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TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR22-SRF0055 Page (1) of (33)	eurofins | KCTL

1. Client

- Name : IDP Corp,.Ltd
- Address : (Guro-dong, Buycksan digital valley 7), 601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
- Date of Receipt : 2022-01-03

2. Use of Report : Certification

3. Name of Product / Model : Card Printer / SMART-81

4. Manufacturer / Country of Origin : IDP Corp,.Ltd / Korea

5. FCC ID : VU2-SMART-81

6. Date of Test : 2022-03-03 to 2022-03-07

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

8. Test method used : FCC Part 15 Subpart C, 15.225

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

Affirmation	Tested by Name : Yoonseok Choi (Signature)	Technical Manager Name : Hyeonsu Jang (Signature)

2022-04-13

KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guara ntee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-04-13	Originally issued	-

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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	:	IDP Corp,.Ltd
Address	:	(Guro-dong, Buycksan digital valley 7), 601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
Manufacturer	:	IDP Corp,.Ltd
Address	:	(Guro-dong, Buycksan digital valley 7), 601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
Factory	:	EVERINT Co., Ltd.
Address	:	129, Chungjusandan 1-ro, Chungju-si, Chungcheongbuk-do, Republic of Korea
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
		CAB Identifier: KR0040, ISED Number: 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	Card Printer
Model	:	SMART-81
Derivative Model	:	SMART-81S, SMART-81SK, SMART-81D, SMART-81DK, SMART-81HS, SMART-81HSK, SMART-81HD, SMART-81HDK, CUBO4 Single, CUBO4 Dual, CUBO4H Single, CUBO4H Dual, SMART-810D, SMART-810DK, SMART-810HD, SMART-810HDK, GRASYS ID300RT, GRASYS ID300RTW, GRASYS ID600RT, GRASYS ID600RTW, FDP-81S, FDP-81D, FDP-81HS, FDP-81HD, QUALICA-RD Hercules S, QUALICA-RD Hercules D, QUALICA-RD Hercules HS, QUALICA-RD Hercules HD, KJJ REHEXA-S, KJJ REHEXA-D, KJJ REHEXA-HS, KJJ REHEXA-HD, ID-81S, ID-81D, ID-81HS, ID-81HD, CP-4S, CP-4D, CP-4HS, CP-4HD, IDBOX-4S, IDBOX-4D, IDBOX-4HS, IDBOX-4HD, SOLID-810S, SOLID-810SK, SOLID-810D, SOLID-810DK, SOLID-810HS, SOLID-810HSK, SOLID-810HD, SOLID-810HDK
Modulation technique	:	ASK (RFID)
Number of channels	:	1 ch (RFID)
Frequency range	:	13.56 ㎒ (RFID)
Power source	:	AC 110 V
Antenna specification	:	FPCB Coil Antenna(RFID)
Antenna gain	:	N/A
Software version	:	Smart81_0_01_48.bin
Hardware version	:	MAIN BD,81 PRT,1.2
Test device serial No.	:	N/A
Operation temperature	:	-20 ℃ ~ 50 ℃

2.1. Information about derivative model

The difference between basic model and derivative models is:
The basic and derivative model are electrically identical.

	Model name	Difference
Basic model	SMART-81	
Derivative model	SMART-81S, SMART-81SK, SMART-81D, SMART-81DK, SMART-81HS, SMART-81HSK, SMART-81HD, SMART-81HDK, CUBO4 Single, CUBO4 Dual, CUBO4H Single, CUBO4H Dual, SMART-810D, SMART-810DK, SMART-810HD, SMART-810HDK, GRASYS ID300RT, GRASYS ID300RTW, GRASYS ID600RT, GRASYS ID600RTW, FDP-81S, FDP-81D, FDP-81HS, FDP-81HD, QUALICA-RD Hercules S, QUALICA-RD Hercules D, QUALICA-RD Hercules HS, QUALICA-RD Hercules HD, KJJ REHEXA-S, KJJ REHEXA-D, KJJ REHEXA-HS, KJJ REHEXA-HD, ID-81S, ID-81D, ID-81HS, ID-81HD, CP-4S, CP-4D, CP-4HS, CP-4HD, IDBOX-4S, IDBOX-4D, IDBOX-4HS, IDBOX-4HD	Simplified derivation based on model name of each buyers.
	SOLID-810S, SOLID-810SK, SOLID-810D, SOLID-810DK, SOLID-810HS, SOLID-810HSK, SOLID-810HD, SOLID-810HDK	It is the same as the basic model, only the exterior color are different.

2.2. Accessory information

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

2.3. Frequency/channel operations

This device contains the following capabilities:
RFID(13.56 ㎒)

Ch.	Frequency (㎒)
01	13.56

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.

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

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.225(a)	In-band Fundamental Emission	Radiated	Pass
15.225(b)(c)	In-band Spurious Emission		Pass
15.225(d) 15.209	Out-of–band Spurious Emission		Pass
15.225(e)	Frequency Stability Tolerance	Conducted	Pass
15.215(c)	20 dB Bandwidth		Pass
15.207(a)	Conducted emissions		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. 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 and Z. It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation
4. 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. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013

5. Measurement uncertainty

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

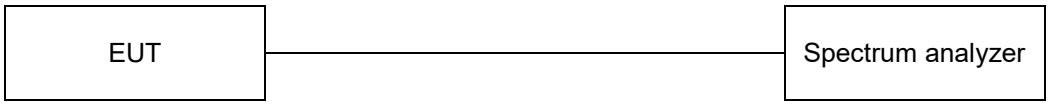
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine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

Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒	2.4 dB
	30 ㎒ ~ 1 000 ㎒	2.3 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	1.6 dB
	150 ㎑ ~ 30 ㎒	1.7 dB

6. Test results

6.1. 20 dB 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.

Test procedure

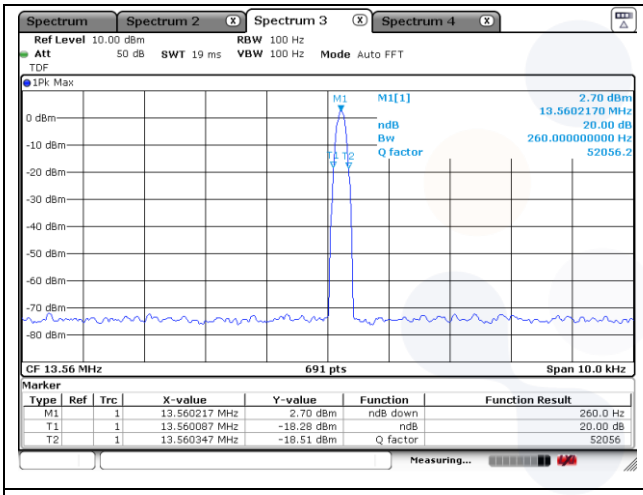
ANSI C63.10 - Section 6.9.2

Test settings

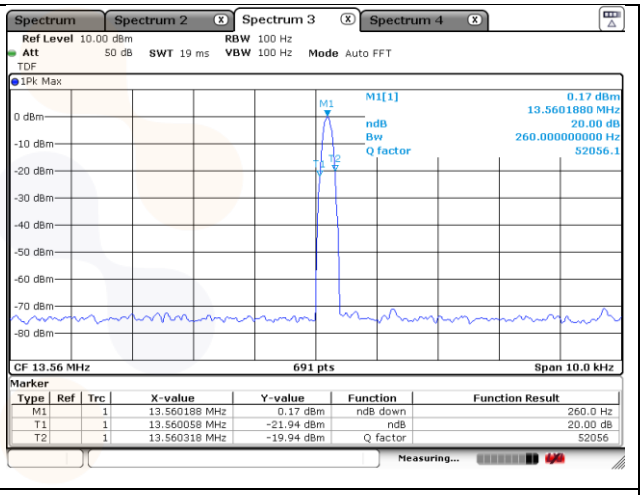
The spectrum analyzer connected receive antenna and the EUT placed on near the receive antenna. The RBW is set to 10 ㎑. The VBW is set to 3 times the RBW. The sweep time is coupled.

Test results

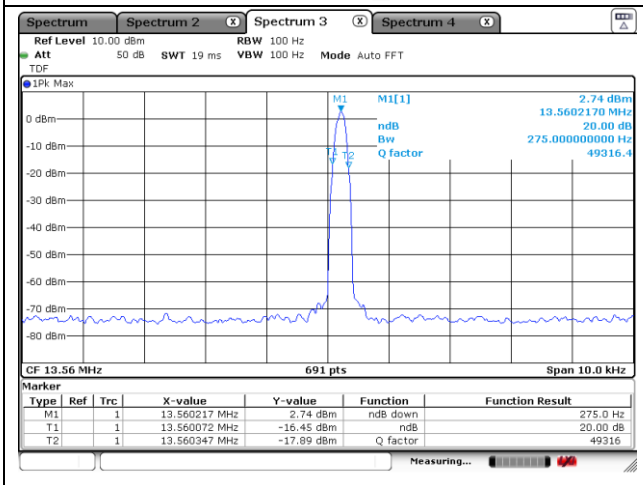
Mode	Frequency [㎒]	20 ㏈ Bandwidth [㎒]		Limit [㎒]	20 ㏈ Bandwidth [㎑]
RIBBON	13.56	Lowest Frequency	13.560 1	13.110 000	0.260
		Highest Frequency	13.560 3	14.010 000	
FILM	13.56	Lowest Frequency	13.560 1	13.110 000	0.260
		Highest Frequency	13. 560 3	14.010 000	
RIBBON + FILM	13.56	Lowest Frequency	13.560 1	13.110 000	0.275
		Highest Frequency	13. 560 3	14.010 000	



20 ㏈ Bandwidth_ RIBBON



20 ㏈ Bandwidth_FILM



20 ㏈ Bandwidth_RIBBON + FILM

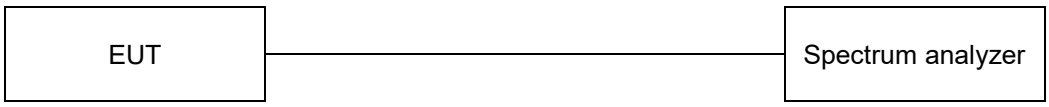
Blank

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

15.225 (e) 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

[RIBBON]

Voltage [%]	Voltage [V]	TEMP [℃]	Maintaining time	Measure frequency [㎐]	Frequency deviation [㎐]	Deviation [%]
100	12.00	20(Ref.)	Startup	13 560 334	-334.0	0.002 46
			2 minutes	13 560 334	-334.0	0.002 46
			5 minutes	13 560 334	-334.0	0.002 46
			10 minutes	13 560 334	-334.0	0.002 46
		-20	Startup	13 560 389	-389.0	0.002 87
			2 minutes	13 560 389	-389.0	0.002 87
			5 minutes	13 560 389	-389.0	0.002 87
			10 minutes	13 560 389	-389.0	0.002 87
		-10	Startup	13 560 389	-389.0	0.002 87
			2 minutes	13 560 389	-389.0	0.002 87
			5 minutes	13 560 389	-389.0	0.002 87
			10 minutes	13 560 389	-389.0	0.002 87
		0	Startup	13 560 389	-389.0	0.002 87
			2 minutes	13 560 389	-389.0	0.002 87
			5 minutes	13 560 389	-389.0	0.002 87
			10 minutes	13 560 389	-389.0	0.002 87
		10	Startup	13 560 375	-375.0	0.002 77
			2 minutes	13 560 375	-375.0	0.002 77
			5 minutes	13 560 375	-375.0	0.002 77
			10 minutes	13 560 375	-375.0	0.002 77
		25	Startup	13 560 360	-360.0	0.002 66
			2 minutes	13 560 360	-360.0	0.002 66
			5 minutes	13 560 360	-360.0	0.002 66
			10 minutes	13 560 360	-360.0	0.002 66
		30	Startup	13 560 303	-303.0	0.002 23
			2 minutes	13 560 303	-303.0	0.002 23
			5 minutes	13 560 303	-303.0	0.002 23
			10 minutes	13 560 303	-303.0	0.002 23
		40	Startup	13 560 274	-274.0	0.002 02
			2 minutes	13 560 274	-274.0	0.002 02
			5 minutes	13 560 274	-274.0	0.002 02
			10 minutes	13 560 274	-274.0	0.002 02
		50	Startup	13 560 259	-259.0	0.001 91
			2 minutes	13 560 259	-259.0	0.001 91
			5 minutes	13 560 259	-259.0	0.001 91
			10 minutes	13 560 259	-259.0	0.001 91
85	10.20	20	Startup	13 560 334	-334.0	0.002 46
			2 minutes	13 560 334	-334.0	0.002 46
			5 minutes	13 560 334	-334.0	0.002 46
			10 minutes	13 560 334	-334.0	0.002 46
115	13.80	20	Startup	13 560 334	-334.0	0.002 46
			2 minutes	13 560 334	-334.0	0.002 46
			5 minutes	13 560 334	-334.0	0.002 46
			10 minutes	13 560 334	-334.0	0.002 46

[FILM]

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[℃]		[㎐]	[㎐]	[%]
100	12.00	20(Ref.)	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57
		-20	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		-10	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		0	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		10	Startup	13 560 389	-389.0	0.002 87
			2 minutes	13 560 389	-389.0	0.002 87
			5 minutes	13 560 389	-389.0	0.002 87
			10 minutes	13 560 389	-389.0	0.002 87
		25	Startup	13 560 374	-374.0	0.002 76
			2 minutes	13 560 374	-374.0	0.002 76
			5 minutes	13 560 374	-374.0	0.002 76
			10 minutes	13 560 374	-374.0	0.002 76
		30	Startup	13 560 317	-317.0	0.002 34
			2 minutes	13 560 317	-317.0	0.002 34
			5 minutes	13 560 317	-317.0	0.002 34
			10 minutes	13 560 317	-317.0	0.002 34
		40	Startup	13 560 288	-288.0	0.002 12
			2 minutes	13 560 288	-288.0	0.002 12
			5 minutes	13 560 288	-288.0	0.002 12
			10 minutes	13 560 288	-288.0	0.002 12
		50	Startup	13 560 273	-273.0	0.002 01
			2 minutes	13 560 273	-273.0	0.002 01
			5 minutes	13 560 273	-273.0	0.002 01
			10 minutes	13 560 273	-273.0	0.002 01
85	10.20	20	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57
115	13.80	20	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57

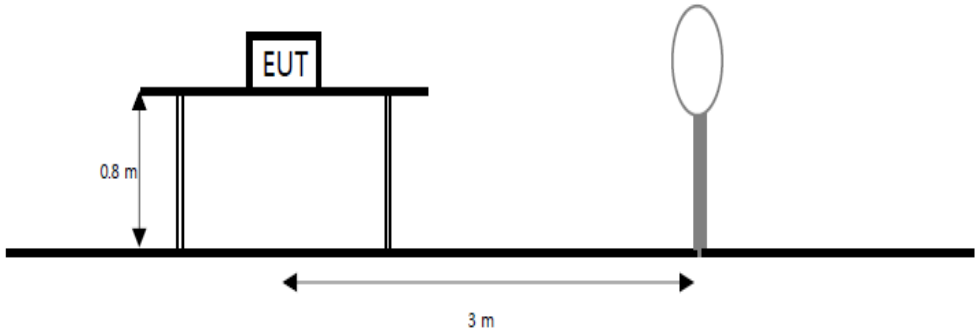
[RIBBON+FILM]

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[℃]		[㎐]	[㎐]	[%]
100	12.00	20(Ref.)	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57
		-20	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		-10	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		0	Startup	13 560 403	-403.0	0.002 97
			2 minutes	13 560 403	-403.0	0.002 97
			5 minutes	13 560 403	-403.0	0.002 97
			10 minutes	13 560 403	-403.0	0.002 97
		10	Startup	13 560 389	-389.0	0.002 87
			2 minutes	13 560 389	-389.0	0.002 87
			5 minutes	13 560 389	-389.0	0.002 87
			10 minutes	13 560 389	-389.0	0.002 87
		25	Startup	13 560 374	-374.0	0.002 76
			2 minutes	13 560 374	-374.0	0.002 76
			5 minutes	13 560 374	-374.0	0.002 76
			10 minutes	13 560 374	-374.0	0.002 76
		30	Startup	13 560 317	-317.0	0.002 34
			2 minutes	13 560 317	-317.0	0.002 34
			5 minutes	13 560 317	-317.0	0.002 34
			10 minutes	13 560 317	-317.0	0.002 34
		40	Startup	13 560 288	-288.0	0.002 12
			2 minutes	13 560 288	-288.0	0.002 12
			5 minutes	13 560 288	-288.0	0.002 12
			10 minutes	13 560 288	-288.0	0.002 12
		50	Startup	13 560 273	-273.0	0.002 01
			2 minutes	13 560 273	-273.0	0.002 01
			5 minutes	13 560 273	-273.0	0.002 01
			10 minutes	13 560 273	-273.0	0.002 01
85	10.20	20	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57
115	13.80	20	Startup	13 560 348	-348.0	0.002 57
			2 minutes	13 560 348	-348.0	0.002 57
			5 minutes	13 560 348	-348.0	0.002 57
			10 minutes	13 560 348	-348.0	0.002 57

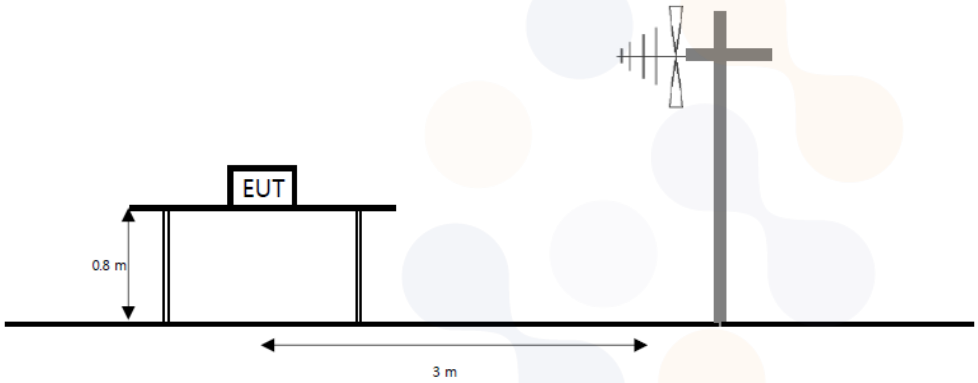
6.3. Radiated spurious emissions

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) 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) 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) 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) 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 ㏈㎶/m)	30
30.0-88.0	100(40 ㏈㎶/m)	3
88-216	150(43.5 ㏈㎶/m)	3
216-960	200 (46 ㏈㎶/m)	3
Above 960	500 (53.98 ㏈㎶/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 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d= Distance factor in ㏈
   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 ㏈/decade) as specified in § 15.31(f)(2). Extrapolation Factor = 40 log10(30/3) = 40 ㏈.
3. Factors(㏈) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or F_d(㏈)
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 ㏈ 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
9. [1] means restricted band

[RIBBON]

Test results for fundamental

15.225 (a) 13.553-13.567 ㎒

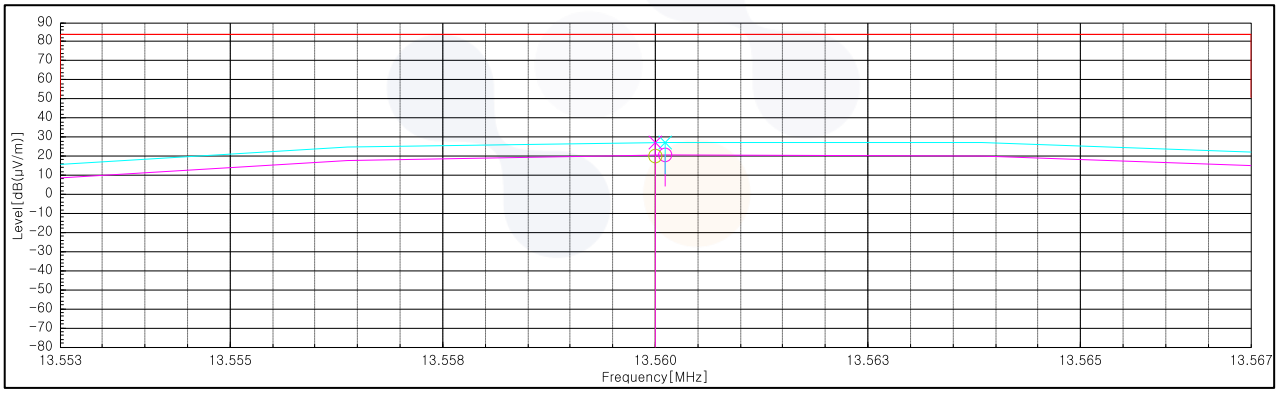
[Face-on]

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	70.80	20.20	-31.02	40.00	19.98	84.00	64.02

[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	77.70	20.20	-31.02	40.00	26.88	84.00	57.12

Face-on/Face-off



Test results for in-band & out-band (9 ㎑ to 30 ㎒)

15.225 (b,c) 13.110-14.010 ㎒

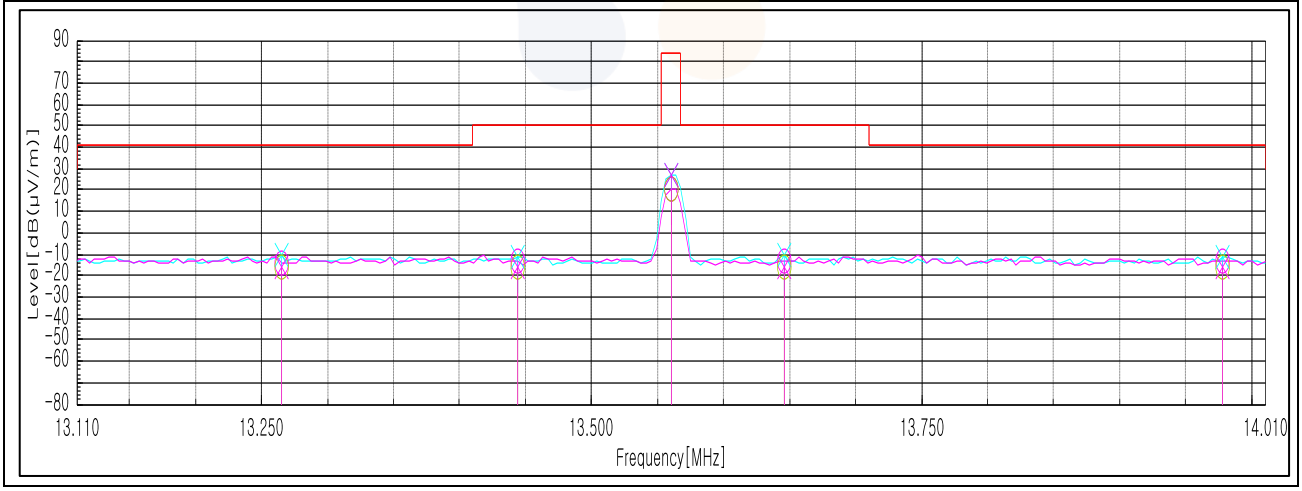
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.27	34.60	20.20	-31.04	40.00	-16.24	40.50	56.74
13.44	34.60	20.20	-31.03	40.00	-16.23	50.50	66.73
13.65	34.60	20.20	-31.01	40.00	-16.21	50.50	66.71
13.98	34.50	20.20	-30.95	40.00	-16.25	40.50	56.75

[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							
13.27	34.60	20.20	-31.04	40.00	-16.24	40.50	56.74
13.44	34.70	20.20	-31.03	40.00	-16.13	50.50	66.63
13.65	34.60	20.20	-31.01	40.00	-16.21	50.50	66.71
13.98	34.60	20.20	-30.95	40.00	-16.15	40.50	56.65

Face-on/Face-off



Test results (9 ㎑ to 30 ㎒)

15.225 (d) 0.009-30 ㎒

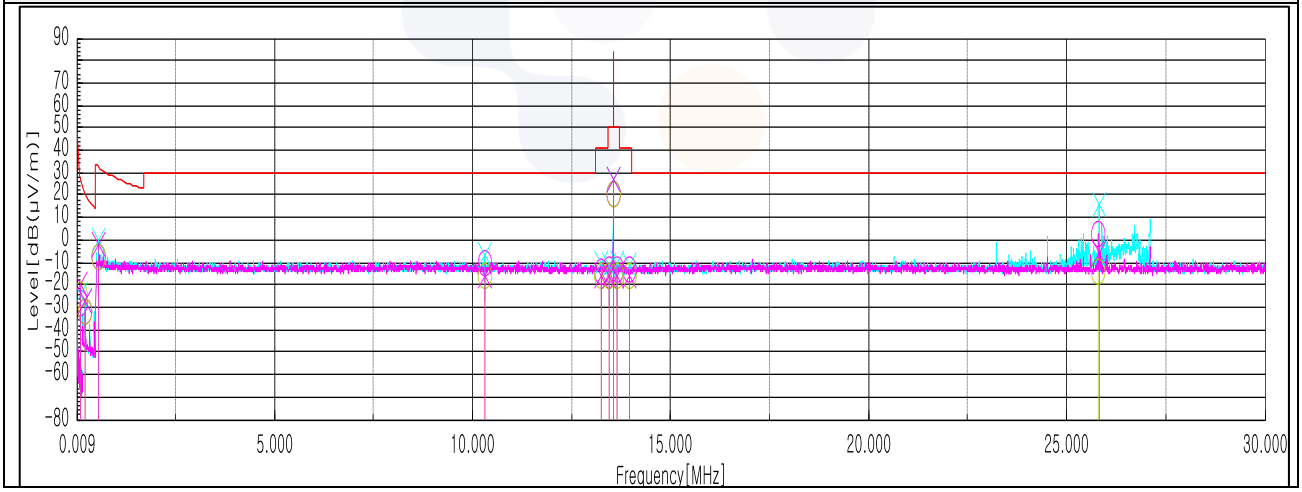
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
0.57	44.80	19.90	-32.14	40.00	-7.44	29.50	36.94
10.33	35.20	20.20	-31.29	40.00	-15.89	29.50	45.39
25.81	35.00	20.69	-30.52	40.00	-14.83	29.50	44.33

[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							
0.57	49.70	19.90	-32.14	40.00	-2.54	29.50	32.04
10.32	35.30	20.20	-31.29	40.00	-15.79	29.50	45.29
25.81	44.10	20.69	-30.52	40.00	-5.73	29.50	35.23

Face-on/Face-off

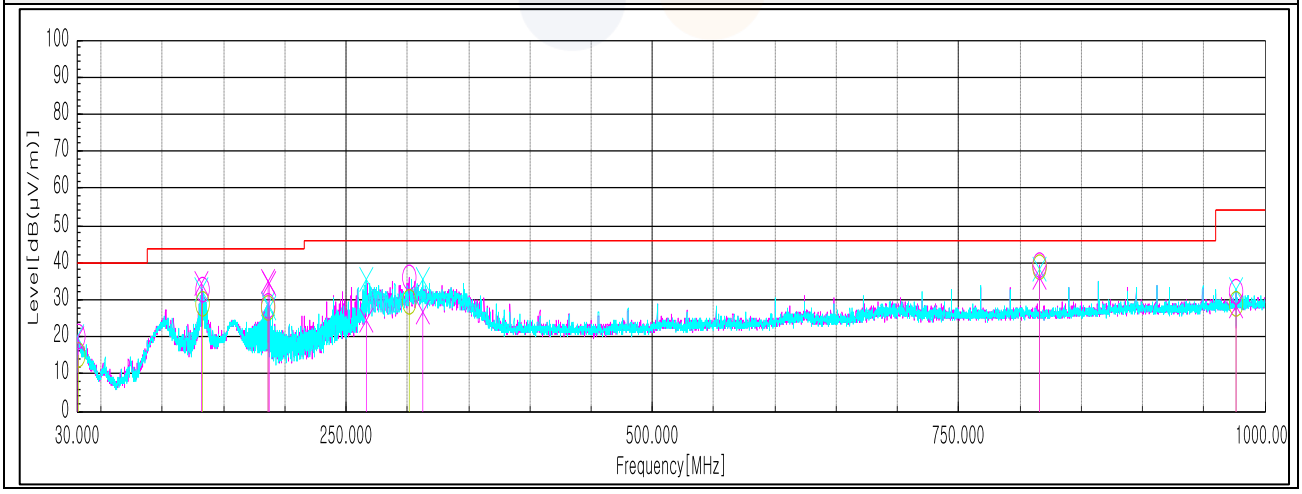


Test results (Below 1 000 ㎒)

15.225 (d) 30-1000 ㎒

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								
30.24	V	25.10	24.90	-30.39	-	19.61	40.00	20.39
31.82	H	21.60	23.86	-30.36	-	15.10	40.00	24.90
132.09[1)]	V	44.60	17.80	-28.16	-	34.24	43.50	9.26
132.58[1)]	H	39.30	17.80	-28.15	-	28.95	43.50	14.55
186.29	V	47.10	14.80	-27.30	-	34.60	43.50	8.90
186.29	H	40.20	14.80	-27.30	-	27.70	43.50	15.80
186.78	V	47.00	14.80	-27.30	-	34.50	43.50	9.00
266.07[1)]	V	30.70	19.53	-26.21	-	24.02	46.00	21.98
301.12	H	35.90	19.12	-25.83	-	29.19	46.00	16.81
312.39	V	32.70	19.40	-25.64	-	26.46	46.00	19.54
816.06	V	30.40	25.78	-20.53	-	35.65	46.00	10.35
816.06	H	33.30	25.78	-20.53	-	38.55	46.00	7.45
976.36[1)]	H	19.50	27.00	-18.48	-	28.02	54.00	25.98
976.48[1)]	V	19.10	27.00	-18.47	-	27.63	54.00	26.37

Horizontal/Vertical



[FILM]

Test results for fundamental

15.225 (a) 13.553-13.567 ㎒

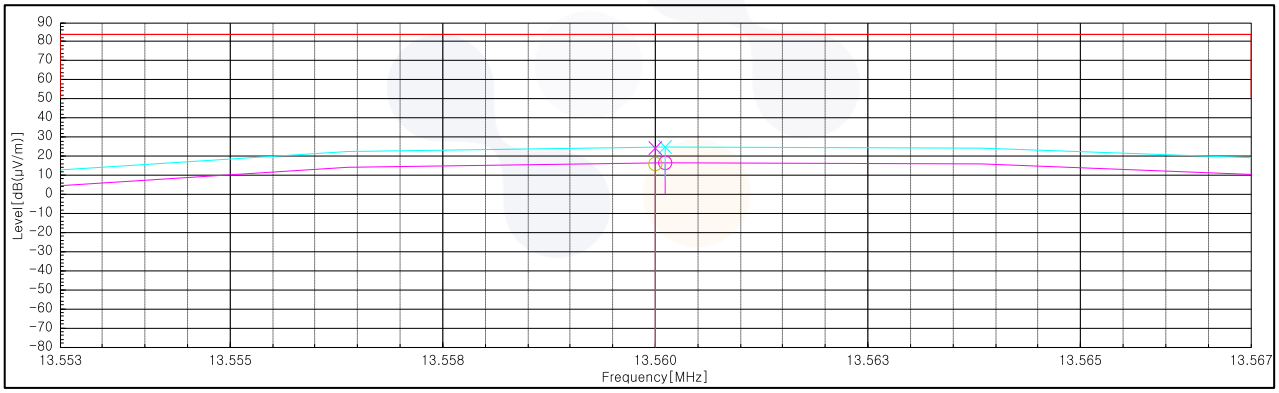
[Face-on]

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	66.70	20.20	-31.02	40.00	15.88	84.00	68.12

[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	74.90	20.20	-31.02	40.00	24.08	84.00	59.92

Face-on/Face-off



Test results for in-band & out-band (9 ㎑ to 30 ㎒)

15.225 (b,c) 13.110-14.010 ㎒

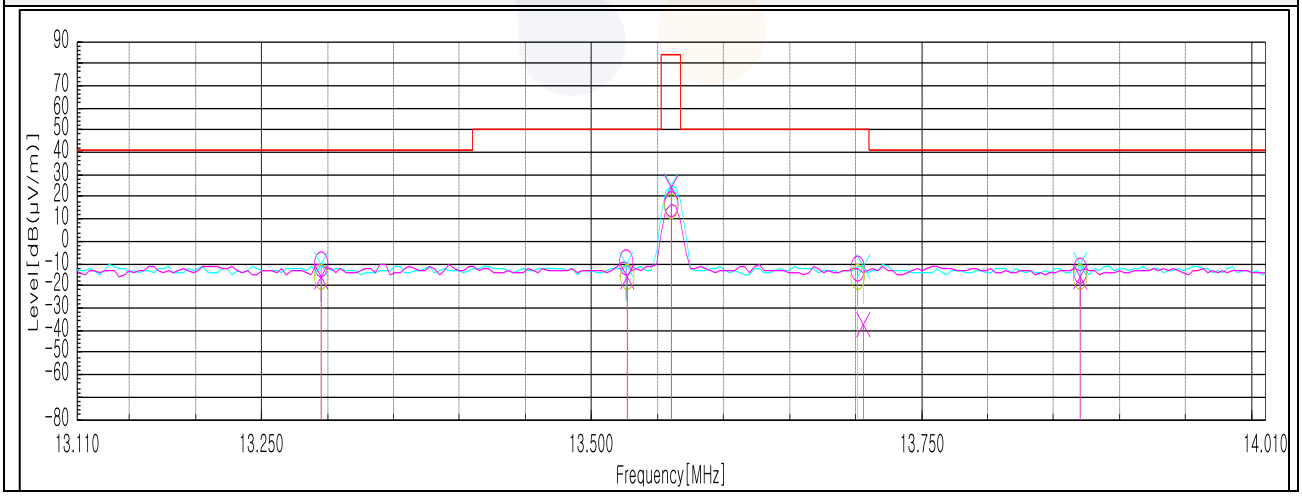
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.30	34.70	20.20	-31.04	40.00	-16.14	40.50	56.64
13.53	34.60	20.20	-31.03	40.00	-16.23	50.50	66.73
13.70	34.60	20.20	-31.00	40.00	-16.20	50.50	66.70
13.87	34.50	20.20	-30.97	40.00	-16.27	40.50	56.77

[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							
13.30	34.60	20.20	-31.04	40.00	-16.24	40.50	56.74
13.53	34.60	20.20	-31.03	40.00	-16.23	50.50	66.73
13.71	13.50	20.20	-31.00	40.00	-37.30	50.50	87.80
13.87	34.60	20.20	-30.97	40.00	-16.17	40.50	56.67

Face-on/Face-off



Test results (9 ㎑ to 30 ㎒)

15.225 (d) 0.009-30 ㎒

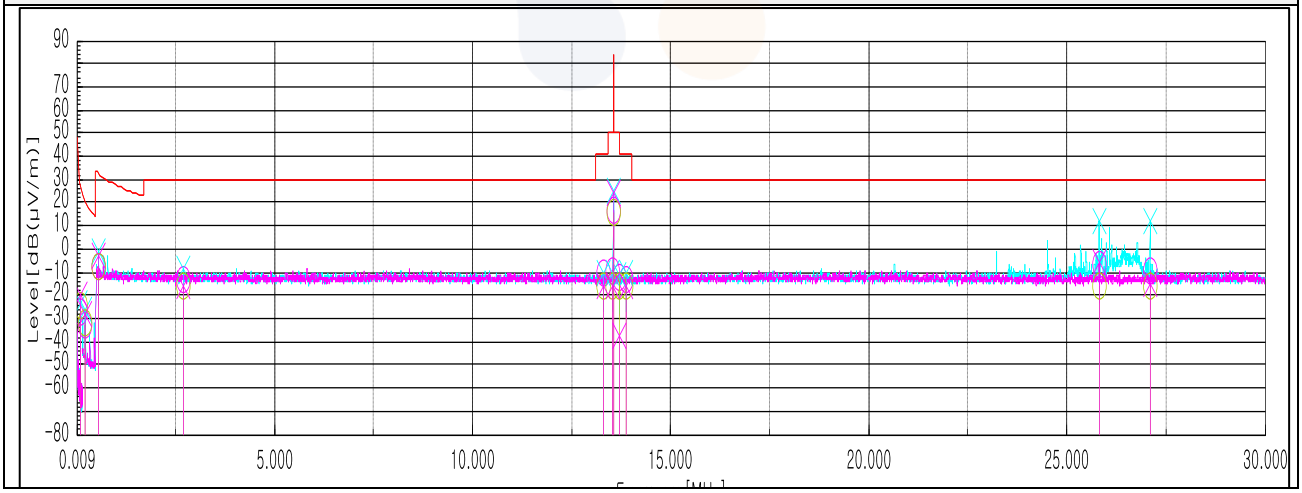
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
0.57	44.60	19.90	-32.14	40.00	-7.64	29.50	37.14
2.71	36.00	20.07	-31.73	40.00	-15.66	29.50	45.16
25.81	33.60	20.69	-30.52	40.00	-16.23	29.50	45.73
27.10	33.40	20.51	-30.51	40.00	-16.60	29.50	46.10

[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							
0.57	49.20	19.90	-32.14	40.00	-3.04	29.50	32.54
2.71	36.00	20.07	-31.73	40.00	-15.66	29.50	45.16
25.81	43.60	20.69	-30.52	40.00	-6.23	29.50	35.73
27.10	34.50	20.51	-30.51	40.00	-15.50	29.50	45.00

Face-on/Face-off

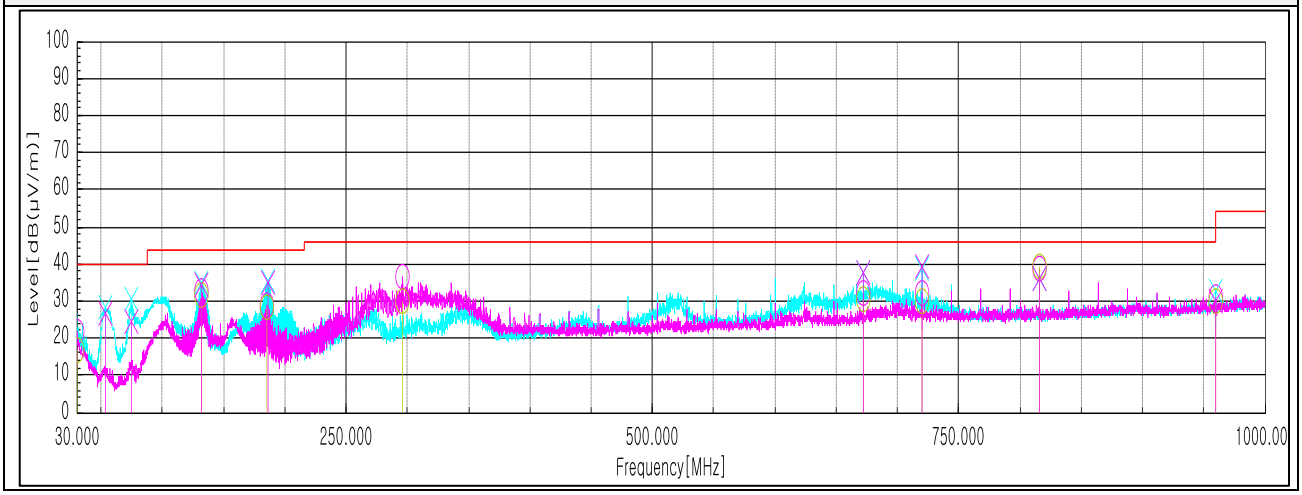


Test results (Below 1 000 ㎒)

15.225 (d) 30-1000 ㎒

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								
30.24	H	22.00	24.90	-30.39	-	16.51	40.00	23.49
53.64	V	43.40	12.91	-29.83	-	26.48	40.00	13.52
74.38[1)]	V	41.10	12.50	-29.34	-	24.26	40.00	15.74
131.61[1)]	V	44.30	17.80	-28.14	-	33.96	43.50	9.54
132.09[1)]	H	41.80	17.80	-28.16	-	31.44	43.50	12.06
185.81	H	40.50	14.80	-27.30	-	28.00	43.50	15.50
186.29	V	47.10	14.80	-27.30	-	34.60	43.50	8.90
296.39	H	36.30	19.03	-25.89	-	29.44	46.00	16.56
672.02	H	27.40	24.94	-21.91	-	30.43	46.00	15.57
672.02	V	34.30	24.94	-21.91	-	37.33	46.00	8.67
720.16	H	26.50	24.90	-21.51	-	29.89	46.00	16.11
720.16	V	35.70	24.90	-21.51	-	39.09	46.00	6.91
816.06	H	33.40	25.78	-20.53	-	38.65	46.00	7.35
816.06	V	30.50	25.78	-20.53	-	35.75	46.00	10.25
960.11[1)]	H	21.60	26.80	-18.73	-	29.67	54.00	24.33
960.11[1)]	V	21.60	26.80	-18.73	-	29.67	54.00	24.33

Horizontal/Vertical



[RIBBON + FILM]

Test results for fundamental

15.225 (a) 13.553-13.567 ㎒

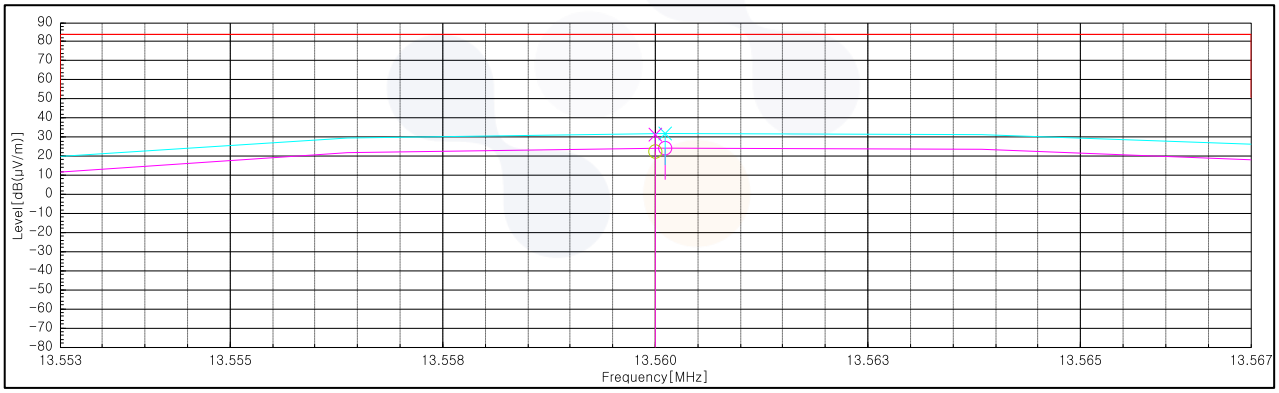
[Face-on]

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	73.40	20.20	-31.02	40.00	22.58	84.00	61.42

[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	82.00	20.20	-31.02	40.00	31.18	84.00	52.82

Face-on/Face-off



Test results for in-band & out-band (9 ㎑ to 30 ㎒)

15.225 (b,c) 13.110-14.010 ㎒

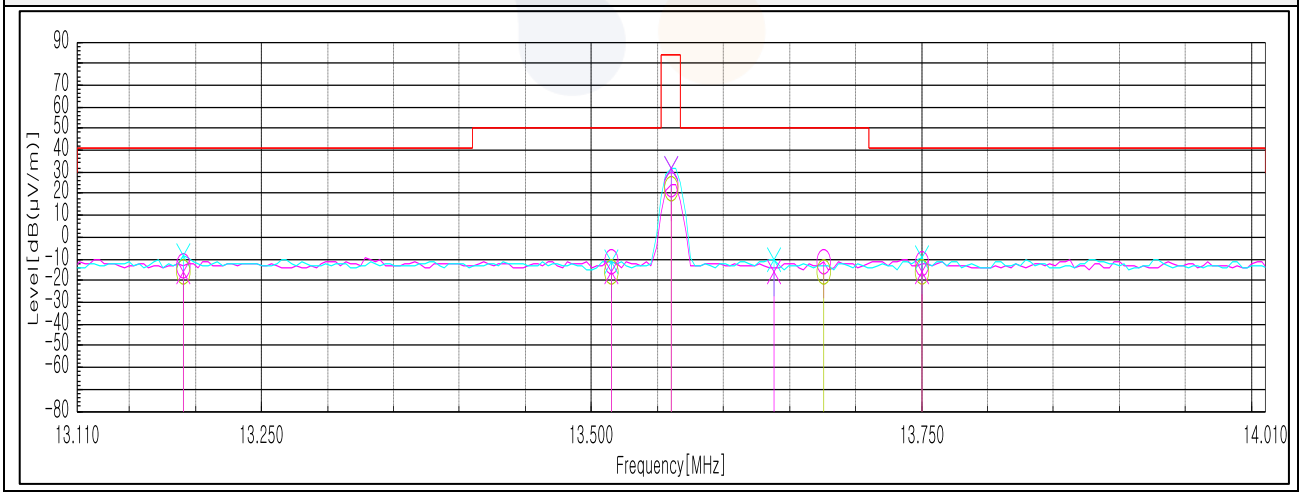
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.19	34.90	20.20	-31.05	40.00	-15.95	40.50	56.45
13.52	35.00	20.20	-31.03	40.00	-15.83	50.50	66.33
13.68	34.50	20.20	-31.00	40.00	-16.30	50.50	66.80
13.75	34.60	20.20	-30.99	40.00	-16.19	40.50	56.69

[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							
13.19	35.00	20.20	-31.05	40.00	-15.85	40.50	56.35
13.52	34.90	20.20	-31.03	40.00	-15.93	50.50	66.43
13.64	34.60	20.20	-31.01	40.00	-16.21	50.50	66.71
13.75	34.80	20.20	-30.99	40.00	-15.99	40.50	56.49

Face-on/Face-off



Test results (9 ㎑ to 30 ㎒)

15.225 (d) 0.009-30 ㎒

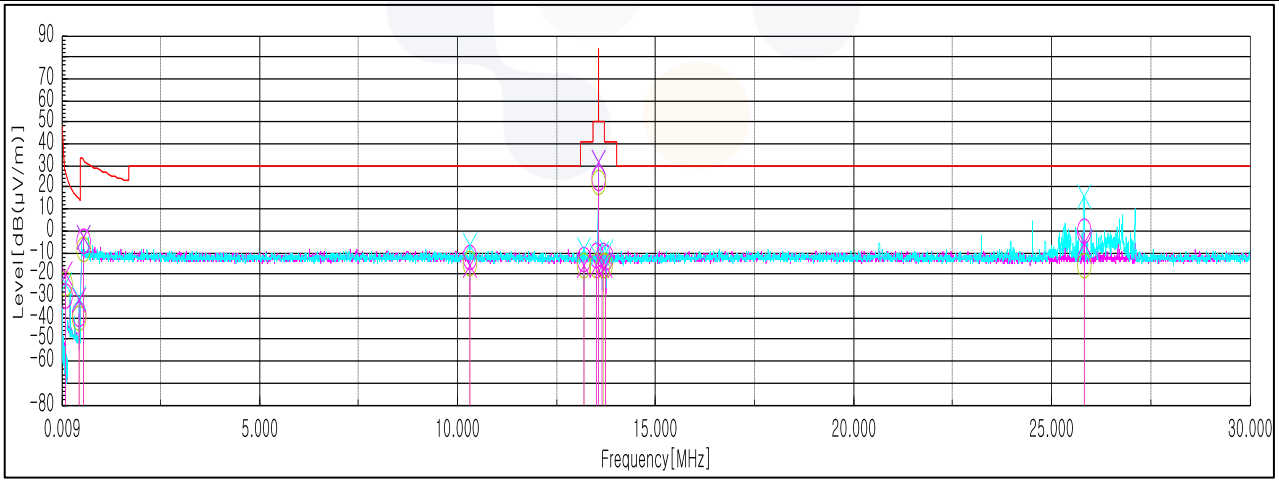
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
0.57	44.00	19.90	-32.14	40.00	-8.24	29.50	37.74
10.32	35.50	20.20	-31.29	40.00	-15.59	30.50	46.09
25.81	33.50	20.69	-30.52	40.00	-16.33	29.50	45.83

[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							
0.58	49.30	19.90	-32.14	40.00	-2.94	29.50	32.44
10.32	35.40	20.20	-31.29	40.00	-15.69	31.50	47.19
25.81	43.70	20.69	-30.52	40.00	-6.13	29.50	35.63

Face-on/Face-off

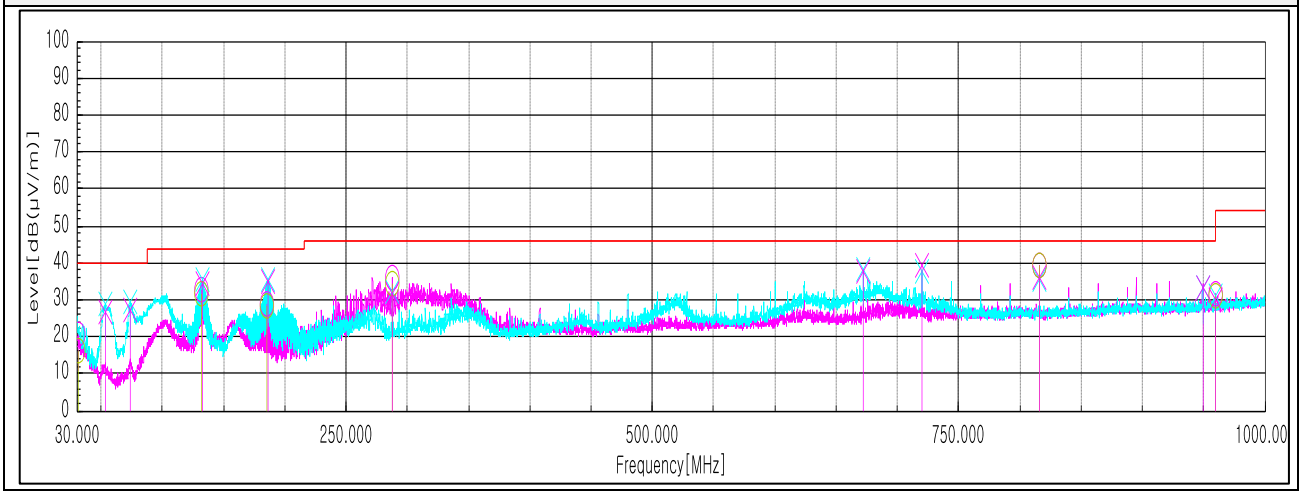


Test results (Below 1 000 ㎒)

15.225 (d) 30-1000 ㎒

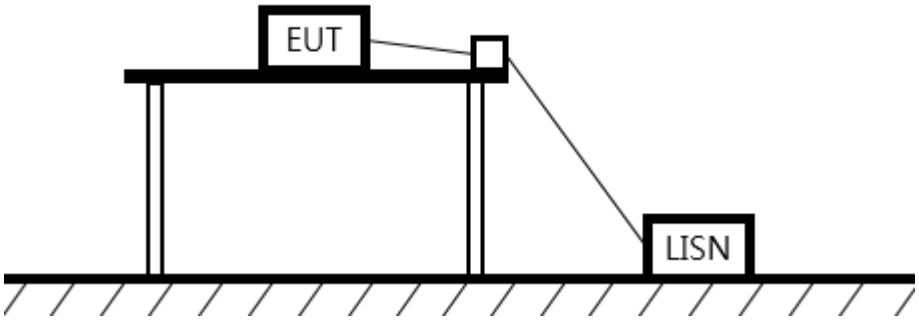
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
31.21	H	21.90	24.41	-30.35	-	15.96	40.00	24.04
53.40	V	43.40	12.98	-29.84	-	26.54	40.00	13.46
73.89[1)]	V	43.90	12.49	-29.38	-	27.01	40.00	12.99
131.61[1)]	H	41.70	17.80	-28.14	-	31.36	43.50	12.14
133.06[1)]	V	44.30	17.79	-28.15	-	33.94	43.50	9.56
185.81	H	40.60	14.80	-27.30	-	28.10	43.50	15.40
186.29	V	47.20	14.80	-27.30	-	34.70	43.50	8.80
288.02	H	41.00	18.86	-25.97	-	33.89	46.00	12.11
288.02	V	38.30	18.86	-25.97	-	31.19	46.00	14.81
672.02	V	34.30	24.94	-21.91	-	37.33	46.00	8.67
720.03	V	35.70	24.90	-21.51	-	39.09	46.00	6.91
816.06	H	33.50	25.78	-20.53	-	38.75	46.00	7.25
816.06	V	30.50	25.78	-20.53	-	35.75	46.00	10.25
949.32	V	24.70	26.79	-18.88	-	32.61	46.00	13.39
960.11[1)]	H	22.80	26.80	-18.73	-	30.87	54.00	23.13
960.11[1)]	V	21.70	26.80	-18.73	-	29.77	54.00	24.23

Horizontal/Vertical



6.4. AC Conducted emission

Test setup



Limit

According to 15.207(a), 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.

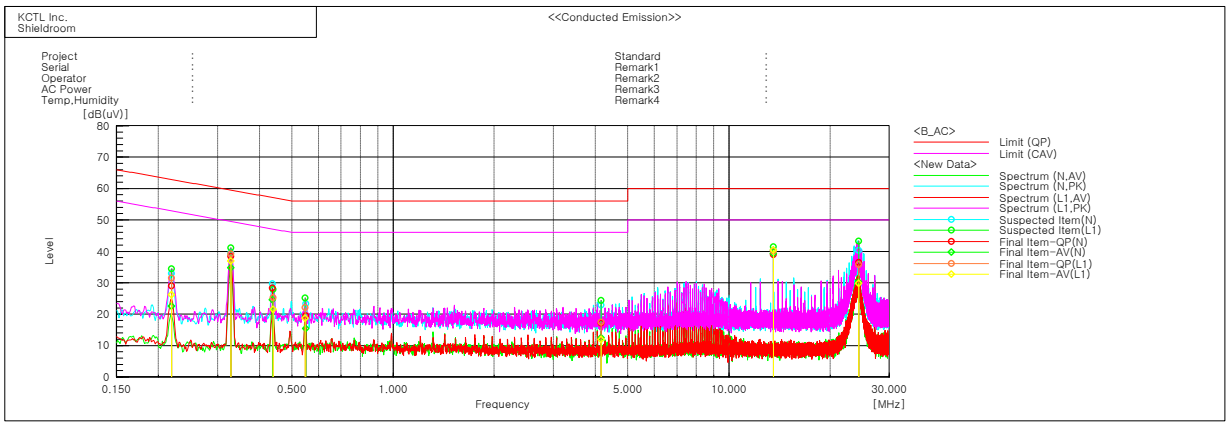
Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

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

[RIBBON]



Final Result

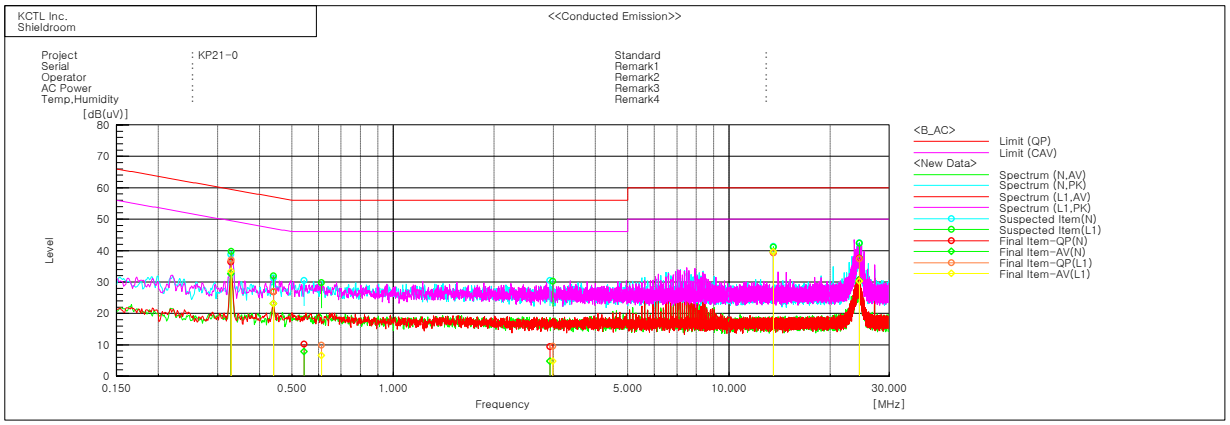
--- N Phase ---

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	0.21895	19.3	12.8	9.7	29.0	22.5	62.9	52.9	33.9	30.4
2	0.32853	28.7	25.0	9.7	38.4	34.7	59.5	49.5	21.1	14.8
3	0.43688	18.5	14.8	9.8	28.3	24.6	57.1	47.1	28.8	22.5
4	0.55016	9.7	5.6	9.8	19.5	15.4	56.0	46.0	36.5	30.6
5	4.15895	7.5	2.8	9.6	17.1	12.4	56.0	46.0	38.9	33.6
6	13.56125	29.1	29.4	9.9	39.0	39.3	60.0	50.0	21.0	10.7
7	24.33125	26.6	20.4	9.8	36.4	30.2	60.0	50.0	23.6	19.8

--- 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	0.21895	21.8	16.5	9.7	31.5	26.2	62.9	52.9	31.4	26.7
2	0.32853	29.4	27.2	9.7	39.1	36.9	59.5	49.5	20.4	12.6
3	0.43934	15.4	11.7	9.8	25.2	21.5	57.1	47.1	31.9	25.6
4	0.54646	12.2	8.9	9.8	22.0	18.7	56.0	46.0	34.0	27.3
5	4.16264	7.9	2.3	9.6	17.5	11.9	56.0	46.0	38.5	34.1
6	13.56125	30.2	30.5	9.9	40.1	40.4	60.0	50.0	19.9	9.6
7	24.33125	25.8	19.9	9.9	35.7	29.8	60.0	50.0	24.3	20.2

[FILM]



Final Result

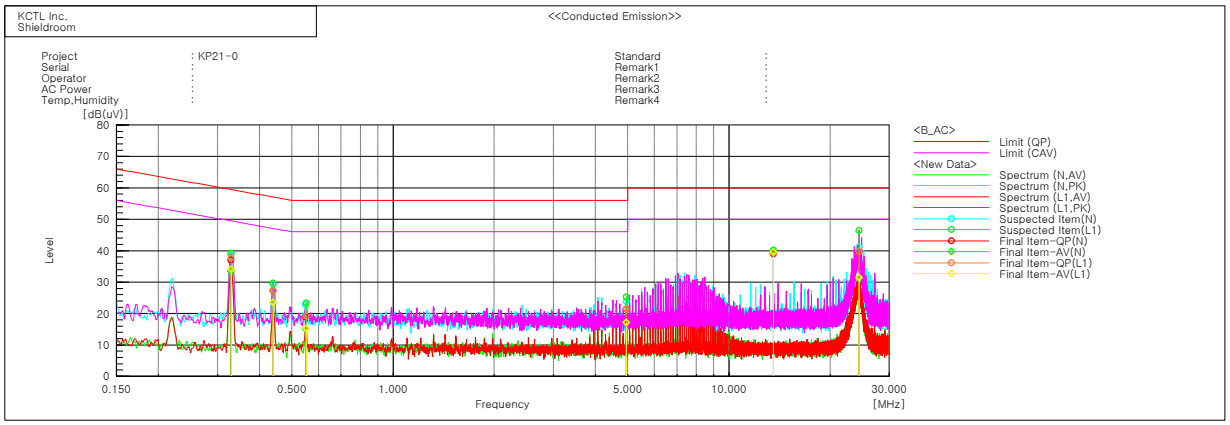
--- N Phase ---

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	0.32853	26.6	22.9	9.7	36.3	32.6	59.5	49.5	23.2	16.9
2	0.44058	17.1	13.3	9.8	26.9	23.1	57.1	47.1	30.2	24.0
3	0.54277	0.4	-2.0	9.8	10.2	7.8	56.0	46.0	45.8	38.2
4	2.93263	-0.2	-4.8	9.6	9.4	4.8	56.0	46.0	46.6	41.2
5	13.560	29.3	29.7	9.9	39.2	39.6	60.0	50.0	20.8	10.4
6	24.42125	27.7	20.7	9.8	37.5	30.5	60.0	50.0	22.5	19.5

--- 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	0.32976	27.3	23.7	9.7	37.0	33.4	59.5	49.5	22.5	16.1
2	0.44058	17.1	13.3	9.8	26.9	23.1	57.1	47.1	30.2	24.0
3	0.61172	0.1	-3.2	9.8	9.9	6.6	56.0	46.0	46.1	39.4
4	2.9868	-0.1	-4.8	9.6	9.5	4.8	56.0	46.0	46.5	41.2
5	13.560	29.3	29.7	9.9	39.2	39.6	60.0	50.0	20.8	10.4
6	24.42125	27.4	20.3	9.9	37.3	30.2	60.0	50.0	22.7	19.8

[RIBBON + FILM]



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	0.32853	27.3	23.8	9.7	37.0	33.5	59.5	49.5	22.5	16.0
2	0.43934	17.5	13.7	9.8	27.3	23.5	57.1	47.1	29.8	23.6
3	0.54769	9.1	5.3	9.8	18.9	15.1	56.0	46.0	37.1	30.9
4	4.94572	11.8	7.6	9.6	21.4	17.2	56.0	46.0	34.6	28.8
5	13.56125	29.0	29.4	9.9	38.9	39.3	60.0	50.0	21.1	10.7
6	24.3975	29.8	21.4	9.8	39.6	31.2	60.0	50.0	20.4	18.8

--- 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	0.32976	28.0	24.4	9.7	37.7	34.1	59.5	49.5	21.8	15.4
2	0.43934	17.5	13.7	9.8	27.3	23.5	57.1	47.1	29.8	23.6
3	0.55139	9.4	5.3	9.8	19.2	15.1	56.0	46.0	36.8	30.9
4	4.94572	11.9	7.5	9.6	21.5	17.1	56.0	46.0	34.5	28.9
5	13.560	29.3	29.7	9.9	39.2	39.6	60.0	50.0	20.8	10.4
6	24.3975	29.8	21.5	9.9	39.7	31.4	60.0	50.0	20.3	18.6

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
EMI TEST RECEIVER	R&S	ESCI7	100732	23.03.04
Bilog Antenna	TESEQ	CBL 6112D	55545	22.04.24
AMPLIFIER	310N	SONOMA	284608	22.08.19
ATTENUATOR	8491B-6dB	KEYSIGHT	MY39271060	22.04.24
Antenna Mast	MA4640/800-XP-ET	Innco Systems	-	-
Turn Table	DT2000	Innco Systems	79	-
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Signal Generator	R&S	SMB100A	176206	23.01.19
Spectrum Analyzer	R&S	FSV30	100806	22.09.17
Attenuator	API Inmet	40AH2W-10	11	22.05.11
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	23.03.28
AC/DC Power Supply	KIKUSUI	PCR2000W	GB001619	22.07.27

End of test report