

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

**Test Report No.** : E123R-016  
**AGR No** : A11DA-004  
**Applicant** : Remote Solution Co., Ltd.  
**Address** : 92, Chogok-ri, Nam-myun, Kimchon-city, Kyungbuk, 740-871, Korea  
**Manufacturer** : Remote Solution Co., Ltd.  
**Address** : 92, Chogok-ri, Nam-myun, Kimchon-city, Kyungbuk, 740-871, Korea  
**Type of Equipment** : IR&RF Remote  
**FCC ID.** : TX4CRB36A  
**Model Name** : CRB36A  
**Multiple Model Name** : HD UDTA Remote Control  
**Serial number** : None  
**Total page of Report** : 19 pages (including this page)  
**Date of Incoming** : February 27, 2012  
**Date of issue** : March 07, 2012

## SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.249.**  
 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.

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**Revision History**

Issue Report No.	Issued Date	Revisions	Effect Section
E123R-016	March 07, 2012	Initial Release	All

**1. VERIFICATION OF COMPLIANCE**

**APPLICANT** : Remote Solution Co., Ltd.  
**ADDRESS** : 92, Chogok-ri, Nam-myun, Kimchon-city, Kyungbuk, 740-871, Korea  
**CONTACT PERSON** : Mr. Dae-Gyu, Lim / Assistant Research Engineer  
**TELEPHONE NO** : +82-54-420-4500  
**FCC ID** : TX4CRB36A  
**MODEL NAME** : CRB36A  
**BRAND NAME** : N/A  
**SERIAL NUMBER** : N/A  
**DATE** : March 07, 2012

EQUIPMENT CLASS	<b>DXX – Low Power Communications Transmitter</b>
KIND OF EQUIPMENT	IR&RF Remote
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.4: 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 15.249
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 m open area test site

-. 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. TEST SUMMARY

### 2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.249 (a)	Field Strength of Emission	Met the Limit / PASS
15.249 (c)	Measurement distance	Met the Requirement / PASS
15.249 (d)	Emissions Radiated Outside of the Specified Frequency Band	Met the Limit / PASS
15.249 (e)	Radiated Emissions above 1 000 MHz	Met the Limit / PASS
15.209	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207	Conducted Limits	N/A (See Note)
15.203	Antenna Requirement	Met the Requirement / PASS

Note: This test is not performed because the EUT is operated by DC battery.

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

### 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 section 2.1.

### 2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2009 at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 307-51, Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Commission on August 21, 2008. (Registration Number: 340658)

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Remote Solution Co., Ltd., Model: CRB36A (referred to as the EUT in this report) is an IR&RF Remote. Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Portable Device
OPERATING FREQUENCY	2 425 MHz ~ 2 475 MHz
RATED RF OUTPUT POWER	0 dBm
ANTENNA TYPE	Inserted into the main board (Pattern Antenna)
MODULATION	O-QPSK
Tx DATA SPEED	250 kbps
USED RF CHIP	Maker: GreenPeak, Model Name: GP561
LIST OF EACH OSC. OR CRY. FREQ.(FREQ. >= 1 MHz)	16 MHz
RATED SUPPLY VOLTAGE	DC 3 V from a battery

#### 3.2 Model Differences

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

Model Name	Differences	Tested
CRB36A	Basic Model	<input checked="" type="checkbox"/>
HD UDTA Remote Control	This model is identical to basic model except for model designation only according to buyer’s request.	<input type="checkbox"/>

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

### 4. EUT MODIFICATIONS

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 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	CRB36A00 RS-Ver 0.02	N/A

### 5.2 Peripheral equipment

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

### 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at Low Channel (2 425 MHz), Middle Channel (2 450 MHz), and High Channel (2 475 MHz). To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

### 5.4 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 C63.4: 2009 8.3.1.1 and 13.4.1 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.

### 5.5 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.

## 6. PRELIMINARY TEST

### 6.1 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 by battery.	

### 6.2 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



## 7. RADIATED EMISSION TEST

### 7.1 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from up to 25 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in 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.

Test set-up photos are included in appendix I.

### 7.2 Measurement uncertainty

Radiated emission electric field intensity, 0.15 MHz ~ 30 MHz : ± 2.61 dB

Radiated emission electric field intensity, 30 MHz ~ 300 MHz : ± 4.43 dB

Radiated emission electric field intensity, 300 MHz ~ 1 000 MHz : ± 3.80 dB

Radiated emission electric field intensity, 1 000 MHz ~ 3 000 MHz : ± 4.40 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2. The measurement uncertainty is given with a confidence of 95 % with the coverage factor,  $k = 2$ .

### 7.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Feb. 06, 2012 (1Y)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Mar 15, 2011(1Y)
■ - SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Dec 15, 2011 (1Y)
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - HD100	HD GmbH	Position Controller	N/A	N/A
■ - DS420S	HD GmbH	Turn Table	N/A	N/A
□ - VHA9103	Schwarzbeck	Biconical Antenna	91031852	Mar. 30, 2010 (2Y)
□ - 9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Mar. 30, 2010 (2Y)
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	889 285 / 26	Nov. 08, 2010(2Y)
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	VULB9163-202	May 27, 2010(2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Jun. 17, 2011 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jun. 17, 2011 (2Y)

All test equipment used is calibrated on a regular basis.

## 7.4 Final Result of Measurement

### 7.4.1 Field Strength of the Fundamental Frequency

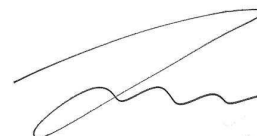
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 47 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)  
 Result : PASSED BY -8.51 dB at 2 425.00 MHz

EUT : IR&RF Remote Date: March 06, 2012  
 Operating Condition : TX mode  
 Distance : 3 m

Channel	Radiated Emissions			Ant Pol.	Correction Factors			Total Amplitude (dBμV/m)	FCC Limit	
	Carrier Freq. (MHz)	Amplitude (dBμV)	Detect Mode		Antenna (dB/m)	Cable (dB)	Pre-Amp (dB)		Limit (dBμV/m)	Margin (dB)
Low	2 425.00	98.04	Peak	H	27.15	5.02	43.10	87.11	113.98	-26.87
		96.40	Average	H				85.47	93.98	-8.51
		94.22	Peak	V				83.29	113.98	-30.69
		92.31	Average	V				81.38	93.98	-12.60
Middle	2 450.00	97.54	Peak	H	27.22	5.04	43.10	86.70	113.98	-27.28
		94.65	Average	H				83.81	93.98	-10.17
		92.56	Peak	V				81.72	113.98	-32.26
		88.60	Average	V				77.76	93.98	-16.22
High	2 475.00	96.37	Peak	H	27.28	5.06	43.10	85.61	113.98	-28.37
		94.23	Average	H				83.47	93.98	-10.51
		94.68	Peak	V				83.92	113.98	-30.06
		92.30	Average	V				81.54	93.98	-12.44

\*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes, but the worst plane data were recorded in the report.



**Tested by: Chang-Uk, Jun / Engineer**

### 7.4.2 Emissions Radiated Outside of the Specified Frequency Bands

#### 7.4.2.1 Test Data for Harmonic

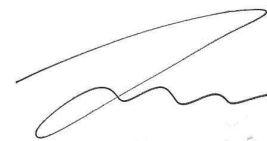
Humidity Level : 47 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)  
 Result : PASSED BY -6.90 dB at 4 850.00 MHz

EUT : IR&RF Remote Date: March 06, 2012  
 Operating Condition : TX mode  
 Distance : 3 m

Channel	Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low	4 850.00*	57.96	Peak	H	31.14	6.90	42.80	53.20	73.98	-20.78
		51.84	Average	H				47.08	53.98	-6.90
		54.26	Peak	V				49.50	73.98	-24.48
		46.18	Average	V				41.42	53.98	-12.56
Other frequencies were not found up to 25 GHz.										
Middle	4 900.00*	53.87	Peak	H	31.22	6.93	42.80	49.22	73.98	-24.76
		46.94	Average	H				42.29	53.98	-11.69
		47.01	Peak	V				42.36	73.98	-31.62
		39.56	Average	V				34.91	53.98	-19.07
Other frequencies were not found up to 25 GHz.										
High	4 950.00*	51.50	Peak	H	31.30	6.97	42.80	46.97	73.98	-27.01
		45.48	Average	H				40.95	53.98	-13.03
		51.27	Peak	V				46.74	73.98	-27.24
		44.59	Average	V				40.06	53.98	-13.92
Other frequencies were not found up to 25 GHz.										

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band



**Tested by: Chang-Uk, Jun / Engineer**

**7.4.2.2 Test Data for Below 1 GHz**

Humidity Level : 47 % R.H.

Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249 (d)

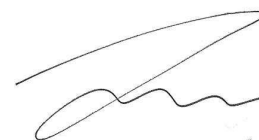
Result : PASSED BY -1.87 dB at 845.76 MHz at low channel

EUT : IR&RF Remote

Date: March 07, 2012

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

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)
<b>Low Channel</b>									
32.59	11.50	H	1.00	162.00	17.32	1.05	29.87	40.00	-10.13
36.48	11.40	H	1.00	142.00	15.93	1.16	28.49	40.00	-11.51
80.35	13.20	V	2.00	188.00	6.21	2.10	21.51	40.00	-18.49
136.47	14.40	V	2.00	184.00	14.46	2.56	31.42	43.52	-12.10
255.68	15.60	V	2.00	193.00	17.64	3.40	36.64	46.02	-9.38
845.76	14.50	V	2.00	186.00	22.70	6.95	44.15	46.02	-1.87
<b>Middle Channel</b>									
32.68	11.20	H	2.00	165.00	17.28	1.05	29.53	40.00	-10.47
40.57	11.80	H	2.00	172.00	14.78	1.35	27.93	40.00	-12.07
64.75	14.60	V	1.00	192.00	8.13	1.98	24.71	40.00	-15.29
109.56	13.40	V	1.00	197.00	11.90	2.40	27.70	43.52	-15.82
224.35	14.90	V	1.00	202.00	17.22	3.29	35.41	46.02	-10.61
232.76	13.70	V	1.00	198.00	17.27	3.33	34.30	46.02	-11.72
<b>High Channel</b>									
31.58	11.70	H	2.00	165.00	17.75	1.03	30.48	40.00	-9.52
38.57	13.60	H	2.00	152.00	15.40	1.24	30.24	40.00	-9.76
64.95	15.20	V	1.00	174.00	8.07	2.00	25.27	40.00	-14.73
108.47	12.90	V	1.00	195.00	11.72	2.38	27.00	43.52	-16.52
133.28	14.30	V	1.00	188.00	14.30	2.53	31.13	43.52	-12.39
240.63	13.40	V	1.00	194.00	17.33	3.36	34.09	46.02	-11.93



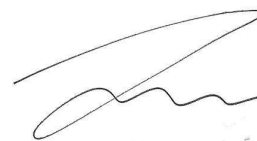
**Tested by: Chang-Uk, Jun / Engineer**

**7.4.2.3 Test Data for Below 30 MHz**

Humidity Level : 47 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249 (d)  
 Result : PASSED

EUT : IR&RF Remote Date: March 07, 2012  
 Detector : CISPR Quasi-Peak (Resolution Bandwidth: 9 kHz)

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.									

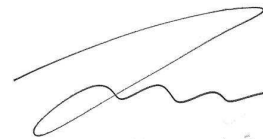


**Tested by: Chang-Uk, Jun / Engineer**

**7.4.2.4 Test Data above 1 GHz except for harmonic**

- . Test Date : March 07, 2012
- . Humidity Level : 47 % R.H.
- . Temperature : 22 °C
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 25 GHz
- . Measurement distance : 3 m
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249 (d)
- Result : PASSED

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.									

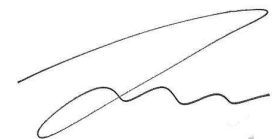


**Tested by: Chang-Uk, Jun / Engineer**

**7.4.2.5 Band Edge**

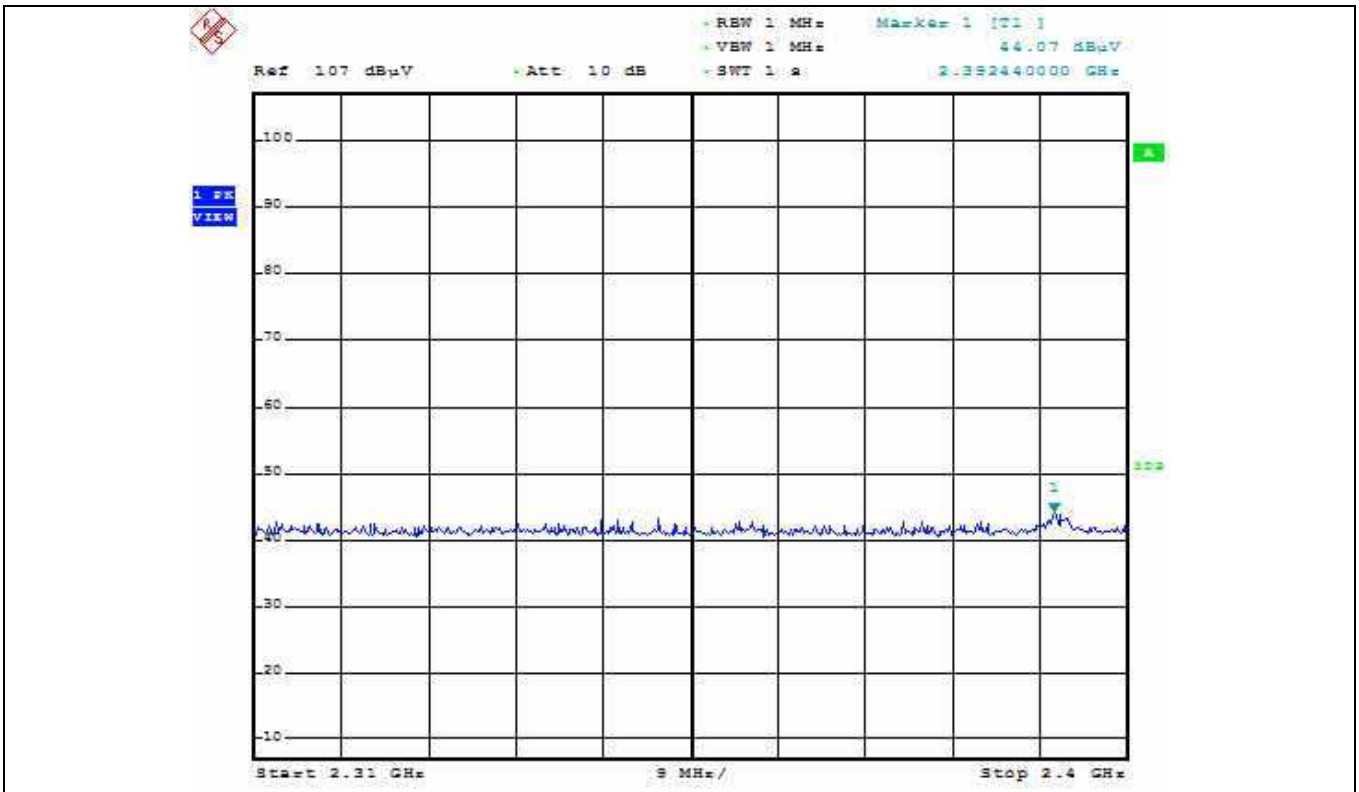
- . Test Date : March 06, 2012
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Operating Condition : Low / High Channel
- . Result : PASSED BY -27.82 dB at high Channel

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 392.44	44.07	Peak	H	27.05	3.14	43.10	31.16	74.00	-42.84
2 392.80	32.79	Average	H				19.88	54.00	-34.12
2 397.12	43.07	Peak	V				30.16	74.00	-43.84
2 392.62	30.85	Average	V				17.94	54.00	-36.06
<b>Test Data for High Channel</b>									
2 483.50	51.02	Peak	H	27.31	3.17	43.10	38.40	74.00	-35.60
2 483.50	38.80	Average	H				26.18	54.00	-27.82
2 483.50	50.04	Peak	V				37.42	74.00	-36.58
2 483.50	37.87	Average	V				25.25	54.00	-28.75

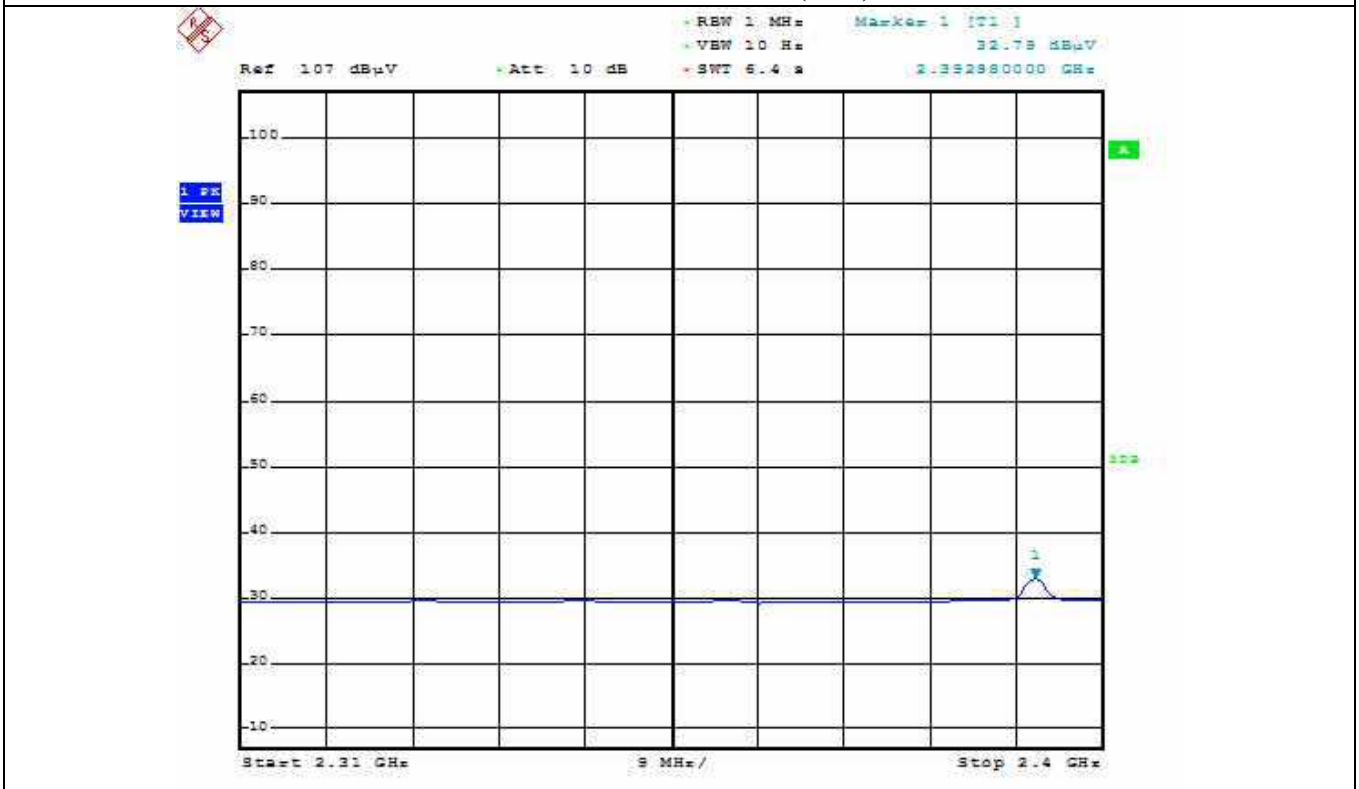


**Tested by: Chang-Uk, Jun / Engineer**

Plotted Data for band edge

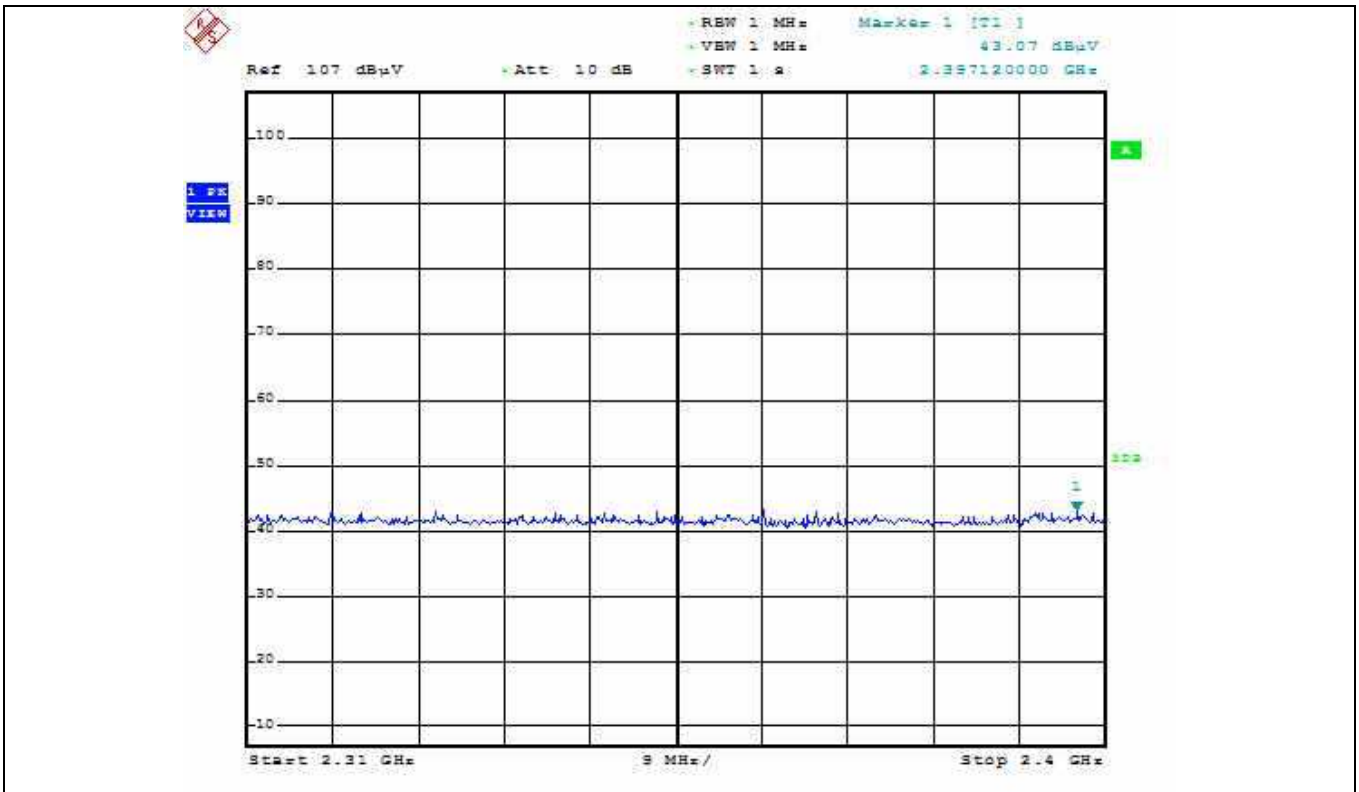


Low Channel – Horizontal (Peak)

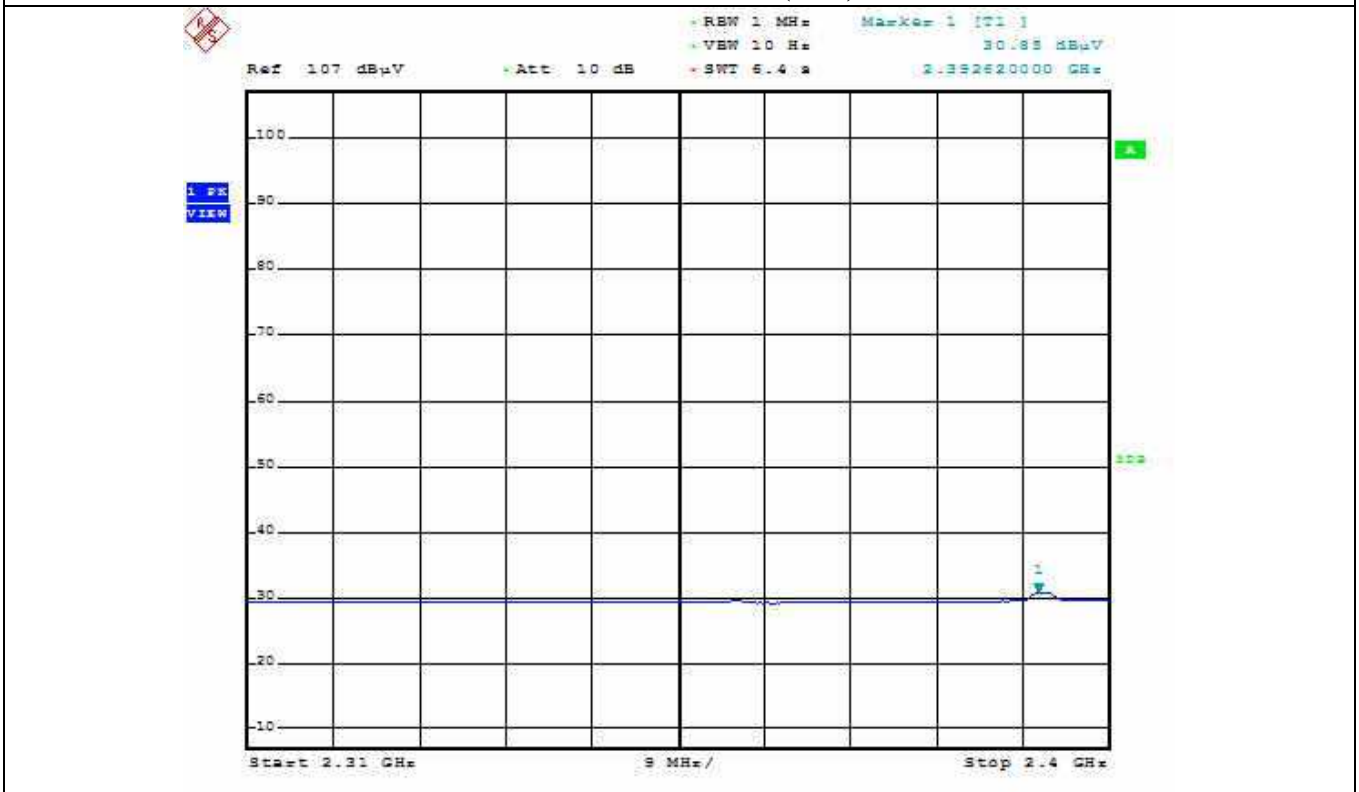


Low Channel – Horizontal (Average)

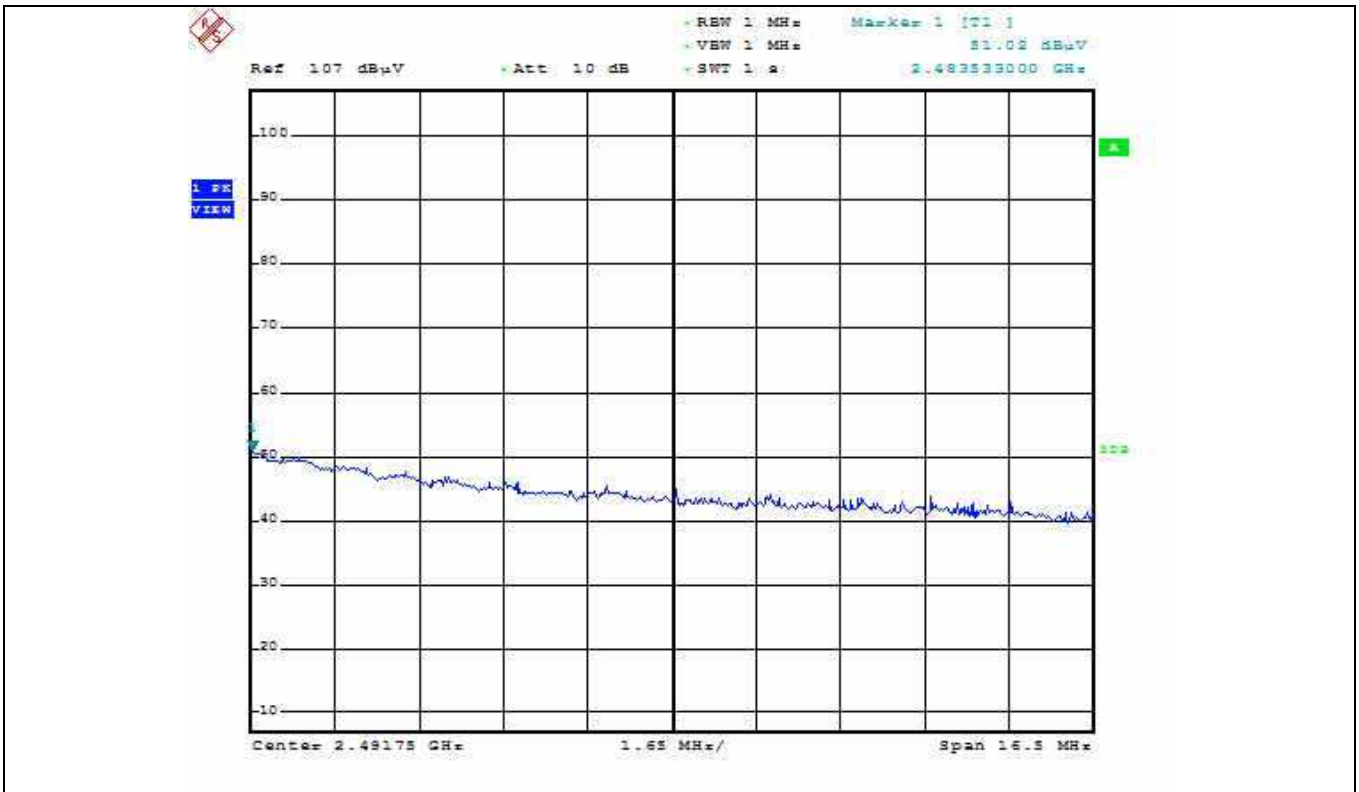




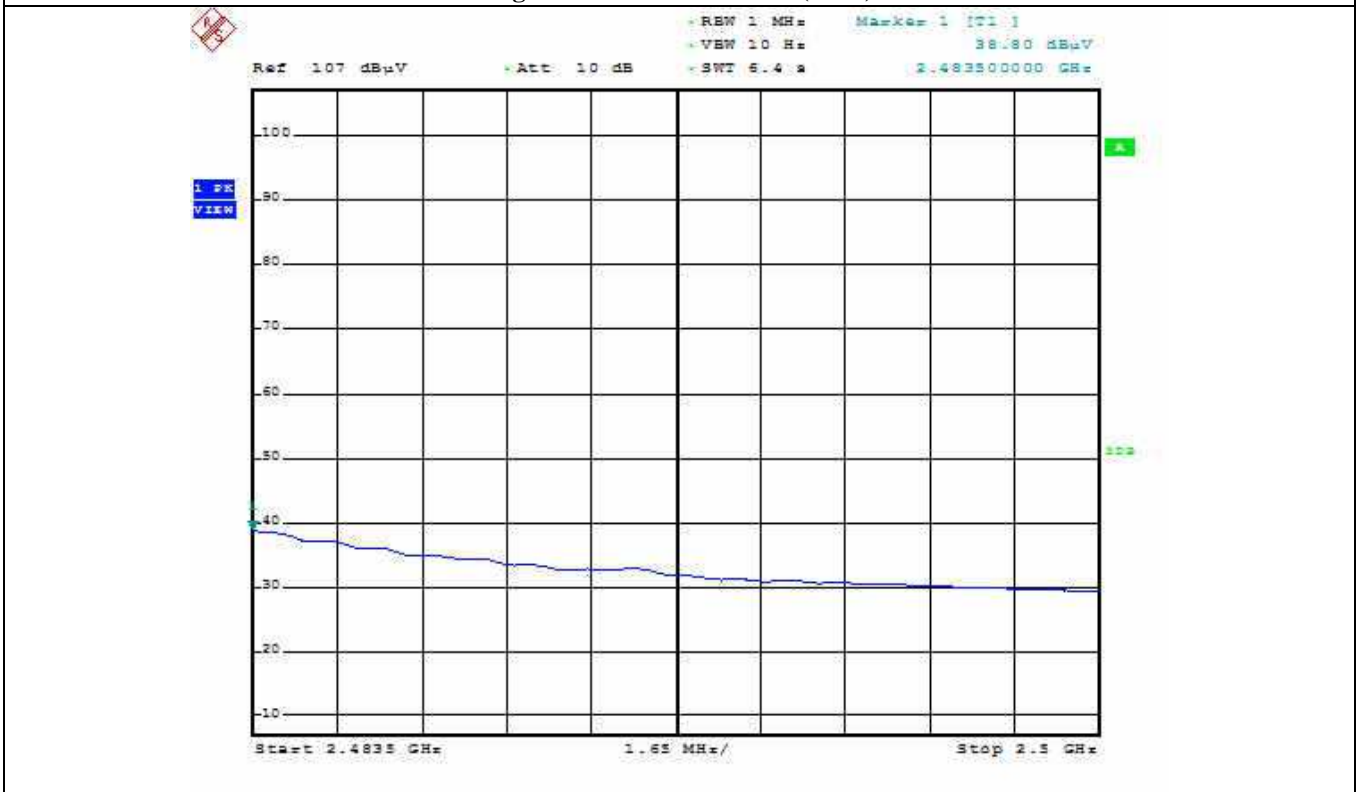
Low Channel - Vertical (Peak)



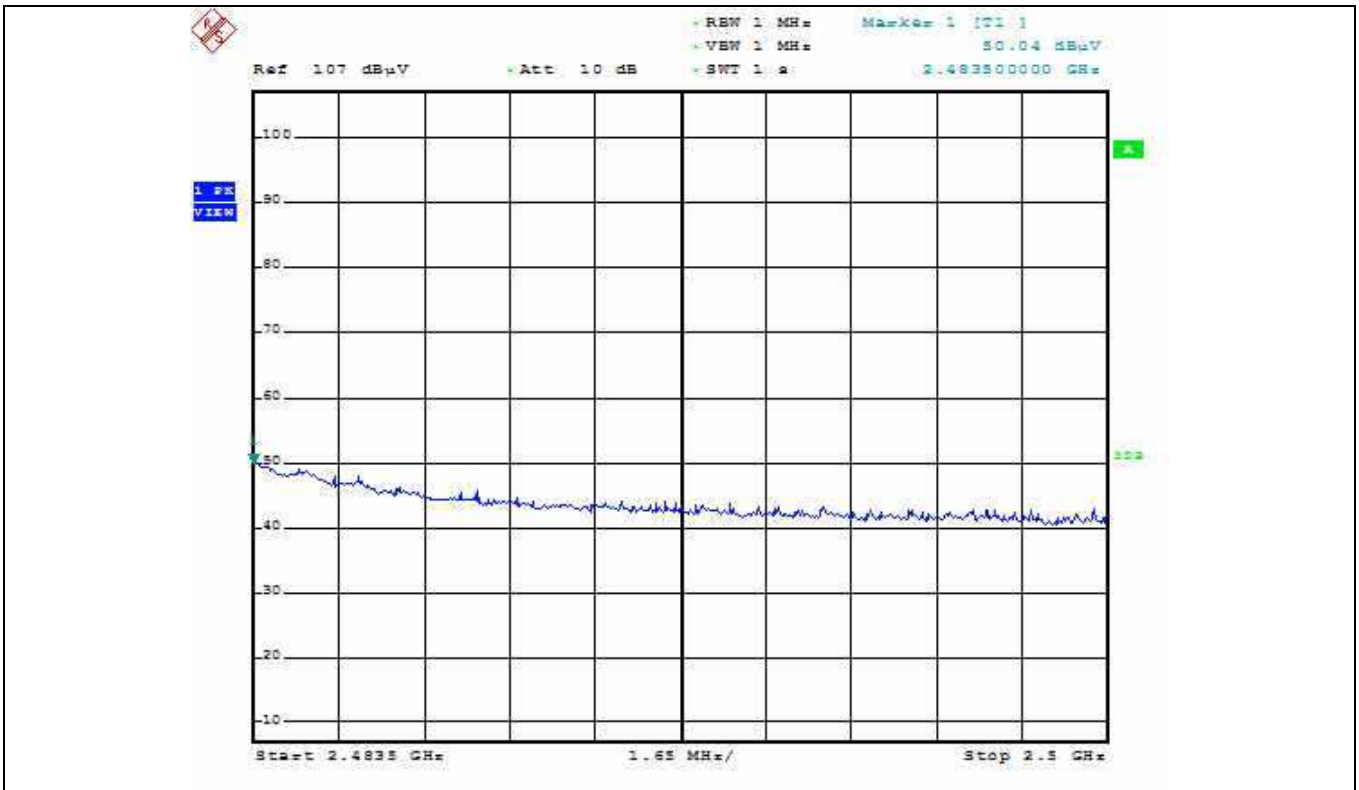
Low Channel - Vertical (Average)



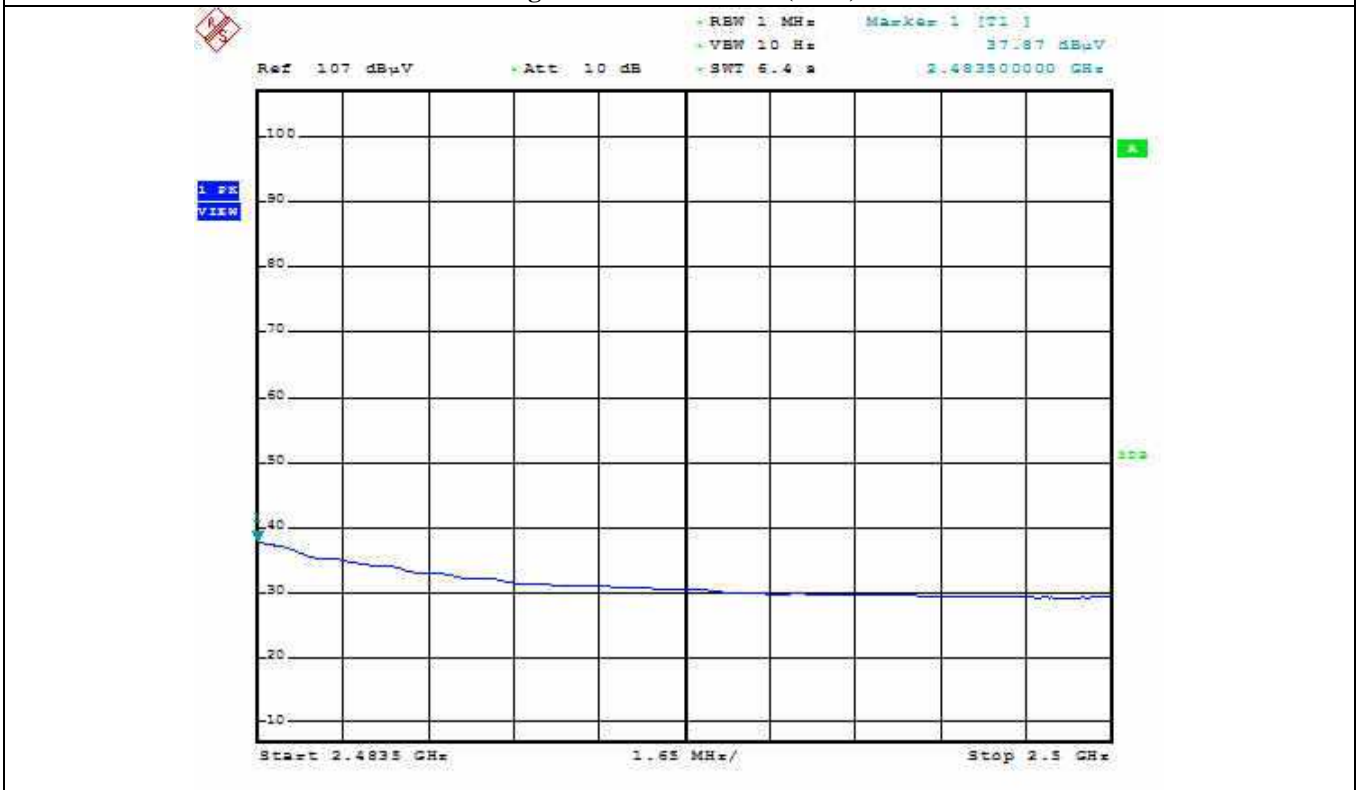
High Channel – Horizontal (Peak)



High Channel – Horizontal (Average)



High Channel - Vertical (Peak)



High Channel - Vertical (Average)