

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : W168R-D036

AGR No. : A167A-147

Applicant : Caregate Co., Ltd.

Address : 1220-ho, Munjeong Daemyung Valleyon, 127 Beobwon-ro, Songpa-gu, Seoul, 05836,
Korea

Manufacturer : Caregate Co., Ltd.

Address : 1220-ho, Munjeong Daemyung Valleyon, 127 Beobwon-ro, Songpa-gu, Seoul, 05836,
Korea

Type of Equipment : Digital Door Lock

FCC ID : 2AJMPKL-100X

Model Name : KL-100x

Multiple Model Name : KL-100S, KL-100B, KL-100P

Serial number : N/A

Total page of Report : 19 pages (including this page)

Date of Incoming : August 03, 2016

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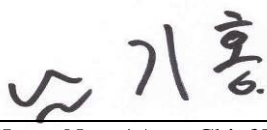
SUMMARY

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: 
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ONETECH Corp.

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ONETECH Corp.

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Revision History

Issue Report No.	Issued Date	Revisions	Effect Section
W168R-D036	August 25, 2016	Initial Release	All

1. VERIFICATION OF COMPLIANCE

-. APPLICANT : Caregate Co., Ltd.
-. ADDRESS : 1220-ho, Munjeong Daemyung Valleyon, 127 Beobwon-ro, Songpa-gu, Seoul, 05836, Korea
-. CONTACT PERSON : Ki-Kwon Yun / President
-. TELEPHONE NO : +82-02-6488-3151
-. FCC ID : 2AJMPKL-100X
-. MODEL NO/NAME : KL-100x
-. SERIAL NUMBER : N/A
-. DATE : August 25, 2016

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Digital Door Lock
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 Caregate Co., Ltd., Model KL-100x (referred to as the EUT in this report) is an Digital Door Lock, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Digital Door Lock
TRANSMITTING FREQUENCY	13.562 MHz
MODULATION	ASK
ANTENNA TYPE	FPCB Pattern Antenna
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	12 MHz, 32.768 kHz

2.2 Model Differences:

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
KL-100x	Basic Model.	☒
KL-100S, KL-100B, KL-100P	The models is add according to buyers request.	☐

Note: 1. The Applicant/manufacture is responsible for the compliance of all variants.

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-4617/ G-666/ T-1842

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

-. 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	Caregate Co., Ltd.	N/A	N/A
SUB BOARD	Caregate Co., Ltd.	N/A	N/A
LED BOARD	Caregate Co., Ltd.	N/A	N/A
Bluetooth LE Module	PROCHILD INC.	PBLN51822m	2AEEY-PBLN51822M

3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
KL-100x	Caregate Co., Ltd.	Digital Door Lock (EUT)	-
IM-A850K	Pantech	Cellular Phone	EUT

3.3 Mode of operation during the test

-. The EUT has Bluetooth, Reading Card and program was used for making continuous transmission mode during the test.

3.4 Equipment Modifications

-. None

3.5 Configuration of Test System

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)
It is not need to test this requirement, because the power of the EUT is supplied from a battery.	

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 RADIATED EMISSION TEST

5.1.1 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 : 49.4 % R.H. Temperature: 24.7 °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 : Digital Door Lock Date: August 11, 2016
 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)
13.562	18.73	H	19.2	0.6	38.53	124	85.47
13.562	16.58	V	19.2	0.6	36.38	124	87.62

Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.


 Tested by: Seok-Jun, Lee / Engineer

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

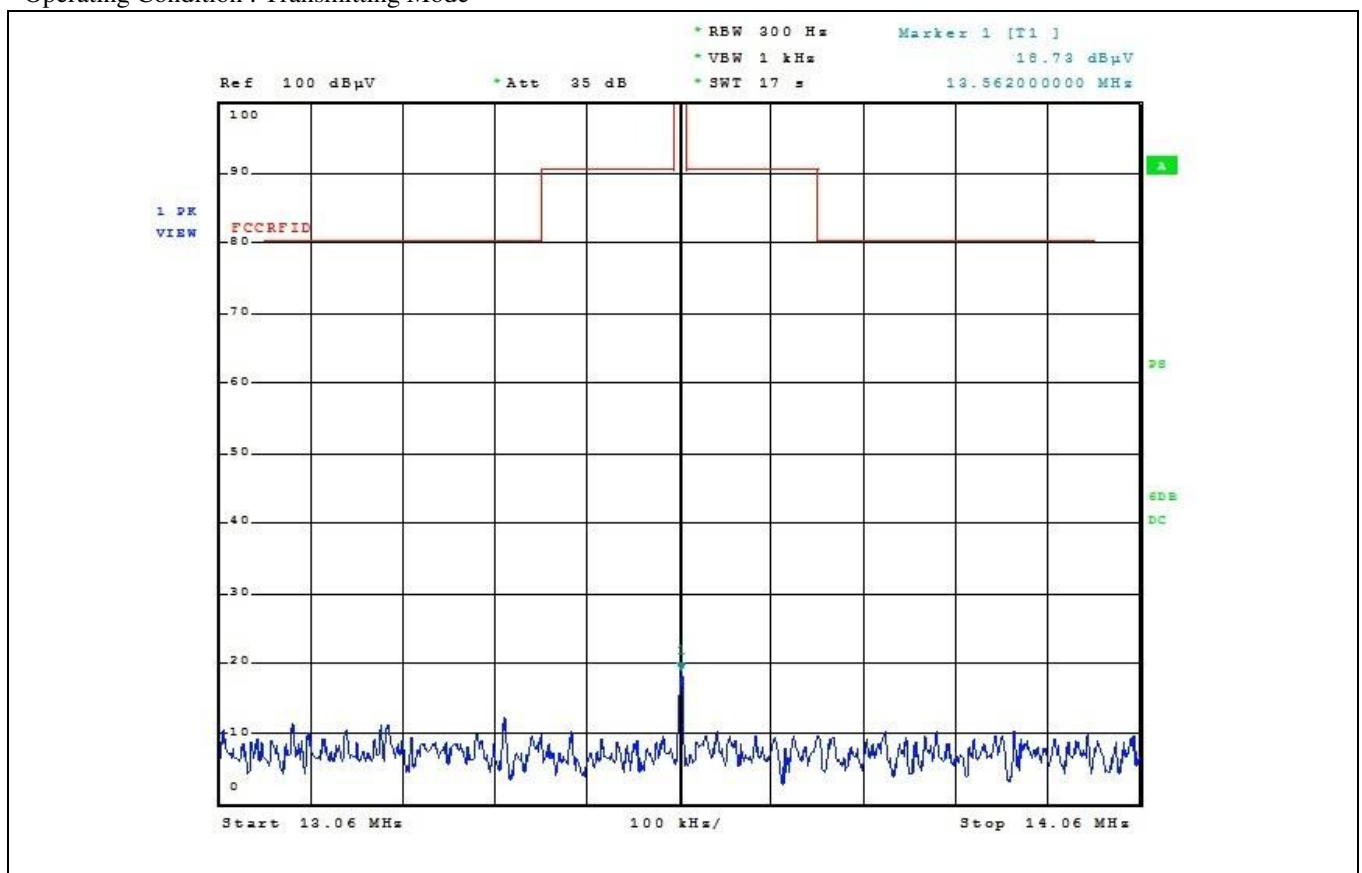
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level	: <u>49.4 % R.H.</u>	Temperature: <u>24.7 °C</u>
Limits apply to	: <u>FCC CFR 47, PART 15, SUBPART C, SECTION 15.209</u>	
Type of Test	: <u>Low Power Transmitter below 1 705 kHz</u>	
Result	: <u>PASSED</u>	

EUT : Digital Door Lock

Date: August 11, 2016

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.558 7 MHz is 56.98 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: Seok-Jun, Lee / Engineer

5.2 SPURIOUS EMISSION TEST

5.2.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 49.4 % R.H.

Temperature: 24.7 °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 : Digital Door Lock

Date: August 11, 2016

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: Seok-Jun, Lee / Engineer

5.2.2 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 : 49.4 % R.H.

Temperature: 24.7 °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

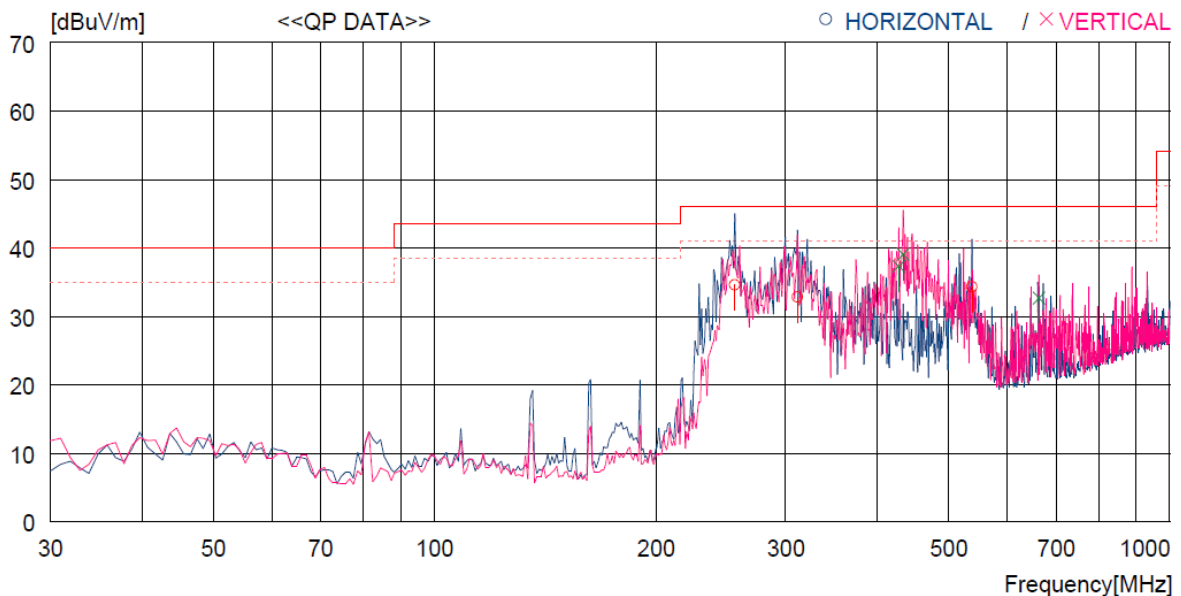
Result : PASSED

EUT : Digital Door Lock

Date: August 11, 2016

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	256.010	51.2	12.1	4.1	32.8	34.6	46.0	11.4	100	295
2	311.300	47.5	13.3	4.7	32.7	32.8	46.0	13.2	200	359
3	538.280	43.2	17.3	6.8	33.0	34.3	46.0	11.7	100	0
----- Vertical -----										
4	427.701	48.7	15.8	5.5	32.7	37.3	46.0	8.7	200	198
5	433.521	50.3	15.8	5.6	32.7	39.0	46.0	7.0	100	0
6	663.406	40.1	19.1	7.0	33.5	32.7	46.0	13.3	200	174


Tested by: Seok-Jun, Lee / Engineer

5.3 20 dB BANDWIDTH

5.3.1 Operating environment

Temperature : 24.1 °C
Relative humidity : 47.6 % R.H.

5.3.2 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.

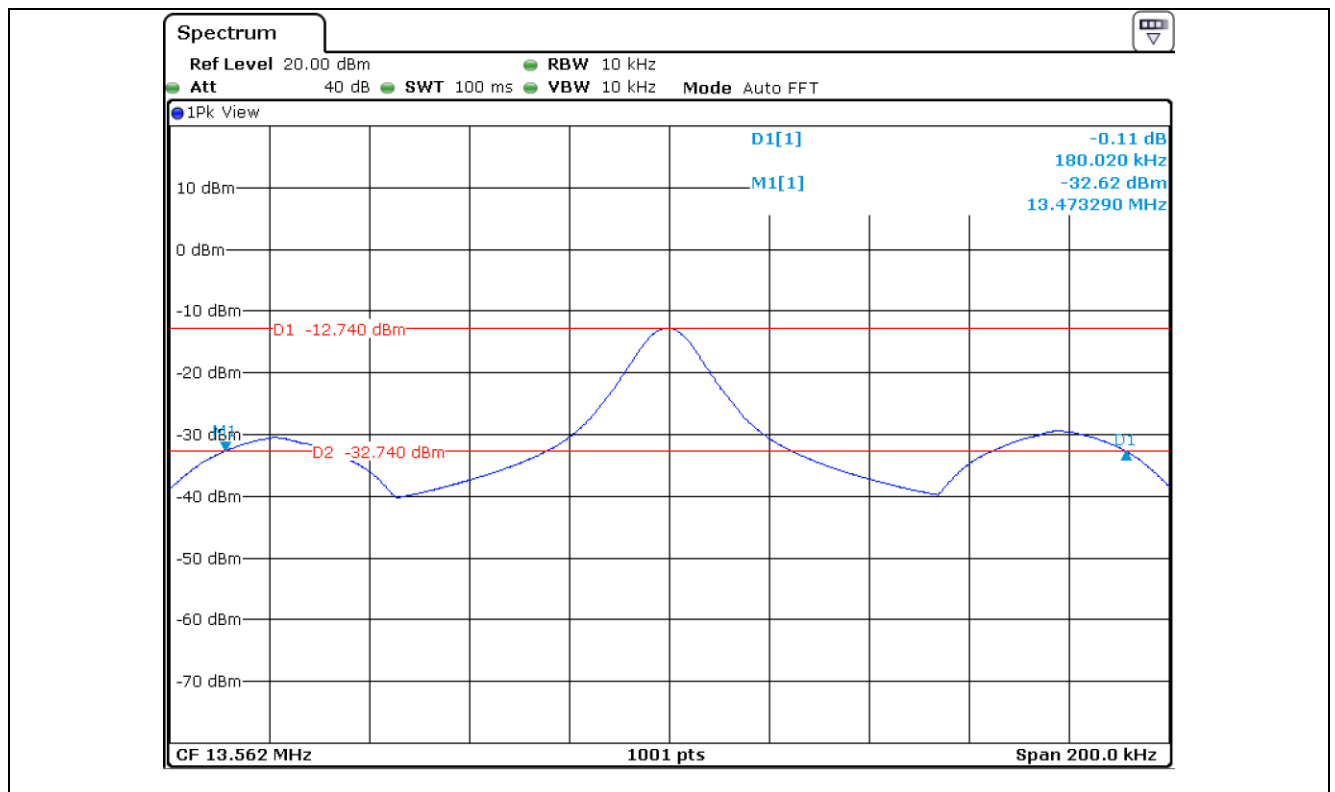


5.3.3 Test data

-. Test Date : August 10, 2016

-. 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
13.562	180.02	900	PASS



Tested by: Seok-Jun, Lee / Engineer

5.4 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.4.1 Operating environment

Temperature : 23.4 °C
Relative humidity : 47.8 % R.H.

5.4.2 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.

5.4.3 Test data

-. Test Date : August 10, 2016

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 562 000	13 562 618	738.2	± 1 356.20
-10		13 562 629	727.2	
0		13 562 642	714.2	
10		13 562 653	703.2	
20		13 562 667	689.2	
30		13 562 682	674.2	
40		13 562 701	655.2	
50		13 562 712	644.2	


Tested by: Seok-Jun, Lee / Engineer

5.5 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.5.1 Operating environment

Temperature : 24.5 °C
Relative humidity : 48.3 % R.H.

5.5.2 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.

5.5.3 Test data

-. Test Date : August 11, 2016
-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
6.9(115 %)	13 562 000	13 562 682	674.2	± 1 356.20
6.0(100 %)		13 562 701	655.2	
5.1(85 %)		13 562 645	711.2	


 Tested by: Seok-Jun, Lee / Engineer

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)
=	Corrected Result	(dB μ V/m)

Margin (dB)

	Specification Limit	(dB μ V/m)
-	Corrected Result	(dB μ V/m)
=	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	101012	Nov. 02, 2015	One Year	☐
2.		R/S	ESU	100261	Apr. 06, 2016	One Year	☒
3.		R/S	ESPI	101278	Nov. 02, 2015	One Year	☐
4.	Spectrum analyzer	R/S	FSU	200319	Apr. 14, 2016	One Year	☒
5.	Amplifier	Sonoma Instrument	310N	312544	Apr. 05, 2016	One Year	☒
6.	Amplifier	Sonoma Instrument	310N	312545	Apr. 05, 2016	One Year	☐
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	May 20, 2016	Two Year	☐
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-421	Apr. 15, 2016	Two Year	☒
9.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	☒
10.	LISN	EMCO	3825/2	9109-1867	Apr. 06, 2016	One Year	☐
				9109-1869	Apr. 06, 2016	One Year	☐
		Schwarzbeck	NSLK8126	8126-404	Apr. 05, 2016	One Year	☐
		Schwarzbeck	NSLK8128	8128-216	Apr. 06, 2016	One Year	☐
11.	Turn Table	Innco System	DT3000	930611	N/A	N/A	☒
12.	Antenna Master	Innco System	MA4000-EP	MA4000/332	N/A	N/A	☒
13.	Antenna Master	Innco System	MA-4000XPET	MA4000/509	N/A	N/A	☐
14.	Loop Antenna	R/S	HFH2-Z2	879285/26	Dec. 09, 2014	Two Year	☒
15.	Frequency Counter	HP	53152A	US39270295	Oct. 07, 2015	One Year	☒
16.	Chamber	ESPEC	PSL-2KP	14009407	Feb. 04, 2016	One Year	☒
17.	DC Power Supply	Digital Electronics	DRP-305DN	4030195	Sep. 03, 2015	One Year	☐