RADIO TEST REPORT

FCC ID	:	R5XBACKSENSE10
Equipment	:	Brigade Backsense Radar
Brand Name	:	BRIGADE
Model Name	:	BS-9100, BS-9100T, BS-9100-U, BS-9100T-U, BS-9100-S, BS-9100T-S, BS-9100-U-S, BS-9100T-U-S, BS-91XXXXXXXXXXX, BS-8100, BS-8100D, BS-8100D-D, BS-81XXXXXXXXX (Please refer to section 1.1.5 for detail information)
Applicant	:	Brigade Electronics Group Plc Brigade House, The Mills, Station Road, South Darenth Kent, United Kingdom
Manufacturer	:	Wistron NeWeb Corporation 5 Lihsin Rd. VI, Hsinchu Science Park, Hsinchu 300, Taiwan
Standard	:	47 CFR FCC Part 95M

The product was received on Apr. 08, 2022, and testing was started from Apr. 13, 2022 and completed on Sep. 13, 2022. 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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Report Template No.: CB-A17_2 Ver1.3

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR232515	01	Initial issue of report	Sep. 30, 2022

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:
1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to report "Measurement Uncertainty".
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: Penny Kao

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	76.175~76.925	76.49	FMCW

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	WNC	-	Array Antenna	N/A	13

Note: The above information was declared by manufacturer.

1.1.3 EUT Operational Condition

EUT Power Type	DC Power (vehicle battery): 12Vdc or 24Vdc			
Supply Voltage	☐	AC	State AC voltage	-
Supply Voltage	☒	DC	State DC voltage	12Vdc or 24Vdc

Note: The EUT power supply comes from the vehicle.

1.1.4 Test Signal Duty Cycle

Test Signal Duty Cycle
☒ Continuous transmission – 37.4%
☐ Transmissions occur regularly in time - …%

1.1.5 Table for Multiple Listing

The model names are listed in the following table:

Model Name	Description
BS-9100	The "X" in model name can be 0 to 9, A to Z or blank, for marketing purpose. All models use identical electronic hardware design when fully populated. The different model names serve as a marketing strategy and for customised CAN message structure.
BS-9100T	
BS-9100-U	
BS-9100T-U	
BS-9100-S	
BS-9100T-S	
BS-9100-U-S	
BS-9100T-U-S	
BS-91XXXXXXXXXXX	
BS-8100	
BS-8100D	
BS-8100D-D	
BS-81XXXXXXXXX	

Note 1: From the above models, model: BS-9100 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 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
RF Radiated (For 24V Frequency Stability)	TH03-CB	Eddie Weng	18.7~19.1 / 65~68	Apr. 15, 2022~ Apr. 18, 2022
RF Radiated (For 12V Frequency Stability)	TH03-CB	Eddie Weng	18.7~19.1 / 65~68	Jun. 23, 2022
Radiated (For Below 1GHz test)	03CH05-CB	Kevin Huang	22.3~23.2 / 64~65	Apr. 13, 2022~ Sep. 13, 2022
Radiated (For other tests)	03CH05-CB	Kevin Huang	22.8~24.6 / 65~67	Apr. 15, 2022~ Apr. 30, 2022

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 Date: Before Jun. 01, 2022

Test Items	Uncertainty	Remark
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.8 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	4.5 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	5.3 dB	Confidence levels of 95%
Radiated Emission (200GHz ~ 280GHz)	5.5 dB	Confidence levels of 95%
Temperature	1.1°C	Confidence levels of 95%

Test Date: After May 31, 2022

Test Items	Uncertainty	Remark
Radiated Emission (9kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 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	No test software was used during testing.
Test Frequencies (GHz)	76.49
Software Setting	Default

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
Occupied Bandwidth	76.49
Radiated E.I.R.P Power	76.49
Transmitter Spurious Emissions (below 1 GHz)	76.49
Transmitter Spurious Emissions (1 GHz-40 GHz)	76.49
Transmitter Spurious Emissions (above 40 GHz)	76.49
Frequency Stability	76.49

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	Normal Link
1	EUT in Y axis with DC Power (12V)
2	EUT in Y axis with DC Power (24V)
3	EUT in Z axis with DC Power (12V)
4	EUT in X axis with DC Power (12V)
For operating mode 2 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
	The EUT was performed at X axis, Y axis and Z axis position. The worst case was found at Y axis, thus the measurement will follow this same test configuration.
1	EUT in Y axis

2.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.5 Accessories

N/A

2.6 Support Equipment

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

2.7 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /λ

where:

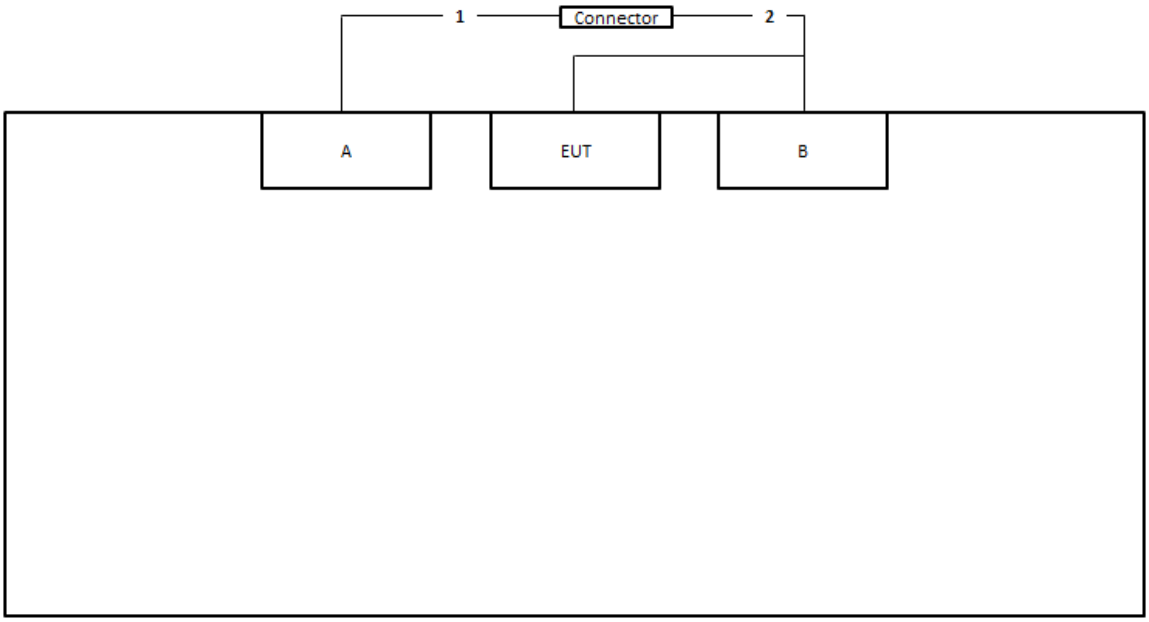
L = Largest Antenna Dimension, including the reflector, in meters

λ= wavelength in meters

Far Field (m)				
Frequency (GHz)	**L (m)**	**Lambda (m)**	**d(Far Field) (m)**	**d(Far Field) (cm)**
76.49	0.09	0.0039222	4.130	413.04

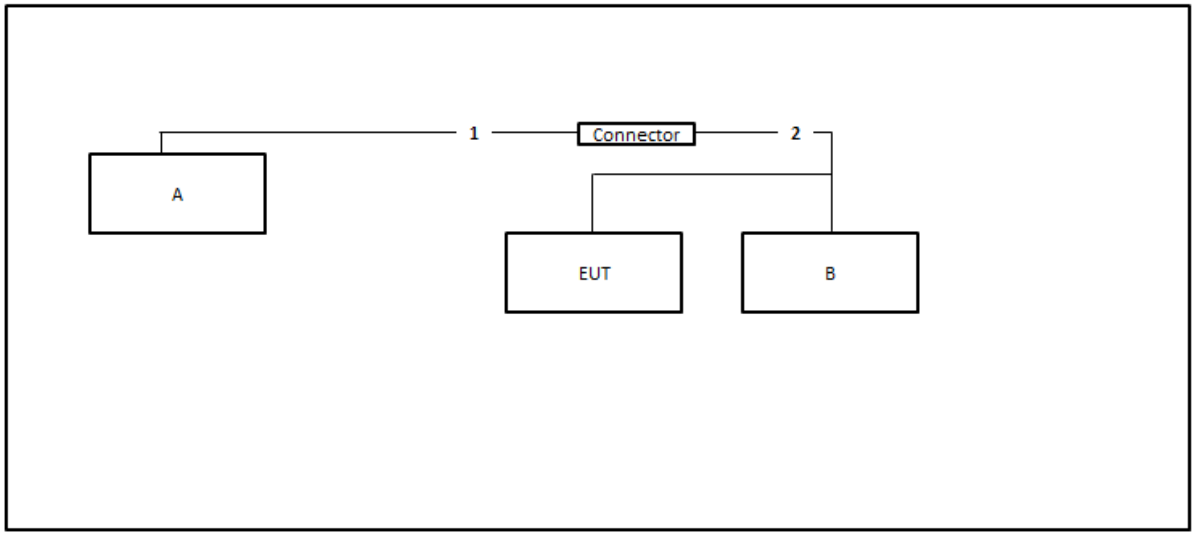
2.8 Test Setup Diagram

Test Setup Diagram - Radiated Test < 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1m
2	Power cable	No	1.5m

Test Setup Diagram - Radiated Test > 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1m
2	Power cable	No	1.5m

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

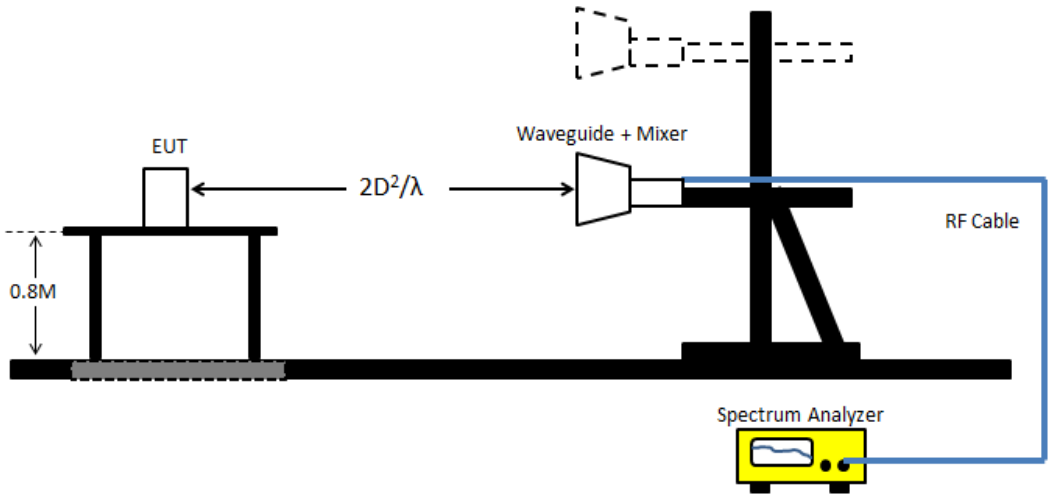
Refer a test equipment and calibration data table in this test report.

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

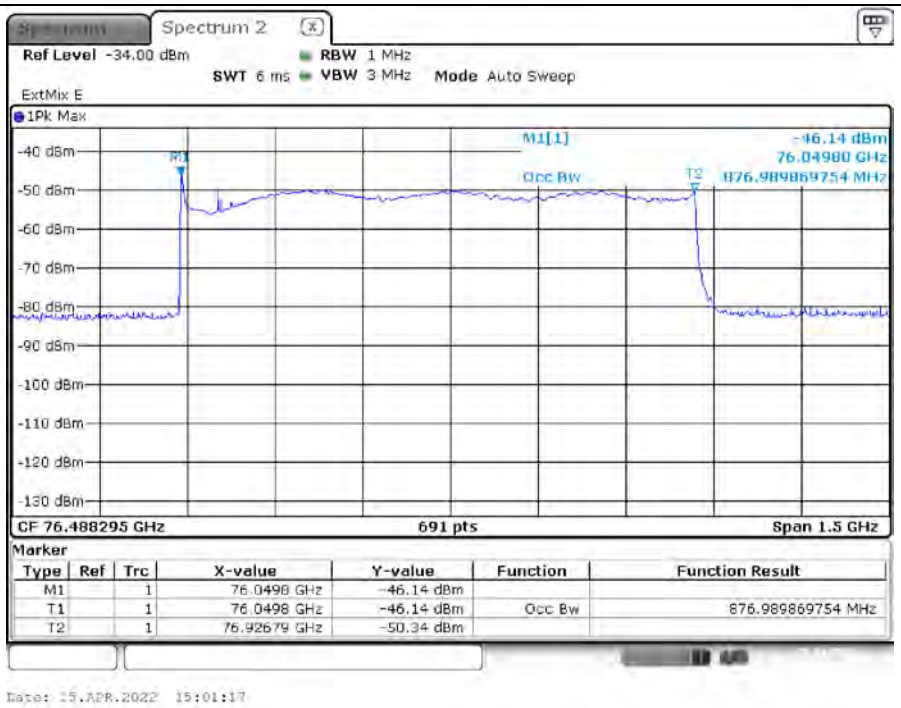


3.1.5 Test Result of Occupied Bandwidth

Test Results		
Test Freq. (GHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
76.49	876.99	N/A

Occupied Bandwidth Plots

Test Frequency: 76.49 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

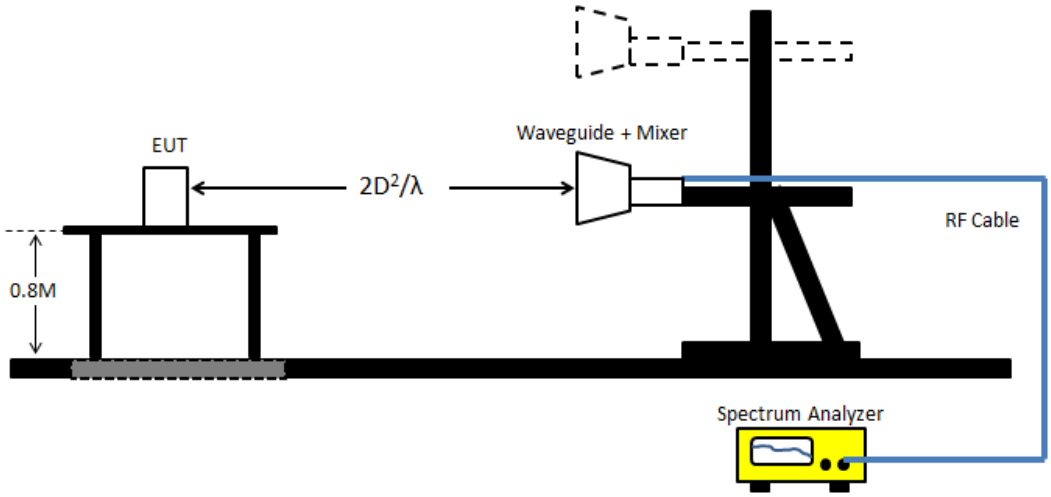
Refer a test equipment and calibration data table in this test report.

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)	P-Average (dBm)	E-Meas-Peak (dBuV/m)	E-Meas-Average (dBuV/m)	Distance (m)	EIRP-Peak (dBm)	EIRP-Average (dBm)
76.49	23.9	-46.62	-47.5	104.41	103.53	4.50	12.67	11.79
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.

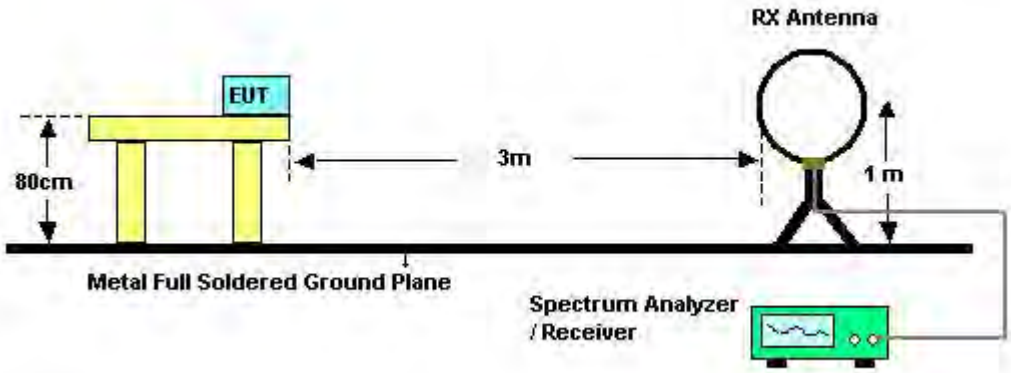
Test Method		
☒	For radiated measurement below 40GHz.	
	☒	Refer as ANSI C63.10, clause 6.3 through 6.6 for radiated emissions from below 40 GHz.
☒	For radiated measurement above 40GHz. Refer as ANSI C63.10, clause 9.12 for radiated measurement.	
	☒	Radiated test was conducted at far-field distance. the distance from the radiating element of the

Test Method		
		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.

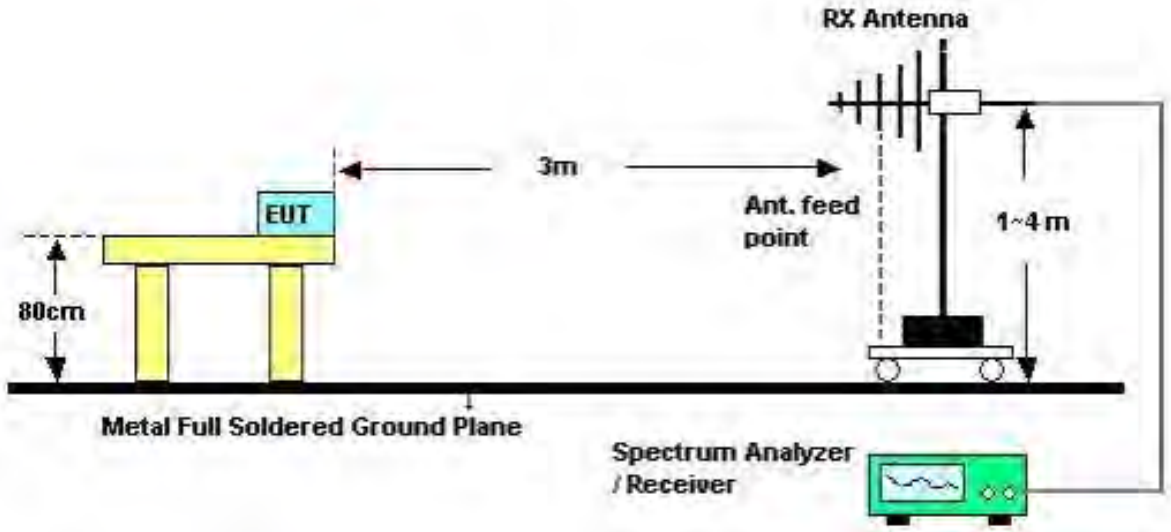
3.3.4 Test Setup

Transmitter Radiated Unwanted Emissions

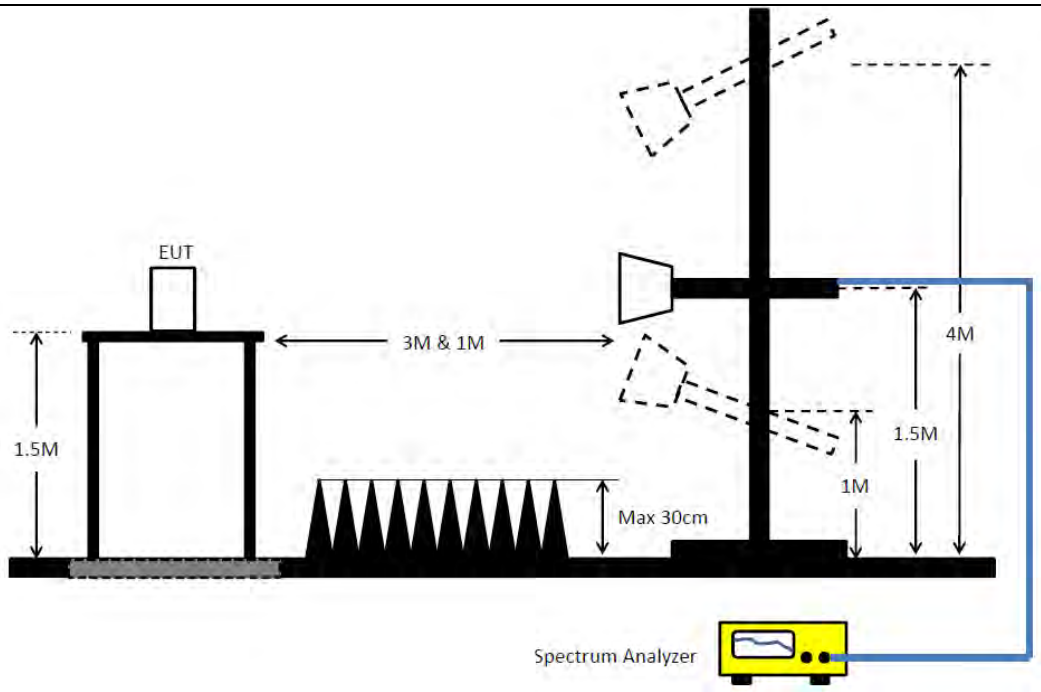
9kHz ~30MHz



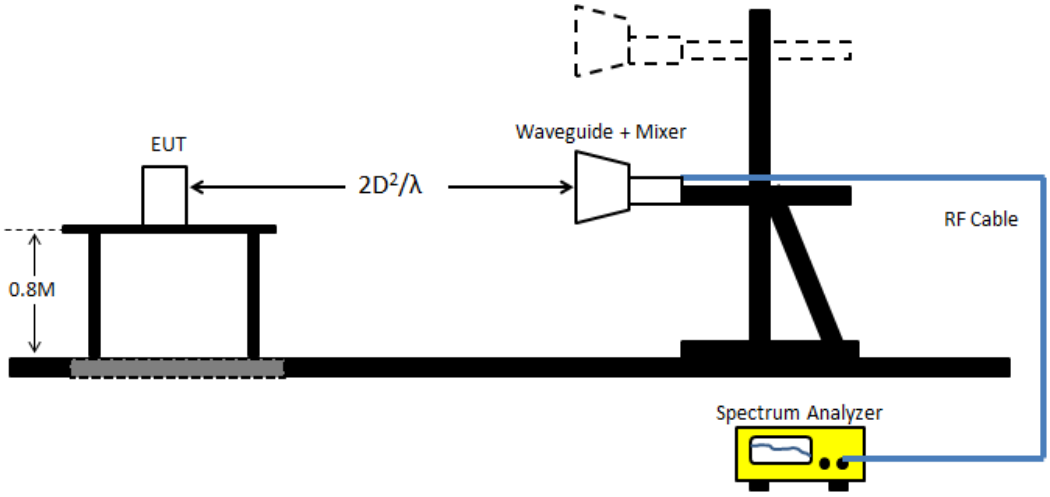
30MHz~1GHz



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.

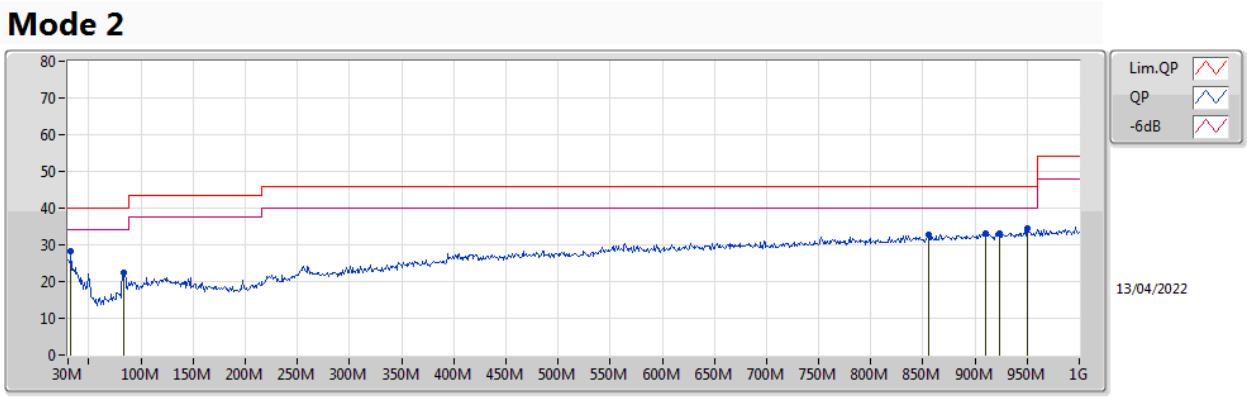
3.3.6 Test Result of Transmitter Radiated Unwanted Emissions (Below 30MHz)

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)

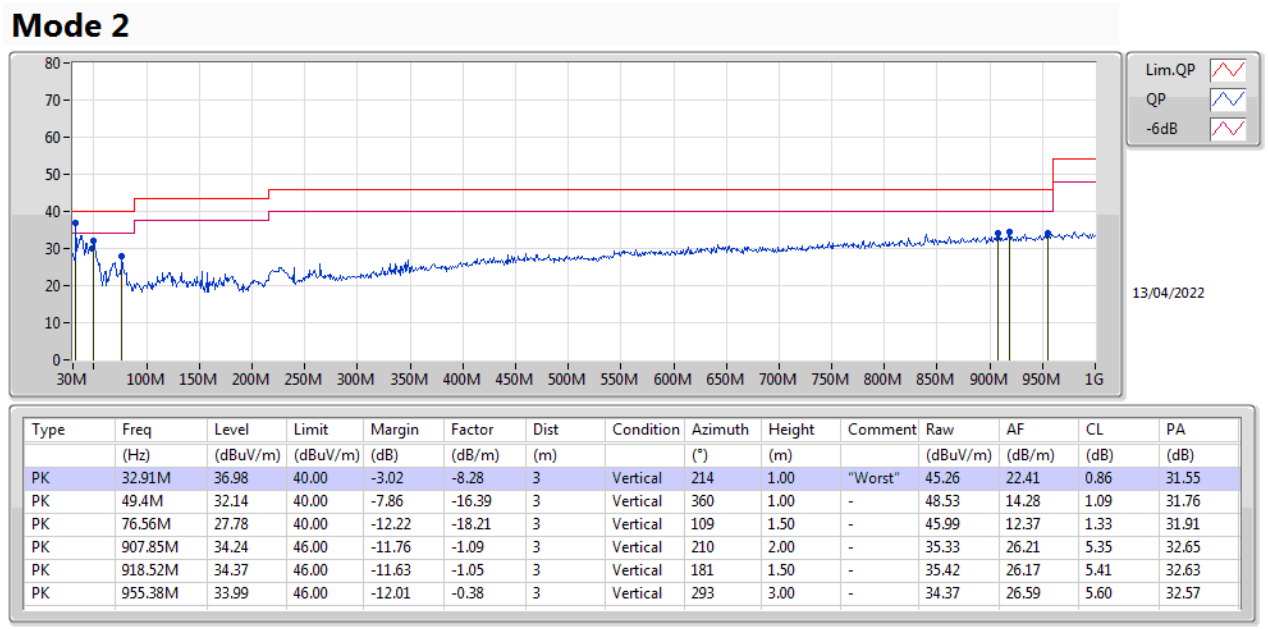
Test Range	30 MHz – 1000 MHz	Test Freq. (GHz)	76.49
Test Distance	3 m		

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)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	32.91M	28.35	40.00	-11.65	-8.28	3	Horizontal	217	1.50	"Worst"	36.63	22.41	0.86	31.55
PK	83.35M	22.48	40.00	-17.52	-17.29	3	Horizontal	263	1.50	-	39.77	13.23	1.40	31.92
PK	855.47M	32.92	46.00	-13.08	-1.58	3	Horizontal	144	3.00	-	34.50	25.92	5.12	32.62
PK	909.79M	33.05	46.00	-12.95	-1.07	3	Horizontal	65	3.00	-	34.12	26.21	5.36	32.64
PK	923.37M	33.08	46.00	-12.92	-1.01	3	Horizontal	177	1.50	-	34.09	26.17	5.44	32.62
PK	950.53M	34.35	46.00	-11.65	-0.49	3	Horizontal	216	1.00	-	34.84	26.48	5.60	32.57

Vertical



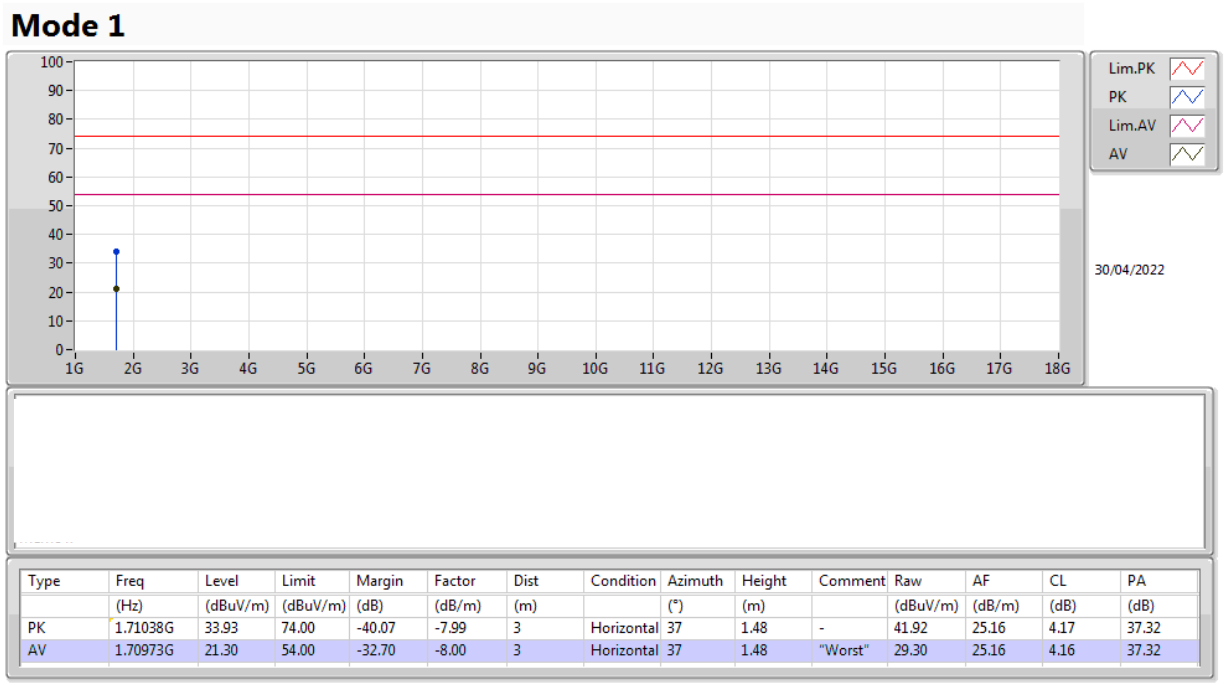
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	32.91M	36.98	40.00	-3.02	-8.28	3	Vertical	214	1.00	"Worst"	45.26	22.41	0.86	31.55
PK	49.4M	32.14	40.00	-7.86	-16.39	3	Vertical	360	1.00	-	48.53	14.28	1.09	31.76
PK	76.56M	27.78	40.00	-12.22	-18.21	3	Vertical	109	1.50	-	45.99	12.37	1.33	31.91
PK	907.85M	34.24	46.00	-11.76	-1.09	3	Vertical	210	2.00	-	35.33	26.21	5.35	32.65
PK	918.52M	34.37	46.00	-11.63	-1.05	3	Vertical	181	1.50	-	35.42	26.17	5.41	32.63
PK	955.38M	33.99	46.00	-12.01	-0.38	3	Vertical	293	3.00	-	34.37	26.59	5.60	32.57

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)

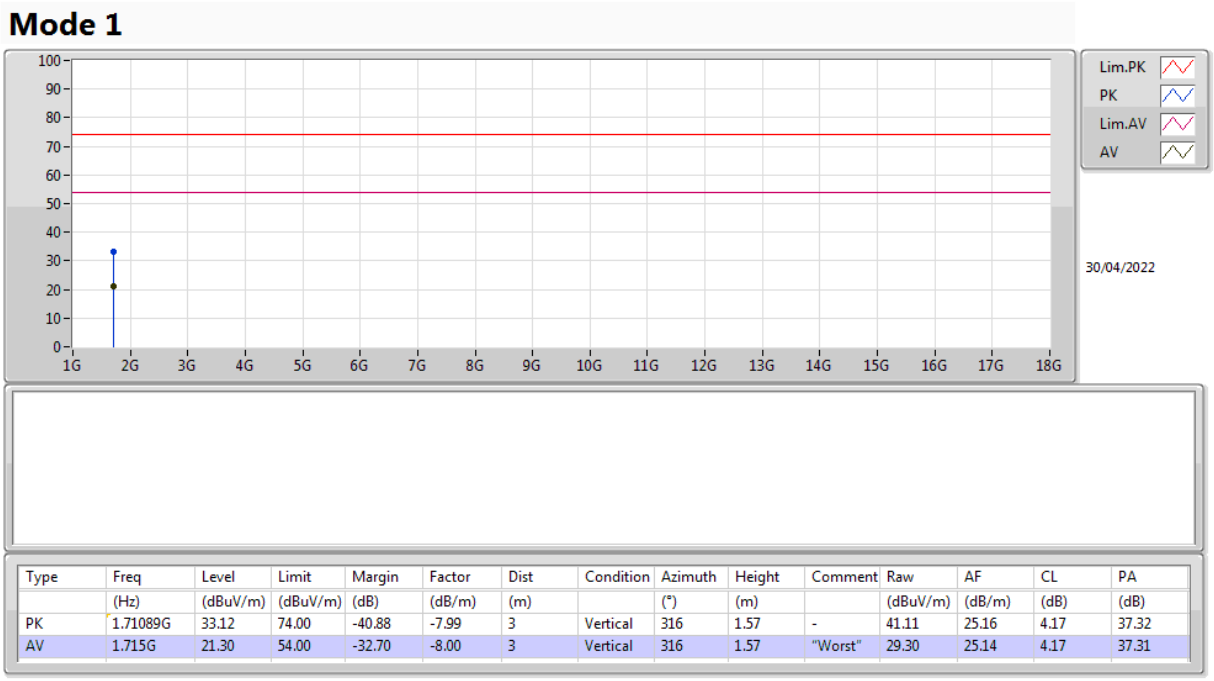
Test Range	1GHz – 18GHz	Test Freq. (GHz)	76.49
Test Distance	3 m		

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)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.71038G	33.93	74.00	-40.07	-7.99	3	Horizontal	37	1.48	-	41.92	25.16	4.17	37.32
AV	1.70973G	21.30	54.00	-32.70	-8.00	3	Horizontal	37	1.48	"Worst"	29.30	25.16	4.16	37.32

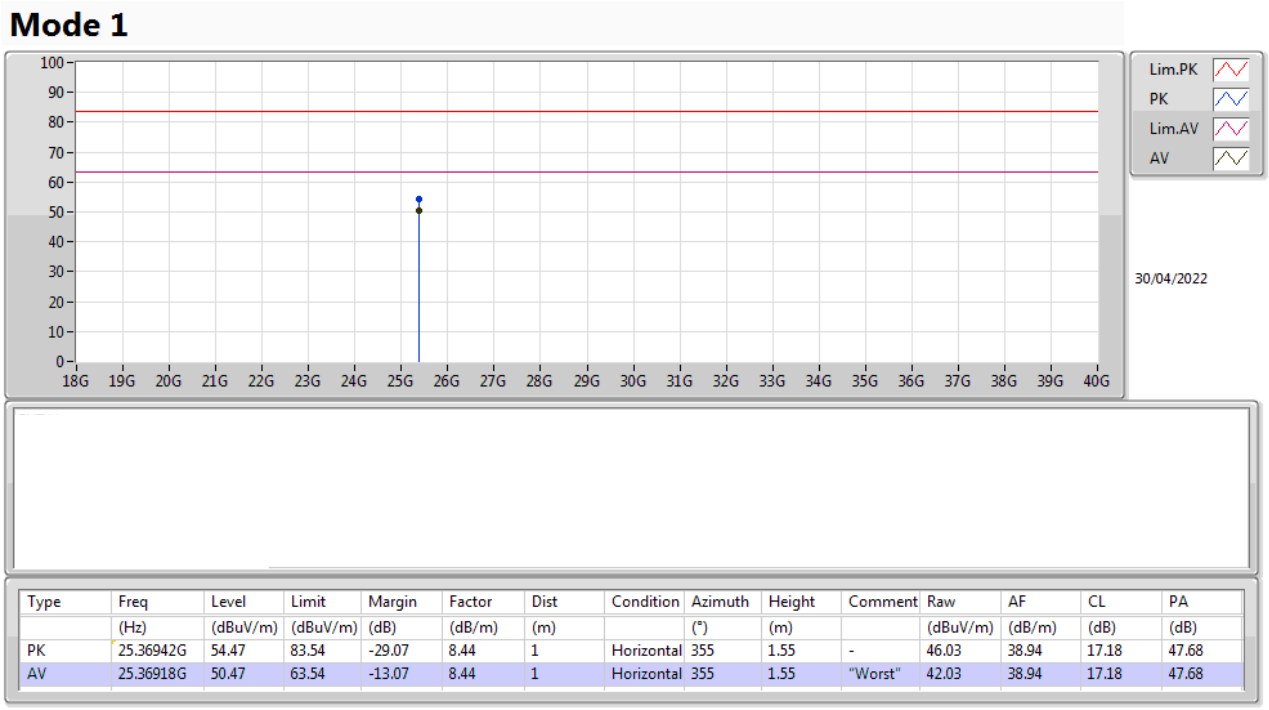
Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	1.71089G	33.12	74.00	-40.88	-7.99	3	Vertical	316	1.57	-	41.11	25.16	4.17	37.32
AV	1.715G	21.30	54.00	-32.70	-8.00	3	Vertical	316	1.57	"Worst"	29.30	25.14	4.17	37.31

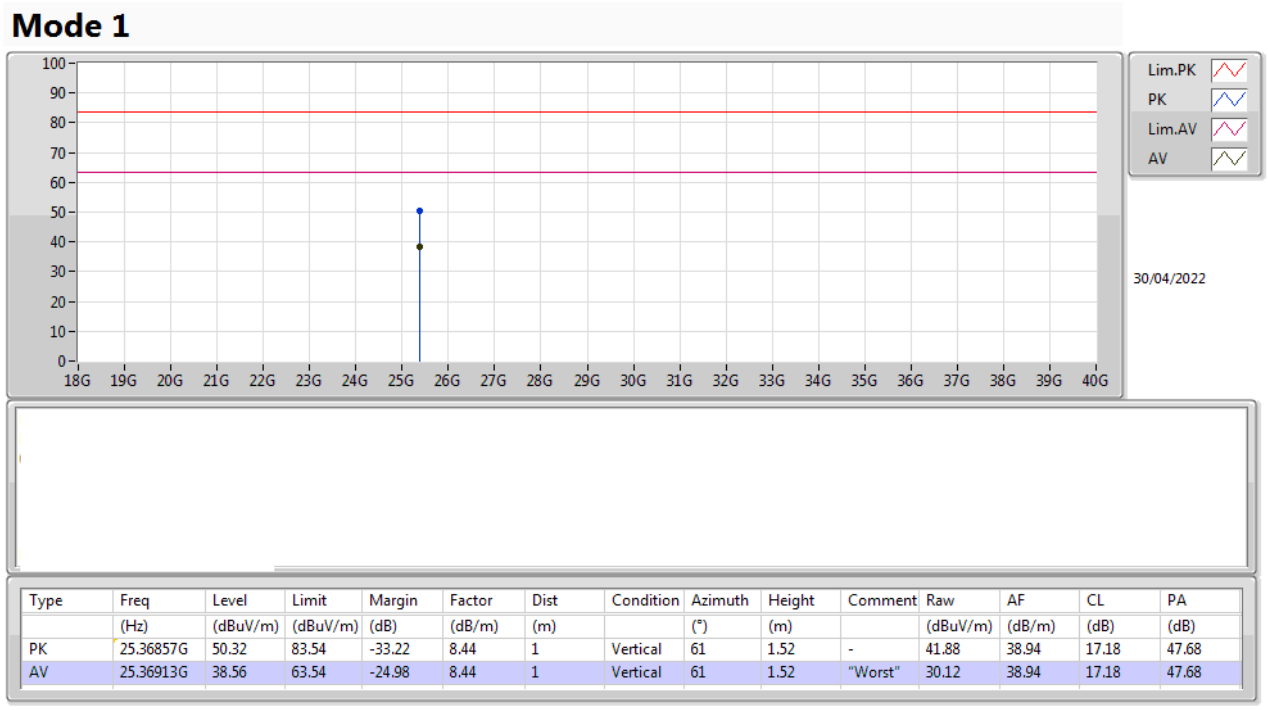
Test Range	18GHz – 40GHz	Test Freq. (GHz)	76.49
Test Distance	1 m		

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)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	25.36942G	54.47	83.54	-29.07	8.44	1	Horizontal	355	1.55	-	46.03	38.94	17.18	47.68
AV	25.36918G	50.47	63.54	-13.07	8.44	1	Horizontal	355	1.55	"Worst"	42.03	38.94	17.18	47.68

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)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	25.36857G	50.32	83.54	-33.22	8.44	1	Vertical	61	1.52	-	41.88	38.94	17.18	47.68
AV	25.36913G	38.56	63.54	-24.98	8.44	1	Vertical	61	1.52	"Worst"	30.12	38.94	17.18	47.68

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
76.49	23.20	4.50	60.03	-83.57	-25.70	4.5	1.0585	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
76.49	23.20	4.50	203.006	-68.82	-0.36	4.5	361.3972	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.

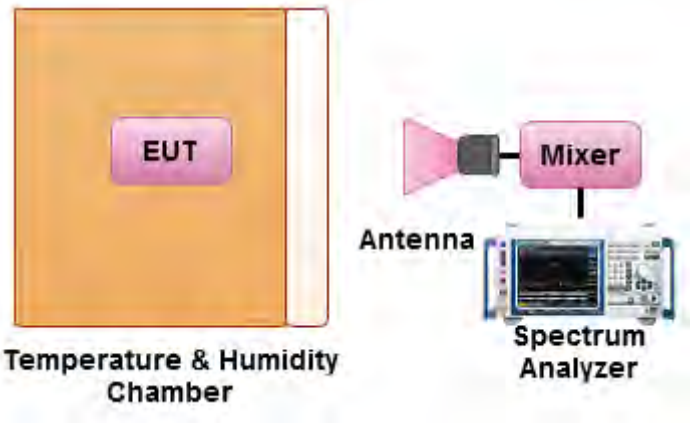
3.4.2 Measuring Instruments

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): 76.49 (24V)

Test Temperature: (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-40	76491.400	3105	**within band**
-30	76492.400	4105	**within band**
-20	76490.512	2217	**within band**
-10	76490.315	2020	**within band**
0	76489.145	850	**within band**
10	76489.145	850	**within band**
20	76488.295	Reference	**within band**
30	76489.145	850	**within band**
40	76489.060	765	**within band**
50	76489.060	765	**within band**
60	76489.060	765	**within band**
70	76486.965	-1330	**within band**
85	76486.965	-1330	**within band**
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
20.4	76490.315	2020	**within band**
24	76488.295	Reference	**within band**
27.6	76489.145	850	**within band**

Test Freq. (GHz): 76.49 (12V)

Test Temperature: (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-40	76491.170	2520	**within band**
-30	76490.820	2170	**within band**
-20	76490.440	1790	**within band**
-10	76490.440	1790	**within band**
0	76491.315	2665	**within band**
10	76489.145	495	**within band**
20	76488.650	Reference	**within band**
30	76488.230	-420	**within band**
40	76489.595	945	**within band**
50	76487.590	-1060	**within band**
60	76487.590	-1060	**within band**
70	76488.025	-625	**within band**
85	76487.590	-1060	**within band**
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
10.2	76489.145	495	**within band**
12	76488.65	Reference	**within band**
13.8	76488.96	310	**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 6120	31244	9kHz - 30 MHz	Mar. 18, 2022	Mar. 17, 2023	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 03, 2022	Aug. 02, 2023	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH05-CB	1GHz ~18GHz 3m	Nov. 07, 2021	Nov. 06, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 25, 2022	Mar. 24, 2023	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120 D-1291	1GHz~18GHz	Oct. 14, 2021	Oct. 13, 2022	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 27, 2021	Apr. 26, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 26, 2022	Apr. 25, 2023	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz – 26.5GHz	Jul. 02, 2021	Jul. 01, 2022	Radiation (03CH05-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Mar. 14, 2022	Mar. 13, 2023	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 17, 2022	Jun. 16, 2023	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5+7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Dec. 08, 2021	Dec. 07, 2022	Radiation (03CH05-CB)
High Cable	Woken	WCA0929M	40G#7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Mar. 10, 2022	Mar. 09, 2023	Radiation (03CH05-CB)
*Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020	Nov. 13, 2022	Radiation (03CH05-CB)
Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Mar. 10, 2022	Mar. 09, 2023	Radiation (03CH05-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Mar. 10, 2022	Mar. 09, 2023	Radiation (03CH05-CB)
Mixer	OML	M03HWD	120320-1	220 ~ 325 GHz	Mar. 10, 2022	Mar. 09, 2023	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	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)
Standard Horn Antenna	Custom Microwave	M03RH	120320-A	220 ~ 325 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Jan. 07, 2022	Jan. 06, 2023	Radiation (TH03-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-C P-AR	MAA1410-011	-40~100 degree	Sep. 09, 2021	Sep. 08, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-11	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-12	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-13	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
Switch	SPTCB	SP-SWI	SWI-03	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P1	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P2	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P3	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P4	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P5	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	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.