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

1. Client

- Name : CMITECH Co., Ltd
- Address : 5th Floor, 38, Burim-ro, 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea
- Date of Receipt : 2019-12-02

2. Use of Report : FCC Class II permissive change

3. Name of Product and Model : Iris Camera / EF-45N

4. Manufacturer and Country of Origin : CMITECH Co., Ltd / Korea

5. FCC ID : 2AJY5UMX-10

6. Date of Test : 2019-12-07 to 2019-12-16

7. Test Standards : FCC Part 15 Subpart C, 15.225

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

Affirmation	Tested by Name : Taekyong Nam (Signature)	Technical Manager Name : Heesu Ahn (Signature)

2020-02-13

KCTL Inc.

Report revision history

Date	Revision	Page No
2020-02-13	Initial report	-

CONTENTS

1. General information

Client	:	CMITECH Co., Ltd
Address	:	5th Floor, 38, Burim-ro, 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea
Manufacturer	:	CMITECH Co., Ltd
Address	:	5th Floor, 38, Burim-ro, 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, 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 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Iris Camera
Model	:	EF-45N
Frequency range	:	13.56 ㎒
Modulation technique	:	ASK
Power source	:	DC 15 V
Antenna specification	:	Pattern antenna (NFC)
Software version	:	Rev 1.0
Hardware version	:	Rev 1.0
Test device serial No.	:	N/A
Operation temperature	:	-20 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
AC/DC Adapter	Foshan Shunde Guanyuda Power Supply Co.,Ltd	GM60-150300-F	A1903384899	Input : 100-240V~50/60Hz 2.0A Output : 15V / 3.0A

2.2. Information about derivative model

The difference between basic model and derivative model is:

In the derivative model(EF-45N), infrared sensors are added to the basic model(UMX-10).
All other internal components are the same as in the previous model.
The added part does not affect the wireless part of the product.

2.3. Frequency/channel operations

This device contains the following capabilities: NFC

Frequency (㎒)
13.56

Table 2.3.1. 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.

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

4. Summary of tests

FCC Part section(s)	Parameter	Test results
15.225(a)	In-band Fundamental Emission	Pass
15.225(b)	In-band Spurious Emission	Pass
15.225(c)	In-band Spurious Emission	Pass
15.225(a) 15.209	Out-of–band Spurious Emission	Pass
	Frequency Stability Tolerance	N/T(Note1)
15.215(c)	20 ㏈ Bandwidth	N/T(Note1)
15.207(a)	Conducted emissions	Pass

Notes: (N/T : Not Tested)

1. This test item is derivative model so, test was previously performed by basic model (Please refer to Test report no. UCSFR-1610-004 issued on October 11, 2016 by UCS Co., Ltd.)
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 : With 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.

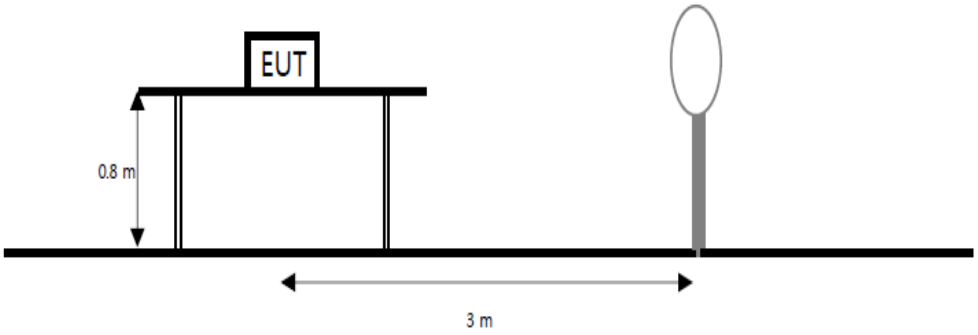
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine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

Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒	2.28 dB
	30 ㎒ ~ 300 ㎒	4.98 dB
	300 ㎒ ~ 1 000 ㎒	5.14 dB
	1 ㎓ ~ 6 ㎓	6.70 dB
	Above 6 ㎓	6.60 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	3.66 dB
	150 ㎑ ~ 30 ㎒	3.26 dB

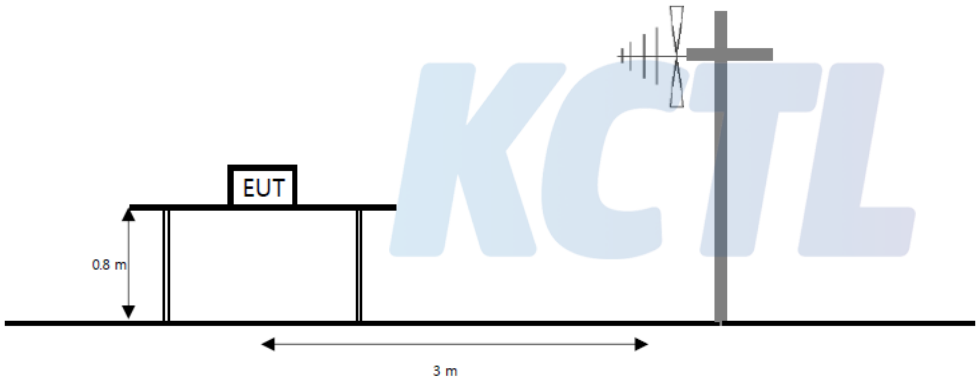
6. Test results
6.1. Radiated spurious emissions

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 = 40log(D_m/Ds)
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. F_d = 20log(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. (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

Test results for fundamental

15.225 (a) 13.553 ㎒ - 13.567 ㎒

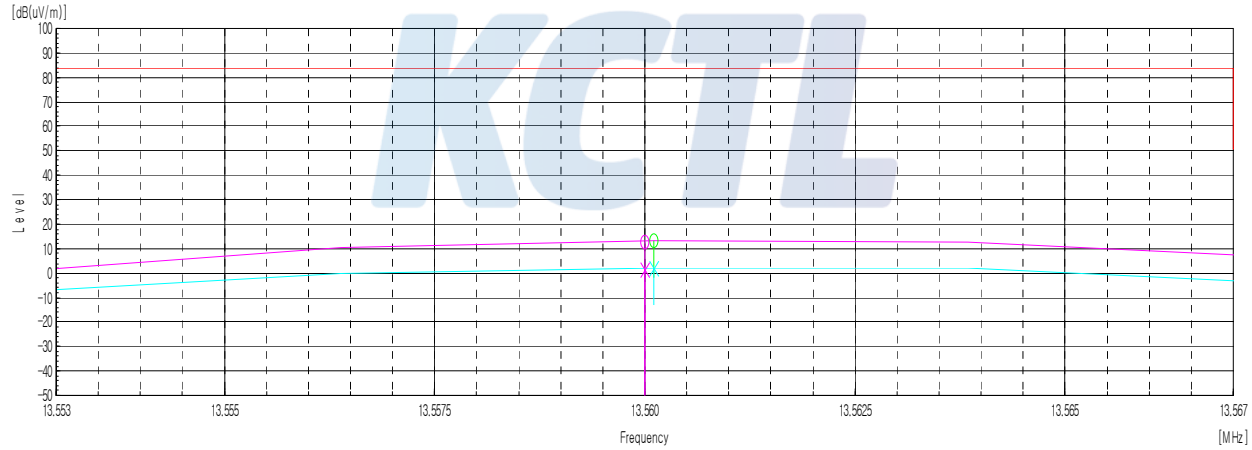
[Face-on]

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	63.70	20.27	-31.27	40.00	12.70	84.00	71.30

[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	52.60	20.27	-31.27	40.00	1.60	84.00	82.40

Face-on/Face-off



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

15.225 (b,c) 13.110 ㎒ - 14.010 ㎒

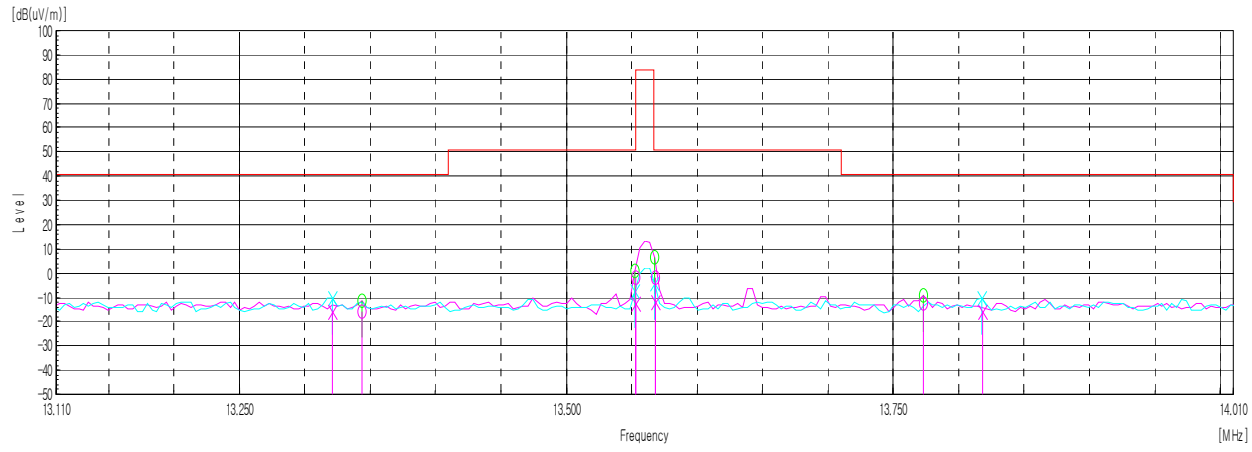
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data							
13.34	35.10	20.26	-31.26	40.00	-15.90	40.51	56.41
13.55	48.90	20.27	-31.27	40.00	-2.10	50.47	52.57
13.57	49.40	20.27	-31.27	40.00	-1.60	50.47	52.07
13.77	38.70	20.28	-31.28	40.00	-12.30	40.51	52.81

[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							
13.32	35.10	20.26	-31.26	40.00	-15.90	40.51	56.41
13.55	38.50	20.27	-31.27	40.00	-12.50	50.47	62.97
13.57	39.00	20.27	-31.27	40.00	-12.00	50.47	62.47
13.82	35.00	20.28	-31.18	40.00	-16.00	40.51	56.51

Face-on/Face-off



15.225 (d) 9 kHz - 30 MHz

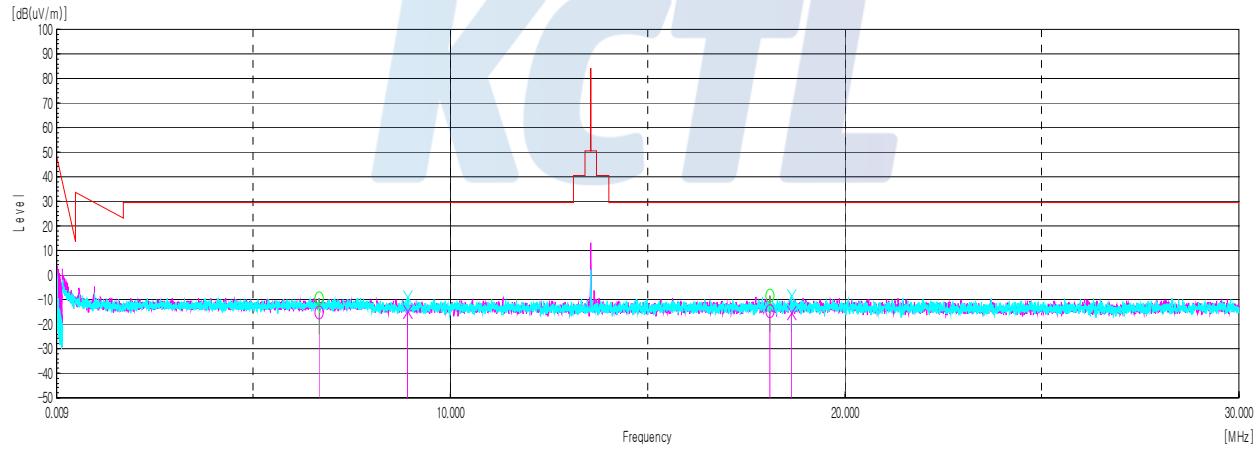
[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(MHz)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Quasi peak data							
6.67	35.90	20.27	-31.57	40.00	-15.40	29.54	44.94
18.11	35.50	20.55	-31.05	40.00	-15.00	29.54	44.54

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(MHz)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Quasi peak data							
8.90	36.30	20.22	-31.42	40.00	-14.90	29.54	44.44
18.64	35.20	20.59	-30.99	40.00	-15.20	29.54	44.74

Face-on/Face-off

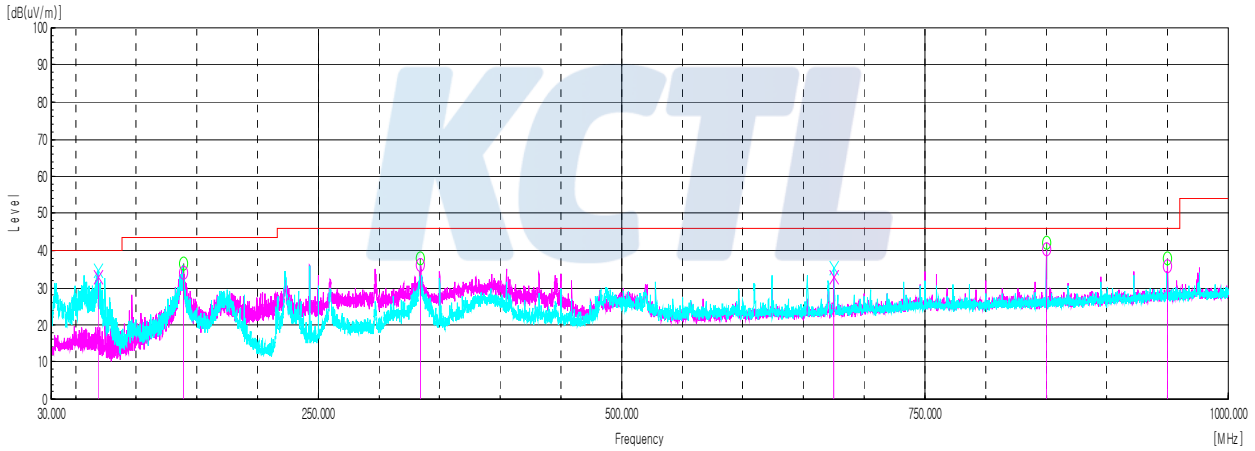


Test results (Below 1 000 ㎒)

15.225 (d) 30 ㎒ - 1000 ㎒

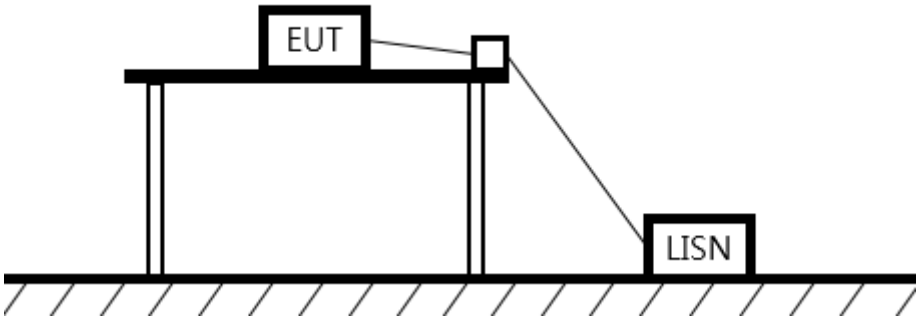
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
68.44	V	46.30	16.62	-29.97	-	32.95	40.00	7.05
139.00	H	44.30	18.72	-28.86	-	34.16	43.50	9.34
334.10	H	43.70	20.08	-27.55	-	36.23	46.00	9.77
675.05	V	32.10	26.45	-25.45	-	33.10	46.00	12.90
850.01	H	36.50	28.70	-24.68	-	40.52	46.00	5.48
950.05	H	29.40	29.90	-23.46	-	35.84	46.00	10.16

Horizontal/Vertical



6.2. AC Conducted emission

Test setup



Limit

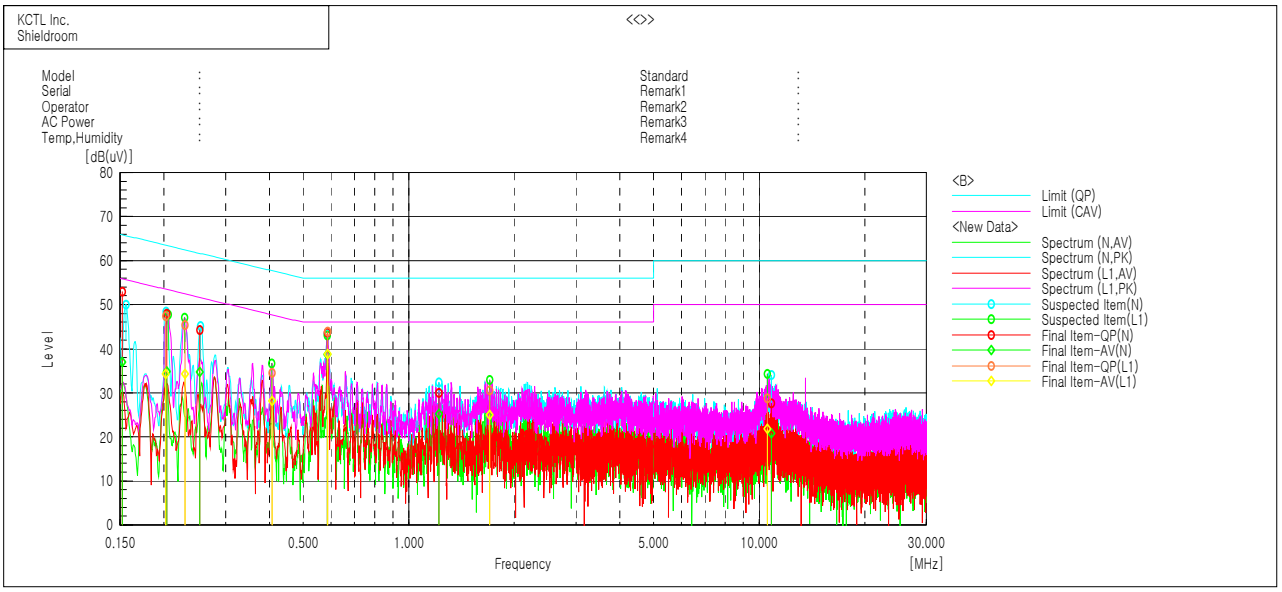
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following 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 ㅡ Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results



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	0.15211	43.2	27.2	9.8	53.0	37.0	65.9	55.9	12.9	18.9
2	0.20379	38.2	25.1	9.8	48.0	34.9	63.5	53.5	15.5	18.6
3	0.25348	34.6	25.0	9.7	44.3	34.7	61.6	51.6	17.3	16.9
4	0.58615	33.7	28.8	9.9	43.6	38.7	56.0	46.0	12.4	7.3
5	1.2175	20.1	15.4	9.8	29.9	25.2	56.0	46.0	26.1	20.8
6	10.84681	17.7	10.9	9.9	27.6	20.8	60.0	50.0	32.4	29.2

--- 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	0.20236	37.6	24.4	9.9	47.5	34.3	63.5	53.5	16.0	19.2
2	0.22995	35.6	24.5	9.8	45.4	34.3	62.5	52.5	17.1	18.2
3	0.40726	24.7	18.2	9.9	34.6	28.1	57.7	47.7	23.1	19.6
4	0.58641	34.0	28.9	9.9	43.9	38.8	56.0	46.0	12.1	7.2
5	1.7015	20.8	15.2	9.8	30.6	25.0	56.0	46.0	25.4	21.0
6	10.55805	18.8	11.9	9.9	28.7	21.8	60.0	50.0	31.3	28.2

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100808	20.07.30
EMI TEST RECEIVER	R&S	ESCI7	100732	20.08.22
Bi-Log Antenna	SCHWARZBECK	VULB 9168	583	20.05.04
Amplifier	SONOMA INSTRUMENT	310N	284608	20.08.22
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	20.05.04
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33 -8P	2000997	20.08.01
LOOP Antenna	R&S	HFH2-Z2	100355	20.08.24
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
TWO-LINE V - NETWORK	R&S	ENV216	101358	20.04.05
EMI TEST RECEIVER	R&S	ESCI	100001	20.08.22
Vector Signal Generator	R&S	SMBV100A	257566	20.01.04
Signal Generator	R&S	SMB100A	176206	20.01.25

End of test report