TEST REPORT

CTK Co., Ltd.	**CTK Co., Ltd.** **(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea** **Tel: +82-31-339-9970** **Fax: +82-31-624-9501**	Report No.: CTK-2023-00331 Page (1) / (23) Pages	

1. Applicant

◦ Name : Haier US Appliance Solutions, Inc.

◦ Address : Appliance Park AP5-2N-65, Louisville, Kentucky, KY 40225, United States

◦ Date of Receipt : 2023-01-13

2. Manufacturer

◦ Name : Haier US Appliance Solutions, Inc.

◦ Address : Appliance Park AP5-2N-65, Louisville, Kentucky, KY 40225, United States

3. Use of Report : For FCC Certification & Canadian Certification

4. Test Sample / Model : Wi-Fi/Bluetooth Combo Module / WCATA008

5. Date of Test : 2023-01-30 to 2023-02-01

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247, ANSI C63.10-2013, RSS-247, RSS-Gen

7. Testing Environment : refer to 6 page

8. Test Results : Compliance

9. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

(Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17142 Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK.

Affirmation	Tested by Su-jun Hwang: (Signature)	Technical Manager Won-Jae Hwang: (Signature)

Remark. This report is not related to KOLAS accreditation and relevant regulation

2023-02-08

CTK Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2021-06-23	Issued (CTK-2021-02398)	all
2023-02-08	Issued (CTK-2023-00331)	all

CONTENTS

1. General Product Description

1.1 Client Information

Company	Haier US Appliance Solutions, Inc.
Contact Point	Appliance Park AP5-2N-65, Louisville, Kentucky, KY 40225, United States
Contact Person	Name : Park, Hansung E-mail : hansung.park@geappliances.com Tel : +82-31-8094-6732

1.2 Product Information

FCC ID	ZKJ-WCATA008
ISED certification number	10229A-WCATA008
Product Description	Wi-Fi/Bluetooth Combo Module
Model name	WCATA008
Variant Model name	-
Operating Frequency	2 402 MHz - 2 480 MHz
RF Output Power	4.09 dBm (2.56 mW)
Antenna Specification	Antenna type : Chip Antenna Peak Gain : 2.00 dBi
Number of channels	40
Channel Spacing	2 MHz
Type of Modulation	GFSK
Power Source	DC 5.0 V
Test Software	RTLBTAPP(Version 5.2.2.59)
Firmware Version Id Number(FVIN)	V1.0
RF Power setting in Test SW	Initial value

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Notebook	HP Inc.	HP Probook 455 G7	5CD0234DWW
AC Adapter	HP Inc.	TPN-LA16	PA-1650-20HL

2. Accreditations

2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A
KOREA	NRRA	KR0025

2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

Section in FCC	Section in RSS	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	RSS-247 5.2(a)	6 dB Bandwidth	NA(Note 4)	Conducted
15.247(e)	RSS-247 5.2(b)	Transmitter power spectral density	NA(Note 4)	
15.247(b)	RSS-247 5.4(d)	Maximum peak conducted output power	NA(Note 4)	
15.247(d)	RSS-247 5.5	Unwanted emission	NA(Note 4)	
15.209	RSS-Gen6.13	Transmitter emission	C	Radiated
15.207(a)	RSS-Gen 8.8	AC Conducted Emission	NA(Note 4)	Line Conducted
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
Note 2: The data in this test report are traceable to the national or international standards.				
Note 3: The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013, RSS-247 Issue 2, RSS-GEN Issue 5, KDB No.558074				
Note 4: It was the same as the existing sample, and only the shield can was changed, so only the radiation test was tested.				

3.2 Testing Environment

Test Item		Test Date	Temperature (℃)	Relative Humidity (%)
Transmitter emission (Radiated)	1) 9 kHz to 30 MHz	2023-01-30	20	36
	2) 30 MHz to 1 GHz			
	3) 1 GHz to 18 GHz	2023-02-01	22	31
	4) 18 GHz to 26.5 GHz			
	5) Restricted Frequency Bands			

3.3 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.
The results are only attached worst cases.

Test Frequency

Lowest channel	Middle channel	Highest channel
2 402 MHz	2 440 MHz	2 480 MHz

Test mode

Modulation
GFSK

3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor k = 2, Confidence levels of 95 %

Description	Uncertainty
Radiated Emissions (f ≤ 1 GHz)	3.88 dB (C.L.: Approx. 95 %, k=2)
Radiated Emissions (f > 1 GHz)	4.62 dB (C.L.: Approx. 95 %, k=2)

4. Technical Characteristic Test

4.1 Radiated Emission

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

KDB 558074 - Section 8.5, 8.6
ANSI C63.10-2013 - Section 11.11, 11.12
RSS-Gen - Section 6.13

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Instrument Settings

Frequency Range = 9 kHz ~ 26.5 GHz (2.4 GHz 10^{th} harmonic)

a) RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz
200 Hz for f < 150 kHz

b) VBW ≥ RBW

c) Sweep time = auto couple

Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
[1]0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	[2]Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

*Certain frequency bands listed in Table 6 and in band above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200- and 300-series of RSSs, such as RSS-210 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency(MHz)	Field Strength uV/m	Field Strength dBuV/m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

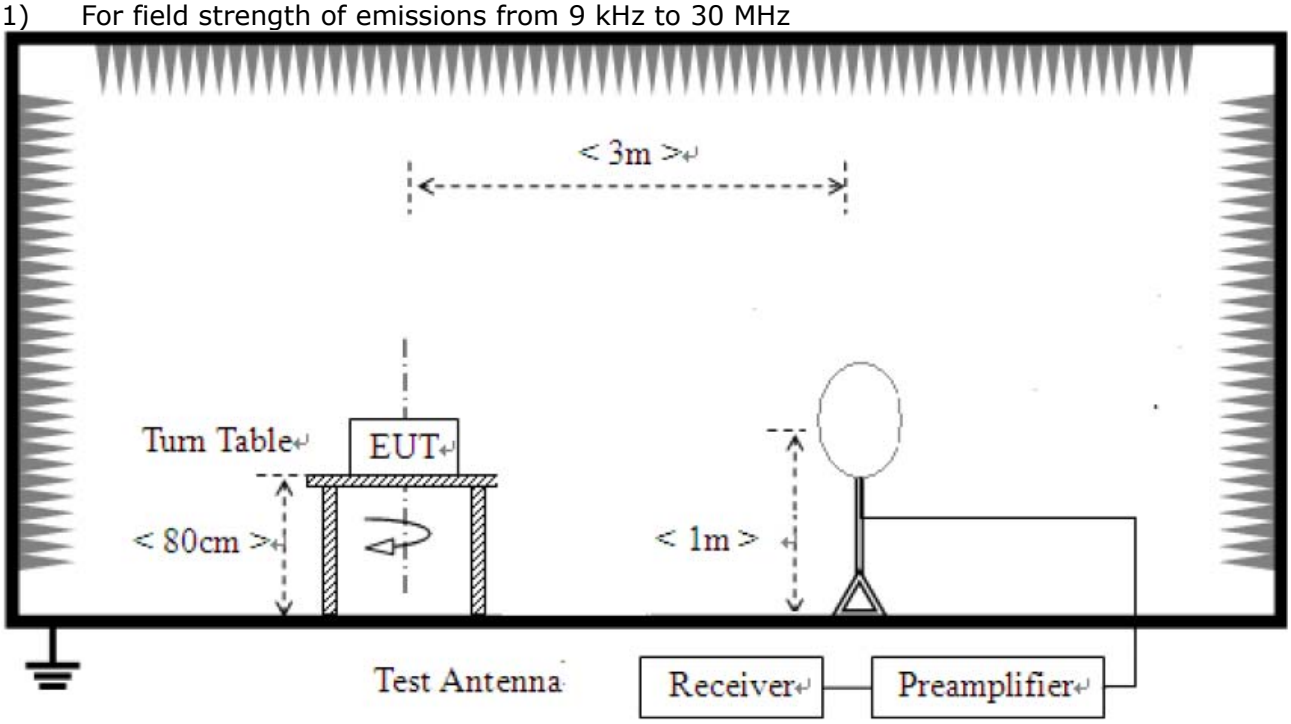
** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

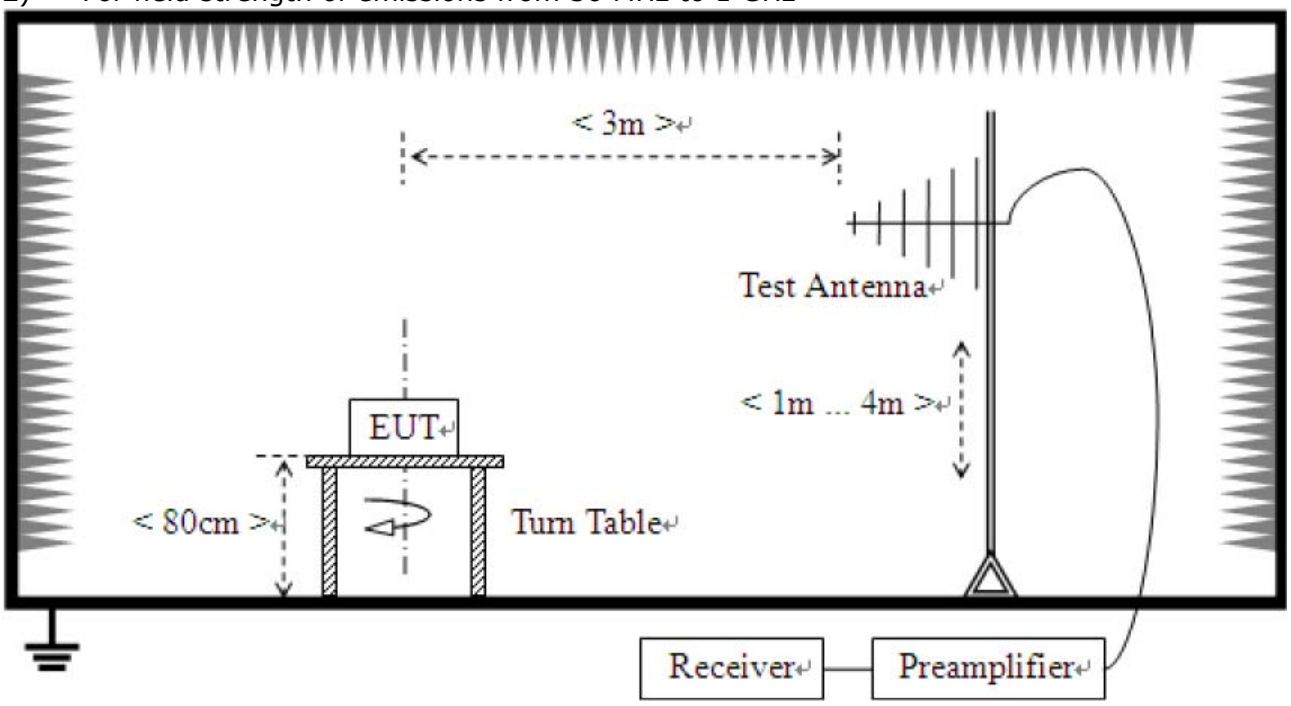
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)
3) For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

Test Setup:

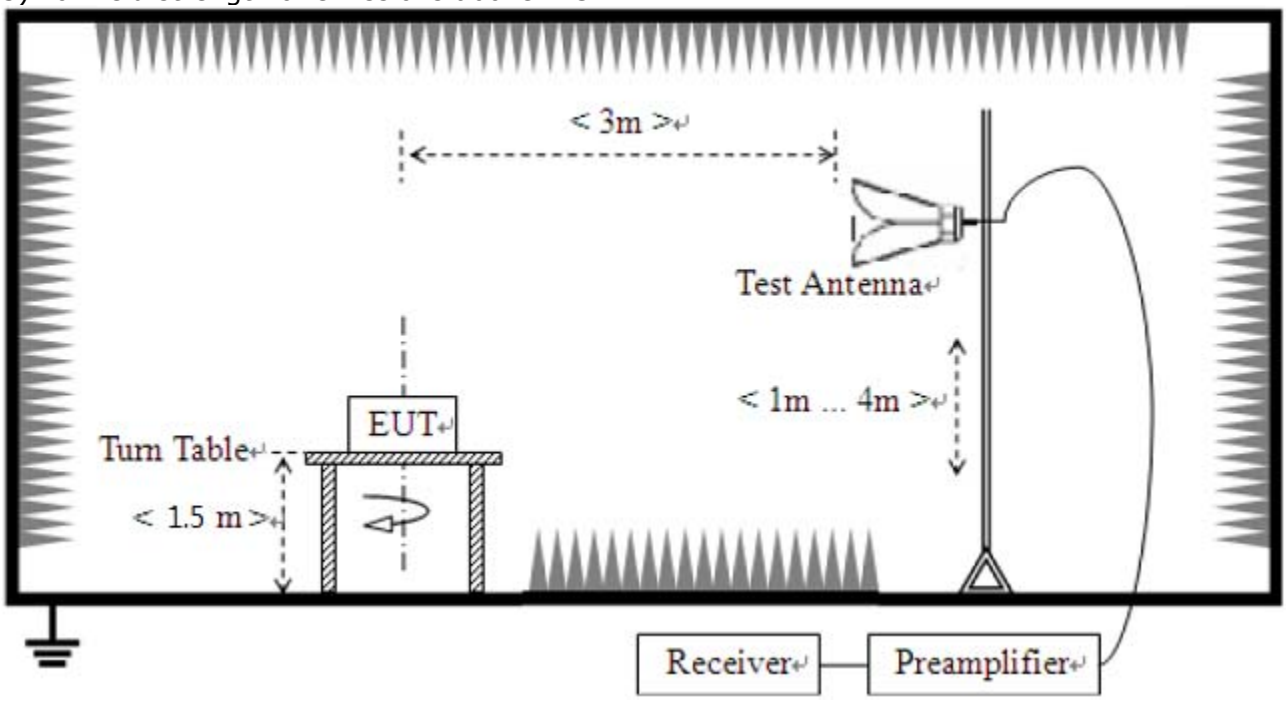
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



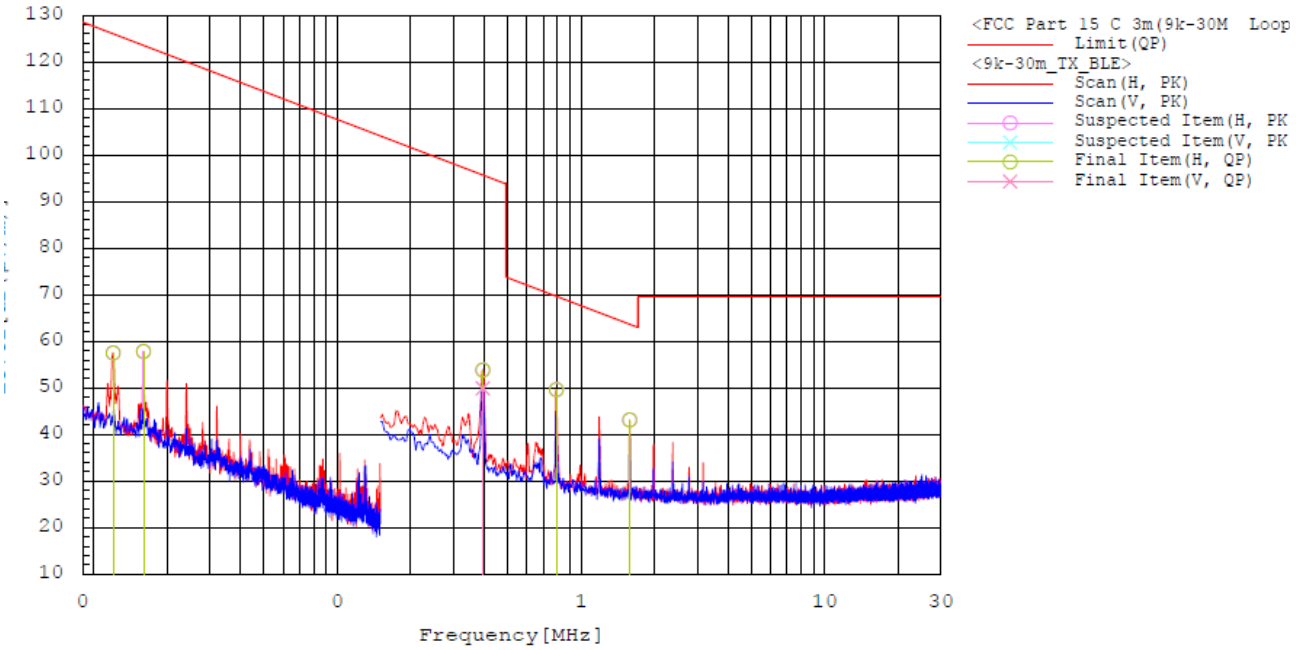
Test Results :

1) 9 kHz to 30 MHz

Test mode : Transmitter (Worst case)

The requirements are:
☒ Complies

Test Data



Final Result

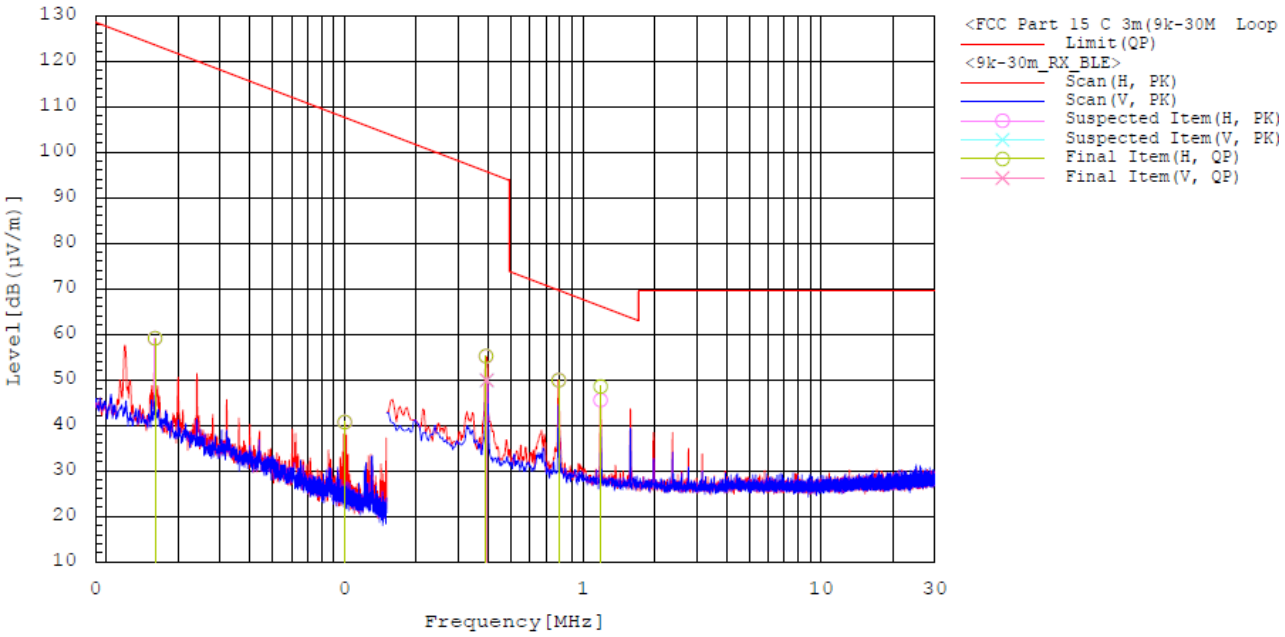
No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	0.012	H	32.5	25.0	57.5	126.0	68.5	99.8	5.0
2	0.016	H	32.8	25.0	57.8	123.5	65.7	99.8	357.8
3	0.395	H	28.8	25.0	53.8	95.7	41.9	99.8	21.5
4	0.395	V	24.9	25.0	49.9	95.7	45.8	99.8	100.6
5	0.792	H	24.6	25.0	49.6	69.6	20.0	99.8	359.1
6	1.583	H	18.1	25.0	43.1	63.6	20.5	99.8	15.2

Remark :
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

Test mode : Receiver (Worst case)

The requirements are:
☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	0.016	H	34.1	25.0	59.1	123.5	64.4	99.8	352.6
2	0.100	H	15.8	24.9	40.7	107.6	66.9	99.8	106.0
3	0.392	H	30.2	25.0	55.2	95.7	40.5	99.8	49.8
4	0.395	V	24.9	25.0	49.9	95.7	45.8	99.8	100.6
5	0.792	H	24.9	25.0	49.9	69.6	19.7	99.8	90.3
6	1.186	H	23.5	25.0	48.5	66.1	17.6	99.8	49.8

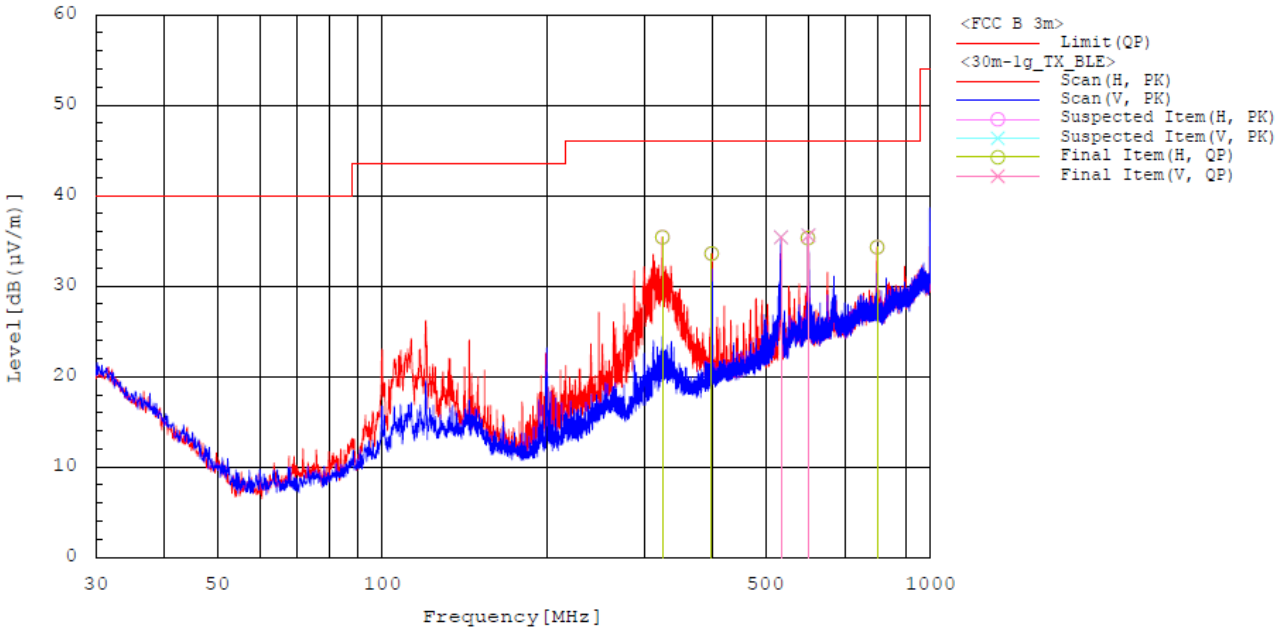
Remark :
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

2) 30 MHz to 1 GHz

Test mode : Transmitter (Worst case)

The requirements are:
☒ Complies

Test Data



Final Result

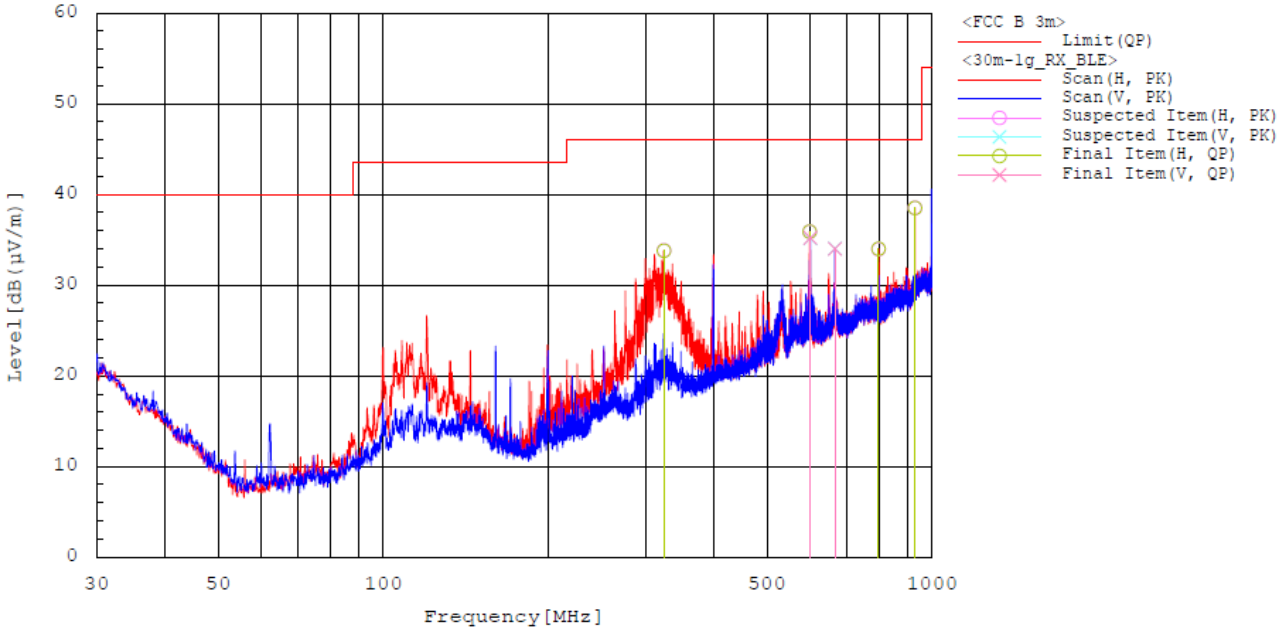
No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	324.201	H	44.8	-9.4	35.4	46.0	10.6	100.0	23.2
2	398.697	H	40.5	-6.9	33.6	46.0	12.4	200.1	359.9
3	533.430	V	39.5	-4.1	35.4	46.0	10.6	99.9	4.6
4	597.450	H	37.1	-1.8	35.3	46.0	10.7	300.0	234.0
5	598.614	V	37.4	-1.8	35.6	46.0	10.4	99.9	173.1
6	799.113	H	32.7	1.6	34.3	46.0	11.7	200.1	50.5

Remark :
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : Receiver (Worst case)

The requirements are:
☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	324.492	H	43.2	-9.4	33.8	46.0	12.2	99.9	217.1
2	598.032	H	37.7	-1.8	35.9	46.0	10.1	300.0	2.3
3	599.584	V	37.0	-1.8	35.2	46.0	10.8	100.0	37.3
4	665.059	V	34.4	-0.4	34.0	46.0	12.0	100.0	241.5
5	798.434	H	32.4	1.6	34.0	46.0	12.0	200.1	137.9
6	930.548	H	33.8	4.7	38.5	46.0	7.5	99.9	359.1

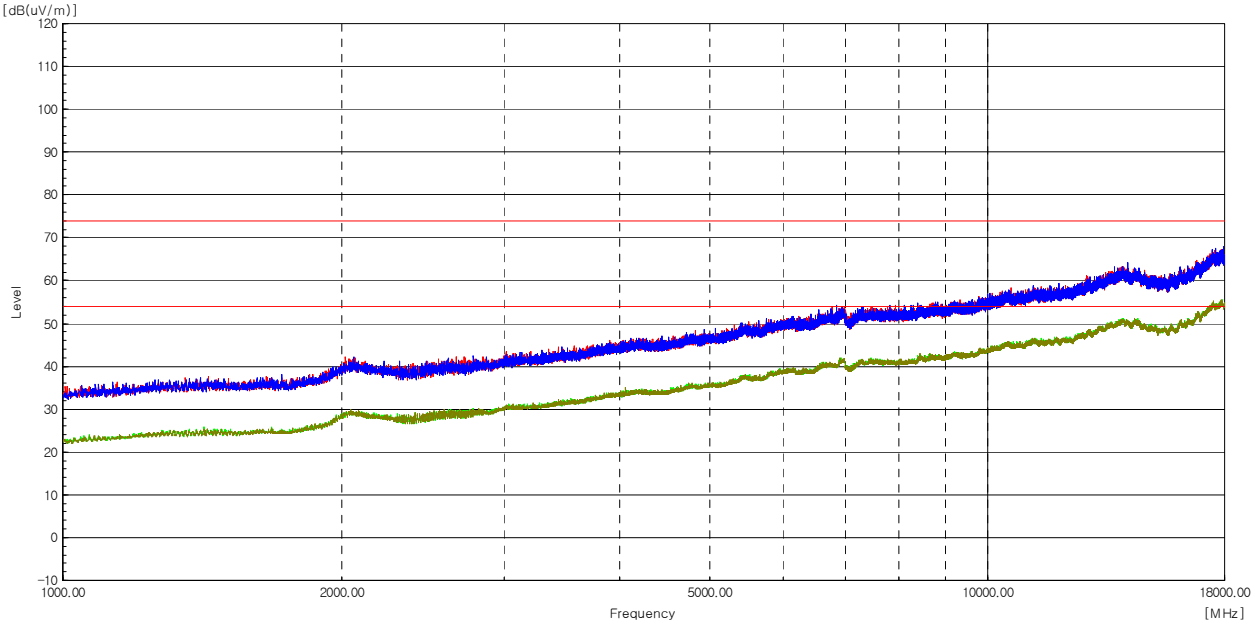
Remark :
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

3) 1 GHz to 18 GHz

Test mode : Transmitter (Worst case)

The requirements are:
☒ Complies

Test Data



Result : No peak found

Remarks

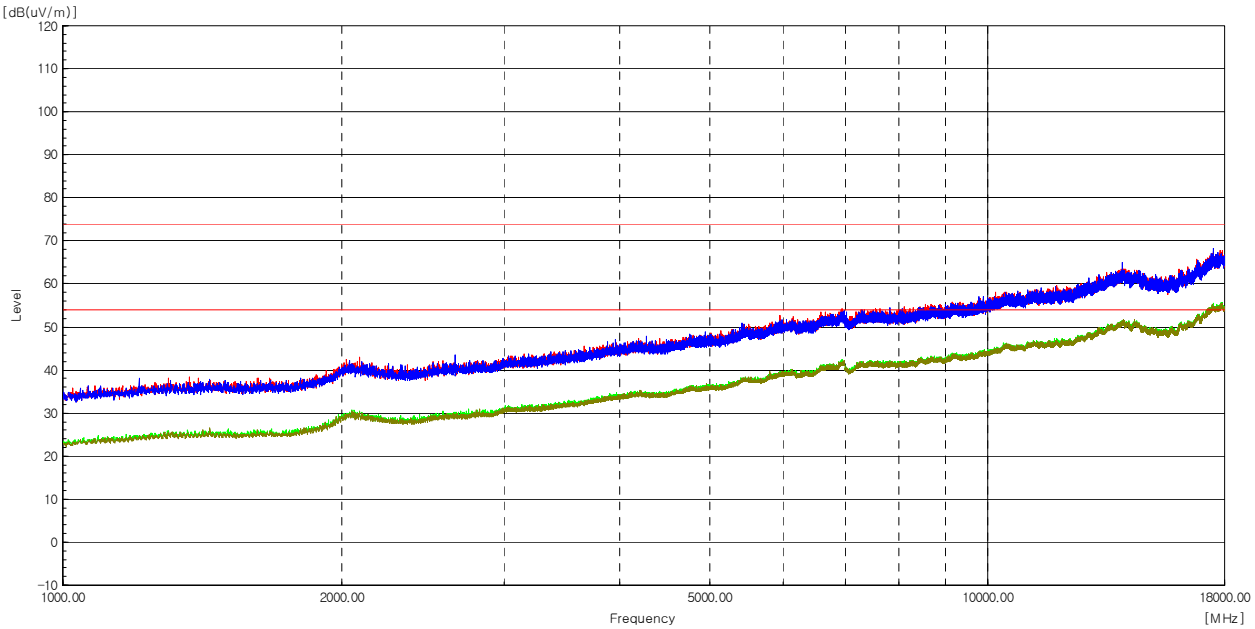
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Band reject filter was used from 1 GHz to 18 GHz
5. The 18 GHz end had no signal detected.

CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Test mode : Receiver (Worst case)

The requirements are:
☒ Complies

Test Data



Result : No peak found

Remarks

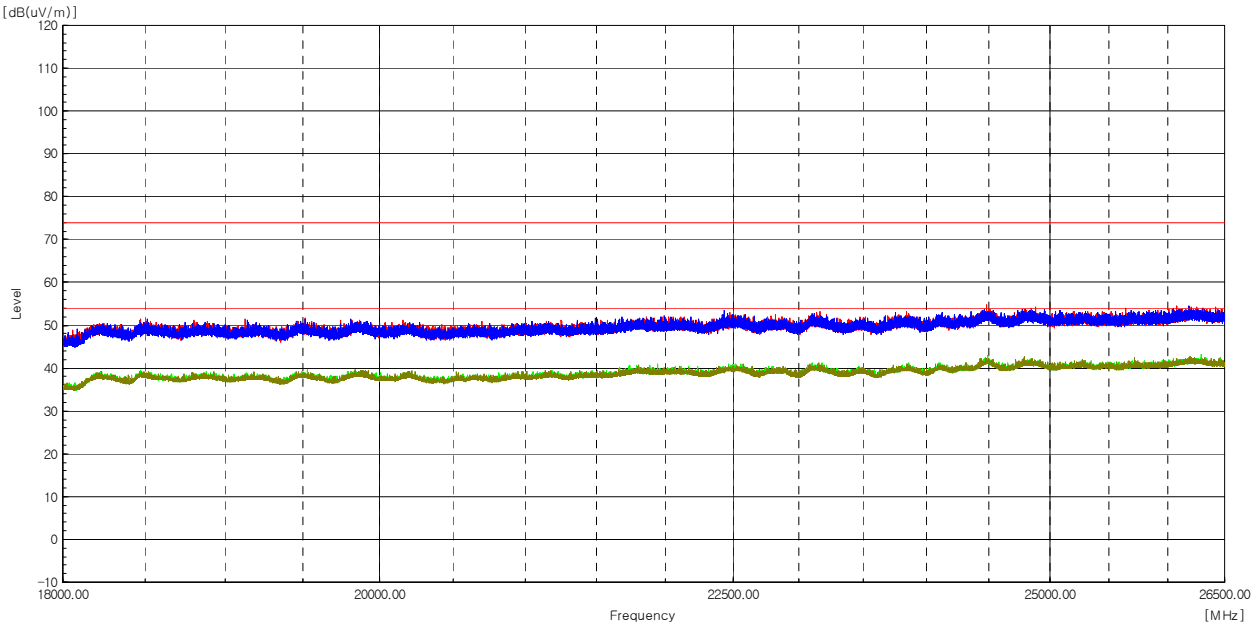
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The 18 GHz end had no signal detected.

4) 18 GHz to 26.5 GHz

Test mode : Transmitter (Worst case)

The requirements are:
☒ Complies

Test Data



Result : No peak found

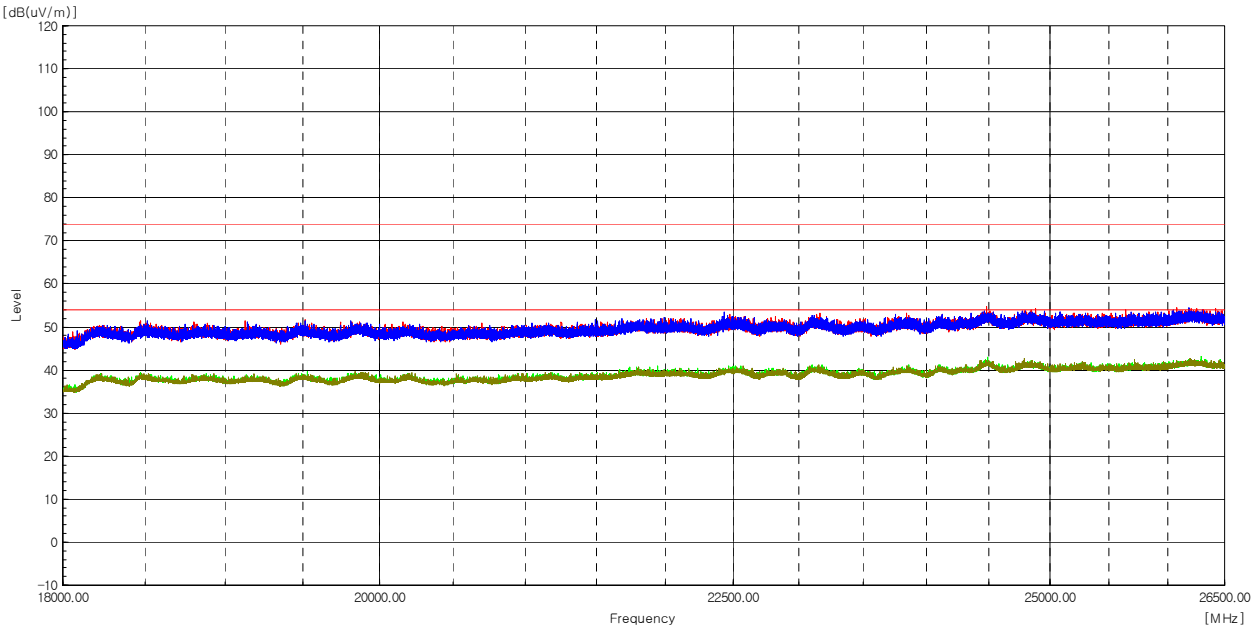
Remarks
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Test mode : Receiver (Worst case)

The requirements are:
☒ Complies

Test Data



Result : No peak found

Remarks

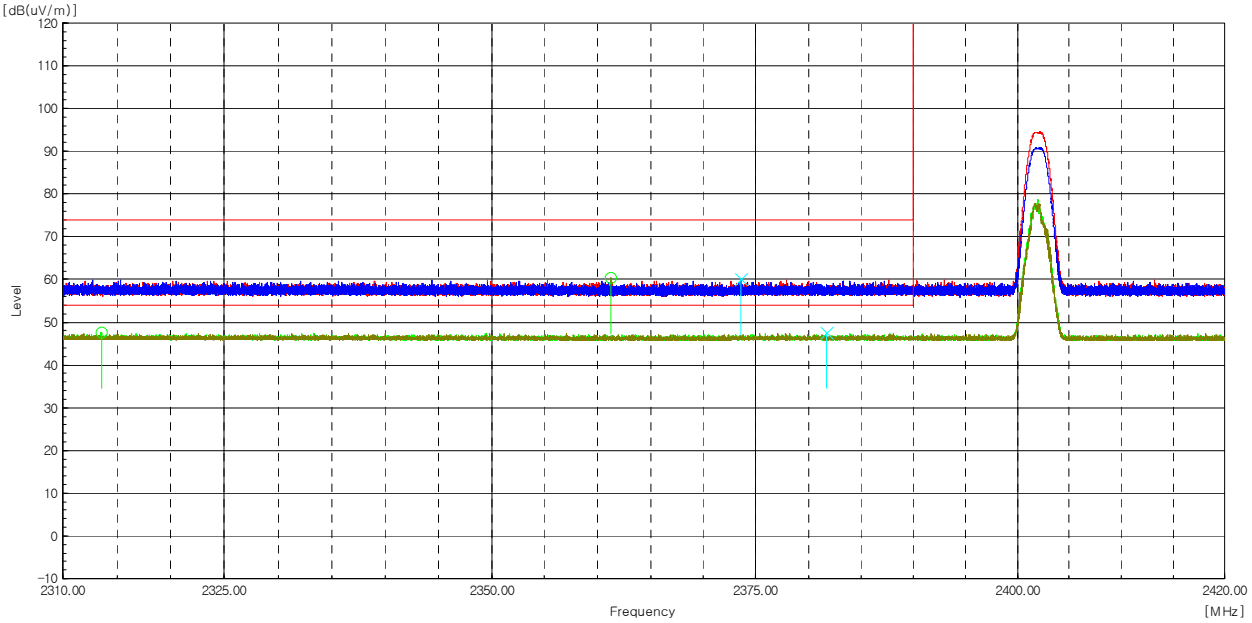
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

5) Restricted Frequency Bands

Test mode : Transmission status Lowest channel
(Test frequency range : 2 310 MHz – 2 390 MHz)

The requirements are:
☒ Complies

Test Data



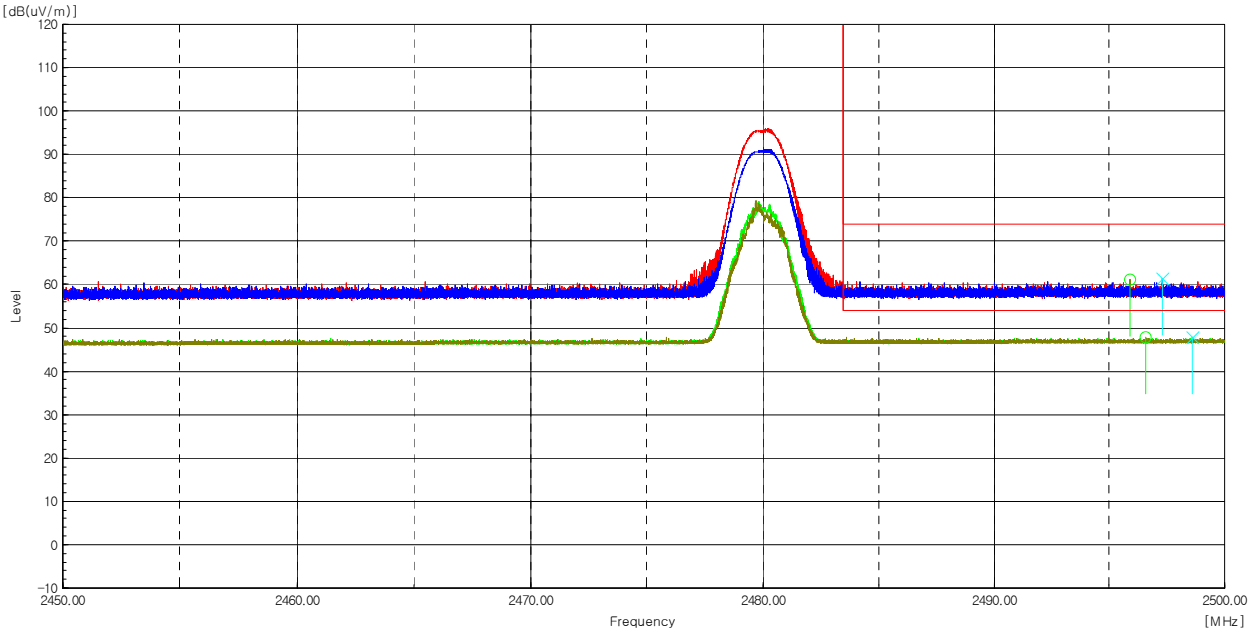
Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 361.280	H	66.30	-----	-6.00	60.30	-----	74.00	-----	13.70	-----
2 313.586	H	-----	53.50	-6.00	-----	47.50	-----	54.00	-----	6.50
2 373.622	V	66.00	-----	-5.90	60.10	-----	74.00	-----	13.90	-----
2 381.771	V	-----	53.50	-5.90	-----	47.60	-----	54.00	-----	6.40

Remarks
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Transmission status Highest channel
(Test frequency range : 2 483.5 MHz – 2 500 MHz)

The requirements are:
☒ Complies

Test Data



Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 495.874	H	66.40	-----	-5.30	61.20	-----	74.00	-----	12.80	-----
2 496.586	H	-----	53.00	-5.20	-----	47.80	-----	54.00	-----	6.20
2 497.302	V	66.70	-----	-5.20	61.50	-----	74.00	-----	12.50	-----
2 498.600	V	-----	53.00	-5.20	-----	47.80	-----	54.00	-----	6.20

Remarks
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

5. APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2022-05-04	2023-05-04
2	Bilog Antenna	TESEQ	CBL6111D	60654	2021-09-03	2023-09-03
3	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2022-04-15	2024-04-15
4	Attenuator	PASTERNACK	PE7AP006-06	L2021050400 0023	2022-08-10	2023-08-10
5	AMPLIFIER	SONOMA	310N	411011	2022-08-10	2023-08-10
6	Spectrum Analyzer	R&S	FSV40	101574	2023-01-11	2024-01-11
7	PRE AMPLIFIER	HP	8449B	3008A00620	2022-05-10	2023-05-10
8	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2022-04-14	2023-04-14
9	Horn Antenna	SCHWARZBECK	BBHA9170	01153	2022-10-31	2023-10-31
10	Band Reject Filter	Micro Tronics	BRM50702	G444	2022-10-13	2023-10-13
11	Low Noise Amplifier	TESTEK	TK-PA1840H	210124-L	2022-11-09	2023-11-09

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (Conducted)	Junkosha Inc.	MWX221	2008S240	2022-11-01
2	RF Cable (9kHz-1GHz Radiated)	Canare Corporation	L-5D2W	N/A	2022-11-10
3	RF Cable (9kHz-1GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2022-11-10
4	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2022-04-14
5	RF Cable (1GHz-18GHz Radiated)	Rosenberger	NONE	1520.9927.00	2022-04-14
6	RF Cable (1GHz-18GHz Radiated)	Sensorview Co., LTD	9S18	TPC2204060007	2022-04-14
7	RF Cable (18GHz-26.5GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2372/2	2022-04-14
8	RF Cable (18GHz-26.5GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY073/2	2022-04-14
9	RF Cable (18GHz-26.5GHz Radiated)	Sensorview Co., LTD	9S40	TP210713-001	2022-04-14

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