TEST REPORT

KCTL Inc.
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Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
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1. Client

- Name : SUPREMA INC
- Address : 17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
- Date of Receipt : 2020-07-01

2. Use of Report : Certification

3. Name of Product / Model : BioEntry W2 / BEW2-OAPB

4. Manufacturer / Country of Origin : SUPREMA INC / Korea

5. FCC ID : TKWBEW2-OAPB

6. IC Certificate No. : 23080-BEW2OAPB

7. Date of Test : 2020-09-14 to 2020-09-23

8. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

9. Test method used : FCC Part 15 Subpart C, 15.209
RSS-210 Issue 10 December 2019
RSS-Gen Issue 5 March 2019

10. Test Results : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Jungwon Seo (Signature)	Name : Heesu Ahn (Signature)

2020-10-27

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2020-09-29	Originally issued	-
2020-10-27	Updated	5, 10,11,15,16

Note. The report No. KR20-SRF0250 is superseded by the report No. KR20-SRF0250-A.

General remarks for test reports

Nothing significant to report.

CONTENTS

1. General information

Client	:	SUPREMA INC
Address	:	17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
Manufacturer	:	SUPREMA INC
Address	:	17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132
		VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
		Industry Canada Registration No. : 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	BioEntry W2
Model	:	BEW2-OAPB
Derivative model	:	BEW2-ODPB , BEW2-OHPB, BC-LRE-BFI
Frequency range	:	2 402 ㎒ ~ 2 480 ㎒ (Bluetooth Low Energy)
		13.56 ㎒ (NFC)
		125 ㎑ (RFID)
Modulation technique	:	GFSK(Bluetooth Low Energy), ASK (NFC, RFID)
Number of channels	:	40 ch (Bluetooth Low Energy), 1 ch (NFC)
Power source	:	DC 12 Ⅴ, PoE 48 Ⅴ
Antenna specification	:	PCB Loop Antenna (NFC)
		PCB Pattern Antenna (Bluetooth Low Energy)
		Coil Antenna (RFID)
Antenna gain	:	3.00 ㏈i (Bluetooth Low Energy)
Software version	:	V1.6.0
Hardware version	:	V1.0
Test device serial No.	:	N/A
Operation temperature	:	-20 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	Note.
GIGABIT PoE SWITCH	IDIS Co., Ltd.	DH2212PF	14377716100013	100-240 V	N/A

2.2. Information about derivative model

The difference between basic model and derivative models is:

- BEW2-ODPB : Removed SAM IC
- BEW2-OHPB : Removed SAM IC, add HID s/w license.
- BC-LRE-BFI: BEW2-OAPB with customer's mark & label

Each models are the same functionality except for the SAM function.

2.3. Frequency/channel operations

This device contains the following capabilities:
NFC, 125 ㎑ (RFID), Bluetooth Low Energy

Ch.	Frequency (㎑)
01	125

Table 2.3.1. RFID

3. Antenna requirement

Requirement of FCC part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached Coil Antenna (internal antenna) on board.

4. Summary of tests

FCC Part section (s)	IC Rule reference	Parameter	Test mode	Test results
15.209	RSS-210 Issue 9 (8.9)	Field Strength of Fundamental and Spurious Emission	Radiated	Pass
2.1049	-	20㏈ Bandwidth	Conducted	Pass
-	RSS-Gen Issue 5 (6.7)	Occupied Bandwidth		Pass
15.203	RSS-Gen Issue 5 (6.8)	Antenna requirement		Pass
15.207	RSS-Gen Issue 5 (8.8)	AC Conducted Emission		Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
3. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
5. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.
6. The radiated test was performed with and without passive tag. The test results shown in the following sections represent the worst case emissions.
   - Worst Case : Without passive tag

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

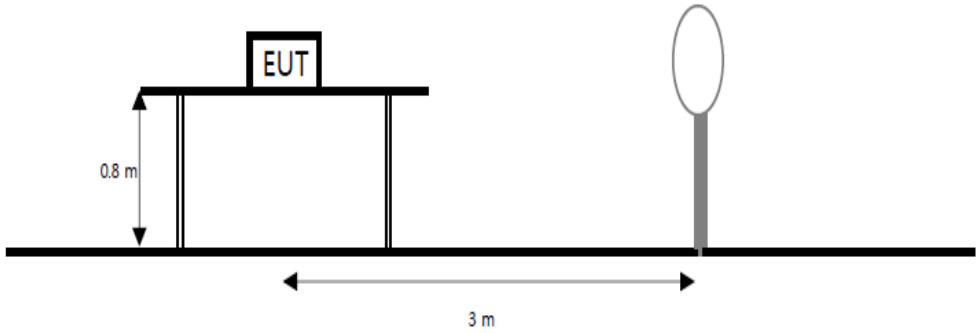
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒	2.30 ㏈

6. Test results

6.1. Field Strength of Fundamental and Spurious Emission

Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



Limit

According to section 15.209(a), RSS-Gen(8.9) 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 (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

Test procedure

ANSI C63.10-2013

Test settings

Test Procedures for emission from 9 ㎑ to 30 ㎒

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.

c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.

d. The test-receiver system was set to Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

e. Below 30 ㎒ frequency range, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported and the worse orientations of Face-on and Face-off were set for final test.

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
2. The test measurement distance is 3 meter
3. Limit (㏈(㎶/m)) = For 0.009 ㎒ - 0.490 ㎒, 20*log(2 400/F(㎑)) ㏈(㎶/m)
   For 0.490 ㎒ - 1.705 ㎒, 20*log(24 000/F(㎑)) ㏈(㎶/m)
   For 1.705 ㎒ - 30 ㎒, 20*log(30) = 29.54 ㏈(㎶/m)

Test results

Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒

12 V

[Face-on]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.131	84.70	PK	19.9	-32.4	-80.0	-92.5	-7.83	25.24	33.07
0.131	74.90	AV	19.9	-32.4	-80.0	-92.5	-17.63	25.24	42.87
0.24	52.60	AV	19.9	-32.4	-80.0	-92.5	-39.93	19.98	59.91
0.654	50.80	QK	19.9	-32.3	-40.0	-52.4	-1.62	31.27	32.89
20.004	39.60	QK	20.6	-31.0	-40.0	-50.4	-10.79	29.56	40.35

[Face-off]

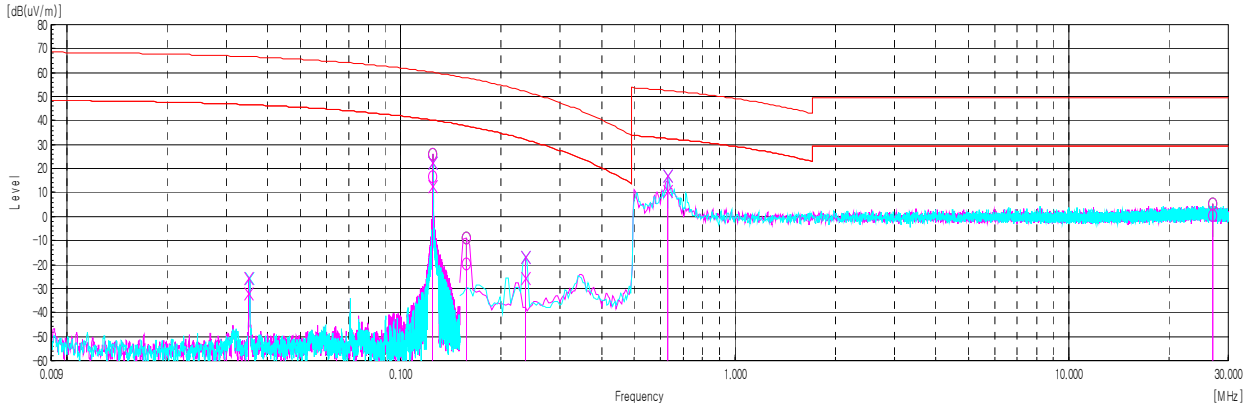
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.131	84.90	PK	19.9	-32.4	-80.0	-92.5	-7.63	25.24	32.87
0.131	75.50	AV	19.9	-32.4	-80.0	-92.5	-17.03	25.24	42.27
0.393	48.40	AV	19.9	-32.4	-80.0	-92.5	-44.09	15.69	59.78
0.654	46.10	QK	19.9	-32.3	-40.0	-52.4	-6.32	31.27	37.59
4.422	40.40	QK	20.1	-31.9	-40.0	-51.8	-11.44	29.56	41.00

Note.

1) Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)

2) -80 is distance factor = 40*log(3/300), -40 is distance factor = 40*log(3/30)

3) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω.
For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit



48 V

[Face-on]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.131	84.10	PK	19.9	-32.4	-80.0	-92.5	-8.43	25.24	33.67
0.131	73.90	AV	19.9	-32.4	-80.0	-92.5	-18.63	25.24	43.87
0.262	42.60	AV	19.9	-32.4	-80.0	-92.5	-49.92	19.22	69.14
0.878	41.80	QK	19.9	-32.3	-40.0	-52.4	-10.58	28.71	39.29
2.437	40.50	QK	20.0	-32.1	-40.0	-52.0	-11.54	29.56	41.10

[Face-off]

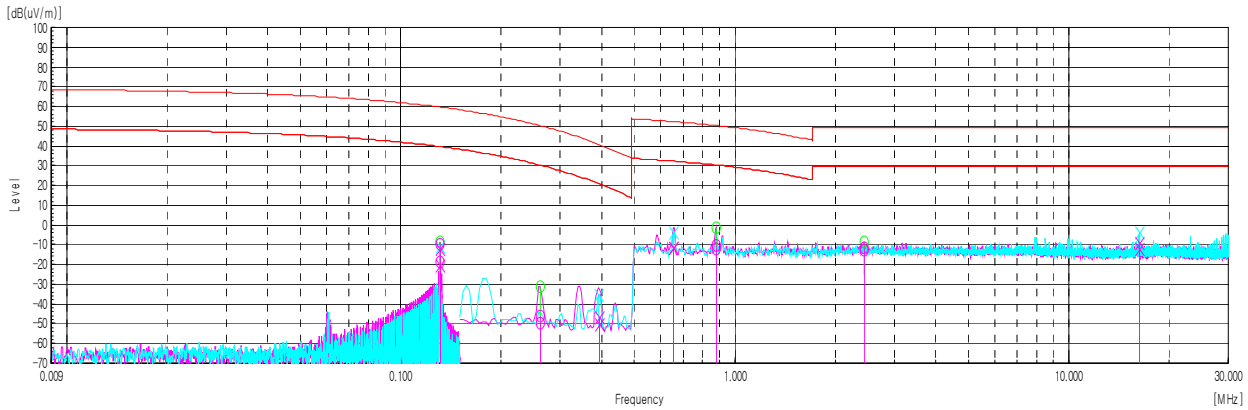
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.131	81.50	PK	19.9	-32.4	-80.0	-92.5	-11.03	25.24	36.27
0.131	72.10	AV	19.9	-32.4	-80.0	-92.5	-20.43	25.24	45.67
0.393	42.10	AV	19.9	-32.4	-80.0	-92.5	-50.39	15.69	66.08
0.654	41.10	QK	19.9	-32.3	-40.0	-52.4	-11.32	31.27	42.59
16.228	42.10	QK	20.3	-31.2	-40.0	-50.9	-8.82	29.56	38.38

Note.

1) Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)

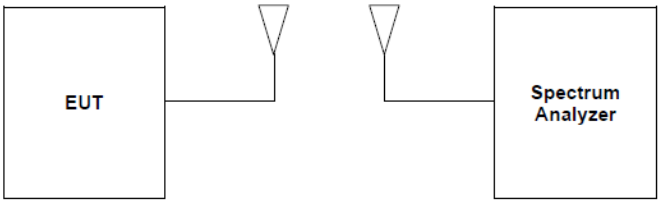
2) -80 is distance factor = 40*log(3/300), -40 is distance factor = 40*log(3/30)

3) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω.
For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit



6.2. Occupied Bandwidth

Test setup



Limit

For reporting purpose only

Test settings

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

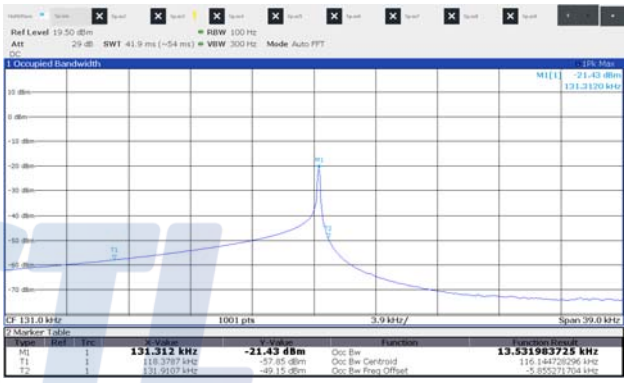
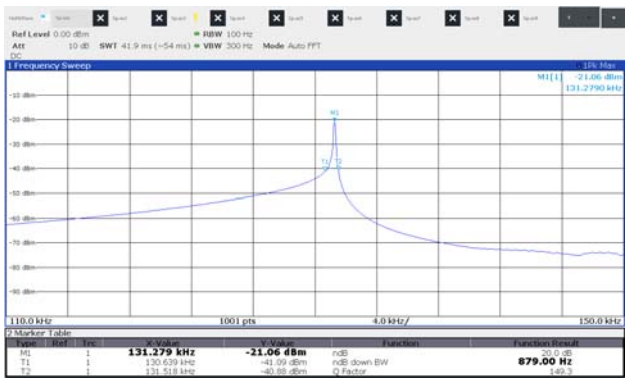
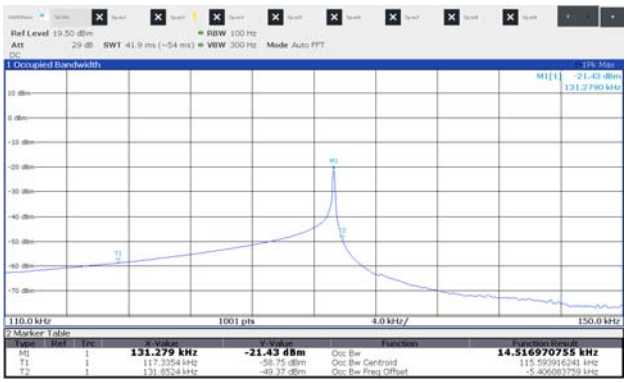
The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

Test results

Frequency (㎑)		20㏈ Bandwidth (㎑)	Occupied Bandwidth (㎑)	Limit
125	12 V	0.84	13.53	Reporting purpose only
	48 V	0.88	14.52	

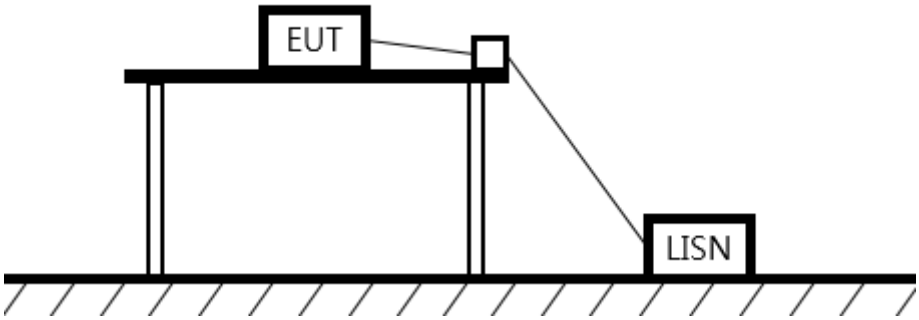
Test Plots

12 V	
20㏈ Bandwidth	**Occupied Bandwidth**
125 ㎑	125 ㎑
	
48 V	
20㏈ Bandwidth	**Occupied Bandwidth**
125 ㎑	125 ㎑
	

Note. Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

6.3. AC Conducted emission

Test setup



Limit

According to 15.207(a), RSS-Gen(8.8) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

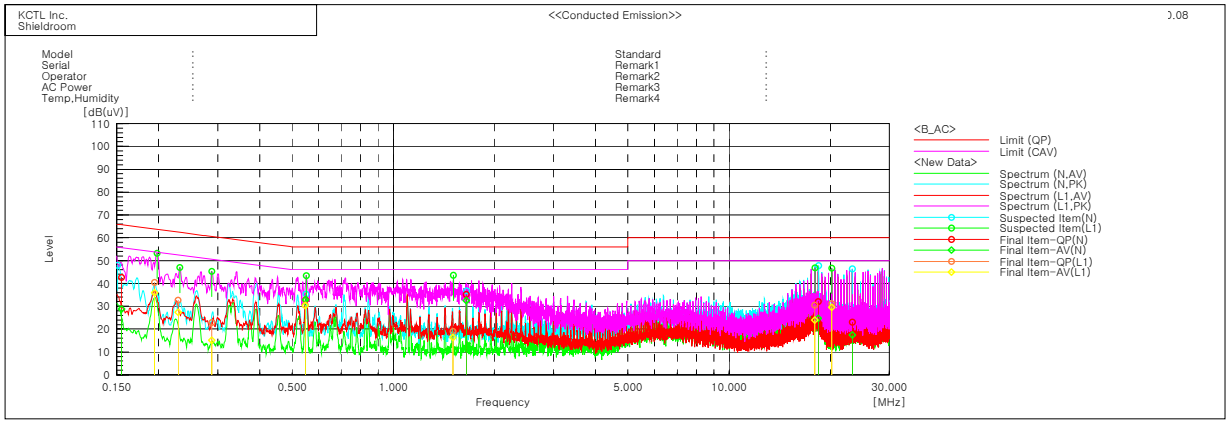
Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity ㅡ Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results

48 V



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.15529	32.8	18.9	9.9	42.7	28.8	65.7	55.7	23.0	26.9
2	0.54789	23.0	23.0	9.8	32.8	32.8	56.0	46.0	23.2	13.2
3	1.64938	25.5	22.8	9.7	35.2	32.5	56.0	46.0	20.8	13.5
4	18.4488	22.2	14.9	9.9	32.1	24.8	60.0	50.0	27.9	25.2
5	23.28416	13.1	7.6	9.9	23.0	17.5	60.0	50.0	37.0	32.5

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.19483	30.4	26.0	10.0	40.4	36.0	63.8	53.8	23.4	17.8
2	0.22846	22.9	17.6	9.7	32.6	27.3	62.5	52.5	29.9	25.2
3	0.28808	13.2	5.4	9.7	22.9	15.1	60.6	50.6	37.7	35.5
4	0.54626	20.6	20.5	9.9	30.5	30.4	56.0	46.0	25.5	15.6
5	1.50666	9.3	6.7	9.7	19.0	16.4	56.0	46.0	37.0	29.6
6	18.00636	20.5	14.0	10.0	30.5	24.0	60.0	50.0	29.5	26.0
7	20.2025	21.0	19.4	10.1	31.1	29.5	60.0	50.0	28.9	20.5

Note. 12 V mode test is not applicable because the EUT in 12 V mode only connects DC power line.

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Vector Signal Generator	R&S	SMBV100A	257566	21.07.13
Signal Generator	R&S	SMB100A	176206	21.01.21
Spectrum Analyzer	R&S	FSW50	101013	21.07.13
DC Power Supply	AGILENT	E3632A	MY40008800	21.07.28
Temp & Humid Chamber	Myeongseong R&P	CTHC-50P-DT	20150824-2	21.07.28
Amplifier	L-3 Narda-MITEQ	AFS5-00101800-25-S-5	2054570	21.05.22
EMI TEST RECIEVER	R&S	ESCI7	100732	21.03.04
Bilog Antenna	Teseq GmbH	CBL6112D	37876	22.09.02
Loop Antenna	R&S	HFH2-Z2	100355	22.08.21
Attenuator	AGILENT	8491B-006	MY37270292	21.05.15
Amplifier	SONOMA	310N	284608	21.08.20
Antenna Mast	Innco Systems	MA4000-EP	303	N/A
Turn Table	Innco Systems	DT2000	79	N/A
E&H Field Probe	narda	EHP-200A	170WX81015	21.02.14 21.02.19
DC Power Supply	AGILENT	E3632A	MY40016393	21.07.28
TWO-LINE V - NETWORK	R&S	ENV216	101584	21.04.06
EMI TEST RECEIVER	R&S	ESCI	101408	21.08.20

End of test report