

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : E13DR-019

AGR No : A13NA-123

Applicant : SHIMWOO ELECTRONICS CO., LTD.
Address : 5F, Yongjin Bldg, 402-1, Yangjae2-Dong, Seocho-gu, Seoul, Korea

Manufacturer : SHIMWOO ELECTRONICS CO., LTD.
Address : 5F, Yongjin Bldg, 402-1, Yangjae2-Dong, Seocho-gu, Seoul, Korea

Type of Equipment : Single Frequency Remote Control

FCC ID. : WT9SC33FO

Model Name : IR/RF REMOTE

Serial number : N/A

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

Date of Incoming : November 20, 2013

Date of issue : December 06, 2013

SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.231.**


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

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

Prepared by:


Ki-Hong, Nam / Senior Engineer
ONETECH Corp.

Approved by:


Gea-Won, Lee / Managing Director
ONETECH Corp.

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1. VERIFICATION OF COMPLIANCE

APPLICANT : SHIMWOO ELECTRONICS CO., LTD.
 ADDRESS : 5F, Yongjin Bldg, 402-1, Yangjae2-Dong, Seocho-gu, Seoul, Korea
 CONTACT PERSON : Jung Hwo, Kim / Chief Engineer
 TELEPHONE NO : +82-11-9291-8532
 FCC ID : WT9SC33FO
 MODEL NAME : IR/RF REMOTE
 BRAND NAME : -
 SERIAL NUMBER : N/A
 DATE : December 06, 2013

EQUIPMENT CLASS	DDX – Low Power Communications Transmitter
KIND OF EQUIPMENT	Single Frequency Remote Control
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.10: 2009
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.231
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 SHIMWOO ELECTRONICS CO., LTD., Model: IR/RF REMOTE (referred to as the EUT in this report) is a Single Frequency Remote Control. The product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Single Frequency Remote Control
RF FREQUENCY	433.92 MHz
MODULATION	ASK
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	4 MHz, 433.92 MHz
ANTENNA TYPE	Inserted into the main board (Pattern Antenna)
TRANSMISSION TIME	Not longer than 5 s
RATED SUPPLY VOLTAGE	AAA x 2, 1.5 V x 2 Battery
NUMBER OF LAYERS	Double side layer

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 15.231.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.10: 2009 a distance of 3 meters from EUT to the antenna.

2.6 Test Facility

The open area test site is located at 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do and 10 m Semi Anechoic Chamber (SAC) and conducted measurement facilities are located at 301-14, Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation number KR0013 under APEC TEL MAR between the RRA and the FCC.

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	SHIMWOO ELECTRONICS CO., LTD.	N/A	N/A

3.2 Peripheral equipment

-. None

3.3 Mode of operation during the test

To get a maximum radiated emission from the EUT, the button on the EUT was continuously pressed to transmit the signal. To activate continuous transmission, place a small plastic block between rubber band and the push button on the EUT. To get a maximum emission levels from the EUT, the EUT was moved throughout the X, Y, and Z axis and the worst case is "X" axis.

3.4. EUT MODIFICATIONS

-. None

3.5 Configuration of Test System

Line Conducted Test: It is not need to test this requirement, because the EUT shall be operated by DC battery.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2009 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

Occupied Bandwidth Measurement:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 20 kHz/division frequency span, 10 kHz resolution bandwidth and 10 dB/division logarithmic display from the spectrum analyzer.

3.6 Antenna Requirement

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 antenna of the EUT is a pattern antenna on the main board in the EUT, so 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 DC battery.	

4.2 General 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

5.1 Test Data

5.1.1 Field Strength of the Carrier Test

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

Humidity Level : 43 %R.H. Temperature: 21 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
 Type of Test : INTENTIONAL RADIATOR
 Result : PASSED

EUT : Single Frequency Remote Control Date: December 02, 2013
 Operating Condition : TX mode
 Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors				Total	FCC	
Carrier Freq. (MHz)	Amplitude (dBμV)	Detector Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amp Gain	Average Level Factor	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
433.92	82.40	Peak	H	17.40	4.30	33.00	-14.30	56.80	80.83	24.03
	70.40	Peak	V				-14.30	44.80	80.83	36.03

* Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

“H”: Horizontal Polarization, “V”: Vertical Polarization



Tested by: Hong-Kyu, Lee/ Engineer

5.1.2 Maximum Modulation Percentage (MMP)

In order to determine possible Maximum Modulation Percentage from the EUT, we measured the duty cycle according to the clause H4.(j) in ANSI C63.10: 2009

The pulse train from the EUT was consisting of long and short pulse. The measured values are as follows.

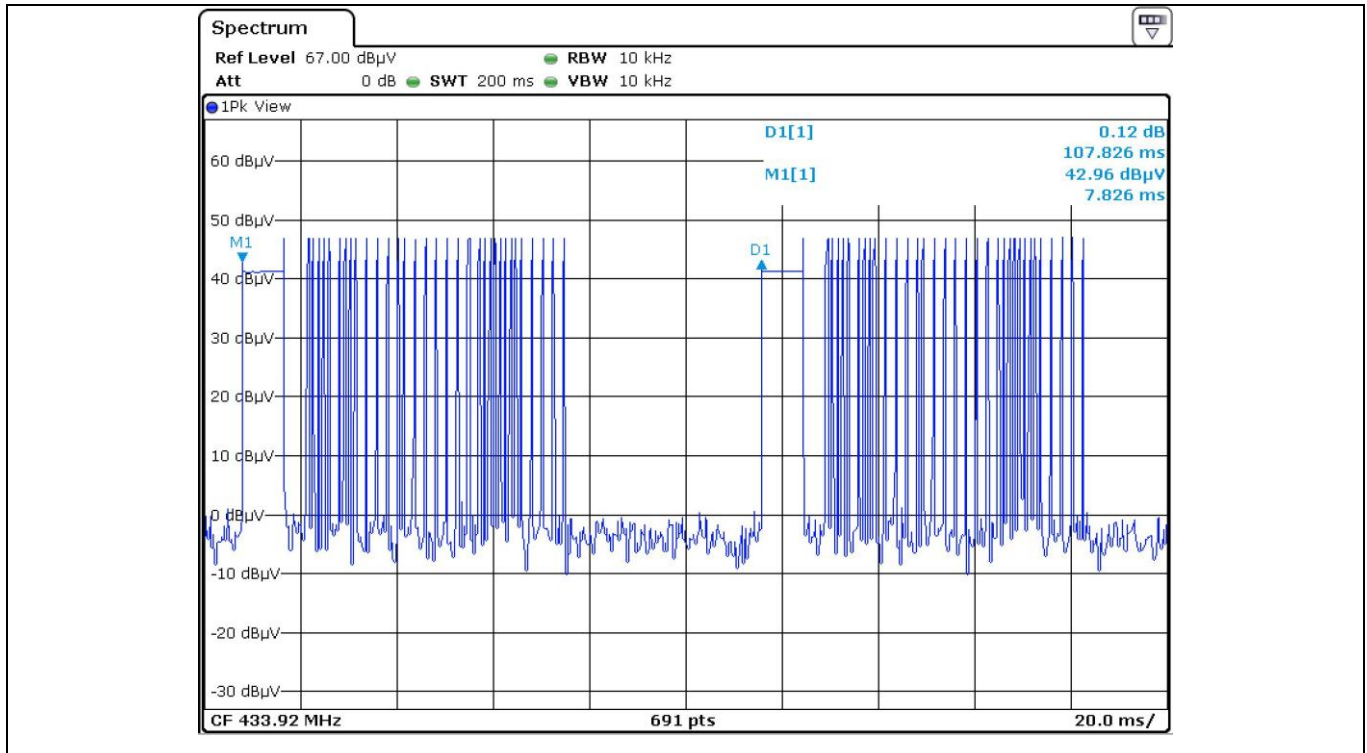
Long Pulse (LP)	Short Pulse (SP)	Total sum of LP	Total sum of SP	Pulse Width
8.72 ms	0.32 ms	1	33	107.83
Duty Cycle		$((8.72 \times 1) + (0.32 \times 33)) / 100 = 0.1928$		
Maximum Modulation Percentage(MMP)		Duty Cycle x 100 % = 19.28 %		
Average Level Factor		-14.30 dB		

Remark: Please refer to Photo Data for MMP.

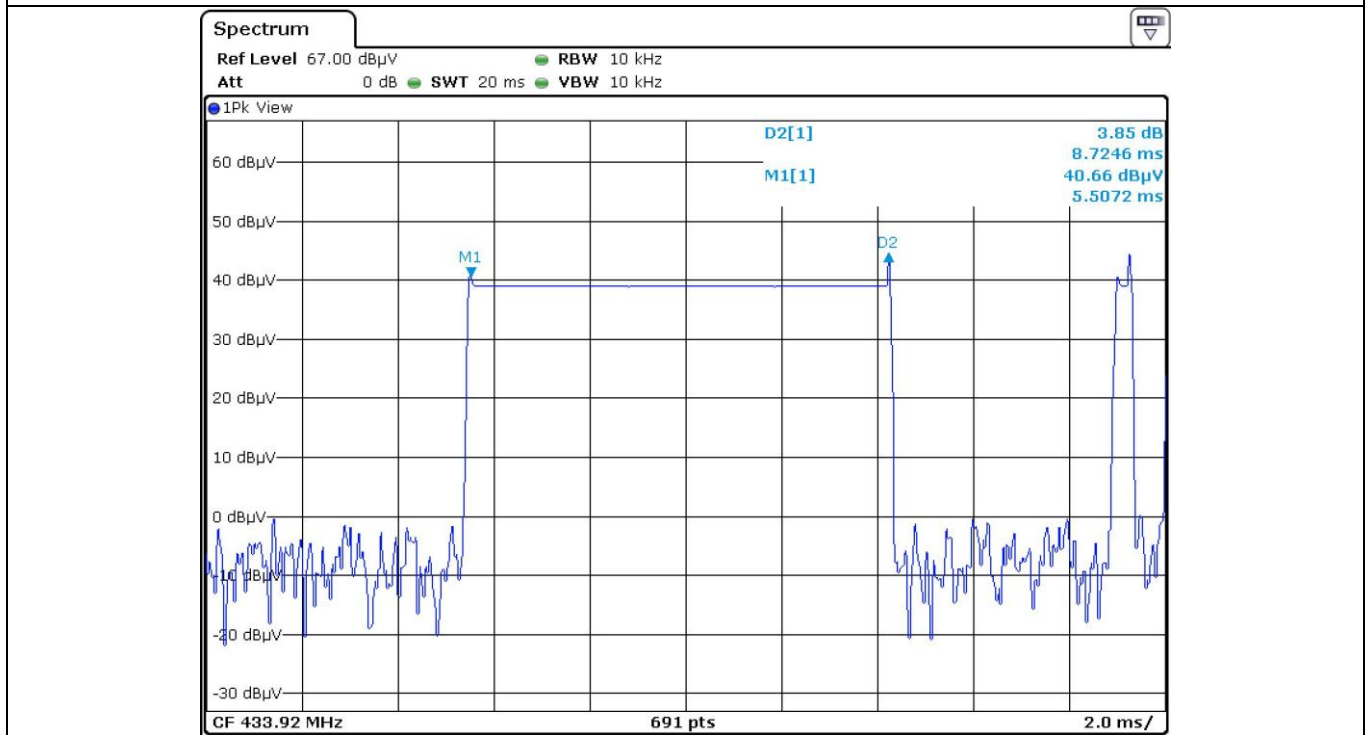


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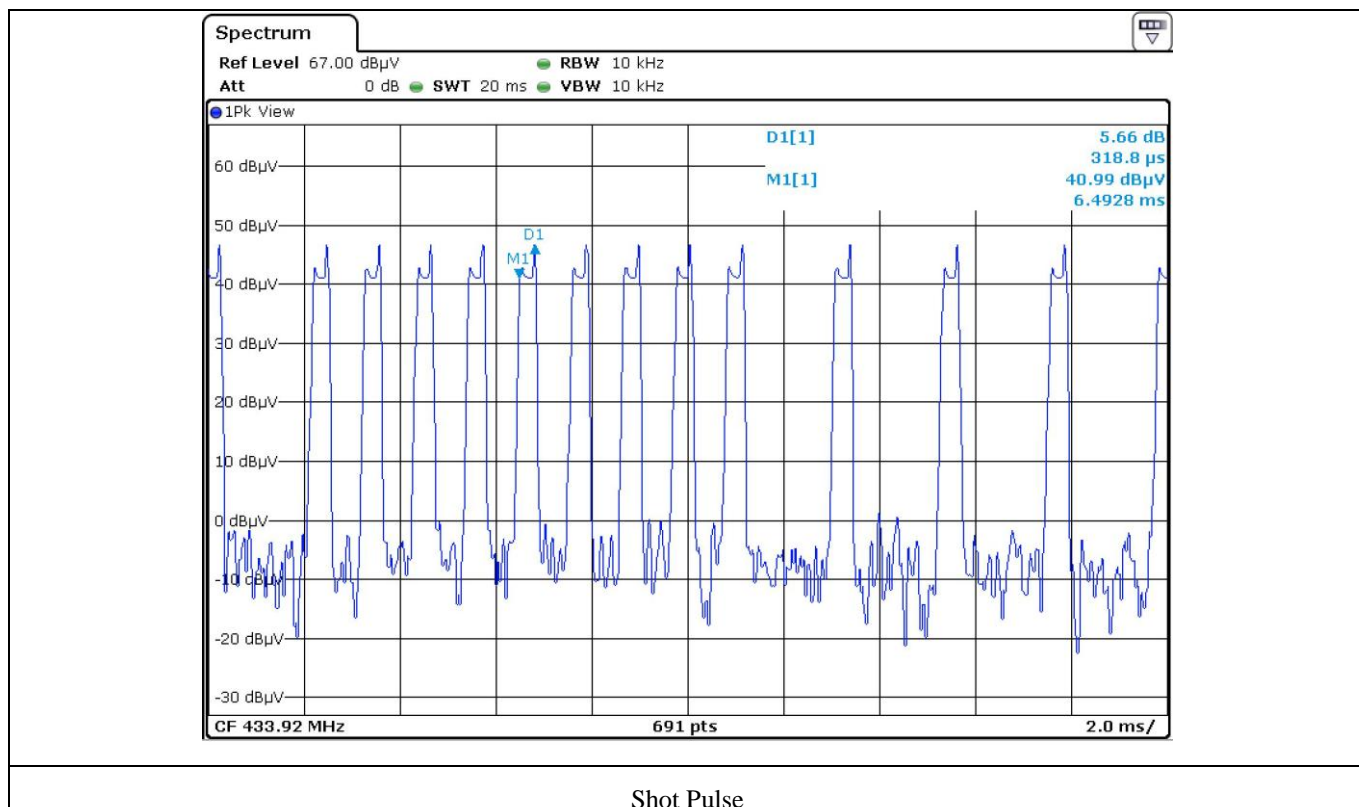
Photo Data for MMP



Pulse width



Long Pulse



5.1.3 Transmitter Transmission Duration

Humidity Level : 42 %R.H.

Temperature: 24 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (a)

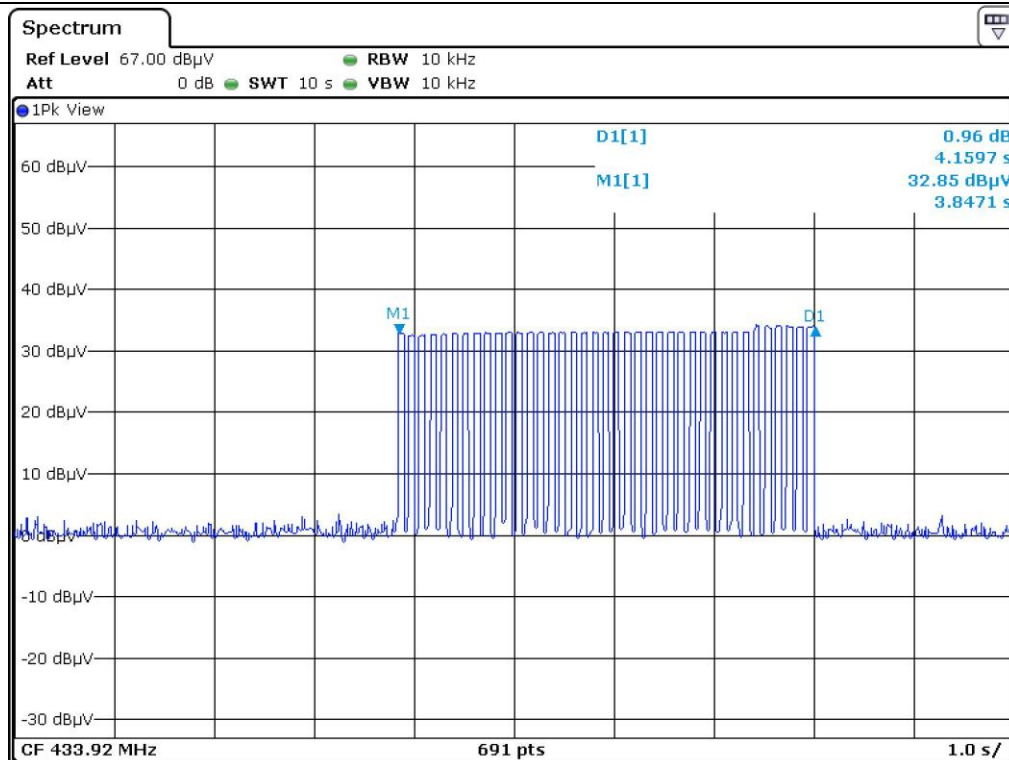
Type of Test : INTENTIONAL RADIATOR

EUT : Single Frequency Remote Control

Date: December 02, 2013

Operating Condition : Switch on the EUT was continuously pushed

Manually Activated Duration (s)	Limit (s)	Margin (s)	Result
4.16	5.00	0.84	Pass



01 30 21

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5.1.4 Spurious Emission Test

5.1.4.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 43 %R.H. Temperature: 21 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
Type of Test : INTENTIONAL RADIATOR
Frequency range : 9 kHz ~ 30 MHz
Result : PASSED

EUT : Single Frequency Remote Control Date: December 02, 2013
Operating Condition : TX mode
Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors				Total	FCC	
Carrier Freq. (MHz)	Amplitude (dBμV)	Detector Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amp Gain	Average Level Factor	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.										



Tested by: Hong-Kyu, Lee/ Engineer

5.1.4.2 Spurious Radiated Emission 30 MHz ~ 1 000 MHz

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

Humidity Level : 43 %R.H. Temperature: 21 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
Type of Test : INTENTIONAL RADIATOR
Frequency range : 30 MHz ~ 1 000 MHz
Result : PASSED

EUT : Single Frequency Remote Control Date: December 02, 2013
Operating Condition : TX mode
Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors				Total	FCC	
Carrier Freq. (MHz)	Amplitude (dBμV)	Detector Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amp Gain	Average Level Factor	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
867.84	53.30	Peak	H	23.00	6.20	32.70	-14.30	35.50	60.83	25.33
	40.70	Peak	V				-14.30	22.90	60.83	37.93

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

“H”: Horizontal Polarization, “V”: Vertical Polarization



Tested by: Hong-Kyu, Lee/ Engineer

5.1.4.3 Spurious Radiated Emission above 1 GHz

Humidity Level : 43 %R.H. Temperature: 21 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
Type of Test : INTENTIONAL RADIATOR
Frequency range : 1 000 MHz ~ 4 400 MHz
Result : PASSED

EUT : Single Frequency Remote Control Date: December 02, 2013
Operating Condition : TX mode
Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors				Total	FCC	
Carrier Freq. (MHz)	Amplitude (dBμV)	Detector Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amp Gain	Average Level Factor	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 735.68	45.72	Peak	H	25.30	6.20	42.70	-14.30	20.22	60.83	40.61
	47.20	Peak	V				-14.30	21.70	60.83	39.13
2 169.60	39.51	Peak	H	26.10	7.10	43.00	-14.30	15.41	60.83	45.42
	42.54	Peak	V				-14.30	18.44	60.83	42.39



Tested by: Hong-Kyu, Lee/ Engineer

5.1.5 Bandwidth of the operating frequency

Humidity Level : 42 %R.H.

Temperature: 24 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (c)

Type of Test : INTENTIONAL RADIATOR

Result : PASSED

EUT : Single Frequency Remote Control

Date: December 02, 2013

Operating Condition : TX mode

Minimum Resolution

Bandwidth : 10 kHz

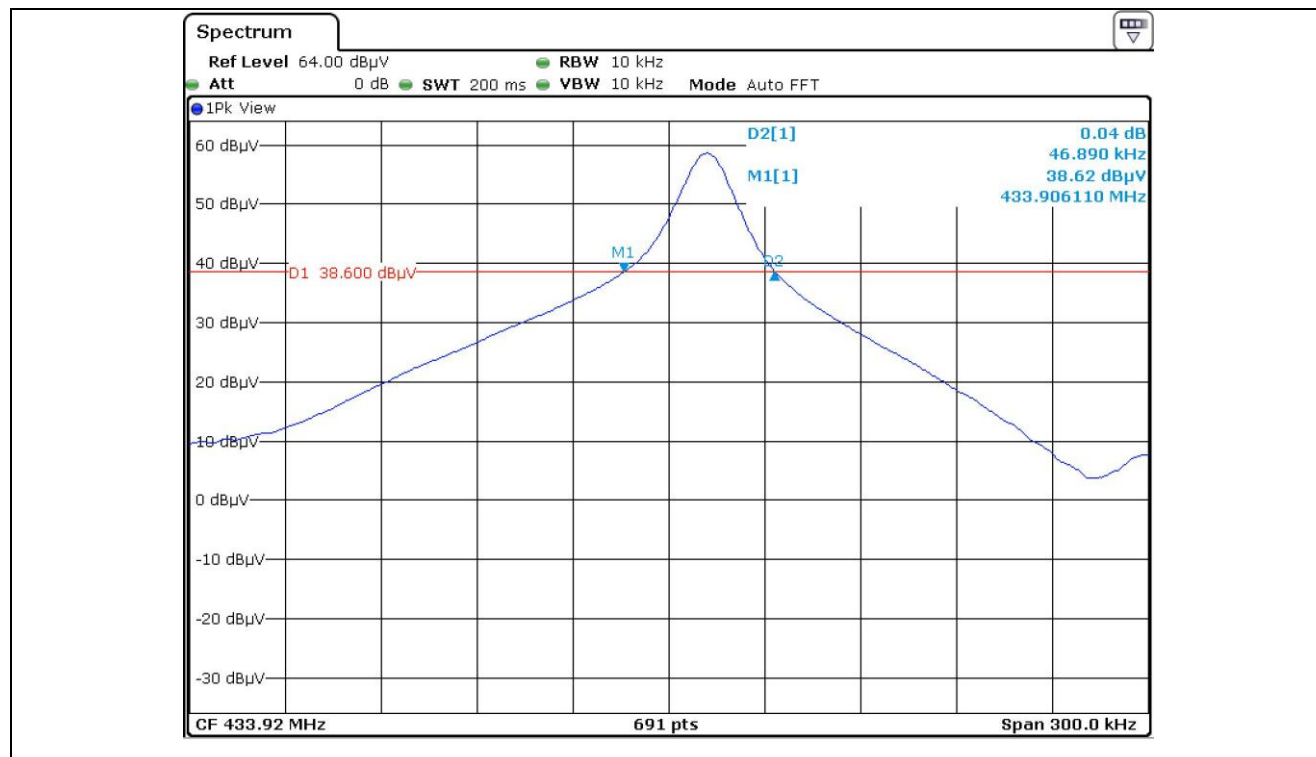
Carrier Freq. (MHz)	Bandwidth of the emission. (kHz)	Limit (kHz)	Remark
433.92	46.89	1 084.80	<u>The point 20 dB down from the modulated carrier</u>

Remark: Please refer to Photo Data for bandwidth for test data.



Tested by: Hong-Kyu, Lee/ Engineer

Photo Data for bandwidth



6. FIELD STRENGTH CALCULATION

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

+	Meter reading	(dB μ V)
+	Cable Loss	(dB)
+	Antenna Factor	(dB/m)
-	Amplifier Gain	(dB)
=	Corrected Reading	(dB μ V/m)
	Specification Limit	(dBuV/m)
-	Corrected Reading	(dBuV/m)
=	dB Relative to Limit	(\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/13	12MONTH	
2.	Test Receiver	R/S	ESU	100261	MAY/13	12MONTH	■
3.	Amplifier	Sonoma Instrument	310N	312544	MAY/13	12MONTH	■
4.	Amplifier	Sonoma Instrument	310N	312545	MAY/13	12MONTH	
5.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	APR/12	24MONTH	■
6.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-420	MAR/12	24MONTH	
7.	Controller	Innco System	CO2000	619/27030611/L	N/A	N/A	■
8.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
9.	Antenna Master	Innco System	MA4000-EP	3320611	N/A	N/A	■
10.	Antenna Master	Innco System	MA4000-EP	3350611	N/A	N/A	
11.	Pre-Amplifier	R/S	SCU-18	10041	JAN/13	12MONTH	■
12.	Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D294	SEP/13	24MONTH	■
13.	Loop Antenna	R/S	HFH2-Z2	879 285 / 26	DEC/13	24MONTH	■