

TEST REPORT

EMC Test for JAS-U3-2024

APPLICANT
JASTEC CO.,LTD.

REPORT NO.
HCT-EM-2502-FC002

DATE OF ISSUE
February 10, 2025

Tested by
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TEST REPORT

FCC Certification

REPORT NO.

HCT-EM-2502-FC002

DATE OF ISSUE

February 10, 2025

FCC ID.

UK4JTJAS-U3-2024

Applicant**JASTEC CO.,LTD.**

C-402, Pankyo Digital Contents Park, 242, Pangyo-ro, Bundang-gu,
Seongnam-si, Gyeonggi-do, Republic of Korea

Product Name

uvim-S

Model Name

JAS-U3-2024

Date of Test

02.27.2024 / 01.13.2025

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 A
ANSI C63.4-2014

Test Results

Refer to the present document

Manufacturer

JASTEC CO.,LTD.

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	February 10, 2025	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

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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1. TESTING LABORATORY

1.1 General Information

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

2. GENERAL INFORMATION

2.1 Description of EUT

FCC ID.	UK4JTJAS-U3-2024
Product Name	uvim-S
Model Name	JAS-U3-2024
Frequency Range	WiFi 2.4 GHz: 2 412 MHz to 2 462 MHz Bluetooth LE: 2 402 MHz to 2 480 MHz
Power Rating	DC: 8 V ~ 36 V
Manufacturer	JASTEC CO.,LTD.

2.2 Power Source

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

Power supply: DC 12 V, DC 24 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
uvim-S (EUT)	JAS-U3-2024	-	JASTEC CO.,LTD.
Jigboard	-	-	-
Vehicle Battery1	-	-	-
Vehicle Battery2	-	-	-
Notebook PC	NT550XEZ	5RNY9FCW401183K	Samsung Electronics
Notebook PC Adapter	EP-TA845 001	-	Samsung Electronics
Jigboard Adapter	QA-1201500K	-	SOMINYU

2.4 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	2pin	N	N/A	3.0(P)
	16pin	N/A	N	3.5(D)

“(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	2pin	N	-	N	-
	16pin	N	-	N	-

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.

Phenomenon	Test Site (Chamber)	Expanded Uncertainty
Radiated emission	10 m Semi Anechoic Chamber #1	30 MHz - 1 GHz: 5.28 dB
	3 m Semi Anechoic Chamber #1	1 GHz - 18 GHz: 2.4 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)	Class A Quasi-Peak (dB μ V)	Class A Average (dB μ V)	Class B Quasi-Peak (dB μ V)	Class B Average (dB μ V)
0.15 to 0.5	79	66	66 to 56*	56 to 46*
0.5 to 5	73	60	56	46
5 to 30	73	60	60	50

NOTE. The more stringent limit applies at transition frequencies.

[*] The limit level in dB μ V decreases linearly with the logarithm of frequency.

3.2 Antenna Conducted Power Measurements

The test procedure was in accordance with ANSI C63.4-2014, Clause 12.2.6.

Antenna-conducted power measurements shall be performed on each broadcast reception tuner input in accordance with the requirements of the applicable regulatory authority. For example, see 47 CFR paragraph 15.111 and ANSI C63.4 paragraph 12.1.5 and Appendix H5 (test method) with the following clarifications:

- a. With the TV tuned to each channel [e.g., channel 2 to channel 69], the level of the local oscillator frequency and the second harmonic shall be measured and recorded for each tuner.
- b. Antenna-conducted power measurements shall be performed with the EUT antenna terminals connected directly to either a spectrum analyzer or another measurement instrument conforming to ANSI C63.2 or CISPR 16-1 or the latest revision thereof, if the antenna impedance matches the impedance of the measuring instrument.

Otherwise, use a balun or impedance-matching network to connect the measuring instrument to the antenna terminals of the EUT. Manufacturer-supplied interconnect cabling or wiring shall be used, or if none is supplied, the cable shall be commercially available and a maximum of 2 m in length. Losses in decibels in any balun or impedance-matching network used shall be added to the measured value in dB μ V.

Antenna Conducted Power Emission Limits

Frequency (MHz)	Limits (dB μ V)	
	Quasi-Peak	Peak
30 to 1 000	51.7	-
1 000 to 2 150	-	51.7

3.3 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 ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)
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 (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	
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

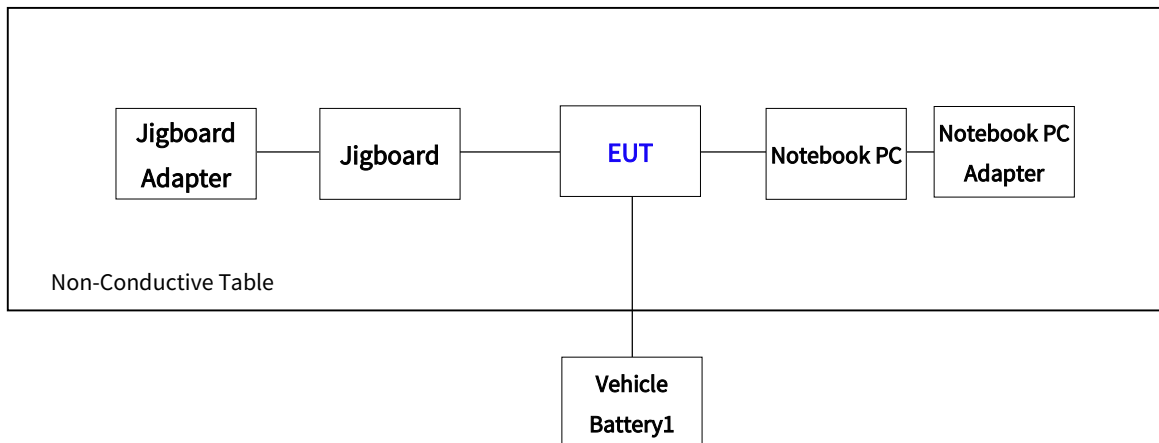
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

3.4 Configuration of Tested System

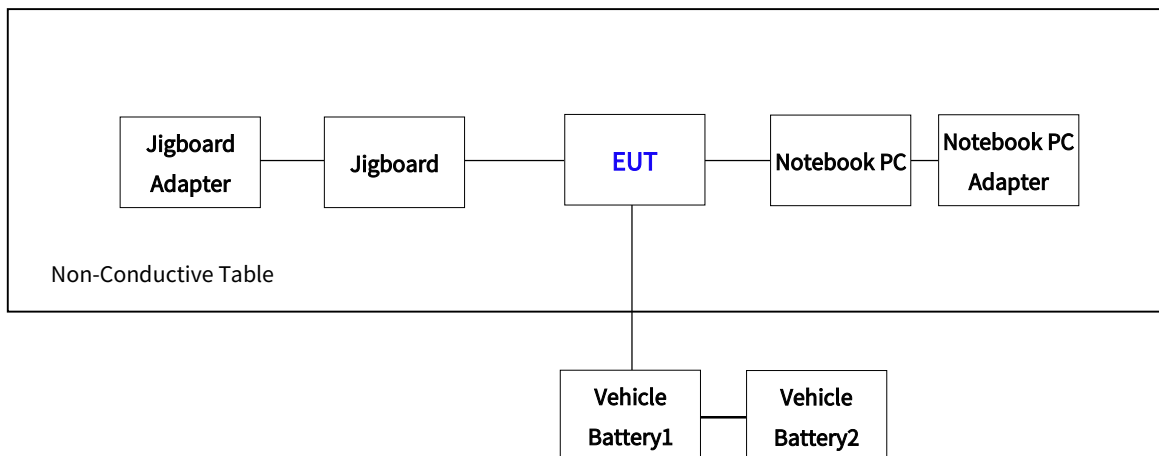
The EUT was configured in the following manner.:

At the request of the manufacturer, the configuration of the tests was arranged.

[12 V] Idle mode



[24 V] Idle mode



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: [12 V] Idle mode
[24 V] Idle mode

5. MEASURING INSTRUMENTS

Type	Model Name	Manufacturer	Serial Number	Cal. Cycle	Next Cal. Date (yy.mm.dd)
Conducted emission					
<input type="checkbox"/> EMI Test Receiver	ESR7	Rohde&Schwarz	101910	1 year	2025.08.27
<input type="checkbox"/> LISN	ENV4200	Rohde & Schwarz	100054	1 year	2026. 01.09
<input type="checkbox"/> LISN	ENV216	Rohde & Schwarz	102246	1 year	2025.11.19
<input type="checkbox"/> LISN	ENV216	Rohde & Schwarz	100073	1 year	2025.05.07
<input type="checkbox"/> Software	EMC32	Rohde & Schwarz	-	-	-
Antenna Conducted Power Emission					
<input type="checkbox"/> EMI Test Receiver	ESCI	Rohde & Schwarz	100584	1 year	2025.05.08
<input type="checkbox"/> Impedance Matching Pad	PE7070	PASTERNAK	5	1 year	2026.01.08
Radiated emission below 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	ESU26	Rohde & Schwarz	100241	1 year	2025.07.25
<input checked="" type="checkbox"/> Bi log Antenna	VULB 9168	SCHWARZBECK	847	2 year	2026.04.23
<input checked="" type="checkbox"/> Antenna master	MA4640-XP-ET	INNCO systems	-	N/A	-
<input checked="" type="checkbox"/> Turn Table	DT3000-3t	INNCO Systems	DT3000/69	N/A	-
<input checked="" type="checkbox"/> Low Noise Amplifier	TK-PA01S	TESTEK	160014-L	1 year	2025.07.25
<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	2024.05.09
<input checked="" type="checkbox"/> Horn Antenna	HF907	Rohde & Schwarz	103160	1 year	2024.10.16
<input checked="" type="checkbox"/> Power Amplifier	TK-PA18H	TESTEK	170034-L	1 year	2024.11.01
<input type="checkbox"/> Horn Antenna	BBHA 9170	Schwarzbeck	BBHA 9170 #786	1 year	2025.10.30
<input type="checkbox"/> Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	2025.02.20
<input checked="" type="checkbox"/> Antenna Mast	MA4640-XP-ET	INNCO systems	-	N/A	-
<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:

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

A Conducted emission is calculated by the following equation:

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

The measurements from both Live (L1) and Neutral (N) of the LISN are combined into a single graph.

6.1.2 Measurement Data

REMARK.

Since this product uses DC power source, this test does not apply.

6.2 Antenna Conducted Power Emission (Not Applicable)

6.2.1 Operating Condition

The test results of antenna conducted power emission provide the following information.;

Date of Test (yy.mm.dd)	---		
Temperature	min.	°C	Relative Humidity
	max.	°C	
		min.	%
		max.	%
Test Site	EMI Shield Room		
Test Method Used	ANSI C63.4-2014		
Frequency Range	30 MHz to 2150 MHz		
Detector / Bandwidth	For frequencies ≤ 1 GHz: Quasi-peak / 120 kHz		
	For frequencies ≥ 1 GHz: Peak / 1 MHz		
Operating Mode	---		

6.2.2 Measurement Data

Not applicable

6.3 Radiated Emission Below 1 GHz

6.3.1 Operating Condition

The test results of radiated emission provide the following information:

Date of Test (yy.mm.dd)	2025.01.13		
Temperature	min. 17.4 °C	Relative Humidity	min. 36.2 %
	max. 23.5 °C		max. 47.0 %
Test Site	10 m Semi Anechoic Chamber #1		
Used Test Standard	FCC CFR 47 PART 15 Subpart B Class A 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		
Measurement Distance	10 m		
Antenna Polarity	Horizontal, Vertical		
Operating Mode	[12 V] Idle mode		
	[24 V] Idle mode		

A field strength is calculated by the following equation.

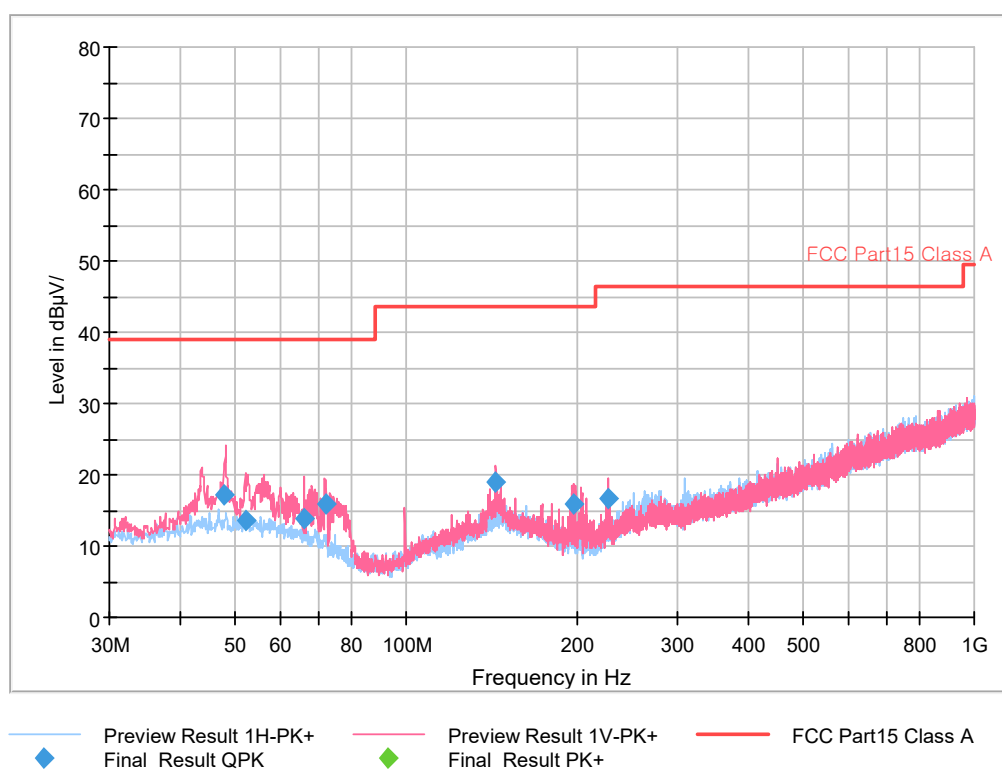
$$\begin{aligned}\text{Calculation Formula: } \text{QuasiPeak} &= \text{Reading (Receiver Reading)} + \text{Corr.} \\ \text{Corr. (Correction Factor)} &= \text{Antenna Factor} + \text{Cable Loss} \\ \text{Margin} &= \text{Limit} - \text{QuasiPeak}\end{aligned}$$

The measurements' polarities are H and V, where H means horizontal and V means vertical.

6.3.2 Measurement Data

[12 V] Idle mode

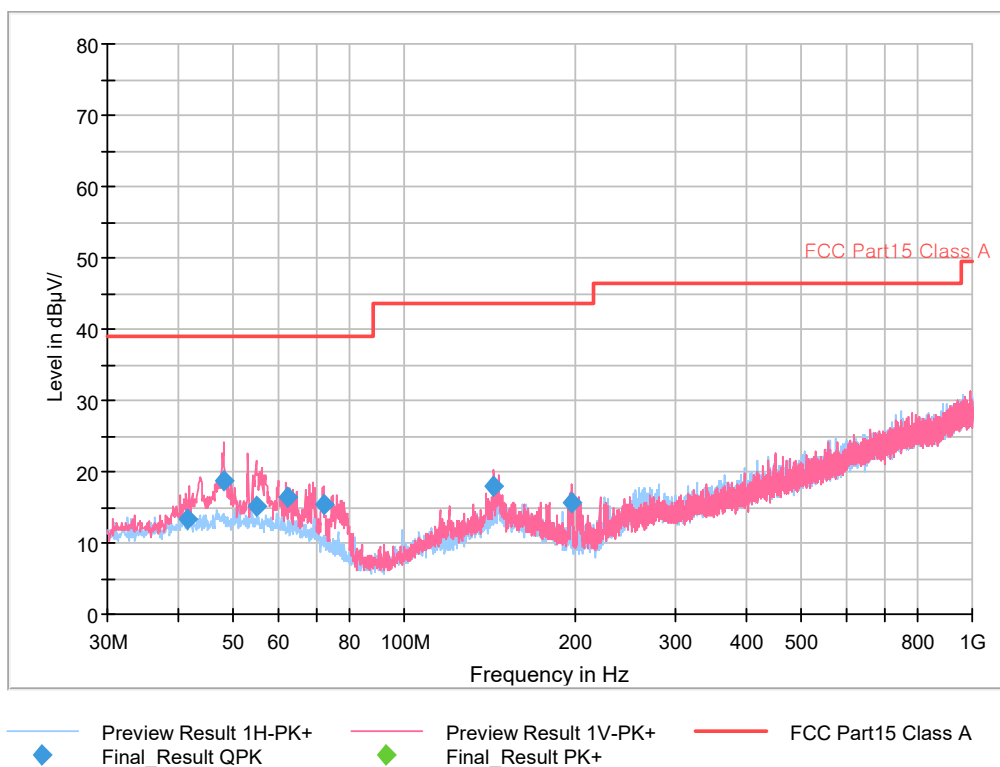
Full Spectrum



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
47.8926	17.12	39.00	21.88	292.4	V	295.0	-19.5
52.1297	13.71	39.00	25.29	250.0	V	192.0	-19.5
66.0190	13.90	39.00	25.10	143.7	V	42.0	-20.9
71.9523	15.79	39.00	23.21	264.6	V	90.0	-21.8
143.9698	19.02	43.50	24.48	100.0	V	0.0	-19.0
196.5039	15.90	43.50	27.60	110.9	V	268.0	-21.8
227.1601	16.60	46.40	29.80	100.0	V	194.0	-21.3

[24 V] Idle mode

Full Spectrum



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.4458	13.30	39.00	25.70	116.7	V	274.0	-19.9
48.1913	18.80	39.00	20.20	171.5	V	173.0	-19.5
54.7987	15.25	39.00	23.75	110.8	V	339.0	-19.7
62.4333	16.50	39.00	22.50	314.6	V	339.0	-20.3
72.0454	15.35	39.00	23.65	264.6	V	95.0	-21.8
143.9646	17.95	43.50	25.55	168.8	V	0.0	-19.0
197.7831	15.60	43.50	27.90	108.4	V	122.0	-21.9

6.4 Radiated Emission Above 1 GHz

6.4.1 Operating Condition

The test results of radiated emission provide the following information:

Date of Test (yy.mm.dd)	2024.02.27		
Temperature	min. 21.1 °C	Relative Humidity	min. 31.1 %
	max. 23.8 °C		max. 33.7 %
Test Site	3 m Semi Anechoic Chamber #1		
Used Test Standard	FCC CFR 47 PART 15 Subpart B Class A ANSI C63.4-2014		
Detector	Peak, CISPR-Average		
Bandwidth	1 MHz		
Highest Frequency	2480 MHz		
Tested Frequency Range	1 GHz to 18 GHz		
Antenna Height	1 m to 4 m		
Measurement Distance	3 m		
Antenna Polarity	Horizontal, Vertical		
Operating Mode	[12 V] Idle mode		
	[24 V] Idle mode		

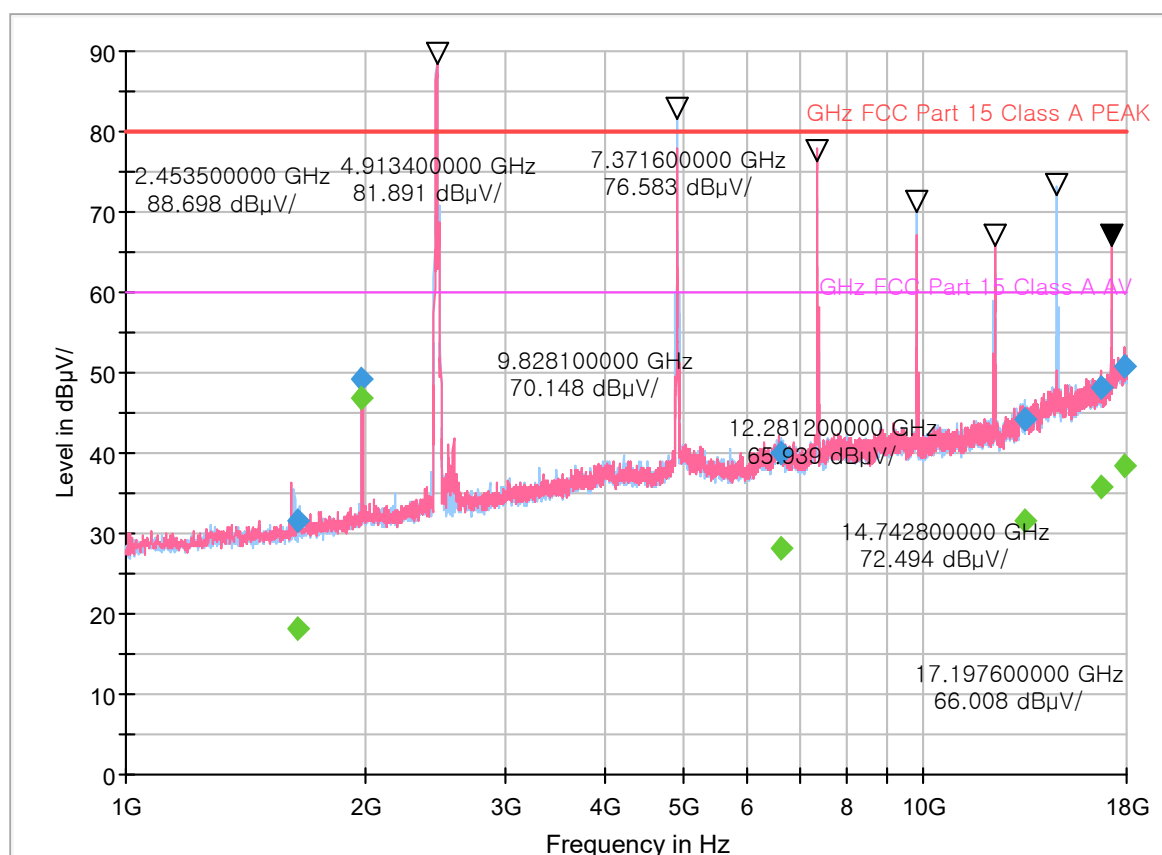
A field strength is calculated by the following equation.

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

The measurements' polarities are H and V, where H means horizontal and V means vertical.

6.4.2 Measurement Data

[12 V] Idle mode
Full Spectrum



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1641.9100	31.46	80.00	48.55	400.0	H	171.0	-28.3
1977.5850	49.22	80.00	30.78	100.0	H	6.0	-26.2
6643.8500	40.00	80.00	40.00	323.6	H	216.0	-11.9
13430.5300	44.12	80.00	35.88	313.5	H	192.0	-3.4
16691.1150	48.05	80.00	31.95	220.6	V	113.0	2.1
17896.8450	50.71	80.00	29.29	114.4	V	220.0	6.2

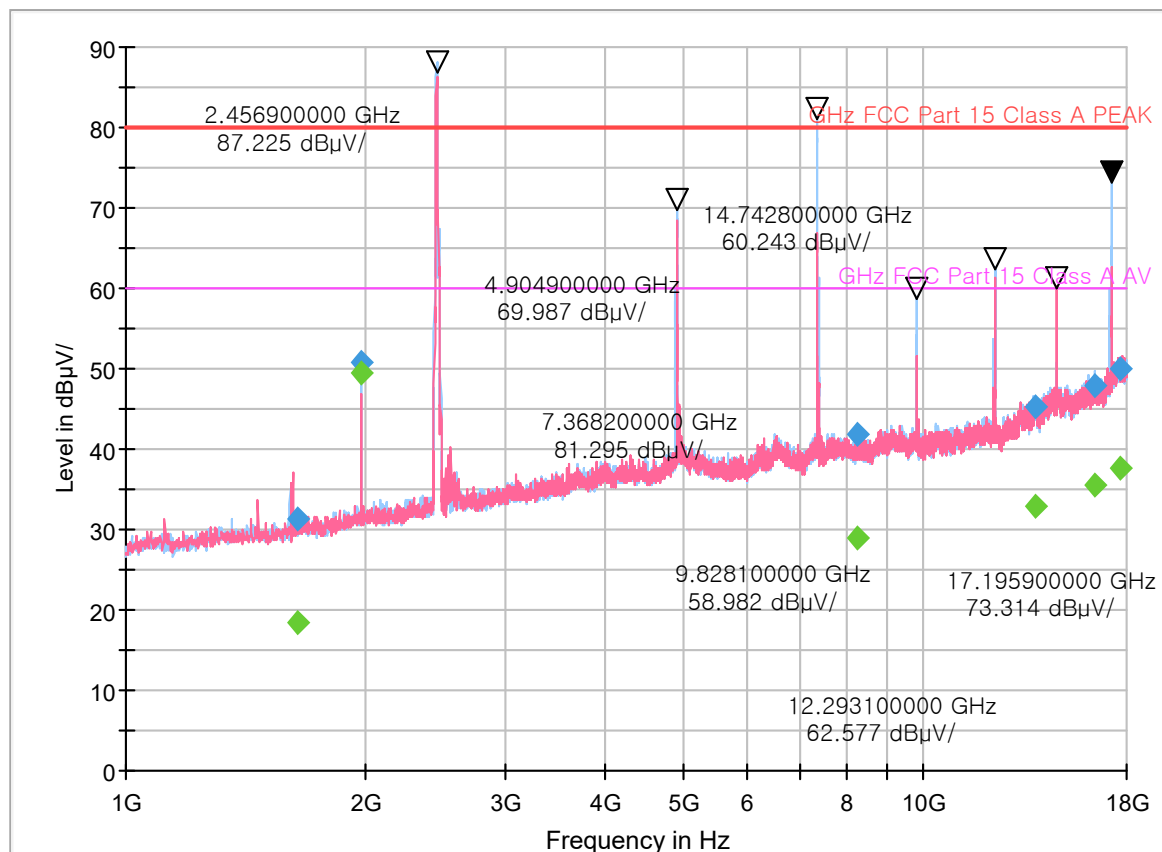
Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1641.9100	18.17	60.00	41.83	400.0	H	171.0	-28.3
1977.5850	46.72	60.00	13.28	100.0	H	6.0	-26.2
6643.8500	28.16	60.00	31.84	323.6	H	216.0	-11.9
13430.5300	31.63	60.00	28.37	313.5	H	192.0	-3.4
16691.1150	35.88	60.00	24.12	220.6	V	113.0	2.1
17896.8450	38.29	60.00	21.71	114.4	V	220.0	6.2

TX frequency: 2.4535 GHz

Harmonic frequency: 4.9134 GHz, 7.3716 GHz, 9.8281 GHz, 12.2812 GHz, 14.7428 GHz, 17.1976 GHz

[24 V] Idle mode

Full Spectrum



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1641.2050	31.21	80.00	48.79	306.6	V	18.0	-28.3
1975.3450	50.87	80.00	29.13	330.6	H	232.0	-26.3
8277.5100	41.89	80.00	38.11	118.3	H	326.0	-10.4
13827.6000	45.14	80.00	34.86	159.7	H	137.0	-2.4
16412.9250	47.92	80.00	32.08	154.7	H	44.0	1.6
17628.3400	49.90	80.00	30.10	229.7	H	169.0	5.1

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1641.2050	18.55	60.00	41.45	306.6	V	18.0	-28.3
1975.3450	49.36	60.00	10.64	330.6	H	232.0	-26.3
8277.5100	28.93	60.00	31.07	118.3	H	326.0	-10.4
13827.6000	32.84	60.00	27.16	159.7	H	137.0	-2.4
16412.9250	35.65	60.00	24.35	154.7	H	44.0	1.6
17628.3400	37.65	60.00	22.35	229.7	H	169.0	5.1

TX frequency: 2.4569 GHz

Harmonic frequency: 4.9049 GHz, 7.3682 GHz, 9.8281 GHz, 12.2931 GHz, 14.7428 GHz, 17.1959 GHz

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-2502-FC002-P	February 10, 2025	Initial Release

End of report