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-SRF0047 Page (1) of (18)	eurofins | KCTL

1. Client

- Name : WINNERCOM CO., LTD
- Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA
- Date of Receipt : 2022-03-15

2. Use of Report : Certification

3. Name of Product / Model : Touch door / SP2 PE

4. Manufacturer / Country of Origin : WINNERCOM CO., LTD / Korea

5. FCC ID : 2AU37SP2PE

6. Date of Test : 2022-03-23 to 2022-03-25

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

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

2022-04-05

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-04-05	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	:	WINNERCOM CO., LTD
Address	:	158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA
Manufacturer	:	WINNERCOM CO., LTD
Address	:	158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, 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	:	Touch door
Model	:	SP2 PE
Derivative Model	:	QX 23 MY
Modulation technique	:	ASK(NFC)
Number of channels	:	1 ch
Frequency range	:	13.56 ㎒
Power source	:	DC 12 Ⅴ
Antenna specification	:	PCB Loop antenna
Antenna gain	:	N/A
Software version	:	Ver 1.0
Hardware version	:	Ver 1.0
Test device serial No.	:	N/A
Operation temperature	:	-30 ℃ ~ 75 ℃

2.1. Information about derivative model

The difference between basic model and derivative models is:
The basic model and derivative model depend on connector difference.
Depending on the derivative, the H/W version and PCB design are same, but only the connector is different. And the other thing is the same.

	Model name	Difference
Basic model	SP2 PE	Connector: MG614130-4
Derivative model	QX 23 MY	Connector: HKC06-12721

2.2. Frequency/channel operations

This device contains the following capabilities:
NFC

Ch.	Frequency (㎒)
01	13.56

Table 2.2.1. NFC

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 transmitters have permanently attached PCB loop antennas (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)	AC Conducted emissions		NA(note2)

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. This test is not applicable because the EUT only connects DC power line.
3. 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.
4. 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
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
6. 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.

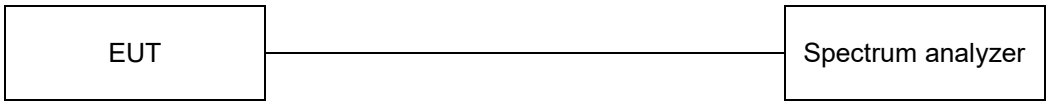
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine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

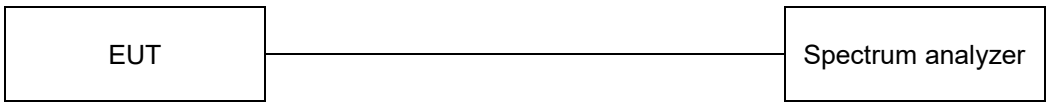
Test mode	Frequency [㎒]	20 ㏈ Bandwidth [㎒]		Limit [㎒]	20 ㏈ Bandwidth [㎑]
TM1	13.56	Lowest Frequency	13.559 700	13.110 000	0.35
		Highest Frequency	13.560 050	14.010 000	

20 ㏈ 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

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

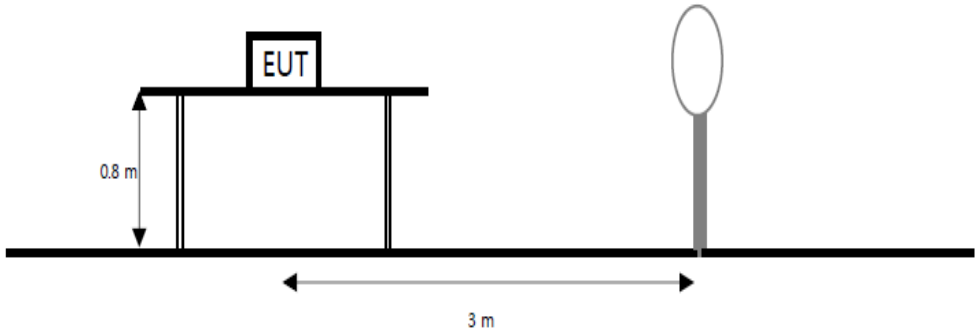
Test results

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[℃]		[㎐]	[㎐]	[%]
100	12.00	20(Ref.)	Startup	13 559 872	128.0	-9.44
			2 minutes	13 559 876	124.0	-9.14
			5 minutes	13 559 833	167.0	-12.32
			10 minutes	13 559 885	115.0	-8.48
		-20	Startup	13 559 825	175.0	-12.91
			2 minutes	13 559 859	141.0	-10.40
			5 minutes	13 559 749	251.0	-18.51
			10 minutes	13 559 794	206.0	-15.19
		-10	Startup	13 559 970	30.0	-2.21
			2 minutes	13 559 974	26.0	-1.92
			5 minutes	13 559 849	151.0	-11.14
			10 minutes	13 559 944	56.0	-4.13
		0	Startup	13 559 906	94.0	-6.93
			2 minutes	13 559 917	83.0	-6.12
			5 minutes	13 559 841	159.0	-11.73
			10 minutes	13 559 911	89.0	-6.56
		10	Startup	13 559 845	155.0	-11.43
			2 minutes	13 559 843	157.0	-11.58
			5 minutes	13 559 822	178.0	-13.13
			10 minutes	13 559 837	163.0	-12.02
		25	Startup	13 559 872	128.0	-9.44
			2 minutes	13 559 876	124.0	-9.14
			5 minutes	13 559 833	167.0	-12.32
			10 minutes	13 559 885	115.0	-8.48
		30	Startup	13 559 880	120.0	-8.85
			2 minutes	13 559 877	123.0	-9.07
			5 minutes	13 559 838	162.0	-11.95
			10 minutes	13 559 887	113.0	-8.33
		40	Startup	13 559 888	112.0	-8.26
			2 minutes	13 559 895	105.0	-7.74
			5 minutes	13 559 845	155.0	-11.43
			10 minutes	13 559 911	89.0	-6.56
		50	Startup	13 559 955	45.0	-3.32
			2 minutes	13 559 896	104.0	-7.67
			5 minutes	13 559 912	88.0	-6.49
			10 minutes	13 559 926	74.0	-5.46
85	10.20	20	Startup	13 559 899	101.0	-7.45
			2 minutes	13 559 945	55.0	-4.06
			5 minutes	13 559 898	102.0	-7.52
			10 minutes	13 559 955	45.0	-3.32
115	13.80	20	Startup	13 559 910	90.0	-6.64
			2 minutes	13 559 889	111.0	-8.19
			5 minutes	13 559 926	74.0	-5.46
			10 minutes	13 559 929	71.0	-5.24

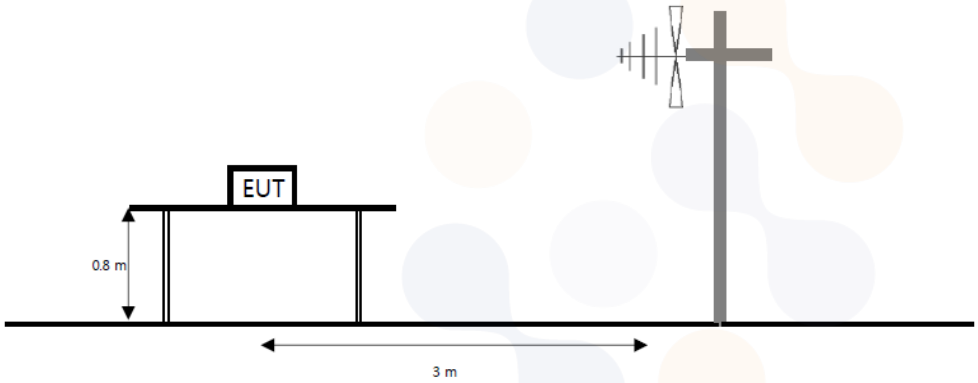
6.3. Radiated spurious emissions

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 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. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/Ds)$
   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. Factors(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
9. [1] means restricted band

Test results for fundamental

15.225 (a) 13.553-13.567 ㎒

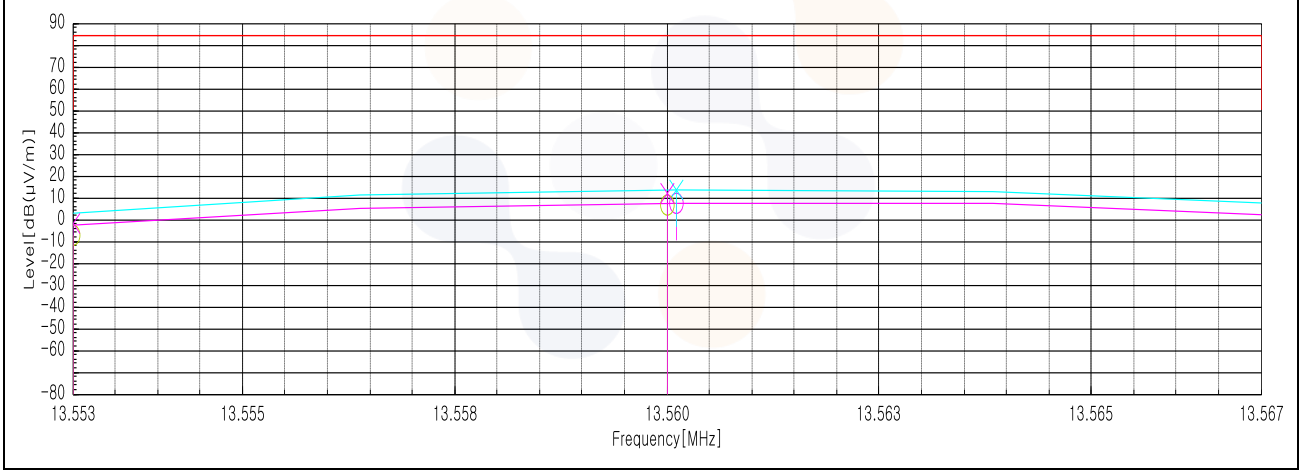
[Face-on]

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	57.00	20.20	-31.00	40.00	6.20	84.00	77.80

[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	62.70	20.20	-31.00	40.00	11.90	84.00	72.10

Face-on/Face-off



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

15.225 (b,c) 13.110-14.010 ㎒

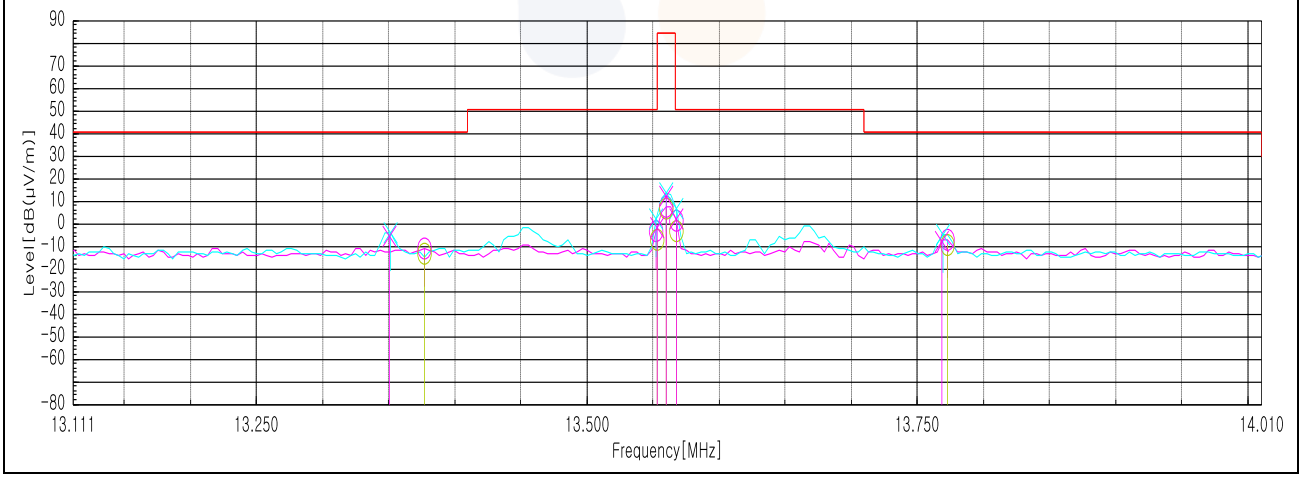
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.38	36.90	20.20	-31.01	40.00	-13.91	40.50	54.41
13.55	43.60	20.20	-31.00	40.00	-7.20	50.50	57.70
13.57	47.10	20.20	-31.00	40.00	-3.70	50.50	54.20
13.77	40.80	20.20	-30.99	40.00	-9.99	40.50	50.49

[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							
13.35	45.00	20.20	-31.01	40.00	-5.81	40.50	46.31
13.55	48.70	20.20	-31.00	40.00	-2.10	50.50	52.60
13.57	52.30	20.20	-31.00	40.00	1.50	50.50	49.00
13.77	42.90	20.20	-30.99	40.00	-7.89	40.50	48.39

Face-on/Face-off



Test results (9 ㎑ to 30 ㎒)

15.225 (d) 0.009-30 ㎒

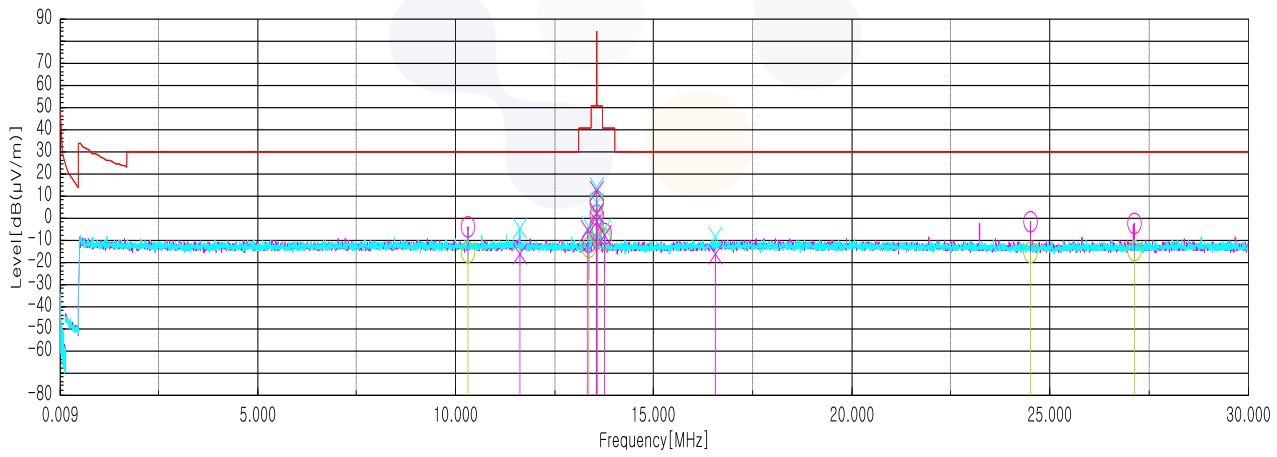
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
10.33	35.00	20.20	-31.17	40.00	-15.97	43.50	59.47
24.52	34.10	20.78	-30.49	40.00	-15.61	33.40	49.01
27.12	34.80	20.50	-30.45	40.00	-15.15	32.20	47.35

[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							
11.61	34.50	20.20	-31.12	40.00	-16.42	43.50	59.92
16.56	34.20	20.33	-30.85	40.00	-16.32	43.50	59.82

Face-on/Face-off

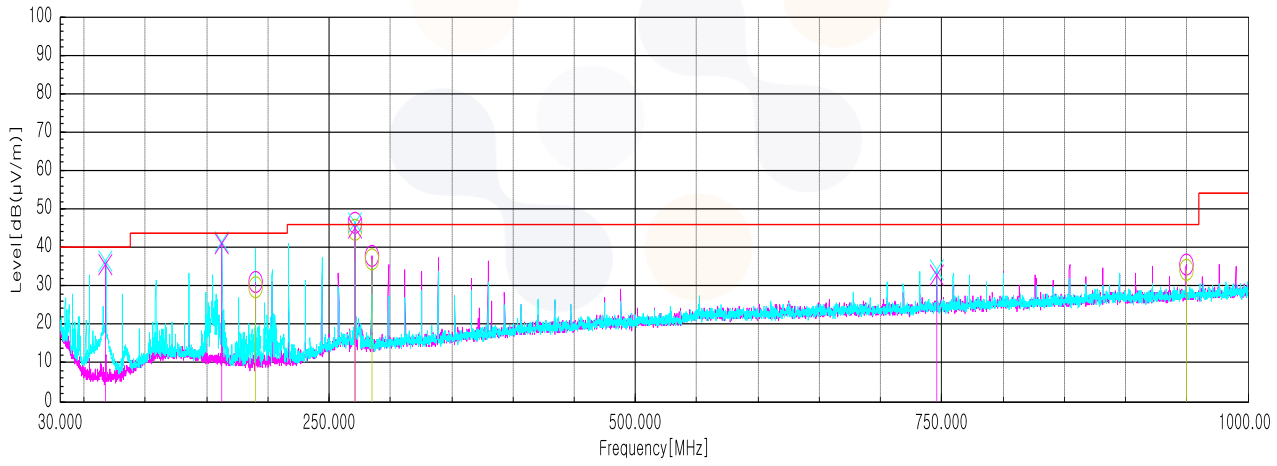


Test results (Below 1 000 ㎒)

15.225 (d) 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								
67.71	V	52.80	12.20	-29.26	-	35.74	40.00	4.26
162.65[1)]	V	52.50	15.84	-27.44	-	40.90	43.50	2.60
189.81	H	41.90	14.80	-27.14	-	29.56	43.50	13.94
271.17[1)]	V	52.00	18.83	-25.97	-	44.86	46.00	1.14
271.17[1)]	H	51.80	18.83	-25.97	-	44.66	46.00	1.34
284.75[1)]	H	44.10	18.79	-25.85	-	37.04	46.00	8.96
745.86	V	28.10	25.52	-21.06	-	32.56	46.00	13.44
949.32	H	25.80	26.79	-18.36	-	34.23	46.00	11.77

Horizontal/Vertical



7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Vector Signal Generator	R&S	SMBV100A	257566	22.07.09
Signal Generator	R&S	SMB100A	176206	23.01.19
Spectrum Analyzer	R&S	FSW50	101013	22.07.09
DC Power Supply	AGILENT	E3632A	KR94907664	22.05.10
Temp & Humid Chamber	Myeongseong R&P	CTHC-50P-DT	20150824-2	22.07.27
Bi-Log Antenna	TESEQ	CBL 6112D	55545	22.04.24
ATTENUATOR	KEYSIGHT	8491B-6dB	MY39271060	22.04.24
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
AMPLIFIER	SONOMA	310N	186280	22.04.03
Antenna Mast	Innco Systems	MA4000-EP	303	N/A
Turn Table	Innco Systems	DT2000	79	N/A
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	22.04.02
EMI TEST RECEIVER	R&S	ESCI7	101408	23.03.04

End of test report