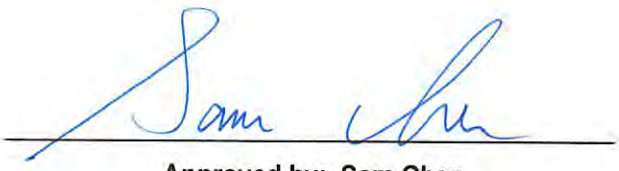
Testing Laboratory
3787

RADIO TEST REPORT

FCC ID	:	2AVCWMWC-922M
Equipment	:	5G NR-U Wireless Module
Brand Name	:	Miliwave
Model Name	:	MWC-922m
Applicant	:	Miliwave Co., Ltd. 504, 106-40 Gwahakdanji-ro, Gangneung-si, Gangwon-do, 25440 South Korea
Manufacturer	:	Miliwave Co., Ltd. 504, 106-40 Gwahakdanji-ro, Gangneung-si, Gangwon-do, 25440 South Korea
Standard	:	47 CFR FCC Part 15.255

The product was received on Dec. 28, 2023, and testing was started from Jan. 03, 2024 and completed on Jan. 15, 2024. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR3D2602	01	Initial issue of report	Jan. 22, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.207	AC Power Conducted Emissions	PASS	-
3.2	15.255(e)	Occupied Bandwidth	PASS	-
3.3	15.255(c)	EIRP Power	PASS	-
3.4	15.255(c)	Peak Conducted Power	PASS	-
3.5	15.255(d)	Transmitter Spurious Emissions	PASS	-
3.6	15.255(f)	Frequency Stability	PASS	-
3.7	15.255(a),(h)	Operation Restriction and Group Installation	PASS	-

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Lavender Zeng

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information	
Frequency Range	57-71 GHz
The Channel Plan(s)	Channel 1: 58.32 GHz Channel 2: 60.48 GHz Channel 3: 62.64 GHz Channel 4: 64.80 GHz Channel 5: 66.96 GHz Channel 6: 69.12 GHz

1.1.2 Modulation

IEEE 802.11ad Modulation Scheme

MCS Index	Modulation	Code rate	Data rate (Mbit/s)
0	π/2-BPSK	1/2	27.5
1	π/2-BPSK	1/2	385
2	π/2-BPSK	1/2	770
3	π/2-BPSK	5/8	962.5
4	π/2-BPSK	3/4	1155
5	π/2-BPSK	13/16	1251.25
6	π/2-QPSK	1/2	1540
7	π/2-QPSK	5/8	1925
8	π/2-QPSK	3/4	2310
9	π/2-QPSK	13/16	2502.5
10	π/2-16QAM	1/2	3080
11	π/2-16QAM	5/8	3850
12	π/2-16QAM	3/4	4620

1.1.3 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Miliwave Reflector	MWC-922 Reflector Antenna	Dish type reflector antenna	N/A	Note 1

Note 1:

Gain (dBi)					
Channel 1	**Channel 2**	**Channel 3**	**Channel 4**	**Channel 5**	**Channel 6**
41.0165	40.5424	41.1639	41.6721	42.0269	41.1283

Note 2: The above information was declared by manufacturer.

1.1.4 Operating Conditions

Operating Conditions				
☒ -40 °C to +85 °C				
☐ 0 °C to +40 °C				
☐ Other:				
EUT Power Type	From DC Power			
Test Software Version	Tera Term 4.75			
Supply Voltage	☐ AC	State AC voltage		V
Supply Voltage	☒ DC	State DC voltage	5	V

1.1.5 Equipment Use Condition

Equipment Use Condition
☐ Fixed field disturbance sensors at 61-61.5GHz
☐ Except fixed field disturbance sensors at 61-61.5GHz
☒ Except fixed field disturbance sensors

1.1.6 User Condition

Intended Operation
☐ Indoor
☐ Outdoor (except outdoor fixed Point to Point)
☒ Outdoor fixed Point to Point

Note: The above information was declared by manufacturer.

1.1.7 Duty Cycle

TX-on(ms)	TX-on+TX-off(ms)	Duty Cycle(%)	Duty Cycle factor(dB)
100	100	100	0

1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15.255
- ANSI C63.10-2013 Section 9. “Procedures for testing millimeter-wave systems”

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 414788 D01 v01r01

1.3 Testing Location

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo’ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	TH03-CB	Gino Huang	21.4~22 / 63~66	Jan. 03, 2024~ Jan. 04, 2024
Radiated	03CH05-CB	Eason Chen	21.2-22.3 / 56-59	Jan. 04, 2024~ Jan. 05, 2024
AC Conduction	CO01-CB	Elvin Yeh	22~23 / 50~51	Jan. 15, 2024

2 Test Configuration of Equipment under Test

2.1 Parameters of Test Software Setting

Parameters of Test Software Setting	
Test Frequencies (GHz)	**Software Setting**
58.32	Default
60.48	Default
62.64	Default
64.80	Default
66.96	Default
69.12	Default

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
AC Power Conducted Emissions Test Voltage: 120Vac / 60Hz	66.96
Occupied Bandwidth	58.32, 60.48, 62.64, 64.80, 66.96, 69.12
EIRP Power	58.32, 60.48, 62.64, 64.80, 66.96, 69.12
Peak Conducted Power	58.32, 60.48, 62.64, 64.80, 66.96, 69.12
Transmitter Spurious Emissions (below 1 GHz)	66.96
Transmitter Spurious Emissions (1 GHz-40 GHz)	58.32, 60.48, 62.64, 64.80, 66.96, 69.12
Transmitter Spurious Emissions (above 40 GHz)	58.32, 60.48, 62.64, 64.80, 66.96, 69.12
Frequency Stability	60.48

Note 1: After evaluating, Y axis generated the worst result, so the test will follow the same test configuration.

Note 2: Due to the large dimensions dish, the far field measurement distance is in excess of 500 m. For in-band tests, the dish was removed please see section 1.1.3), allowing measurements to be made in the far field at 0.5 m. The section 1.1.3 reflector gain was added to the measured results.

Note 3: Transmitter spurious emissions tests were performed with the reflector fitted. All measurements were performed in the far field of the measurement antenna.

2.3 EUT Operation during Test

During the test, “Tera Term 4.75” under WIN 10 was executed the test program to control the EUT continuously transmit RF signal.

2.4 Accessories

N/A

2.5 Support Equipment

For AC Conduction test:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Power Supply	MOTECH	LPS-305	N/A
B	Device NB	ACER	N16Q2	N/A
C	Earphone	SHYARO CHI	MIC-04	N/A
D	Mouse	Logitech	M-U0026	N/A

For Radiated and RF Conducted test:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	NB	ACER	Aspire	N/A
B	DC Power Supply	MOTECH	LPS-305	N/A

2.6 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /**λ**

where:

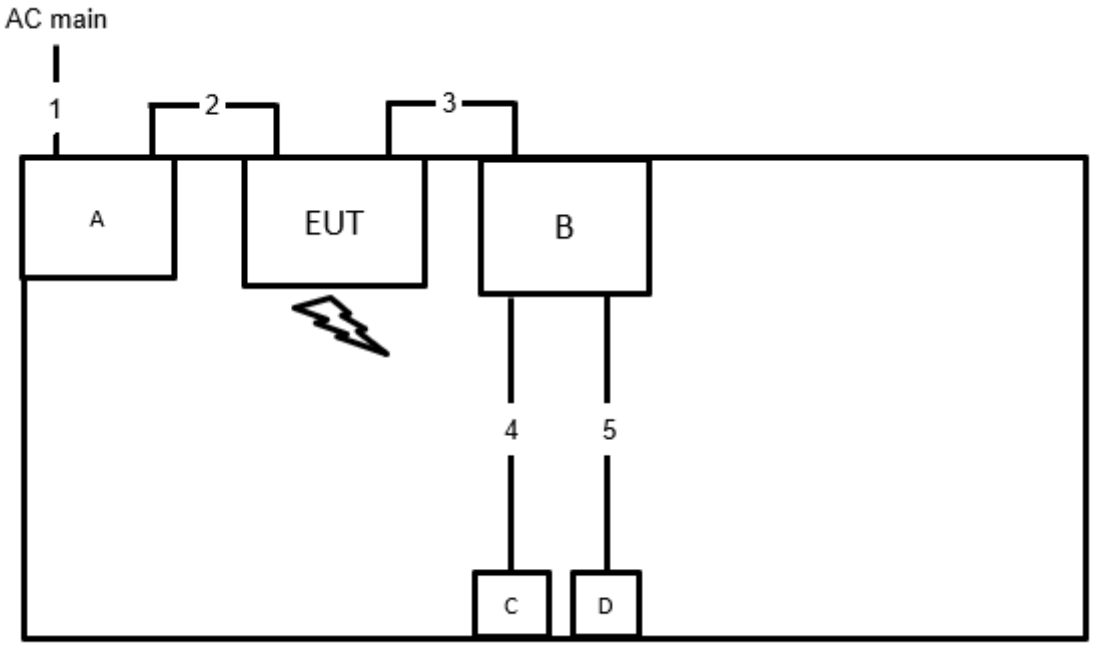
L = Largest Antenna Dimension, including the reflector, in meters

λ= wavelength in meters

Far Field (m)				
Frequency (GHz)	**L (m)**	**Lambda (m)**	**d(Far Field) (m)**	**d(Far Field) (cm)**
58.32	0.028	0.0051440	0.305	30.48
60.48	0.028	0.0049603	0.316	31.61
62.64	0.028	0.0047893	0.327	32.74
64.80	0.028	0.0046296	0.339	33.87
66.96	0.028	0.0044803	0.350	35.00
69.12	0.028	0.0043403	0.361	36.13

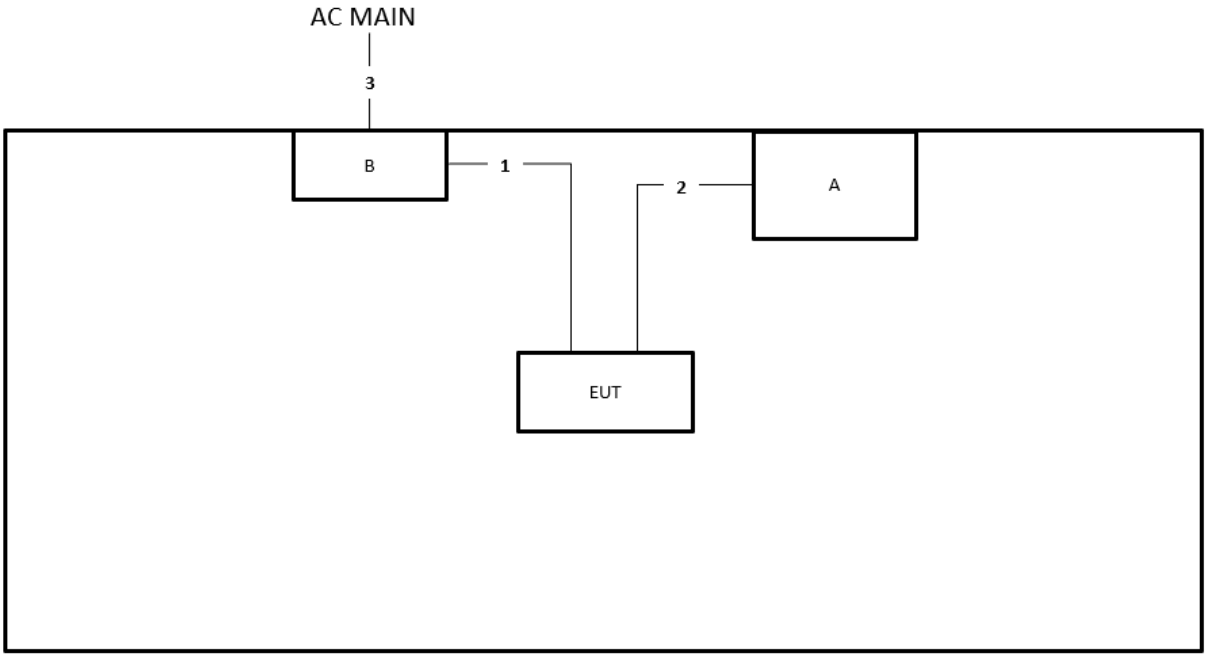
2.7 Test Setup Diagram

Test Setup Diagram - AC Power Conducted Emissions



Item	Connection	Shielded	Length
1	AC Power cable	No	1.5m
2	DC Power cable	No	1.1m
3	USB cable	Yes	1m
4	Audio cable	No	1.2m
5	USB cable	Yes	1.8m

Test Setup Diagram - Transmitter Spurious Emissions



Item	Connection	Shielded	Length
1	Crocodile clip cable	No	1.2m
2	USB to TypeC cable	Yes	1m
3	Power cable	No	1m

3 Transmitter Test Result

3.1 AC Power Conducted Emissions

3.1.1 Limit of AC Power Conducted Emissions

AC Power Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

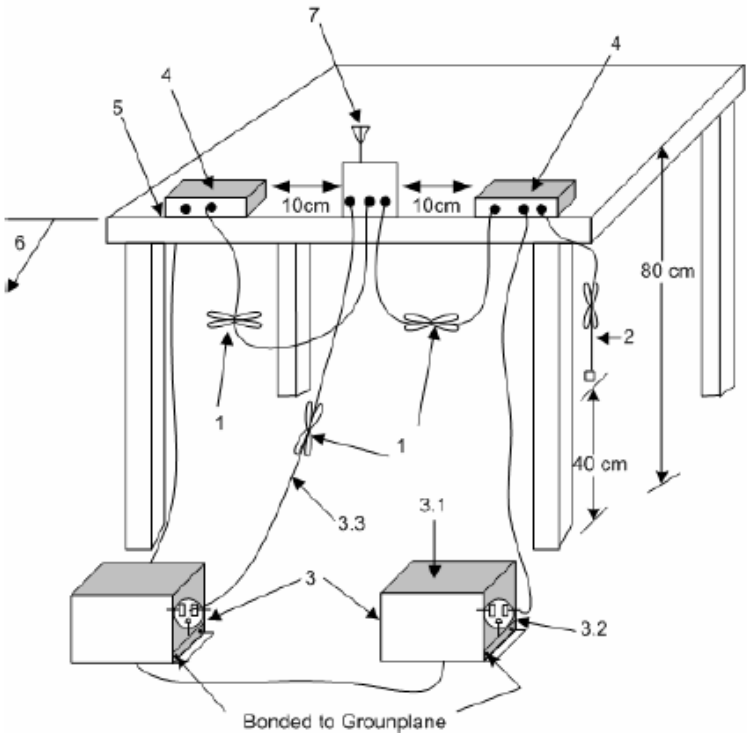
Refer a measuring instruments list in this test report.

3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.2.

3.1.4 Test Setup

AC Power Conducted Emissions



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 Measurement Results Calculation

The measured Level is calculated using:

a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level

b. Margin = -Limit + Level

3.1.6 Test Result of AC Power Conducted Emissions

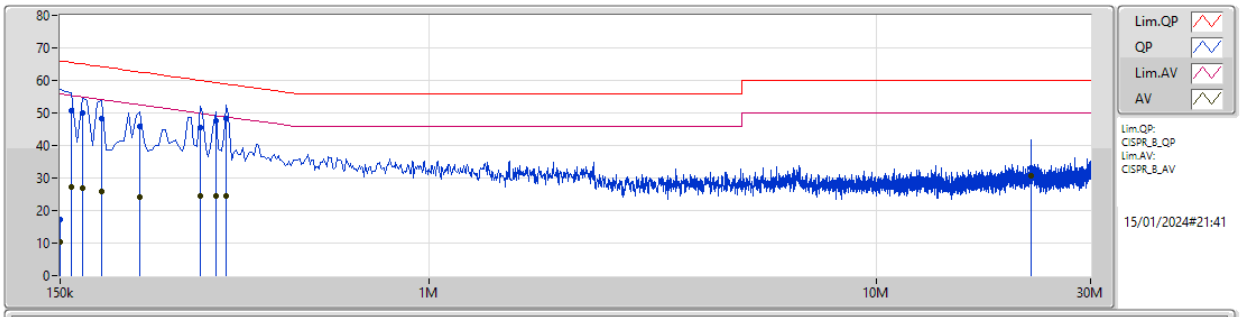
Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.2.3

NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.

NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.

Phase	Line	Configuration	CTX

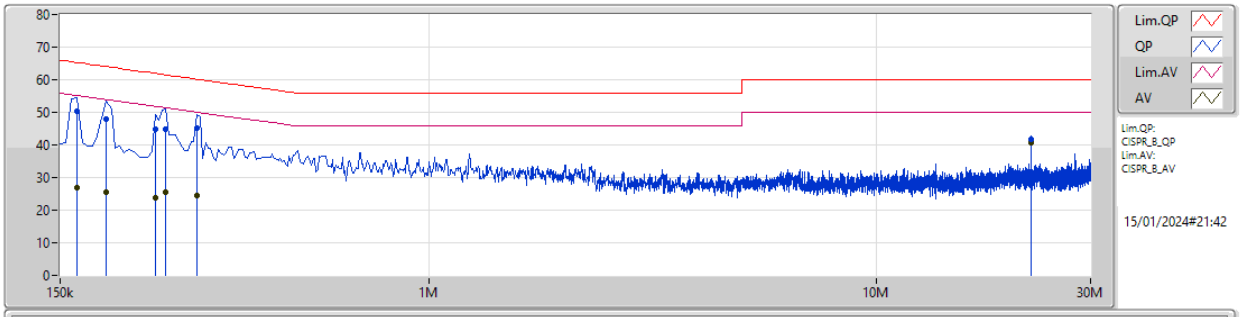
Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	17.15	66.00	-48.85	9.98	Line	-	7.17	0.09	0.02	9.87
AV	150k	10.27	56.00	-45.73	9.98	Line	-	0.29	0.09	0.02	9.87
QP	159k	50.78	65.52	-14.74	9.98	Line	-	40.80	0.09	0.02	9.87
AV	159k	27.28	55.52	-28.24	9.98	Line	-	17.30	0.09	0.02	9.87
QP	168k	49.84	65.06	-15.22	9.98	Line	-	39.86	0.09	0.02	9.87
AV	168k	26.93	55.06	-28.13	9.98	Line	-	16.95	0.09	0.02	9.87
QP	186k	48.24	64.20	-15.96	9.96	Line	-	38.28	0.08	0.02	9.86
AV	186k	25.95	54.20	-28.25	9.96	Line	-	15.99	0.08	0.02	9.86
QP	226.5k	45.70	62.58	-16.88	9.97	Line	-	35.73	0.08	0.02	9.87
AV	226.5k	23.97	52.58	-28.61	9.97	Line	-	14.00	0.08	0.02	9.87
QP	307.5k	45.47	60.03	-14.56	9.99	Line	-	35.48	0.09	0.02	9.88
AV	307.5k	24.40	50.03	-25.63	9.99	Line	-	14.41	0.09	0.02	9.88
QP	334.5k	47.64	59.35	-11.71	10.00	Line	-	37.64	0.09	0.02	9.89
AV	334.5k	24.33	49.35	-25.02	10.00	Line	-	14.33	0.09	0.02	9.89
QP	352.5k	48.27	58.91	-10.64	10.00	Line	"Worst"	38.27	0.09	0.02	9.89
AV	352.5k	24.33	48.91	-24.58	10.00	Line	-	14.33	0.09	0.02	9.89
QP	22.124M	33.09	60.00	-26.91	10.57	Line	-	22.52	0.31	0.23	10.03
AV	22.124M	30.85	50.00	-19.15	10.57	Line	-	20.28	0.31	0.23	10.03

Phase	Neutral	Configuration	CTX

Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	163.5k	50.27	65.27	-15.00	9.96	Neutral	-	40.31	0.07	0.02	9.87
AV	163.5k	27.03	55.27	-28.24	9.96	Neutral	-	17.07	0.07	0.02	9.87
QP	190.5k	47.76	64.01	-16.25	9.95	Neutral	-	37.81	0.07	0.02	9.86
AV	190.5k	25.67	54.01	-28.34	9.95	Neutral	-	15.72	0.07	0.02	9.86
QP	244.5k	44.97	61.95	-16.98	9.96	Neutral	-	35.01	0.07	0.02	9.87
AV	244.5k	23.72	51.95	-28.23	9.96	Neutral	-	13.76	0.07	0.02	9.87
QP	258k	44.77	61.49	-16.72	9.96	Neutral	-	34.81	0.07	0.02	9.87
AV	258k	25.42	51.49	-26.07	9.96	Neutral	-	15.46	0.07	0.02	9.87
QP	303k	45.25	60.17	-14.92	9.97	Neutral	-	35.28	0.07	0.02	9.88
AV	303k	24.36	50.17	-25.81	9.97	Neutral	-	14.39	0.07	0.02	9.88
QP	22.119M	41.81	60.00	-18.19	10.57	Neutral	-	31.24	0.31	0.23	10.03
AV	22.119M	40.84	50.00	-9.16	10.57	Neutral	"Worst"	30.27	0.31	0.23	10.03

3.2 Occupied Bandwidth

3.2.1 Limit of Occupied Bandwidth

6dBc Bandwidth (see Note 1)	None
99% Occupied Bandwidth (see Note 2)	None

NOTE 1: The 6dBc bandwidth is the frequency bandwidth of the signal power at the -6 dBc points when measured with a 100 kHz resolution bandwidth. These measurements shall also be performed at normal test conditions.

NOTE 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.

3.2.2 Measuring Instruments

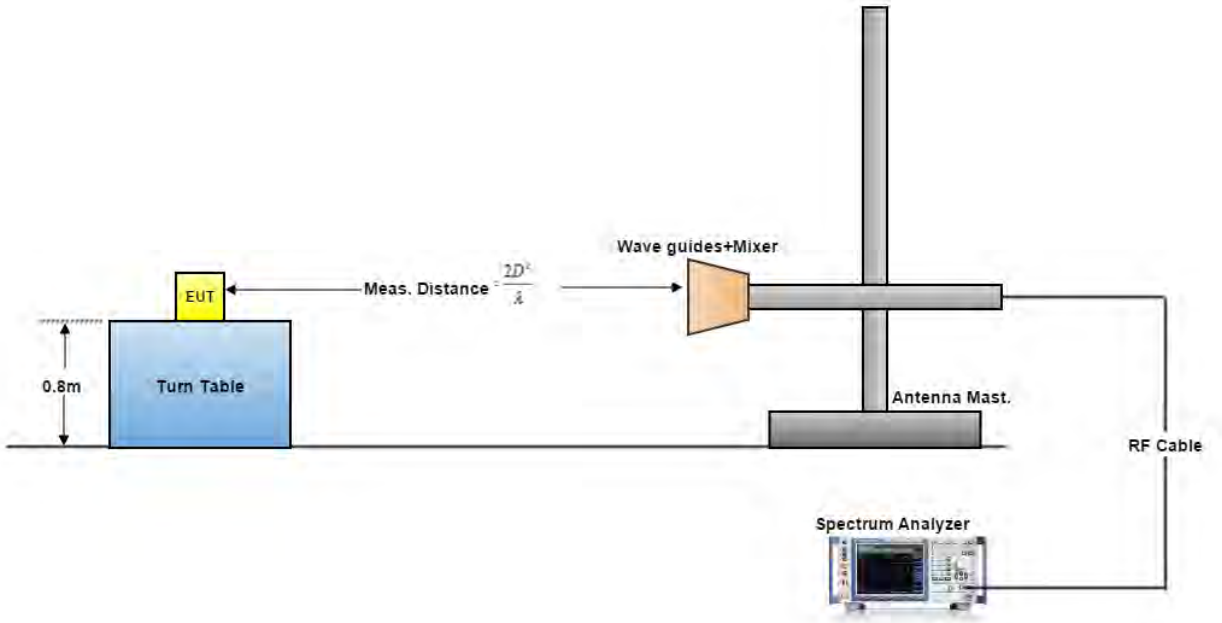
Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.9.2.

3.2.4 Test Setup

Occupied Channel Bandwidth



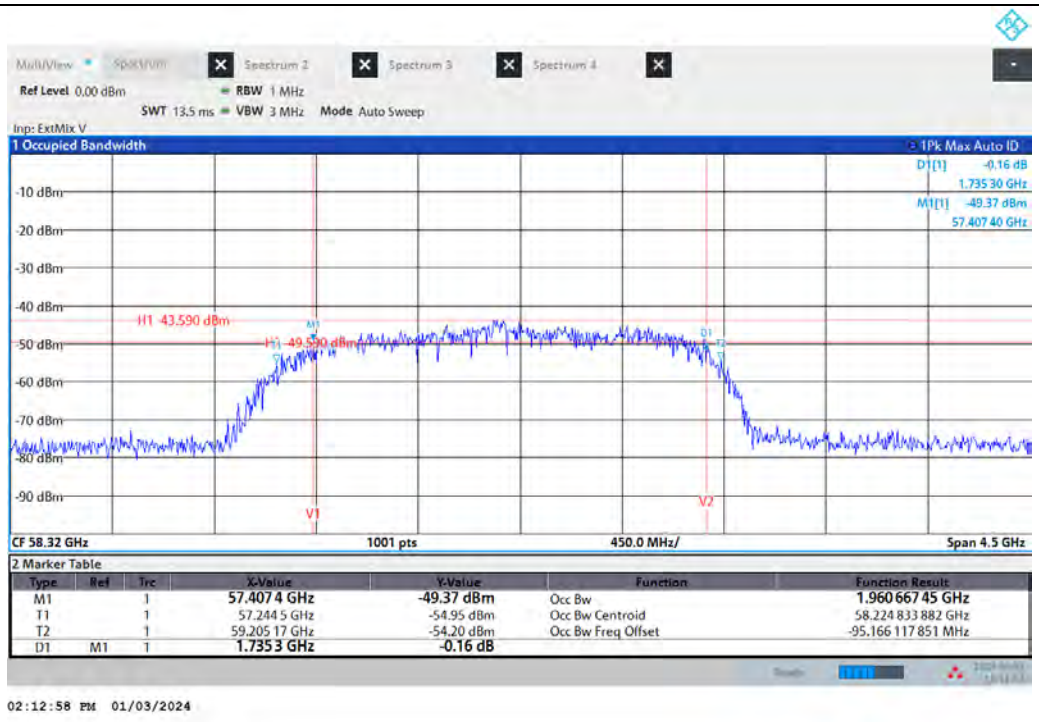
3.2.5 Test Result of Occupied Bandwidth

Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.9.2
NOTE: If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 15, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.	

Test Results			
Test Freq. (GHz)	**6 dBc Bandwidth (MHz)**	**99% Occupied Bandwidth (MHz)**	**Limit (MHz)**
58.32	1735.3	1960.66	N/A
60.48	1721.8	1905.91	N/A
62.64	1694.8	1922.69	N/A
64.80	1631.9	1876.12	N/A
66.96	1703.8	1887.90	N/A
69.12	1591.4	1814.15	N/A

3.2.5.1 Bandwidth Plots

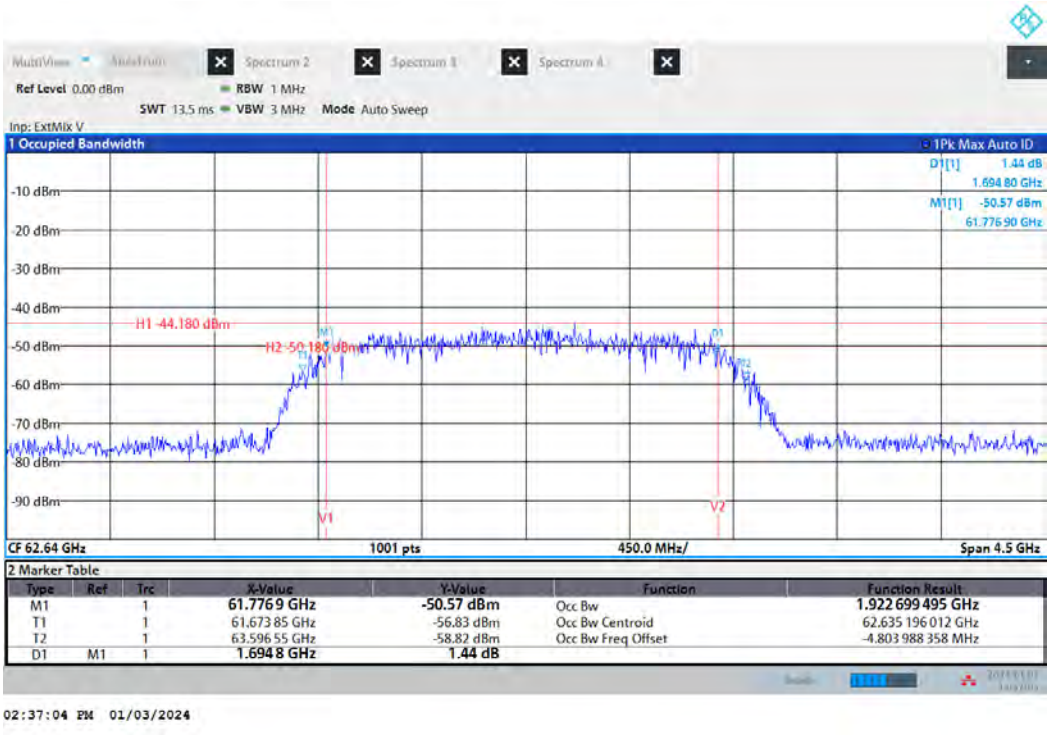
Test Frequency: 58.32 GHz
6 dBc Bandwidth and Occupied Bandwidth



Test Frequency: 60.48 GHz
6 dBc Bandwidth and Occupied Bandwidth

Test Frequency: 62.64 GHz

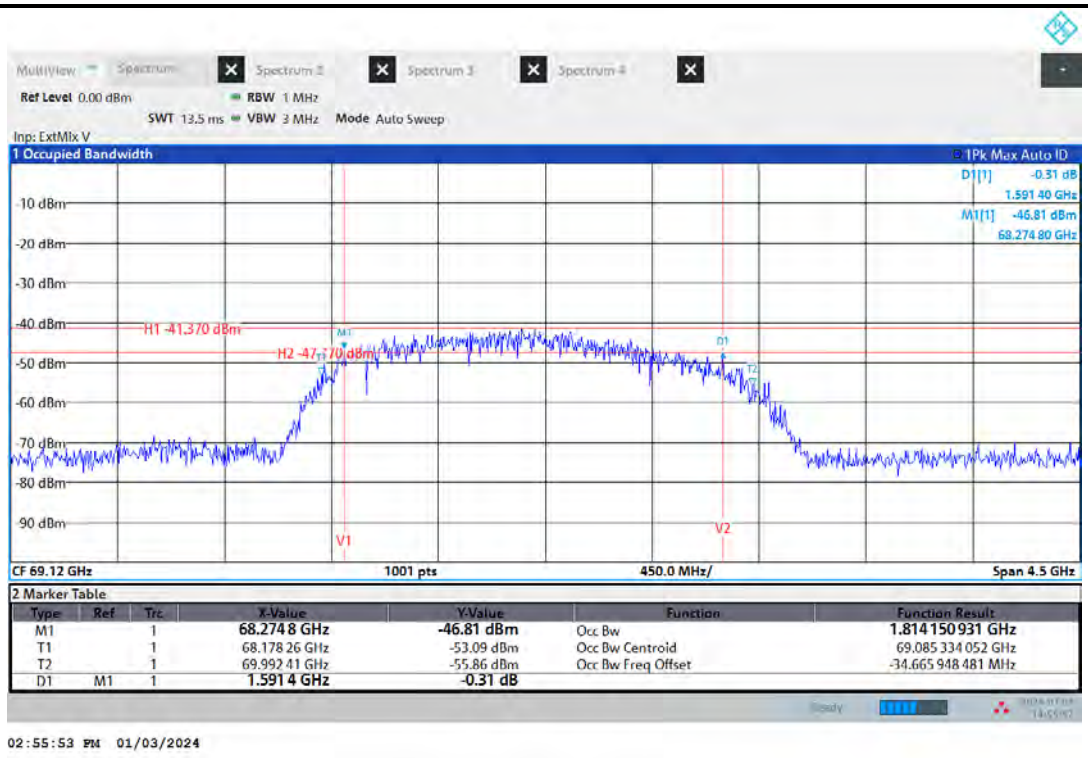
6 dBc Bandwidth and Occupied Bandwidth



Test Frequency: 64.80 GHz
6 dBc Bandwidth and Occupied Bandwidth

Test Frequency: 66.96 GHz
6 dBc Bandwidth and Occupied Bandwidth

Test Frequency: 69.12 GHz
6 dBc Bandwidth and Occupied Bandwidth



3.3 EIRP Power

3.3.1 Limit of EIRP Power

EIRP Power Limit		
Use Condition	**EIRP Average Power**	**EIRP Peak Power**
Fixed field disturbance sensors at within the frequency band 61-61.5GHz	40 dBm	43 dBm
Fixed field disturbance sensors at outside of the band 61-61.5GHz	10 dBm	13 dBm
Except fixed field disturbance sensors at 61-61.5GHz	N/A	10 dBm
Except outdoor fixed Point to Point	40 dBm	43 dBm
Outdoor fixed Point to Point	82 dBm	85 dBm
Note: For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi.		

NOTE: For the applicable limit, see 15.255 (c)

3.3.2 Measuring Instruments

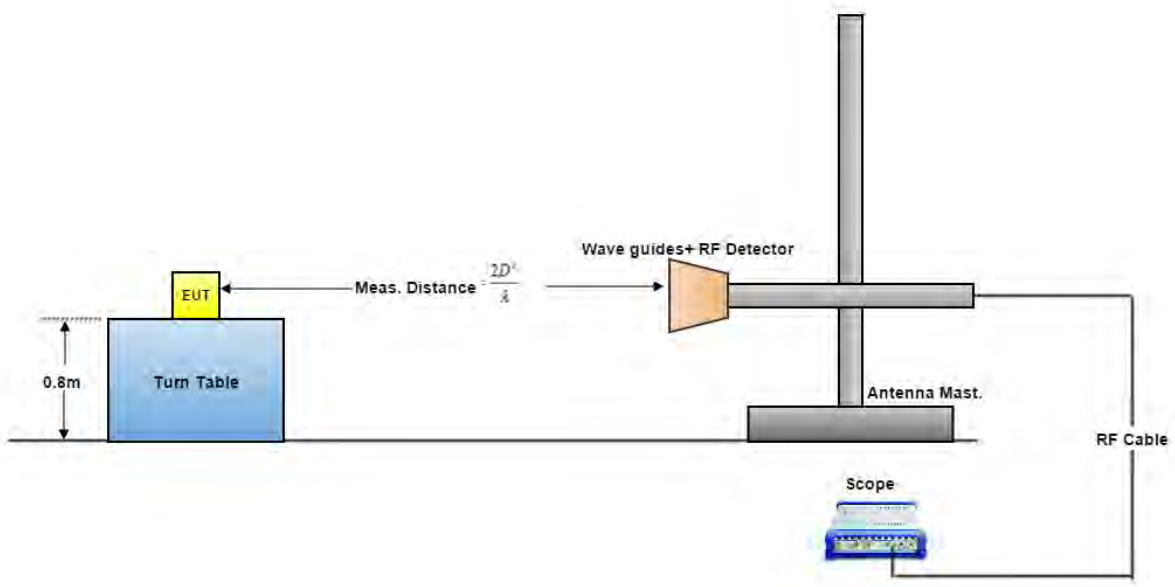
Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013 clause 9.3 & 9.5.

3.3.4 Test Setup

EIPR Power



3.3.5 Test Result of EIRP Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11

NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.

3.3.5.1 Test Result of EIRP Power

Test Distance		0.50 m									
Test Results											
Test Freq. (GHz)	Rx Gain (dBi)	DSO (mV)		Power Measured (dBm)		E_{Meas} (dBuV/m)		EIRP (dBm)		EIRP Limit (dBm) (note 1)	
		Peak	AV	Peak	AV	Peak	AV	Peak	AV	Peak	AV
58.32	23.6	32.05	21.88	-16.66	-18.68	132.31	130.29	62.51	60.49	65.03	62.03
60.48	23.6	30.13	20.75	-17.16	-18.94	132.13	130.35	61.85	60.07	64.08	61.08
62.64	23.6	30.28	20.79	-16.94	-18.93	132.65	130.66	63.00	61.01	65.33	62.33
64.80	23.6	30.44	21.64	-16.92	-18.73	132.97	131.16	63.82	62.01	66.34	63.34
66.96	23.6	30.59	21.02	-16.81	-18.88	133.36	131.29	64.57	62.50	67.05	64.05
69.12	23.6	29.33	20.24	-17.12	-19.07	133.33	131.38	63.64	61.69	65.26	62.26

The measured power level is converted to EIRP using the Friis equation:

For radiated emissions, calculate the field strength (E) in dBμV/meter.

$E = 126.8 – 20\log(\lambda) + P - G$

where:

E : is the field strength of the emission at the measurement distance, in dBμV/m

P : is the power measured at the output of the test antenna, in dBm

λ: is the wavelength of the emission under investigation [300/fMHz], in m

G : is the gain of the test antenna, in dBi For radiated emissions, calculate the EIRP (dBm). If the measurement was performed in the far field, calculate the EIRP.

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBμV/m

d-meas. : is the measurement distance, in m

NOTE 1: For the applicable limit, see 15.255 (c)

NOTE 2: The comparison method which replaces EUT with a signal generator is used to find the correct conversion factor between “DSO(mV)” & “Power Measured(dBm)”.

3.4 Peak Conducted Power

3.4.1 Limit of Peak Conducted Power

Peak Conducted Power Limit			
Use Condition	**6dBc Bandwidth**	**Occupied Bandwidth**	**Peak Conducted Power (note 1)**
Fixed field disturbance sensors at within the frequency band 61-61.5GHz	> 100MHz	≤ 500MHz	500mW
	≤ 100MHz		500mW x (BW/100) (see note 2)
Fixed field disturbance sensors at outside of the band 61-61.5GHz and within 57 -71 GHz	> 100MHz	N/A	500mW
	≤ 100MHz		500mW x (BW/100) (see note 2)
Except fixed field disturbance sensors at 61-61.5GHz	N/A	> 500MHz	-10 dBm
Except outdoor fixed Point to Point,	> 100MHz	N/A	500mW
Outdoor fixed Point to Point	≤ 100MHz	N/A	500mW x (BW/100) (see note 2)
NOTE 1: For the applicable limit, see FCC 15.255(c) NOTE 2: BW= 6dB bandwidth (measured at RBW 100kHz)			

3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.5

3.4.4 Test Result of Peak Conducted Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11
NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.	

3.4.4.1 Peak Conducted Power

Test Results						
Test Freq. (GHz)	**EIRP (dBm)**	**Max. Ant. Gain (dBi)**	**Peak Power (dBm)** (note1)	**Peak Power (mW)**	**6dBc BW (MHz)** (note2)	**Peak Power Limit (mW)** (note3)
58.32	62.51	41.0165	21.49	141.037	1735.30	500.00
60.48	61.85	40.5424	21.31	135.183	1721.80	500.00
62.64	63.00	41.1639	21.83	152.546	1694.80	500.00
64.80	63.82	41.6721	22.15	164.001	1631.90	500.00
66.96	64.57	42.0269	22.54	179.609	1703.80	500.00
69.12	63.64	41.1283	22.51	178.199	1591.40	500.00

NOTE 1: Because EUT used for the integral antenna without temporary RF connector provided. Therefore peak conducted power is equal to EIRP power subtract the antenna gain.

NOTE 2: For the 6dBc bandwidth, see test report clause 3.2.5.

NOTE 3: For the applicable limit, see FCC 15.255(c)

NOTE 4: For radiated emission measurements, calculate conducted transmitter output power P(cond)(dBm)

P(cond) = EIRP - G(dBi)

where:

G(dBi) is gain of EUT antenna.

3.5 Transmitter Spurious Emissions

3.5.1 Limit of Transmitter Spurious Emissions

Frequency Range	Limit
Radiated emissions below 40 GHz	Reference to section 15.209
Radiated emissions above 40 GHz – 200GHz	90 pW/cm^2 @ 3 m (Equivalent EIRP 102 μW, -9.91dBm)
NOTE 1: For the applicable limit, see 15.255(d)	
NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

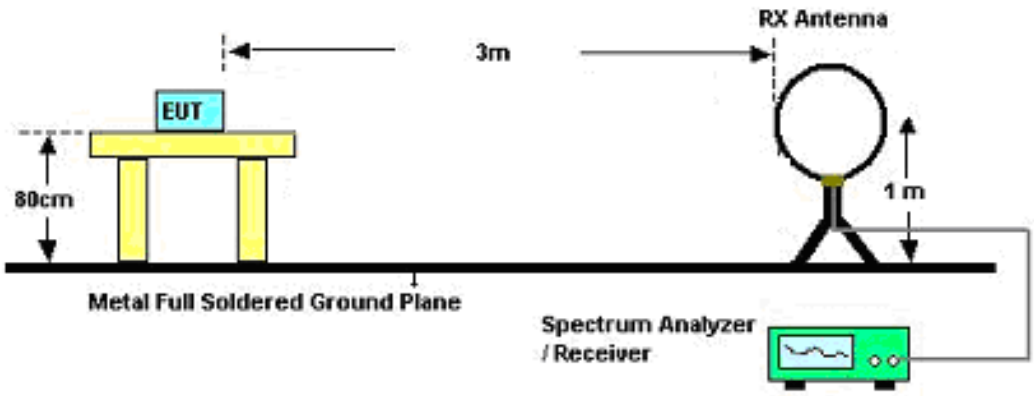
3.5.2 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.12

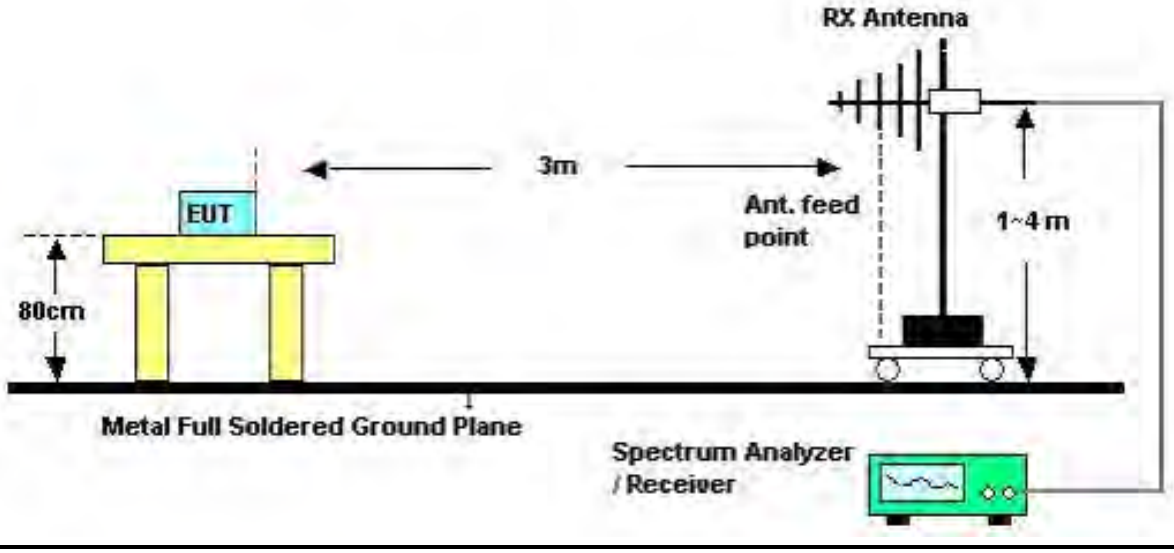
3.5.3 Test Setup

Transmitter Spurious Emissions

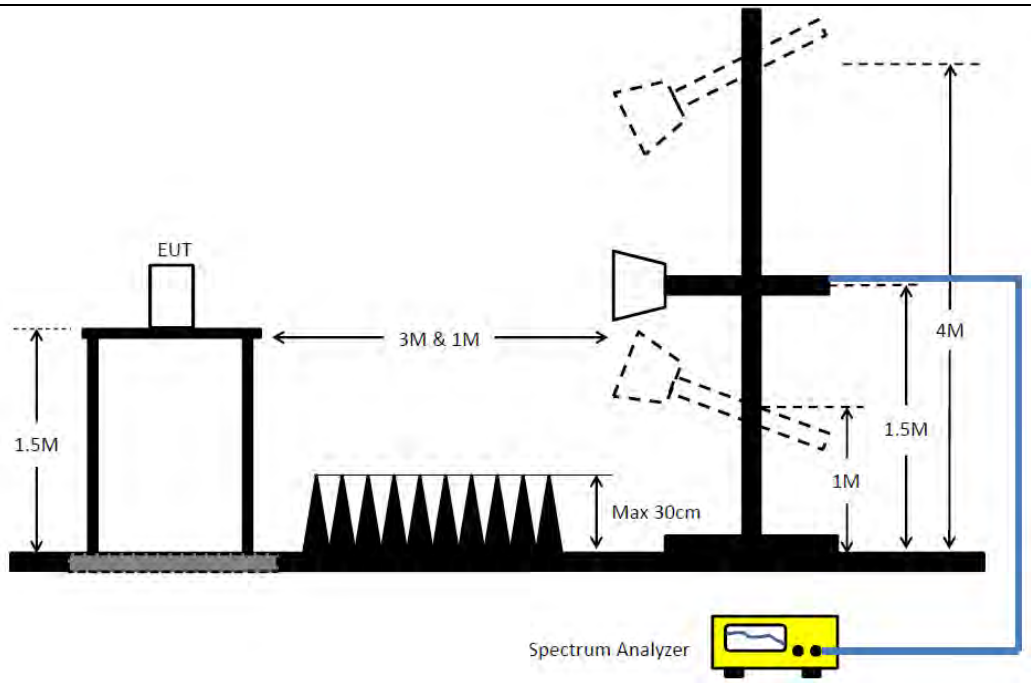
9kHz ~30MHz



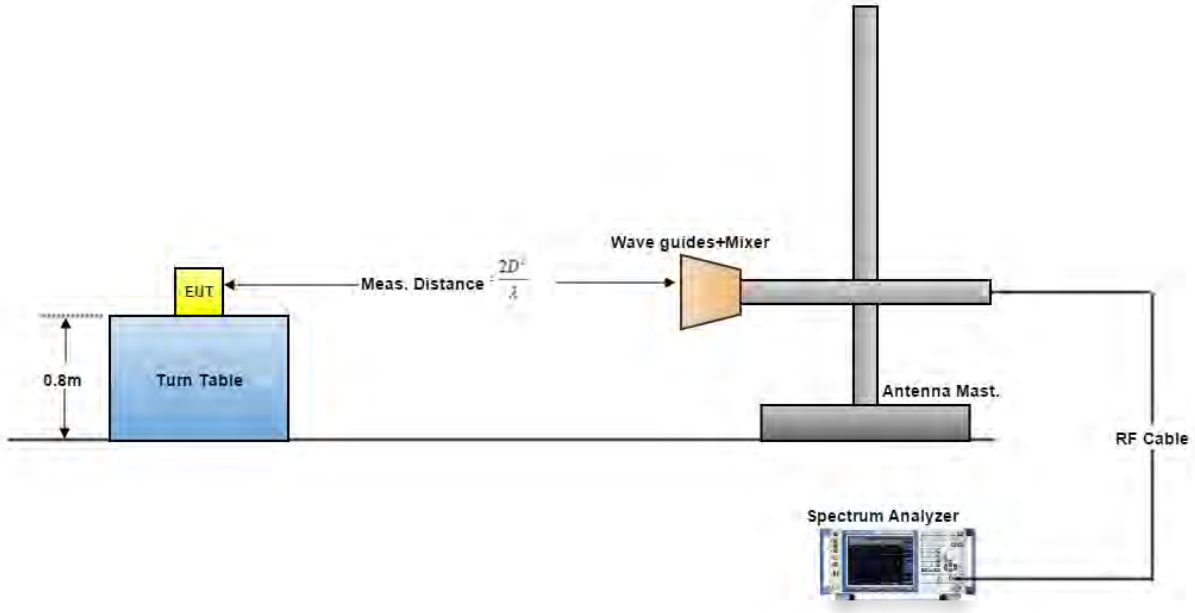
30MHz~1GHz



1GHz~40GHz



Above 40GHz



A measuring distance of at 3 m shall be used for measurements at frequencies up to 15 GHz. For frequencies above 15 GHz, any suitable measuring distance may be used. The measurement distance is chosen up to far field distance, depending on the test system noise floor for detecting spurious emission signals. Then above 15 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from spec. distance (3 m) to measurement distance. Distance extrapolation factor = 20 log (spec. distance [3 m] / measurement distance [N m]) (dB) .The measurements described in ANSI C63.10, clause 7.8.6. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

3.5.4 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

For above 40GHz

EIRP = Meas. Level - RX Antenna Gain + 20*log(4*Pi(3.14159)*D/(300/(Frequency*1000)))

3.5.5 Test Result of Transmitter Spurious Emissions

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.12 、9.13
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.5.5.1 Test Result of Transmitter Spurious Emissions (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

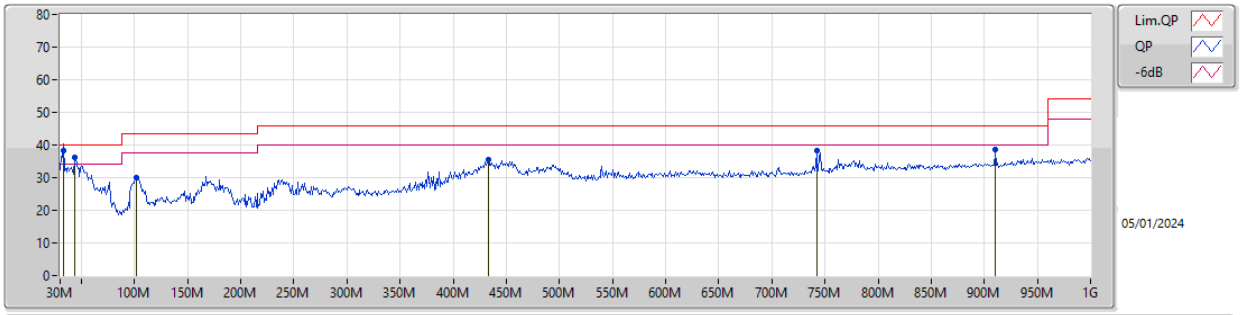
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

3.5.5.2 Test Result of Transmitter Spurious Emissions

Test Range	30 MHz – 1000 MHz	Test Distance	3 m
Test Configuration	CTX		

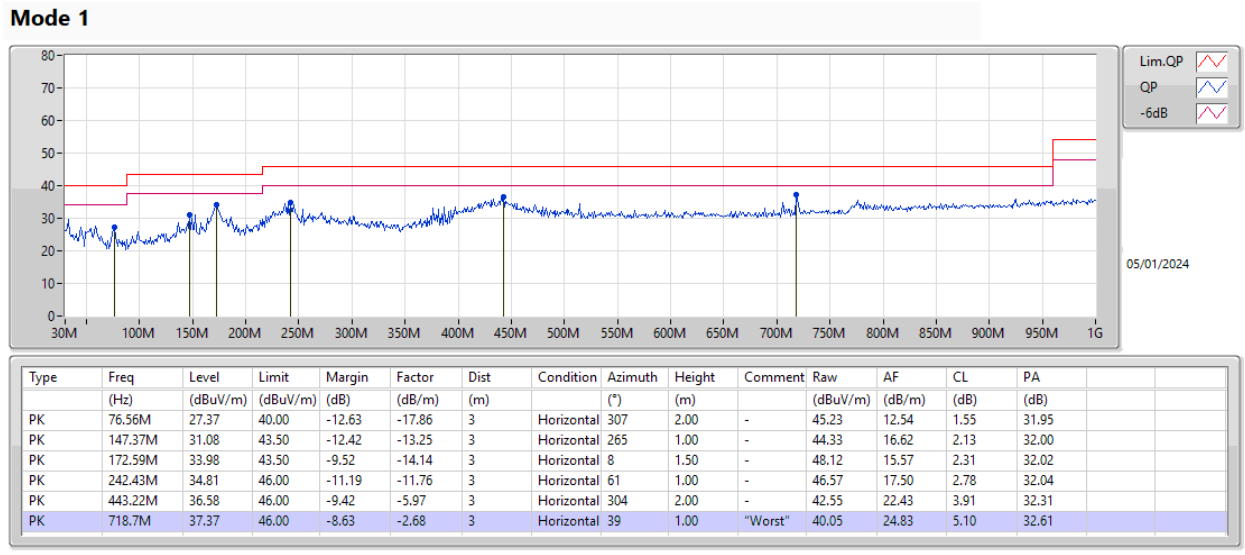
Vertical

Mode 1



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
QP	32.91M	38.18	40.00	-1.82	-8.12	3	Vertical	262	1.00	"Worst"	46.30	22.55	0.95	31.62
PK	43.58M	36.20	40.00	-3.80	-13.70	3	Vertical	95	1.00	-	49.90	16.89	1.21	31.80
PK	101.78M	30.04	43.50	-13.46	-13.16	3	Vertical	244	1.00	-	43.20	17.01	1.77	31.94
PK	433.52M	35.50	46.00	-10.50	-6.10	3	Vertical	11	1.25	-	41.60	22.32	3.86	32.28
PK	741.98M	38.33	46.00	-7.67	-2.10	3	Vertical	89	3.00	-	40.43	25.33	5.20	32.63
PK	910.76M	38.55	46.00	-7.45	-0.23	3	Vertical	336	3.00	-	38.78	26.37	5.87	32.47

Horizontal

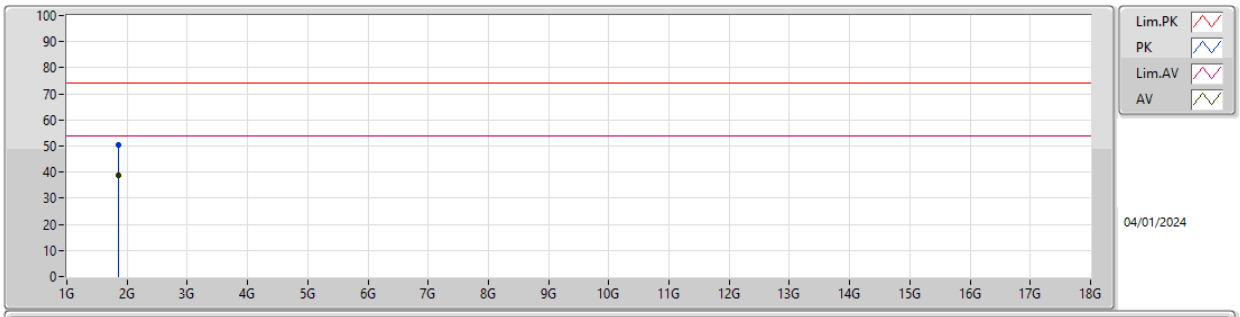


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	76.56M	27.37	40.00	-12.63	-17.86	3	Horizontal	307	2.00	-	45.23	12.54	1.55	31.95
PK	147.37M	31.08	43.50	-12.42	-13.25	3	Horizontal	265	1.00	-	44.33	16.62	2.13	32.00
PK	172.59M	33.98	43.50	-9.52	-14.14	3	Horizontal	8	1.50	-	48.12	15.57	2.31	32.02
PK	242.43M	34.81	46.00	-11.19	-11.76	3	Horizontal	61	1.00	-	46.57	17.50	2.78	32.04
PK	443.22M	36.58	46.00	-9.42	-5.97	3	Horizontal	304	2.00	-	42.55	22.43	3.91	32.31
PK	718.7M	37.37	46.00	-8.63	-2.68	3	Horizontal	39	1.00	"Worst"	40.05	24.83	5.10	32.61

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	58.32		

Vertical

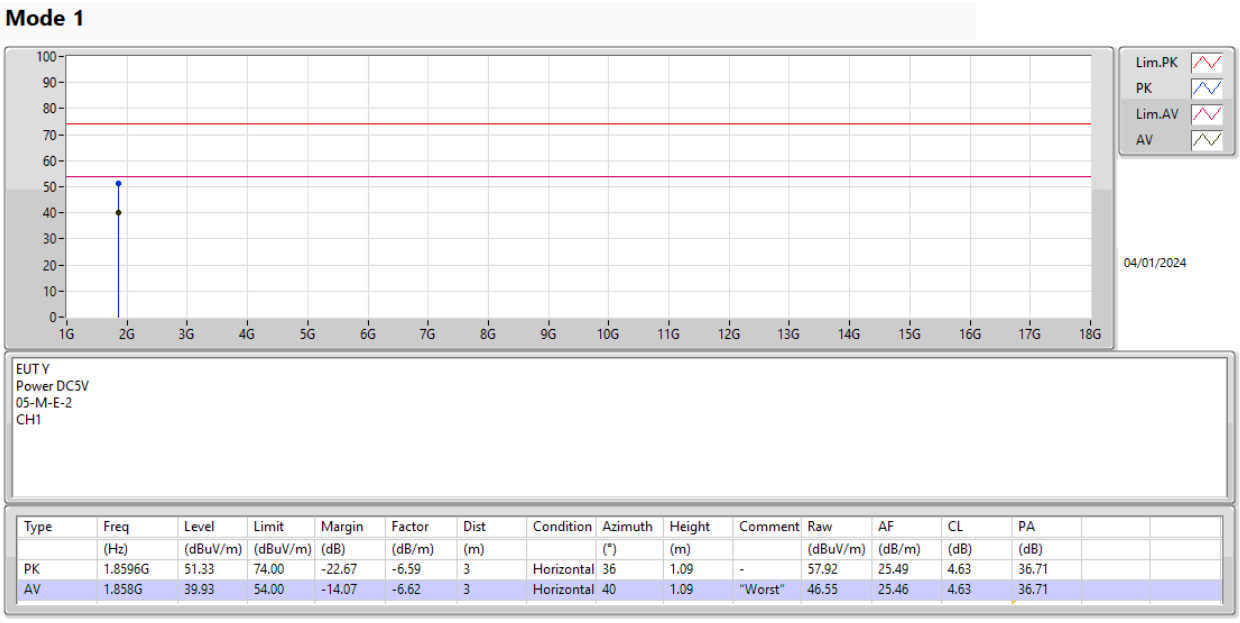
Mode 1



EUT Y
Power DC5V
05-M-E-2
CH1

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.85565G	50.23	74.00	-23.77	-6.67	3	Vertical	45	2.18	-	56.90	25.41	4.63	36.71
AV	1.85725G	38.91	54.00	-15.09	-6.63	3	Vertical	42	2.18	"Worst"	45.54	25.45	4.63	36.71

Horizontal

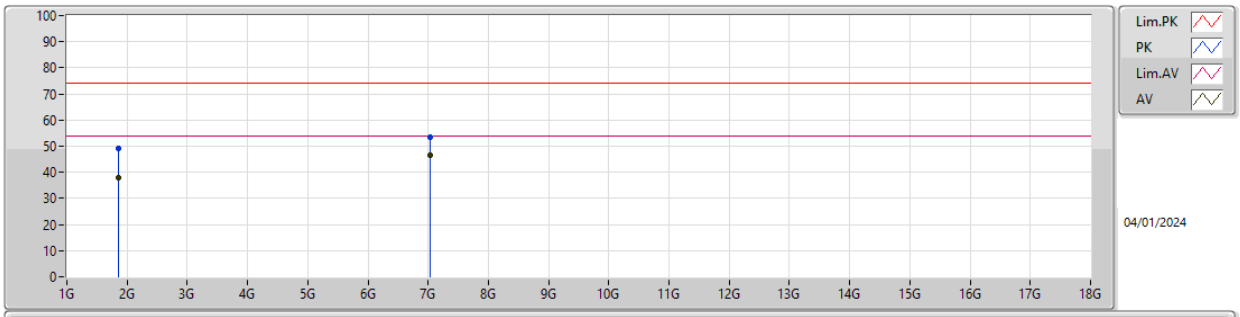


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.8596G	51.33	74.00	-22.67	-6.59	3	Horizontal	36	1.09	-	57.92	25.49	4.63	36.71
AV	1.858G	39.93	54.00	-14.07	-6.62	3	Horizontal	40	1.09	"Worst"	46.55	25.46	4.63	36.71

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	60.48		

Vertical

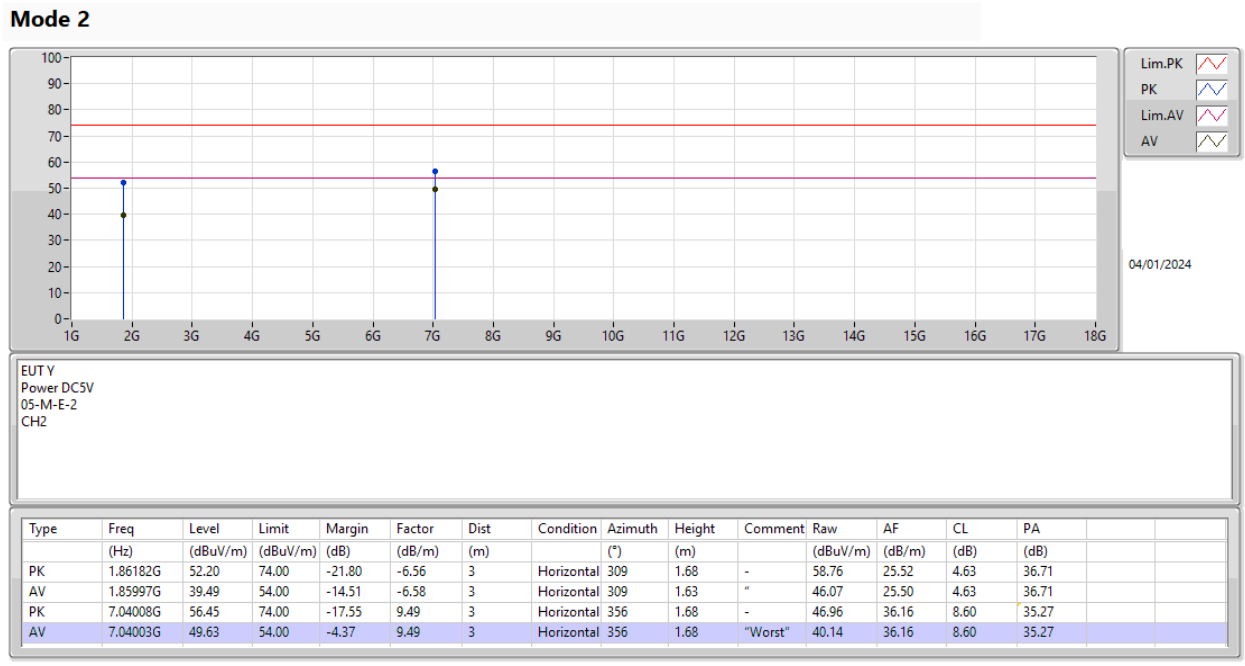
Mode 2



EUT Y
Power DC5V
05-M-E-2
CH2

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.85775G	49.07	74.00	-24.93	-6.62	3	Vertical	44	2.09	-	55.69	25.46	4.63	36.71
AV	1.857G	38.11	54.00	-15.89	-6.64	3	Vertical	42	2.09	-	44.75	25.44	4.63	36.71
PK	7.04017G	53.58	74.00	-20.42	9.49	3	Vertical	7	1.50	-	44.09	36.16	8.60	35.27
AV	7.04003G	46.72	54.00	-7.28	9.49	3	Vertical	7	1.50	"Worst"	37.23	36.16	8.60	35.27

Horizontal

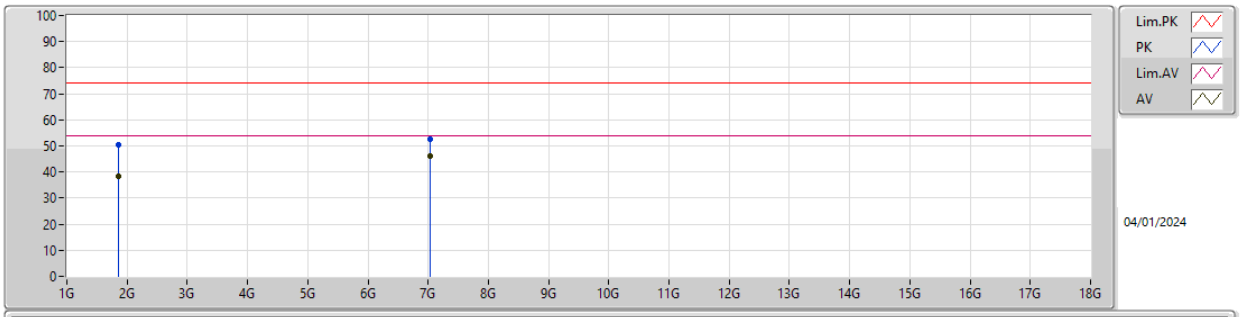


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.86182G	52.20	74.00	-21.80	-6.56	3	Horizontal	309	1.68	-	58.76	25.52	4.63	36.71
AV	1.85997G	39.49	54.00	-14.51	-6.58	3	Horizontal	309	1.63	"	46.07	25.50	4.63	36.71
PK	7.04008G	56.45	74.00	-17.55	9.49	3	Horizontal	356	1.68	-	46.96	36.16	8.60	35.27
AV	7.04003G	49.63	54.00	-4.37	9.49	3	Horizontal	356	1.68	"Worst"	40.14	36.16	8.60	35.27

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	62.64		

Vertical

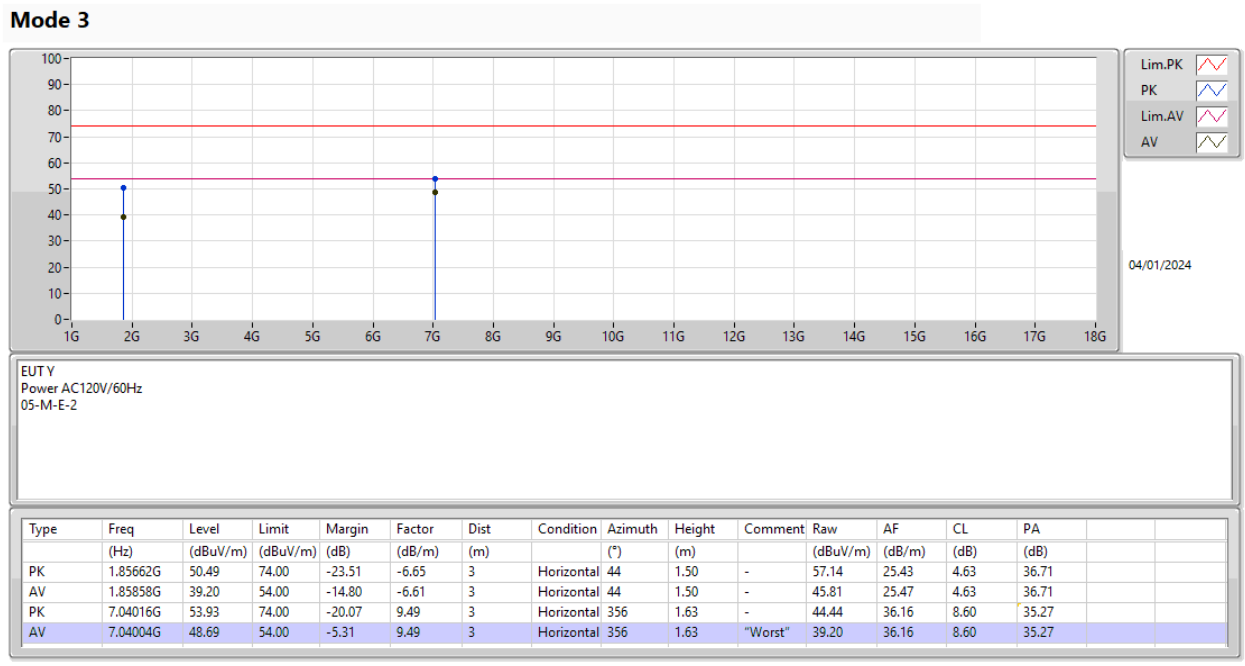
Mode 3



EUT Y
Power AC120V/60Hz
05-M-E-2

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.85122G	50.49	74.00	-23.51	-6.77	3	Vertical	43	2.22	-	57.26	25.32	4.62	36.71
AV	1.85716G	38.56	54.00	-15.44	-6.64	3	Vertical	44	2.22	"	45.20	25.44	4.63	36.71
PK	7.04008G	52.38	74.00	-21.62	9.49	3	Vertical	7	1.34	-	42.89	36.16	8.60	35.27
AV	7.04004G	45.99	54.00	-8.01	9.49	3	Vertical	7	1.34	"Worst"	36.50	36.16	8.60	35.27

Horizontal

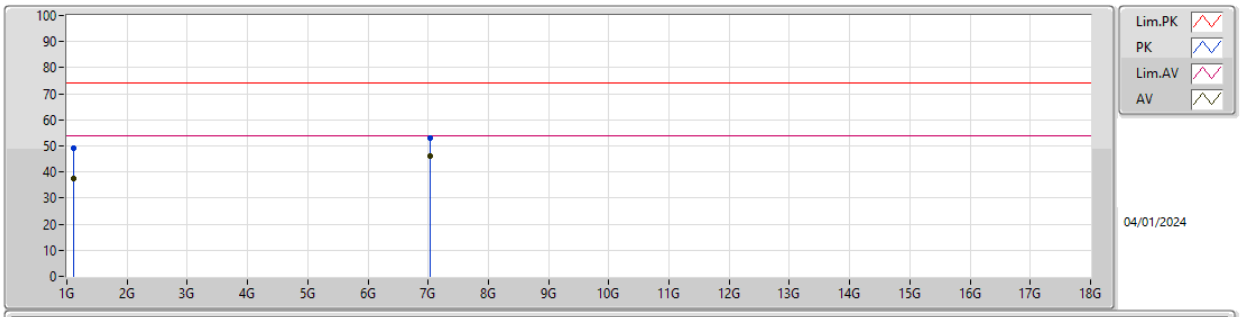


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.85662G	50.49	74.00	-23.51	-6.65	3	Horizontal	44	1.50	-	57.14	25.43	4.63	36.71
AV	1.85858G	39.20	54.00	-14.80	-6.61	3	Horizontal	44	1.50	-	45.81	25.47	4.63	36.71
PK	7.04016G	53.93	74.00	-20.07	9.49	3	Horizontal	356	1.63	-	44.44	36.16	8.60	35.27
AV	7.04004G	48.69	54.00	-5.31	9.49	3	Horizontal	356	1.63	"Worst"	39.20	36.16	8.60	35.27

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	64.80		

Vertical

Mode 4

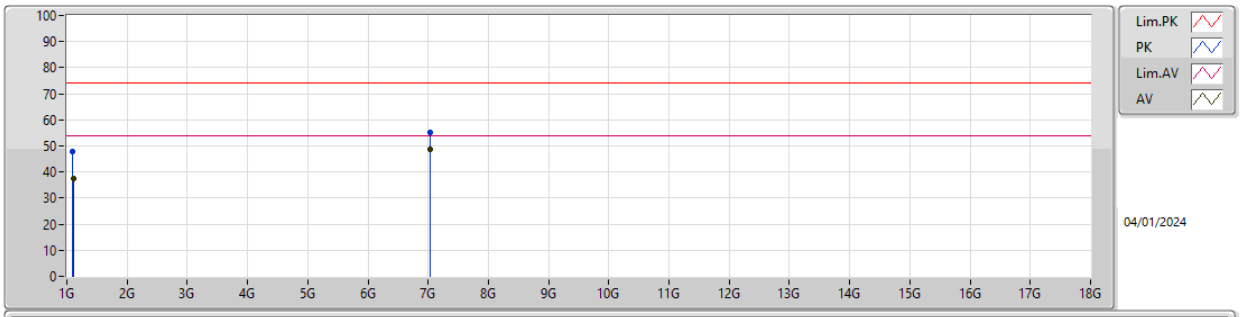


EUT Y
Power DC5V
05-M-E-2

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.1058G	48.99	74.00	-25.01	-7.96	3	Vertical	50	1.23	-	56.95	25.27	3.64	36.87
AV	1.10645G	37.67	54.00	-16.33	-7.94	3	Vertical	49	1.21	-	45.61	25.29	3.64	36.87
PK	7.03998G	52.93	74.00	-21.07	9.49	3	Vertical	8	1.50	-	43.44	36.16	8.60	35.27
AV	7.04004G	46.29	54.00	-7.71	9.49	3	Vertical	8	1.50	"Worst"	36.80	36.16	8.60	35.27

Horizontal

Mode 4



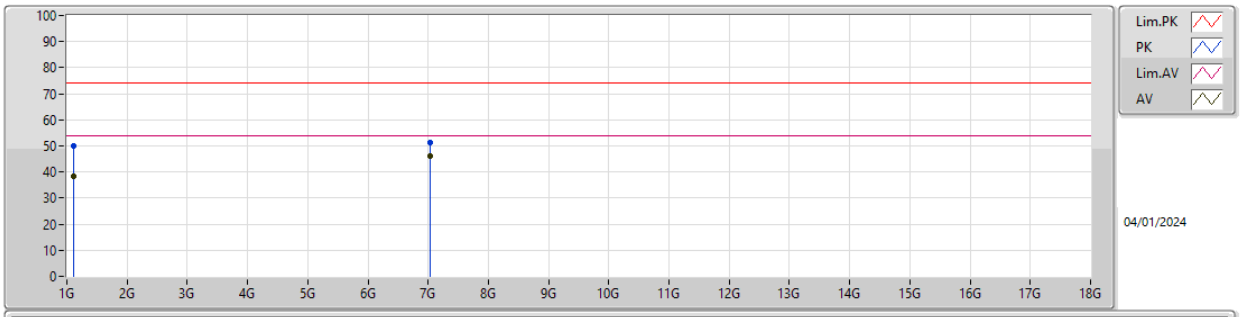
EUT Y
Power DC5V
05-M-E-2

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.10035G	47.97	74.00	-26.03	-8.13	3	Horizontal	78	1.38	-	56.10	25.11	3.63	36.87
AV	1.10515G	37.69	54.00	-16.31	-7.98	3	Horizontal	80	1.38	-	45.67	25.25	3.64	36.87
PK	7.0402G	55.02	74.00	-18.98	9.49	3	Horizontal	357	1.67	-	45.53	36.16	8.60	35.27
AV	7.04005G	48.74	54.00	-5.26	9.49	3	Horizontal	357	1.67	"Worst"	39.25	36.16	8.60	35.27

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	66.96		

Vertical

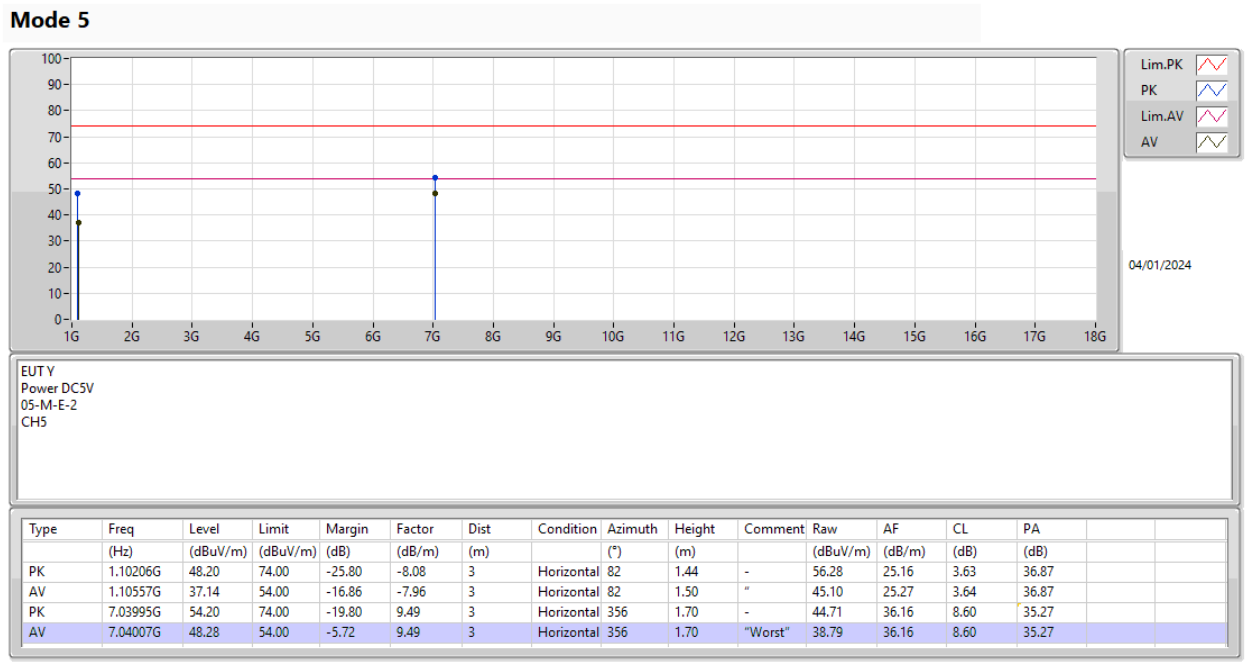
Mode 5



EUT Y
Power DC5V
05-M-E-2
CH5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.10572G	50.02	74.00	-23.98	-7.96	3	Vertical	49	1.20	-	57.98	25.27	3.64	36.87
AV	1.10773G	38.54	54.00	-15.46	-7.90	3	Vertical	48	1.20	-	46.44	25.33	3.64	36.87
PK	7.03998G	51.33	74.00	-22.67	9.49	3	Vertical	7	1.50	-	41.84	36.16	8.60	35.27
AV	7.04004G	46.09	54.00	-7.91	9.49	3	Vertical	7	1.50	"Worst"	36.60	36.16	8.60	35.27

Horizontal

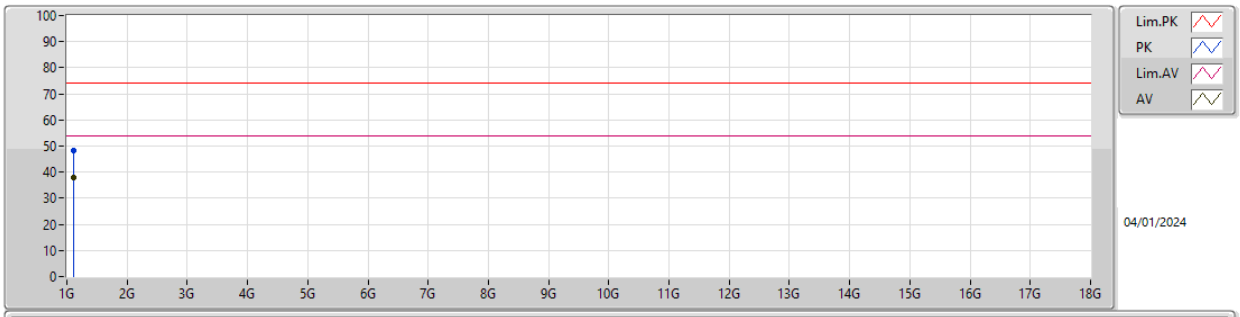


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.10206G	48.20	74.00	-25.80	-8.08	3	Horizontal	82	1.44	-	56.28	25.16	3.63	36.87
AV	1.10557G	37.14	54.00	-16.86	-7.96	3	Horizontal	82	1.50	"	45.10	25.27	3.64	36.87
PK	7.03995G	54.20	74.00	-19.80	9.49	3	Horizontal	356	1.70	-	44.71	36.16	8.60	35.27
AV	7.04007G	48.28	54.00	-5.72	9.49	3	Horizontal	356	1.70	"Worst"	38.79	36.16	8.60	35.27

Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	69.12		

Vertical

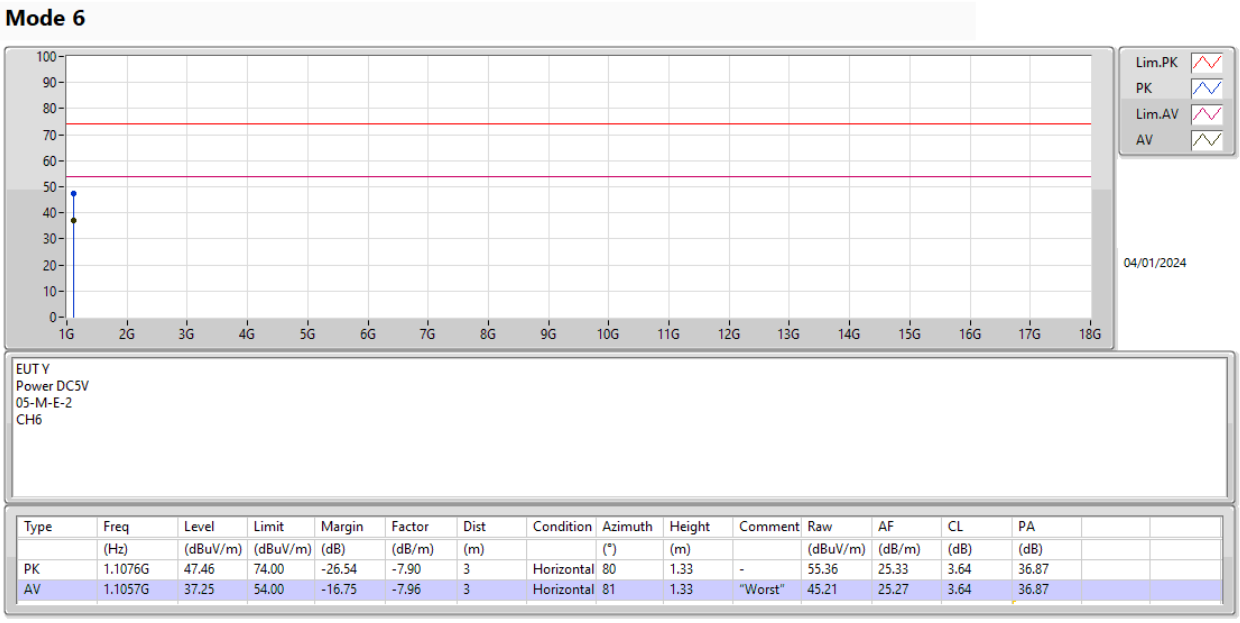
Mode 6



EUT Y
Power DC5V
05-M-E-2
CH6

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.107G	48.49	74.00	-25.51	-7.92	3	Vertical	50	1.21	-	56.41	25.31	3.64	36.87
AV	1.1072G	38.11	54.00	-15.89	-7.91	3	Vertical	50	1.21	"Worst"	46.02	25.32	3.64	36.87

Horizontal

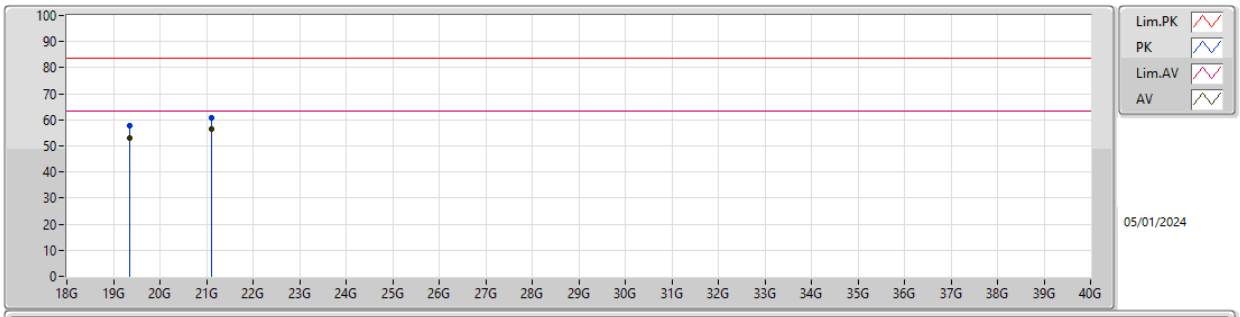


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.1076G	47.46	74.00	-26.54	-7.90	3	Horizontal	80	1.33	-	55.36	25.33	3.64	36.87
AV	1.1057G	37.25	54.00	-16.75	-7.96	3	Horizontal	81	1.33	"Worst"	45.21	25.27	3.64	36.87

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	58.32		

Vertical

Mode 1

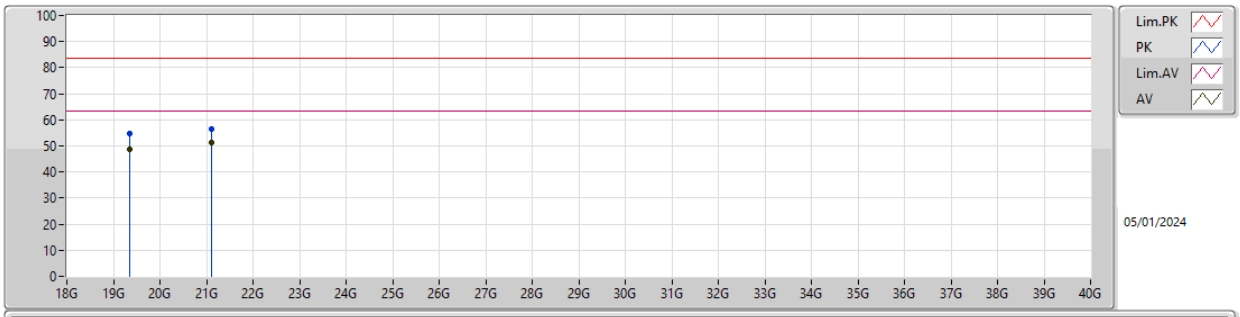


EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36013G	57.84	83.54	-25.70	5.38	1	Vertical	12	2.18	-	52.46	37.84	18.97	51.43
AV	19.36014G	52.81	63.54	-10.73	5.38	1	Vertical	12	2.18	-	47.43	37.84	18.97	51.43
PK	21.11995G	60.87	83.54	-22.67	5.45	1	Vertical	10	2.18	-	55.42	38.14	19.51	52.20
AV	21.12016G	56.68	63.54	-6.86	5.45	1	Vertical	10	2.18	"Worst"	51.23	38.14	19.51	52.20

Horizontal

Mode 1



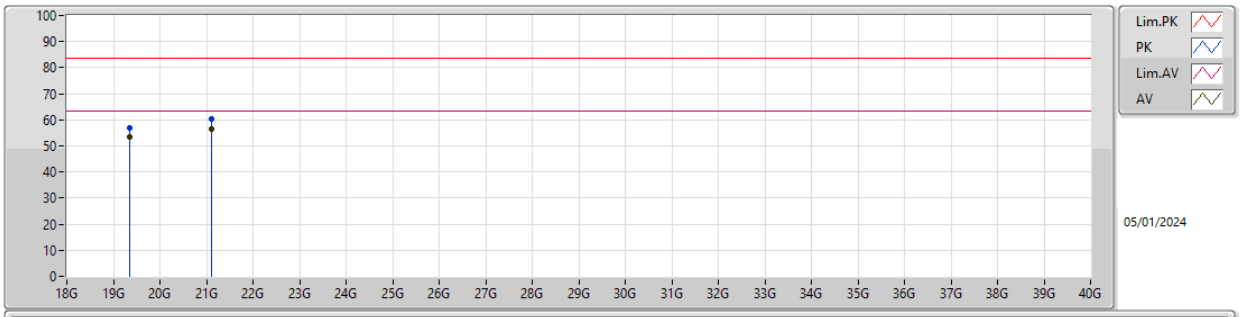
EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36024G	54.67	83.54	-28.87	5.38	1	Horizontal	13	1.54	-	49.29	37.84	18.97	51.43
AV	19.36016G	48.83	63.54	-14.71	5.38	1	Horizontal	13	1.54	-	43.45	37.84	18.97	51.43
PK	21.11984G	56.60	83.54	-26.94	5.45	1	Horizontal	8	1.59	-	51.15	38.14	19.51	52.20
AV	21.12015G	51.23	63.54	-12.31	5.45	1	Horizontal	8	1.59	"Worst"	45.78	38.14	19.51	52.20

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	60.48		

Vertical

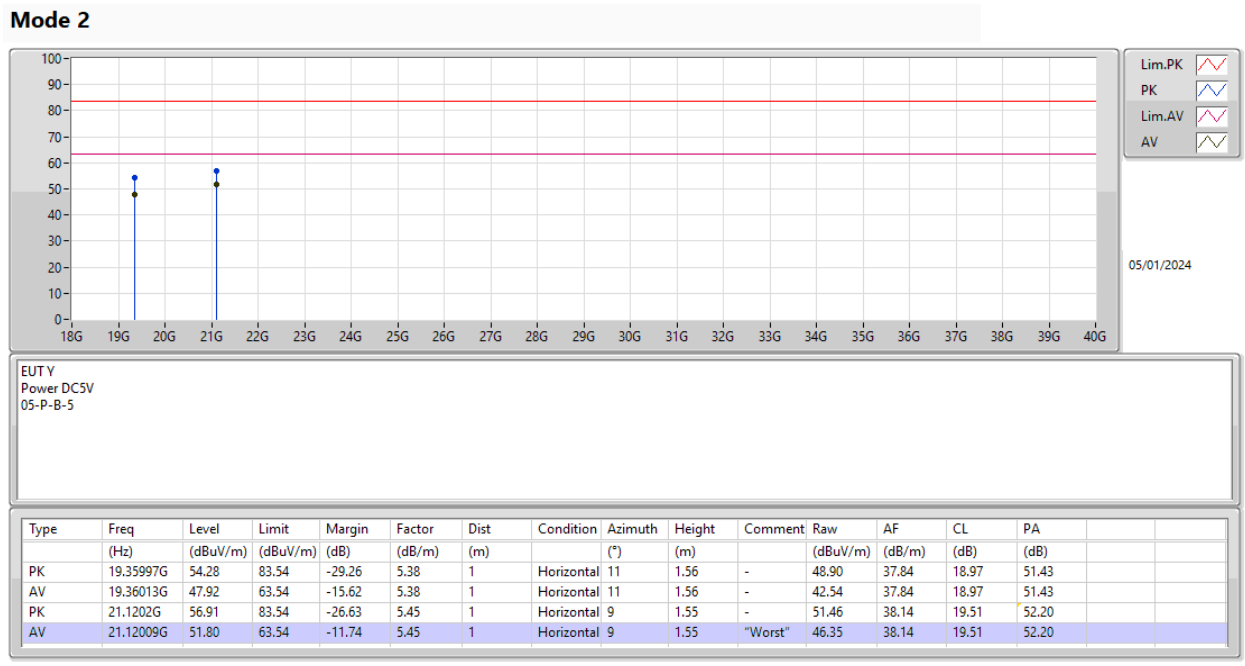
Mode 2



EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.35994G	56.79	83.54	-26.75	5.38	1	Vertical	12	1.54	-	51.41	37.84	18.97	51.43
AV	19.36011G	53.48	63.54	-10.06	5.38	1	Vertical	12	1.54	-	48.10	37.84	18.97	51.43
PK	21.11977G	60.24	83.54	-23.30	5.45	1	Vertical	9	1.56	-	54.79	38.14	19.51	52.20
AV	21.12011G	56.26	63.54	-7.28	5.45	1	Vertical	9	1.56	"Worst"	50.81	38.14	19.51	52.20

Horizontal

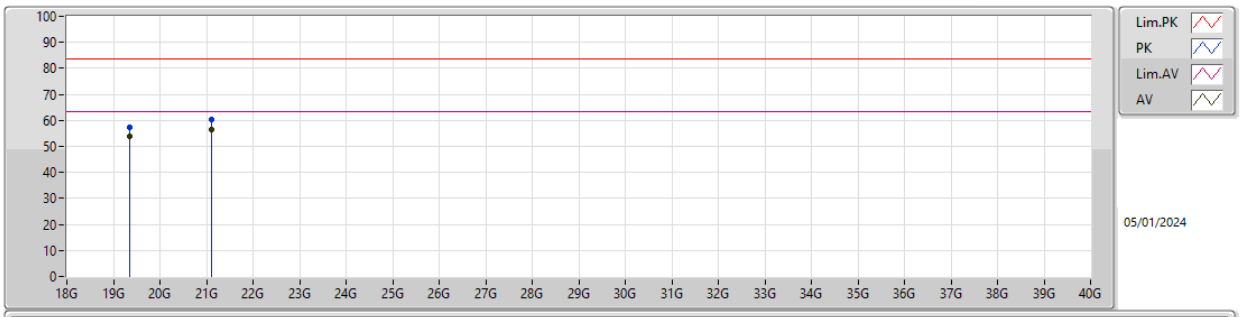


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.35997G	54.28	83.54	-29.26	5.38	1	Horizontal	11	1.56	-	48.90	37.84	18.97	51.43
AV	19.36013G	47.92	63.54	-15.62	5.38	1	Horizontal	11	1.56	-	42.54	37.84	18.97	51.43
PK	21.1202G	56.91	83.54	-26.63	5.45	1	Horizontal	9	1.55	-	51.46	38.14	19.51	52.20
AV	21.12009G	51.80	63.54	-11.74	5.45	1	Horizontal	9	1.55	"Worst"	46.35	38.14	19.51	52.20

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	62.64		

Vertical

Mode 3

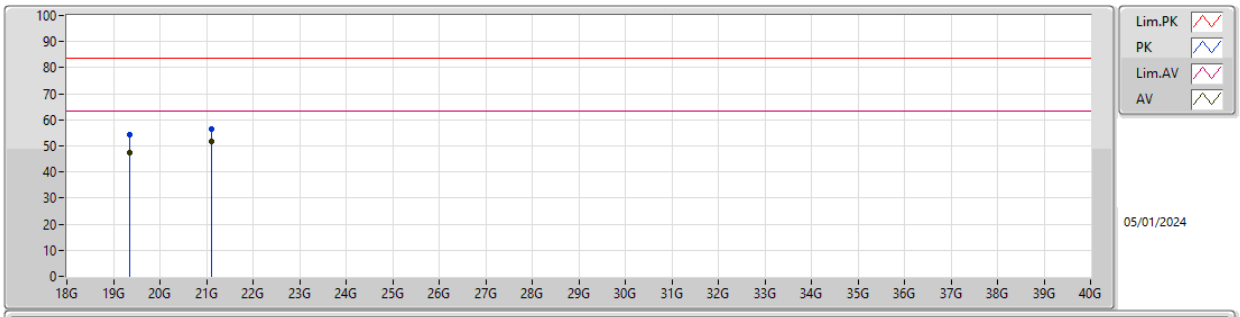


EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36019G	57.31	83.54	-26.23	5.38	1	Vertical	6	1.55	-	51.93	37.84	18.97	51.43
AV	19.36012G	53.91	63.54	-9.63	5.38	1	Vertical	6	1.55	-	48.53	37.84	18.97	51.43
PK	21.12017G	60.24	83.54	-23.30	5.45	1	Vertical	10	1.50	-	54.79	38.14	19.51	52.20
AV	21.12014G	56.33	63.54	-7.21	5.45	1	Vertical	10	1.50	"Worst"	50.88	38.14	19.51	52.20

Horizontal

Mode 3



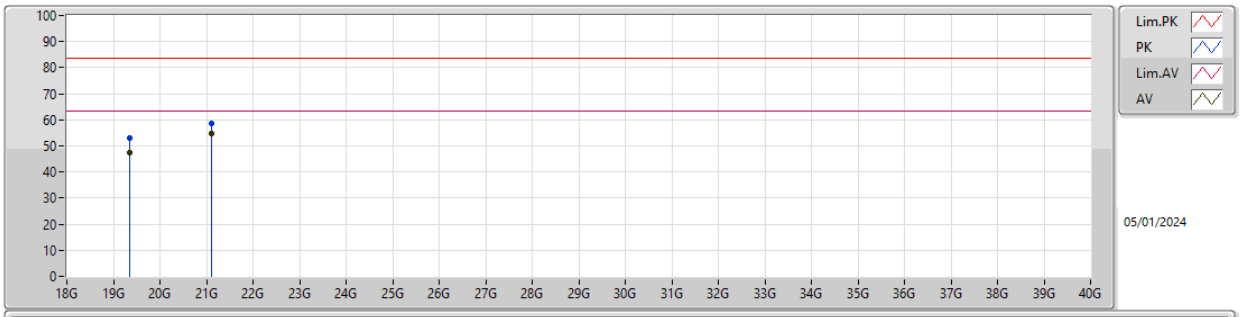
EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36001G	54.12	83.54	-29.42	5.38	1	Horizontal	6.5	1.10	-	48.74	37.84	18.97	51.43
AV	19.3601G	47.52	63.54	-16.02	5.38	1	Horizontal	6.5	1.10	-	42.14	37.84	18.97	51.43
PK	21.12024G	56.38	83.54	-27.16	5.45	1	Horizontal	6.5	1.10	-	50.93	38.14	19.51	52.20
AV	21.12014G	51.78	63.54	-11.76	5.45	1	Horizontal	6.5	1.10	"Worst"	46.33	38.14	19.51	52.20

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	64.80		

Vertical

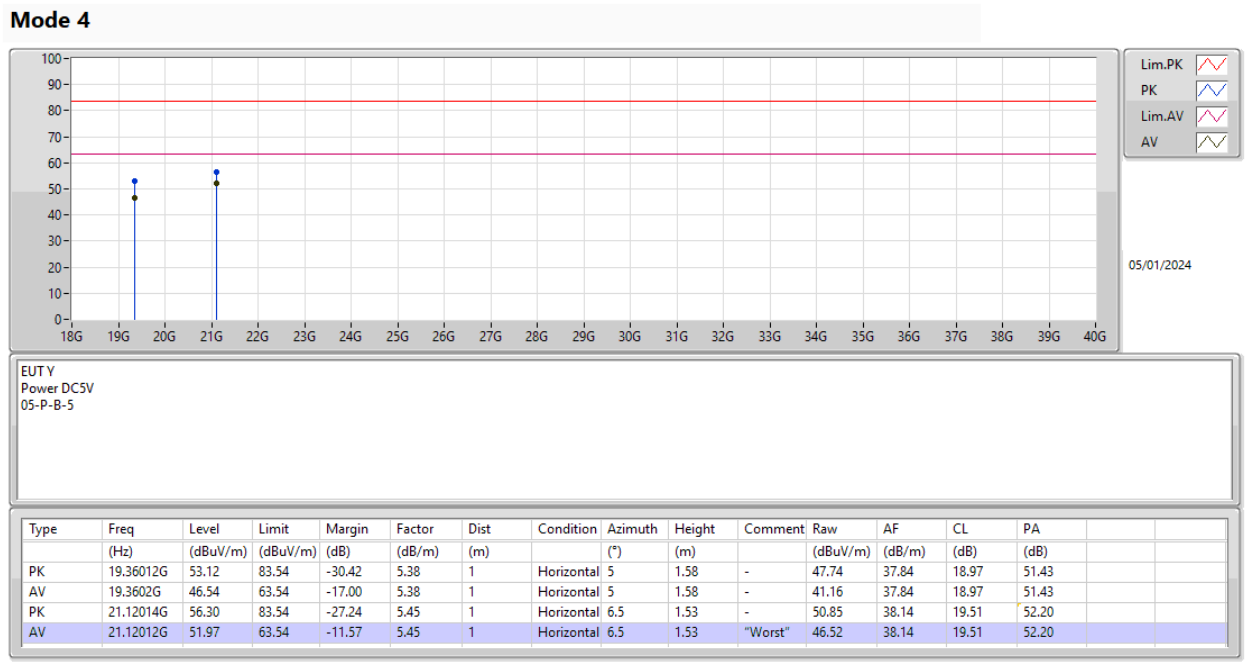
Mode 4



EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36012G	53.17	83.54	-30.37	5.38	1	Vertical	11	1.48	-	47.79	37.84	18.97	51.43
AV	19.36013G	47.54	63.54	-16.00	5.38	1	Vertical	11	1.48	-	42.16	37.84	18.97	51.43
PK	21.12015G	58.74	83.54	-24.80	5.45	1	Vertical	8	1.52	-	53.29	38.14	19.51	52.20
AV	21.12014G	54.95	63.54	-8.59	5.45	1	Vertical	8	1.52	"Worst"	49.50	38.14	19.51	52.20

Horizontal

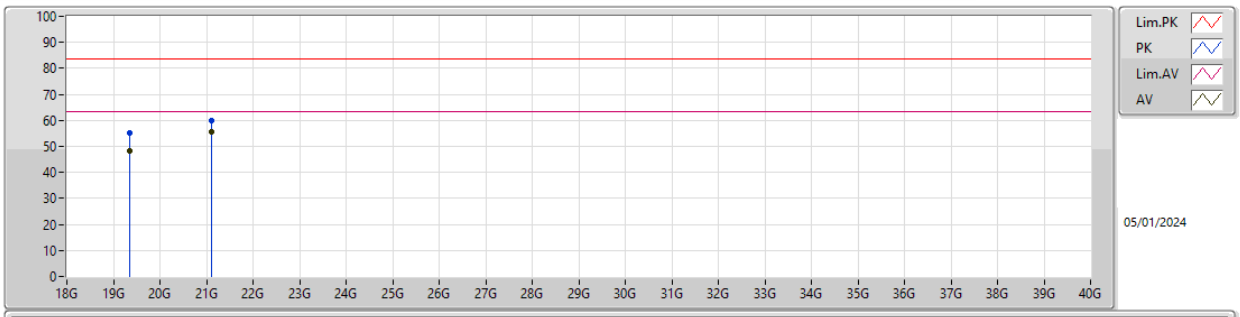


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA		
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)		
PK	19.36012G	53.12	83.54	-30.42	5.38	1	Horizontal	5	1.58	-	47.74	37.84	18.97	51.43		
AV	19.3602G	46.54	63.54	-17.00	5.38	1	Horizontal	5	1.58	-	41.16	37.84	18.97	51.43		
PK	21.12014G	56.30	83.54	-27.24	5.45	1	Horizontal	6.5	1.53	-	50.85	38.14	19.51	52.20		
AV	21.12012G	51.97	63.54	-11.57	5.45	1	Horizontal	6.5	1.53	"Worst"	46.52	38.14	19.51	52.20		

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	66.96		

Vertical

Mode 5

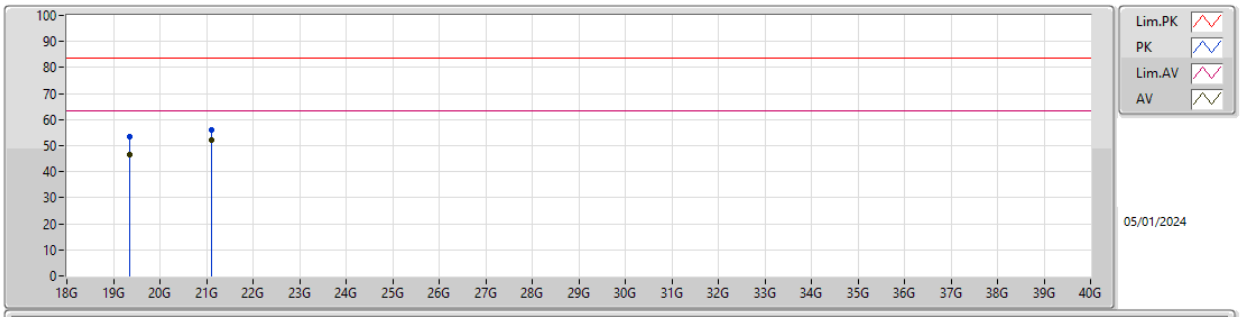


EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36004G	55.19	83.54	-28.35	5.38	1	Vertical	6.5	1.53	-	49.81	37.84	18.97	51.43
AV	19.3601G	48.38	63.54	-15.16	5.38	1	Vertical	6.5	1.53	-	43.00	37.84	18.97	51.43
PK	21.12025G	59.81	83.54	-23.73	5.45	1	Vertical	16	1.42	-	54.36	38.14	19.51	52.20
AV	21.12015G	55.67	63.54	-7.87	5.45	1	Vertical	16	1.42	"Worst"	50.22	38.14	19.51	52.20

Horizontal

Mode 5



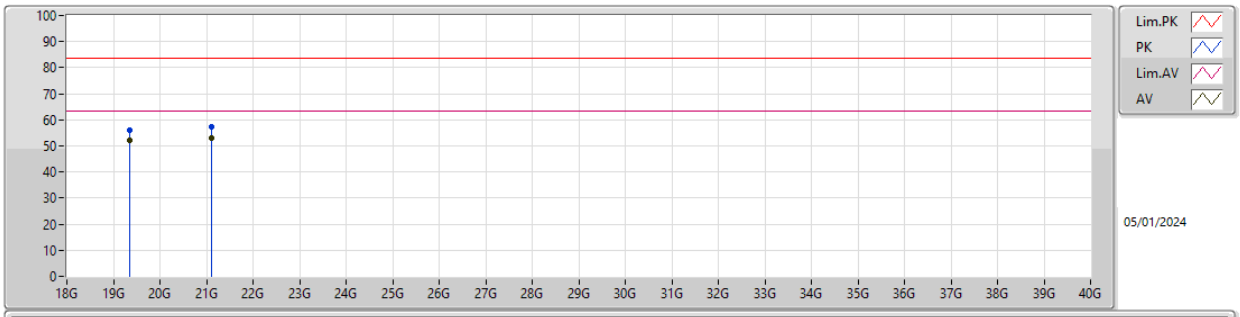
EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36013G	53.30	83.54	-30.24	5.38	1	Horizontal	6.5	1.54	-	47.92	37.84	18.97	51.43
AV	19.36012G	46.40	63.54	-17.14	5.38	1	Horizontal	6.5	1.54	-	41.02	37.84	18.97	51.43
PK	21.12027G	56.24	83.54	-27.30	5.45	1	Horizontal	15	1.47	-	50.79	38.14	19.51	52.20
AV	21.12014G	52.04	63.54	-11.50	5.45	1	Horizontal	15	1.47	"Worst"	46.59	38.14	19.51	52.20

Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	69.12		

Vertical

Mode 6

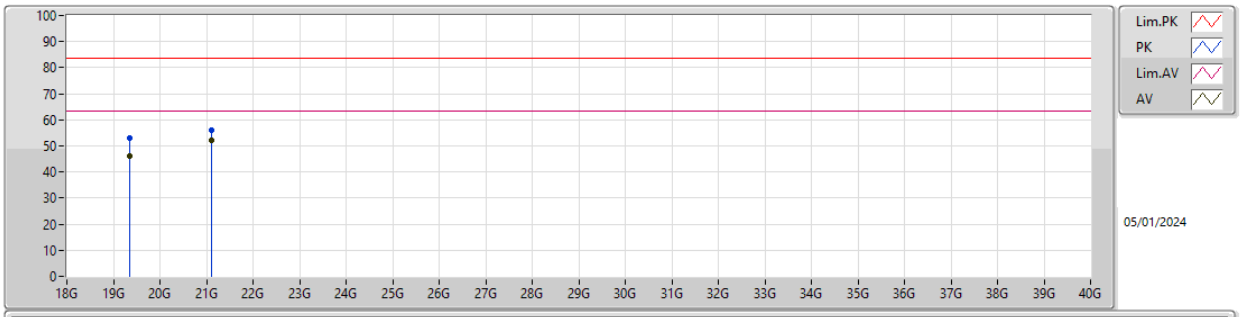


EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36015G	55.93	83.54	-27.61	5.38	1	Vertical	5	1.49	-	50.55	37.84	18.97	51.43
AV	19.36018G	52.26	63.54	-11.28	5.38	1	Vertical	5	1.49	-	46.88	37.84	18.97	51.43
PK	21.11994G	57.13	83.54	-26.41	5.45	1	Vertical	9	1.53	-	51.68	38.14	19.51	52.20
AV	21.12017G	53.01	63.54	-10.53	5.45	1	Vertical	9	1.53	"Worst"	47.56	38.14	19.51	52.20

Horizontal

Mode 6



EUT Y
Power DC5V
05-P-B-5

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	19.36013G	53.11	83.54	-30.43	5.38	1	Horizontal	0	1.56	-	47.73	37.84	18.97	51.43
AV	19.36012G	46.22	63.54	-17.32	5.38	1	Horizontal	0	1.56	-	40.84	37.84	18.97	51.43
PK	21.12012G	56.22	83.54	-27.32	5.45	1	Horizontal	12	1.60	-	50.77	38.14	19.51	52.20
AV	21.12016G	52.07	63.54	-11.47	5.45	1	Horizontal	12	1.60	"Worst"	46.62	38.14	19.51	52.20

Test Range	40GHz – 200GHz

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
58.32	23.4	0.50	42.32	-65.70
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-30.15	3	0.8546	90.00	PASS

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23.7	0.50	47.28	-74.84
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-38.63	3	0.1213	90.00	PASS

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.64	23.9	0.50	51.49	-79.18
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-42.42	3	0.0506	90.00	PASS

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
64.80	24.3	0.50	72.39	-59.90
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-20.59	3	7.7268	90.00	PASS

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
66.96	24.3	0.50	72.84	-53.04
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-13.67	3	37.9668	90.00	PASS

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
69.12	24.4	0.50	73.04	-69.59
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-30.30	3	0.8257	90.00	PASS

Note:
EIRP = Prx – Grx + Free Space Path Loss = Prx – Grx + 20Log(4πd/ λ)2
Which
Prx = Read Level.
Grx = Rx Antenna Gain.
A distance factor is offset and the formula is 20LOG(D1/D2)
Which
D1 = Specification Distance
D2 = Measurement Distance

3.6 Frequency Stability

3.6.1 Limit of Frequency Stability

Frequency Stability	Limit
Refer as 15.255(f) and ANSI C63.10-2013, clause 9.14	within the frequency bands
Note: These measurements shall also be performed at normal and extreme test conditions.	

3.6.2 Measuring Instruments

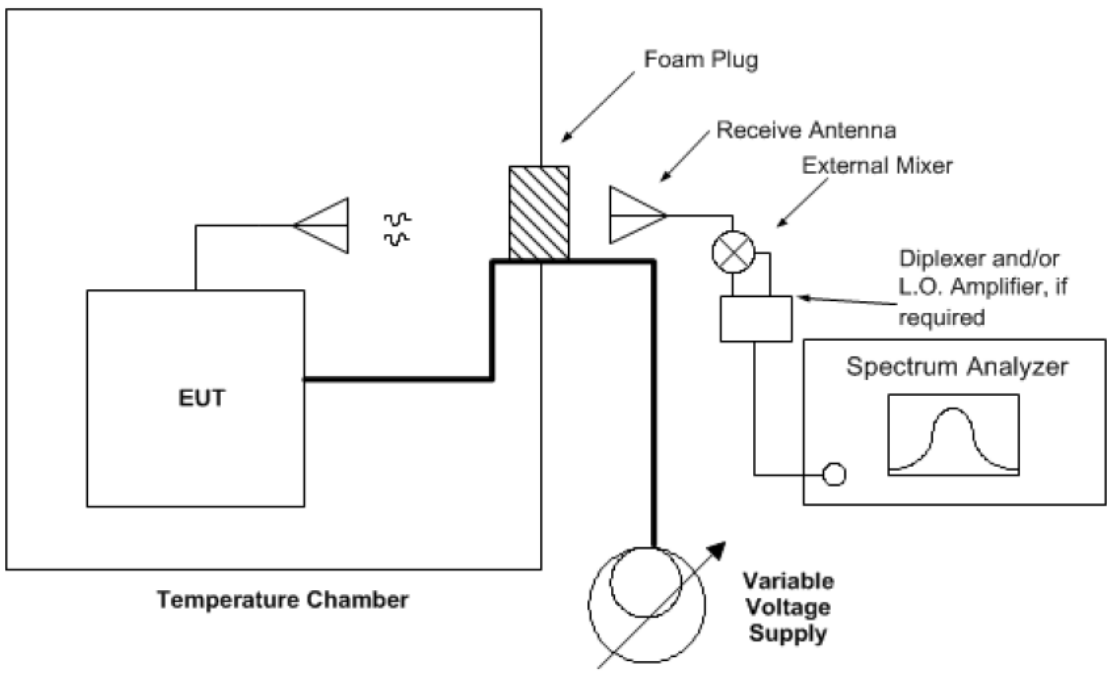
Refer a measuring instruments list in this test report.

3.6.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 9.14.

3.6.4 Test Setup

Frequency Stability



3.6.5 Test Result of Frequency Stability

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.14
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.6.5.1 Frequency Stability with Respect to Ambient Temperature

Frequency Stability with Respect to Ambient Temperature			
Test Results			
Test Temp.erature (°C)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
-40	60497.54	9520	Within band
-30	60495.48	7460	Within band
-20	60493.35	5330	Within band
-10	60492.85	4830	Within band
0	60486.17	-1850	Within band
10	60485.47	-2550	Within band
20	60488.02	Reference	Within band
30	60489.43	1410	Within band
40	60387.15	-100870	Within band
50	60371.05	-116970	Within band
60	60362.32	-125700	Within band
70	60359.52	-128500	Within band
80	60359.55	-128470	Within band
85	60341.59	-146430	Within band
NOTE: The manufacturer’s specified temperature range of -40 to 85°C.			

3.6.5.2 Frequency Stability When Varying Supply Voltage

Frequency Stability When Varying Supply Voltage			
Test Results			
Test Voltage: (Vdc)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
4.25	60485.47	-2550	Within band
5	60488.02	Reference	Within band
5.75	60489.43	1410	Within band

3.7 Operation Restriction and Group Installation

3.7.1 Limit of Operation Restriction and Group Installation

Item	Limit
Operation Restriction	Operation is not permitted for the following products: ♦ Equipment used on aircraft or satellites. (Refer as 15.255 (a)) ♦ Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. (Refer as 15.255 (a))
Group Installation	Operation is not permitted for the following products: ♦ External phase-locking (Refer as 15.255 (h))

3.7.2 Result of Operation Restriction

Manufacturer declares that EUT will not been used on aircraft or satellites. Then user manual will include a statement to caution EUT is not permitted for used on aircraft or satellites.

3.7.3 Result of Group Installation

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 20, 2023	Feb. 19, 2024	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Feb. 16, 2023	Feb. 15, 2024	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 27, 2023	Apr. 26, 2024	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 09, 2023	Feb. 08, 2024	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	Oct. 17, 2023	Oct. 16, 2024	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30 MHz	Oct. 13, 2023	Oct. 12, 2024	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 02, 2023	Aug. 01, 2024	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH05-CB	1GHz ~18GHz 3m	Sep. 29, 2023	Sep. 28, 2024	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 24, 2023	Mar. 23, 2024	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120 D-1291	1GHz~18GHz	Jun. 08, 2023	Jun. 07, 2024	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Sep. 04, 2023	Sep. 03, 2024	Radiation (03CH05-CB)
Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	May 03, 2023	May 02, 2024	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz – 26.5GHz	Jun. 30, 2023	Jun. 29, 2024	Radiation (03CH05-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 24, 2023	Nov. 23, 2024	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Apr. 18, 2023	Apr. 17, 2024	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 13, 2023	Jun. 12, 2024	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Dec. 06, 2023	Dec. 05, 2024	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5+6	1GHz ~ 40 GHz	Dec. 06, 2023	Dec. 05, 2024	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#6	1GHz ~ 40 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH05-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)
*Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Mar. 10, 2022	Mar. 09, 2024	Radiation (03CH05-CB)
*Mixer	OML	M15HWA	V91113-1	50 ~ 75 GHz	Oct. 01, 2023	Sep. 30, 2024	Radiation (03CH05-CB)
*Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Oct. 01, 2023	Sep. 30, 2024	Radiation (03CH05-CB)
*Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Mar. 10, 2022	Mar. 09, 2024	Radiation (03CH05-CB)
*Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Mar. 10, 2022	Mar. 09, 2024	Radiation (03CH05-CB)
Detector	MI-WAVE	950V/385	04YYP5	50 ~ 75 GHz	Nov. 15. 2023	Nov. 24. 2024	Radiation (03CH05-CB)
PC Oscilloscope	PICO TECH	6402C	CX372/002	N/A	Jul. 05, 2023	Jul. 04, 2024	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Dec. 22, 2023	Dec. 21, 2024	Radiation (TH03-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-CP-AR	MAA1410-011	-40~100 degree	Sep. 01, 2023	Aug. 31, 2024	Radiation (TH03-CB)
RF Cable	Woken	RG402	High Cable-11	30MHz –18 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable	Woken	RG402	High Cable-12	30MHz –18 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable	Woken	RG402	High Cable-13	30MHz –18 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1 GHz –18 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1 GHz –18 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)

Note: Calibration Interval of instruments listed above is one year.

"*" Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.1 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.1 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	4.3 dB	Confidence levels of 95%
Temperature	1.3°C	Confidence levels of 95%