

Annexure-1**Procurement of a Lightwave Component Analyzer System**

Brief Description: Lightwave Component Analyzer for Silicon Photonics device/circuit input/output characterizations in terms of Optical to Electrical (O/E), Electrical to Optical (E/O), and Electrical to Electrical (E/E) up to a frequency range of K-band (~ 27 GHz).

S.No.	Specifications	Description
1.	System Capability	Should be able to test electrical and optical properties of silicon photonics devices and circuits (passive and active) through an in-built 4 port network analyzer bench-top system. The 4 port Network Analyzer/Optical Unit should be an integrated system and should function as a single unit - (i) <i>multi-vendor, modular or discreet multi-box setups (with external O/E and E/O units) will not be accepted</i> (ii) <i>Computer interfacing (Labview or equivalent) and data acquisition support should be provided.</i>
2.	Frequency Range	10 MHz to 26.5 GHz (up-to K-band)
3.	Absolute RF frequency uncertainty	± 1.5 dB @ 20 GHz
4.	Phase uncertainty	$\pm 2.0^\circ$
5.	Noise Floor	≤ -75 dB W/A for E/O measurements or better ≤ -75 dB A/W for O/E measurements or better
Optical Input Characteristics		
6.	Optical input wavelength Range	1300 nm to 1600 nm (covering O, S, C, and L bands)
7.	Maximum Safe Input Power of Optical Input Port (Receiver)	≥ 17 dBm (≥ 50 mW)
8.	Optical Input Return Loss	>25 dB
9.	In-built Optical power meter	Optical input ports should have Built-in optical power meter for fast transmitter power verification with power measurement range up to > 13 dBm
Optical Output Characteristics		
10.	Operating Wavelength Range	1300 nm to 1600 nm through external/in-built tunable laser source for Transmitter and Receiver
11.	External Laser Input Connector	9/125 μ m Panda PMF FC/APC
12.	Average Output Power Range	-2 dBm to $+4$ dBm
13.	Optical modulation index (OMI) at 10 GHz	$> 47\%$ @ $+10$ dBm RF power
14.	Average output power uncertainty	± 0.5 dB (optical)
15.	Average output power stability	± 0.5 dB (optical)
Connector Types		
16.	Optical Input and Output Ports	Standard SMF FC/APC
17.	RF Input and Output Ports	3.5 mm (standard)

Calibration and RF Ports		
18.	Maximum safe input level at RF port	>15 dBm (30 mW)
19.	Calibration	Automated calibration. Electronic Calibration kit should be provided with frequency range up to 27 GHz.
20.	Forward RF power	+5 dBm
Specifications for Electro-Optical (E/O) Measurements at 1550 nm (up to 26.5 GHz)		
21.	Relative frequency response uncertainty	± 1 dB (electrical) or lower over the entire frequency range
22.	Absolute frequency response uncertainty	± 2 dB (electrical) or lower over the entire frequency range
23.	Minimum measurable frequency response (noise floor)	-60 dB (W/A) or lower over the entire frequency range
Specifications for Opto-Electrical (O/E) Measurements at 1550 nm (50 MHz to 26.5 GHz)		
24.	Relative frequency response uncertainty	± 1 dB (electrical) or lower over the entire frequency range
25.	Absolute frequency response uncertainty	± 2.1 dB (electrical) or lower over the entire frequency range
26.	Minimum measurable frequency response (noise floor)	<-48 dB (W/A) or lower over the entire frequency range
Specifications for Optical to Optical (O/O) Measurements at 1550 nm (50 MHz to 26.5 GHz)		
28.	Relative frequency response uncertainty	± 0.125 dB (optical) or lower over the entire range
29.	Absolute frequency response uncertainty	± 0.6 dB (optical) or better over the entire range
30.	Minimum measurable frequency response (noise floor)	-17.5 dB (optical) or lower over the entire range
Measurements Capabilities		
31.	Responsivity (S21, amplitude and phase)	Absolute frequency response (conversion efficiency of a transmitter, responsivity and gain of a receiver), Relative frequency response (filter shapes or amplifier gain), 3-dB bandwidth of the electro-optical (electrical transfer function), Group Delay vs. frequency of the transfer function, Optical Insertion Loss (IL)
32.	Reflectivity (S11 or S22, amplitude and phase)	Electrical reflectivity at the RF port, Impedance match
33.	Balanced measurements (with 4-port VNA)	Differential gain, gain imbalance, Common-mode rejection, common-mode transfer function
34.	Time Domain Analysis	Step Response and Impulse Response Measurements must be supported
35.	Spectral Analysis	Spectrum Analysis on Input ports must be supported
General Conditions		
36.	Supply to Indian Users	Similar system should have been already supplied to at least one of the recognized labs in India. Name(s) and address(es) of such Indian user(s) must be provided for references.
37.	Servicing and AMC	Routine service and annual maintenance should be provided for 5 years starting from the installation. Service centre should be available in India.