

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-233-RWD-003

Reception No. : 2302000534

Applicant : Fitogether

Address : #302, 95 Hangang-daero, Yongsan-gu, Seoul, 04378, South Korea

Manufacturer : Fitogether

Address : #302, 95 Hangang-daero, Yongsan-gu, Seoul, 04378, South Korea

Type of Equipment : OHCOACH Real Time Wireless Communication System

FCC ID. : 2BAGE-FITOLIVEHUBP1

Model Name : LHP1-1A

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 29 pages (including this page)

Date of Incoming : February 23, 2023

Date of issue : March 06, 2023

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.

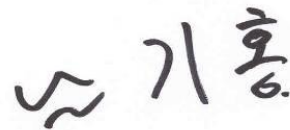
This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.



Tested by
Myeong-Hwa, Jang / Manager
ONETECH Corp.



Reviewed by
Tae-Ho, Kim / General Manager
ONETECH Corp.



Approved by
Ki-Hong, Nam / General Manager
ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	6
2. TEST SUMMARY	7
2.1 TEST ITEMS AND RESULTS	7
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	7
2.3 RELATED SUBMITTAL(S) / GRANT(S)	7
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	7
3. GENERAL INFORMATION.....	8
3.1 PRODUCT DESCRIPTION.....	8
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	8
4. EUT MODIFICATIONS.....	8
5. SYSTEM TEST CONFIGURATION	9
5.1 JUSTIFICATION.....	9
5.2 PERIPHERAL EQUIPMENT	9
5.3 MODE OF OPERATION DURING THE TEST	9
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 MEASUREMENT UNCERTAINTY	13
7.4 TEST DATE	13
7.5 TEST DATA FOR ANTENNA 0	14
7.6 TEST DATA FOR ANTENNA 1	14
7.7 TEST DATA FOR ANTENNA 2	14
8. MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER	15
8.1 OPERATING ENVIRONMENT	15
8.2 TEST SET-UP	15

8.3 MEASUREMENT UNCERTAINTY	15
8.4 TEST DATE	15
8.5 TEST DATA FOR ANTENNA 0	16
8.6 TEST DATA FOR ANTENNA 1	16
8.7 TEST DATA FOR ANTENNA 2	16
8.8 TEST DATA FOR MULTIPLE ANTENNA	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 MEASUREMENT UNCERTAINTY	17
9.5 TEST DATE	17
9.6 TEST DATA FOR CONDUCTED EMISSION	17
9.7 TEST DATA FOR RADIATED EMISSION.....	18
9.7.1 Radiated Emission which fall in the Restricted Band.....	18
9.7.2 Spurious & Harmonic Radiated Emission.....	19
10. POWER SPECTRAL DENSITY	20
10.1 OPERATING ENVIRONMENT	20
10.2 TEST SET-UP	20
10.3 MEASUREMENT UNCERTAINTY	20
10.4 TEST DATE	20
10.5 TEST DATA FOR ANTENNA 0	21
10.6 TEST DATA FOR ANTENNA 1	21
10.7 TEST DATA FOR ANTENNA 2	21
10.8 TEST DATA FOR MULTIPLE ANTENNA	21
11. RADIATED EMISSION TEST	22
11.1 OPERATING ENVIRONMENT	22
11.2 TEST SET-UP	22
11.3 MEASUREMENT UNCERTAINTY	23
11.4 TEST DATE	23
11.5 TEST DATA FOR 30 MHz ~ 1 000 MHz	24
11.6 TEST DATA FOR BELOW 30 MHz	25
11.7 TEST DATA FOR ABOVE 1 GHz	25
12. CONDUCTED EMISSION TEST	26
12.1 OPERATING ENVIRONMENT	26
12.2 TEST SET-UP	26

12.3 MEASUREMENT UNCERTAINTY	26
12.4 TEST DATE	26
12.4 TEST DATA	27
13. LIST OF TEST EQUIPMENT	29

※ Please refer to the Annex section for All test plots

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-233-RWD-003	March 06, 2023	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Fitotogether
 Address : #302, 95 Hangang-daero, Yongsan-gu, Seoul, 04378, South Korea
 Contact Person : Bobby, Shin / Senior Engineer
 Telephone No. : +82-10-6263-8930
 FCC ID : 2BAGE-FITOLIVEHUBP1
 Model Name : LHP1-1A
 Brand Name : -
 Serial Number : N/A
 Date : March 06, 2023

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	OHCOACH Real Time Wireless Communication System
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	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

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 Fittogether, Model LHP1-1A (referred to as the EUT in this report) is a OHCOACH Real Time Wireless Communication System. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	OHCOACH Real Time Wireless Communication System
OPERATING FREQUENCY	2 412 MHz ~ 2 462 MHz (802.11g)
MODULATION TYPE	OFDM Modulation (BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER	Antenna 0: 9.67 dBm Antenna 1: 9.18 dBm Antenna 2: 8.54 dBm Multiple Antenna: 13.90 dBm
ANTENNA TYPE	Antenna 0: Patch Antenna Antenna 1: Patch Antenna Antenna 2: Dipole Antenna
ANTENNA GAIN	Antenna 0: 9.13 dBi Antenna 1: 9.13 dBi Antenna 2: 4.29 dBi Multiple Antenna: 12.80 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	25 MHz, 40 MHz
RATED SUPPLY VOLTAGE	DC 7.40 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
LHP1-1A	Fittogether	OHCOACH Real Time Wireless Communication System (EUT)	-
Ideapad L340	Lenovo	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 (Antenna 0)

Band	TEST Mode	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
WLAN 2.4 GHz	802.11 g	6	2.064	2.170	95.10	0.22
		9	1.384	1.490	92.87	0.32
		12	1.044	1.150	90.76	0.42
		18	0.704	0.810	86.89	0.61
		24	0.532	0.638	83.36	0.79
		36	0.364	0.470	77.41	1.11
		48	0.276	0.382	72.28	1.41
		54	0.248	0.354	70.08	1.54

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

Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

-. Duty Cycle (Antenna 1)

Band	TEST Mode	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
WLAN 2.4 GHz	802.11 g	6	2.064	2.170	95.10	0.22
		9	1.384	1.490	92.87	0.32
		12	1.044	1.150	90.76	0.42
		18	0.704	0.810	86.89	0.61
		24	0.532	0.638	83.40	0.79
		36	0.364	0.470	77.41	1.11
		48	0.276	0.382	72.20	1.41
		54	0.248	0.354	69.99	1.55

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

Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

-. Duty Cycle (Antenna 2)

Band	TEST Mode	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
WLAN 2.4 GHz	802.11 g	6	2.064	2.170	95.12	0.22
		9	1.384	1.490	92.87	0.32
		12	1.044	1.150	90.76	0.42
		18	0.704	0.810	86.92	0.61
		24	0.532	0.638	83.40	0.79
		36	0.364	0.470	77.41	1.11
		48	0.276	0.382	72.20	1.41
		54	0.248	0.354	69.99	1.55

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

Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

-. Data Rate applied to all test items

A data rate of 6 Mbps is applied.

5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to adaptor and the power of adaptor was connected to LISN. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

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 Patch Antenna and Dipole 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)
Transmitting Mode	X

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. MINIMUM 6 dB BANDWIDTH

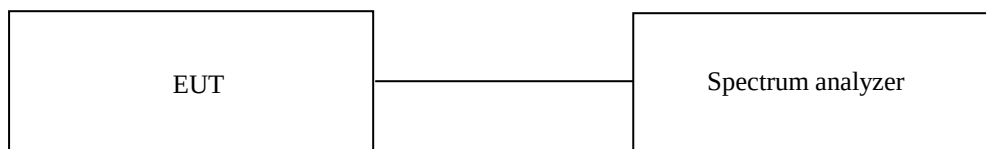
7.1 Operating environment

Temperature : 23 °C

Relative humidity : 49 % 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 Measurement uncertainty

The uncertainty for Minimum 6 dB bandwidth is $\pm 8\,623.60\text{ Hz}$

7.4 Test date

February 27, 2023 ~ March 03, 2023

7.5 Test data for Antenna 0

-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	16.33	0.50	15.83
Middle	2 437.00	16.33	0.50	15.88
High	2 462.00	16.38	0.50	15.83

Remark. Margin = Measured Value – Limit

7.6 Test data for Antenna 1

-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	16.38	0.50	15.88
Middle	2 437.00	16.38	0.50	15.83
High	2 462.00	16.38	0.50	15.83

Remark. Margin = Measured Value – Limit

7.7 Test data for Antenna 2

-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	16.38	0.50	15.88
Middle	2 437.00	16.38	0.50	15.83
High	2 462.00	16.38	0.50	15.88

Remark. Margin = Measured Value – Limit

8. MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER

8.1 Operating environment

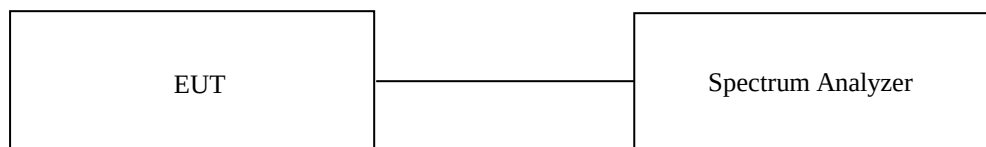
Temperature : 23 °C

Relative humidity : 49 % 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 Measurement uncertainty

The uncertainty for Maximum conducted(average) output power is ± 1.51 dBm

8.4 Test date

February 27, 2023 ~ March 03, 2023

8.5 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : 95.10 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm)	Margin (dB)
LOW	2 412.00	9.45	0.22	9.67	23.20	13.53
MIDDLE	2 437.00	9.42	0.22	9.64	23.20	13.56
HIGH	2 462.00	9.38	0.22	9.60	23.20	13.60

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

8.6 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : 95.10 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm)	Margin (dB)
LOW	2 412.00	8.85	0.22	9.07	23.20	14.13
MIDDLE	2 437.00	8.41	0.22	8.63	23.20	14.57
HIGH	2 462.00	8.96	0.22	9.18	23.20	14.02

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

8.7 Test data for Antenna 2

-. Test Result : Pass

-. Duty Cycle : 95.12 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm)	Margin (dB)
LOW	2 412.00	8.28	0.22	8.50	23.20	14.70
MIDDLE	2 437.00	8.19	0.22	8.41	23.20	14.79
HIGH	2 462.00	8.32	0.22	8.54	23.20	14.66

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

8.8 Test data for Multiple Antenna

-. Test Result : Pass

Channel	Frequency (MHz)	ANT0 + ANT1 + ANT2 Total Value (dBm)	Limit (dBm)	Margin (dB)
LOW	2 412.00	13.88	23.20	9.32
MIDDLE	2 437.00	13.70	23.20	9.50
HIGH	2 462.00	13.90	23.20	9.30

Remark. Margin = Limit – Total Value

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

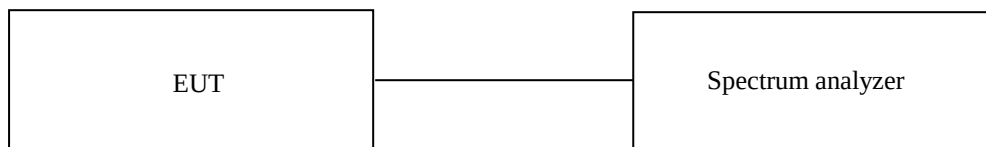
9.1 Operating environment

Temperature : 23 °C

Relative humidity : 49 % 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 Measurement uncertainty

The uncertainty for 100 kHz bandwidth outside the frequency band is ± 1.56 dBm

9.5 Test date

February 27, 2023 ~ March 03, 2023

9.6 Test data for conducted emission

Please refer to the Annex

9.7 Test data for radiated emission

9.7.1 Radiated Emission which fall in the Restricted Band

9.7.1.1 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 : 95.10 %
- 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											
2 390.04	53.69	Peak	H	27.54	6.92	44.94	9.95	-	53.16	74.00	20.84
2 390.04	41.73	Average	H	27.54	6.92	44.94	9.95	0.22	41.42	54.00	12.58
2 362.63	53.86	Peak	V	27.38	6.66	44.95	9.95	-	52.90	74.00	21.10
2 390.04	41.43	Average	V	27.54	6.92	44.94	9.95	0.22	41.12	54.00	12.88
Test Data for High Channel											
2 484.23	58.16	Peak	H	27.56	6.94	44.91	9.95	-	57.70	74.00	16.30
2 484.38	43.21	Average	H	27.56	6.94	44.91	9.95	0.22	42.97	54.00	11.03
2 483.96	58.39	Peak	V	27.56	6.94	44.91	9.95	-	57.93	74.00	16.07
2 483.73	42.29	Average	V	27.57	6.94	44.91	9.95	0.22	42.06	54.00	11.94

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

9.7.2 Spurious & Harmonic Radiated Emission

9.7.2.1 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 : 95.10 %
- 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										
4 822.90	53.89	Peak	H	31.30	11.15	44.66	-	51.68	74.00	22.32
4 823.45	41.84	Average	H	31.30	11.15	44.66	0.22	39.85	54.00	14.15
4 822.60	52.59	Peak	V	31.30	11.15	44.66	-	50.38	74.00	23.62
4 822.80	40.08	Average	V	31.30	11.15	44.66	0.22	38.09	54.00	15.91
Test Data for Middle Channel										
4 877.05	51.15	Peak	H	31.30	11.15	44.68	-	48.92	74.00	25.08
4 877.35	39.14	Average	H	31.30	11.15	44.68	0.22	37.13	54.00	16.87
4 876.90	50.78	Peak	V	31.30	11.15	44.68	-	48.55	74.00	25.45
4 877.60	39.05	Average	V	31.30	11.15	44.68	0.22	37.04	54.00	16.96
Test Data for High Channel										
4 924.35	50.89	Peak	H	31.30	11.15	44.68	-	48.66	74.00	25.34
4 923.85	39.55	Average	H	31.30	11.15	44.68	0.22	37.54	54.00	16.46
4 923.00	50.37	Peak	V	31.30	11.15	44.68	-	48.14	74.00	25.86
4 922.85	38.51	Average	V	31.30	11.15	44.68	0.22	36.50	54.00	17.50

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

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

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

10. POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature : 23 °C

Relative humidity : 49 % 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 Measurement uncertainty

The uncertainty for Power spectral density is $\pm 1.51 \text{ dB}$

10.4 Test date

February 27, 2023 ~ March 03, 2023

10.5 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : 95.10 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm / 3 kHz)	Margin (dB)
LOW	2 412.00	-25.12	0.22	-24.90	1.20	26.10
MIDDLE	2 437.00	-25.14	0.22	-24.92	1.20	26.12
HIGH	2 462.00	-25.27	0.22	-25.05	1.20	26.25

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

10.6 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : 95.10 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm / 3 kHz)	Margin (dB)
LOW	2 412.00	-25.87	0.22	-25.65	1.20	26.85
MIDDLE	2 437.00	-25.66	0.22	-25.44	1.20	26.64
HIGH	2 462.00	-25.40	0.22	-25.18	1.20	26.38

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

10.7 Test data for Antenna 2

-. Test Result : Pass

-. Duty Cycle : 95.12 %

Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor(dB)	Total Value(dBm)	Limit (dBm / 3 kHz)	Margin (dB)
LOW	2 412.00	-26.34	0.22	-26.12	1.20	27.32
MIDDLE	2 437.00	-26.30	0.22	-26.08	1.20	27.28
HIGH	2 462.00	-26.22	0.22	-26.00	1.20	27.20

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

10.8 Test data for Multiple Antenna

-. Test Result : Pass

Channel	Frequency (MHz)	ANT0 + ANT1 + ANT2 Total Value (dBm)	Limit (dBm)	Margin (dB)
LOW	2 412.00	-20.76	1.20	21.96
MIDDLE	2 437.00	-20.68	1.20	21.88
HIGH	2 462.00	-20.62	1.20	21.82

Remark. Margin = Limit – Total Value

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C

Relative humidity : 49 % R.H.

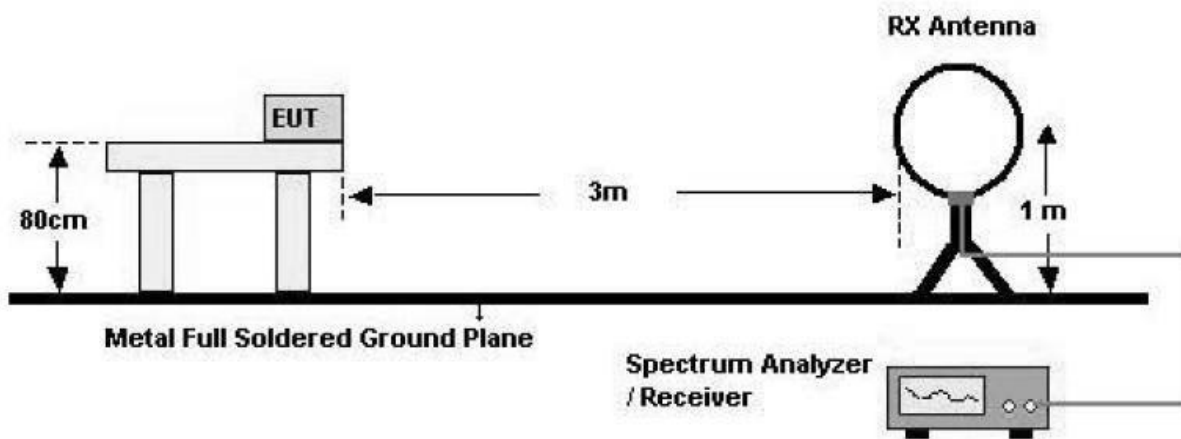
11.2 Test set-up

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.

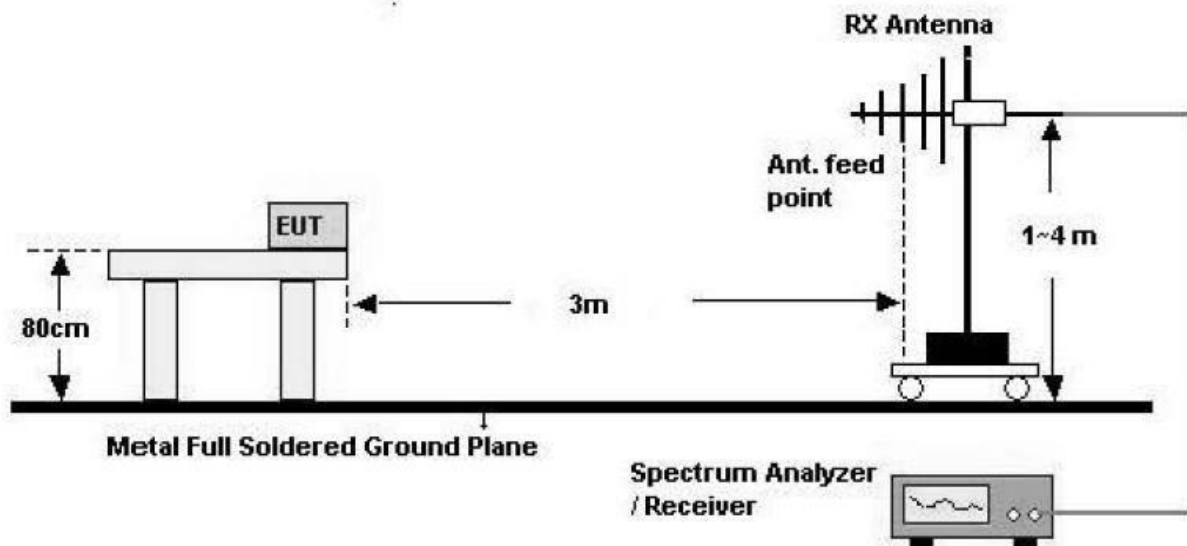
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal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

- Test Configuration

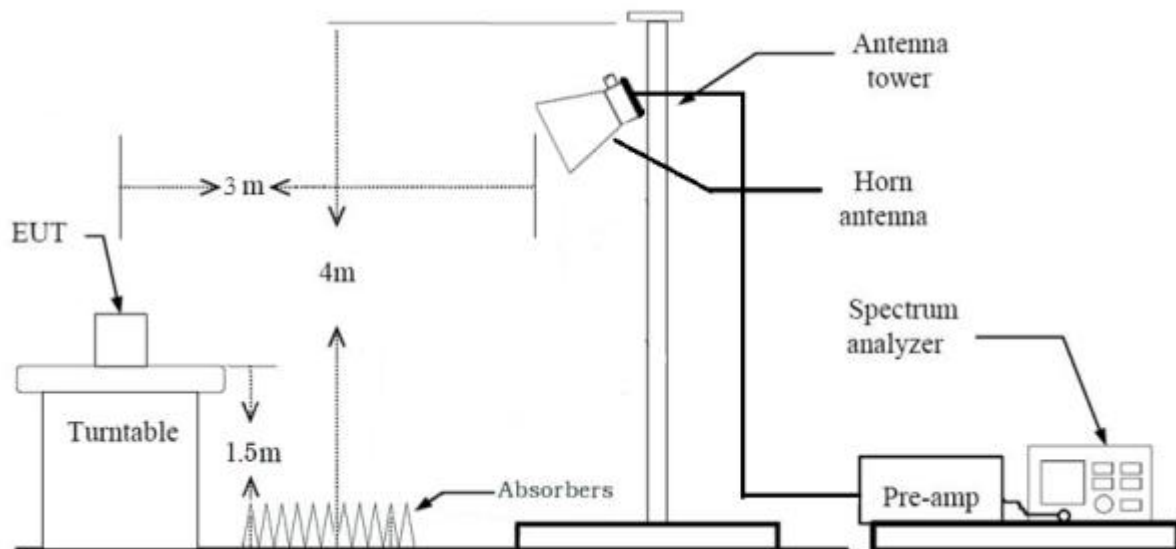
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



11.3 Measurement uncertainty

The uncertainty for Radiated emission test is ± 3.83 dB below 30 MHz

The uncertainty for Radiated emission test is ± 3.71 dB in 30 MHz ~ 1GHz

The uncertainty for Radiated emission test is ± 4.86 dB above 1 GHz

11.4 Test date

February 27, 2023 ~ March 03, 2023

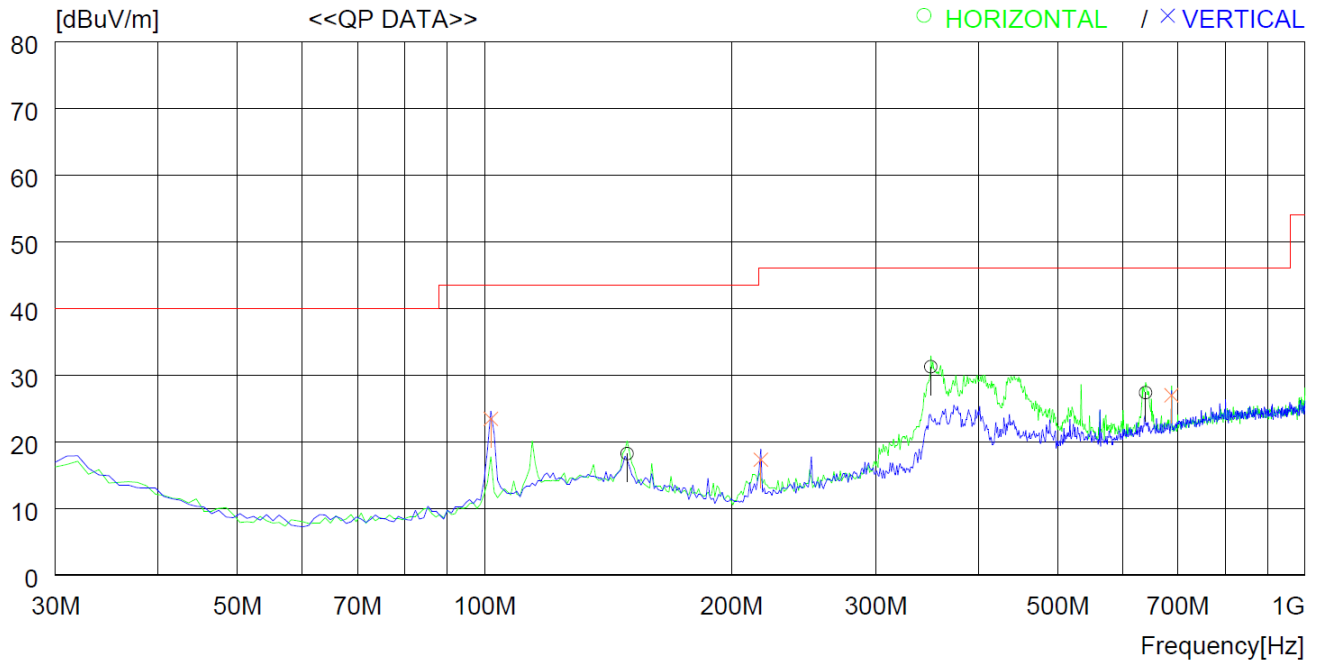
11.5 Test data for 30 MHz ~ 1 000 MHz

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

Result : PASSED

EUT : OHCOACH Real Time Wireless Communication System

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



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	149.310	30.1	18.5	1.6	32.0	18.2	43.5	25.3	400	0
2	350.100	40.9	19.9	2.4	32.0	31.2	46.0	14.8	100	98
3	639.157	31.6	24.6	3.3	32.2	27.3	46.0	18.7	200	0
----- Vertical -----										
4	101.780	38.5	15.6	1.3	32.0	23.4	43.5	20.1	100	0
5	217.210	31.2	16.2	1.9	32.0	17.3	46.0	28.7	400	359
6	687.655	30.7	25.2	3.4	32.3	27.0	46.0	19.0	200	359

11.6 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.									

11.7 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. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 °C

Relative humidity : 49 % R.H.

12.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

12.3 Measurement uncertainty

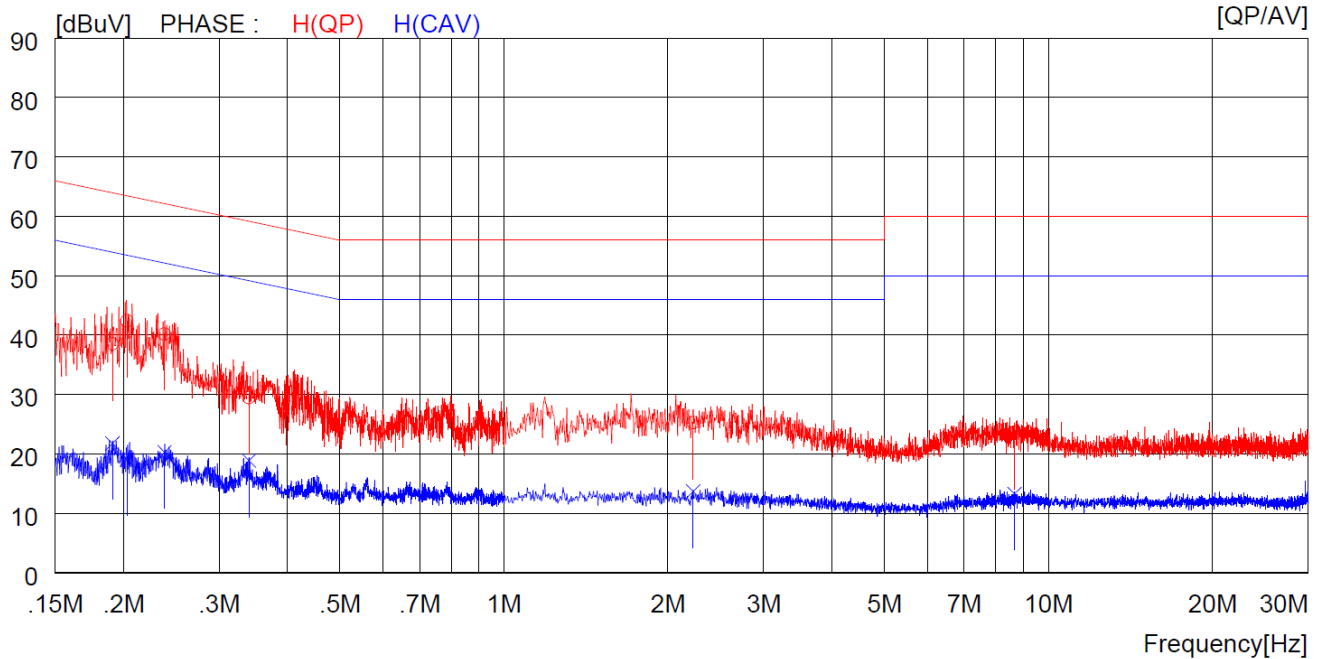
The uncertainty for Conducted emission test is ± 1.6 dB

12.4 Test date

February 27, 2023 ~ March 03, 2023

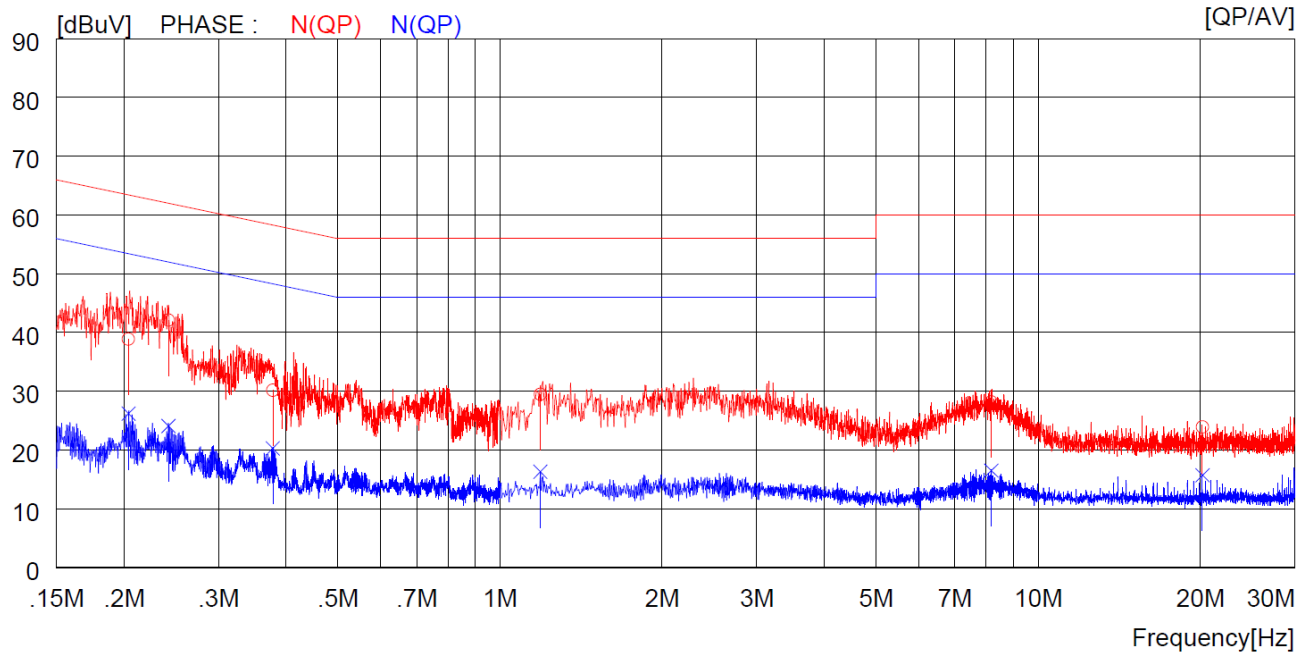
12.4 Test data

- . Resolution bandwidth : 9 kHz
- . Frequency range : 0.15 MHz ~ 30 MHz
- . Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19100	28.5	----	10.0	38.5	----	64.0	----	25.5	----	H (QP)
2	0.20300	32.4	----	10.0	42.4	----	63.5	----	21.1	----	H (QP)
3	0.23800	30.1	----	10.1	40.2	----	62.2	----	22.0	----	H (QP)
4	0.34000	19.4	----	10.1	29.5	----	59.2	----	29.7	----	H (QP)
5	2.22400	15.0	----	10.3	25.3	----	56.0	----	30.7	----	H (QP)
6	8.66500	13.2	----	10.4	23.6	----	60.0	----	36.4	----	H (QP)
7	0.19100	----	11.8	10.0	----	21.8	----	54.0	----	32.2	H (CAV)
8	0.20300	----	9.1	10.0	----	19.1	----	53.5	----	34.4	H (CAV)
9	0.23800	----	10.2	10.1	----	20.3	----	52.2	----	31.9	H (CAV)
10	0.34000	----	8.8	10.1	----	18.9	----	49.2	----	30.3	H (CAV)
11	2.22400	----	3.4	10.3	----	13.7	----	46.0	----	32.3	H (CAV)
12	8.66500	----	2.9	10.4	----	13.3	----	50.0	----	36.7	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.20400	28.9	----	10.0	38.9	----	63.4	----	24.5	----	N (QP)
2	0.24200	32.0	----	10.1	42.1	----	62.0	----	19.9	----	N (QP)
3	0.37800	20.1	----	10.1	30.2	----	58.3	----	28.1	----	N (QP)
4	1.18800	19.2	----	10.3	29.5	----	56.0	----	26.5	----	N (QP)
5	8.18500	17.8	----	10.4	28.2	----	60.0	----	31.8	----	N (QP)
6	20.20000	13.2	----	10.7	23.9	----	60.0	----	36.1	----	N (QP)
7	0.20400	----	16.2	10.0	----	26.2	----	53.4	----	27.2	N (CAV)
8	0.24200	----	14.0	10.1	----	24.1	----	52.0	----	27.9	N (CAV)
9	0.37800	----	10.2	10.1	----	20.3	----	48.3	----	28.0	N (CAV)
10	1.18800	----	6.0	10.3	----	16.3	----	46.0	----	29.7	N (CAV)
11	8.18500	----	6.1	10.4	----	16.5	----	50.0	----	33.5	N (CAV)
12	20.20000	----	5.0	10.7	----	15.7	----	50.0	----	34.3	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

13. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSVA40	Rohde & Schwarz	Signal Analyzer	101593	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, 2023 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 03, 2022 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter (1-3 GHz)	N/A	Jan. 17, 2023 (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-1349	Jul. 08, 2022 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 25, 2023 (1Y)
ESR 3	Rohde & Schwarz	EMI Test Receiver	102602	Mar. 14, 2022 (1Y)
ESH3Z2	Rohde & Schwarz	Pulse Limiter	357.8810.52	Mar. 14, 2022 (1Y)
NSLK8126	Schwarzbeck	LISN	8126404	Aug. 09, 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