

TEST REPORT

EMC Test for LCWB-007

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-EM-2406-FC001

DATE OF ISSUE
June 11, 2024

Tested by
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Accredited by KOLAS, Republic of KOREA

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TEST REPORT

FCC SDoC

REPORT NO.

HCT-EM-2406-FC001

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FCC ID.

BEJ-LCWB007

Applicant

LG Electronics Inc.

170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si,
Gyeongsangnam-do, 51533, Republic of Korea

Product Name
Model Name

RF Module
LCWB-007

Date of Test

05.30.2024-05.31.2024

Location of Test

Permanent Testing Lab On Site Testing Lab
(Address: See clause 1.2)

Test Standard Used

FCC CFR 47 PART 15 Subpart B Class B
ANSI C63.4-2014

Test Results

Refer to the present document

Manufacturer
Brand Name

LG Electronics Inc.
LG

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	June 11, 2024	Initial Release

Notice

Content

The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.

The test results have only been applied with the test methods required by the standard(s).

The laboratory is not accredited for the test results marked *.

Information provided by the applicant is marked **.

Test results provided by external providers are marked ***.

When confirmation of authenticity of this test report is required, please contact www.hct.co.kr

This test report provides test result(s) under the scope accredited by the Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.

(KOLAS (KS Q ISO/IEC 17025) Accreditation No. KT197)

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1. TESTING LABORATORY

1.1 General Information

Organization Name	HCT Co., Ltd.
Address	2-6, 73, 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383. Rep. of Korea
Telephone	+82 31 645 6300
FAX	+82 31 645 6401

1.2 Location of the Test Site

The test site is located at the following address.;

Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383. Rep. of Korea
Telephone	031-645-6300
FAX	031-645-6401

2. GENERAL INFORMATION

2.1 Description of EUT

FCC ID	BEJ-LCWB007
Model Name	LCWB-007
Product Name	RF Module
Frequency Range	WiFi 2.4 GHz: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Power Rating	DC 5 V, DC 12 V
Manufacturer	LG Electronics Inc.

2.2 Power Source

During the test, the following power supply levels are utilized/provided.;

Power supply: DC 5 V, DC 12 V

2.3 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Serial Number	Manufacturer
RF Module	LCWB-007	-	LG Electronics Inc.
JigBoard	-	-	LG Electronics Inc.
DC Power Supply	PWS-3003D	04050810	Protek

2.4 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	7 pin	N	N	(P,D) 0.3
DC Power Supply	AC IN	N	N	(P) 1.8

“(D)” data cable and “(P)” power cable.

2.5 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	7 pin	N	N/A	N	N/A
DC Power Supply	AC IN	N	N/A	N	N/A

2.6 Test Facility

Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014 and ANSI C63.4a-2017

Our laboratories are accredited and designated in accordance with the provisions of Radio Waves ACT and International Standard ISO/IEC 17025:2017. (National Radio Research Agency, CABID No. KR0032)

2.7 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5:2017.

2.8 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the UCISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Test Item	Test Site (Chamber)	Expanded Uncertainty
Radiated Emission (30 MHz to 1 GHz)	3 m Semi Anechoic Chamber #1	5.8 dB
Radiated Emission (1 GHz to 18 GHz)	3 m Semi Anechoic Chamber #1	4.8 dB

3. DESCRIPTION OF TEST

3.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).

If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).

Other support units were connected to the power mains through another LISN.

The two LISNs provide $50 \Omega / 50 \mu\text{H}$ of coupling impedance for the measuring instrument.

b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.

c. The frequency ranges from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dB μV)	Average (dB μV)	Quasi-Peak (dB μV)	Average (dB μV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

3.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. (1 GHz to 40 GHz)

Radiated Emission Limits

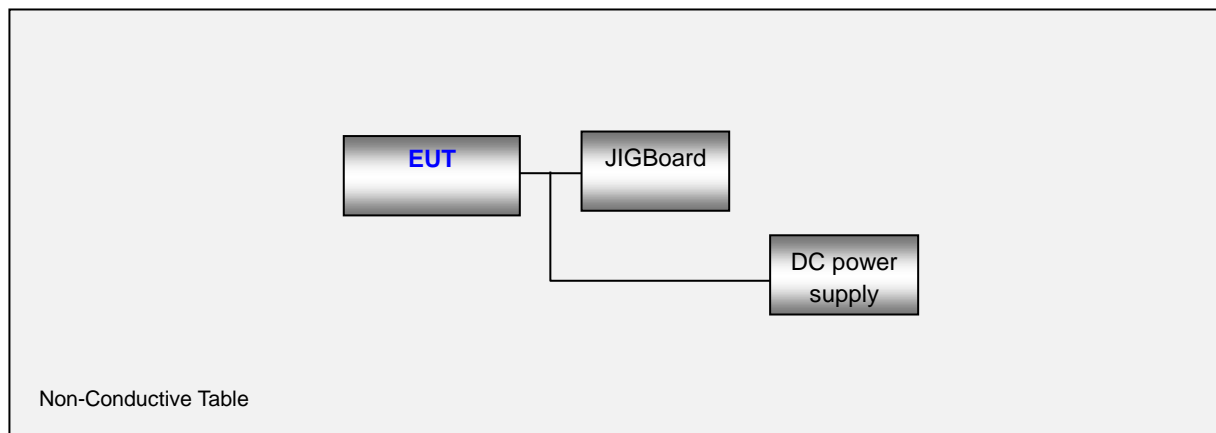
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)	
Above 1 000	3	80	60	74	54	

Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

3.3 Configuration of Tested System



4. OPERATION OF THE EUT

During preliminary test and final tests, the following operating mode was investigated.
It was tested the following operating mode, after connecting all peripheral devices.

Operating Mode: [Input Voltage: 5 VDC] IDLE Mode
[Input Voltage: 12 VDC] IDLE Mode

5. MEASURING INSTRUMENTS

Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Next Calibration Date
Conducted emission					
<input type="checkbox"/>	LISN	ENV4200	Rohde & Schwarz	100054	1 year 01.09.2025
<input type="checkbox"/>	LISN	ENV216	Rohde & Schwarz	102246	1 year 11.20.2024
<input type="checkbox"/>	LISN	ENV216	Rohde & Schwarz	100073	1 year 05.07.2025
<input type="checkbox"/>	Software	EMC32	Rohde & Schwarz	-	-
Radiated emission below 1 GHz					
<input checked="" type="checkbox"/>	EMI Test Receiver	ESU40	Rohde & Schwarz	100524	1 year 05.07.2025
<input checked="" type="checkbox"/>	Bilog Antenna	VULB9168	Schwarzbeck	255	2 year 03.10.2025
<input checked="" type="checkbox"/>	Antenna master	MA4640-XP-ET	INNCO SYSTEM	-	N/A -
<input checked="" type="checkbox"/>	Turn Table	1060	INNCO SYSTEM	-	N/A -
<input checked="" type="checkbox"/>	DC Power Supply	PWS-3003D	Protek	04050810	1 year 11.10.2024
<input checked="" type="checkbox"/>	Software	EMC32	Rohde & Schwarz	-	-
Radiated emission above 1 GHz					
<input checked="" type="checkbox"/>	EMI test receiver	ESU40	Rohde & Schwarz	100524	1 year 05.07.2025
<input checked="" type="checkbox"/>	Horn Antenna	HF907	Rohde & Schwarz	103160	1 year 10.16.2024
<input checked="" type="checkbox"/>	Power Amplifier	TK-PA18H	TESTEK	170034-L	1 year 11.01.2024
<input type="checkbox"/>	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA 9170 #786	1 year 11.01.2024
<input type="checkbox"/>	Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year 02.20.2025
<input checked="" type="checkbox"/>	Antenna master	MA4640-XP-ET	INNCO SYSTEM	-	N/A -
<input checked="" type="checkbox"/>	Turn Table	1060	INNCO SYSTEM	-	N/A -
<input checked="" type="checkbox"/>	DC Power Supply	PWS-3003D	Protek	04050810	1 year 11.10.2024
<input checked="" type="checkbox"/>	Software	EMC32	Rohde & Schwarz	-	-

6. EMISSION TEST SUMMARY

6.1 Conducted Emission (Not Applicable)

6.1.1 Operating Condition

The test results of conducted emission at mains ports provide the following information:

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	0.15 MHz to 30 MHz
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Test Site	EMI Shield Room
Temperature	min. - °C, max. - °C
Relative Humidity	min. - %, max. - %
Test Date	---

A Conducted emission is calculated by the following equation:

$$\begin{aligned} \text{Calculation Formula: } & \text{QuasiPeak or CAverage} = \text{Receiver Reading} + \text{Corr.} \\ & \text{Corr.} = \text{LISN Factor} + \text{Cable Loss} \\ & \text{Margin} = \text{Limit} - \text{QuasiPeak or CAverage} \end{aligned}$$

Two graphs measurement for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

REMARK.

Since the module is supplied with DC power, the test is not applicable.

6.1.2 Measurement Data

Not applicable

6.2 Radiated Emission Below 1 GHz

6.2.1 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	30 MHz to 1 000 MHz
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Antenna Height	1 m to 4 m
Antenna Polarity	Horizontal, Vertical
Operating Mode	[Input Voltage: 5 VDC] IDLE Mode [Input Voltage: 12 VDC] IDLE Mode
Test Site	3 m Semi Anechoic Chamber #1
Temperature	min. 24.1 °C, max. 25.9 °C
Relative Humidity	min. 35.7 %, max. 42.5 %
Test Date	05.30.2024

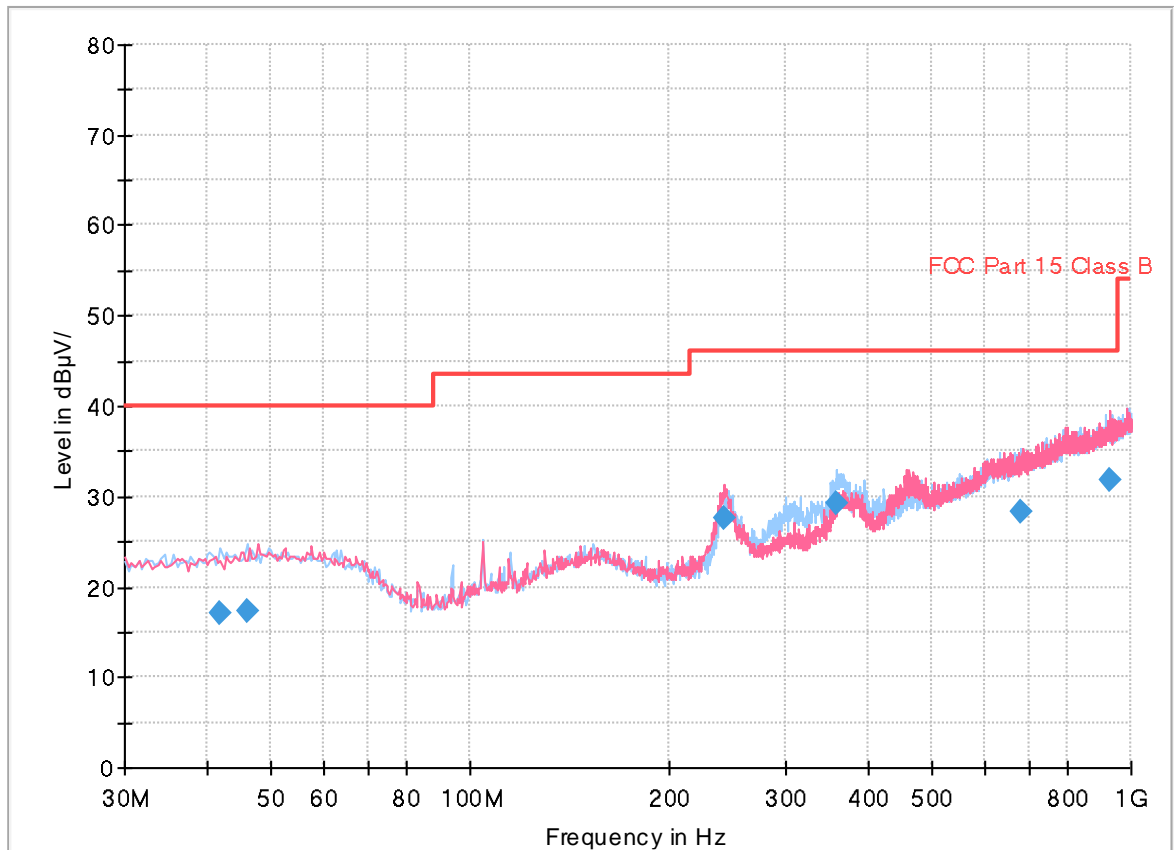
A field strength is calculated by the following equation.

$$\begin{aligned} \text{Calculation Formula: } \quad & \text{QuasiPeak} = \text{Reading (Receiver Reading)} + \text{Corr.} \\ & \text{Corr. (Correction Factor)} = \text{Antenna Factor} + \text{Cable Loss} \\ & \text{Margin} = \text{Limit} - \text{QuasiPeak} \end{aligned}$$

5.2.2 Measurement Data

[Input Voltage: 5 VDC] IDLE Mode

Full Spectrum

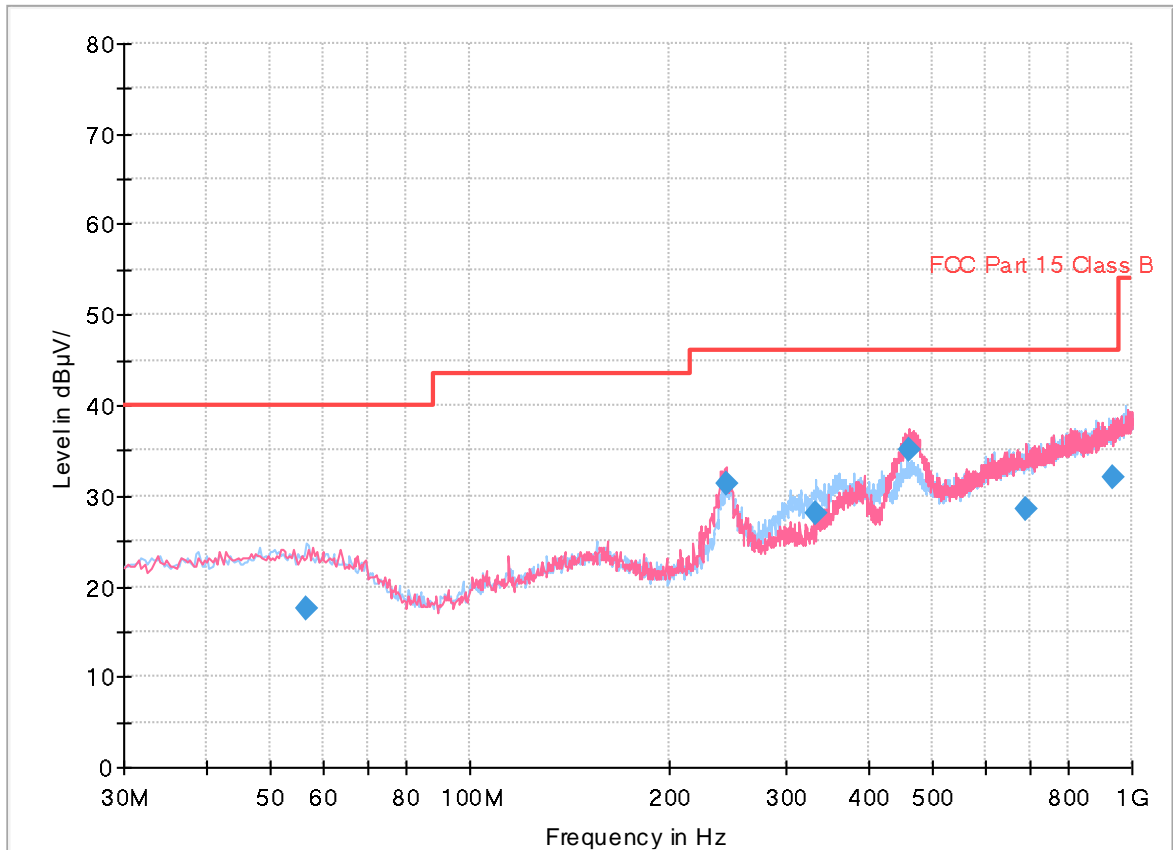


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.8889	17.05	40.00	22.95	225.1	H	1.0	19.7
46.0128	17.35	40.00	22.65	185.7	H	7.0	20.1
241.8603	27.66	46.00	18.34	100.0	V	224.0	18.8
358.6725	29.22	46.00	16.78	100.0	H	318.0	22.1
680.2952	28.37	46.00	17.63	307.7	H	183.0	28.6
927.2263	31.92	46.00	14.08	125.0	V	6.0	31.8

[Input Voltage: 12 VDC] IDLE Mode

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
56.4726	17.44	40.00	22.56	400.0	H	0.0	19.9
243.8085	31.42	46.00	14.58	100.0	V	227.0	18.8
333.6527	28.16	46.00	17.84	108.7	H	329.0	21.4
460.9362	35.02	46.00	10.98	125.2	V	0.0	24.5
689.9779	28.52	46.00	17.48	275.0	V	342.0	28.7
936.5303	32.04	46.00	13.96	109.8	V	0.0	32.0

6.3 Radiated Emission Above 1 GHz

6.3.1 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Peak, CISPR-Average
Bandwidth	1 MHz
Tested Frequency Range	1 GHz to 18 GHz
Antenna Height	1 m to 4 m
Antenna Polarity	Horizontal, Vertical
Operating Mode	[Input Voltage: 5 VDC] IDLE Mode [Input Voltage: 12 VDC] IDLE Mode
Test Site	3 m Semi Anechoic Chamber #1
Temperature	min. 23.6 °C, max. 25.7 °C
Relative Humidity	min. 34.8 %, max. 42.1 %
Test Date	05.31.2024

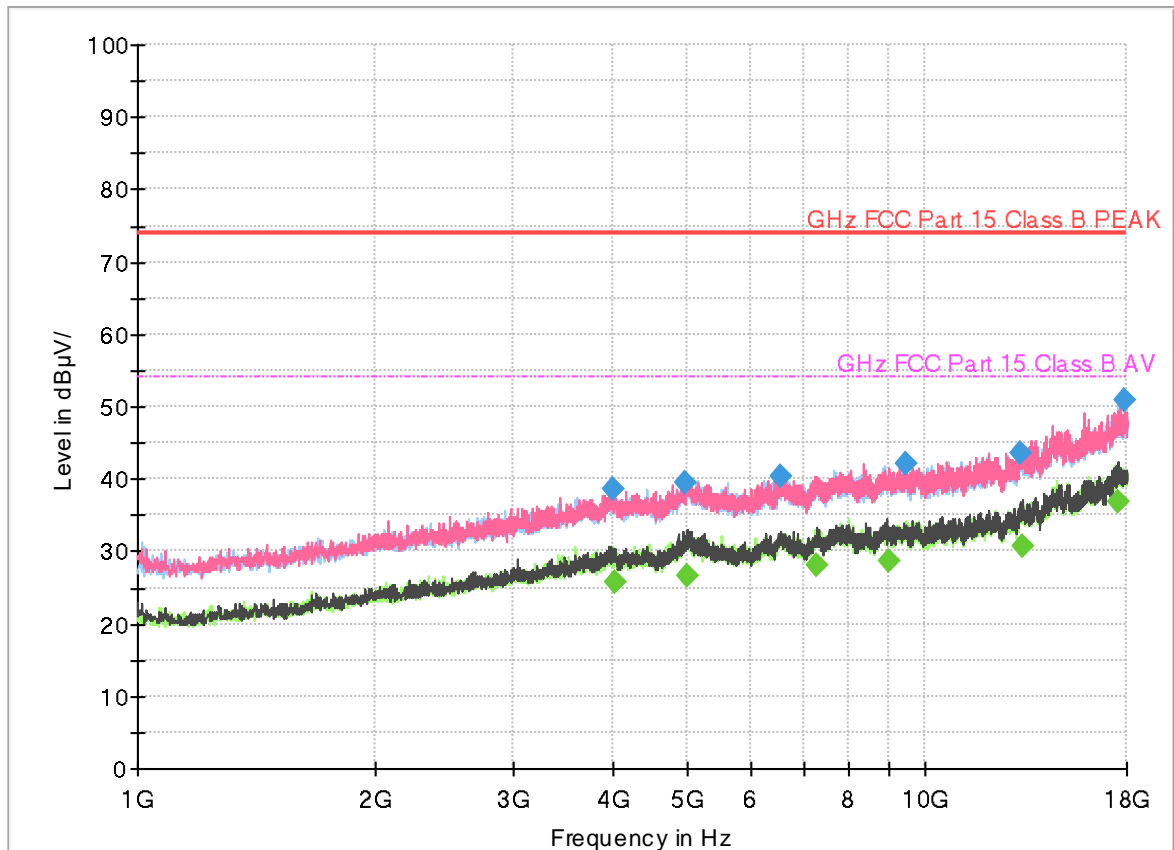
A field strength is calculated by the following equation.

Calculation Formula: $Peak\ or\ CAverage = Reading\ (Receiver\ Reading) + Corr.$
 $Corr.\ (Correction\ Factor) = Antenna\ Factor + Cable\ Loss - Amplifier\ Gain$
 $Margin = Limit - Peak\ or\ CAverage$

6.3.2 Measurement Data

[Input Voltage: 5 VDC] IDLE Mode

Full Spectrum

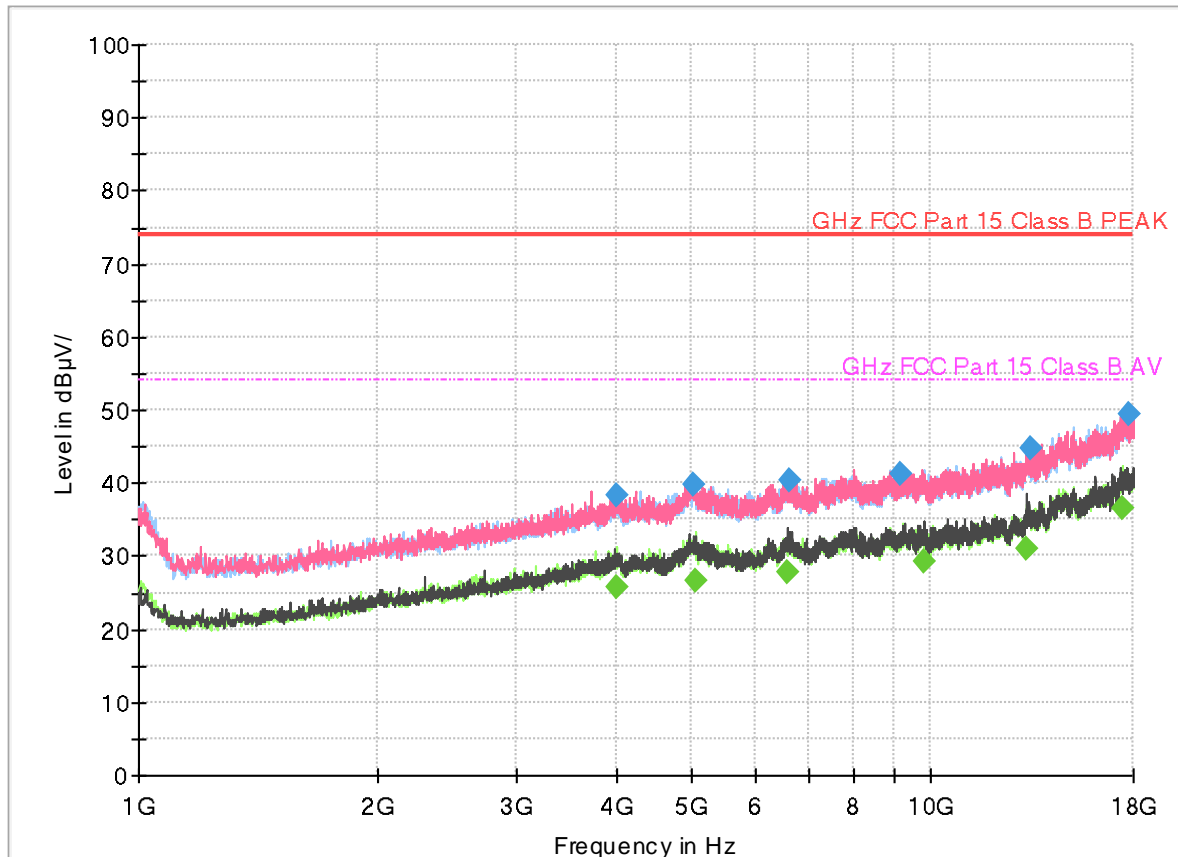


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4011.3300	38.57	74.00	35.43	124.9	V	307.0	-17.6
4946.7000	39.34	74.00	34.66	100.0	V	29.0	-15.1
6550.3050	40.28	74.00	33.72	125.2	V	331.0	-12.1
9459.5450	42.06	74.00	31.94	174.8	V	3.0	-9.2
13207.6000	43.67	74.00	30.33	321.8	H	217.0	-4.1
17890.3450	50.89	74.00	23.11	100.0	V	226.0	5.9

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4031.1250	25.77	54.00	28.23	306.8	H	287.0	-17.6
4972.2350	26.49	54.00	27.51	107.8	V	237.0	-15.0
7270.9650	28.20	54.00	25.80	107.7	V	100.0	-11.0
8960.6850	28.74	54.00	25.26	315.7	V	5.0	-9.7
13320.2150	30.81	54.00	23.19	125.2	V	0.0	-3.8
17565.1650	36.91	54.00	17.09	100.0	V	69.0	4.7

[Input Voltage: 12 VDC] IDLE Mode

Full Spectrum



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4018.2550	38.34	74.00	35.66	224.9	V	289.0	-17.6
5002.0050	39.64	74.00	34.36	215.6	H	114.0	-14.9
6615.6700	40.39	74.00	33.61	125.1	V	53.0	-12.0
9159.4800	41.33	74.00	32.67	325.1	V	41.0	-9.5
13330.8200	44.78	74.00	29.22	197.5	V	351.0	-3.8
17770.2350	49.48	74.00	24.52	110.7	V	41.0	5.5

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4023.5200	25.71	54.00	28.29	100.0	H	0.0	-17.6
5037.0300	26.59	54.00	27.41	125.1	H	0.0	-14.8
6583.6050	27.70	54.00	26.30	100.0	V	354.0	-12.1
9778.3400	29.39	54.00	24.61	274.6	V	234.0	-8.7
13232.7800	30.92	54.00	23.08	184.6	V	158.0	-4.0
17478.9100	36.55	54.00	17.45	109.6	H	10.0	4.3

7. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-2406-FC001-P	June 11, 2024	Initial Release

End of report