Testing Laboratory 3787

RADIO TEST REPORT

FCC ID	:	RCC-RAR720001
Equipment	:	77G Millimeter Wave Radar
Brand Name	:	RoyalTek
Model Name	:	RAR-7201
Applicant	:	RoyalTek Company Ltd. 8th Floor, No. 40 Wenhwa 2nd Rd., Guishan Dist., Tao Yuan City, 333010, Taiwan
Manufacturer	:	RoyalTek Company Ltd. 8th Floor, No. 40 Wenhwa 2nd Rd., Guishan Dist., Tao Yuan City, 333010, Taiwan
Standard	:	47 CFR FCC Part 95M

The product was received on Jul. 16, 2024, and testing was started from Jul. 17, 2024 and completed on Jul. 17, 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: Rex Liao

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
FR430115-01	01	Initial issue of report	Nov. 15, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	95.303	Occupied Bandwidth	PASS	-
3.2	95.3367	Radiated E.I.R.P Power	PASS	-
3.3	95.3379	Transmitter Radiated Unwanted Emissions	PASS	-
3.4	95.3379	Frequency Stability	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: Sophia Shiung

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information			
Frequency Range (GHz)	**Operating Frequency Range (GHz)**	**Test Frequency (GHz)**	**Modulation**
76-81	76-77	76.50	FMCW

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	TX/RX Function
1	RoyalTek	RAR-7200	Patch Array	N/A	9.2831	2TX/4RX

Note: The above information was declared by manufacturer.

1.1.3 EUT Operational Condition

EUT Power Type	From DC power supply (24Vdc)			
Supply Voltage	☐	AC	State AC voltage	-
Supply Voltage	☒	DC	State DC voltage	24

1.1.4 Test Signal Duty Cycle

Test Signal Duty Cycle
☒ Continuous transmission – 14.3%
☐ Transmissions occur regularly in time - …%

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 95M
- ANSI C63.10 - Testing Unlicensed Wireless Devices
- KDB653005 D01 76-81 GHz Radars v01r02

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

- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) 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 (Others)	03CH06-CB	Alex Kuo	21.7~22.9 / 58~62	Jul. 17, 2024
Radiated (Frequency Stability)	TH03-CB	Gino Huang	23.8~24.6 / 62~63	Jul. 17, 2024

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Radiated Emission (9kHz ~ 30MHz)	4.1 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.0 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	2.5 dB	Confidence levels of 95%
Radiated Emission (200GHz ~ 280GHz)	5.0 dB	Confidence levels of 95%
Temperature	1.2°C	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Frequencies Configuration

Test Software Version	7201 : 5544_4691(BSD)
Test Frequencies (GHz)	76.50
Software Setting	Default

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
Occupied Bandwidth	76.50
Radiated E.I.R.P Power	76.50
Transmitter Spurious Emissions (below 1 GHz)	76.50
Transmitter Spurious Emissions (1 GHz-40 GHz)	76.50
Transmitter Spurious Emissions (above 40 GHz)	76.50
Frequency Stability	76.50

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Occupied Bandwidth Radiated E.I.R.P Power Frequency Stability
Test Condition	Radiated measurement
Operating Mode	CTX

The Worst Case Mode for Following Conformance Tests	
Tests Item	Transmitter Radiated Unwanted Emissions
Test Condition	Radiated measurement
Operating Mode	CTX
	After evaluating, EUT in Z axis was the worst case, so the measurement will follow this same test configuration.
1	EUT in Z axis

2.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting/receiving mode.

2.5 Accessories

Accessories
ECU*1
ECU to radar cable*1: Non-shielded, 3.7m
ECU to signal cable*1: Non-shielded, 5m
Radar bracket*1
Indicator*1: Non-shielded, 1m

2.6 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Battery	YUASA	38B19L-MF	N/A

2.7 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /λ

where:

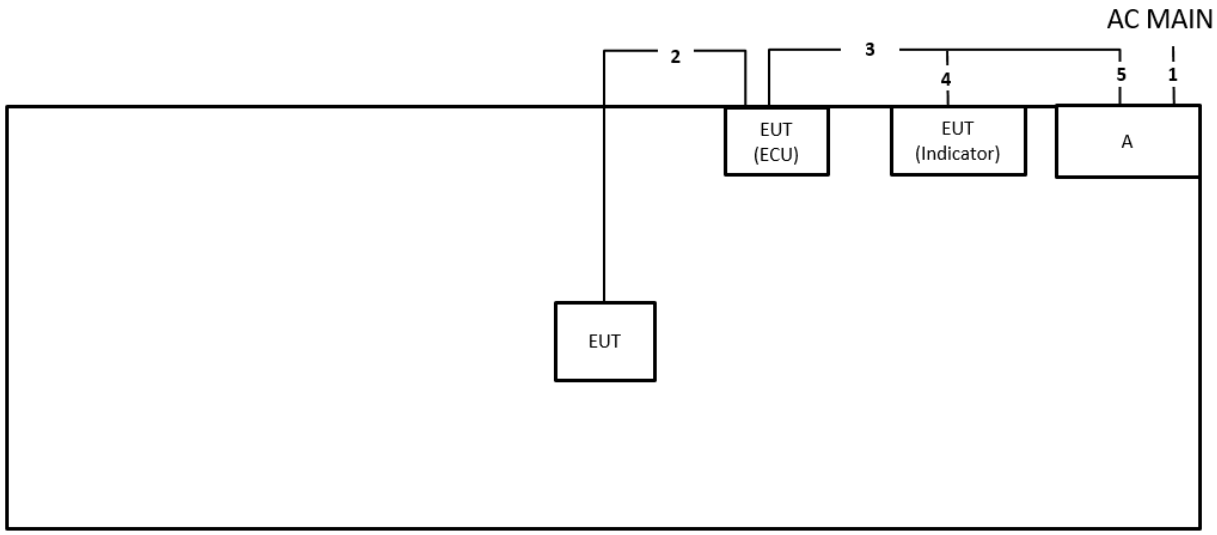
L = Largest Antenna Dimension, including the reflector, in meters

λ= wavelength in meters

Far Field (m)				
Frequency (GHz)	**L (m)**	**Lambda (m)**	**d(Far Field) (m)**	**d(Far Field) (cm)**
76.50	0.01953	0.0039216	0.195	19.45

2.8 Test Setup Diagram

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	ECU to radar cable	No	3.7m
3	ECU to signal cable	No	5m
4	Indicator cable	No	1m
5	Crocodile clip cable*2	No	1m

3 Transmitter Test Result

3.1 Occupied Bandwidth

3.1.1 Occupied Bandwidth (OBW) Limit

Occupied Bandwidth (EBW) Limit
Information only

3.1.2 Measuring Instruments

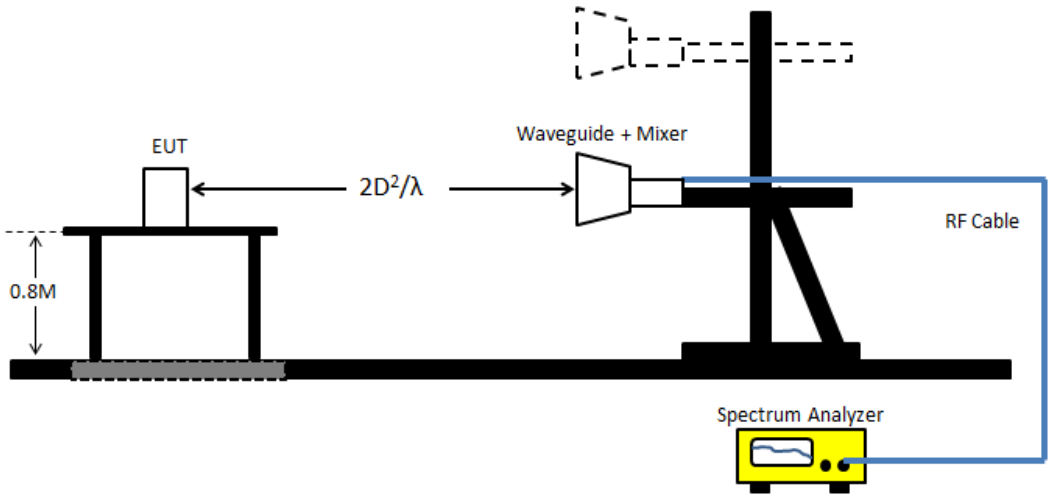
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method	
☒	For the Occupied bandwidth shall be measured using one of the options below:
	☒ Refer as ANSI C63.10, clause 7.8.7 for EBW measurement.
	☐ Refer as ANSI C63.10, clause 6.9.2 for occupied bandwidth testing.
☒	Refer as ANSI C63.10, clause 9 for radiated measurement.
	☒ Radiated test was conducted at far-field distance. the distance from the radiating element of the EUT to the edge of the far field may be calculated from [$r \geq 2D^2/\lambda$] r is the distance from the radiating element of the EUT to the edge of the far field, in m D is the largest dimension of both the radiating element and the test antenna (horn), in m λ is the wavelength of the emission under investigation [300/f (MHz)], in m

3.1.4 Test Setup

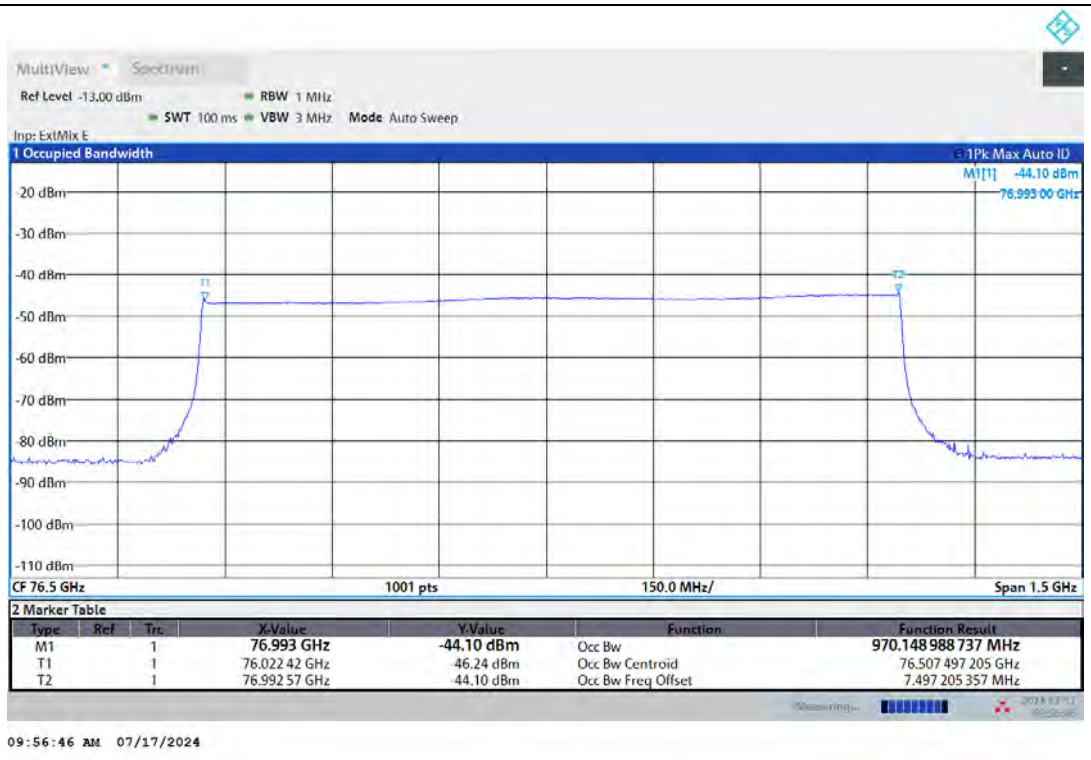
Occupied Bandwidth



3.1.5 Test Result of Occupied Bandwidth

Test Results		
Test Freq. (GHz)	**99% Occupied Bandwidth (MHz)**	**Limit (MHz)**
76.50	970.15	N/A

Occupied Bandwidth Plots
Test Frequency: 76.50 GHz



3.2 Radiated E.I.R.P Power

3.2.1 Radiated E.I.R.P Power Limit

Radiated E.I.R.P Power	
☒	76-81 GHz Band:
	☒ Peak: EIRP 55 dBm [279uW/cm^2 at 3m] Average: EIRP 50 dBm [88uW/cm^2 at 3m]

3.2.2 Measuring Instruments

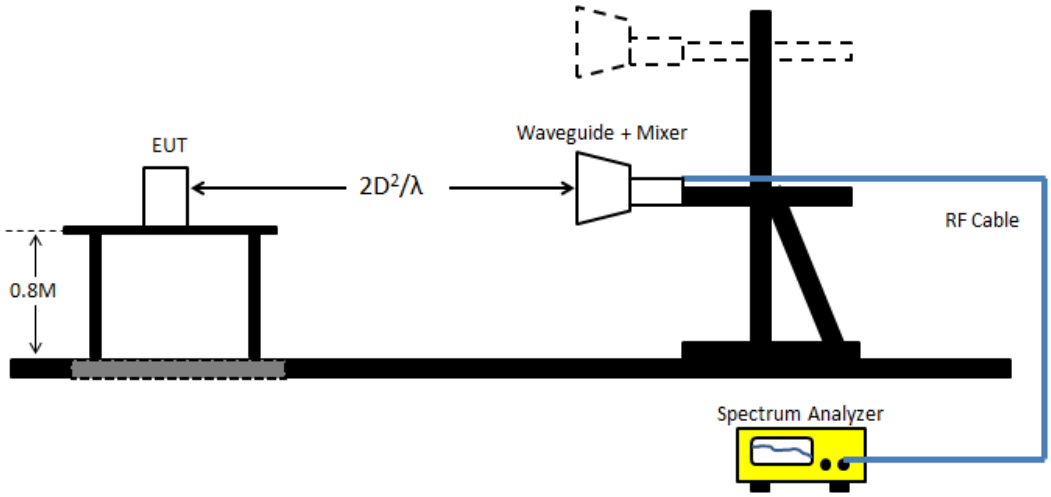
Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
☒	For the Occupied bandwidth shall be measured using one of the options below:
☒	Refer as ANSI C63.10, clause 9 for radiated measurement.
	☒ Radiated test was conducted at far-field distance. the distance from the radiating element of the EUT to the edge of the far field may be calculated from [$r \geq 2D^2/\lambda$] r is the distance from the radiating element of the EUT to the edge of the far field, in m D is the largest dimension of both the radiating element and the test antenna (horn), in m λ is the wavelength of the emission under investigation [300/f (MHz)], in m
	☒ The measured power level is converted to EIRP using the Friis equation: E Meas = 126.8 - 20log(λ) + 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 EIRP = E Meas + 20 log(d Meas) – 104.7 where EIRP : is the equivalent isotropically 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.

3.2.4 Test Setup

Radiated E.I.R.P Power



3.2.5 Measurement Results Calculation

The measured Level is calculated using:
EIRP = Read Level - Rx Gain +20*LOG(4*3.14159* Distance / (300/(Test Freq.*1000))).
Power Density = ((10^(EIRP/10)/1000)/(4*3.14159*(Specification Distance *100)^2))*1000000000000.

3.2.6 Test Result of Radiated E.I.R.P Power

Freq. (GHz)	Rx Gain (dBi)	P-Peak (dBm/MHz)	P-Average (dBm)	E-Meas-Peak (dBuV/m)	E-Meas-Average (dBuV/m)	Distance (m)	EIRP-Peak (dBm/MHz)	EIRP-Average (dBm)
76.50	23.9	-6.49	-38.55	144.54	112.48	0.50	33.72	1.66
EIRP Limit							**55**	**50**

3.3 Transmitter Radiated Unwanted Emissions

3.3.1 Transmitter Radiated Unwanted Emissions Limit

Transmitter Radiated Unwanted Emissions Limit (Below 40 GHz)			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960 - 40000	500	54	3

Frequency Range (GHz)	EIRP (dBm)	Power Density (pW/cm^2 @ 3m)
40 - 200	-1.7	600
200 - 231	0.5	1000

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

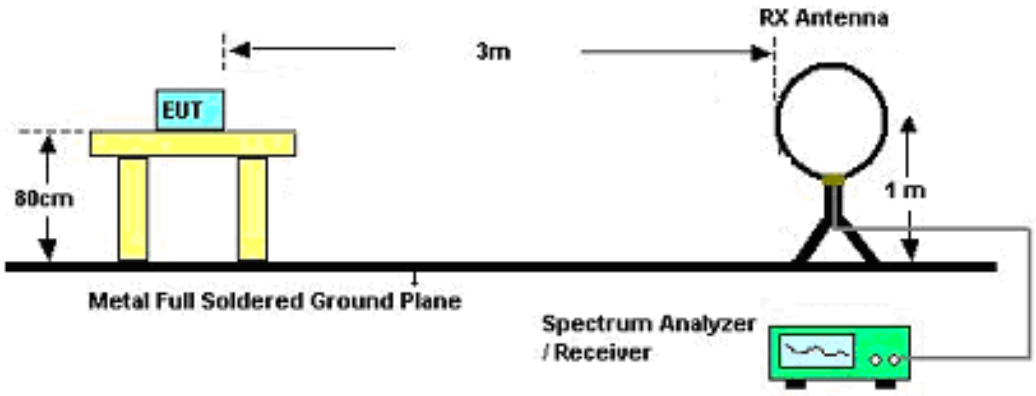
Test Method – General Information			
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as ANSI C63.10, clause 6.3 for unwanted emissions into non-restricted bands.	
	☒	For unwanted emissions below 40GHz bands.	
		☒	Radiated emissions below 40 GHz shall not exceed the general limits in LP0002 Section 2.8
		☒	Refer as ANSI C63.10, clause 4.1.4.2.3 (Video Averaging) average measurements using spectrum reduced video bandwidth (VBW≥10Hz) - [duty cycle ≥ 98 or external power trigger].
		☐	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
		☐	Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.

Test Method		
☒	For radiated measurement below 40GHz.	
	☒	Refer as ANSI C63.10, clause 6.3 through 6.6 for radiated emissions from below 40 GHz.
☒	For radiated measurement above 40GHz. Refer as ANSI C63.10, clause 9.12 for radiated measurement.	
	☒	Radiated test was conducted at far-field distance. the distance from the radiating element of the EUT to the edge of the far field may be calculated from [$r \geq 2D^2/\lambda$] r is the distance from the radiating element of the EUT to the edge of the far field, in m D is the largest dimension of both the radiating element and the test antenna (horn), in m λ is the wavelength of the emission under investigation [300/f (MHz)], in m
	☒	The measured power level is converted to EIRP using the Friis equation: E Meas = 126.8 - 20log(λ) + 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
		EIRP = E Meas + 20 log(d Meas) – 104.7 where EIRP : is the equivalent isotropically 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.
		Equations to calculate power density Calculate the power density at the distance specified by the limit from the EIRP in watts using Equation: $PD = \frac{EIRP_{Linear}}{4\pi d^2}$ where PD is the power density at the distance specified by the limit, in W/m2 EIRPLinear is the equivalent isotropically radiated power, in watts d is the distance at which the power density limit is specified, in m.

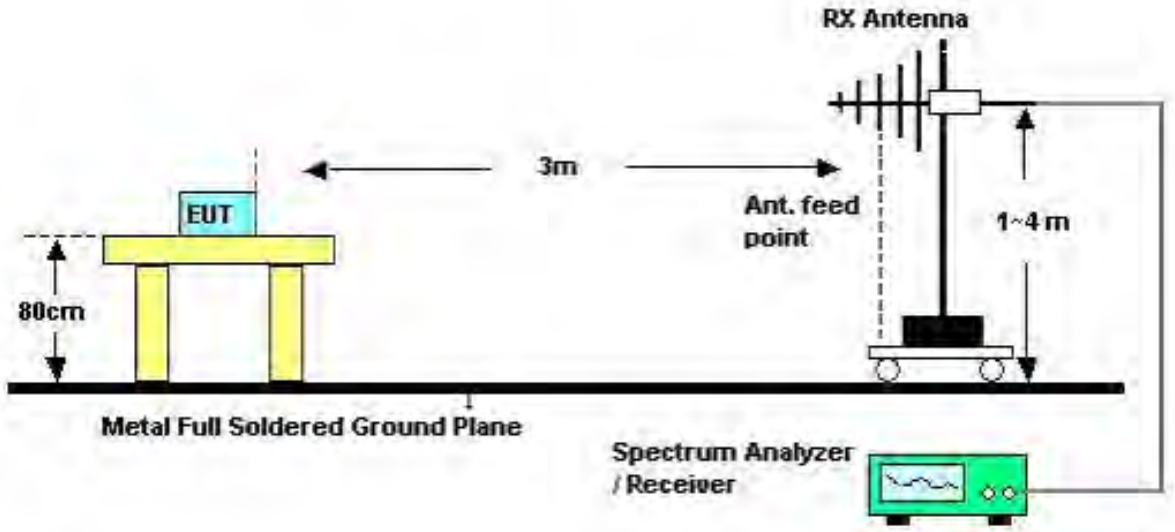
3.3.4 Test Setup

Transmitter Radiated Unwanted Emissions

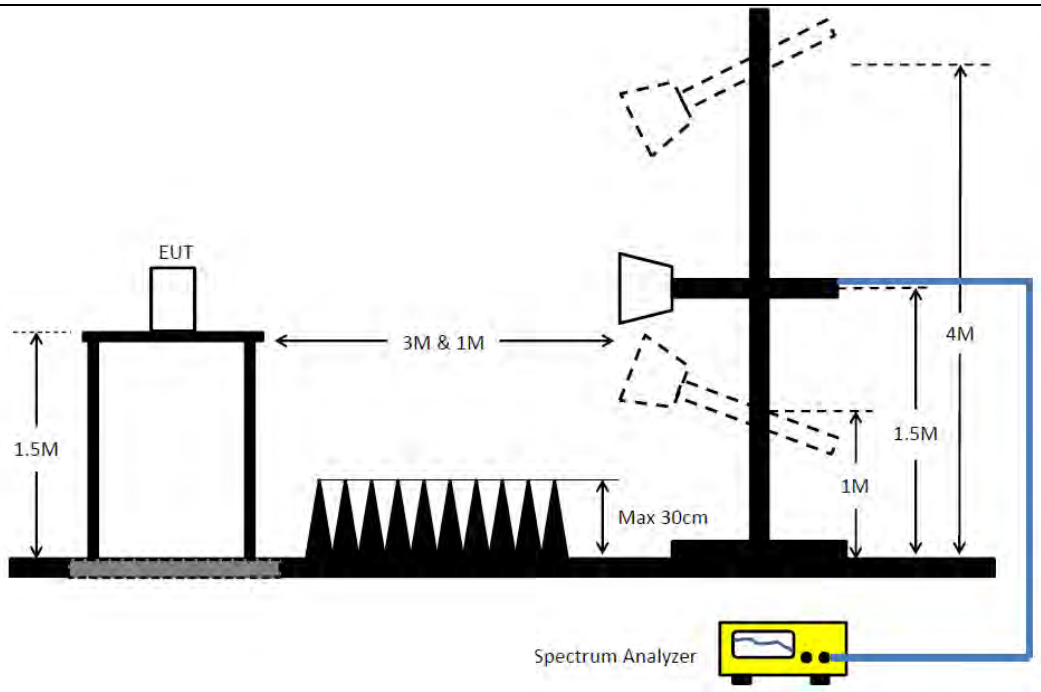
9kHz ~30MHz



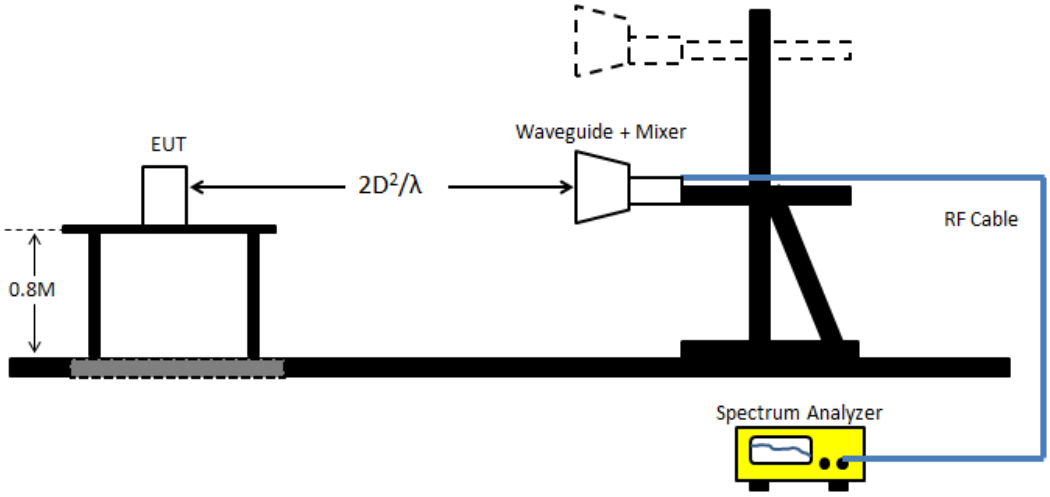
30MHz~1GHz



1GHz ~40GHz



Above 40GHz



3.3.5 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 = Read Level - Rx Gain +20*LOG(4*3.14159* Distance / (300/(Test Freq.*1000))).
Power Density = ((10^(EIRP/10)/1000)/(4*3.14159*(Specification Distance *100)^2))*1000000000000.

3.3.6 Test Result of Transmitter Radiated Unwanted Emissions (Below 30MHz)

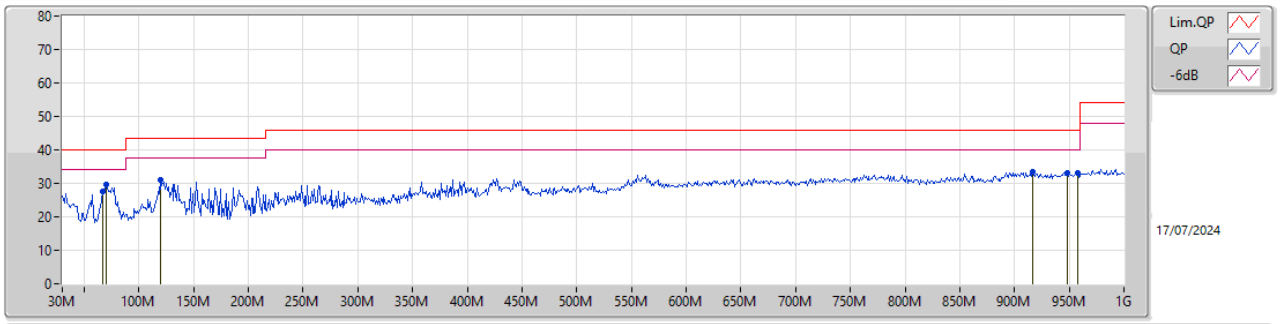
There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need 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.

3.3.7 Test Result of Transmitter Radiated Unwanted Emissions (30MHz ~ 1GHz)

Test Range	30 MHz – 1000 MHz

Horizontal

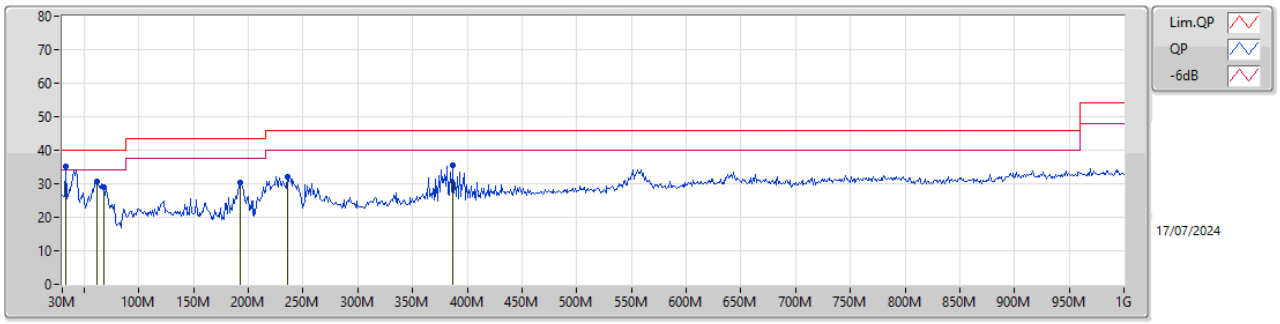
Mode 1



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)	(dB/m)	(dB)	(dB)
PK	66.86M	27.68	40.00	-12.32	-18.54	3	Horizontal	124	2.00	-	46.22	12.29	1.45	32.28
PK	69.77M	29.70	40.00	-10.30	-18.41	3	Horizontal	144	3.00	"Worst"	48.11	12.40	1.48	32.29
PK	119.24M	31.19	43.50	-12.31	-12.39	3	Horizontal	112	1.50	-	43.58	18.13	1.79	32.31
PK	916.58M	33.49	46.00	-12.51	-0.32	3	Horizontal	244	1.00	-	33.81	26.52	4.34	31.18
PK	948.59M	33.24	46.00	-12.76	0.56	3	Horizontal	303	1.50	-	32.68	26.65	4.39	30.48
PK	957.32M	33.08	46.00	-12.92	0.69	3	Horizontal	360	1.00	-	32.39	26.69	4.42	30.42

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)	(dB/m)	(dB)	(dB)
PK	32.91M	35.19	40.00	-4.81	-8.66	3	Vertical	76	1.00	"Worst"	43.85	22.58	1.17	32.41
PK	62.01M	30.78	40.00	-9.22	-18.39	3	Vertical	336	2.00	-	49.17	12.46	1.42	32.27
PK	67.83M	28.89	40.00	-11.11	-18.52	3	Vertical	235	2.00	-	47.41	12.31	1.46	32.29
PK	192.96M	30.36	43.50	-13.14	-15.07	3	Vertical	290	1.25	-	45.43	15.07	2.15	32.29
PK	235.64M	32.16	46.00	-13.84	-13.31	3	Vertical	266	1.00	-	45.47	16.65	2.35	32.31
PK	386.96M	35.44	46.00	-10.56	-8.01	3	Vertical	148	1.25	-	43.45	21.01	2.95	31.97

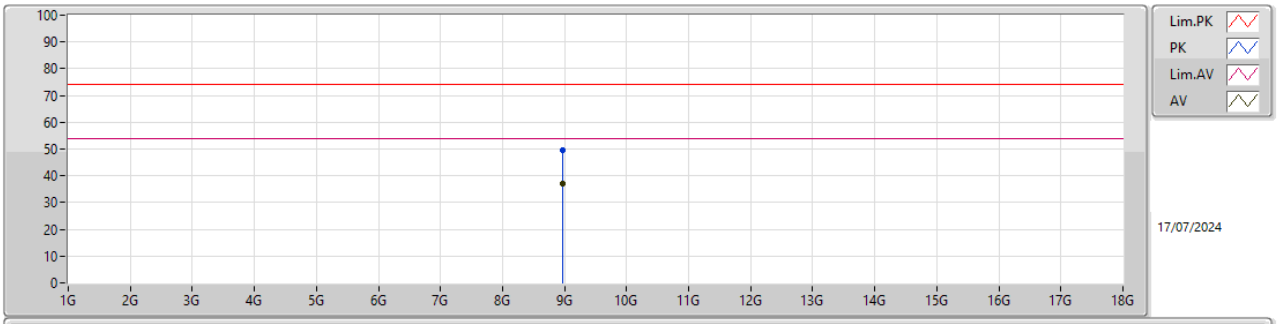
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

3.3.8 Test Result of Transmitter Radiated Unwanted Emissions (1GHz – 40GHz)

Test Range	1GHz – 18GHz

Horizontal

Mode 1

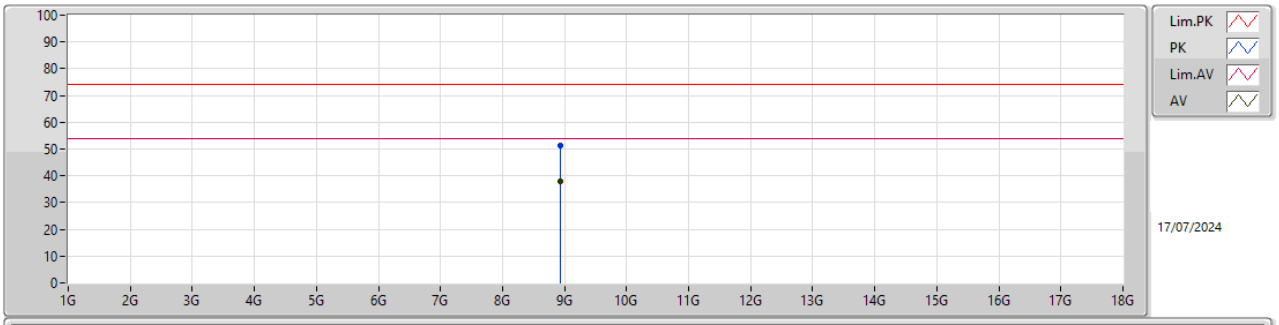


EUT Z
Power DC 24V
06-C-A-4

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)	(dB/m)	(dB)	(dB)
PK	8.9668G	49.58	74.00	-24.42	14.76	3	Horizontal	125	1.50	-	34.82	37.93	9.29	32.46
AV	8.9668G	37.25	54.00	-16.75	14.76	3	Horizontal	125	1.50	-	22.49	37.93	9.29	32.46

Vertical

Mode 1



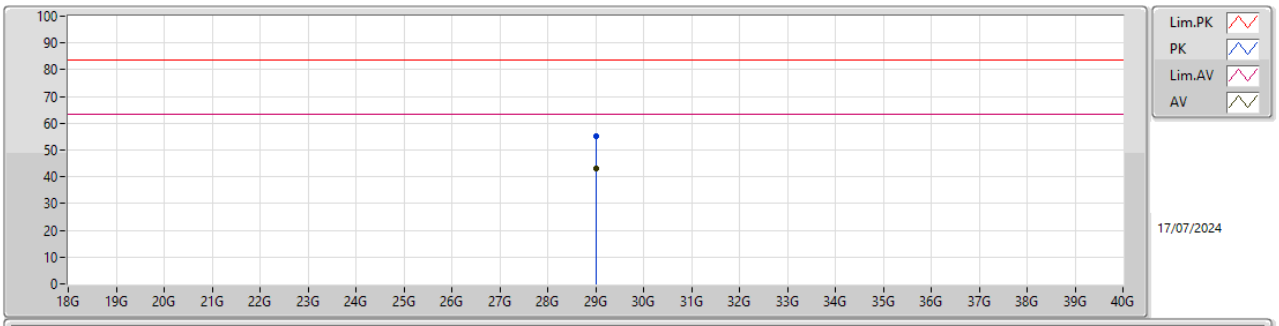
EUT Z
Power DC 24V
06-C-A-4

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)	(dB/m)	(dB)	(dB)
PK	8.94G	51.14	74.00	-22.86	14.70	3	Vertical	346	1.50	-	36.44	37.90	9.28	32.48
AV	8.94G	38.08	54.00	-15.92	14.70	3	Vertical	346	1.50	-	23.38	37.90	9.28	32.48

Test Range	18GHz – 40GHz

Horizontal

Mode 1

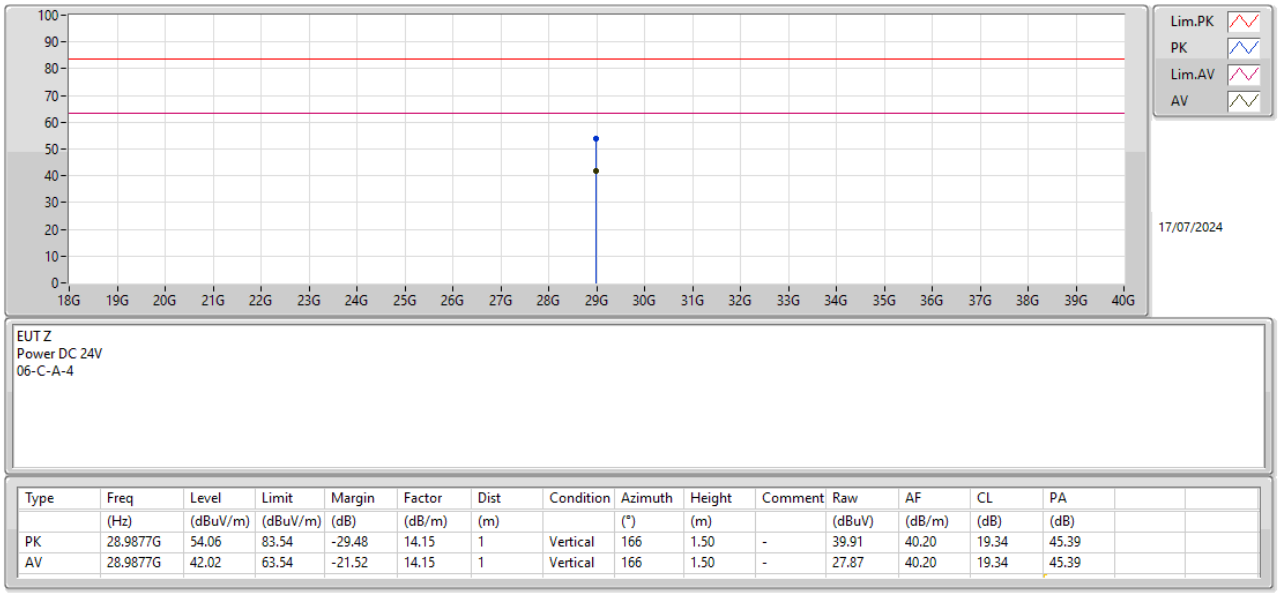


EUT Z
Power DC 24V
06-C-A-4

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)	(dB/m)	(dB)	(dB)
PK	29.01535G	55.17	83.54	-28.37	14.27	1	Horizontal	32	1.50	-	40.90	40.29	19.36	45.38
AV	29.01535G	43.31	63.54	-20.23	14.27	1	Horizontal	32	1.50	-	29.04	40.29	19.36	45.38

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)	(dB/m)	(dB)	(dB)
PK	28.9877G	54.06	83.54	-29.48	14.15	1	Vertical	166	1.50	-	39.91	40.20	19.34	45.39
AV	28.9877G	42.02	63.54	-21.52	14.15	1	Vertical	166	1.50	-	27.87	40.20	19.34	45.39

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)

3.3.9 Test Result of Transmitter Radiated Unwanted Emissions (40GHz – 200GHz)

Test Freq. (GHz)	Rx Gain (dBi)	Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)	EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm^2)	Test Result
76.50	23.3	0.50	42.47	-85.92	-50.24	3	0.0084	PASS
Limit							**600**	-

3.3.10 Test Result of Transmitter Radiated Unwanted Emissions (200GHz – 231GHz)

Test Freq. (GHz)	Rx Gain (dBi)	Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)	EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm^2)	Test Result
76.50	24.2	0.50	203.66	-74.99	-26.59	3	1.9386	PASS
Limit							**1000**	-

3.4 Frequency Stability

3.4.1 Frequency Stability Limit

Frequency Stability Limit
Fundamental emissions must be contained within the frequency bands specified in this 76-81GHz band during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage.

3.4.2 Measuring Instruments

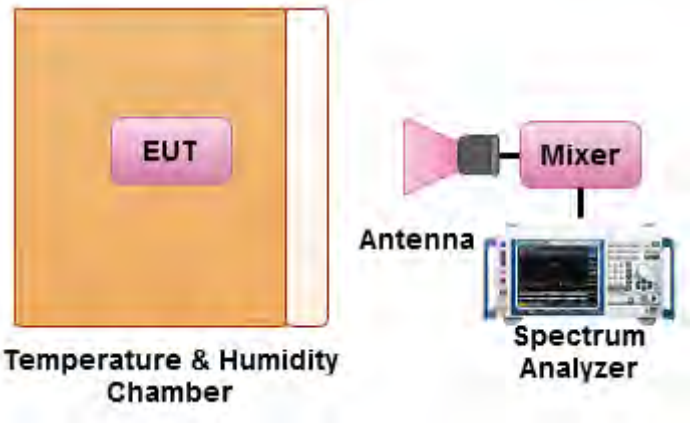
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method	
☒	For the frequency stability shall be measured using one of the options below:
	☒ Refer as ANSI C63.10, clause 9.14 for frequency stability measurement.
☒	Refer as ANSI C63.10, clause 9 for radiated measurement.
	☒ Radiated test was conducted at far-field distance. the distance from the radiating element of the EUT to the edge of the far field may be calculated from [$r \geq 2D^2/\lambda$] r is the distance from the radiating element of the EUT to the edge of the far field, in m D is the largest dimension of both the radiating element and the test antenna (horn), in m λ is the wavelength of the emission under investigation [300/f (MHz)], in m
	☒ The mixer may be placed outside the chamber in front of the temperature chamber door, and the chamber door opened for each reading.

3.4.4 Test Setup

Frequency Stability



3.4.5 Test Result of Frequency Stability

Test Freq. (GHz): 76.50

Test Temperature: (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-40	972.63	2480	**within band**
-30	972.63	2480	**within band**
-20	972.11	1960	**within band**
-10	971.97	1820	**within band**
0	971.92	1770	**within band**
10	969.09	-1060	**within band**
20	970.15	Reference	**within band**
30	970.38	230	**within band**
40	970.03	-120	**within band**
50	969.36	-790	**within band**
60	969.12	-1030	**within band**
70	968.65	-1500	**within band**
80	968.56	-1590	**within band**
85	966.19	-3960	**within band**
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
20.4	969.09	-1060	**within band**
24	970.15	Reference	**within band**
27.6	970.38	230	**within band**

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30 MHz	Oct. 13, 2023	Oct. 12, 2024	Radiation (03CH06-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH06-CB	30MHz ~ 1GHz	Aug. 03, 2023	Aug. 02, 2024	Radiation (03CH06-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH06-CB	1GHz ~18GHz 3m	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH06-CB)
Bilog Antenna with 6 dB attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37878 & AT-N0606	20MHz ~ 2GHz	Jul. 30, 2023	Jul. 29, 2024	Radiation (03CH06-CB)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1370	1GHz~18GHz	Jul.11, 2024	Jul. 10, 2025	Radiation (03CH06-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Sep. 04, 2023	Sep. 03, 2024	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	310N	187290	0.1MHz ~ 1GHz	Nov. 03, 2023	Nov. 02, 2024	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	83017A	MY53270064	0.5GHz ~ 26.5GHz	Aug. 01, 2023	Jul. 31, 2024	Radiation (03CH06-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 24, 2023	Nov. 23, 2024	Radiation (03CH06-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	Apr. 26, 2024	Apr. 25, 2025	Radiation (03CH06-CB)
EMI Test Receiver	R&S	ESR7	102172	9kHz ~ 7GHz	Oct. 20, 2023	Oct. 19, 2024	Radiation (03CH06-CB)
RF Cable-low	Woken	RG402	Low Cable-24+68	30MHz~1GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-05+68	1GHz~18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH06-CB)
High Cable	Woken	WCA0929M	40G#5+6	1GHz ~ 40GHz	Jan. 11, 2024	Jan. 10, 2025	Radiation (03CH06-CB)
Mixer	OML	M19HWA	U91113-1	40GHz ~ 60GHz	Aprr. 23, 2024	Apr. 22, 2025	Radiation (03CH06-CB)
*Harmonic Mixer	R&S	FS-Z90	102135	60GHz~90GHz	Jul. 28, 2022	Jul. 27, 2024	Radiation (03CH06-CB)
*Harmonic Mixer	R&S	FS-Z140	101160	90GHz~140GHz	Feb. 22.2023	Feb. 21.2025	Radiation (03CH06-CB)
*Harmonic Mixer	R&S	FS-Z220	101065	140GHz~ 220GHz	Feb. 22.2023	Feb. 21.2025	Radiation (03CH06-CB)
*Harmonic Mixer	R&S	FS-Z325	101026	220GHz~ 325GHz	Feb. 22.2023	Feb. 21.2025	Radiation (03CH06-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60GHz	N.C.R	N.C.R	Radiation (03CH06-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90GHz	N.C.R	N.C.R	Radiation (03CH06-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140GHz	N.C.R	N.C.R	Radiation (03CH06-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220GHz	N.C.R	N.C.R	Radiation (03CH06-CB)
Standard Horn Antenna	Custom Microwave	M03RH	120320-A	220 ~ 325GHz	N.C.R	N.C.R	Radiation (03CH06-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH06-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 –18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable	Woken	RG402	High Cable-12	30MHz –18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable	Woken	RG402	High Cable-13	30MHz –18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1GHz –18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1GHz –18GHz	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.