

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : W17NR-D050

AGR No. : A176A-395

Applicant : LG CNS CO., LTD.

Address : FKI Tower, 24, Yeoui-daero, Yeongdeungpo-gu, 07320, Seoul, South Korea

Manufacturer : LG CNS CO., LTD.

Address : FKI Tower, 24, Yeoui-daero, Yeongdeungpo-gu, 07320, Seoul, South Korea

Type of Equipment : RFID Card Reader

FCC ID : RTQXID500

Model Name : XID-500

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 21 pages (including this page)

Date of Incoming : July 11, 2017

Date of Issuing : November 16, 2017

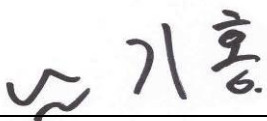
SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART C Section 15.225**

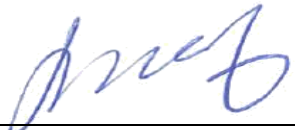
This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Reviewed by:


Ki-Hong, Nam / Asst, Chief Engineer
ONETECH Corp.

Approved by:


Keun-Young, Choi / Vice President
ONETECH Corp.

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REVISION HISTORY

Issued Report No.	Issued Date	Revisions	Effect Section
W17NR-D050	November 16, 2017	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

- . APPLICANT : LG CNS CO., LTD.
- . ADDRESS : FKI Tower, 24, Yeoui-daero, Yeongdeungpo-gu, 07320, Seoul, South Korea
- . CONTACT PERSON : TAE YOUNG, JEONG / Manager
- . TELEPHONE NO : +82-2-2099-0165
- . FCC ID : RTQXID500
- . MODEL NO/NAME : XID-500
- . SERIAL NUMBER : N/A
- . DATE : November 16, 2017

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	RFID Card Reader
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	10 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The LG CNS CO., LTD., Model XID-500 (referred to as the EUT in this report) is an RFID Card Reader, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	RFID Card Reader
TRANSMITTING FREQUENCY	13.56 MHz
NUMBER OF CHANNELS	1
MODULATION	ASK
ANTENNA TYPE	PCB Pattern Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	27.12 MHz

2.2 Model Differences:

-. None

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.225.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	XID410_MAIN_PCB REV 06	N/A
Sub Board	N/A	XID410_BOTTOM_BRD REV06	N/A
USB Board	N/A	XID400_RE0.6 USB SUB	N/A
Display	N/A	N/A	N/A
Antenna Board	N/A	XID-400 Rev0.6 SUB Board	N/A
Adapter	ShenZhen SOY Yechnology Co., Ltd	SOY-1200300	N/A

3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested: None

3.3 Mode of operation during the test

-. The EUT has NFC and program was used for making continuous transmission mode for only NFC during the test.

3.4 Equipment Modifications

-. None

3.5 Configuration of Test System

Line Conducted Test : The EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test : Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.
 For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.
 The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

3.6 Antenna Requirement

For intentional device, according to 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.

Antenna Construction:

The transmitter antenna of the EUT is a PCB pattern antenna so there is no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X

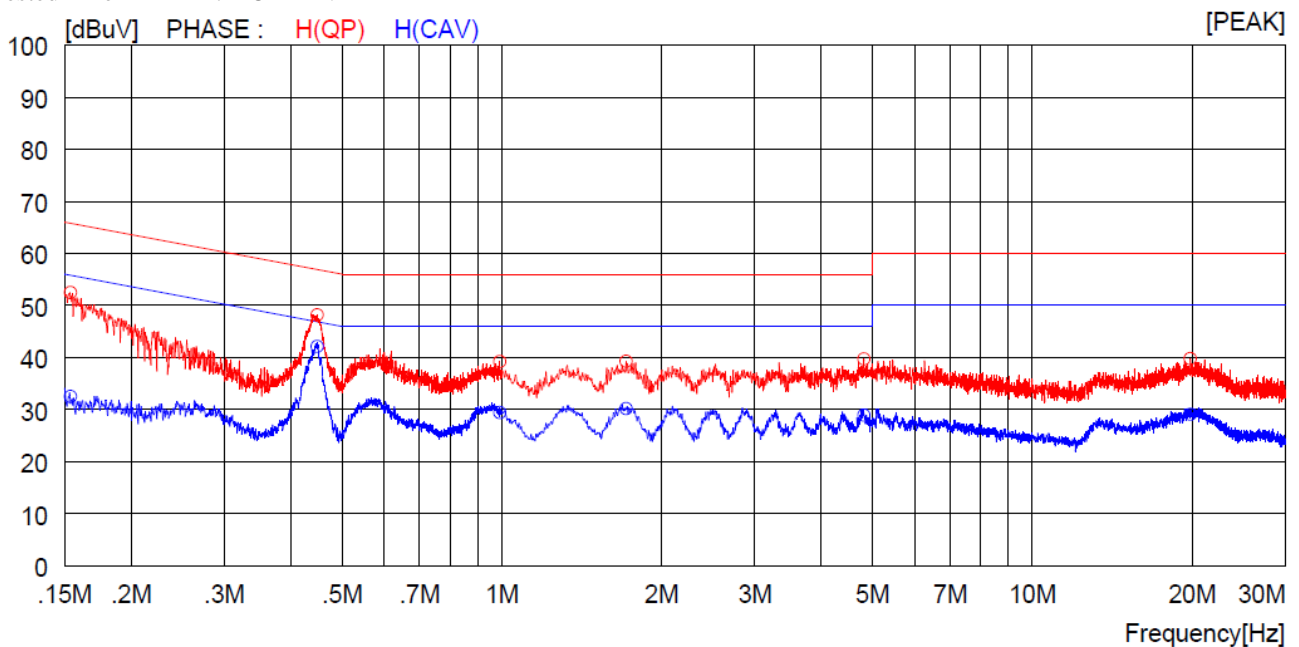
5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

5.1 CONDUCTED EMISSION TEST

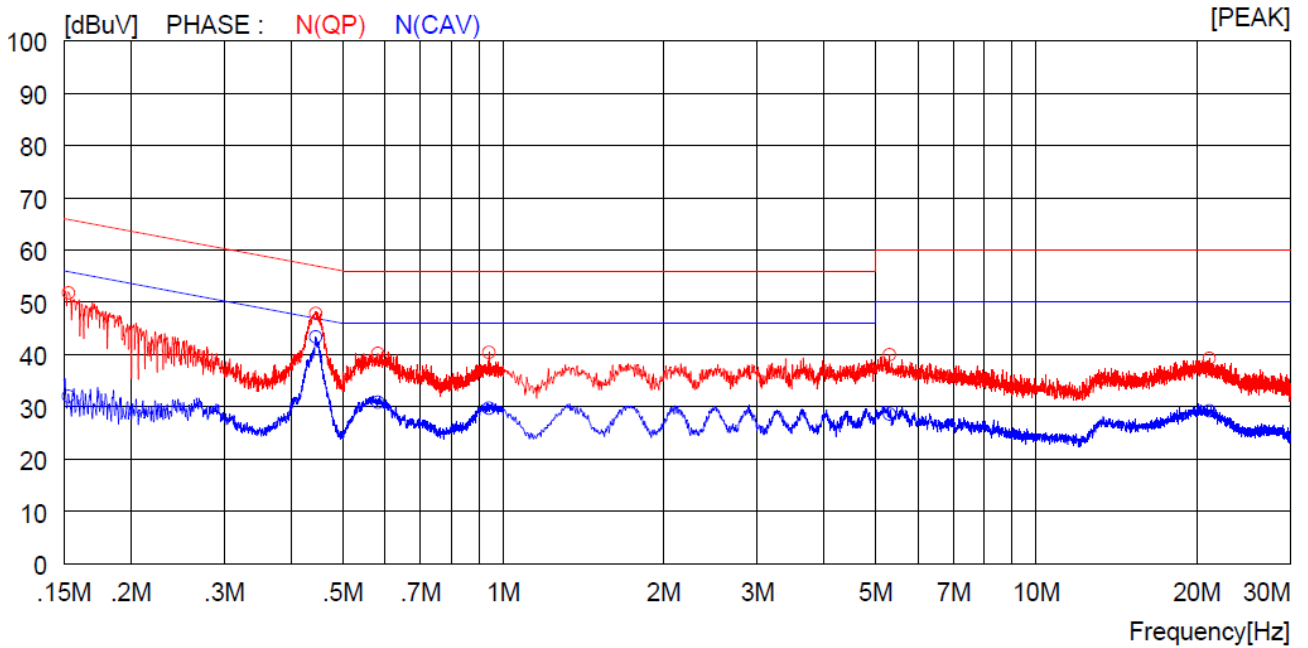
Humidity Level : (47 ~ 48) % R.H. Temperature: (23 ~ 24) °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.207(a)
 Result : PASSED

EUT : RFID Card Reader Date: November 01, 2017
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)
 Tested Line : HOT LINE



NO	FREQ [MHz]	READING (PK) [dBuV]	C. F [dB]	RESULT [dBuV]	LIMIT		MARGIN		PHASE
					QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
1	0.15400	32.3	20.2	52.5	65.8		13.3		H (QP)
2	0.44900	27.9	20.3	48.2	56.9		8.7		H (QP)
3	0.99200	18.8	20.4	39.2	56.0		16.8		H (QP)
4	1.71600	18.9	20.4	39.3	56.0		16.7		H (QP)
5	4.81600	19.3	20.4	39.7	56.0		16.3		H (QP)
6	19.86000	19.4	20.4	39.8	60.0		20.2		H (QP)
7	0.15400	12.3	20.2	32.5		55.8		23.3	H (CAV)
8	0.44900	21.8	20.3	42.1		46.9		4.8	H (CAV)
9	0.99200	9.0	20.4	29.4		46.0		16.6	H (CAV)
10	1.71600	9.8	20.4	30.2		46.0		15.8	H (CAV)
11	4.81600	8.4	20.5	28.9		46.0		17.1	H (CAV)
12	19.86000	8.7	20.4	29.1		50.0		20.9	H (CAV)

Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING (PK) [dBuV]	C.F [dB]	RESULT [dBuV]	LIMIT		MARGIN		PHASE
					QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
1	0.15300	31.6	20.2	51.8	65.8		14.0		N(QP)
2	0.44500	27.6	20.3	47.9	57.0		9.1		N(QP)
3	0.58200	19.9	20.3	40.2	56.0		15.8		N(QP)
4	0.94100	20.0	20.4	40.4	56.0		15.6		N(QP)
5	5.30500	19.5	20.5	40.0	60.0		20.0		N(QP)
6	21.14000	18.9	20.4	39.3	60.0		20.7		N(QP)
7	0.15300	11.8	20.2	32.0		55.8		23.8	N(CAV)
8	0.44500	23.1	20.3	43.4		47.0		3.6	N(CAV)
9	0.58200	10.6	20.3	30.9		46.0		15.1	N(CAV)
10	0.94100	9.3	20.4	29.7		46.0		16.3	N(CAV)
11	5.30500	8.2	20.4	28.6		50.0		21.4	N(CAV)
12	21.14000	8.8	20.4	29.2		50.0		20.8	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Tae-Ho, Kim / Manager

5.2 RADIATED EMISSION TEST

5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 49.0 % R.H. Temperature: 24.1 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Result : PASSED

EUT : RFID Card Reader Date: November 14, 2017
 Operating Condition : Transmitting Mode
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)
 Distance : 3 m

Radiated Emission		Ant	Correction Factors		Total	FCC	
Freq. (MHz)	Amplitud (dBμV)	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.56	17.99	H	19.98	1.09	39.06	124	84.94
13.56	17.27	V	19.98	1.09	38.34	124	85.66

Note: According to the distance of measurements was reduced to 3 m, the limit was extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as follows.

Limit calculation: Limit at specified distance + $40\log(30/3) = 84 \text{ dB}\mu\text{V/m} + 40 \text{ dB}$



Tested by: Tae-Ho, Kim / Manager

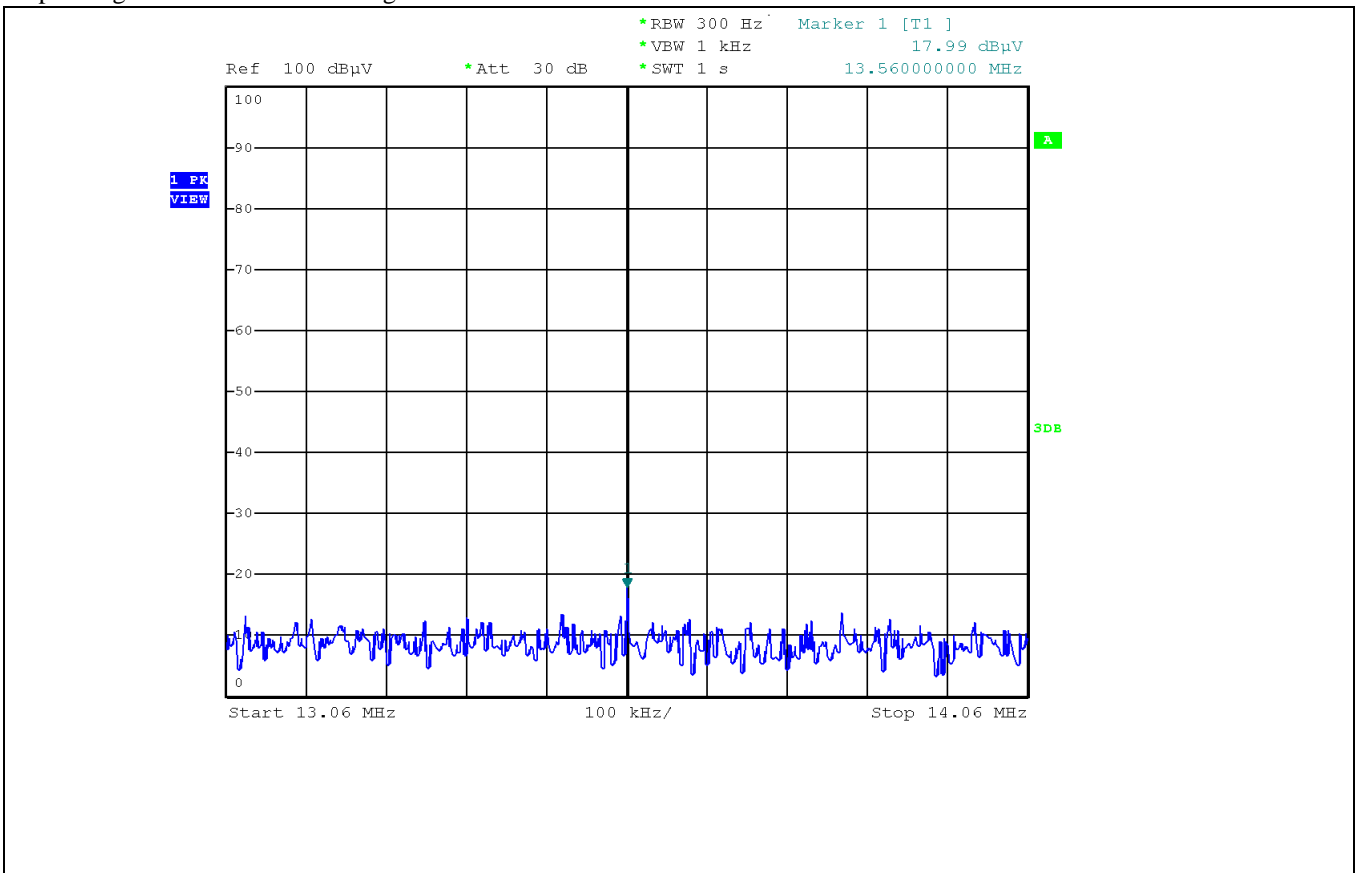
5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 49.0 % R.H. Temperature: 24.1 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Result : PASSED

EUT : RFID Card Reader Date: November 14, 2017

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.56 MHz is 17.99 dBuV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBuV/m, so the EUT meets the requirement.

Tested by: Tae-Ho, Kim / Manager

5.3 SPURIOUS EMISSION TEST

5.3.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : (46 ~ 47) % R.H. Temperature: (24 ~ 25) °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Frequency Range : 9 kHz ~ 30 MHz
 Result : PASSED

EUT : RFID Card Reader Date: November 01, 2017
 Operating Condition : Transmitting Mode
 Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Manager

5.3.2 Spurious Radiated Emission below 1 GHz

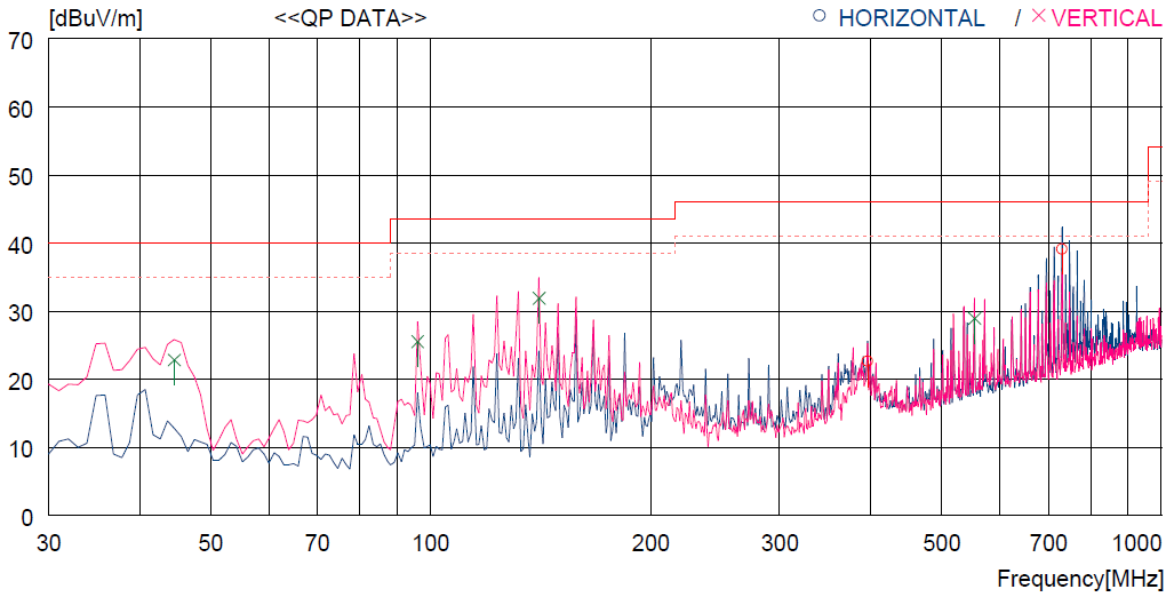
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : (46 ~ 47) % R.H. Temperature: (24 ~ 25) °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Frequency range : 30 MHz ~ 1 000 MHz
 Result : PASSED

EUT : RFID Card Reader Date: November 01, 2017

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	395.690	35.3	15.9	4.6	33.2	22.6	46.0	23.4	100	359
2	730.334	46.4	19.9	6.2	33.4	39.1	46.0	6.9	100	359
----- Vertical -----										
3	44.550	40.3	13.9	1.7	33.1	22.8	40.0	17.2	100	129
4	95.960	45.0	11.2	2.3	33.0	25.5	43.5	18.0	100	0
5	140.580	54.0	8.0	2.8	32.9	31.9	43.5	11.6	100	0
6	554.769	39.2	17.6	5.4	33.3	28.9	46.0	17.1	100	113

Tested by: Tae-Ho, Kim / Manager

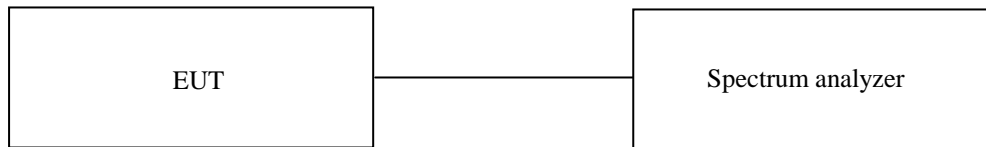
5.4 20 dB BANDWIDTH

5.4.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 49.0 % R.H.

5.4.2 Test set-up

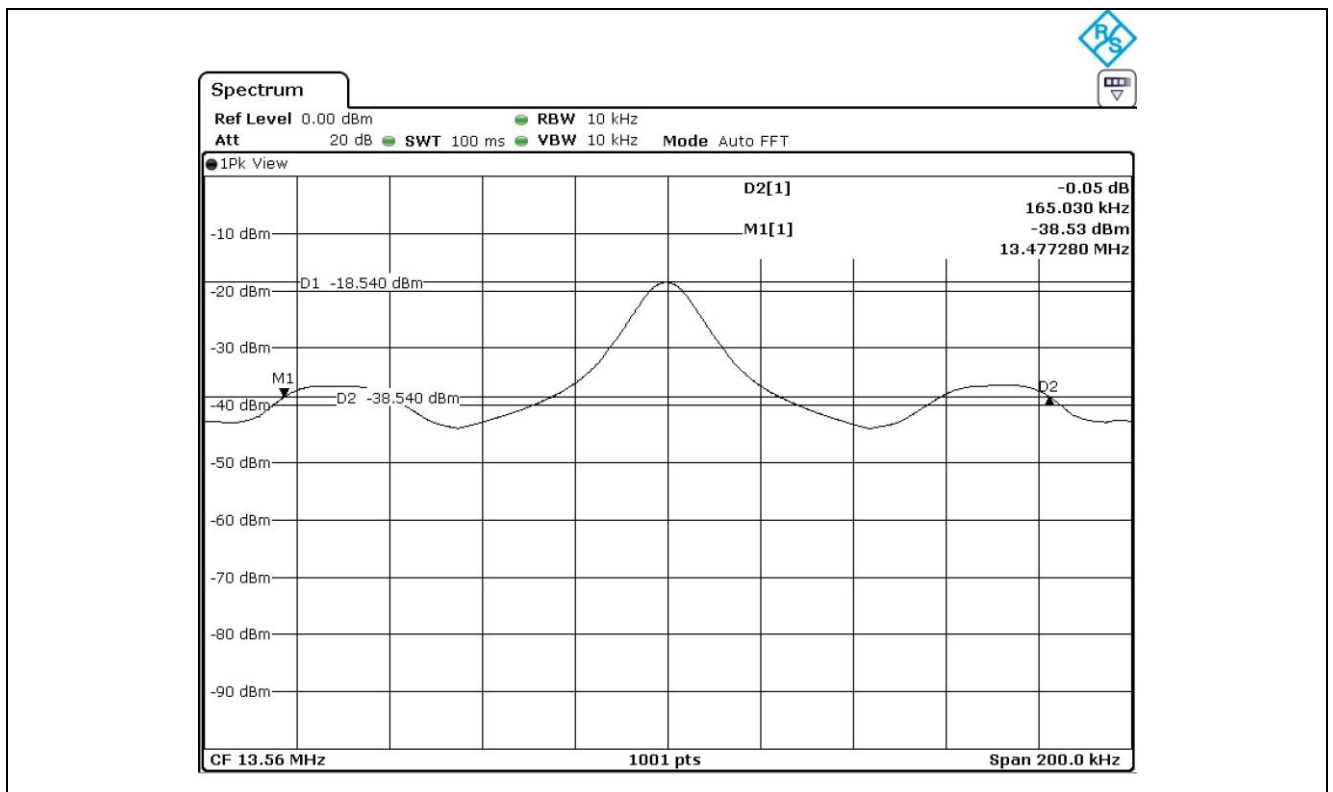
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



5.4.3 Test data

- Test Date : October 17, 2017
- Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Operating Freq. (MHz)	Measured Value (kHz)	Assigned Operating Frequency Band (kHz)	Result
13.56	165.03	900	PASS



Tested by: Tae-Ho, Kim / Manager

5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.5.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 49.0 % R.H.

5.5.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

5.5.3 Test data

-. Test Date : November 14, 2017
 -. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 56	13 560 088	1 268	± 1 356.0
-10		13 560 065	1 291	
0		13 560 072	1 284	
10		13 560 034	1 322	
20		13 560 028	1 328	
30		13 560 013	1 343	
40		13 560 069	1 287	
50		13 560 088	1 268	



Tested by: Tae-Ho, Kim / Manager

5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.6.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 49.0 % R.H.

5.6.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

5.6.3 Test data

-. Test Date : November 14, 2017
 -. Result : PASSED

Voltage (Vac)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
264.5(115 %)	13 560 000	13 560 044	1312	± 1 356.00
230(100 %)		13 560 013	1343	
195.5(85 %)		13 560 038	1318	



Tested by: Tae-Ho, Kim / Manager

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+ Meter reading	(dB μ V)
- Amplifier Gain	(dB)
+ Cable Loss	(dB)
- Antenna Factor	(dB/m)
<hr/>	
= Corrected Result	(dB μ V/m)

Margin (dB)

Specification Limit	(dB μ V/m)
- Corrected Result	(dB μ V/m)
<hr/>	
= dB Relative to Spec	(\pm dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101013	Apr. 04, 2017	One Year	<input type="checkbox"/>
2.		R/S	ESPI	101278	Oct. 26, 2017	One Year	<input checked="" type="checkbox"/>
3.		R/S	ESU	100261	Apr. 05, 2017	One Year	<input type="checkbox"/>
4.	Spectrum analyzer	R/S	FSU26	200319	Apr. 04, 2017	One Year	<input type="checkbox"/>
5.	Spectrum analyzer	R/S	FSV30	101199	Apr. 05, 2017	One Year	<input checked="" type="checkbox"/>
6.	Amplifier	Sonoma Instrument	310N	312544	Apr. 04, 2017	One Year	<input checked="" type="checkbox"/>
7.	Amplifier	Sonoma Instrument	310N	312545	Apr. 04, 2017	One Year	<input type="checkbox"/>
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	May. 20, 2016	Two Year	<input type="checkbox"/>
9.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 05, 2016	Two Year	<input checked="" type="checkbox"/>
10.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	<input checked="" type="checkbox"/>
11.	LISN	EMCO	3825/2	9109-1867	Apr. 07, 2017	One Year	<input type="checkbox"/>
				9109-1869	Apr. 06, 2017	One Year	<input type="checkbox"/>
		Schwarzbeck	NSLK8126	8126-404	Apr. 03, 2017	One Year	<input type="checkbox"/>
		Schwarzbeck	NSLK8128	8128-216	Apr. 05, 2017	One Year	<input type="checkbox"/>
12.	Turn Table	Innco System	DT3000	930611	N/A	N/A	<input checked="" type="checkbox"/>
13.	Antenna Master	Innco System	MA-4000XPET	MA4000/509/ 37211215/L	N/A	N/A	<input checked="" type="checkbox"/>
14.	Antenna Master	Innco System	MA4000-EP	MA4000/332/ 27030611/L	N/A	N/A	<input type="checkbox"/>
15.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-235	Jun. 10, 2016	Two Year	<input checked="" type="checkbox"/>
16.	Frequency Counter	HP	53152A	US39270295	Sep. 05, 2017	One Year	<input checked="" type="checkbox"/>
17.	Chamber	ESPEC	EBE- 5E30W6PT2L- 22	3015006449	Mar. 22, 2017	One Year	<input checked="" type="checkbox"/>
18.	DC Power Supply	Protek	PWS-3003D	4020409	Sep. 01, 2017	One Year	<input checked="" type="checkbox"/>
19.	Slidacs	Dea Kwang Elec.	DH-60	N/A	Sep. 01, 2017	One Year	<input type="checkbox"/>