

# CSIR- NATIONAL PHYSICAL LABORATORY

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From: Director, CSIR-NPL

Ref No. 14-VIII/SKD(15-GTE)2024PB/T-100

Dated : 03.12.2024

## CORRIGENDUM

With reference to NPL's Global Tender ID: **2024\_CSIR\_777446\_1**, for "Spectrum Analyzer (D Band, 110GHz-170GHz)". Consequent upon the outcome of PBC, **some changes have been made in the technical specification of captioned tender. Revised specifications are as follows:**

### Final Specs after Pre-Bid Meeting

#### FINAL DETAILED TECHNICAL SPECIFICATIONS

S.N.	Parameter	Specification
1	Frequency Range	<b>Frequency Range:</b> <b>DC Coupled: 2Hz to 50GHz AC Coupled: 10MHz to 50GHz or DC block may be offered for DC protection</b>
2	Frequency Span	0Hz, 10Hz to 50GHz
3	Frequency Counter Resolution	0.001 Hz or better
4	Aging Rate	<b>± 1x10E-7/yr or better</b>
5	<b>Temperature Drift</b>	<b>Temperature Drift: ± 2x10E-8 or better (0°C to +45°C)</b>
6	No. of Sweep points	Upto 100001 or better
7	SSB phase noise @ 1 GHz	-88 dBc/Hz at 10 Hz Offset -107 dBc/Hz at 100 Hz Offset -123 dBc/Hz at 1 KHz Offset -132 dBc/Hz at 10 KHz Offset -138 dBc/Hz at 100 KHz Offset -144 dBc/Hz at 1 MHz Offset
8	Sweep Time	Span = 0 Hz : 1 µs to 6000 s, Span ≥ 10 Hz : 1 ms to 4000 s
9	Resolution bandwidth	1 Hz to 10 MHz in steps
10	Maximum Internal Signal Analysis Bandwidth	4000 MHz or Better
11	<b>Maximum Input Level</b>	<b>DC Voltage: 50V (additional DC Protection in term of DC may be provided)</b> <b>CW RF Power: 30 dBm RF Attenuation ≥ 10dB</b>
12	1dB Compression at Input Mixer	+5 dBm (nom) at 1GHz, +5 dBm (nom) at 50 GHz

13	<b>TOI</b>	≥15 dBm @ 1GHz, ≥ 10 dBm @ 20GHz ≥ 7dBm@40GHz, ≥ 7dBm nom @50GHz
14	SHI @ input level -15 dBm RF Attenuation = 0dB	>45 dBm @ 1GHz > 50 dBm @ 3GHz 64 dBm (nom) @10GHz 52 dBm (nom) @25GHz
15	Displayed Average Noise Level RF attenuation = 0dB, termination=50Ω	With Preamp OFF -147 dBm @ 1GHz -144 dBm @ 10GHz -138 dBm @ 20GHz -120 dBm @50GHz
		With Preamp ON -163 dBm @ 1GHz -160 dBm @ 10GHz -160 dBm @ 20GHz -145 dBm @50GHz
16	Trigger	Free Run, Video, external, IF Power, RF Power
17	I/Q Data	
	Max Record Length	1000 Msample I and Q
	Sampling Rate	100 Hz to 10GHz
	Analysis Bandwidth	4000 MHz or better
18	RF INPUT	
	<b>Connector &amp; Impedance</b>	<b>1.85 mm / 2.4mm, 50Ω</b>
	VSWR	< 2.5:1 nom
	<b>Attenuator Range</b>	<b>2 dB steps over the frequency range 2 Hz to 50 GHz</b>
	External Reference Input	Should have provision to input 1 MHz to 50MHz
	Reference Output	10 MHz
	IF Frequency & Video Output	Should be available
19	Power Suite Measurements	Channel Power, Adjacent Channel Power ratio, Occupied Bandwidth, Carrier to noise ratio, Spurious Emission Measurement, Time domain Power Measurement, Harmonic Distortion Measurement, Third order intercept measurement, AM modulation Depth measurement, Statistical Measurement (APD, CCDF), Spectrogram
20	Storage & OS	Windows Based with 200 GB SSD
21	Power Supply	230V AC, 50 Hz
22	Interfaces	USB, GPIB, LAN
23	Display	12-inch Touch screen display
24	<b>Warranty</b>	<b>03 years for base unit and standard warranty for consumables items</b>
25	Frequency extension module shall be Integrated solution	Analysis of D band frequency i.e. 110 to 170 GHz
a	LO source	Internal or external to down convert D band
b	1 dB compression point	-4 dBm or better
c	RF Connector	WR 6.5

d	Analysis Bandwidth	4000 MHz or better
e	RF Input Power	0 dBm
f	Temperature Drift	<1dB typ
g	<b>Operating temperature</b>	<b>20 to 30 deg C</b>
h	Displayed Average noise level	-100dB or better
i	Phase Noise @140 GHz	-88 dBc/Hz or better
26	Accessories	110 to 170 GHz Horn antenna
27	Operating System	<b>Windows 10 or better (Builtin or external)</b>
28	a) Calibration and test reports to be made available from NMI traceable or equivalent lab b) OEM must have <b>NABL accredited or equivalent</b> service and repair facility in India for Base Unit Minimum	

Warranty for 5 years for the system may be quoted separately. However, L1 will be decided only on the 3 year warranty basis.

**Due date & time of tender submission**

For : 09.12.2024 up to 3.00PM (IST)  
Read as : 23.12.2024 up to 3.00PM (IST)

**Date & Time of Tender Opening**

For : 10.12.2024 at 3:00PM (IST)  
Read as : 24.12.2024 at 3.00PM (IST)

All other terms & conditions of said tender will remain the same. Revision in specifications, if any shall be intimated in due course.



Sr. Controller of Stores & Purchase



## Minutes of TSC

### Pre-bid Meeting (To be typed clearly by the I/O)

Name of Indentor: Satya Kesh Dubey  
 Indent No.: NPL3030820244MMPO152014  
 Item Description: Spectrum Analyzer (D band,110GHz-170GHz)  
 Project No.: MMP015201  
 Estimated Cost (in INR): 150 Lakh  
 No. of Budgetary Quotes: 2  
 (1) a pre-bid meeting of TSC was held on 19/11/2024.  
 (2) Following queries were raised by participating Bidders:

Name of the Firm	Queries Raised	Remarks, if any
Keysight	25 a. Please confirm if the source to be provided from NPL.	Vendor has to provide LO and all other items and accessories to meet performance and values mentioned in the tender.
Keysight	25 h. for D band downconverter we will analysis signal at IF frequency downconverted from D -band module. So this specification is not applicable for D - band. This needs to be consider for base unit only, please confirm	Base unit as well as D band extender
Keysight	25 i. for D band downconverter we will analysis signal at IF frequency down converted from D -band module. So this specification is not applicable for D - band. This needs to be consider for base unit only, please confirm	Base unit as well as D band extender

#### Indentor's recommendation

1. The comments, as received from bidders during PBC, and our response is as follows:

Tender Specification and its number	Comment of bidder	Response of Indentor (Accepted/ Not accepted)	Revised specification (If any)	Justification for non-acceptance
1. Frequency Range: DC Coupled: 2Hz to 50GHz AC Coupled: 10MHz to 50GHz  (DC Block can be provided if internally not available)	M/s Anritsu requested to amend to "9 KHz to 40 GHz/43 GHz or better"  M/s Keysight requested to remove AC coupled frequency band.	<b>Not Accepted</b>  <b>Accepted with DC block for DC protection</b>	Frequency Range: DC Coupled: 2Hz to 50GHz AC Coupled: 10MHz to 50GHz or a DC block may be offered for DC protection	The prosed system narrow the frequency spectrum from 2Hz to 9kHz and similarly from 50 GHz to 43 GHz.  M/s Keysigh request is considered with additional DC Block
1. Frequency Span:	M/s Anritsu	<b>Not</b>		As per point no 1 it is

0Hz, 10Hz to 50GHz	requested to amend to 0Hz, 300 Hz to 40/43 GHz or better	<b>Accepted. No Change.</b>		not acceptable
4. Aging Rate: $\pm 3 \times 10^{-8}$ /yr or better	M/s Anritsu requested amend to $\pm 1 \times 10^{-7}$ /year	<b>Accepted</b>	Aging Rate: $\pm 1 \times 10^{-7}$ /yr or better	It can be considered
5. Temperature Drift: $\pm 5 \times 10^{-9}$ or better	M/s Anritsu requested to amend to $\pm 2 \times 10^{-8}$ (0°C to +45°C)	<b>Accepted</b>	Temperature Drift: $\pm 2 \times 10^{-8}$ or better (0°C to +45°C)	It can be considered
6. No. of sweep points: Upto 100001 or better	M/s Anritsu requested to amend to "up to 30001 or more"	<b>Not Accepted. No Change.</b>		As per point no 1, for a wide frequency range the of points should be more for better accuracy and resolution
7. SSB phase noise @ 1 GHz -88 dBc/Hz at 10 Hz Offset -107 dBc/Hz at 100 Hz Offset -123 dBc/Hz at 1 KHz Offset -132 dBc/Hz at 10 KHz Offset -138 dBc/Hz at 100 KHz Offset -144 dBc/Hz at 1 MHz Offset	M/s Anritsu requested to amend to -80 dBc/Hz at 10 Hz Offset -92 dBc/Hz at 100 Hz Offset -117 dBc/Hz at 1 KHz Offset -123 dBc/Hz at 10 KHz Offset -123 dBc/Hz at 100 KHz Offset -135 dBc/Hz at 1 MHz Offset	<b>Not Accepted. No Change.</b>		Requested modification as not upto the mark so cannot be considered
8. Sweep Time: Span = 0 Hz : 1 $\mu$ s to 6000 s Span $\geq$ 10 Hz : 1 ms to 4000 s	M/s Anritsu requested to amend to Span = 0 Hz : 1 $\mu$ s to 1000 s; Span $\geq$ 300Hz : 1 ms to 1000 s	<b>Not Accepted</b>		As mentioned in Point No 6
10. Maximum Internal Signal Analysis Bandwidth: 4000 MHz or Better	M/s Anritsu requested to amend to "1 GHz analysis BW or better"	<b>Not Accepted. No Change.</b>		As per project requirements
11. Maximum Input Level: 50V	M/s Anritsu requested to change to +15VDC  M/s Keysight requested to change specification for	<b>Not Accepted. No Change.</b>		For Instrument safety at ultra low frequency levels  M/s Keysight query already explained in

	DC voltage to 0 V.			point no 1
12. 1dB Compression at Input Mixer: +5 dBm (nom) at 1GHz, +5 dBm (nom) at 50 GHz	M/s Anritsu requested to amend to "+3dBm or better upto 3 GHz and -1 dBm or better at 40 GHz"	<b>Not Accepted. No Change.</b>		Critical parameters for active device characterization
13. TOI: >15 dBm @ 1GHz > 10 dBm @ 20GHz > 7dBm@40GHz 7dBm nom @50GHz	M/s Anritsu requested to remove specs at 50 GHz  M/s Keysight requested to change '+15 dBm @1GHz +7dBm@40GHz'	<b>Not Accepted. No Change</b>  <b>Accepted</b>	TOI: ≥15 dBm @ 1GHz ≥10 dBm @ 20GHz ≥ 7dBm@40GHz ≥7dBm nom @50GHz	As per point no 1  Very minor correction suggested so accepted
14. SHI @ input level - 15 dBm RF Attenuation = 0dB: >45 dBm @ 1GHz >50 dBm @ 3GHz 64 dBm (nom) @10GHz 52 dBm (nom) @25GHz	M/s Anritsu requested to remove the specification	<b>Not Accepted. No Change.</b>		Critical parameters for active device characterization
15. RF attenuation = 0dB, termination=50Ω With Preamp OFF -147 dBm @ 1GHz -144 dBm @ 10GHz -138 dBm@ 20GHz -120 dBm @50GHz  With Preamp ON -163 dBm @ 1GHz -160 dBm @ 10GHz -160 dBm@ 20GHz -145 dBm @50GHz	M/s Anritsu requested to amend to  "-142 dBm or better at 10 GHz" "-135 dBm or better at 20 GHz" "-130 dBm or better at 40 GHz"  "-155 dBm or better at 20 GHz" "-148 dBm or better at 40 GHz"	<b>Not Accepted. No Change.</b>		As point no 1 in not complied for frequency range no point to discuss DANL
16. Trigger: Free Run,	M/s Anritsu	<b>Not</b>		Required in sensitive

Video, external, IF Power and RF Power	requested to remove "RF Power"	<b>Accepted</b>		power trigger measurements
17. I/Q Data	M/s Anritsu requested to	<b>Not Accepted. No Change.</b>		As per point no 10 it is already not accepted
Max Record Length: 1000 Msample I and Q	Remove this requirement			
Sampling Rate: 100 Hz to 10GHz	amend to "up to 1 GHz or better"			
Analysis Bandwidth: 4000 MHz or better	amend to "1 GHz or better"			
18. RF INPUT	M/s Anritsu requested to amend to	<b>Not Accepted</b>		As per point no 1
Connector & Impedance: 1.85 mm (M), 50Ω	2.92mm/K/2.4mm connector			
	M/s Keysight requested to change to 2.4 mm male, 50 Ω (nominal)	<b>Accepted</b>	1.85 mm/2.4mm, 50Ω	50 GHz system works at 2.4 mm connector or small connector so this is considered
18 Attenuator Range: 0 to 70dB in 1 steps upto 3 GHz 0 to 70dB in 2dB steps above 3 GHz	M/s Anritsu requested to amend to "0 to 60 dB, 2 dB steps or better for full frequency range"	<b>Not Accepted. No Change.</b>		As per point no 1
	M/s Keysight requested to consider 2 dB steps over the frequency range 2 Hz to 50 GHz	<b>Accepted</b>	2 dB steps over the frequency range 2 Hz to 50 GHz	This can be considered as per our project requirements
External Reference Input: Should have provision to input 1 MHz to 50MHz	M/s Anritsu requested to amend to 10 MHz, should have at least one or more ref-in 5 MHz/13 MHz/15 MHz etc. or better	<b>Not Accepted. No Change.</b>		As per point no 1
IF Frequency & Video Output: Should be	M/s Anritsu requested to remove Video	<b>Not Accepted. No Change.</b>		As point no 1 in not complied for frequency

available	Output			
19. Power Suite Measurements: Channel Power, Adjacent Channel Power ratio, Occupied Bandwidth, Carrier to noise ratio, Spurious Emission Measurement, Time domain Power Measurement, Harmonic Distortion Measurement, Third order intercept measurement, AM modulation Depth measurement, Statistical Measurement	M/s Anritsu requested to remove Carrier to noise ratio with markers  And remove "Harmonic Distortion Measurement"	<b>Not Accepted. No Change.</b>		As point no 1 in not complied for frequency
23. Display: 12-inch Touch screen display	M/s Anritsu requested to amend to "8 inch LCD or better"	<b>Not Accepted. No Change. Accepted</b>		As per point no 1
24. Warranty: 1 Year	M/s Anritsu suggested for 3 Years and all others agreed	<b>Accepted</b>	Warranty: 3 Year for base unit and D Band extenders and standard for other consumables items	
25. Frequency extension module shall be Integrated solution: Analysis of D band frequency i.e. 110 to 170 GHz	M/s Anritsu suggested Integrated/ external Spectrum Analyzer/mixer module for D Band Frequency (110-170 GHz) analysis	<b>Not Accepted. No Change.</b>		Complying to this parameter so no change
a. LO source: Internal or external to down convert D band	M/s Anritsu suggested to remove a	<b>Not Accepted. No Change.</b>		This is applicable with LO based systems (external or internal ) if system is working without LO that is acceptable if it complies other parameters mentioned in 25 c. to 25
b. 1 dB compression point: -4 dBm or better	M/s Anritsu suggested to remove b	<b>Not Accepted. No Change.</b>		



c. RF Connector WR 6.5	M/s Anritsu suggested to change to WR 6.5 connector/ interface should be provided	<b>Not Accepted. No Change.</b>		i. WR 6 waveguide is acceptable so WR 6.5 is technically complied too so no change required
d. Analysis Bandwidth: 4000 MHz or better	M/s Anritsu suggested to removed	<b>Not Accepted. No Change.</b>		As mentioned in Sr no 10.
e. RF Input Power: 0 dBm	M/s Anritsu suggested to removed	<b>Not Accepted</b>		1 mW power is very nominal.
f. Temperature Drift: <1dB typ	M/s Keysight requested to remove f.	<b>Not Accepted</b>		System performance with temperature drift is very critical parameters for system sensitivity. It can not be removed
g. Operating temperature: +5 to 40 deg C	M/s Keysight requested to change 20 to 30 deg C	Very narrow range but accepted	Operating temperature: 20 to 30 deg C	AS the system will be in controlled environment only this narrow range can be accepted.
h. Displayed Average noise level: -100dB or better	M/s Anritsu suggested to amend to : > -127 dBm up to 90 GHz >-107 dBm up to 170 GHz"	<b>Not Accepted. No Change.</b>		Not change required as requested range is also technically complied
i. Phase Noise @140 GHz: -88 dBc/Hz or better	M/s Anritsu suggested to remove this specification	<b>Not Accepted. No Change.</b>		Essential parameter for spectrum analyzer performance
27. Operating System: Windows 10 or better	M/s Anritsu suggested to add a external PC for acquisition	<b>Both internal and external Accepted</b>	Operating System: Windows 10 or better (both internal or external)	A GUI Based system is required for the same.
28. b) OEM must have NABL accredited service and repair facility in India for Base Unit Minimum	M/s Anritsu suggested to remove this clause.	<b>Not accepted</b>		Required for standardization purpose  Due to degree of equivalence in

	M/s Keysight NABL accredited lab in India but provide UKAS calibration	<b>Accepted</b>	<b>NABL Accredited or Equivalent lab in India</b>	measurements we can considered this request.
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The specifications are generic and broad based.

**Warranty for 5 years for the system may be quoted separately. However, L1 will be decided only on the 3 year warranty basis.**