Testing Laboratory 1190

FCC RADIO TEST REPORT

FCC ID	:	NKR-77FRONT
Equipment	:	77Ghz Front center radar sensor
Brand Name	:	Wistron NeWeb Corporation
Model Name	:	UMD-RN01T / UMD-RN01x (Please refer to section 1.1.5 for detail information.)
Applicant	:	Wistron NeWeb Corporation 20 Park Avenue II Hsinchu Science Park Taiwan 308
Manufacturer	:	Wistron NeWeb Corporation 20 Park Avenue II Hsinchu Science Park Taiwan 308
Standard	:	47 CFR FCC Part 95M

The product was received on Jan. 15, 2021, and testing was started from Jan. 22, 2021 and completed on Jan. 25, 2021. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications 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. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Cliff Chang

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR111512	01	Initial issue of report	Feb. 09, 2021

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	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Vicky Huang

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	76.425~76.575 (Port 1)	76.44	FMCW
	76.275~76.725 (Port 3)		

1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
						TX	RX
1	1	Wistron NeWeb Corporation	-	Patch Antenna	N/A	22	15.1
	2	Wistron NeWeb Corporation	-	Patch Antenna	N/A	-	15.1
	3	Wistron NeWeb Corporation	-	Patch Antenna	N/A	15.6	15.1
	4	Wistron NeWeb Corporation	-	Patch Antenna	N/A	-	15.1

Note1: The above information was declared by manufacturer.

Note2: The antenna has four ports (2TX, 4RX).

Port 1 and Port 3 could transmit simultaneously.

Port 1, Port 2, Port 3 and Port 4 could receive simultaneously.

1.1.3 EUT Operational Condition

EUT Power Type	From DC 24V			
Supply Voltage	☐	AC	State AC voltage	-
Supply Voltage	☒	DC	State DC voltage	24V

1.1.4 Test Signal Duty Cycle

Test Signal Duty Cycle
☒ Continuous transmission - 36.70%
☐ Transmissions occur regularly in time - …%

1.1.5 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
UMD-RN01T / UMD-RN01x (where “x” can be “0-9, or “a-z”, or “A-Z”, or blank)	All the models are identical, the difference model served as marketing strategy.

Note 1: From the above models, model: UMD-RN01T was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

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 v01r01

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			
☐	HWA YA	ADD :	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)
		TEL :	886-3-327-3456 FAX : 886-3-327-0973
☒	JHUBEI	ADD :	No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302, Taiwan (R.O.C.)
		TEL :	886-3-656-9065 FAX : 886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	TH03-CB	Eddie Weng	23-23.7 / 53-58	Jan. 23, 2021
Radiated	03CH04-CB	Eason Chen	21.2-21.7 / 59-61	Jan. 22, 2021~ Jan. 25, 2021

Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086D with Industry Canada.

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)	3.8 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	5.0 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.9 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.9 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	3.9 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	5.3 dB	Confidence levels of 95%
Radiated Emission (200GHz ~ 280GHz)	5.6 dB	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration
Test Channel Frequencies (GHz)
76.44

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
Occupied Bandwidth	76.44
Radiated E.I.R.P Power	76.44
Transmitter Spurious Emissions (below 1 GHz)	76.44
Transmitter Spurious Emissions (1 GHz-40 GHz)	76.44
Transmitter Spurious Emissions (above 40 GHz)	76.44
Frequency Stability	76.44

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 < 1GHz	CTX
The EUT was performed at Z axis and Y axis position for Radiated Unwanted Emission above 1GHz test, and the worst case was found at Y axis. So the measurement will follow this same test configuration.	
1	EUT in Y-axis
Operating Mode > 1GHz	CTX
The EUT was performed at Z axis and Y axis position, and the worst case was found at Y axis. So the measurement will follow this same test configuration.	
1	EUT in Y-axis

2.4 EUT Operation during Test

During the test, executed the test program to control the EUT continuously transmit RF signal.

2.5 Accessories

N/A

2.6 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Power Supply	Advanced	LPS-305	N/A

2.7 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /λ

where:

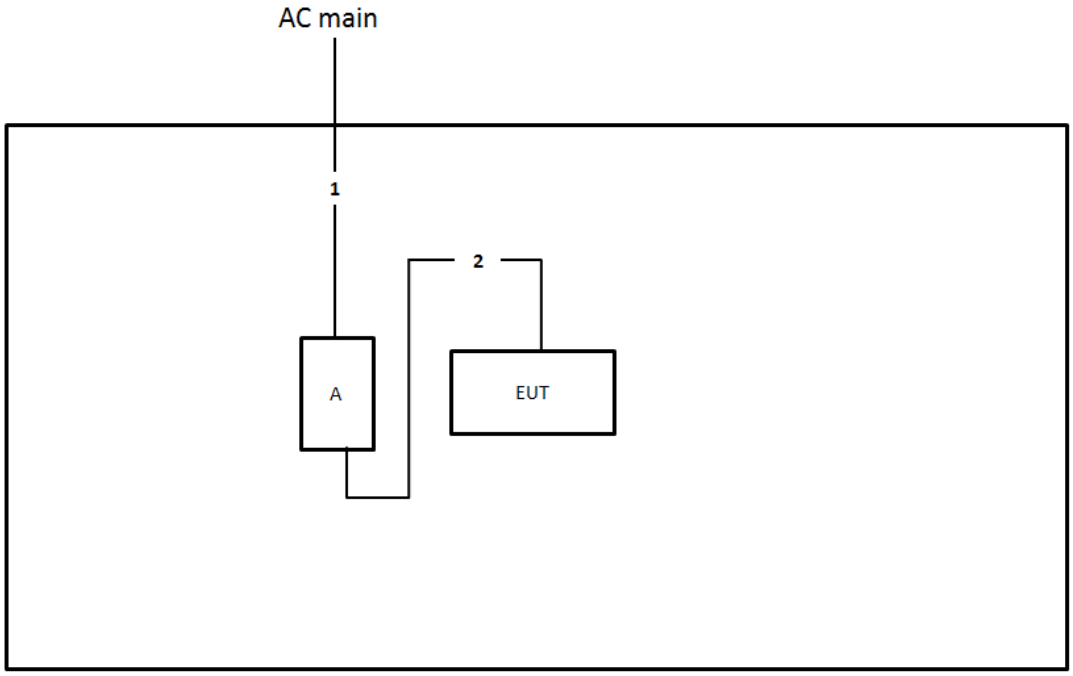
L = Largest Antenna Dimension, including the reflector, in meters

λ= wavelength in meters

Far Field (m)				
Frequency (GHz)	**L (m)**	**Lambda (m)**	**d(Far Field) (m)**	**d(Far Field) (cm)**
76.44	0.053	0.0039247	1.431	143.15

2.8 Test Setup Diagram

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	AC Power cable	No	1.8m
2	DC Power cable	No	2m

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

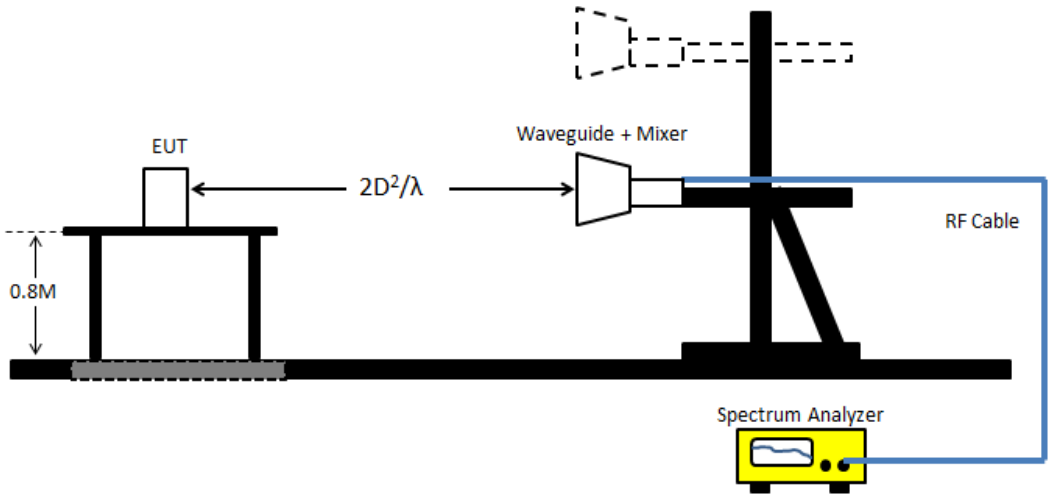
Refer a test equipment and calibration data table in this test report.

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

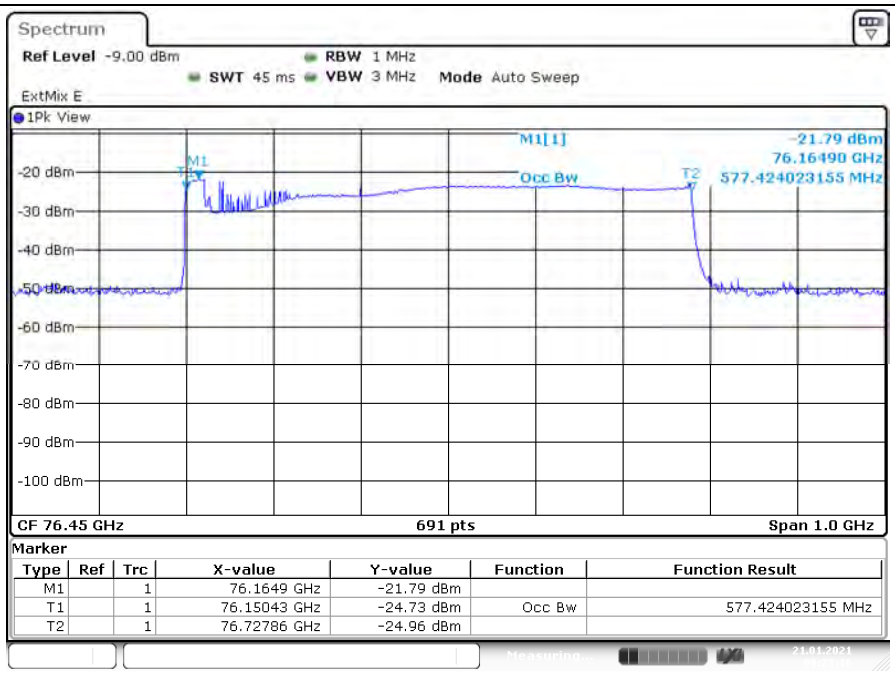
Occupied Bandwidth



3.1.5 Test Result of Occupied Bandwidth

Test Results		
Test Freq. (GHz)	**99% Occupied Bandwidth (MHz)**	**Limit (MHz)**
76.44	577.42	N/A

Occupied Bandwidth Plots
Test Frequency: 76.44 GHz



Date: 21.JAN.2021 09:23:16

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

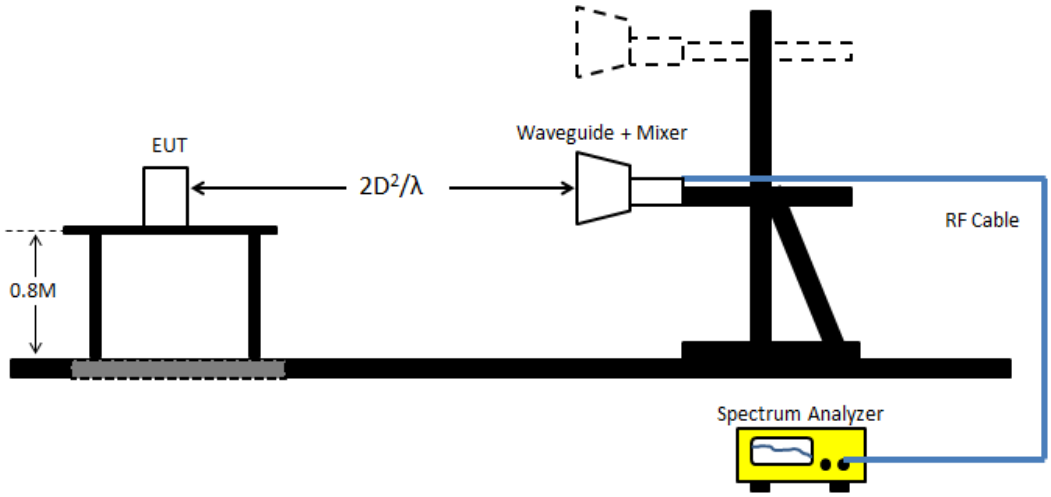
Refer a test equipment and calibration data table in this test report.

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)	P-Average (dBm)	E-Meas-Peak (dBuV/m)	E-Meas-Average (dBuV/m)	Distance (m)	EIRP-Peak (dBm)	EIRP-Average (dBm)
76.44	23.9	-6.95	-24.55	144.07	126.47	1.50	42.80	25.20
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

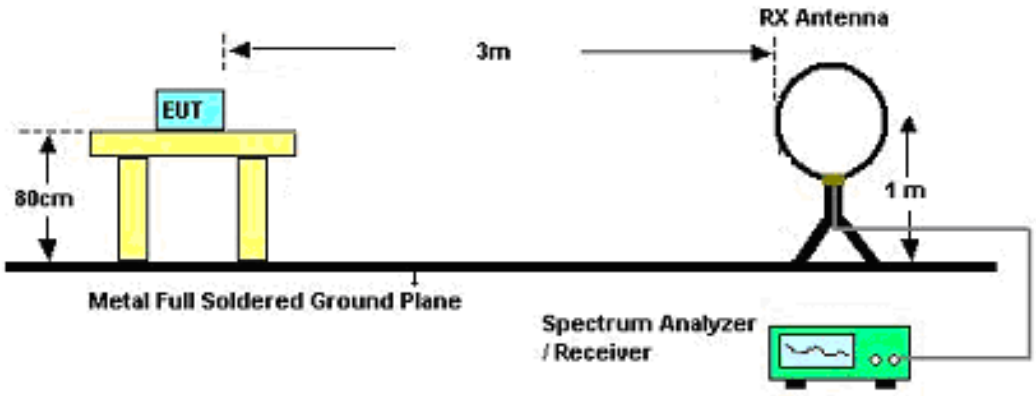
Test Method – General Information			
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as ANSI C63.10, clause 6.3 for unwanted emissions into non-restricted bands.	
	☒	For unwanted emissions below 40GHz bands.	
		☒	Radiated emissions below 40 GHz shall 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.

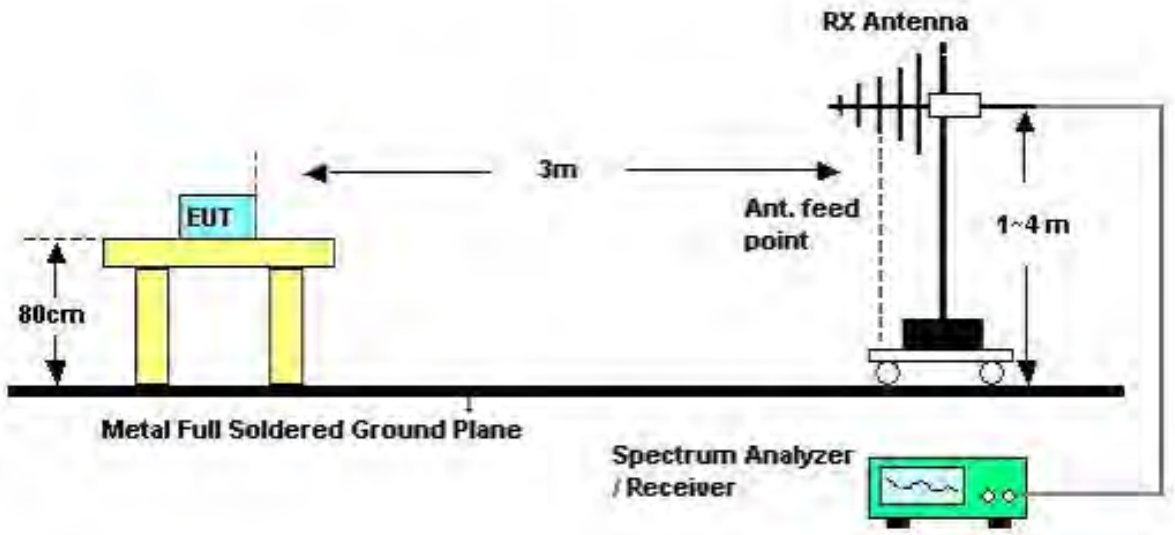
3.3.4 Test Setup

Transmitter Radiated Unwanted Emissions

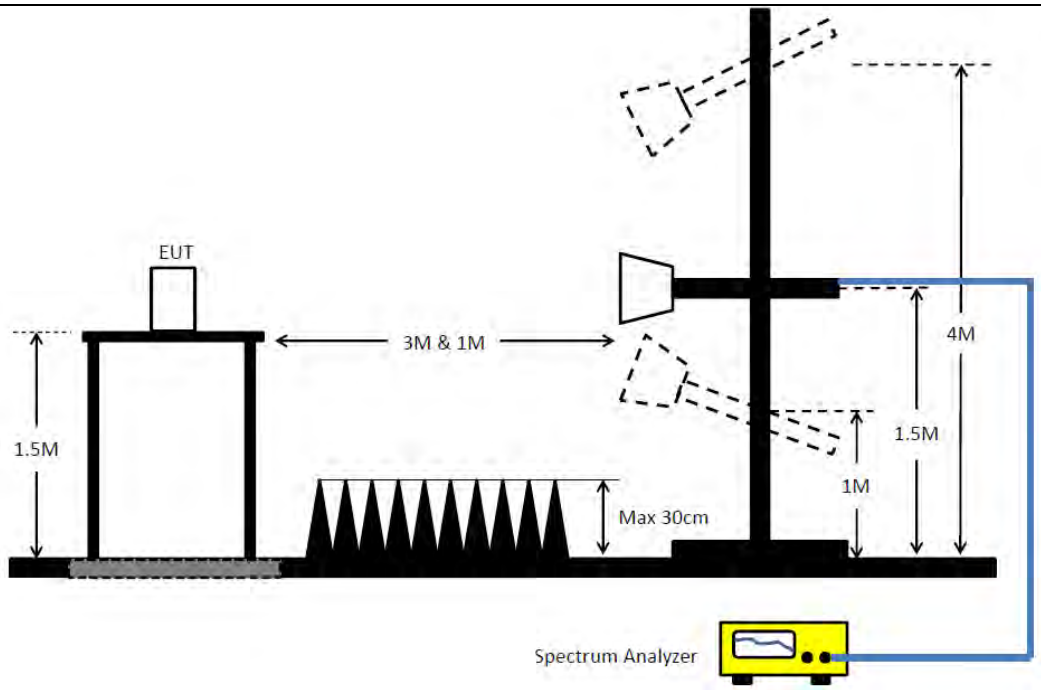
9kHz ~30MHz



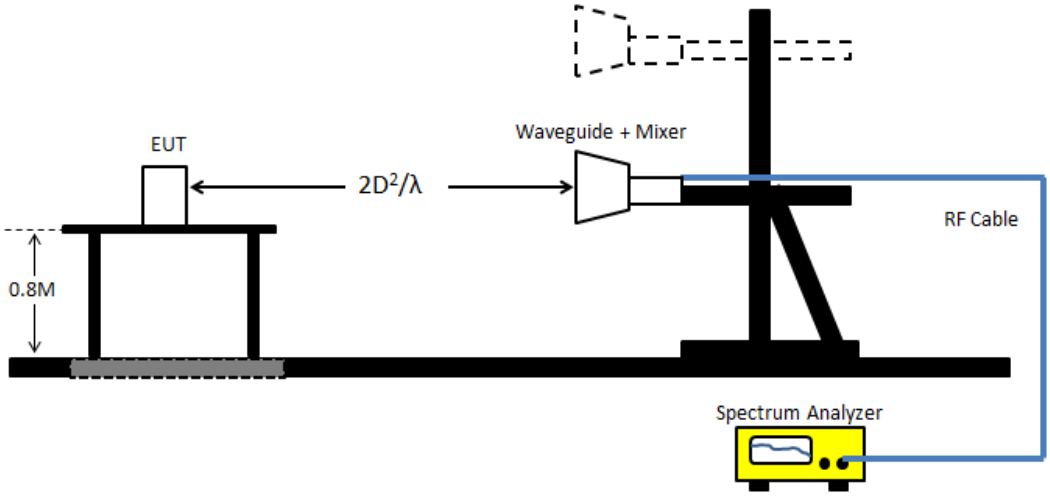
30MHz~1GHz



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.

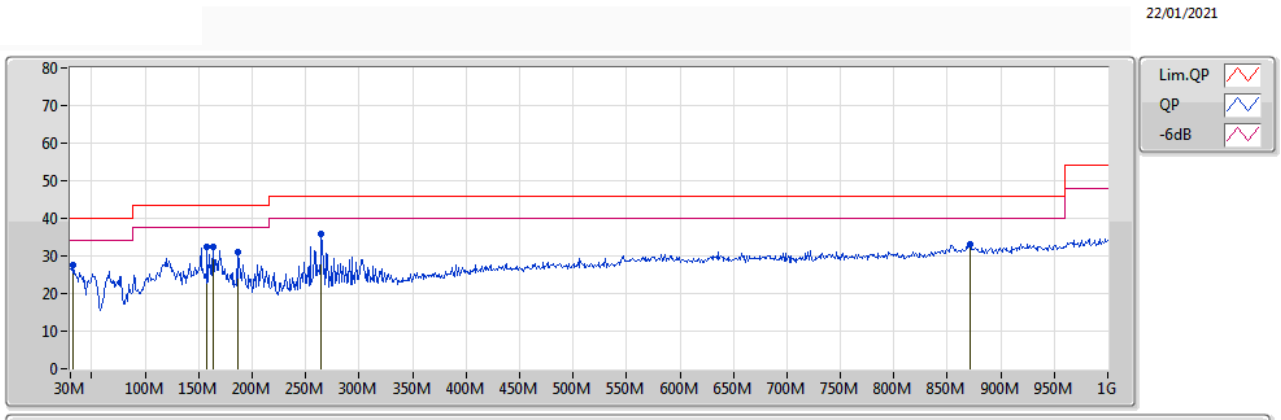
3.3.6 Test Result of Transmitter Radiated Unwanted Emissions (Below 30MHz)

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)

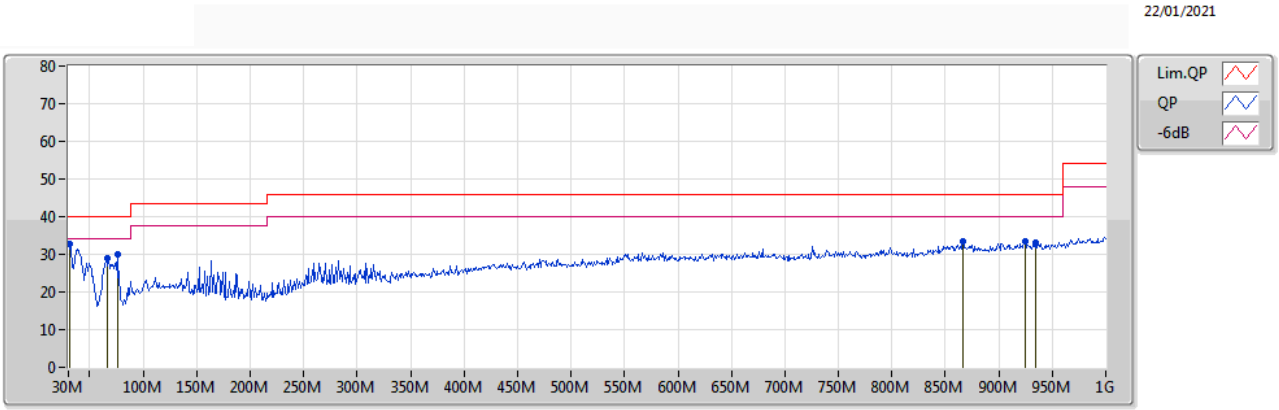
Test Range	30 MHz – 1000 MHz	Test Freq. (GHz)	76.44
Test Distance	3 m		

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)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	32.91M	27.65	40.00	-12.35	-8.72	3	Horizontal	254	1.00	-	36.37	22.81	0.60	32.13
PK	158.04M	32.42	43.50	-11.08	-14.78	3	Horizontal	310	2.00	-	47.20	16.16	1.30	32.24
PK	163.86M	32.40	43.50	-11.10	-15.09	3	Horizontal	307	1.25	-	47.49	15.83	1.34	32.26
PK	186.17M	31.11	43.50	-12.39	-15.83	3	Horizontal	111	1.50	-	46.94	14.94	1.53	32.30
PK	264.74M	35.69	46.00	-10.31	-11.45	3	Horizontal	105	1.00	"Worst"	47.14	19.25	1.76	32.46
PK	870.99M	33.12	46.00	-12.88	-3.44	3	Horizontal	0	1.00	-	36.56	26.15	3.24	32.83

Vertical



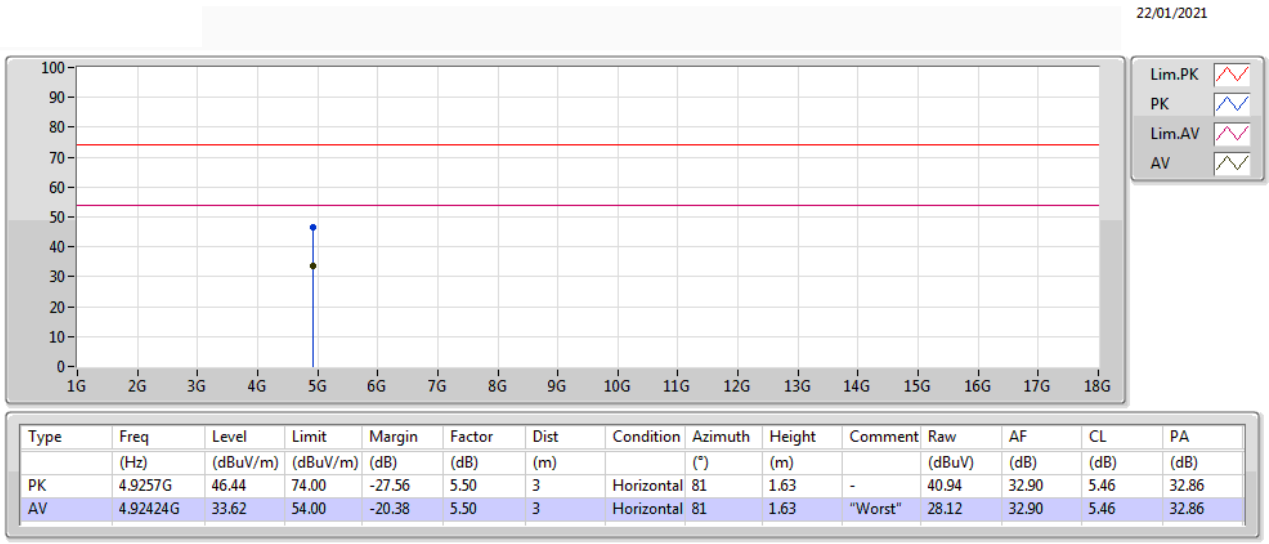
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	30.97M	32.82	40.00	-7.18	-7.67	3	Vertical	338	2.00	"Worst"	40.49	23.87	0.60	32.14
PK	65.89M	29.11	40.00	-10.89	-19.17	3	Vertical	47	2.00	-	48.28	12.12	0.90	32.19
PK	75.59M	30.07	40.00	-9.93	-18.93	3	Vertical	300	1.00	-	49.00	12.29	0.90	32.12
PK	866.14M	33.32	46.00	-12.68	-3.45	3	Vertical	162	1.50	-	36.77	26.16	3.23	32.84
PK	925.31M	33.31	46.00	-12.69	-2.61	3	Vertical	200	3.00	-	35.92	26.42	3.40	32.43
PK	935.01M	33.06	46.00	-12.94	-2.42	3	Vertical	83	1.50	-	35.48	26.44	3.44	32.30

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)

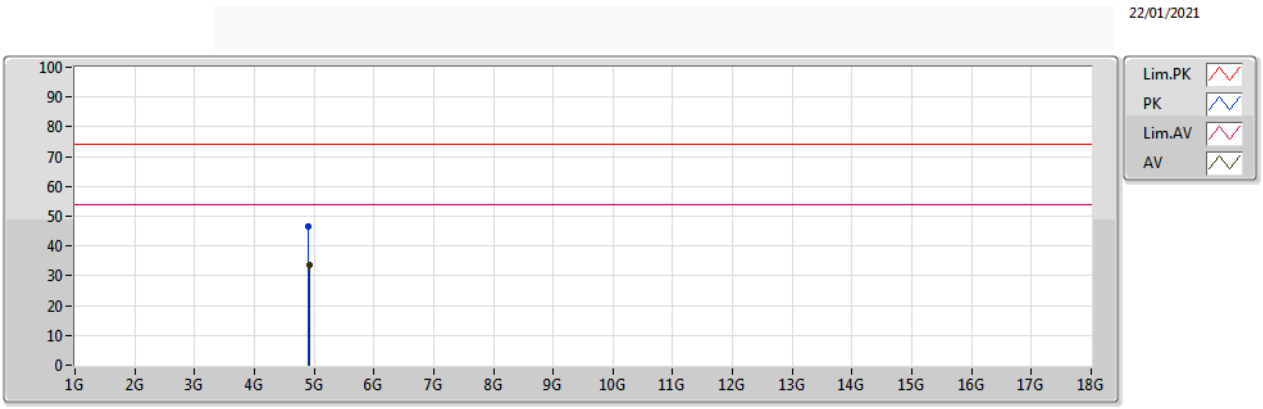
Test Range	1GHz – 18GHz	Test Freq. (GHz)	76.44
Test Distance	3 m		

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)		(dBuV)	(dB)	(dB)	(dB)
PK	4.9257G	46.44	74.00	-27.56	5.50	3	Horizontal	81	1.63	-	40.94	32.90	5.46	32.86
AV	4.92424G	33.62	54.00	-20.38	5.50	3	Horizontal	81	1.63	"Worst"	28.12	32.90	5.46	32.86

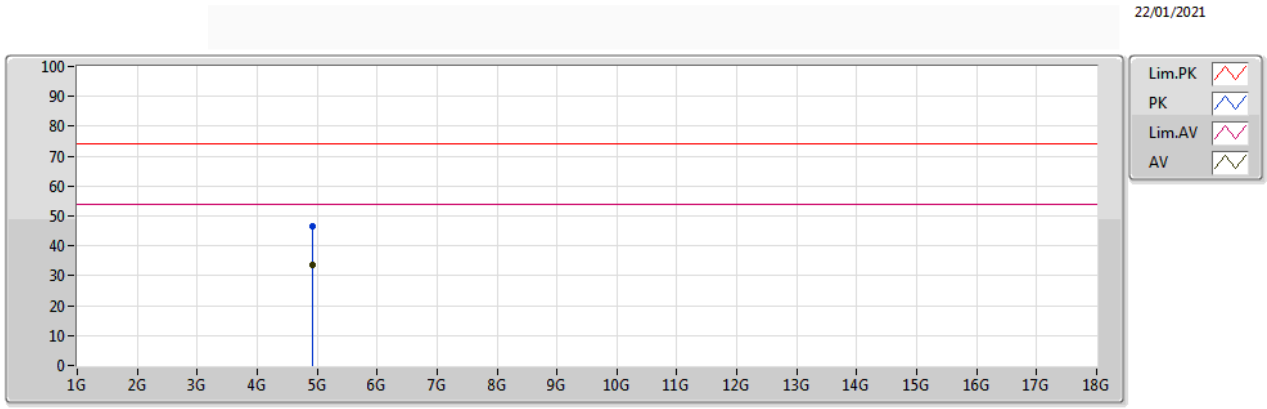
Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	4.91002G	46.56	74.00	-27.44	5.44	3	Vertical	256	1.86	-	41.12	32.84	5.46	32.86
AV	4.92812G	33.52	54.00	-20.48	5.51	3	Vertical	256	1.86	"Worst"	28.01	32.91	5.46	32.86

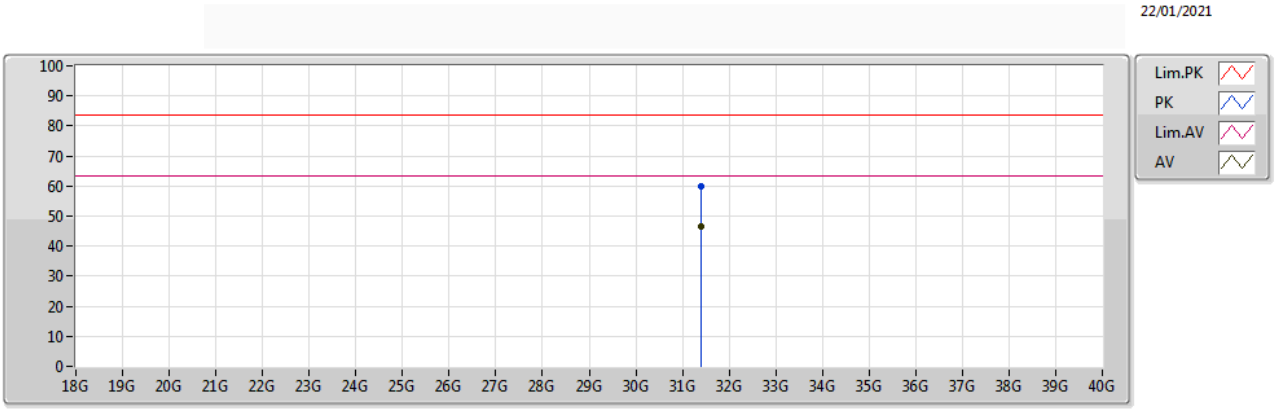
Test Range	18GHz – 40GHz	Test Freq. (GHz)	76.44
Test Distance	1 m		

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)		(dBuV)	(dB)	(dB)	(dB)
PK	4.9257G	46.44	74.00	-27.56	5.50	3	Horizontal	81	1.63	-	40.94	32.90	5.46	32.86
AV	4.92424G	33.62	54.00	-20.38	5.50	3	Horizontal	81	1.63	"Worst"	28.12	32.90	5.46	32.86

Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	31.40035G	60.02	83.54	-23.52	13.08	1	Vertical	112	1.50	-	46.94	40.62	18.72	46.26
AV	31.40585G	46.61	63.54	-16.93	13.08	1	Vertical	112	1.50	"Worst"	33.53	40.62	18.72	46.26

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
76.44	23.9	1.50	87.58	-71.27	-20.36	3	8.1421	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
76.44	23.9	1.50	221.43	-71.38	-12.41	3	50.7411	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.

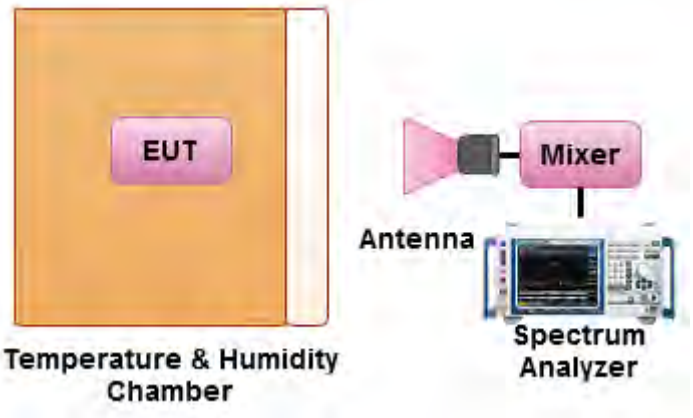
3.4.2 Measuring Instruments

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): 76.44

Test Temperature: (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-40	76436.32	-2825	**within band**
-30	76436.87	-2275	**within band**
-20	76437.52	-1625	**within band**
-10	76437.91	-1235	**within band**
0	76438.32	-825	**within band**
10	76438.32	-825	**within band**
20	76439.15	Reference	**within band**
30	76439.85	705	**within band**
40	76440.12	975	**within band**
50	76440.66	1515	**within band**
60	76440.66	1515	**within band**
70	76441.53	2385	**within band**
80	76441.32	3000	**within band**
85	76442.11	2965	**within band**
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
20.4	76439.15	0	**within band**
24	76439.15	Reference	**within band**
27.6	76439.15	0	**within band**

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH04-CB	30 MHz ~ 1 GHz	Aug. 09, 2020	Aug. 08, 2021	Radiation (03CH04-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH04-CB	1GHz ~18GHz 3m	Feb. 26, 2020	Feb. 25, 2021	Radiation (03CH04-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH04-CB)
BILOG ANTENNA with 6 dB attenuator	Schaffner & EMCI	CBL6112B & N-6-06	22021&AT-N0607	30MHz ~ 1GHz	Oct. 11, 2020	Oct. 10, 2021	Radiation (03CH04-CB)
Horn Antenna	ETS・Lindgren	3115	00143147	750MHz~18GHz	Oct. 23, 2020	Oct. 22, 2021	Radiation (03CH04-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2020	Jul. 20, 2021	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	310N	187291	0.1MHz ~ 1GHz	Dec. 17, 2020	Dec. 16, 2021	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Jul. 14, 2020	Jul. 13, 2021	Radiation (03CH04-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 08, 2020	Jul. 07, 2021	Radiation (03CH04-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	May 12, 2020	May 11, 2021	Radiation (03CH04-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 13, 2020	May 12, 2021	Radiation (03CH04-CB)
RF Cable-low	Woken	RG402	Low Cable-03+67	30MHz – 1GHz	Nov. 05, 2020	Nov. 04, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21	1GHz - 18GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21+67	1GHz - 18GHz	Nov. 05, 2020	Nov. 04, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH04-CB)
Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (03CH04-CB)
Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020	Nov. 13, 2021	Radiation (03CH04-CB)
Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (03CH04-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (03CH04-CB)
Mixer	OML	M03HWD	120320-1	220 ~ 325 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (03CH04-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M03RH	120320-A	220 ~ 325 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Dec. 31, 2020	Dec. 30, 2021	Radiation (TH03-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-C P-AR	MAA1410-011	-40~100 degree	Sep. 09, 2020	Sep. 08, 2021	Radiation (TH03-CB)

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

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