

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

Test Report No. : E126R-056
AGR No : A122A-013
Applicant : Shimwoo Electronics Co.,Ltd.
Address : 5F, Yongjin Bldg, 402-1, Yangjae-Dong, Seocho-Gu, Seoul, Korea
Manufacturer : Shimwoo Electronics Co.,Ltd.
Address : 5F, Yongjin Bldg, 402-1, Yangjae-Dong, Seocho-Gu, Seoul, Korea
Type of Equipment : Single Frequency Remote Control
FCC ID. : WT9MET8460001
Model Name : DIGIMET D4
Multiple Model Name : None
Serial number : None
Total page of Report : 24 pages (including this page)
Date of Incoming : May 03, 2012
Date of issue : June 27, 2012

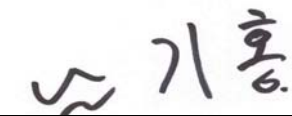
SUMMARY

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.

Prepared 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
E126R-056	June 27, 2012	Initial Release	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : Shimwoo Electronics Co.,Ltd.
 ADDRESS : 5F, Yongjin Bldg, 402-1, Yangjae-Dong, Seocho-Gu, Seoul, Korea
 CONTACT PERSON : Mr. Dae-Gyu, Lim / Assistant Research Engineer
 TELEPHONE NO : +82-2-579-8512
 FCC ID : WT9MET8460001
 MODEL NAME : DIGIMET D4
 BRAND NAME : N/A
 SERIAL NUMBER : N/A
 DATE : June 27, 2012

EQUIPMENT CLASS	DDX – Low Power Communications Device Transmitter
KIND OF EQUIPMENT	Single Frequency Remote Control
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, 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. 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 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.

3. GENERAL INFORMATION

3.1 Product Description

The Shimwoo Electronics Co.,Ltd., Model: SC33 (referred to as the EUT in this report) is an Remote Control. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Portable Device
OPERATING FREQUENCY	2 442 MHz
RATED RF OUTPUT POWER	1 dBm
ANTENNA TYPE	Inserted into the main board (Pattern Antenna)
MODULATION	OOK(ON-OFF-KEYING)
Tx DATA SPEED	1 200 bps
USED RF CHIP	Maker: TEXAS INSTRUMENTS INCORPORATED Model Name: CC2550
LIST OF EACH OSC. OR CRY. FREQ.(FREQ. \geq 1 MHz)	26 MHz
RATED SUPPLY VOLTAGE	DC 3 V from a battery

3.2 Model Differences

-. None

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	MET-6411-001	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 at 2 442 MHz is programmed.

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, semi anechoic chamber. 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 ~ 18 000 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)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Sep. 27, 2012 (1Y)
□ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
□ - FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Mar 12, 2012(1Y)
■ - 310N	Sonoma Instrument	AMPLIFIER	312544	May 30, 2013(1Y)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	Aug. 29, 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
■ - 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.

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EMC-003 (Rev.2)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

7.4 Final Result of Measurement

7.4.1 Maximum Modulation Percentage (MMP)

In order to determine possible Maximum Modulation Percentage from the EUT, we measured the duty cycle according to the clause 13.4.2 in ANSI C63.4: 2009.

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

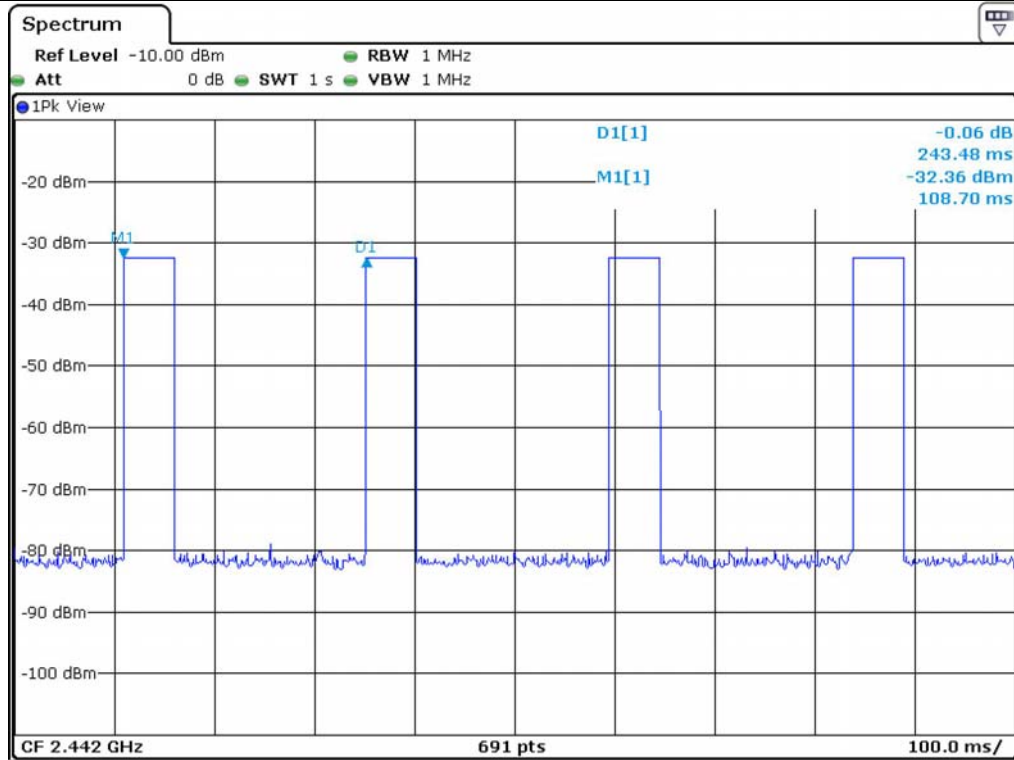
Pulse	Total sum of Pulse	Pulse Width
50.435 ms	1	243.48
Duty Cycle	$(50.435 \times 1) / 100 = 0.50435$	
Average Level Factor	-5.95 dB	

Remark: Please refer to Photo Data for MMP.

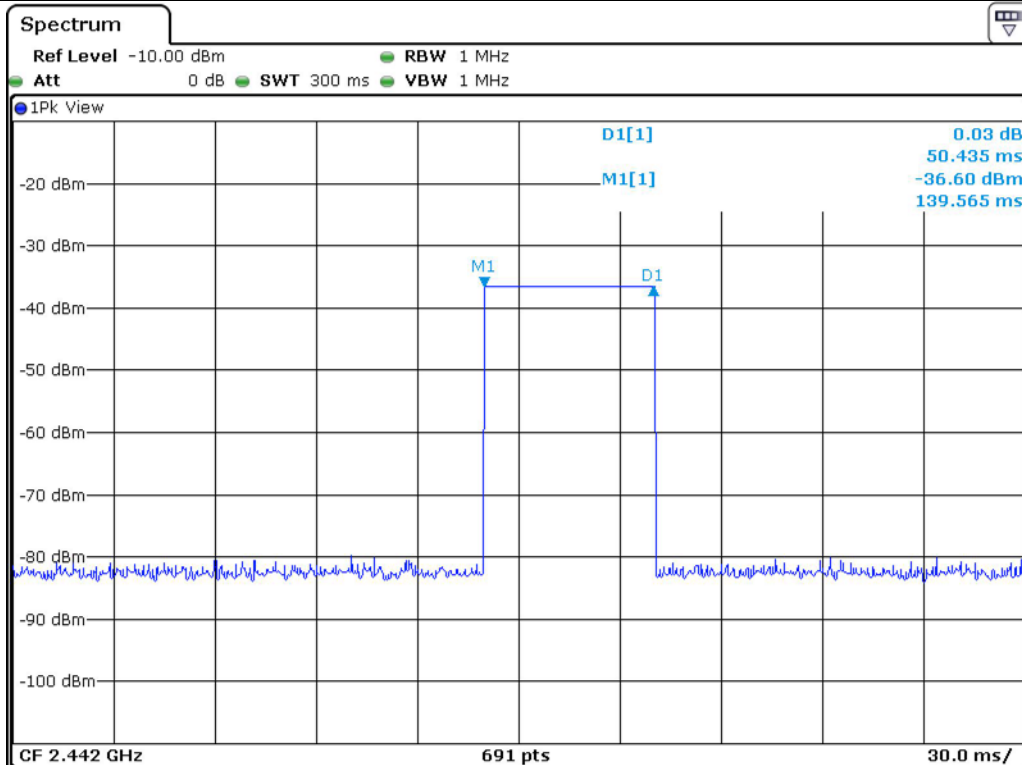


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Photo Data for MMP



Pulse Width



Pulse

7.4.2 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 : 53 % R.H. Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
 Result : PASSED

EUT : Remote Control Date: June 08, 2012
 Operating Condition : TX mode
 Distance : 3 m

Measured Emissions Level			Ant	Correction Factors				Total	FCC Limit	
Carrier Freq. (MHz)	Reading (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Pre-Amp (dB)	Average Level Factor (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 442.00	81.02	Peak	H	27.30	7.10	42.50	-5.95	66.97	93.98	-27.01
	85.28	Peak	V					71.23	93.98	-22.75

*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.

Total = Reading + Antenna + Cable – Pre-Amp – Average Level Factor

Margin = Total - Limit



Tested by: Chang-Uk, Jun / Engineer

7.4.3 Field Strength of the Harmonic Frequency Emissions

Humidity Level : 53 % R.H. Temperature: 24 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
Result : PASSED

EUT : Remote Control Date: June 08, 2012
Operating Condition : TX mode
Distance : 3 m


Measured Emissions Level			Ant	Correction Factors				Total	FCC Limit	
Freq. (MHz)	Reading (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Pre-Amp (dB)	Average Level Factor (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 884.00*	57.14	Peak	H	31.14	9.50	42.50	-5.95	50.33	54.00	-4.67
	58.42	Peak	V					50.61	54.00	-3.39

Tabulated test data for Restricted Band

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

Total = Reading + Antenna + Cable – Pre-Amp – Average Level Factor

Margin = Total - Limit



Tested by: Chang-Uk, Jun / Engineer

7.4.4 Emissions Radiated Outside of the Specified Frequency Band

7.4.4.1 Test Data for Frequency range: 30 MHz ~ 1 000 MHz

Humidity Level : 45 % R.H.

Temperature: 24 °C

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

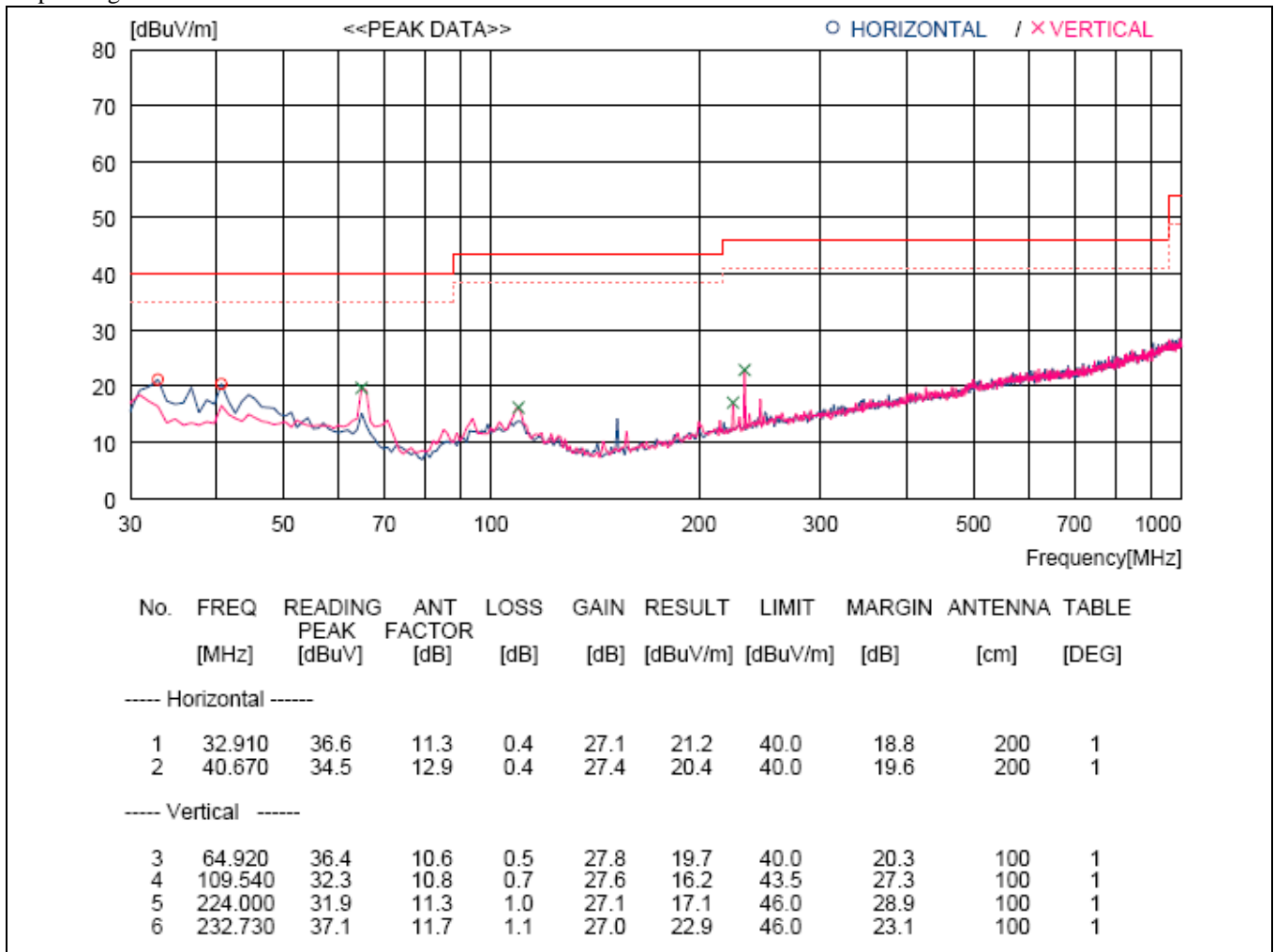
Result : PASSED

EUT : Remote Control

Date: June 08, 2012

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

Operating condition : TX mode



Remark: Margin (dB) = Limit – Result and Result = Reading Peak + Antenna Factor + Loss - Gain

Loss and Gain in above table means Cable Loss and Pre-amplifier gain.

Tested by: Chang-Uk, Jun / Engineer

7.4.4.2 Test Data for Below 30 MHz

Humidity Level : 45 % R.H.

Temperature: 24 °C

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

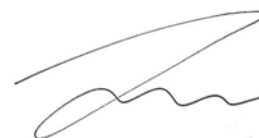
Result : PASSED

EUT : Remote Control

Date: June 08, 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

7.4.4.3 Outside the operating frequency band

- . Test Date : June 08, 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
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249 (d)
- . Result : PASSED

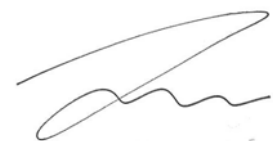
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Pre-Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Lowest frequency band									
2400.00	42.44	Peak	H	27.05	3.14	43.10	29.53	74.00	-44.47
2400.00	30.61	Average	H				17.70	54.00	-36.30
2400.00	43.30	Peak	V				30.39	74.00	-43.61
2400.00	30.75	Average	V				17.84	54.00	-36.16
Highest frequency band									
2483.50	42.17	Peak	H	27.31	3.17	43.10	29.55	74.00	-44.45
2483.50	29.79	Average	H				17.17	54.00	-36.83
2483.50	43.34	Peak	V				30.72	74.00	-43.28
2483.50	30.08	Average	V				17.46	54.00	-36.54

Tabulated test data for Restricted Band

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

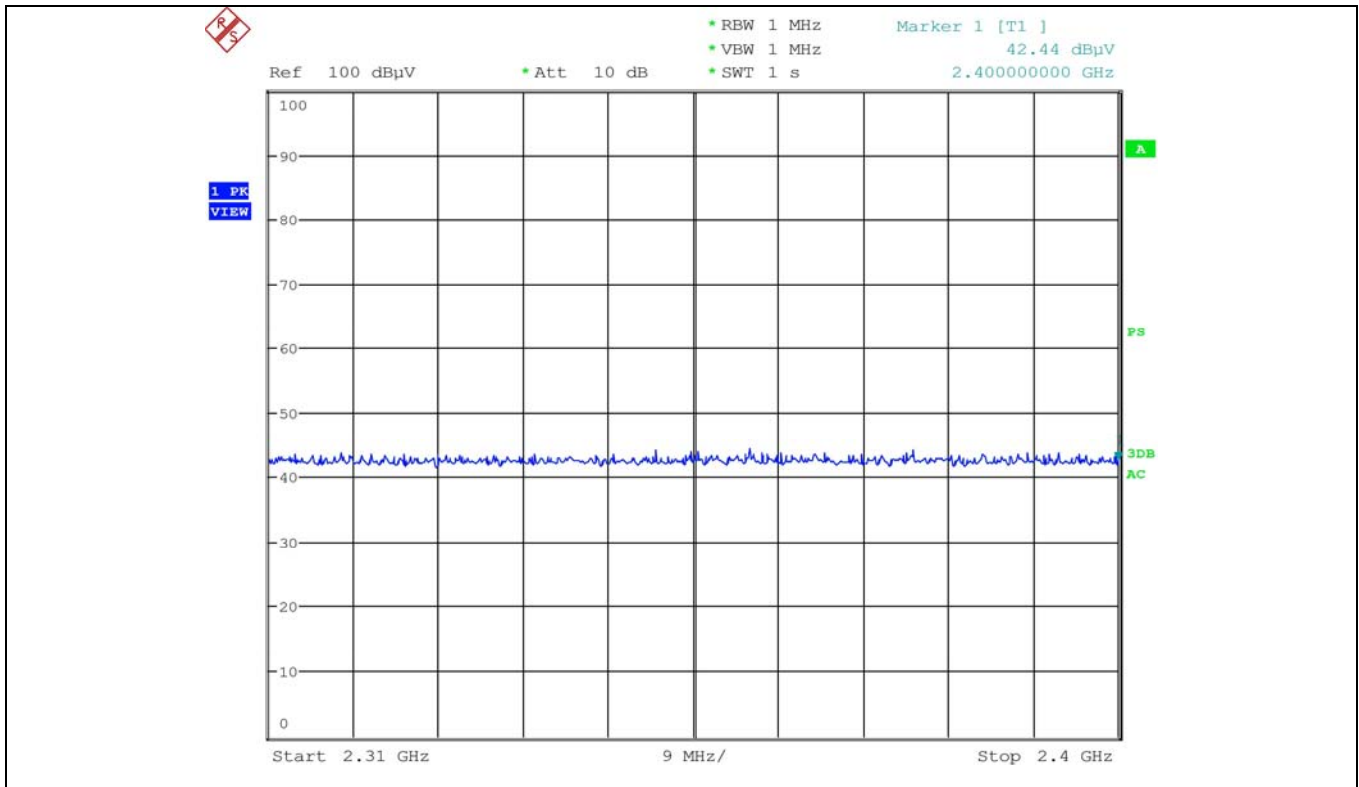
Total = Reading + Antenna factor + Cable loss – Pre-Amp Gain

Margin = Total - Limit

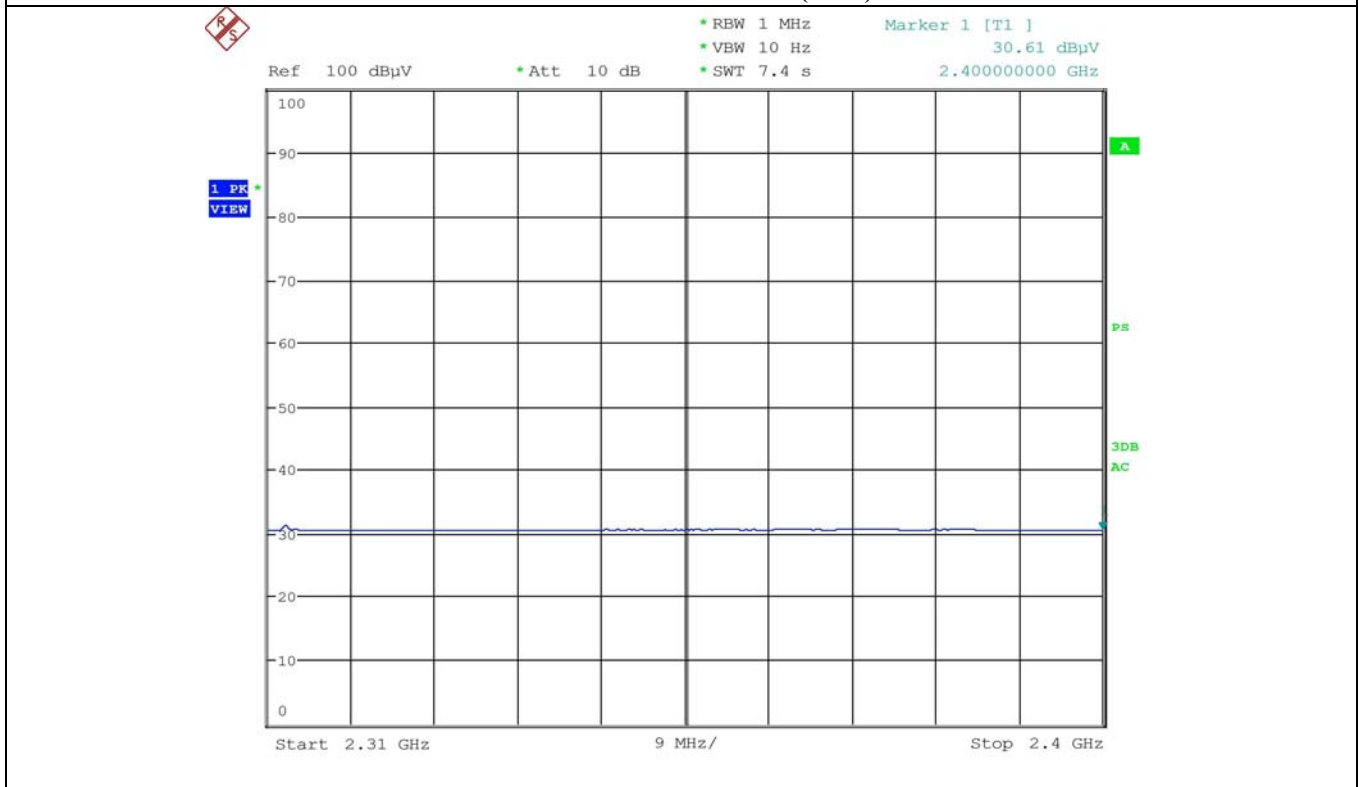


Tested by: Chang-Uk, Jun / Engineer

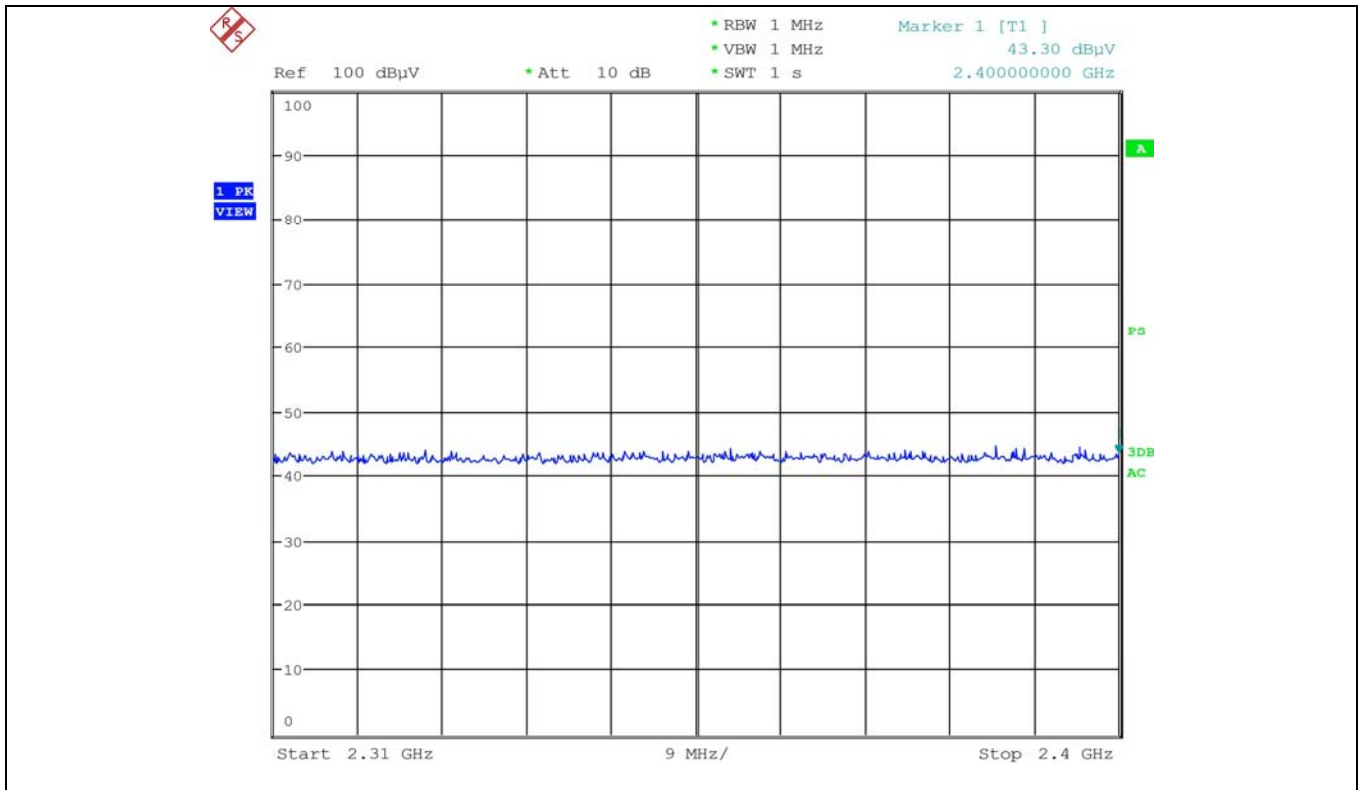
Plotted Data for Restricted Band



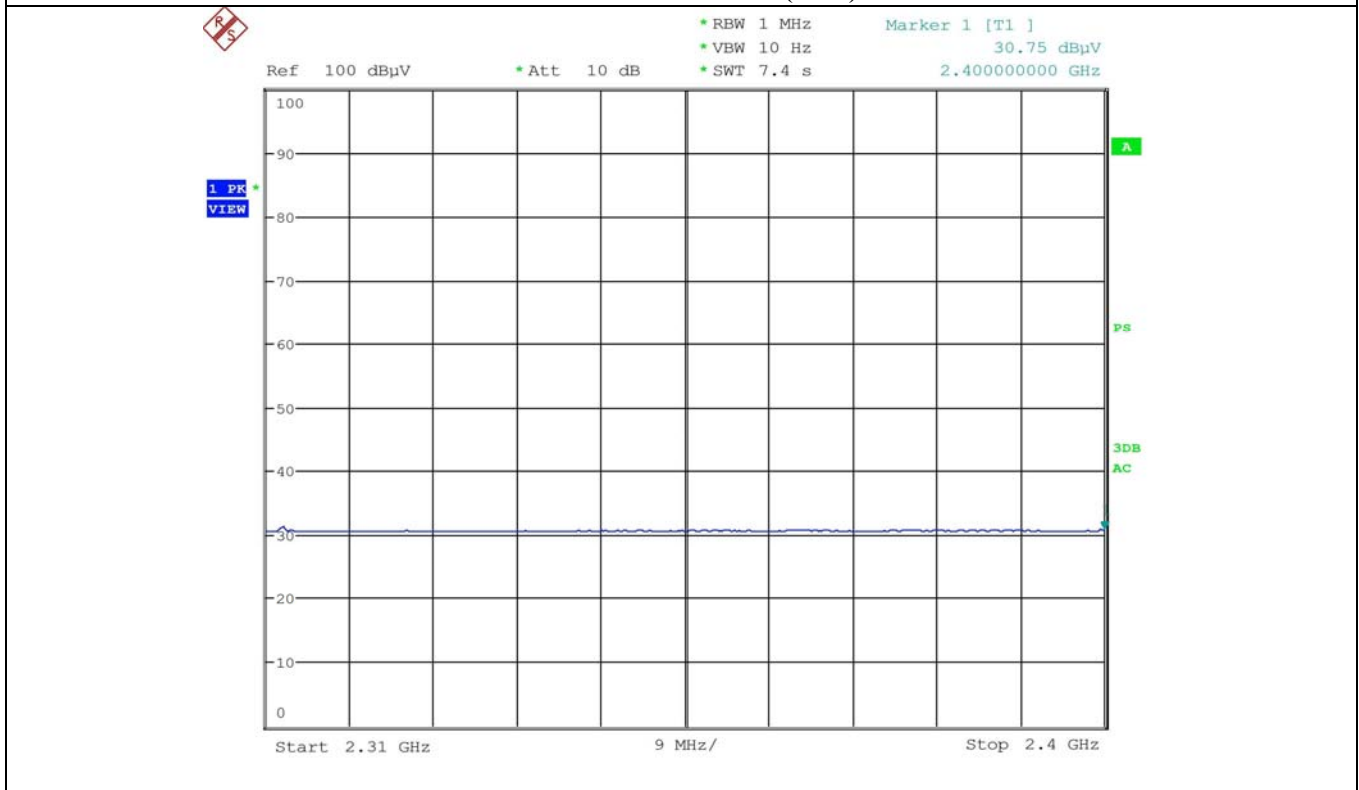
Low Channel – Horizontal (Peak)



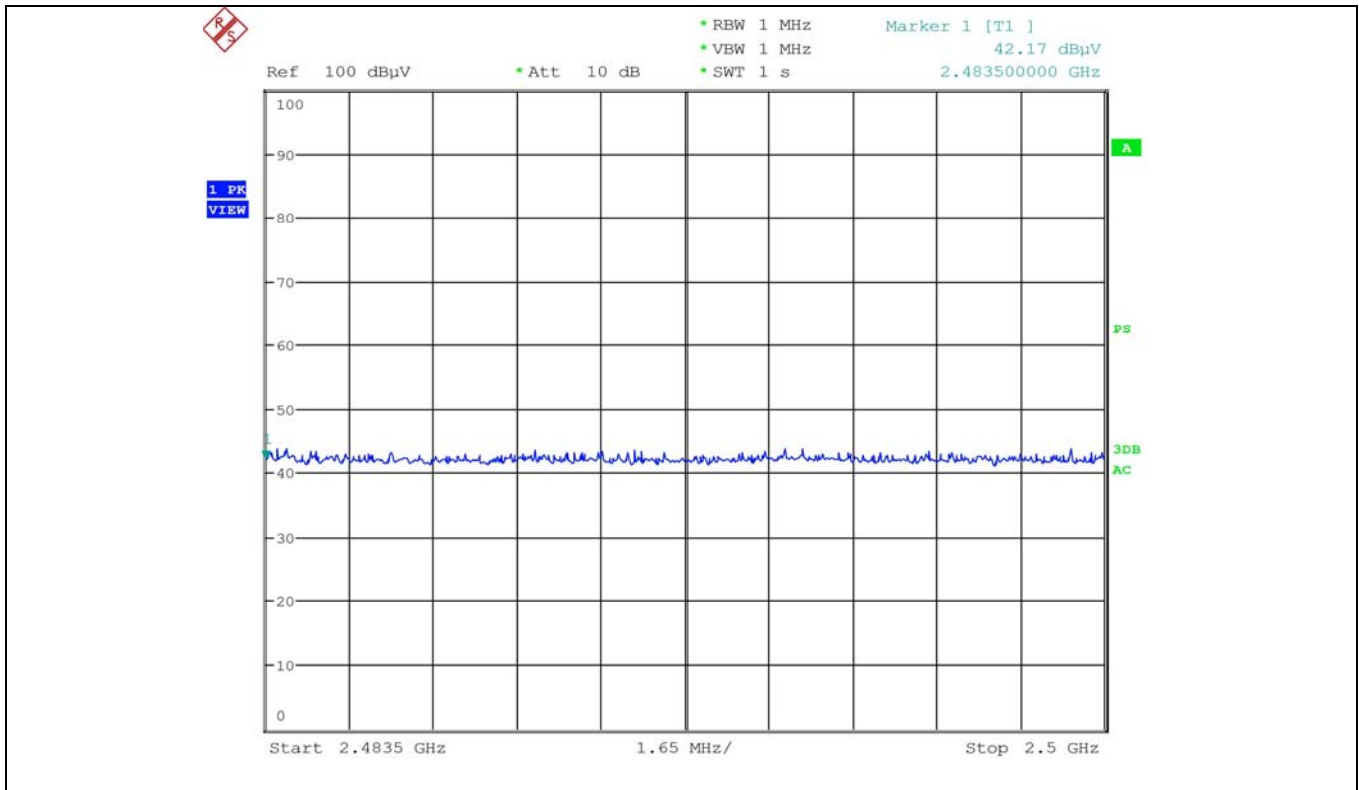
Low Channel – Horizontal (Average)



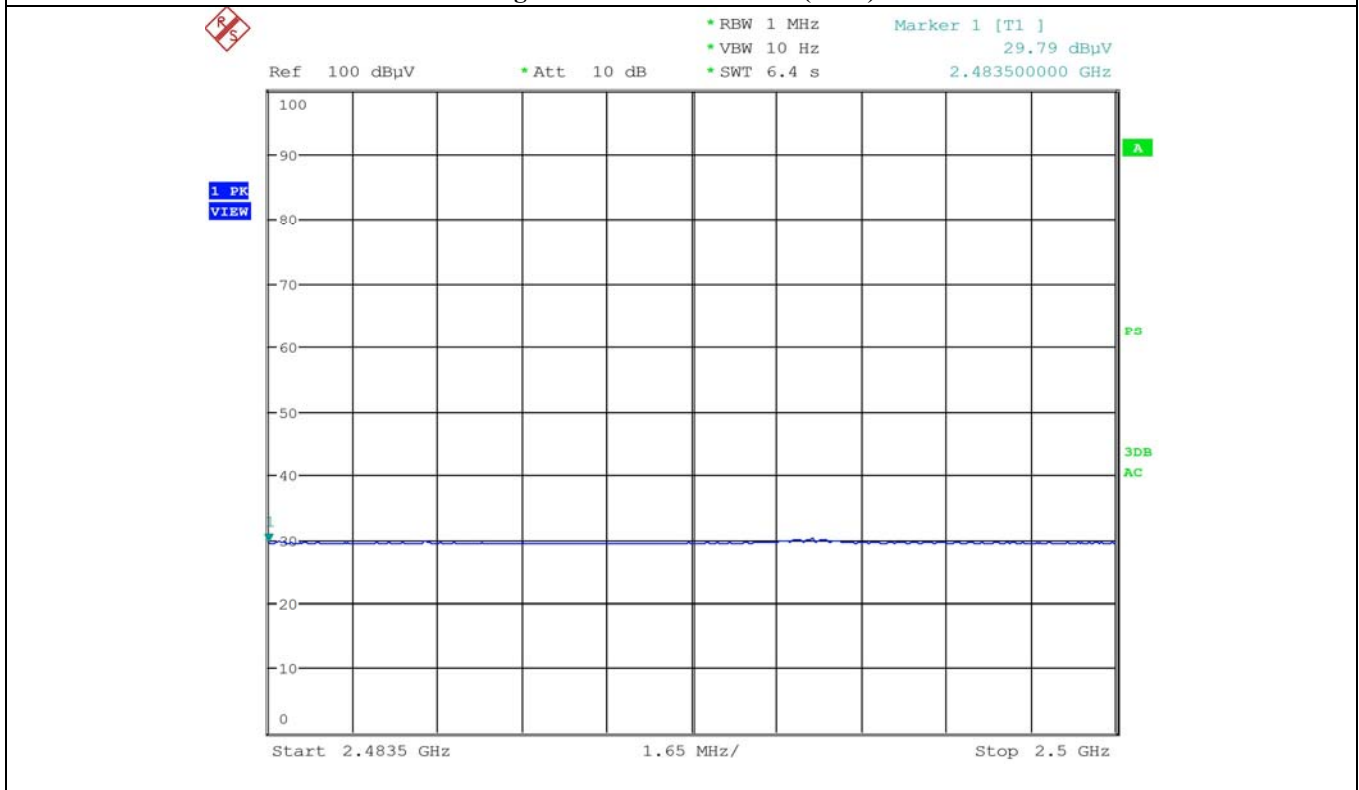
Low Channel – Vertical (Peak)



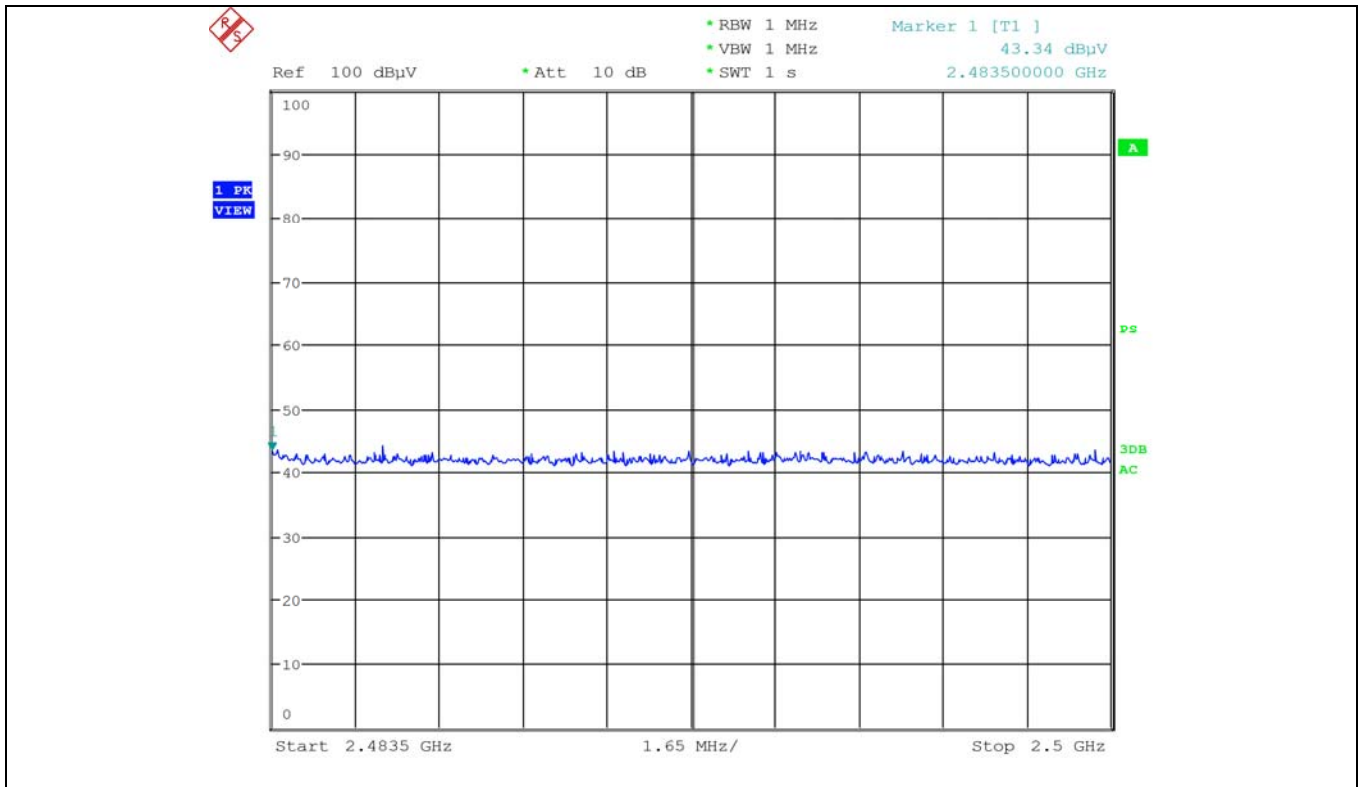
Low Channel – Vertical (Average)



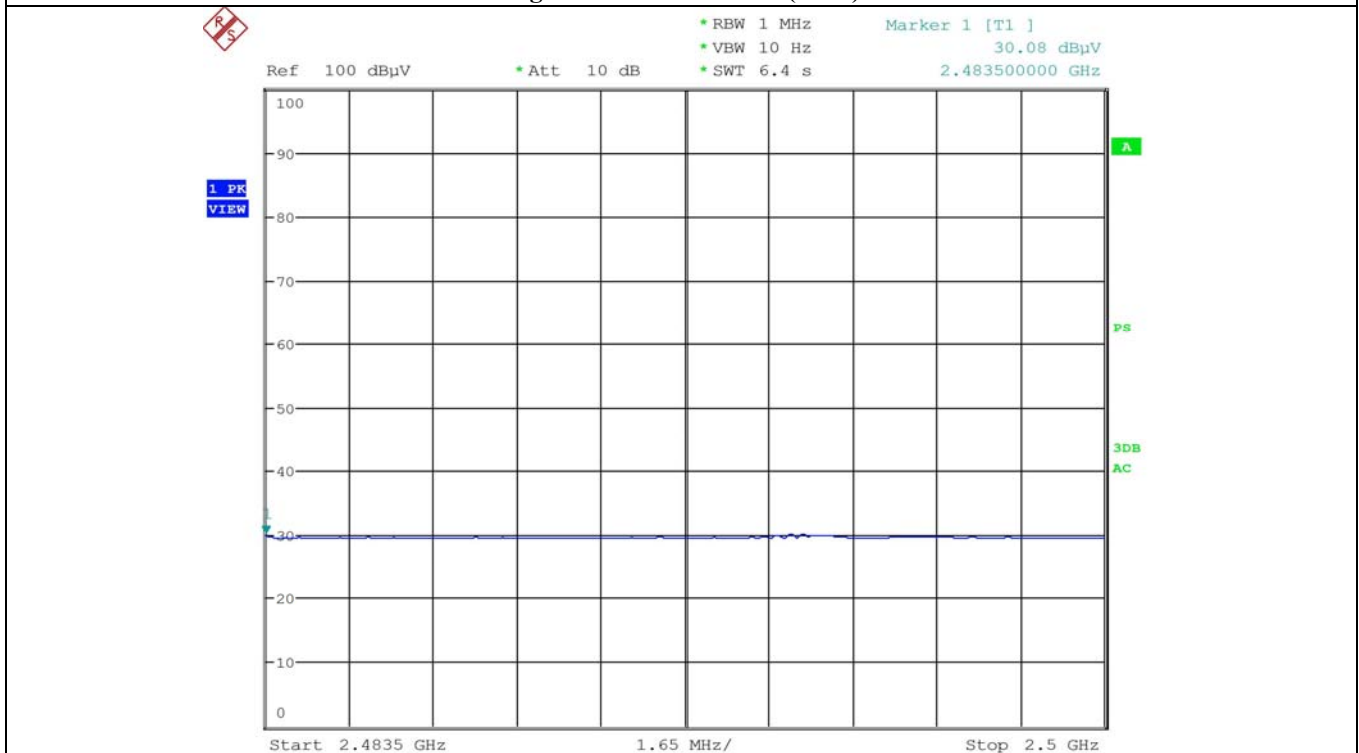
High Channel – Horizontal (Peak)



High Channel – Horizontal (Average)



High Channel – Vertical (Peak)



High Channel – Vertical (Average)

7.4.4.4 Test Data above 1 GHz except for harmonic

- Test Date : June 08, 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

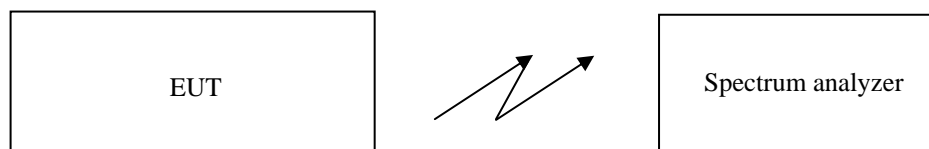
8. 20 dB BANDWIDTH

8.1 Operating environment

Temperature : 22 °C
Relative humidity : 47 % R.H.

8.2 Test set-up

The output signal of EUT was received by 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.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)

8.4 Test data

- . Test Date : June 08, 2012
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.215(c)

Channel	Operating Freq. (MHz)	20 dB Bandwidth (kHz)	Result
1	2442.00	403.80	Met the requirement

Remark: See next page for 20 dB Bandwidth test data.

The 20 dB bandwidth is within the assigned frequency band from 2 400 MHz to 2 483.5 MHz.

Tested by: Chang-Uk, Jun / Engineer

