

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : W171R-D004

AGR No. : A171A-032R

Applicant : LG Innotek Co., Ltd.

Address : 26, Hanamsandan 5beon-ro Gwangsan-gu, Gwangju, 506-731, South Korea

Manufacturer : SUZHOU NIHONE Electronics Technology Co., LTD.

Address : No.185 XiaoXiang Road Suzhou High tech Zone

Type of Equipment : ESL Tag Controller

FCC ID : YZP-REAXXOXXA

Model Name : REAX-XOXXA

Serial number : N/A

Total page of Report : 18 pages (including this page)

Date of Incoming : January 03, 2017

Date of Issuing : January 17, 2017

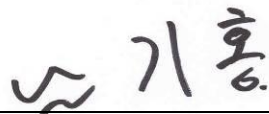
SUMMARY

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.

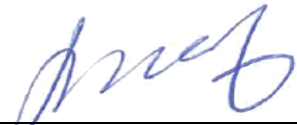
It is not a general valid assessment of the features of the respective products of the mass-production.

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

Issue Report No.	Issued Date	Revisions	Effect Section
W171R-D004	January 17, 2017	Initial Release	All

1. VERIFICATION OF COMPLIANCE

- . APPLICANT : LG Innotek Co., Ltd.
- . ADDRESS : 26, Hanamsandan 5beon-ro Gwangsan-gu, Gwangju, 506-731, South Korea
- . CONTACT PERSON : Inchang Jeong / Senior Research Engineer
- . TELEPHONE NO : +82-62-950-0332
- . FCC ID : YZP-REAXXOXXA
- . MODEL NO/NAME : REAX-XOXXA
- . SERIAL NUMBER : N/A
- . DATE : January 17, 2017

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	ESL Tag Controller
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 Innotek Co., Ltd., Model REAX-XOXXA (referred to as the EUT in this report) is an ESL Tag Controller, Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	ESL Tag Controller
TRANSMITTING FREQUENCY	13.56 MHz
MODULATION	ASK
ANTENNA TYPE	PCB Antenna
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	16 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-4617/ 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	LG Innotek Co., Ltd.	ESL Remote Controller Rev0.5	N/A
ANTTENA BOARD	N/A	N/A	N/A

3.2 Peripheral equipment

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

Model	Manufacturer	Description	Connected to
REAX-XOXXA	SUZHOU NIHONE Electronics Technology Co., LTD.	ESL Tag Controller (EUT)	-
REBE-TZ74A	SUZHOU NIHONE Electronics Technology Co., LTD.	Electronic Shelf Label	-

3.3 Mode of operation during the test

-. The EUT continuously transmitted signal by pushing the button on the EUT.

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 : ESL Tag Controller Date: January 13, 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	21.58	H	19.98	0.95	42.51	124	81.49
13.56	17.53	V	19.98	0.95	38.46	124	85.54

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



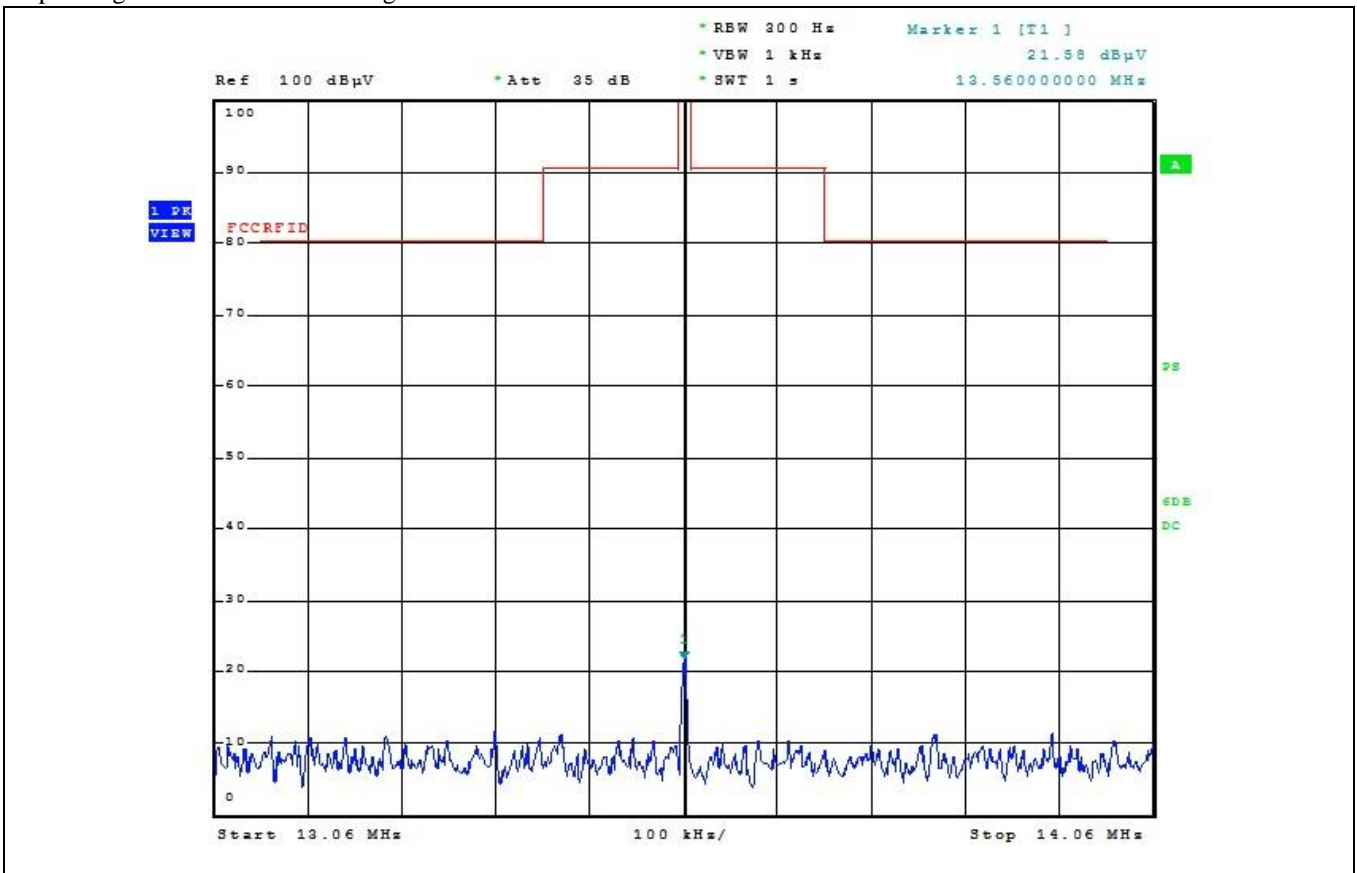
Tested by: Seok-Jun, Lee / Engineer

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 : 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 : ESL Tag Controller Date: January 13, 2017
 Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.56 MHz is 21.58 dBuV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBuV/m, so the EUT meets the requirement.

[Signature]
 Tested by: Seok-Jun, Lee / Engineer

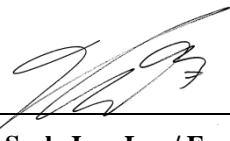
5.2 SPURIOUS EMISSION TEST

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 : ESL Tag Controller Date: January 13, 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.									



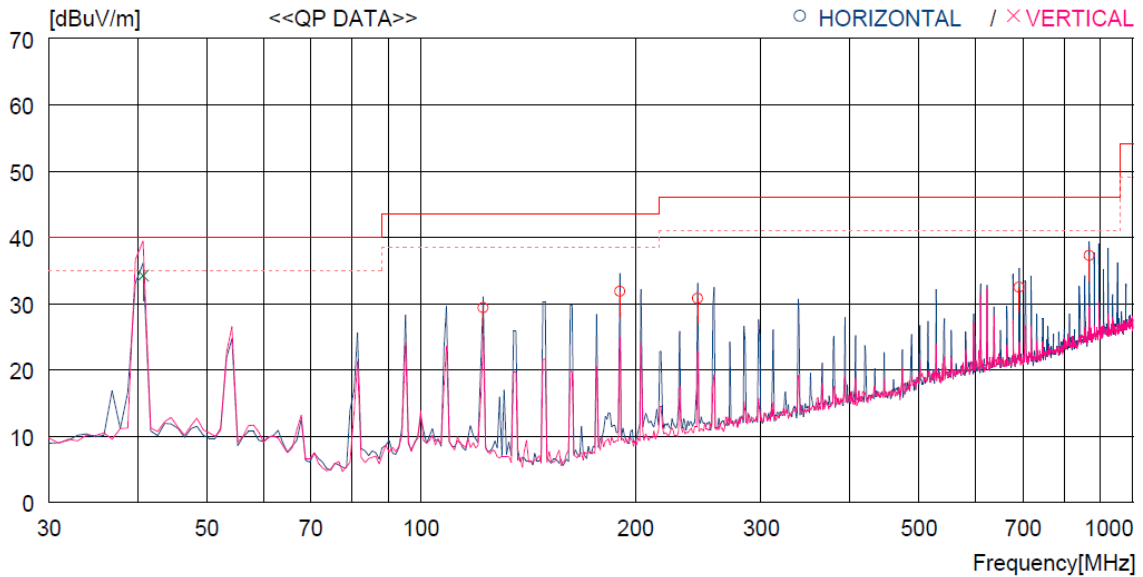
Tested by: Seok-Jun, Lee / Engineer

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 : ESL Tag Controller Date: January 13, 2017
 Operating Condition : Transmitting Mode
 Distance : 3 m



No.	FREQ [MHz]	READING [dBuV]	ANT QP FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	122.150	48.9	10.1	3.4	33.1	29.3	43.5	14.2	300	267
2	190.050	50.1	11.0	3.7	33.0	31.8	43.5	11.7	100	86
3	244.370	47.5	12.2	4.1	33.0	30.8	46.0	15.2	100	359
4	691.535	38.9	19.7	7.2	33.4	32.4	46.0	13.6	100	359
5	868.070	40.1	21.7	8.3	32.9	37.2	46.0	8.8	100	70
----- Vertical -----										
6	40.670	51.2	14.2	1.8	33.0	34.2	40.0	5.8	100	66


Tested by: Seok-Jun, Lee / Engineer

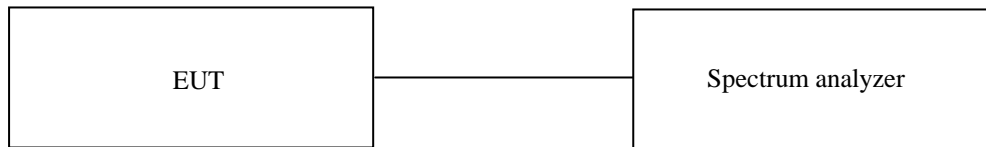
5.3 20 dB BANDWIDTH

5.3.1 Operating environment

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

5.3.2 Test set-up

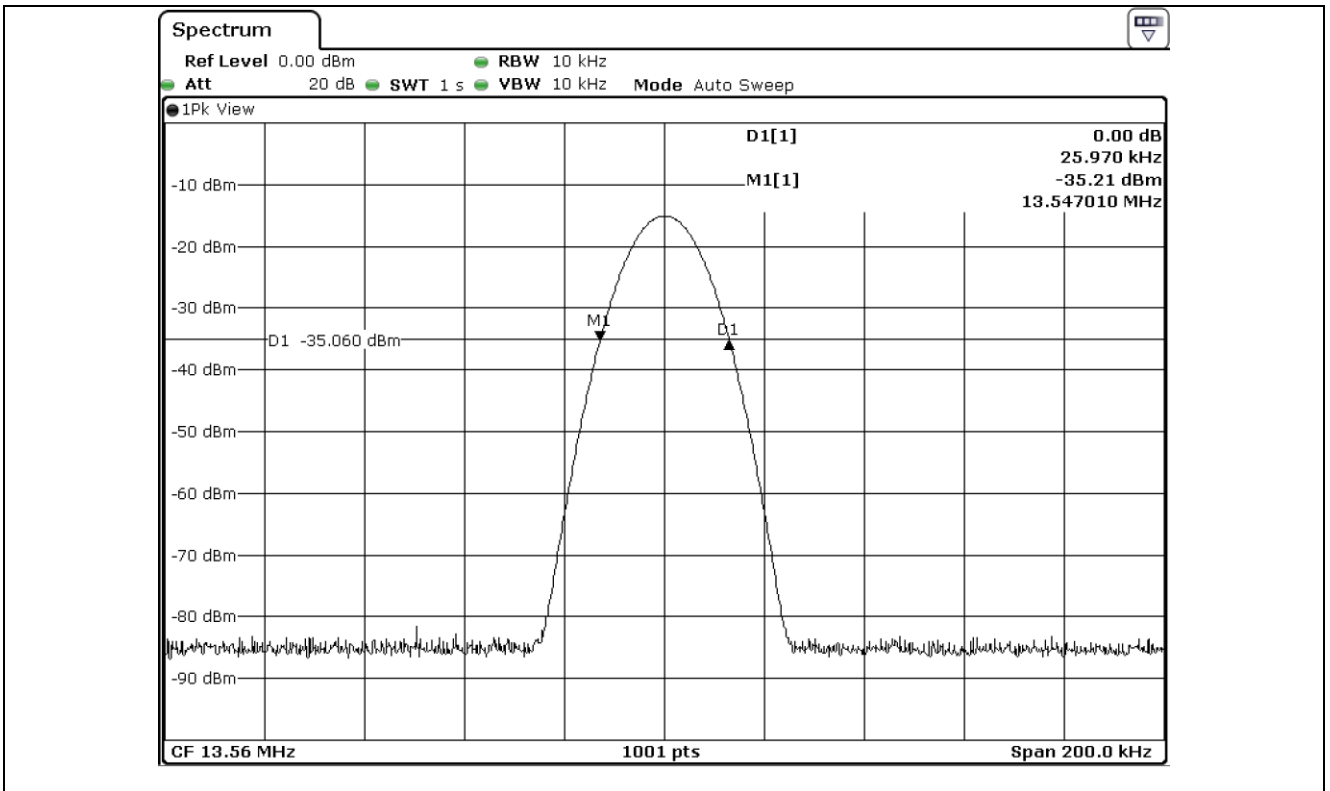
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



5.3.3 Test data

- Test Date : January 13, 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	25.97	900	PASS



(Signature)
 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 : January 12, 2017
 -. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 560 000	13 560 004	1 352	± 1 356.00
-10		13 560 007	1 349	
0		13 560 007	1 349	
10		13 560 009	1 347	
20		13 560 012	1 344	
30		13 560 018	1 338	
40		13 560 023	1 333	
50		13 560 026	1 330	



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.

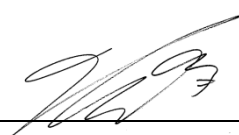
5.5.2 Test set-up

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 : January 12, 2017
 -. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
3.45(115 %)	13 560 000	13 560 024	1 332	± 1 356.00
3(100 %)		13 560 010	1 346	
2.55(85 %)		13 560 001	1 355	



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)
<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	101012	Nov. 01, 2016	One Year	<input type="checkbox"/>
2.		R/S	ESU	100261	Apr. 06, 2016	One Year	<input checked="" type="checkbox"/>
3.		R/S	ESPI	101278	Nov. 01, 2016	One Year	<input type="checkbox"/>
4.	Spectrum analyzer	R/S	FSV30	101372	Nov. 10, 2016	One Year	<input checked="" type="checkbox"/>
5.	Amplifier	Sonoma Instrument	310N	312544	Apr. 05, 2016	One Year	<input checked="" type="checkbox"/>
6.	Amplifier	Sonoma Instrument	310N	312545	Apr. 05, 2016	One Year	<input type="checkbox"/>
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	May 20, 2016	Two Year	<input type="checkbox"/>
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 05, 2016	Two Year	<input checked="" type="checkbox"/>
9.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	<input checked="" type="checkbox"/>
10.	LISN	EMCO	3825/2	9109-1867	Apr. 06, 2016	One Year	<input type="checkbox"/>
				9109-1869	Apr. 06, 2016	One Year	<input type="checkbox"/>
		Schwarzbeck	NSLK8126	8126-404	Apr. 05, 2016	One Year	<input type="checkbox"/>
		Schwarzbeck	NSLK8128	8128-216	Apr. 06, 2016	One Year	<input type="checkbox"/>
11.	Turn Table	Innco System	DT3000	930611	N/A	N/A	<input checked="" type="checkbox"/>
12.	Antenna Master	Innco System	MA4000-EP	MA4000/332	N/A	N/A	<input type="checkbox"/>
13.	Antenna Master	Innco System	MA-4000XPET	MA4000/509	N/A	N/A	<input checked="" type="checkbox"/>
14.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-235	Jun. 10, 2016	Two Year	<input checked="" type="checkbox"/>
15.	Frequency Counter	HP	53152A	US39270295	Sep. 29, 2016	One Year	<input checked="" type="checkbox"/>
16.	Chamber	Samkun Tech	SSE-43CI-A	60712	Feb. 04, 2016	One Year	<input checked="" type="checkbox"/>
17.	DC Power Supply	Digital Electronics	DRP-305DN	4030195	Sep. 02, 2016	One Year	<input type="checkbox"/>