TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0185 Page (1) of (28)	eurofins | KCTL

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 : 2023-05-01

2. Use of Report : FCC Class II permissive change

3. Name of Product / Model : BioStation3 / BS3-DB

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

5. FCC ID : TKWBS3-DB

6. IC Certificate No. : 23080-BS3DB

7. Date of Test : 2023-06-07 to 2023-06-27

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : FCC Part 15 Subpart C, 15.225
RSS-210 Issue 10 April 2020
RSS-Gen Issue 5 February 2021

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

Affirmation	Tested by Name : Minki Kim (Signature)	Technical Manager Name : Heesu Ahn (Signature)

2023-07-13

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-07-13	Originally issued	-

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

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	:	Eurofins KCTL Co.,Ltd.
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
		CAB Identifier: KR0040, ISED Number: 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	BioStation3
Model	:	BS3-DB
Frequency range	:	13.56 ㎒(NFC)
		125 ㎑(RFID)
		2 402 ㎒ ~ 2 480 ㎒(Bluetooth Low Energy)
Modulation technique	:	ASK(NFC,RFID), GFSK(Bluetooth Low Energy)
Number of channels	:	40 ch(Bluetooth Low Energy), 1 ch(NFC, RFID)
Power source	:	DC 12 V, DC 24 V
Antenna specification	:	PCB Loop antenna(NFC)
		Coil antenna(RFID)
		PCB antenna(Bluetooth Low Energy)
Antenna gain	:	-2.42 ㏈i(Bluetooth Low Energy)
Software version	:	1.0.0
Hardware version	:	1.0.0
Operation temperature	:	- 20 ℃ ~ 50 ℃
Test device serial No.	:	Conducted : 538204715
		Radiated : 538204712

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
N/A	-	-	-	-

2.2. Frequency/channel operations

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

Frequency (㎒)
13.56

Table 2.2.1. NFC mode

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 ㏈i) 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 ㏈i) and the required impedance for each antenna type.

-The transmitter has permanently attached PCB Loop antenna (internal antenna) on board.

4. Summary of tests

FCC Part Section(s)	IC Rule Reference	Parameter	Test Condition	Test Results
15.225(a)	RSS-210 B.6 (Ⅰ)	In-band Fundamental Emission	Radiated	Pass
15.225(b), (c)	RSS-210 B.6 (Ⅱ), (Ⅲ)	In-band Spurious Emission		Pass
15.225(d) 15.209	RSS-210 B.6 (Ⅳ) RSS-Gen Issue 9 (8.9)	Out-of–band Spurious Emission		Pass
15.225(e)	RSS-210 B.6 (b)	Frequency Stability Tolerance	Conducted	Pass
15.215(c)	-	20 ㏈ Bandwidth		Pass
-	RSS-Gen Issue 5 (6.7)	Occupied Bandwidth		Pass
15.207(a)	RSS-Gen Issue 5 (8.8)	AC Conducted emissions		Pass

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. 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 based on KDB 414788.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z It was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation
4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
5. 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.

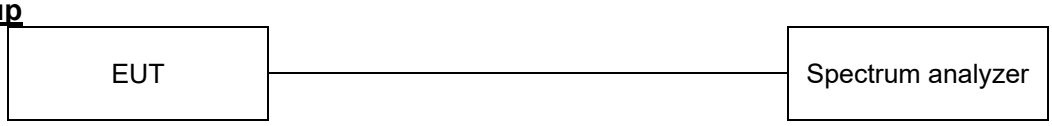
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine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

Parameter	Expanded Uncertainty (±)	
Radiated Emissions	Below 30 ㎒	2.3 ㏈
	30 ㎒ to 1 000 ㎒	2.5 ㏈
	1 000 ㎒ to 18 000 ㎒	4.7 ㏈
	Above 18 000 ㎒	4.8 ㏈
Conducted Emissions	150 ㎑ to 30 ㎒	2.7 ㏈

6. Test results

6.1. 20 dB Bandwidth & 99% Bandwidth

Test setup



Limit

According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

According to RSS-Gen Issue 5 (6.7) The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

Test procedure

ANSI C63.10-2013 - Section 6.9.2

Test settings

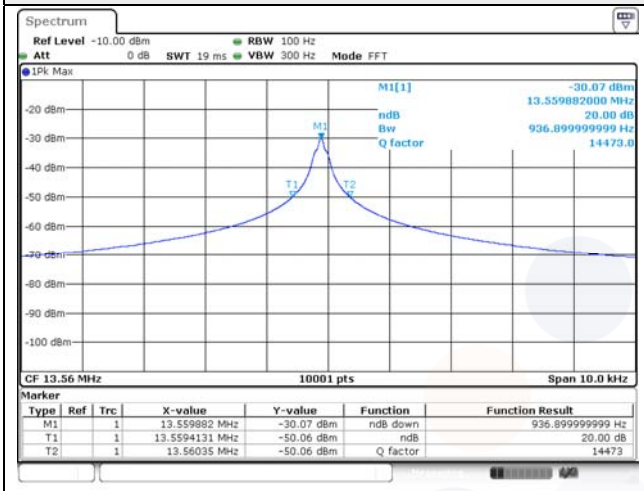
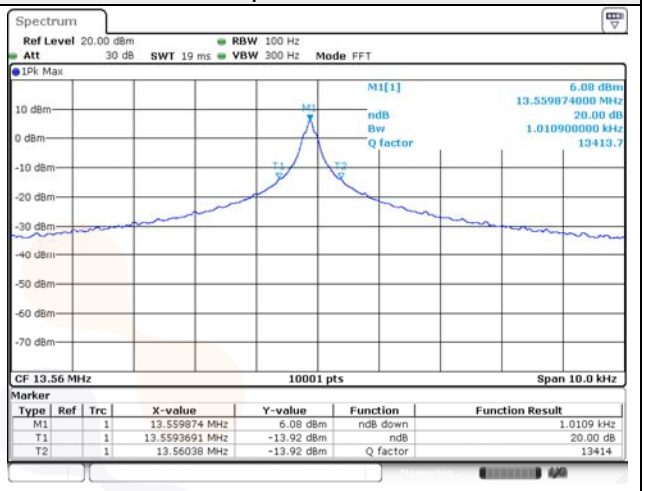
The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are −6 dB, −20 dB, and −26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by "−xx dB." The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the "−xx dB" bandwidth; other requirements might specify that the "−xx dB" bandwidth be entirely contained within the authorized or designated frequency band.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
b) Span: Two times and five times the OBW.
c) RBW = 1 % to 5 % of the OBW and VBW ≥ 3 x RBW
d) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
f) Detector: peak
g) Trace mode: max hold.
h) Allow the trace to stabilize.
i) Determine the "−xx dB down amplitude" using ((reference value) − xx). Alternatively, this calculation may be made by using the marker-delta function of the instrument.
j) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j)
k) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "−xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

Test results

[DC 12 V]

Frequency [㎒]	20 dB Bandwidth [㎒]		Limit [㎒]	20 dB Bandwidth [㎑]	Occupied Bandwidth (99 % BW) [㎑]
13.56	Lowest Frequency	13.559 4	13.110 0	0.94	1.01
	Highest Frequency	13.560 4	14.010 0		

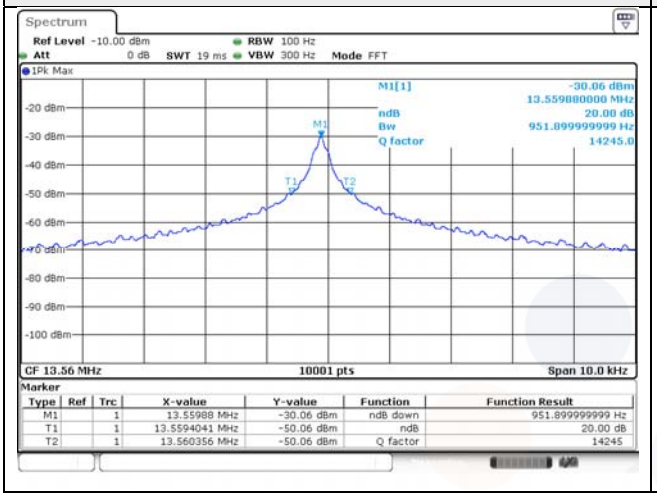
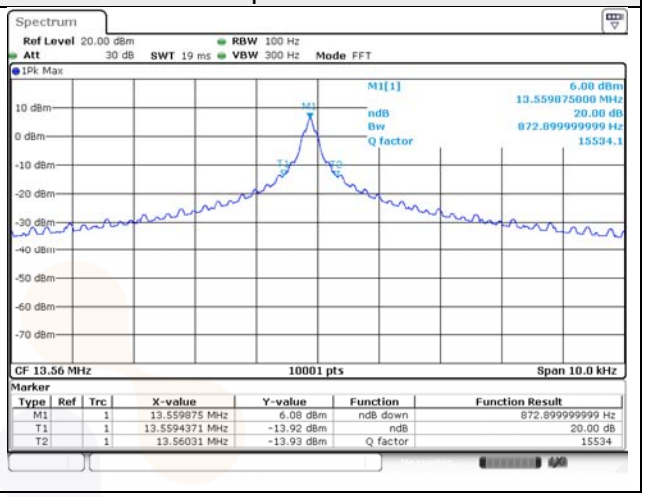
20 dB Bandwidth	Occupied Bandwidth
	

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

[DC 24 V]

Frequency [㎒]	20 dB Bandwidth [㎒]		Limit [㎒]	20 dB Bandwidth [㎑]	Occupied Bandwidth (99 % BW) [㎑]
13.56	Lowest Frequency	13.559 4	13.110 0	0.95	0.87
	Highest Frequency	13.560 4	14.010 0		

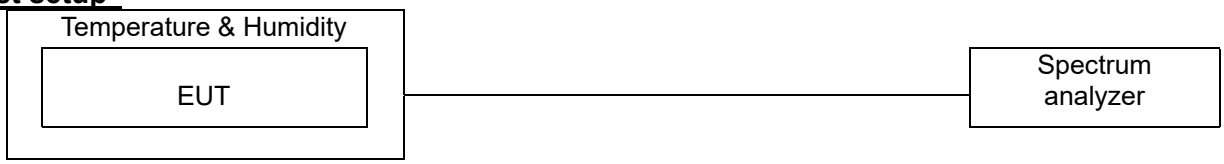
20 dB Bandwidth	Occupied Bandwidth
	

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

6.2. Frequency tolerance

Test setup



Limit

According to §15.225 (e), RSS-210 B.6.(b) The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test procedure

ANSI C63.10-2013 - Section 6.8.1

Test results

[DC 12 V]

Voltage	Voltage	TEMP	Maintaining Time	Measure Frequency	Frequency Deviation	Deviation
[%]	[V]	[℃]		[㎐]	[㎐]	[%]
100	12.00	20(Ref.)	Startup	13 559 613	386.8	-0.002 85
			2 minutes	13 559 596	404.0	-0.002 98
			5 minutes	13 559 600	400.2	-0.002 95
			10 minutes	13 559 624	376.0	-0.002 77
		-20	Startup	13 559 791	208.7	-0.001 54
			2 minutes	13 559 800	200.0	-0.001 48
			5 minutes	13 559 819	181.0	-0.001 34
			10 minutes	13 559 803	197.5	-0.001 46
		-10	Startup	13 559 794	206.5	-0.001 52
			2 minutes	13 559 803	196.8	-0.001 45
			5 minutes	13 559 805	194.7	-0.001 44
			10 minutes	13 559 810	190.0	-0.001 40
		0	Startup	13 559 820	180.0	-0.001 33
			2 minutes	13 559 804	195.7	-0.001 44
			5 minutes	13 559 804	195.8	-0.001 44
			10 minutes	13 559 807	193.2	-0.001 43
		10	Startup	13 559 724	276.4	-0.002 04
			2 minutes	13 559 719	281.4	-0.002 08
			5 minutes	13 559 721	278.8	-0.002 06
			10 minutes	13 559 724	276.1	-0.002 04
		25	Startup	13 559 730	270.0	-0.001 99
			2 minutes	13 559 729	271.1	-0.002 00
			5 minutes	13 559 720	279.9	-0.002 06
			10 minutes	13 559 737	263.1	-0.001 94
		30	Startup	13 559 728	272.3	-0.002 01
			2 minutes	13 559 724	276.1	-0.002 04
			5 minutes	13 559 747	252.9	-0.001 87
			10 minutes	13 559 727	273.3	-0.002 02
		40	Startup	13 559 721	279.1	-0.002 06
			2 minutes	13 559 726	273.7	-0.002 02
			5 minutes	13 559 727	273.3	-0.002 02
			10 minutes	13 559 703	297.0	-0.002 19
		50	Startup	13 559 391	609.2	-0.004 49
			2 minutes	13 559 424	575.9	-0.004 25
			5 minutes	13 559 405	595.2	-0.004 39
			10 minutes	13 559 468	532.2	-0.003 93
85	10.20	20	Startup	13 559 624	376.4	-0.002 78
			2 minutes	13 559 603	396.9	-0.002 93
			5 minutes	13 559 595	404.9	-0.002 99
			10 minutes	13 559 620	380.3	-0.002 81
115	13.80	20	Startup	13 559 602	397.8	-0.002 93
			2 minutes	13 559 603	397.1	-0.002 93
			5 minutes	13 559 591	408.9	-0.003 02
			10 minutes	13 559 594	405.9	-0.002 99

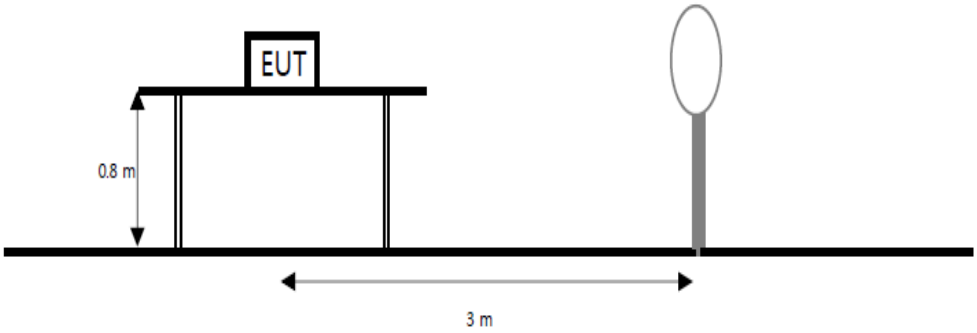
[DC 24 V]

Voltage	Voltage	TEMP	Maintaining Time	Measure Frequency	Frequency Deviation	Deviation
[%]	[V]	[℃]		[㎐]	[㎐]	[%]
100	24.00	20(Ref.)	Startup	13 559 619	381.1	-0.002 81
			2 minutes	13 559 602	397.9	-0.002 93
			5 minutes	13 559 606	393.9	-0.002 91
			10 minutes	13 559 630	370.1	-0.002 73
		-20	Startup	13 559 797	202.8	-0.001 50
			2 minutes	13 559 806	193.7	-0.001 43
			5 minutes	13 559 825	174.9	-0.001 29
			10 minutes	13 559 810	190.4	-0.001 40
		-10	Startup	13 559 798	201.7	-0.001 49
			2 minutes	13 559 809	191.5	-0.001 41
			5 minutes	13 559 811	189.3	-0.001 40
			10 minutes	13 559 816	183.9	-0.001 36
		0	Startup	13 559 826	174.1	-0.001 28
			2 minutes	13 559 810	190.4	-0.001 40
			5 minutes	13 559 810	189.9	-0.001 40
			10 minutes	13 559 813	186.8	-0.001 38
		10	Startup	13 559 730	269.6	-0.001 99
			2 minutes	13 559 726	274.2	-0.002 02
			5 minutes	13 559 726	273.6	-0.002 02
			10 minutes	13 559 730	270.1	-0.001 99
		25	Startup	13 559 736	264.0	-0.001 95
			2 minutes	13 559 735	265.1	-0.001 96
			5 minutes	13 559 726	274.1	-0.002 02
			10 minutes	13 559 743	256.9	-0.001 90
		30	Startup	13 559 734	265.9	-0.001 96
			2 minutes	13 559 730	269.9	-0.001 99
			5 minutes	13 559 753	247.1	-0.001 82
			10 minutes	13 559 733	266.8	-0.001 97
		40	Startup	13 559 727	272.6	-0.002 01
			2 minutes	13 559 732	267.8	-0.001 98
			5 minutes	13 559 734	266.5	-0.001 97
			10 minutes	13 559 709	290.7	-0.002 14
		50	Startup	13 559 397	602.9	-0.004 45
			2 minutes	13 559 430	569.8	-0.004 20
			5 minutes	13 559 411	588.7	-0.004 34
			10 minutes	13 559 473	527.2	-0.003 89
85	20.40	20	Startup	13 559 629	371.2	-0.002 74
			2 minutes	13 559 609	391.0	-0.002 88
			5 minutes	13 559 601	399.3	-0.002 95
			10 minutes	13 559 626	373.9	-0.002 76
115	27.60	20	Startup	13 559 608	392.1	-0.002 89
			2 minutes	13 559 609	391.1	-0.002 88
			5 minutes	13 559 597	403.1	-0.002 97
			10 minutes	13 559 600	399.6	-0.002 95

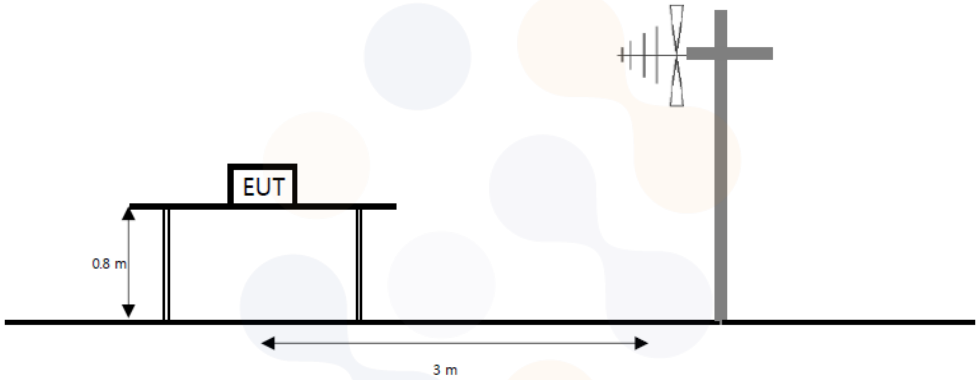
6.3. Radiated spurious emissions

Test setup

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



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



Limit

15.225 (a), RSS-210 B.6.(a).(ⅰ) The field strength of any emission within the band 13.553-13.567 ㎒ shall not exceed 15, 848 microvolts/meter at 30 meters.

15.225 (b), RSS-210 B.6.(a).(ⅱ) With in the bands 13.410-13.553 ㎒ and 13.567-13.710 ㎒, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c), RSS-210 B.6 (a).(ⅲ) With in the bands 13.110-13.410 ㎒ and 13.710-14.010 ㎒, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

15.225 (d), RSS-210 B.6.(a).(ⅳ) RSS-Gen Issue 9 (8.9) The Field Strength of any emissions appearing outside of the 13.110-14.010 ㎒ band shall not exceed the general radiated emission limits in 15.209.

Frequency (㎒)	Field Strength (㎶/m)	Measurement distance (meters)
0.009-0.490	2400/F(㎑)	300
0.490-1.705	24000/F(㎑)	30
1.705-30.0	30(29.54 dB㎶/m)	30
30.0-88.0	100(40 dB㎶/m)	3
88-216	150(43.5 dB㎶/m)	3
216-960	200 (46 dB㎶/m)	3
Above 960	500 (53.98 dB㎶/m)	3

Test procedure

ANSI C63.10-2013 - Section 6.4, 6.5

Test settings

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ 3 x RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Table. RBW as a function of frequency

Frequency	RBW
9 ㎑ to 150 ㎑	200 ㎐ to 300 ㎐
0.15 ㎒ to 30 ㎒	9 ㎑ to 10 ㎑
30 ㎒ to 1 000 ㎒	100 ㎑ to 120 ㎑
> 1 000 ㎒	1 ㎒

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in § 15.31(f)(2). Extrapolation Factor = 40 log10(30/3) = 40 dB.
3. (dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) - or F_d(dB)
4. Result = Reading + Cable loss + Amp gain + Ant. factor - Distance factor
5. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
6. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.
7. 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.
8. Face-on = Parallel, Face-off = Perpendicular

[DC 12 V]

Test results for fundamental

15.225 (a), RSS-210 B.6.(a).(i) 13.553-13.567 ㎒

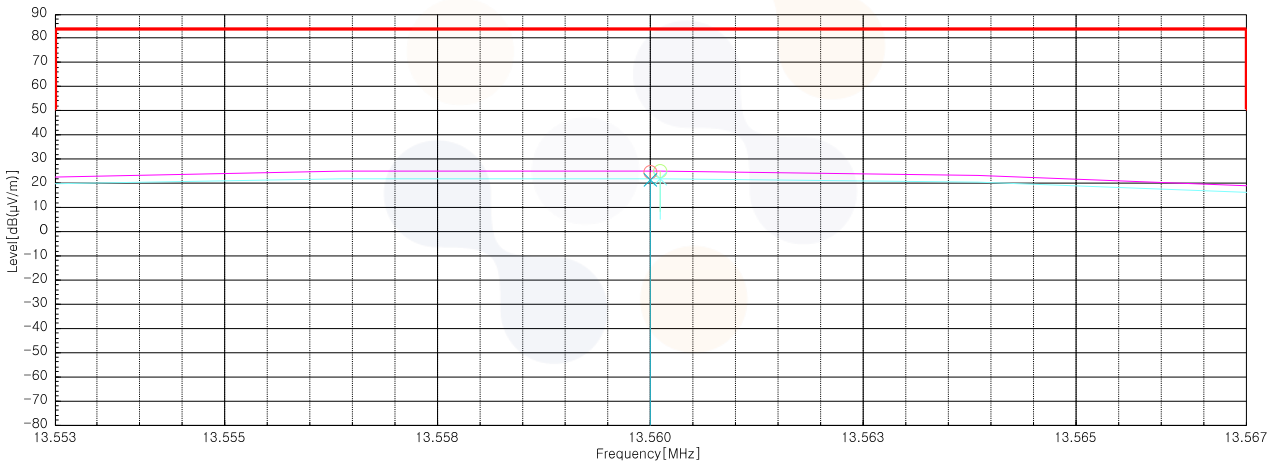
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.56	76.50	20.31	-31.13	40.00	25.68	84.00	58.32

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.56	73.30	20.31	-31.13	40.00	22.48	84.00	61.52

Face-on/Face-off



Test results for in-band & out-band (9 ㎑ to 30 ㎒)
15.225 (b,c), RSS-210 B.6.(a).(ii, iii) 13.110-14.010 ㎒

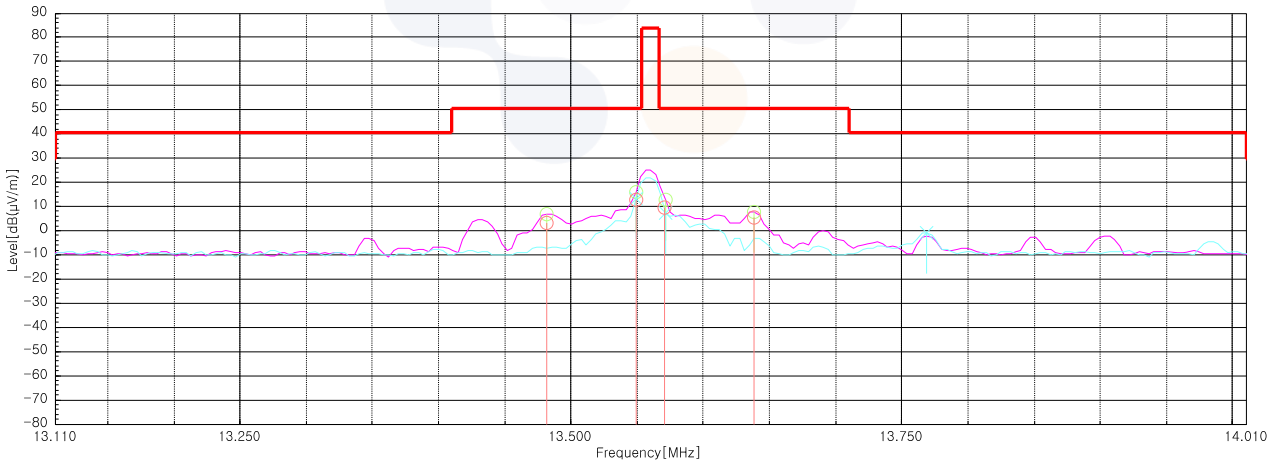
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.48	55.00	20.31	-31.13	40.00	4.18	50.50	46.32
13.55	64.80	20.31	-31.13	40.00	13.98	50.50	36.52
13.57	61.30	20.31	-31.13	40.00	10.48	50.50	40.02
13.64	57.40	20.32	-31.13	40.00	6.59	50.50	43.91

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.55	61.10	20.31	-31.13	40.00	10.28	50.50	40.22
13.57	57.60	20.31	-31.13	40.00	6.78	50.50	43.72
13.77	48.90	20.33	-31.14	40.00	-1.91	40.50	42.41

Face-on/Face-off



Note. 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 ㎑ resulted in a level of Y dB㎶/m, which is equivalent to Y-51.5 = Z dB㎂/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.

Test results (9 ㎑ to 30 ㎒)

15.225 (d), RSS-210 B.6.(a).(iv) 0.009-30 ㎒

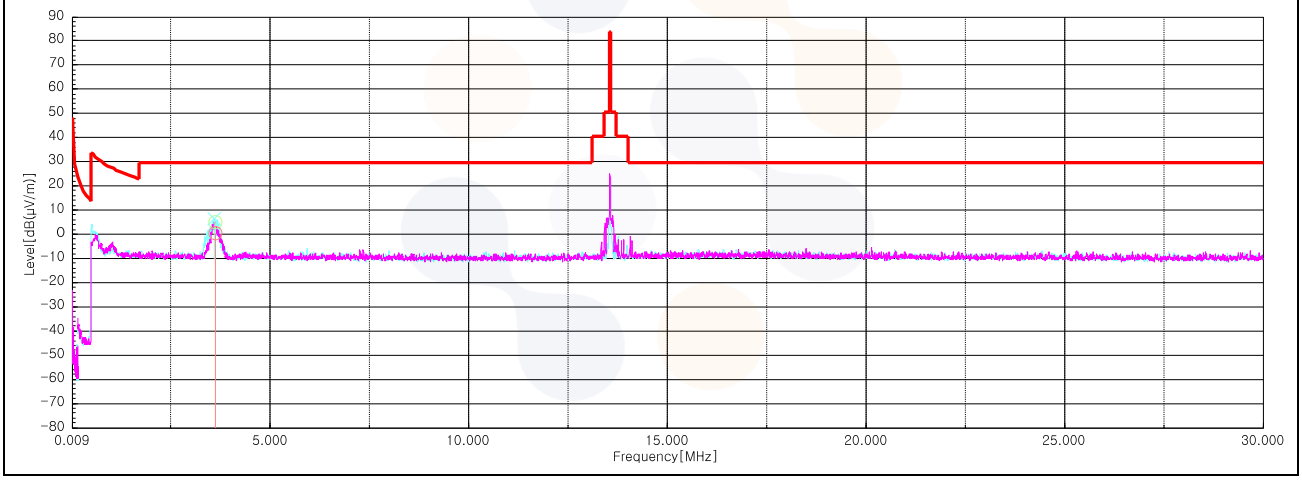
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
3.62	52.70	20.13	-31.72	40.00	1.11	29.54	28.43

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
3.60	55.80	20.13	-31.72	40.00	4.21	29.54	25.33

Face-on/Face-off



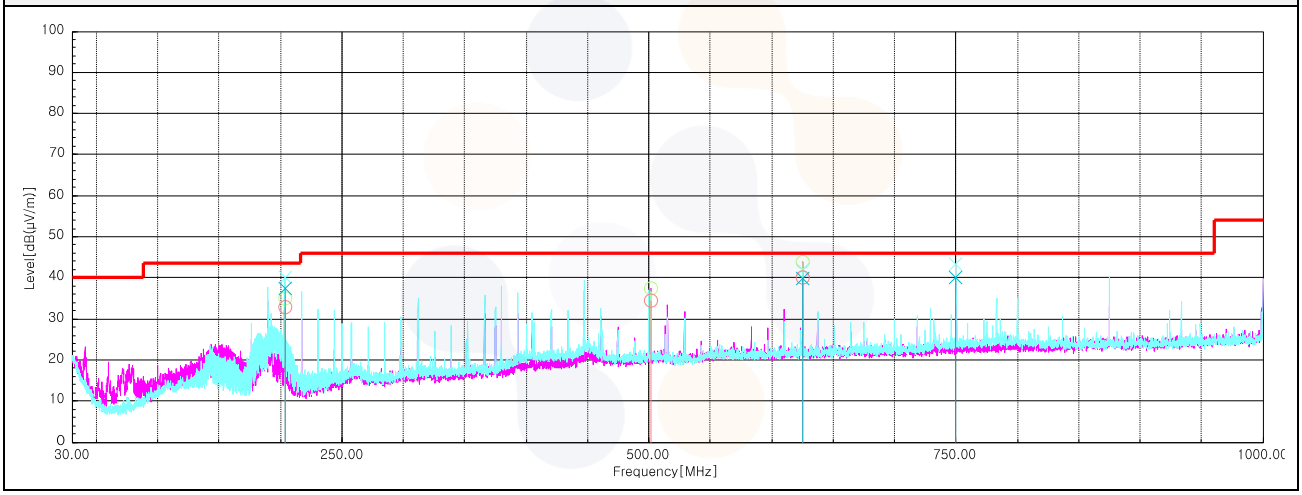
Note. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance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

Test results (Below 1 000 ㎒)

15.225 (d), RSS-210 B.6.(a).(iv) 30-1 000 ㎒

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
203.39	H	48.90	15.37	-30.26	-	34.01	43.50	9.49
203.39	V	53.40	15.37	-30.26	-	38.51	43.50	4.99
501.78	H	41.90	23.20	-29.85	-	35.25	46.00	10.75
624.97	H	46.20	24.55	-29.73	-	41.02	46.00	4.98
625.10	V	45.70	24.55	-29.73	-	40.52	46.00	5.48
750.10	V	44.60	25.50	-29.39	-	40.71	46.00	5.29

Horizontal/Vertical



[DC 24 V]

Test results for fundamental

15.225 (a), RSS-210 B.6.(a).(i) 13.553-13.567 ㎒

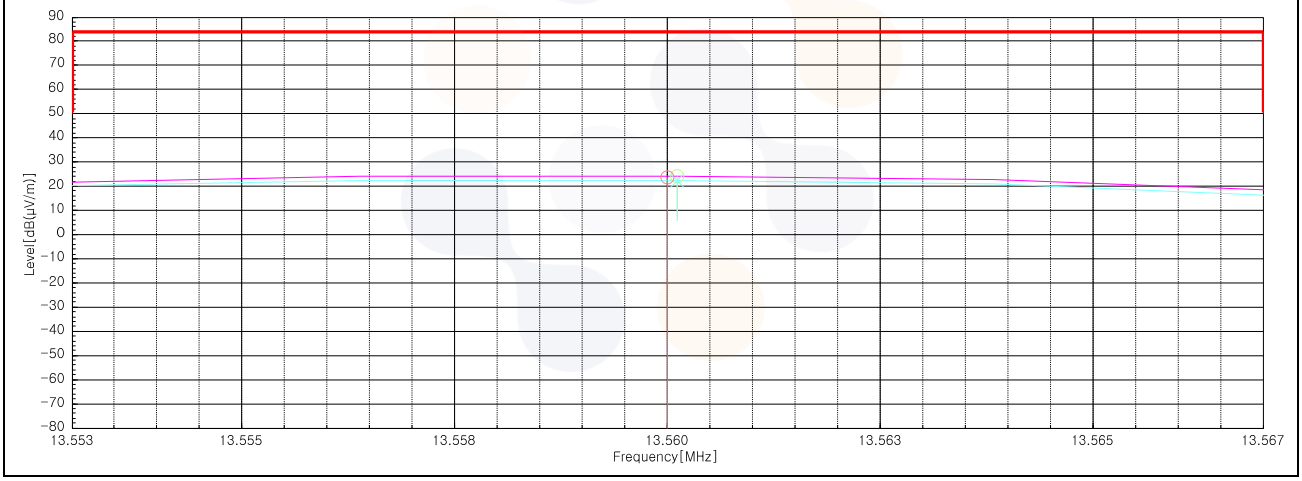
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.56	75.80	20.31	-31.13	40.00	24.98	84.00	59.02

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.56	74.00	20.31	-31.13	40.00	23.18	84.00	60.82

Face-on/Face-off



Test results for in-band & out-band (9 ㎑ to 30 ㎒)
15.225 (b,c), RSS-210 B.6.(a).(ii, iii) 13.110-14.010 ㎒

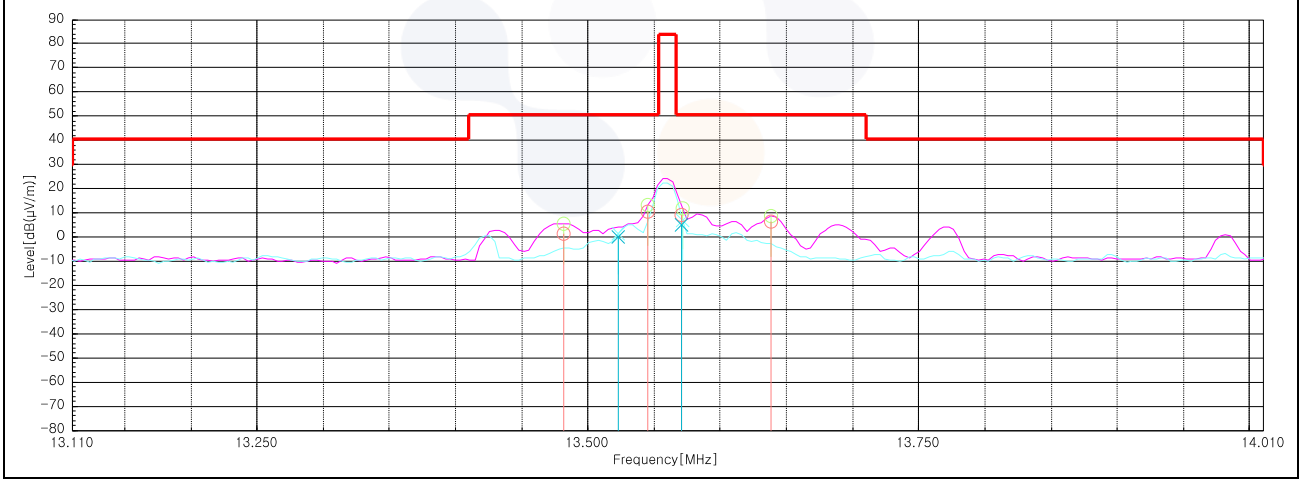
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.48	53.40	20.31	-31.13	40.00	2.58	50.50	47.92
13.55	62.50	20.31	-31.13	40.00	11.68	50.50	38.82
13.57	60.90	20.31	-31.13	40.00	10.08	50.50	40.42
13.64	58.20	20.32	-31.13	40.00	7.39	50.50	43.11

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.52	51.70	20.31	-31.13	40.00	0.88	50.50	49.62
13.57	56.90	20.31	-31.13	40.00	6.08	50.50	44.42

Face-on/Face-off



Note. 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 ㎑ resulted in a level of Y dB㎶/m, which is equivalent to Y-51.5 = Z dB㎂/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.

Test results (9 ㎑ to 30 ㎒)

15.225 (d), RSS-210 B.6.(a).(iv) 0.009-30 ㎒

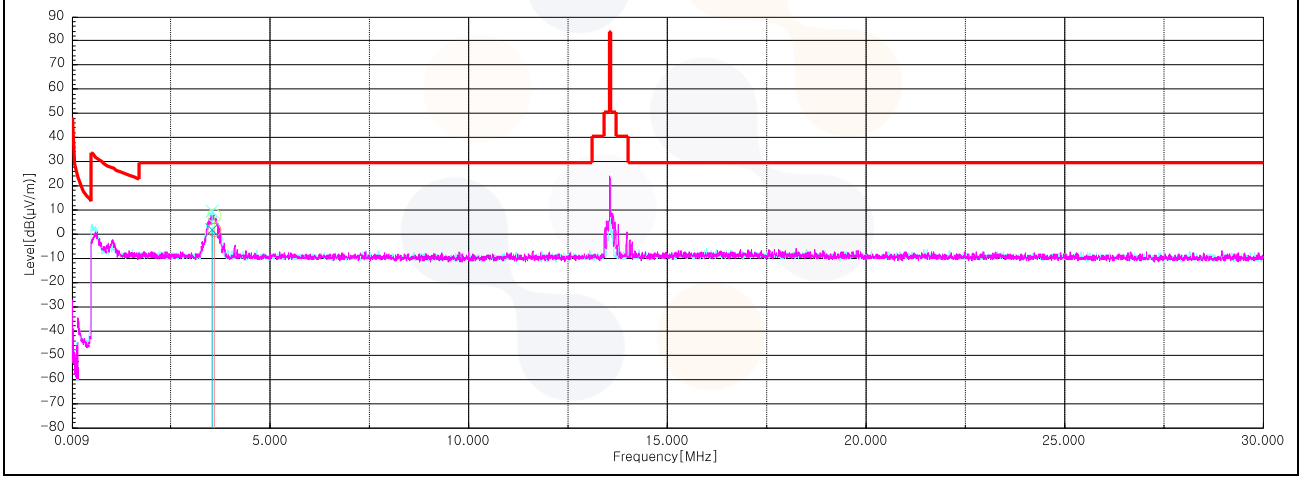
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
3.59	54.10	20.13	-31.72	40.00	2.51	29.54	27.03

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
3.55	53.90	20.13	-31.73	40.00	2.30	29.54	27.24

Face-on/Face-off



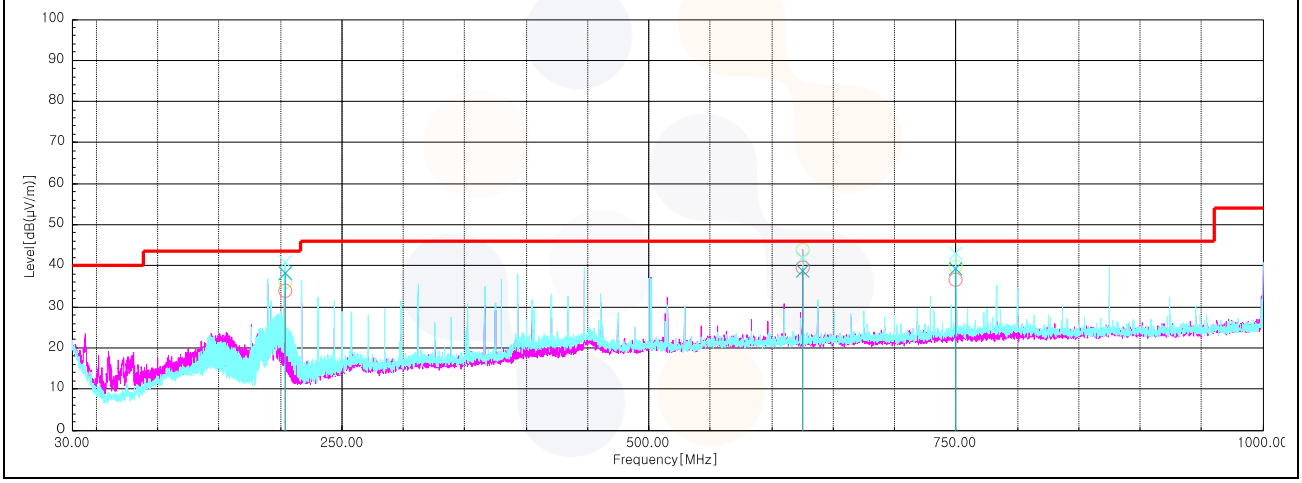
Note. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance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

Test results (Below 1 000 ㎒)

15.225 (d), RSS-210 B.6.(a).(iv) 30-1 000 ㎒

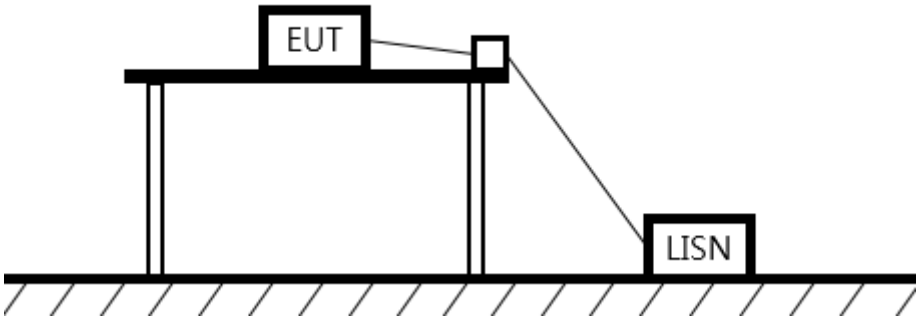
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
203.39	H	49.80	15.37	-30.26	-	34.91	43.50	8.59
203.39	V	54.20	15.37	-30.26	-	39.31	43.50	4.19
624.97	H	45.50	24.55	-29.73	-	40.32	46.00	5.68
624.97	V	44.70	24.55	-29.73	-	39.52	46.00	6.48
750.10	H	41.20	25.50	-29.39	-	37.31	46.00	8.69
750.10	V	43.90	25.50	-29.39	-	40.01	46.00	5.99

Horizontal/Vertical



6.4. AC Conducted emission

Test setup



Limit

According to 15.207(a) and 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

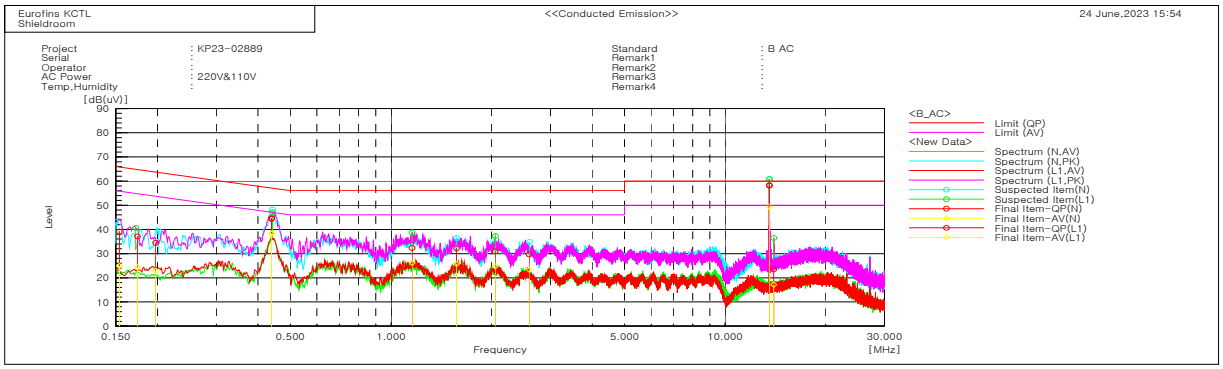
Measurement procedure

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 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

[DC 12 V]

[Tests with the antenna connected]



Final Result

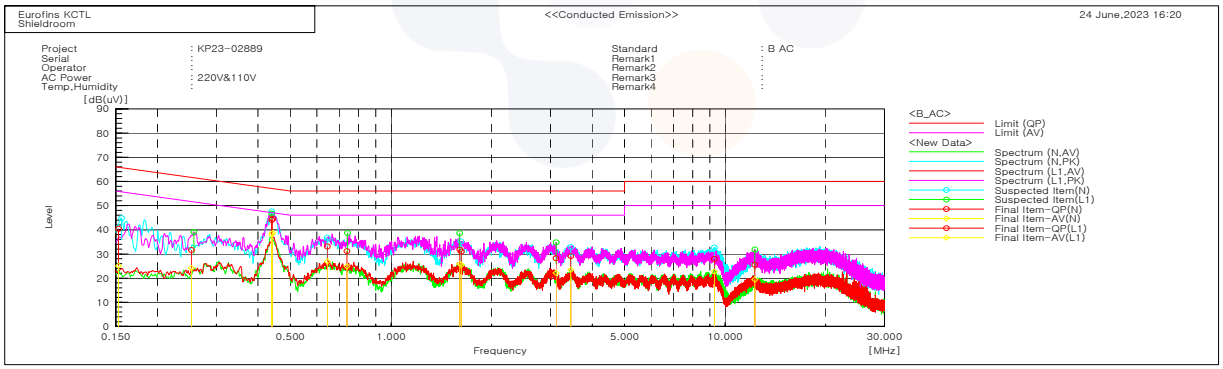
--- N Phase ---

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	0.15388	29.3	15.1	9.8	39.1	24.9	65.8	55.8	26.7	30.9
2	0.19751	24.5	13.0	9.9	34.4	22.9	63.7	53.7	29.3	30.8
3	0.43922	34.8	28.7	9.8	44.6	38.5	57.1	47.1	12.5	8.6
4	1.57026	22.5	16.0	9.7	32.2	25.7	56.0	46.0	23.8	20.3
5	2.59071	20.0	13.7	9.7	29.7	23.4	56.0	46.0	26.3	22.6
6	13.56028	48.4	39.6	9.9	58.3	49.5	60.0	50.0	1.7	0.5

--- 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	0.17434	27.0	14.2	10.1	37.1	24.3	64.8	54.8	27.7	30.5
2	0.439	34.6	28.4	9.8	44.4	38.2	57.1	47.1	12.7	8.9
3	1.15643	22.7	16.5	9.7	32.4	26.2	56.0	46.0	23.6	19.8
4	2.05091	21.3	15.0	9.7	31.0	24.7	56.0	46.0	25.0	21.3
5	13.55984	48.2	39.4	9.9	58.1	49.3	60.0	50.0	1.9	0.7
6	13.98473	13.6	7.2	9.9	23.5	17.1	60.0	50.0	36.5	32.9

[Retest with a dummy load]



Final Result

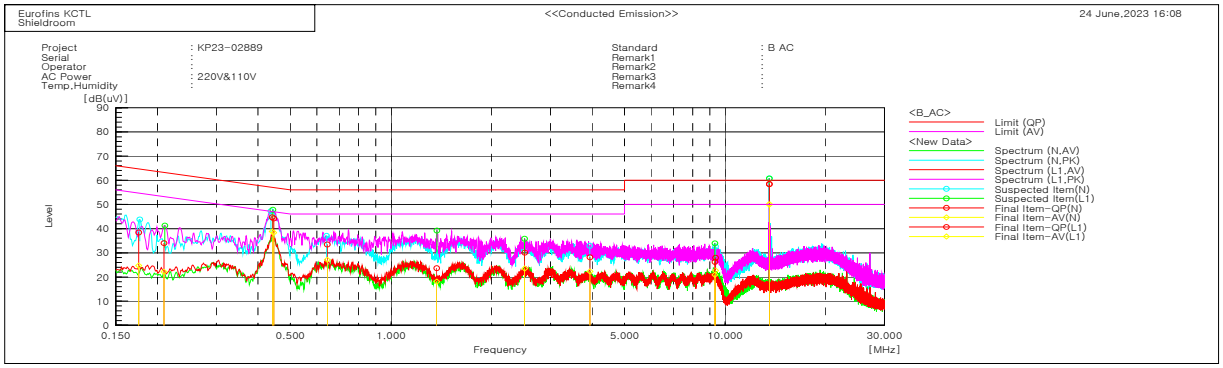
--- N Phase ---

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	0.15299	30.7	15.4	9.7	40.4	25.1	65.8	55.8	25.4	30.7
2	0.44258	34.7	29.0	9.8	44.5	38.8	57.0	47.0	12.5	8.2
3	0.64471	23.3	17.1	9.8	33.1	26.9	56.0	46.0	22.9	19.1
4	1.62256	21.3	15.7	9.7	31.0	25.4	56.0	46.0	25.0	20.6
5	3.45211	19.4	13.8	9.7	29.1	23.5	56.0	46.0	26.9	22.5
6	9.28336	18.2	12.9	9.8	28.0	22.7	60.0	50.0	32.0	27.3

--- 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	0.25265	22.0	14.6	9.6	31.6	24.2	61.7	51.7	30.1	27.5
2	0.43933	34.3	28.5	9.8	44.1	38.3	57.1	47.1	13.0	8.8
3	0.73817	21.4	15.1	9.8	31.2	24.9	56.0	46.0	24.8	21.1
4	1.6073	22.1	16.2	9.7	31.8	25.9	56.0	46.0	24.2	20.1
5	3.1162	18.6	12.5	9.7	28.3	22.2	56.0	46.0	27.7	23.8
6	12.27155	15.6	9.5	9.9	25.5	19.4	60.0	50.0	34.5	30.6

[DC 24 V]
[Tests with the antenna connected]



Final Result

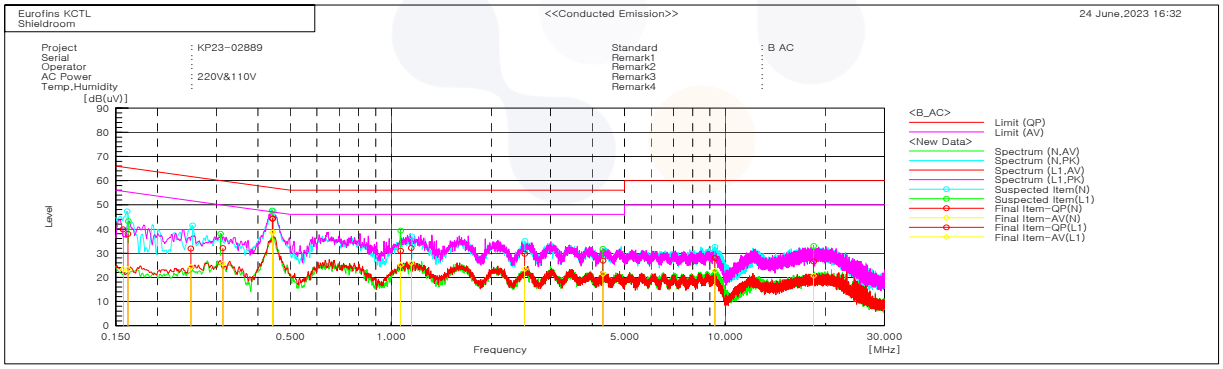
--- N Phase ---

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	0.17572	28.3	14.6	10.1	38.4	24.7	64.7	54.7	26.3	30.0
2	0.44059	34.9	29.0	9.8	44.7	38.8	57.1	47.1	12.4	8.3
3	0.64445	23.6	17.3	9.8	33.4	27.1	56.0	46.0	22.6	18.9
4	3.93729	18.4	12.6	9.7	28.1	22.3	56.0	46.0	27.9	23.7
5	9.3658	18.2	12.8	9.8	28.0	22.6	60.0	50.0	32.0	27.4
6	13.55987	48.5	40.3	9.9	58.4	50.2	60.0	50.0	1.6	-0.2

--- 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	0.20917	24.2	12.3	9.8	34.0	22.1	63.2	53.2	29.2	31.1
2	0.44541	34.4	28.5	9.8	44.2	38.3	57.0	47.0	12.8	8.7
3	1.37012	13.9	8.4	9.7	23.6	18.1	56.0	46.0	32.4	27.9
4	2.51305	20.3	13.8	9.7	30.0	23.5	56.0	46.0	26.0	22.5
5	9.31722	16.4	11.1	9.8	26.2	20.9	60.0	50.0	33.8	29.1
6	13.55993	48.4	40.0	9.9	58.3	49.9	60.0	50.0	1.7	0.1

[Retest with a dummy load]



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	0.15764	30.0	13.7	9.8	39.8	23.5	65.6	55.6	25.8	32.1
2	0.25187	22.3	14.6	9.6	31.9	24.2	61.7	51.7	29.8	27.5
3	0.44293	34.6	29.0	9.8	44.4	38.8	57.0	47.0	12.6	8.2
4	1.15016	22.4	16.2	9.7	32.1	25.9	56.0	46.0	23.9	20.1
5	2.51259	20.0	13.7	9.7	29.7	23.4	56.0	46.0	26.3	22.6
6	9.31914	18.2	12.9	9.8	28.0	22.7	60.0	50.0	32.0	27.3

--- 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	0.16313	28.0	13.3	10.0	38.0	23.3	65.3	55.3	27.3	32.0
2	0.31364	22.4	16.0	9.7	32.1	25.7	59.9	49.9	27.8	24.2
3	0.44122	34.4	28.7	9.8	44.2	38.5	57.0	47.0	12.8	8.5
4	1.06841	21.3	15.4	9.7	31.0	25.1	56.0	46.0	25.0	20.9
5	4.30753	17.2	11.7	9.7	26.9	21.4	56.0	46.0	29.1	24.6
6	18.4016	16.5	10.6	10.0	26.5	20.6	60.0	50.0	33.5	29.4

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100808	24.07.03
DC Power Supply	TOYOTECH	TL305TP	20100121	24.07.03
Temp & Humid Chamber	ESPEC CORP.	SH-642	93016978	24.01.19
Signal Generator	R&S	SMB100A	176206	24.01.19
Vector Signal Generator	R&S	SMBV100A	257566	24.07.04
Spectrum Analyzer	R&S	FSVA40	101575	24.06.19
PSA Spectrum Analyzer	Agilent	E4440A	MY46186407	24.03.22
Amplifier	SONOMA INSTRUMENT	310N	421821	23.12.14
Bilog Antenna	Teseq GmbH	CBL 6112D	63756	24.11.17
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
TWO-LINE V - NETWORK	R&S	ENV216	101358	23.09.29
EMI TEST RECEIVER	R&S	ESCI3	100001	23.08.18
Controller	INNCO SYSTEMS	CO3000	1441/54370322/P	-
Antenna Mast	INNCO SYSTEMS	MA4640-XP-ET	-	-
Turn Device	INNCO SYSTEMS	DS1200-S-1t	-	-

End of test report