

# RADIO PERFORMANCE TEST REPORT

**Test Report No.** : OT-241-RWD-029

**Reception No.** : 2311004036

**Applicant** : LG Electronics USA

**Address** : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, 07632, United States

**Manufacturer** : LG Electronics Inc.

**Address** : 128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea

**Type of Equipment** : Car Navigation

**FCC ID.** : BEJ-MIB3CLASSIC

**Model Name** : MIB3CLASSIC

**Multiple Model Name** : N/A

**Serial number** : N/A

**Total page of Report** : 32 pages (including this page)

**Date of Incoming** : December 04, 2023

**Date of issue** : January 24, 2024

## SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.



Tested by  
Si-eon Lee / Sr. Engineer  
ONETECH Corp.



Reviewed by  
Tae-Ho, Kim / Chief Engineer  
ONETECH Corp.



Approved by  
Jae-Ho, Lee / Chief Engineer  
ONETECH Corp.

**CONTENTS**

**PAGE**

**1. VERIFICATION OF COMPLIANCE .....5**

**2. TEST SUMMARY.....6**

**2.1 TEST ITEMS AND RESULTS .....6**

**2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....6**

**2.3 RELATED SUBMITTAL(S) / GRANT(S) .....6**

**2.4 PURPOSE OF THE TEST .....6**

**2.5 TEST METHODOLOGY.....6**

**2.6 TEST FACILITY.....6**

**3. GENERAL INFORMATION.....7**

**3.1 PRODUCT DESCRIPTION.....7**

**3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....9**

**4. EUT MODIFICATIONS.....9**

**5. SYSTEM TEST CONFIGURATION .....10**

**5.1 JUSTIFICATION.....10**

**5.2 PERIPHERAL EQUIPMENT .....10**

**5.3 MODE OF OPERATION DURING THE TEST .....10**

**5.4 CONFIGURATION OF TEST SYSTEM.....12**

**5.5 ANTENNA REQUIREMENT .....12**

**6. PRELIMINARY TEST .....12**

**6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....12**

**6.2 GENERAL RADIATED EMISSIONS TESTS .....12**

**7. MIMIMUM 6 DB BANDWIDTH .....13**

**7.1 OPERATING ENVIRONMENT .....13**

**7.2 TEST SET-UP .....13**

**7.3 TEST DATE .....13**

**7.4 TEST DATA FOR 802.11B WLAN MODE.....14**

**7.5 TEST DATA FOR 802.11G WLAN MODE .....14**

**7.6 TEST DATA FOR 802.11N\_HT20 WLAN MODE.....14**

**8. MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER .....15**

**8.1 OPERATING ENVIRONMENT .....15**

**8.2 TEST SET-UP .....15**

**8.3 TEST DATE .....15**

8.4 TEST DATA FOR 802.11B WLAN MODE.....16

8.5 TEST DATA FOR 802.11G WLAN MODE .....16

8.6 TEST DATA FOR 802.11N\_HT20 WLAN MODE.....16

**9. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....17**

9.1 OPERATING ENVIRONMENT .....17

9.2 TEST SET-UP FOR CONDUCTED MEASUREMENT .....17

9.3 TEST SET-UP FOR RADIATED MEASUREMENT.....17

9.4 TEST DATE .....17

9.5 TEST DATA FOR CONDUCTED EMISSION .....17

9.6 TEST DATA FOR RADIATED EMISSION.....18

    9.6.1 Radiated Emission which fall in the Restricted Band.....18

    9.6.2 Spurious & Harmonic Radiated Emission.....21

**10. POWER SPECTRAL DENSITY .....24**

10.1 OPERATING ENVIRONMENT .....24

10.2 TEST SET-UP .....24

10.3 TEST DATE .....24

10.4 TEST DATA FOR 802.11B WLAN MODE.....25

10.5 TEST DATA FOR 802.11G WLAN MODE .....25

10.6 TEST DATA FOR 802.11N\_HT20 WLAN MODE.....25

**11. RADIATED EMISSION TEST .....26**

11.1 OPERATING ENVIRONMENT .....26

11.2 TEST SET-UP .....26

11.3 TEST DATE .....27

11.4 TEST DATA FOR 30 MHZ ~ 1 000 MHZ .....28

    11.4.1 Test data for WLAN 2.4 GHz .....28

    11.4.2 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz) .....29

    11.4.3 Test data for Intermodulation Mode(WLAN 2.4 GHz + WLAN 5 GHz) .....30

11.5 TEST DATA FOR BELOW 30 MHZ .....31

11.6 TEST DATA FOR ABOVE 1 GHZ .....31

**12. LIST OF TEST EQUIPMENT .....32**

※ Please refer to the Annex section for All test plots

**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-241-RWD-029	January 24, 2024	Initial Release	All

## 1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA  
 Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, 07632, United States  
 Contact Person : Heejae, Cho / Director, Regulatory and Environmental Affairs  
 Telephone No. : +201-266-2215  
 FCC ID : BEJ-MIB3CLASSIC  
 Model Name : MIB3CLASSIC  
 Brand Name : LG  
 Serial Number : N/A  
 Date : January 24, 2024

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Car Navigation
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: This test is not performed because the EUT is operated by only using DC Power.

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

### 2.3 Related Submittal(s) / Grant(s)

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The LG Electronics USA, Model MIB3CLASSIC (referred to as the EUT in this report) is a Car Navigation. The product specification described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Car Navigation	
OPERATING FREQUENCY	Bluetooth	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
	WLAN 5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20))
		5 190 MHz ~ 5 230 MHz (802.11n(HT40))
		5 210 MHz (802.11ac(VHT80))
	WLAN 5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20))
		5 755 MHz ~ 5 795 MHz (802.11n(HT40))
		5 775 MHz (802.11ac(VHT80))
MODULATION TYPE	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps
	WLAN 2.4 GHz	802.11b: DSSS Modulation (DBPSK/DQPSK/CCK)
		802.11g/n(HT20): OFDM Modulation (BPSK/QPSK/16QAM/64QAM)
WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	

RF OUTPUT POWER	Bluetooth	2.53 dBm (1 Mbps) 1.64 dBm (2 Mbps) 1.92 dBm (3 Mbps)		
	WLAN 2.4 GHz	8.09 dBm (802.11b) 7.83 dBm (802.11g) 7.99 dBm (802.11n_HT20)		
	WLAN 5 150 MHz ~ 5 250 MHz Band	Antenna 0	9.44 dBm(802.11a) 9.45 dBm(802.11n_HT20) 9.43 dBm(802.11n_HT40) 9.57 dBm(802.11ac_VHT80)	
		Antenna 1	9.29 dBm(802.11a) 9.17 dBm(802.11n_HT20) 9.13 dBm(802.11n_HT40) 9.25 dBm(802.11ac_VHT80)	
		Multiple Antenna	12.38 dBm(802.11a) 12.32 dBm(802.11n_HT20) 12.29 dBm(802.11n_HT40) 12.42 dBm(802.11ac_VHT80)	
	WLAN 5 725 MHz ~ 5 850 MHz Band	Antenna 0	12.14 dBm(802.11a) 12.30 dBm(802.11n_HT20) 11.95 dBm(802.11n_HT40) 12.04 dBm(802.11ac_VHT80)	
		Antenna 1	11.72 dBm(802.11a) 11.88 dBm(802.11n_HT20) 11.63 dBm(802.11n_HT40) 11.59 dBm(802.11ac_VHT80)	
		Multiple Antenna	14.93 dBm(802.11a) 15.11 dBm(802.11n_HT20) 14.80 dBm(802.11n_HT40) 14.83 dBm(802.11ac_VHT80)	



ANTENNA TYPE	Bluetooth	PCB Antenna	
	WLAN 2.4 GHz	PCB Antenna	
	WLAN 5 GHz	PCB Antenna	
ANTENNA GAIN	Bluetooth & WLAN 2.4 GHz	Antenna 0	3.28 dBi
		Antenna 1	4.87 dBi
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	3.76 dBi
		Antenna 1	5.04 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	5.28 dBi
		Antenna 1	6.70 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		2.17 MHz, 2.2 MHz, 3 MHz, 19.2 MHz, 25 MHz, 26 MHz, 27 MHz, 28.636 36 MHz, 38.4 MHz, 40 MHz, 55.466 67 MHz	
RATED SUPPLY VOLTAGE		DC 14.0 V	

**3.2 Alternative type(s)/model(s); also covered by this test report.**

-. None

**4. EUT MODIFICATIONS**

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	N/A

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
MIB3CLASSIC	LG Electronics Inc.	Car Navigation (EUT)	-
RTL8852BE	HP	Notebook PC	EUT

### 5.3 Mode of operation during the test

#### -. Channel List (WLAN 2.4 GHz)

Channel	Frequency[MHz]	Channel	Frequency[MHz]	Channel	Frequency[MHz]
1	2 412.00	6	2 437.00	11	2 462.00
2	2 417.00	7	2 442.00		
3	2 422.00	8	2 447.00		
4	2 427.00	9	2 452.00		
5	2 432.00	10	2 457.00		

**-. Duty Cycle**

Band	TEST Mode	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
WLAN 2.4 GHz	802.11 b	1	8.624374	8.635625	99.869721	0.005662
		2	4.408125	4.419375	99.745441	0.011069
		5.5	1.725000	1.736250	99.352044	0.028232
		11	0.958125	0.969375	98.839456	0.050697
	802.11 g	6	1.431875	1.449062	98.813900	0.051820
		9	0.960000	0.977187	98.241132	0.077066
		12	0.727969	0.745156	97.693429	0.101346
		18	0.492031	0.509219	96.624732	0.149117
		24	0.375937	0.393125	95.627981	0.194150
		36	0.256094	0.273281	93.710692	0.282109
		48	0.200000	0.217187	92.086331	0.358048
		54	0.180000	0.197188	91.283677	0.396069
	802.11 n(HT20)	MCS0	1.340000	1.357188	98.733590	0.055351
		MCS1	0.687969	0.705156	97.562589	0.107167
		MCS2	0.472031	0.489219	96.486745	0.155323
		MCS3	0.364062	0.381250	95.491803	0.200339
		MCS4	0.255938	0.273125	93.707094	0.282275
		MCS5	0.200000	0.217188	92.086332	0.358048
		MCS6	0.184062	0.201250	91.459627	0.387706
		MCS7	0.167969	0.185156	90.717300	0.423099

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) \* 100

Correction Factor : 10 \* Log(1 / (Duty Cycle / 100))

### 5.4 Configuration of Test System

**Line Conducted Test:** It is not need to test this requirement, because the EUT shall be operated by only using DC Battery.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

### 5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

**Antenna Construction:**

The antenna of the EUT is a PCB Antenna on the main board in the EUT, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
It is not need to test this requirement, because the power of the EUT is supplied by DC Battery.	

### 6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

## 7. MIMIMUM 6 dB BANDWIDTH

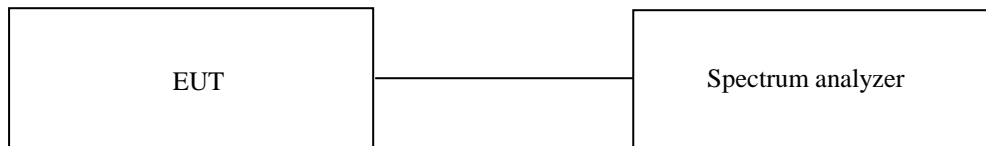
### 7.1 Operating environment

Temperature : 22 °C

Relative humidity : 48 % R.H.

### 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



### 7.3 Test Date

December 15, 2023 ~ January 12, 2024

**7.4 Test data for 802.11b WLAN Mode**

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412.00	10.09	0.50	9.59
Middle	2 437.00	10.09	0.50	9.59
High	2 462.00	10.09	0.50	9.59

Remark. Margin = Measured Value – Limit

**7.5 Test data for 802.11g WLAN Mode**

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412.00	16.28	0.50	15.78
Middle	2 437.00	16.38	0.50	15.88
High	2 462.00	16.38	0.50	15.88

Remark. Margin = Measured Value – Limit

**7.6 Test data for 802.11n\_HT20 WLAN Mode**

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412.00	16.93	0.50	16.43
Middle	2 437.00	16.83	0.50	16.33
High	2 462.00	16.78	0.50	16.28

Remark. Margin = Measured Value – Limit

## 8. MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER

### 8.1 Operating environment

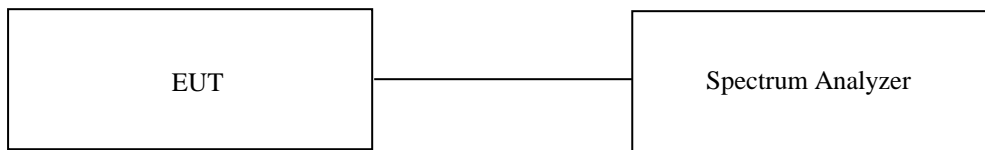
Temperature : 22 °C

Relative humidity : 48 % R.H.

### 8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth.



### 8.3 Test Date

December 15, 2023 ~ January 12, 2024

**8.4 Test data for 802.11b WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 99.87 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	7.54	0.01	7.55	30.00	22.45
MIDDLE	2 437.00	8.08	0.01	8.09	30.00	21.91
HIGH	2 462.00	7.44	0.01	7.45	30.00	22.55

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)

**8.5 Test data for 802.11g WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 98.81 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	7.39	0.05	7.44	30.00	22.56
MIDDLE	2 437.00	7.78	0.05	7.83	30.00	22.17
HIGH	2 462.00	7.63	0.05	7.68	30.00	22.32

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)

**8.6 Test data for 802.11n HT20 WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 98.73 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	7.51	0.06	7.57	30.00	22.43
MIDDLE	2 437.00	7.93	0.06	7.99	30.00	22.01
HIGH	2 462.00	7.75	0.06	7.81	30.00	22.19

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)



## 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

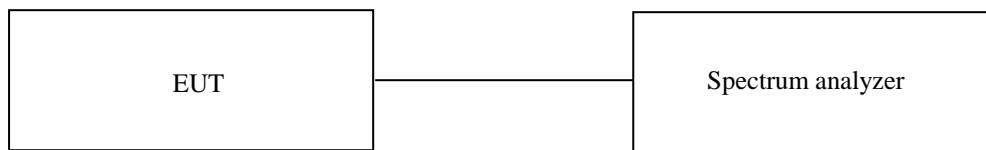
### 9.1 Operating environment

Temperature : 22 °C

Relative humidity : 48 % R.H.

### 9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz and video bandwidth is set to 300 kHz, and peak detection was used.



### 9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 9.4 Test Date

December 15, 2023 ~ January 12, 2024

### 9.5 Test data for conducted emission

Please refer to the Annex

**9.6 Test data for radiated emission**

**9.6.1 Radiated Emission which fall in the Restricted Band**

**9.6.1.1 Test data for 802.11b WLAN Mode**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 99.87 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>											
2 313.31	52.85	Peak	H	27.82	4.56	42.57	6.11	0.00	48.77	74.00	25.23
2 375.47	41.64	Average	H	27.55	4.65	42.55	6.12	0.01	37.42	54.00	16.58
2 366.09	53.04	Peak	V	27.57	4.63	42.55	6.11	0.00	48.80	74.00	25.20
2 376.08	41.49	Average	V	27.55	4.65	42.55	6.12	0.01	37.27	54.00	16.73
<b>Test Data for High Channel</b>											
2 496.22	54.00	Peak	H	27.51	4.93	42.50	6.11	0.00	50.05	74.00	23.95
2 484.83	42.52	Average	H	27.53	4.83	42.51	6.13	0.01	38.51	54.00	15.49
2 484.04	53.85	Peak	V	27.53	4.83	42.51	6.13	0.00	49.83	74.00	24.17
2 484.61	42.36	Average	V	27.53	4.83	42.51	6.13	0.01	38.35	54.00	15.65

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{ATT} + \text{Duty Factor} - \text{AMP Gain}$$

**9.6.1.2 Test data for 802.11g WLAN Mode**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 98.81 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>											
2 389.74	61.61	Peak	H	27.52	4.65	42.54	6.11	0.00	57.35	74.00	16.65
2 389.43	43.78	Average	H	27.52	4.65	42.54	6.11	0.05	39.57	54.00	14.43
2 389.02	58.90	Peak	V	27.52	4.65	42.54	6.11	0.00	54.64	74.00	19.36
2 389.84	42.42	Average	V	27.52	4.65	42.54	6.11	0.05	38.21	54.00	15.79
<b>Test Data for High Channel</b>											
2 483.70	64.37	Peak	H	27.53	4.83	42.51	6.13	0.00	60.35	74.00	13.65
2 483.85	44.08	Average	H	27.53	4.83	42.51	6.13	0.05	40.11	54.00	13.89
2 483.89	62.27	Peak	V	27.53	4.83	42.51	6.13	0.00	58.25	74.00	15.75
2 483.81	43.26	Average	V	27.53	4.83	42.51	6.13	0.05	39.29	54.00	14.71

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{ATT} + \text{Duty Factor} - \text{AMP Gain}$$

**9.6.1.3 Test data for 802.11n\_HT20 WLAN Mode**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 98.73 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>											
2 389.74	60.32	Peak	H	27.52	4.65	42.54	6.11	0.00	56.06	74.00	17.94
2 389.74	43.69	Average	H	27.52	4.65	42.54	6.11	0.06	39.49	54.00	14.51
2 390.04	62.62	Peak	V	27.52	4.65	42.54	6.11	0.00	58.36	74.00	15.64
2 389.63	42.80	Average	V	27.52	4.65	42.54	6.11	0.06	38.60	54.00	15.40
<b>Test Data for High Channel</b>											
2 483.85	62.62	Peak	H	27.53	4.83	42.51	6.13	0.00	58.60	74.00	15.40
2 483.51	45.11	Average	H	27.53	4.83	42.51	6.13	0.06	41.15	54.00	12.85
2 483.51	64.90	Peak	V	27.53	4.83	42.51	6.13	0.00	60.88	74.00	13.12
2 483.77	45.64	Average	V	27.53	4.83	42.51	6.13	0.06	41.68	54.00	12.32

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{ATT} + \text{Duty Factor} - \text{AMP Gain}$$

### 9.6.2 Spurious & Harmonic Radiated Emission

#### 9.6.2.1 Test data for 802.11b WLAN Mode

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 99.87 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>										
4 818.16	49.83	Peak	H	31.24	6.60	41.84	0.00	45.83	74.00	28.17
4 848.08	37.76	Average	H	31.30	6.59	41.83	0.01	33.83	54.00	20.17
4 841.03	49.31	Peak	V	31.28	6.59	41.83	0.00	45.35	74.00	28.65
4 836.34	37.88	Average	V	31.27	6.59	41.83	0.01	33.92	54.00	20.08
<b>Test Data for Middle Channel</b>										
4 871.50	49.91	Peak	H	31.30	6.69	41.83	0.00	46.07	74.00	27.93
4 852.67	37.70	Average	H	31.30	6.69	41.83	0.01	33.87	54.00	20.13
4 850.32	49.34	Peak	V	31.30	6.69	41.83	0.00	45.50	74.00	28.50
4 851.62	37.69	Average	V	31.30	6.69	41.83	0.01	33.86	54.00	20.14
<b>Test Data for High Channel</b>										
4 913.26	49.74	Peak	H	31.27	6.70	41.82	0.00	45.89	74.00	28.11
4 926.55	37.70	Average	H	31.25	6.70	41.81	0.01	33.85	54.00	20.15
4 925.20	49.87	Peak	V	31.25	6.70	41.81	0.00	46.01	74.00	27.99
4 939.93	37.64	Average	V	31.22	6.70	41.81	0.01	33.76	54.00	20.24

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Duty Factor} - \text{AMP Factor}$$

**9.6.2.2 Test data for 802.11g WLAN Mode**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 98.81 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>										
4 845.73	49.78	Peak	H	31.29	6.59	41.83	0.00	45.83	74.00	28.17
4 840.58	37.64	Average	H	31.28	6.59	41.83	0.05	33.73	54.00	20.27
4 841.38	49.53	Peak	V	31.28	6.59	41.83	0.00	45.57	74.00	28.43
4 813.36	37.67	Average	V	31.23	6.60	41.84	0.05	33.71	54.00	20.29
<b>Test Data for Middle Channel</b>										
4 860.16	49.47	Peak	H	31.30	6.69	41.83	0.00	45.63	74.00	28.37
4 854.12	37.62	Average	H	31.30	6.69	41.83	0.05	33.83	54.00	20.17
4 854.02	49.73	Peak	V	31.30	6.69	41.83	0.00	45.89	74.00	28.11
4 852.67	37.53	Average	V	31.30	6.69	41.83	0.05	33.74	54.00	20.26
<b>Test Data for High Channel</b>										
4 920.20	50.17	Peak	H	31.26	6.70	41.82	0.00	46.31	74.00	27.69
4 905.52	37.57	Average	H	31.29	6.70	41.82	0.05	33.79	54.00	20.21
4 907.02	49.31	Peak	V	31.29	6.70	41.82	0.00	45.48	74.00	28.52
4 923.10	37.61	Average	V	31.25	6.70	41.82	0.05	33.79	54.00	20.21

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Duty Factor} - \text{AMP Factor}$$

**9.6.2.3 Test data for 802.11n\_HT20 WLAN Mode**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 98.73 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>										
4 835.14	49.64	Peak	H	31.27	6.59	41.83	0.00	45.67	74.00	28.33
4 831.79	37.58	Average	H	31.26	6.59	41.83	0.06	33.66	54.00	20.34
4 841.38	49.63	Peak	V	31.28	6.59	41.83	0.00	45.67	74.00	28.33
4 831.64	37.60	Average	V	31.26	6.59	41.83	0.06	33.68	54.00	20.32
<b>Test Data for Middle Channel</b>										
4 885.49	49.41	Peak	H	31.30	6.70	41.82	0.00	45.59	74.00	28.41
4 855.52	37.48	Average	H	31.30	6.69	41.83	0.06	33.70	54.00	20.30
4 854.02	49.30	Peak	V	31.30	6.69	41.83	0.00	45.46	74.00	28.54
4 853.42	37.51	Average	V	31.30	6.69	41.83	0.06	33.73	54.00	20.27
<b>Test Data for High Channel</b>										
4 915.81	49.40	Peak	H	31.27	6.70	41.82	0.00	45.55	74.00	28.45
4 916.46	37.46	Average	H	31.27	6.70	41.82	0.06	33.67	54.00	20.33
4 943.93	49.54	Peak	V	31.21	6.70	41.81	0.00	45.64	74.00	28.36
4 912.61	37.45	Average	V	31.27	6.70	41.82	0.06	33.66	54.00	20.34

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Duty Factor} - \text{AMP Factor}$$

## 10. POWER SPECTRAL DENSITY

### 10.1 Operating environment

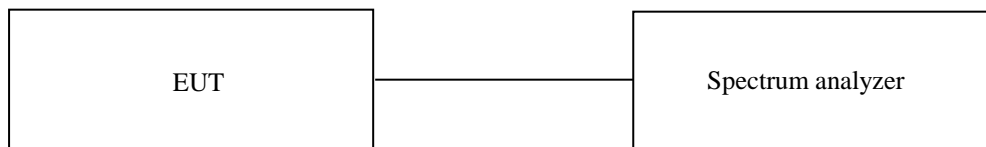
Temperature : 22 °C

Relative humidity : 48 % R.H.

### 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$  , the video bandwidth is set to 3 times the resolution bandwidth.



### 10.3 Test Date

December 15, 2023 ~ January 12, 2024



**10.4 Test data for 802.11b WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 99.87 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm / 3 kHz)	MARGIN (dB)
LOW	2 412.00	-25.42	0.01	-25.41	8.00	33.41
MIDDLE	2 437.00	-24.91	0.01	-24.90	8.00	32.90
HIGH	2 462.00	-25.66	0.01	-25.65	8.00	33.65

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)

**10.5 Test data for 802.11g WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 98.81 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm / 3 kHz)	MARGIN (dB)
LOW	2 412.00	-26.99	0.05	-26.94	8.00	34.94
MIDDLE	2 437.00	-26.51	0.05	-26.46	8.00	34.46
HIGH	2 462.00	-26.93	0.05	-26.88	8.00	34.88

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)

**10.6 Test data for 802.11n HT20 WLAN Mode**

-. Test Result : Pass

-. Duty Cycle : 98.73 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm / 3 kHz)	MARGIN (dB)
LOW	2 412.00	-27.11	0.06	-27.05	8.00	35.05
MIDDLE	2 437.00	-26.63	0.06	-26.57	8.00	34.57
HIGH	2 462.00	-26.77	0.06	-26.71	8.00	34.71

Remark. Margin = Limit – Result (=Measured Value + Duty Factor)

## 11. RADIATED EMISSION TEST

### 11.1 Operating environment

Temperature : 22 °C

Relative humidity : 48 % R.H.

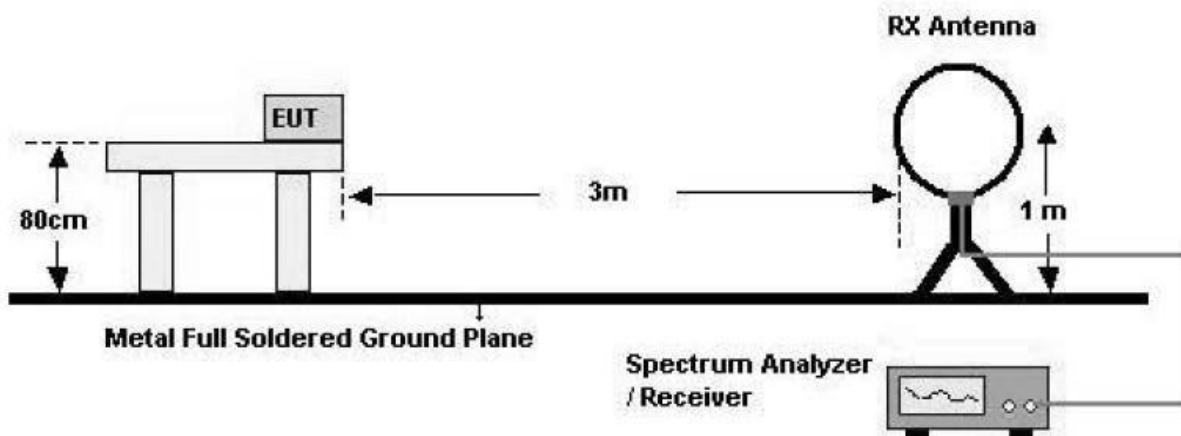
### 11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

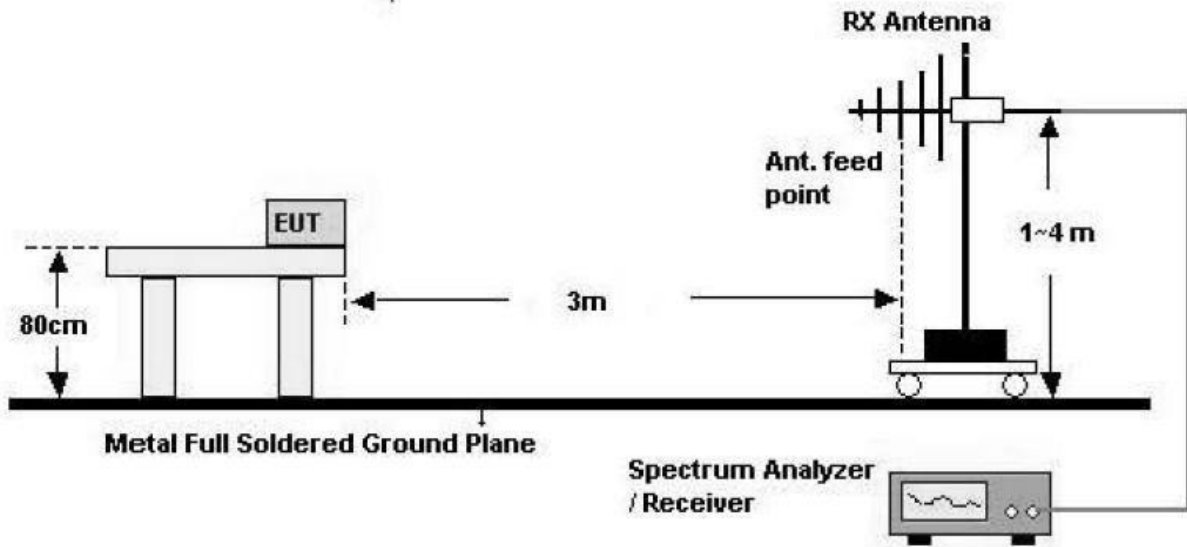
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

#### - Test Configuration

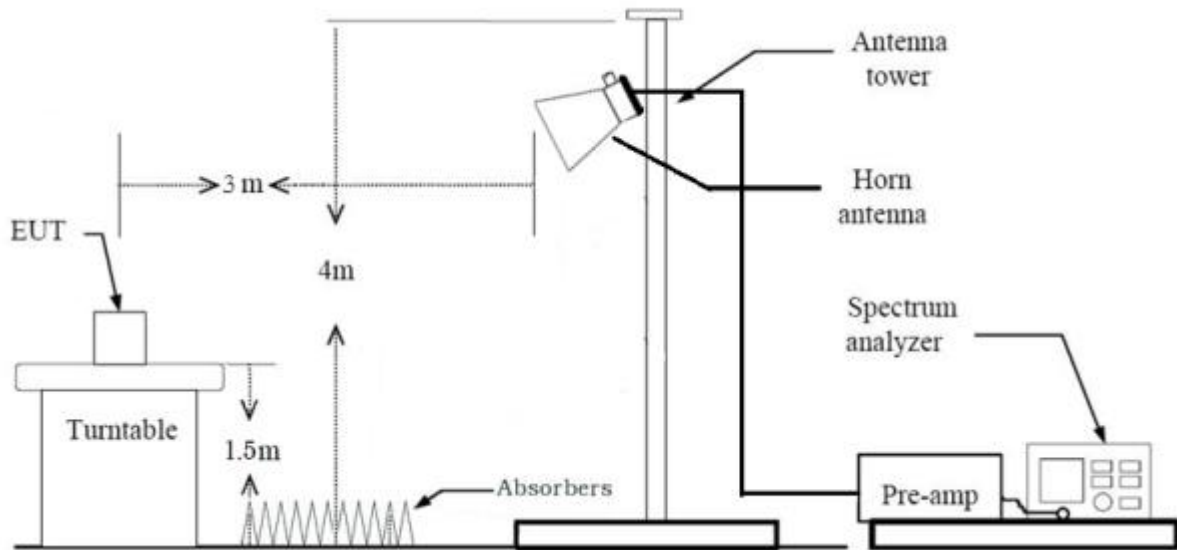
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



**11.3 Test Date**

December 15, 2023 ~ January 12, 2024

11.4 Test data for 30 MHz ~ 1 000 MHz

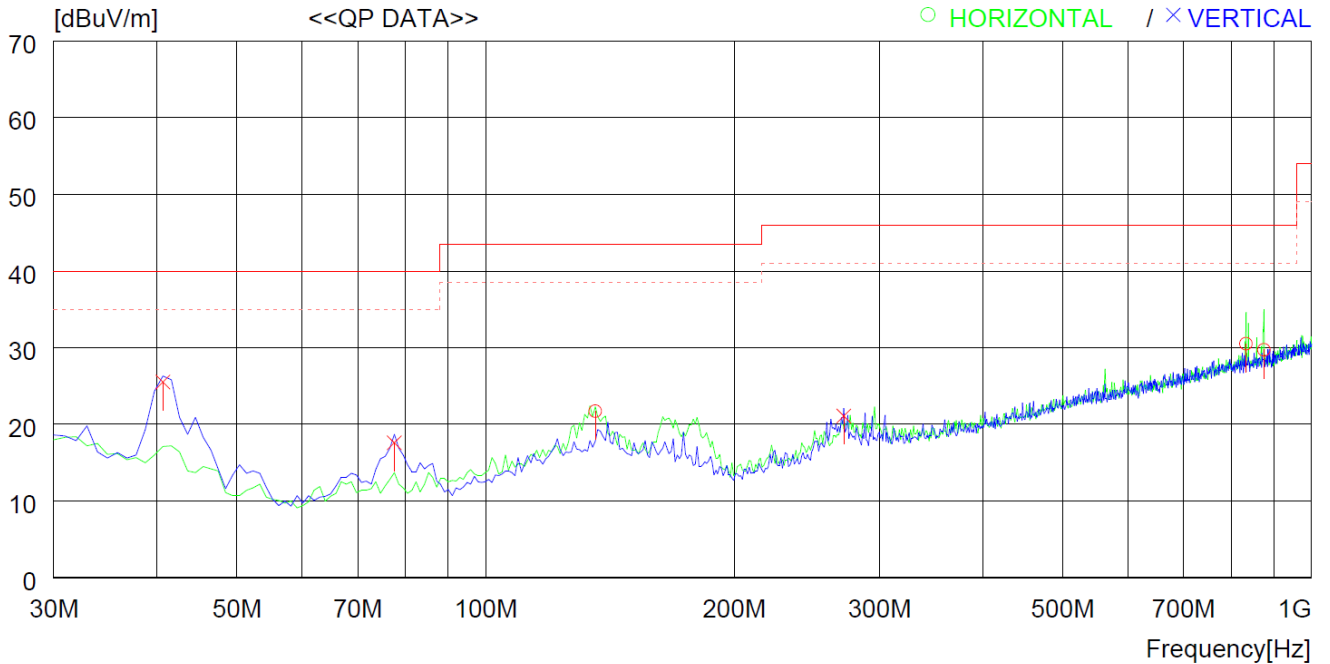
11.4.1 Test data for WLAN 2.4 GHz

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Car Navigation

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	135.730	33.0	19.1	1.7	32.1	21.7	43.5	21.8	200	0
2	833.151	31.1	27.2	4.4	32.2	30.5	46.0	15.5	300	88
3	875.830	29.9	27.4	4.5	32.1	29.7	46.0	16.3	100	359
----- Vertical -----										
4	40.670	40.0	16.7	0.9	32.1	25.5	40.0	14.5	100	126
5	77.530	35.1	13.2	1.3	32.0	17.6	40.0	22.4	100	8
6	271.530	32.4	18.3	2.5	32.1	21.1	46.0	24.9	200	359

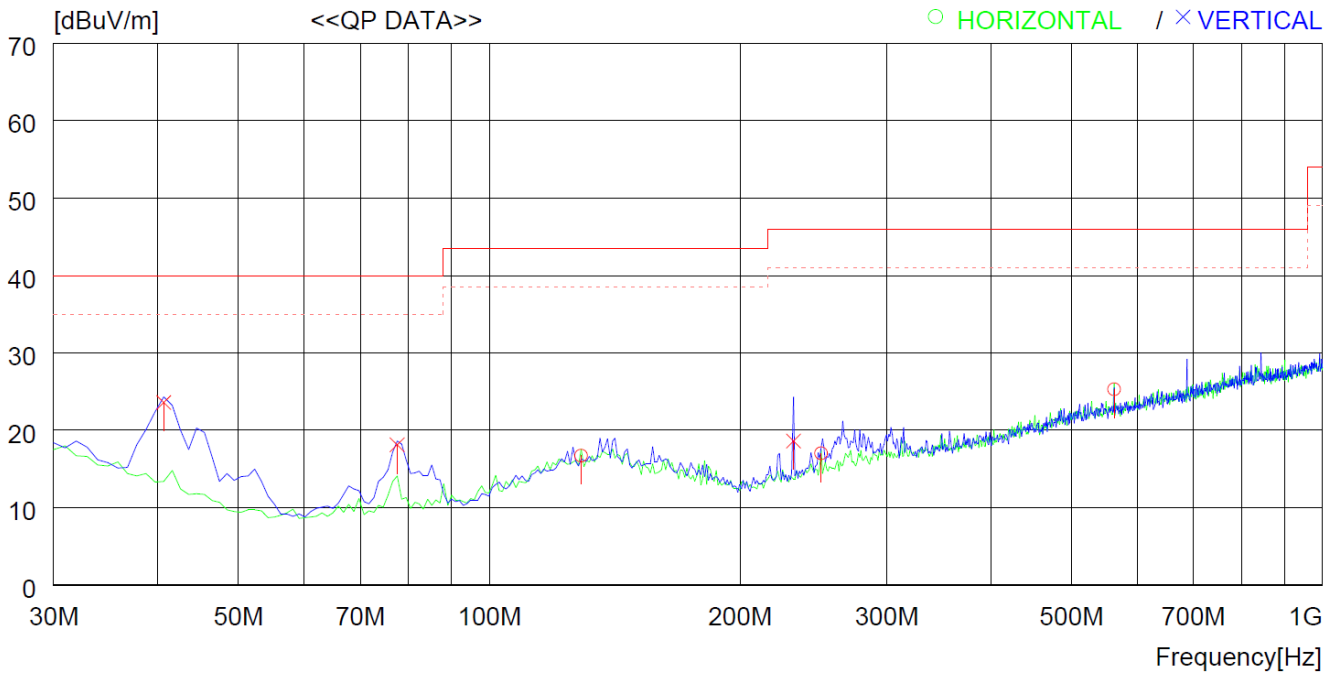
**11.4.2 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz)**

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Car Navigation

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	128.940	28.2	18.9	1.7	32.1	16.7	43.5	26.8	400	0
2	250.190	29.1	17.6	2.4	32.1	17.0	46.0	29.0	300	273
3	562.529	30.2	23.7	3.7	32.3	25.3	46.0	20.7	300	359
----- Vertical -----										
4	40.670	38.1	16.7	0.9	32.1	23.6	40.0	16.4	100	0
5	77.530	35.6	13.2	1.3	32.0	18.1	40.0	21.9	100	0
6	231.760	31.6	16.8	2.3	32.1	18.6	46.0	27.4	400	40

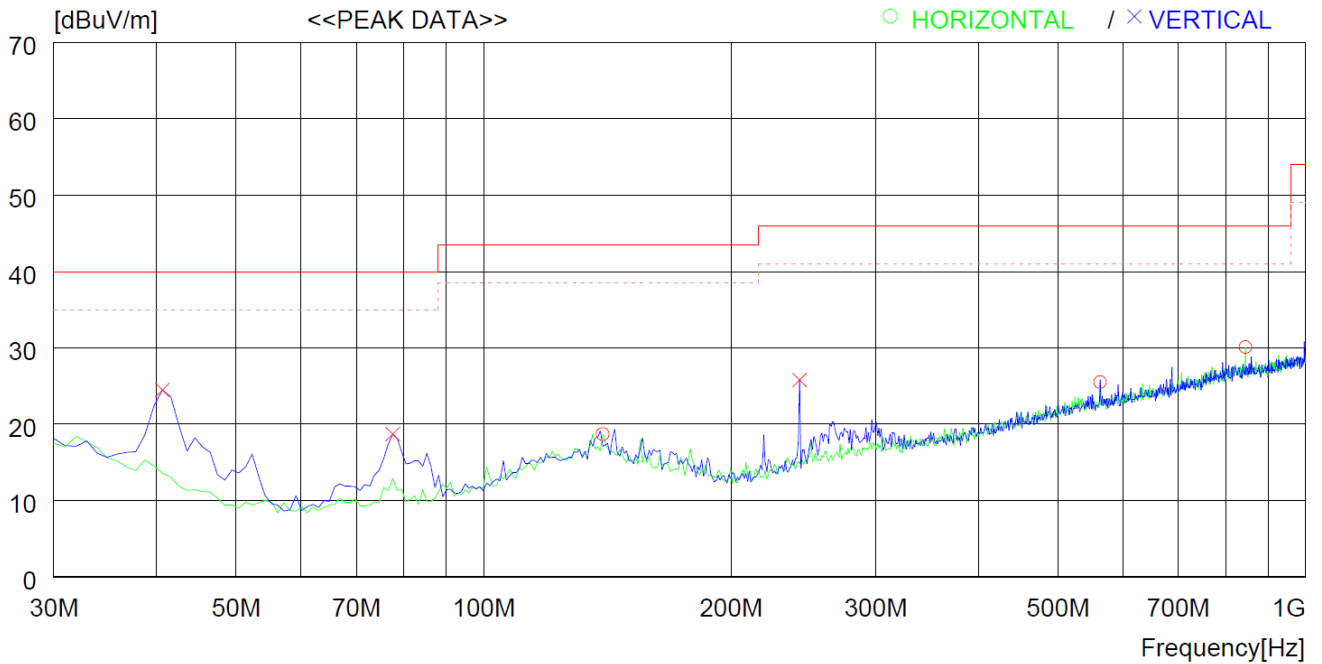
**11.4.3 Test data for Intermodulation Mode(WLAN 2.4 GHz + WLAN 5 GHz)**

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Car Navigation

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING [dBuV]	ANT PEAK FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	139.610	29.8	19.2	1.8	32.1	18.7	43.5	24.8	400	314
2	562.529	30.4	23.7	3.7	32.3	25.5	46.0	20.5	300	359
3	844.791	30.6	27.2	4.5	32.2	30.1	46.0	15.9	200	0
----- Vertical -----										
4	40.670	39.0	16.7	0.9	32.1	24.5	40.0	15.5	100	86
5	77.530	36.2	13.2	1.3	32.0	18.7	40.0	21.3	100	0
6	242.430	38.3	17.3	2.3	32.1	25.8	46.0	20.2	400	359

**11.5 Test data for Below 30 MHz**

- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

**11.6 Test data for above 1 GHz**

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

**12. LIST OF TEST EQUIPMENT**

<b>Model Number</b>	<b>Manufacturer</b>	<b>Description</b>	<b>Serial Number</b>	<b>Last Cal.(Interval)</b>
FSV40-N	Rohde & Schwarz	Signal Analyzer	102165	Jul. 15, 2024 (1Y)
FSVA40	Rohde & Schwarz	Signal Analyzer	101593	Jul. 15, 2024 (1Y)
ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 06, 2023 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2023 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 11, 2023 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Jan. 18, 2024 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 17, 2024 (1Y)
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2022 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Mar. 07, 2022 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jun. 22, 2023 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 25, 2024 (1Y)
DT2000-2t	Innco System	Turn Table	N/A	N/A
MA-4640-XPET	Innco System	Antenna Master	MA4640/652/43100318/P	N/A
CO3000	Innco System	Controller	1026/40960617/P	N/A