RADIO PERFORMANCE TEST REPORT

Test Report No.	**: OT-22N-RWD-048**
Reception No.	**: 2209002850**
Applicant	**: LG Electronics USA**
Address	**: 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, 07632, United States**
Manufacturer	**: LG Electronics Inc.**
Address	**: 222 LG-ro, Jinwi-Myeon, Pyeongtaek -Si, Gyeonggi-Do, 451-713, Korea**
Type of Equipment	**: Car Navigation**
FCC ID.	**: BEJ-MEBICAS301**
Model Name	**: MEB ICAS3**
Multiple Model Name	**: N/A**
Serial number	**: N/A**
Total page of Report	**: 32 pages (including this page)**
Date of Incoming	**: October 13, 2022**
Date of issue	**: November 21, 2022**

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	Reviewed by	Approved by
Ju-Yun, Park / Manager	Tae-Ho, Kim / General Manager	Ki-Hong, Nam / General Manager
ONETECH Corp.	ONETECH Corp.	ONETECH Corp.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

CONTENTS

PAGE

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

※ Please refer to the Annex section for All test plots

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-22N-RWD-048	November 21, 2022	Initial Release	All

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA

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

Contact Person : Sung Soo, Kim / Director, Regulatory and Environmental Affairs

Telephone No. : +201-266-2215

FCC ID : BEJ-MEBICAS301

Model Name : MEB ICAS3

Brand Name : LG, Volkswagen, SKODA, SEAT

Serial Number : N/A

Date : November 21, 2022

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.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

3. GENERAL INFORMATION

3.1 Product Description

The LG Electronics USA, Model MEB ICAS3 (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, π/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	1 Mbps	2.51 dBm
		2 Mbps	1.59 dBm
		3 Mbps	1.83 dBm
	WLAN 2.4 GHz	8.55 dBm(802.11b) 8.54 dBm(802.11g) 8.71 dBm(802.11n_HT20)	
	WLAN 5 150 MHz ~ 5 250 MHz Band	Antenna 0	10.05 dBm(802.11a) 10.08 dBm(802.11n_HT20) 9.94 dBm(802.11n_HT40) 9.86 dBm(802.11ac_VHT80)
		Antenna 1	9.18 dBm(802.11a) 9.23 dBm(802.11n_HT20) 9.03 dBm(802.11n_HT40) 8.76 dBm(802.11ac_VHT80)
		Multiple Antenna	12.65 dBm(802.11a) 12.69 dBm(802.11n_HT20) 12.52 dBm(802.11n_HT40) 12.36 dBm(802.11ac_VHT80)
	WLAN 5 725 MHz ~ 5 850 MHz Band	Antenna 0	12.44 dBm(802.11a) 12.44 dBm(802.11n_HT20) 12.53 dBm(802.11n_HT40) 12.64 dBm(802.11ac_VHT80)
		Antenna 1	11.36 dBm(802.11a) 11.41 dBm(802.11n_HT20) 11.51 dBm(802.11n_HT40) 11.62 dBm(802.11ac_VHT80)
		Multiple Antenna	14.92 dBm(802.11a) 14.94 dBm(802.11n_HT20) 15.06 dBm(802.11n_HT40) 15.17 dBm(802.11ac_VHT80)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

ANTENNA TYPE	Bluetooth	PCB Antenna	
	WLAN 2.4 GHz	Chip Antenna	
	WLAN 5 GHz	Antenna 0	Chip Antenna
		Antenna 1	PCB Antenna
ANTENNA GAIN	Bluetooth	2.07 dBi	
	WLAN 2.4 GHz	5.02 dBi	
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	3.74 dBi
		Antenna 1	5.52 dBi
		Multiple Antenna	7.73 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	1.60 dBi
		Antenna 1	8.48 dBi
		Multiple Antenna	9.29 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		55.466 67 MHz , 40.00 MHz, 20 MHz, 25 MHz, 19.2 MHz	
RATED SUPPLY VOLTAGE		DC 12.0 V	

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

-. None

4. EUT MODIFICATIONS

-. None

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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
MEB ICAS3	LG Electronics Inc.	Car Navigation (EUT)	-
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	EUT
ProBook 4540s	HP	Notebokk 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		

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

-. 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	8.624	8.635	99.87	0.01
		2	4.408	4.419	99.75	0.01
		5.5	1.725	1.736	99.37	0.03
		11	0.959	0.970	98.87	0.05
	802.11 g	6	1.432	1.449	98.83	0.05
		9	0.960	0.977	98.26	0.08
		12	0.728	0.745	97.72	0.10
		18	0.492	0.509	96.66	0.15
		24	0.376	0.393	95.67	0.19
		36	0.256	0.273	93.77	0.28
		48	0.200	0.217	92.17	0.35
		54	0.180	0.197	91.37	0.39
	802.11 n(HT20)	MCS0	1.340	1.357	98.75	0.05
		MCS1	0.688	0.705	97.59	0.11
		MCS2	0.472	0.489	96.52	0.15
		MCS3	0.364	0.381	95.54	0.20
		MCS4	0.256	0.273	93.77	0.28
		MCS5	0.200	0.217	92.17	0.35
		MCS6	0.184	0.201	91.54	0.38
		MCS7	0.168	0.185	90.81	0.42

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

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

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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 Power.

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 and Chip 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 Power.	

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

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

7. MIMIMUM 6 dB BANDWIDTH

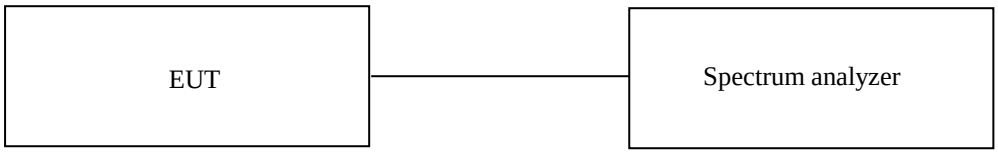
7.1 Operating environment

Temperature : 23 °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

October 17, 2022 ~ October 31, 2022

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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	16.33	0.50	15.83
High	2 462.00	16.33	0.50	15.83

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	17.08	0.50	16.58
Middle	2 437.00	17.48	0.50	16.98
High	2 462.00	17.23	0.50	16.73

Remark. Margin = Measured Value – Limit

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8. MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER

8.1 Operating environment

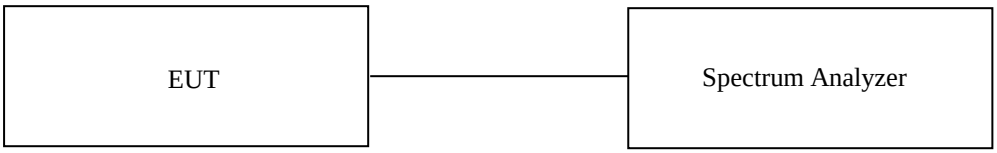
Temperature : 23 °C

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

October 17, 2022 ~ October 31, 2022

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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	8.02	0.01	8.03	30.00	21.97
MIDDLE	2 437.00	8.54	0.01	8.55	30.00	21.45
HIGH(11)	2 462.00	8.32	0.01	8.33	30.00	21.67

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

8.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

-. Duty Cycle : 98.83 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	8.09	0.05	8.14	30.00	21.86
MIDDLE	2 437.00	8.49	0.05	8.54	30.00	21.46
HIGH(11)	2 462.00	8.44	0.05	8.49	30.00	21.51

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

8.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Result : Pass

-. Duty Cycle : 98.75 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	8.35	0.05	8.40	30.00	21.60
MIDDLE	2 437.00	8.66	0.05	8.71	30.00	21.29
HIGH(11)	2 462.00	8.57	0.05	8.62	30.00	21.38

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

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

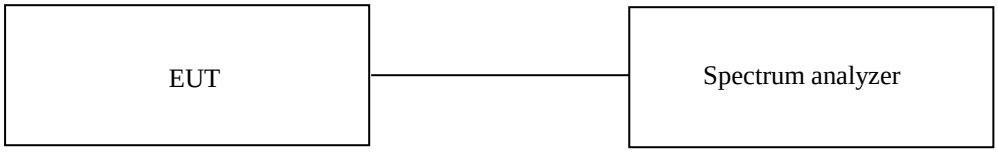
9.1 Operating environment

Temperature : 23 °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

October 17, 2022 ~ October 31, 2022

9.5 Test data for conducted emission

Please refer to the Annex

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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)
Test Data for Low Channel											
2 386.27	53.96	Peak	H	28.36	7.60	44.95	5.77	-	50.74	74.00	23.26
2 386.27	44.03	Average	H	28.36	7.60	44.95	5.77	0.01	40.82	54.00	13.18
2 325.03	53.43	Peak	V	28.00	7.39	44.97	5.77	-	49.62	74.00	24.38
2 386.37	42.76	Average	V	28.36	7.60	44.95	5.77	0.01	39.55	54.00	14.45
Test Data for High Channel											
2 495.96	54.69	Peak	H	28.81	7.65	44.90	5.77	-	52.02	74.00	21.98
2 495.88	45.72	Average	H	28.81	7.65	44.90	5.77	0.01	43.06	54.00	10.94
2 495.73	55.24	Peak	V	28.81	7.65	44.90	5.77	-	52.57	74.00	21.43
2 496.07	44.49	Average	V	28.81	7.65	44.90	5.77	0.01	41.83	54.00	12.17

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + ATT + Duty Factor– AMP Gain

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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 : 98.83 %

-. 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)
Test Data for Low Channel											
2 389.74	63.37	Peak	H	28.40	7.60	44.94	5.77	-	60.20	74.00	13.80
2 389.94	45.81	Average	H	28.40	7.60	44.94	5.77	0.05	42.69	54.00	11.31
2 390.00	63.91	Peak	V	28.40	7.60	44.94	5.77	-	60.74	74.00	13.26
2 389.94	44.49	Average	V	28.40	7.60	44.94	5.77	0.05	41.37	54.00	12.63
Test Data for High Channel											
2 483.62	67.60	Peak	H	28.83	7.65	44.91	5.77	-	64.94	74.00	9.06
2 483.51	51.27	Average	H	28.83	7.65	44.91	5.77	0.05	48.66	54.00	5.34
2 483.85	66.88	Peak	V	28.83	7.65	44.91	5.77	-	64.22	74.00	9.78
2 483.51	48.64	Average	V	28.83	7.65	44.91	5.77	0.05	46.03	54.00	7.97

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + ATT + Duty Factor– AMP Gain

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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 : 98.75 %

-. 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)
Test Data for Low Channel											
2 389.74	64.56	Peak	H	28.40	7.60	44.94	5.77	-	61.39	74.00	12.61
2 389.94	48.19	Average	H	28.40	7.60	44.94	5.77	0.05	45.07	54.00	8.93
2 390.00	64.12	Peak	V	28.40	7.60	44.94	5.77	-	60.95	74.00	13.05
2 390.00	47.26	Average	V	28.40	7.60	44.94	5.77	0.05	44.14	54.00	9.86
Test Data for High Channel											
2 483.69	70.35	Peak	H	28.83	7.65	44.91	5.77	-	67.69	74.00	6.31
2 483.92	53.84	Average	H	28.83	7.65	44.91	5.77	0.05	51.23	54.00	2.77
2 483.73	67.11	Peak	V	28.83	7.65	44.91	5.77	-	64.45	74.00	9.55
2 483.50	53.82	Average	V	28.83	7.65	44.91	5.77	0.05	51.21	54.00	2.79

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + ATT + Duty Factor– AMP Gain

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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)
Test Data for Low Channel										
4 824.000	49.85	Peak	H	33.45	11.81	44.66	-	50.45	74.00	23.55
4 824.000	37.86	Average	H	33.45	11.81	44.66	0.01	38.47	54.00	15.53
4 824.000	50.85	Peak	V	33.45	11.81	44.66	-	51.45	74.00	22.55
4 824.000	38.14	Average	V	33.45	11.81	44.66	0.01	38.75	54.00	15.25
Test Data for Middle Channel										
4 874.000	49.49	Peak	H	33.45	11.93	44.67	-	50.20	74.00	23.80
4 874.000	37.64	Average	H	33.45	11.93	44.67	0.01	38.36	54.00	15.64
4 874.000	50.57	Peak	V	33.45	11.93	44.67	-	51.28	74.00	22.72
4 874.000	38.01	Average	V	33.45	11.93	44.67	0.01	38.73	54.00	15.27
Test Data for High Channel										
4 924.000	50.60	Peak	H	33.55	11.93	44.68	-	51.40	74.00	22.60
4 924.000	37.91	Average	H	33.55	11.93	44.68	0.01	38.72	54.00	15.28
4 924.000	50.82	Peak	V	33.53	11.93	44.68	-	51.60	74.00	22.40
4 924.000	38.42	Average	V	33.55	11.93	44.68	0.01	39.23	54.00	14.77

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

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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 : 98.83 %

-. 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)
Test Data for Low Channel										
4 824.000	50.24	Peak	H	33.45	11.81	44.66	-	50.84	74.00	23.16
4 824.000	38.03	Average	H	33.45	11.81	44.66	0.05	38.68	54.00	15.32
4 824.000	50.41	Peak	V	33.45	11.81	44.66	-	51.01	74.00	22.99
4 824.000	37.77	Average	V	33.45	11.81	44.66	0.05	38.42	54.00	15.58
Test Data for Middle Channel										
4 874.000	49.80	Peak	H	33.45	11.93	44.67	-	50.51	74.00	23.49
4 874.000	37.95	Average	H	33.45	11.93	44.67	0.05	38.71	54.00	15.29
4 874.000	49.60	Peak	V	33.45	11.93	44.67	-	50.31	74.00	23.69
4 874.000	37.82	Average	V	33.45	11.93	44.67	0.05	38.58	54.00	15.42
Test Data for High Channel										
4 924.000	49.84	Peak	H	33.55	11.93	44.68	-	50.64	74.00	23.36
4 924.000	37.83	Average	H	33.55	11.93	44.68	0.05	38.68	54.00	15.32
4 924.000	49.86	Peak	V	33.53	11.93	44.68	-	50.64	74.00	23.36
4 924.000	37.76	Average	V	33.55	11.93	44.68	0.05	38.61	54.00	15.39

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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 : 98.75 %

-. 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)
Test Data for Low Channel										
4 824.000	50.42	Peak	H	33.45	11.81	44.66	-	51.02	74.00	22.98
4 824.000	37.95	Average	H	33.45	11.81	44.66	0.05	38.60	54.00	15.40
4 824.000	49.87	Peak	V	33.45	11.81	44.66	-	50.47	74.00	23.53
4 824.000	37.77	Average	V	33.45	11.81	44.66	0.05	38.42	54.00	15.58
Test Data for Middle Channel										
4 874.000	49.70	Peak	H	33.45	11.93	44.67	-	50.41	74.00	23.59
4 874.000	37.75	Average	H	33.45	11.93	44.67	0.05	38.51	54.00	15.49
4 874.000	49.42	Peak	V	33.45	11.93	44.67	-	50.13	74.00	23.87
4 874.000	37.83	Average	V	33.45	11.93	44.67	0.05	38.59	54.00	15.41
Test Data for High Channel										
4 924.000	49.90	Peak	H	33.55	11.93	44.68	-	50.70	74.00	23.30
4 924.000	37.76	Average	H	33.55	11.93	44.68	0.05	38.61	54.00	15.39
4 924.000	50.52	Peak	V	33.53	11.93	44.68	-	51.30	74.00	22.70
4 924.000	37.81	Average	V	33.55	11.93	44.68	0.05	38.66	54.00	15.34

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

10. POWER SPECTRAL DENSITY

10.1 Operating environment

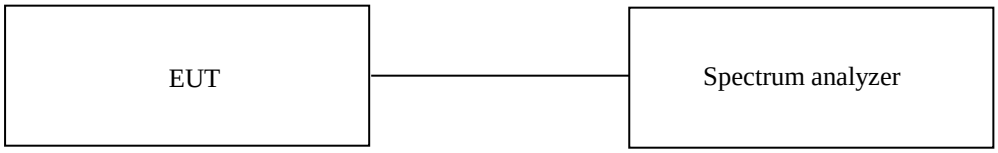
Temperature : 23 °C

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 kHz ≤ RBW ≤ 100 kHz , the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test Date

October 17, 2022 ~ October 31, 2022

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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	-25.06	0.01	-25.05	8.00	33.05
MIDDLE	2 437.00	-24.50	0.01	-24.49	8.00	32.49
HIGH(11)	2 462.00	-24.83	0.01	-24.82	8.00	32.82

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

10.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

-. Duty Cycle : 98.83 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm / 3 kHz)	MARGIN (dB)
LOW	2 412.00	-26.16	0.05	-26.11	8.00	34.11
MIDDLE	2 437.00	-25.75	0.05	-25.70	8.00	33.70
HIGH(11)	2 462.00	-26.00	0.05	-25.95	8.00	33.95

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

10.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Result : Pass

-. Duty Cycle : 98.75 %

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	Duty Factor(dB)	Total Value(dBm)	LIMIT (dBm / 3 kHz)	MARGIN (dB)
LOW	2 412.00	-26.30	0.05	-26.25	8.00	34.25
MIDDLE	2 437.00	-25.87	0.05	-25.82	8.00	33.82
HIGH(11)	2 462.00	-25.98	0.05	-25.93	8.00	33.93

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

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C

Relative humidity : 48 % R.H.

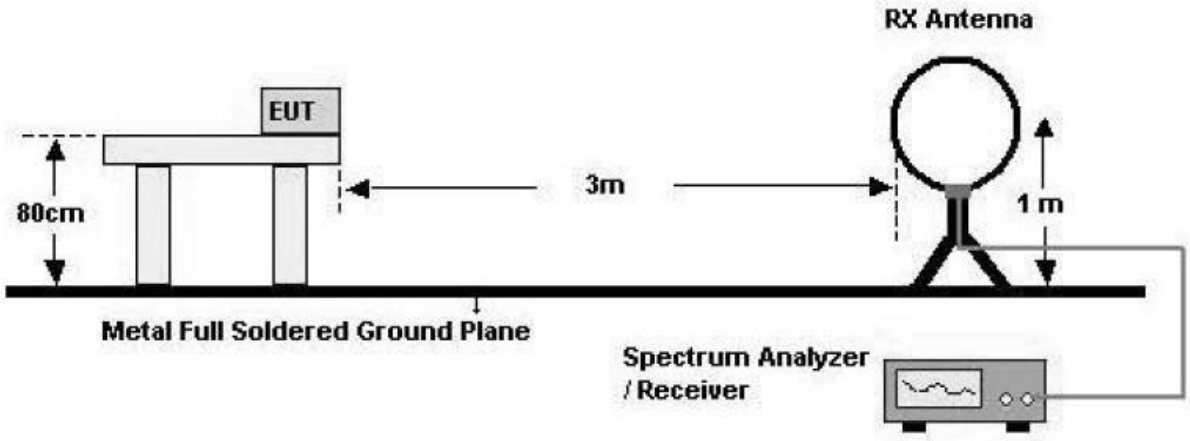
11.2 Test set-up

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.

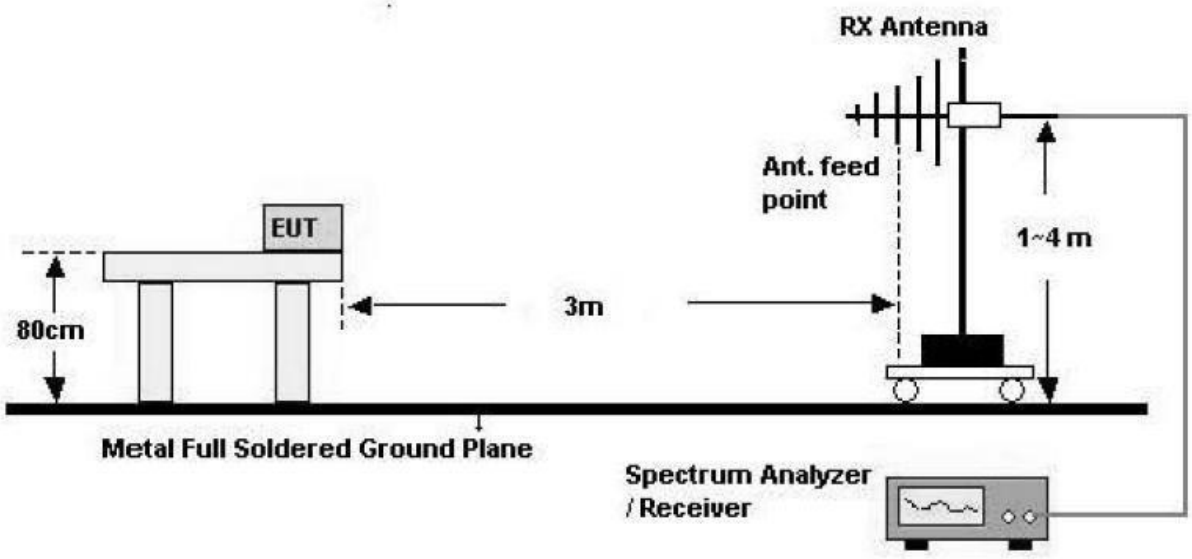
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal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

- Test Configuration

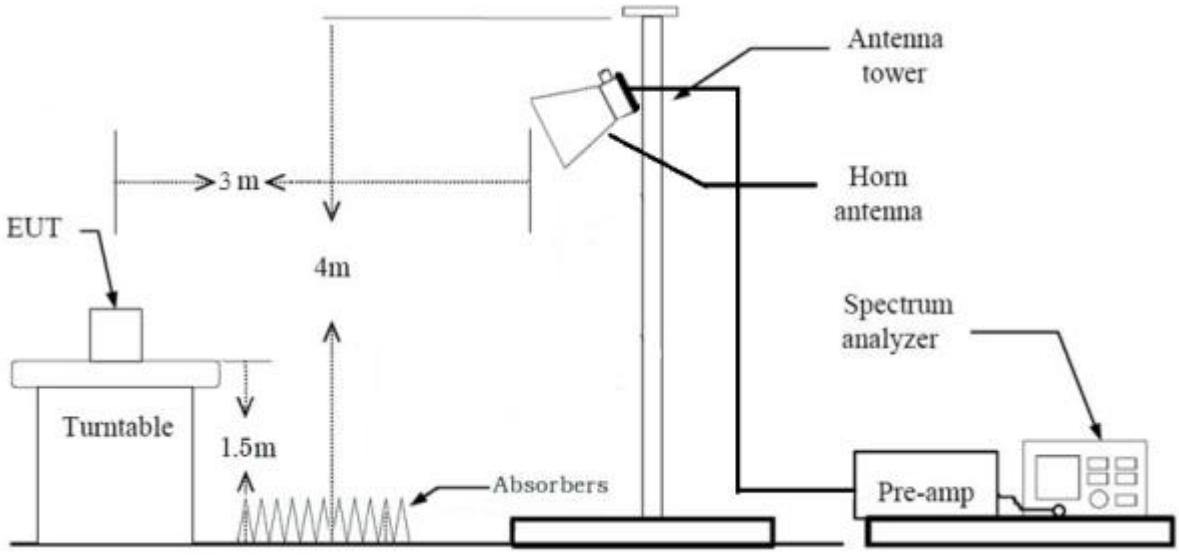
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



11.3 Test Date

October 17, 2022 ~ October 31, 2022

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

11.4 Test data for 30 MHz ~ 1 000 MHz

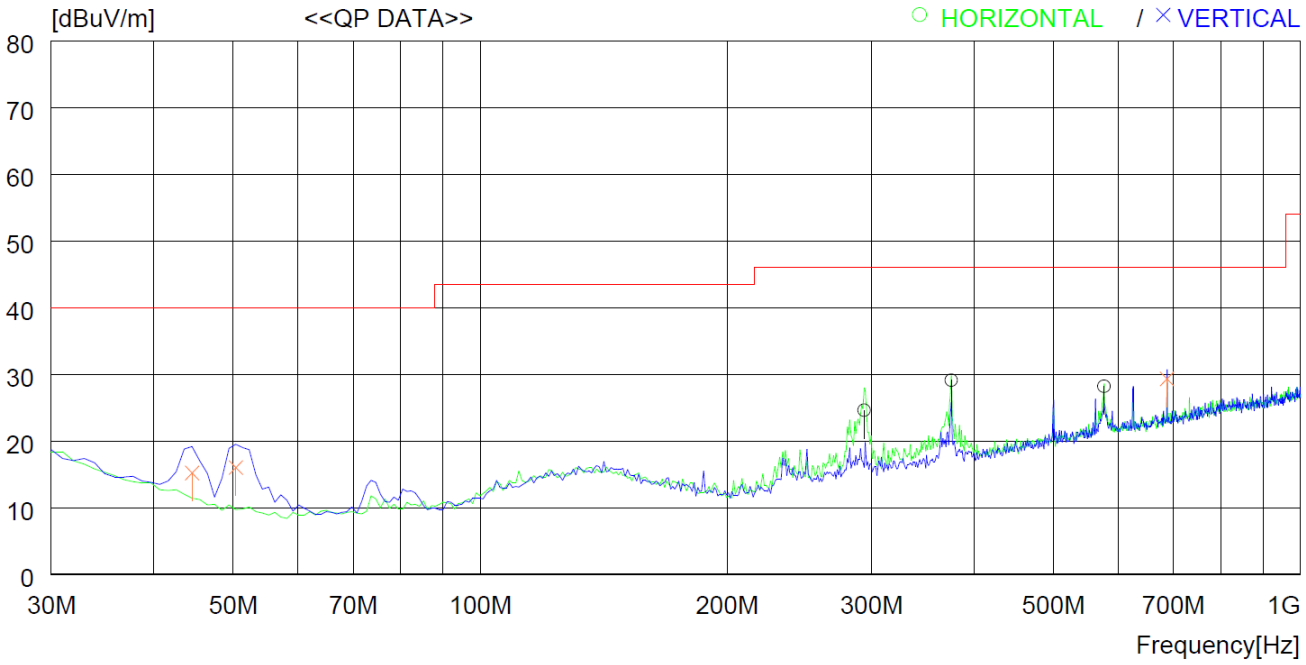
11.4.1 Test data for WLAN 2.4 GHz

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	293.840	35.6	19.0	2.2	32.2	24.6	46.0	21.4	100	359
2	375.320	38.5	20.3	2.5	32.2	29.1	46.0	16.9	100	9
3	576.109	33.6	23.9	3.1	32.4	28.2	46.0	17.8	200	118
----- Vertical ------										
4	44.550	31.4	15.0	0.8	32.0	15.2	40.0	24.8	100	68
5	50.370	34.2	12.9	0.9	32.0	16.0	40.0	24.0	100	0
6	687.655	33.1	25.2	3.4	32.4	29.3	46.0	16.7	100	0

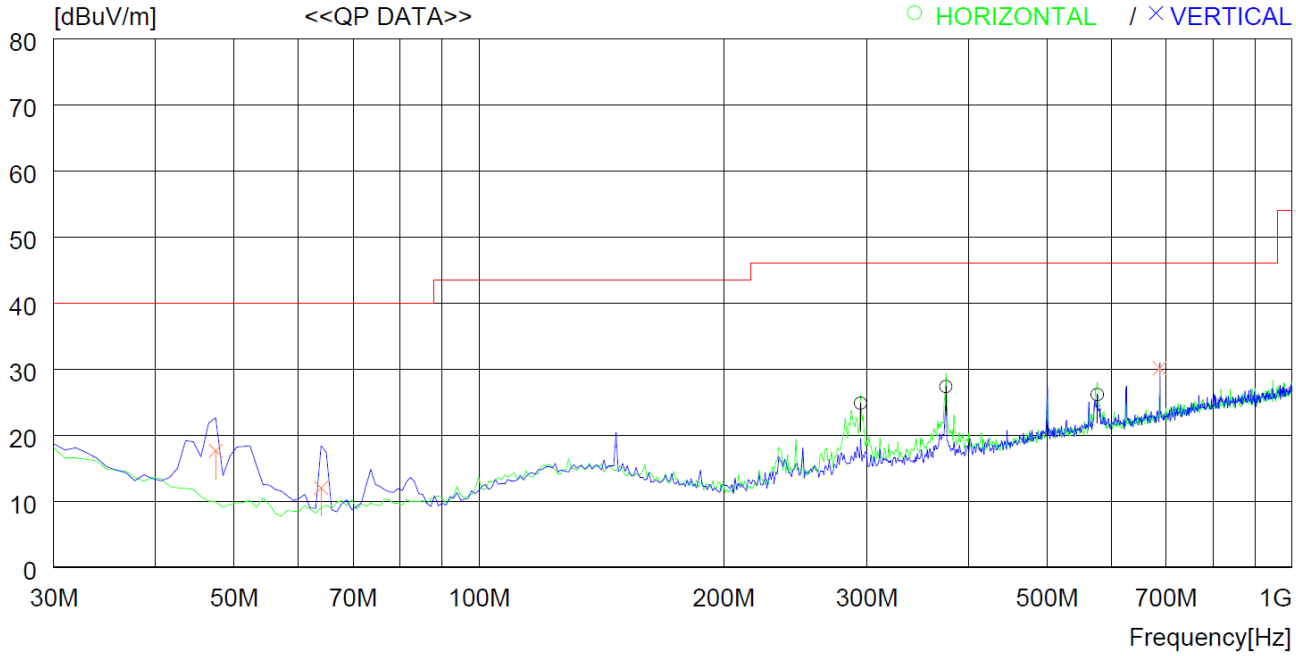
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m



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	294.810	35.8	19.0	2.2	32.2	24.8	46.0	21.2	100	0
2	375.320	36.7	20.3	2.5	32.2	27.3	46.0	18.7	100	0
3	576.109	31.5	23.9	3.1	32.4	26.1	46.0	19.9	200	137
----- Vertical ------										
4	47.460	34.8	13.9	0.9	32.0	17.6	40.0	22.4	200	0
5	63.950	30.5	12.5	1.0	32.0	12.0	40.0	28.0	200	0
6	687.655	33.9	25.2	3.4	32.4	30.1	46.0	15.9	100	359

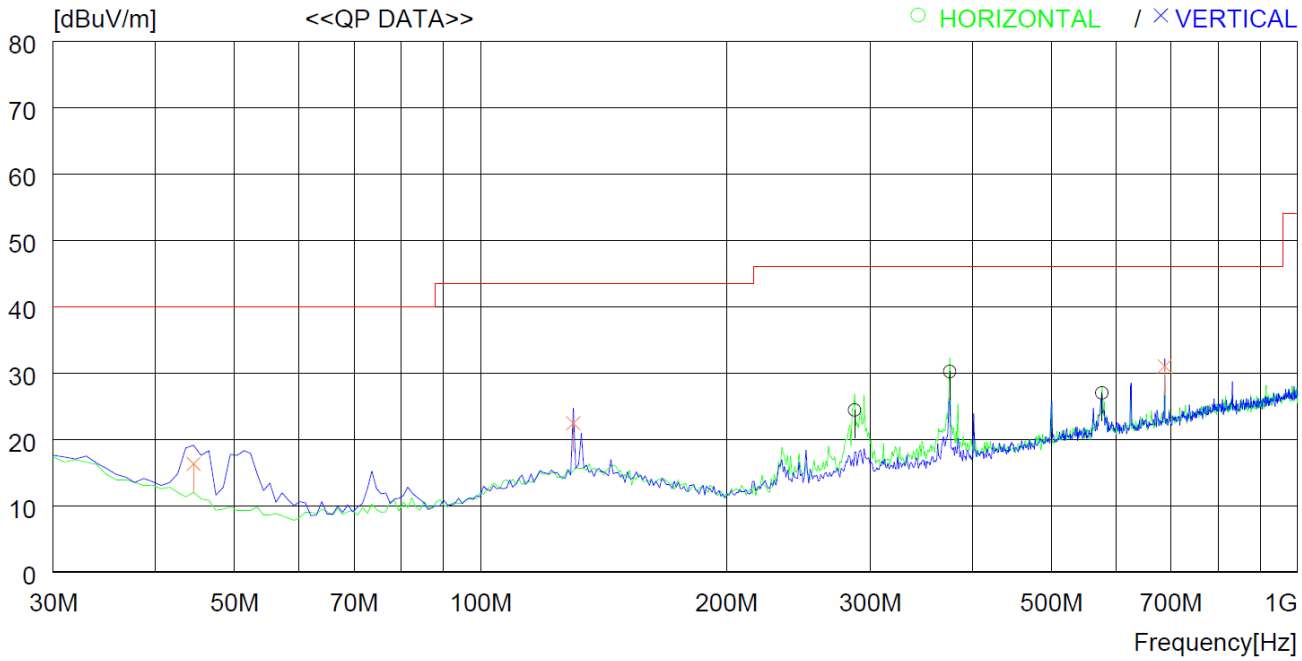
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m



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	287.050	35.6	18.8	2.2	32.2	24.4	46.0	21.6	200	359
2	375.320	39.6	20.3	2.5	32.2	30.2	46.0	15.8	100	0
3	576.109	32.4	23.9	3.1	32.4	27.0	46.0	19.0	200	359
----- Vertical ------										
4	44.550	32.5	15.0	0.8	32.0	16.3	40.0	23.7	100	359
5	129.910	34.2	18.9	1.4	32.1	22.4	43.5	21.1	100	49
6	687.655	34.8	25.2	3.4	32.4	31.0	46.0	15.0	100	359

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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.									

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

12. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSVA40	Rohde & Schwarz	Signal Analyzer	101586	Apr. 21, 2022 (1Y)
ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 07, 2022 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 13, 2022 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 12, 2022 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Jan. 18, 2022 (1Y)
WT-A3882-R10	Microwave	Cavity Band Rejection Filter	WT22040502-1	Jun. 21, 2022 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC POWER SUPPLY	5071069	Jan. 03, 2022 (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
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-1349	Jul. 08, 2022 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 21, 2022 (1Y)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)