Output impedance & Connector	50 Ω & 2.92 mm
7	Maximum reverse power	+27dBm, 30 VDC
8	Spectral purity	Harmonics: < -30 dBc
		Non-Harmonics > 10 KHz offset -80 dBc @ 1 GHz -75 dBc @ 3 GHz -65 dBc @ 12 GHz
9	SSB phase noise@20 KHz offset	-125 dBc/Hz @ 100 MHz
		-125 dBc/Hz @ 1 GHz
		-112 dBc/Hz @ 6 GHz
		-108 dBc/Hz @ 10 GHz
10	**I/Q Modulation**	
	Operating modes	External I/Q, Internal Baseband Generator
	RF Modulation Bandwidth	External Wideband I/Q Inputs F > 2 GHz: ± 500 MHz or better
	I/Q Input & Output	Should have provision for BNC Connector
11	**Internal baseband generator**	
	Modulation bandwidth	120 MHz upgradable to 1 GHz
	Baseband waveform memory	64 Msa or better
12	**Multi Carrier Waveform Mode**	
	No. of Carriers	Up to 400
	Total RF Bandwidth	120 MHz or better
	Frequency, Amplitude & Phase	Should have provision to define arbitrary values
	Arbitrary Waveforms	Should have provision to input different waveform files for each carrier
	Carrier Spacing	Depend on No. of Carriers and Bandwidth
13	**Real time Custom modulation**	
	Types of Modulation	ASK, FSK, BPSK, QPSK, pi/4 QPSK, QPSK 45° offset, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 1024QAM, 4096QAM
	Filter Types	Cosine, Root Cosine, Gaussian
	Data Source	PRBS 9, 11, 15, 21, 23 Pattern: up to 64 Bit User defined lists
14	5G NR Signal Generation	To be able generate 5G NR Signal as per 3GPP Standards and updated in real time
15	Aging Rate	0.1 ppm/year
16	External reference Input & Output	10 MHz, BNC Female
17	**Sweep**	
	Mode	Step sweep of frequency or amplitude (start to stop)

		List sweep of frequency or amplitude (arbitrary list)
	Sweep Range	Frequency Sweep: Within instrument frequency range Amplitude Sweep: within attenuator hold range
	Dwell time setting range	5 ms to 100 s
	Triggering	Auto, external, single
18	Interfaces	GPIB, USB, LAN
19	Internal Storage	400 GB SSD
20	Control languages	SCPI; Automatic recording of SCPI commands is preferable so that it simplifies automation procedures
21	Display & Control	6-inch Touch Screen Inbuilt
22	Power requirements	220/240 V AC, 50/60 Hz
23	Warranty	01 Year (minimum)

Notes to bidder

1. The bidder shall provide a compliance statement as per the format provided in Annexure-C of the tender. Each item not mentioned here but required for proper functioning of the instrument shall be quoted with the cost.

2. Proper combined specifications should be provided with the bid with pagination and index. The bidder shall clearly provide the model number or decoding sheet for the quoted model.

3. The bidder shall quote in a modular form as detailed in Annexure-E of the tender.

4. A minimum of one year guarantee/warrantee shall be provided for all items from the date of installation for manufacturing defects.