

APPLICATION FOR CERTIFICATION

On Behalf of
FUTABA Corporation
Radio Control
Model No. : R7003SB
FCC ID : AZPR7003SB-24G
Brand: Futaba

Prepared for : FUTABA Corporation
1080 Yabutsuka Chosei-son Chosei-gun
Chiba, 299-4395 Japan.

Prepared by : AUDIX Technology Corporation
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TABLE OF CONTENTS

Description	Page
TEST REPORT CERTIFICATION	4
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT).....	5
1.2. Tested Supporting System Details	5
1.3. Description of Test Facility	6
1.4. Measurement Uncertainty	6
2. CONDUCTED EMISSION MEASUREMENT.....	7
3. RADIATED EMISSION MEASUREMENT	8
3.1. Test Equipment	8
3.2. Test Setup	8
3.3. Radiated Emission Limits (§15.209)	10
3.4. Operating Condition of EUT	10
3.5. Test Procedure	10
3.6. Radiated Emission Measurement Results	11
4. DUTY CYCLE CORRECTION FACTOR.....	26
4.1. Test Equipment	26
4.2. Block Diagram of Test Setup.....	26
4.3. Test Results.....	26
5. 6dB BANDWIDTH MEASUREMENT	28
5.1. Test Equipment	28
5.2. Block Diagram of Test Setup.....	28
5.3. Specification Limits (§15.247(a)(2))	28
5.4. Operating Condition of EUT	28
5.5. Test Procedure	28
5.6. Test Results.....	28
6. MAXIMUM PEAK OUTPUT POWER MEASUREMENT	31
6.1. Test Equipment	31
6.2. Block Diagram of Test Setup.....	31
6.3. Specification Limits (§15.247(b)-(3)).....	31
6.4. Operating Condition of EUT	31
6.5. Test Procedure	31
6.6. Test Results.....	31
7. EMISSION LIMITATIONS MEASUREMENT.....	32
8. BAND EDGES MEASUREMENT.....	33
8.1. Test Equipment	33
8.2. Block Diagram of Test Setup.....	33
8.3. Specification Limits (§15.247(c)).....	33
8.4. Operating Condition of EUT	33
8.5. Test Procedure	33
8.6. Reference Level	34
8.7. Test Results.....	35
9. POWER SPECTRAL DENSITY MEASUREMENT	36
9.1. Test Equipment	36
9.2. Block Diagram of Test Setup.....	36
9.3. Specification Limits (§15.247(d)).....	36
9.4. Operating Condition of EUT	36
9.5. Test Procedure	36

9.6. Test Results..... 36

10. DEVIATION TO TEST SPECIFICATIONS39

11. PHOTOGRAPHS40

11.1. Photos of Radiated Measurement at Semi-Anechoic Chamber..... 40

11.2. Photo of RF Conducted Measurement 41

TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation
 Manufacturer : FUTABA Corporation
 EUT Description : Radio Control
 FCC ID : AZPR7003SB-24G
 (A) Model No. : R7003SB
 (B) Serial No. : N/A
 (C) Brand : Futaba
 (D) Power Supply : DC 3.5V ~ 8.4V
 (E) Test Voltage : DC 4.8V (Via DC Power Supply)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, Oct. 2011
 AND ANSI C63.4/2003
 (FCC CFR 47 Part 15C, §15.207 and §15.209 and §15.247)

The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart B & C limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test : Oct. 19 ~ 26, 2012 Date of Report : Nov. 01, 2012

Producer : Annie Yu
 (Annie Yu/Assistant Administrator)

Signatory : Leon Liu
 (Leon Liu/Deputy General Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	Radio Control
Model Number	:	R7003SB
Serial Number	:	N/A
FCC ID	:	AZPR7003SB-24G
Applicant	:	FUTABA Corporation 1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.
Manufacturer	:	FUTABA Corporation 1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.
Radio Technology	:	DSSS
Modulation	:	FSK
Frequency Band	:	2405.376MHz ~ 2472.960MHz
Tested Frequency	:	2405.376MHz (Channel 02) 2439.168MHz (Channel 35) 2472.960MHz (Channel 68)
Frequency Channel	:	23 channels
Antenna Gain	:	-5dBi
Date of Receipt of Sample	:	Oct. 11, 2012
Date of Test	:	Oct. 19 ~ 26, 2012

1.2. Tested Supporting System Details

1.2.1. DC POWER SUPPLY

Model Number	:	3303A
Serial Number	:	721773
Manufacturer	:	TOP WARD
DC Power Cable	:	Non-Shielded, Detachable, 0.8m
AC Power Cord	:	Non-Shielded, Detachable, 1.8m

1.3. Description of Test Facility

Name of Firm : **AUDIX Technology Corporation**
EMC Department
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan, R.O.C.

Test Location & Facility (AC) : **Semi-Anechoic Chamber**
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan, R.O.C.
 May 14, 2009 Renewal on
 Federal Communication Commission
 Registration Number: 90993

NVLAP Lab. Code : 200077-0

TAF Accreditation No : 1724

1.4. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Radiation Test (Distance: 3m)	30MHz~300MHz	± 2.91dB
	300MHz~1000MHz	± 2.74dB
	Above 1GHz	± 5.02dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dBm
Emission Limitations	± 0.13dB
Band edges	± 0.13dB
Power spectral density	± 0.13dB

2. CONDUCTED EMISSION MEASUREMENT

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

3. RADIATED EMISSION MEASUREMENT

3.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

3.1.1. For Frequency Range 30MHz~1000MHz (at Semi-Anechoic Chamber)

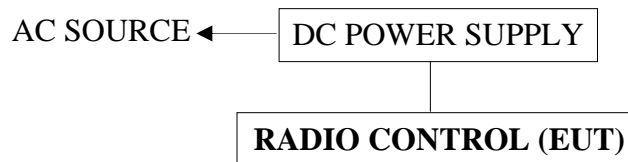
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Test Receiver	R & S	ESCS30	100339	Mar. 08, 12'	Mar. 07, 13'
3.	Amplifier	HP	8447D	2944A06305	Feb. 13, 12'	Feb. 12, 13'
4.	Log Periodic Antenna	Schwarzbeck	UHALP 9108-A	0810	Mar. 03, 12'	Mar. 02, 13'
5.	Biconical Antenna	CHASE	VBA6106A	1264	Mar. 03, 12'	Mar. 02, 13'

3.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

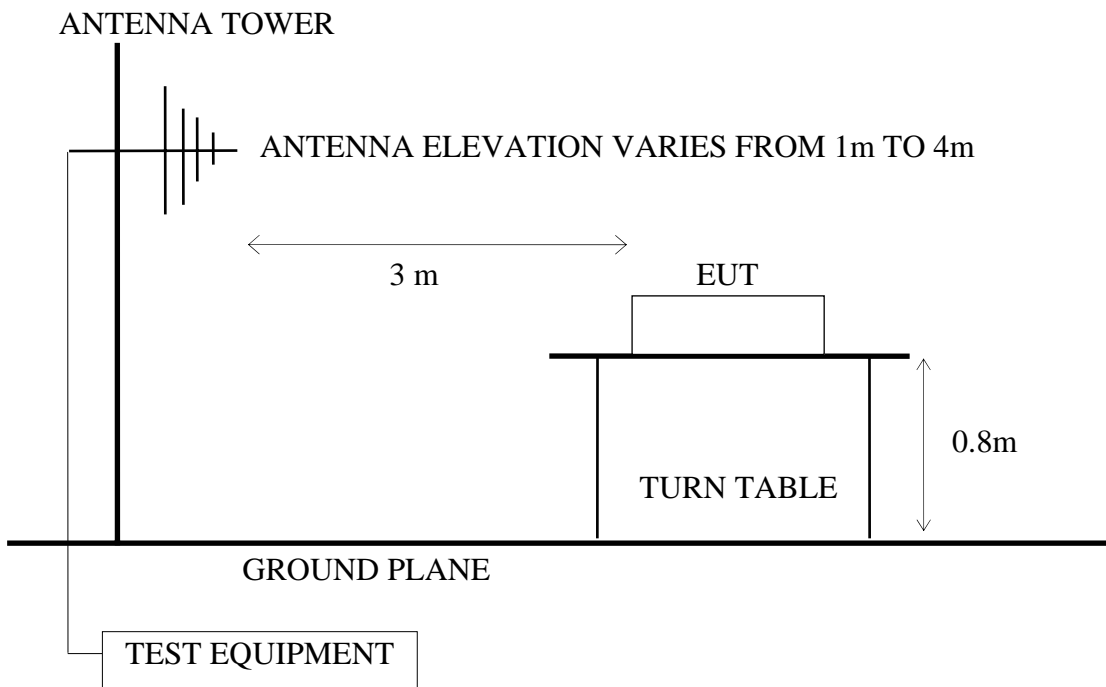
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Test Receiver	R & S	ESCS30	100339	Mar. 08, 12'	Mar. 07, 13'
3.	Amplifier	HP	8449B	3008A00529	Dec. 09, 11'	Dec. 08, 12'
4.	Horn Antenna	EMCO	3115	9112-3775	May 09, 12'	May 08, 13'
5.	Horn Antenna	EMCO	3116	2653	Oct. 15, 12'	Oct. 14, 13'
6.	2.4GHz Notch Filter	EWT	EWT-14-007 0-R1	G2	Dec. 05, 11'	Dec. 04, 12'
7.	3.5GHz High Pass Filter	HP	84300-80038	005	Jan. 04, 12'	Jan. 03, 13'

3.2. Test Setup

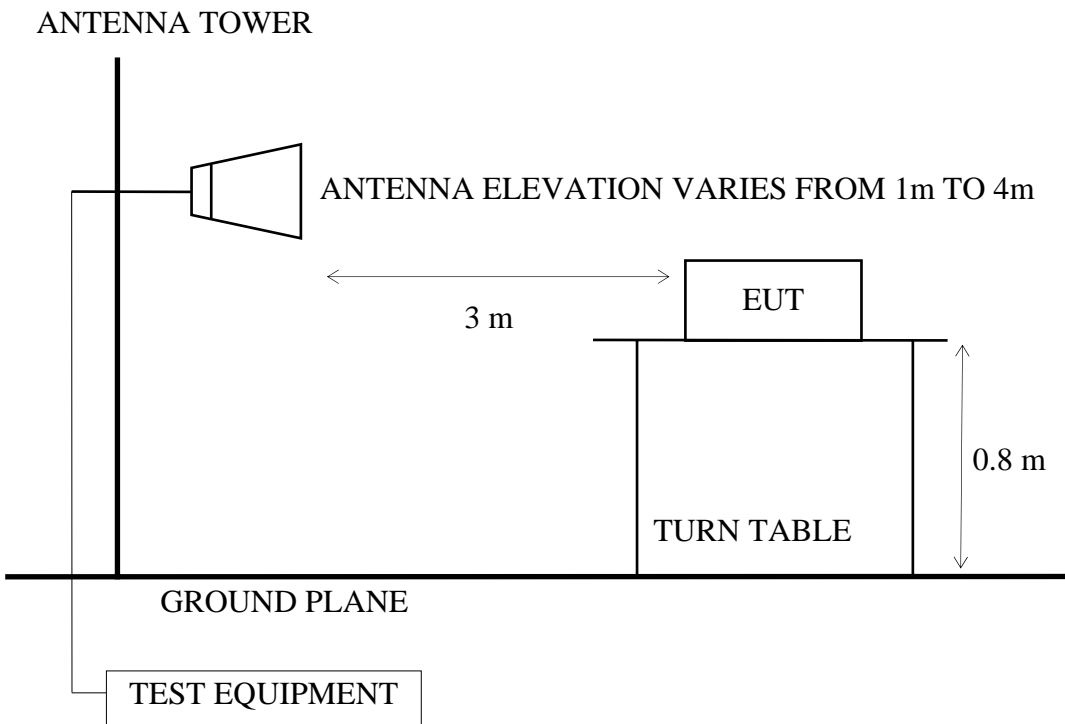
3.2.1. Block Diagram of connection between EUT and simulators



3.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz



3.2.3. Semi-Anechoic Chamber (3m) Setup Diagram for above 1GHz



3.3. Radiated Emission Limits (§15.209)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

- Remark :
- (1) Emission level ($\text{dB}\mu\text{V/m}$) = 20 log Emission level ($\mu\text{V/m}$)
 - (2) The tighter limit applies at the edge between two frequency bands.
 - (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
 - (4) The limits in this table are based on CFR 47 Part 15.205(a)(b) and Part 15.209 (a).
 - (5) The over 1GHz limit, FCC limit is used based on CFR 47 Part 15.35 (b) and Part 15.205(b) & Part 15.209(e) and Part 15.207(c).

3.4. Operating Condition of EUT

- 3.4.1. Set up the EUT (Radio Control) as shown on 3.2.
- 3.4.2. To turn on the power of all equipment.
- 3.4.3. The EUT was set the PC system using test program “Futaba Term”.
- 3.4.4. The EUT was set to continuously transmit signals at 2405.376MHz, 2439.168MHz and 2472.960MHz during testing.

3.5. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set to 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antennas such as calibrated biconical and log-periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The resolution bandwidth of test spectrum analyzer is 1MHz and the video bandwidth is 10Hz for average detection (AV) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to 10th harmonics from fundamental frequency) was checked.

Above 1GHz was measured with peak and average detector. For frequency from 18GHz to 25GHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist.

3.6. Radiated Emission Measurement Results

PASSED.

(All emissions not reported below are too low against the prescribed limits.)

EUT : Radio Control M/N : R7003SB

Test Date : Oct. 26, 2012 Temperature : 20 Humidity : 56%

For Frequency Range 30MHz~1000MHz:

The EUT with following test modes was performed during this section testing and all the test results are listed in section 3.6.1.

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	02	2405.376MHz	Transmit	# 14	# 13
2.	35	2439.168MHz		# 14	# 13
3.	68	2472.960MHz		# 14	# 13

* Above all final readings were measured with Quasi-Peak detector.

For Frequency above 1GHz:

The EUT with following test modes was performed during this section testing and all the test results are listed in section 3.6.2.

Mode	Chnnel	Frequency	Test Mode	Test Frequency Range
1.	02	2405.376MHz	Transmit	1000-2680MHz
2.				2680-4000MHz*
3.				4000-5500MHz*
4.				5500-8000MHz*
5.				8000-11000MHz
6.				11000-18000MHz
7.				18000-25000MHz
8.	35	2439.168MHz	Transmit	1000-2680MHz
9.				2680-4000MHz*
10.				4000-5500MHz*
11.				5500-8000MHz*
12.				8000-11000MHz
13.				11000-18000MHz
14.				18000-25000MHz
15.	68	2472.960MHz	Transmit	1000-2680MHz
16.				2680-4000MHz*
17.				4000-5500MHz*
18.				5500-8000MHz*
19.				8000-11000MHz
20.				11000-18000MHz
21.				18000-25000MHz

- Note: 1. Above all final readings were measured with Peak and Average detector.
- 2. The emissions (up to 25GHz) not reported are too low to be measured.
- 3. "*" means there is spurious emission falling the frequency band and be measures.

For Restricted Bands:

The EUT was tested in restricted bands and all the test results are listed in section 3.6.3. (The restricted bands defined in part 15.205(a))

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	02	2405.376MHz	Transmit	# 2	# 1
2.	68	2472.960MHz	Transmit	# 4	# 3

3.6.1. Frequency Range 30-1000MHz

Frequency: 2405.376MHz

Site no. : A/C Chamber Data no. : 14
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20*C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	192.960	21.66	3.00	9.43	34.08	43.50	9.42	QP
2	288.990	25.97	3.80	7.21	36.98	46.00	9.02	QP
3	360.770	16.24	4.43	13.99	34.66	46.00	11.34	QP
4	745.860	22.91	6.65	1.63	31.19	46.00	14.81	QP
5	963.140	26.63	7.60	2.68	36.91	54.00	17.09	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : A/C Chamber Data no. : 13
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20*C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	48.430	17.32	1.40	11.03	29.75	40.00	10.25	QP
2	360.770	16.24	4.43	14.12	34.79	46.00	11.21	QP
3	624.610	21.31	6.20	3.35	30.86	46.00	15.14	QP
4	950.530	25.93	7.55	-0.17	33.32	46.00	12.68	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Frequency: 2439.168MHz

Site no. : A/C Chamber Data no. : 14
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2439.168MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	192.960	21.66	3.00	8.69	33.34	43.50	10.16	QP
2	288.990	25.97	3.80	3.93	33.70	46.00	12.30	QP
3	360.770	16.24	4.43	13.85	34.52	46.00	11.48	QP
4	793.390	23.98	6.90	6.39	37.27	46.00	8.73	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : A/C Chamber Data no. : 13
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2439.168MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	72.680	12.42	1.80	19.01	33.23	40.00	6.77	QP
2	360.770	16.24	4.43	15.05	35.72	46.00	10.28	QP
3	963.140	26.63	7.60	-0.06	34.17	54.00	19.83	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Frequency: 2472.960MHz

Site no. : A/C Chamber Data no. : 14
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20*C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2472.96MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	192.960	21.66	3.00	8.43	33.08	43.50	10.42	QP
2	288.990	25.97	3.80	6.70	36.47	46.00	9.53	QP
3	360.770	16.24	4.43	14.15	34.82	46.00	11.18	QP
4	963.140	26.63	7.60	3.37	37.60	54.00	16.40	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : A/C Chamber Data no. : 13
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E446A 20*C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2472.96MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	48.430	17.32	1.40	13.36	32.08	40.00	7.92	QP
2	156.100	20.70	2.70	11.43	34.84	43.50	8.66	QP
3	360.770	16.24	4.43	17.11	37.78	46.00	8.22	QP
4	486.870	18.67	6.20	10.06	34.93	46.00	11.07	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

3.6.2. Above 1GHz Frequency Range Measurement Results

Date of Test : Oct. 26, 2012 Temperature : 20

EUT : Radio Control Humidity : 56%

Test Mode : Transmitting Mode, Frequency: 2405.376MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
@ 1603.120	26.08	6.18	18.63	50.89	54.00	3.11
3210.640	30.77	7.36	18.35	56.48	74.00	17.52
4813.000	33.06	9.14	15.17	57.37	74.00	16.63

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. “@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3210.64	56.48	-36.92	19.56	54.00	34.44
4813.00	57.37	-36.92	20.45	54.00	33.55

- Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

Date of Test : Oct. 26, 2012 Temperature : 20

EUT : Radio Control Humidity : 56%

Test Mode : Transmitting Mode, Frequency: 2405.376MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
@ 1603.120	26.08	6.18	12.39	44.65	54.00	9.35
3210.640	30.77	7.36	18.04	56.17	74.00	17.83
4813.000	33.06	9.14	19.94	62.14	74.00	11.86

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. “@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3210.64	56.17	-36.92	19.25	54.00	34.75
4813.00	65.14	-36.92	28.22	54.00	25.78

- Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.91$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

Date of Test : Oct. 26, 2012 Temperature : 20
 EUT : Radio Control Humidity : 56%
 Test Mode : Transmitting Mode, Frequency: 2439.168MHz

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
@	1628.320	26.21	6.36	17.84	50.41	54.00	3.59
	3252.880	30.87	7.40	18.90	57.16	74.00	16.84
	4880.500	33.18	9.15	13.78	56.10	74.00	17.90

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. “@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3252.88	57.16	-36.92	20.24	54.00	33.76
4880.50	56.10	-36.92	19.18	54.00	34.82

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

Date of Test : Oct. 26, 2012 Temperature : 20
 EUT : Radio Control Humidity : 56%
 Test Mode : Transmitting Mode, Frequency: 2439.168MHz

	Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Vertical	Emission Level Vertical	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dBμV)	(dBμV/m)	(dBμV/m)	(dB)
@	1628.320	26.21	6.36	9.62	42.19	54.00	11.81
	3252.880	30.87	7.40	15.90	54.16	74.00	19.84
	4880.500	33.18	9.15	19.09	61.41	74.00	12.59

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. “@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency	Peak Value	Duty Cycle Correction Factor	Average Value Vertical	Limit	Margin
(MHz)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
3252.88	54.16	-36.92	17.24	54.00	36.76
4880.50	61.41	-36.92	24.49	54.00	29.51

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

Date of Test : Oct. 26, 2012 Temperature : 20
 EUT : Radio Control Humidity : 56%
 Test Mode : Transmitting Mode, Frequency: 2472.960MHz

	Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Horizontal	Emission Level Horizontal	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dBμV)	(dBμV/m)	(dBμV/m)	(dB)
@	1650.160	26.27	6.49	14.92	47.68	54.00	6.32
@	3299.080	30.93	7.45	13.66	52.04	54.00	1.96
	4948.000	33.31	9.10	14.70	57.11	74.00	16.89

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. “@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency	Peak Value	Duty Cycle Correction Factor	Average Value Horizontal	Limit	Margin
(MHz)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
4948.00	57.11	-36.92	20.19	54.00	33.81

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

Date of Test : Oct. 26, 2012 Temperature : 20

EUT : Radio Control Humidity : 56%

Test Mode : Transmitting Mode, Frequency: 2472.960MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
@ 1650.160	26.27	6.49	9.56	42.32	54.00	11.68
@ 3299.080	30.93	7.45	14.90	53.28	54.00	0.72
4948.000	33.31	9.10	22.74	65.15	74.00	8.85

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. *: Measured at 1m and limit is transformed to 83.5dBμV/m by adding a factor 9.5 which is calculated from 20log(3/1).
 4. "@”The peak measured value complies with the average limit, it is unnecessary to perform an average measurement. (According to ANSI C63.4-2003 section 8.3.1.2)

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4948.00	65.15	-36.92	28.23	54.00	25.77

- Remarks: 1. Duty Cycle Correction Factor = 20log (cumulative on/T) = 20log (1.425ms/100ms)=-36.92
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value=Peak value+ Duty Cycle Correction Factor
 3. All final readings of measurement were with Average values.

3.6.3. Restricted Bands Measurement Results

Date of Test : Oct. 26, 2012 Temperature : 20

EUT : Radio Control Humidity : 56%

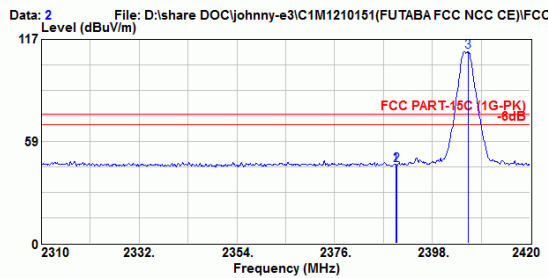
Test Mode : Transmit, Channel: 02, Frequency: 2405.376MHz

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Peak*	2389.860	28.47	6.34	10.31	45.12	74.00	28.88

- Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).
 3. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

	Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Average*	2389.86	45.13	-36.92	8.21	54.00	45.79

- Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value = Peak value + Duty Cycle Correction Factor
 3. Low frequency section (spurious in the restricted band 2310-2430MHz).
 4. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



Site no. : A/C Chamber Data no. : 2
 Dis. / Ant. : 3m 3115 (4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2389.860	28.47	6.34	10.31	45.13	74.00	28.87	Peak
2	2390.000	28.47	6.34	10.21	45.03	74.00	28.97	Peak
3	2406.140	28.51	6.36	75.12	109.99	74.00	-35.99	Peak

- Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

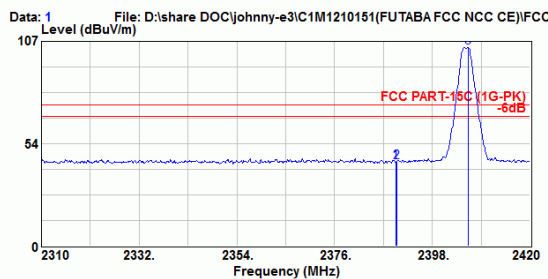
Date of Test : Oct. 26, 2012 Temperature : 20
 EUT : Radio Control Humidity : 56%
 Test Mode : Transmit, Channel: 02, Frequency: 2405.376MHz

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Peak*	2389.860	28.47	6.34	9.15	43.96	74.00	30.04

Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

	Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Average*	2389.86	43.96	-36.92	7.04	54.00	46.96

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value = Peak value + Duty Cycle Correction Factor
 3. Low frequency section (spurious in the restricted band 2310-2430MHz).
 4. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



Site no. : A/C Chamber Data no. : 1
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2389.860	28.47	6.34	9.15	43.96	74.00	30.04	Peak
2	2390.000	28.47	6.34	9.12	43.94	74.00	30.06	Peak
3	2406.140	28.51	6.36	69.09	103.96	74.00	-29.96	Peak

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Date of Test : Oct. 26, 2012 Temperature : 20

EUT : Radio Control Humidity : 56%

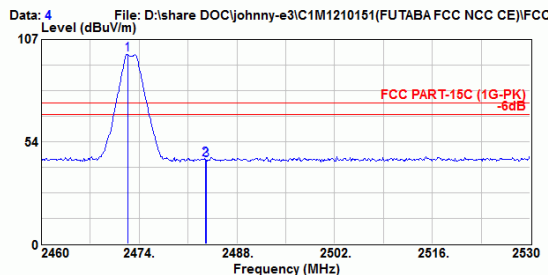
Test Mode : Transmit, Channel: 68, Frequency: 2472.960MHz

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Peak*	2483.500	28.66	6.45	9.09	44.20	74.00	29.80

- Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

	Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Average*	2483.50	44.20	-36.92	7.28	54.00	46.72

- Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on/T}) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value = Peak value + Duty Cycle Correction Factor
 3. Low frequency section (spurious in the restricted band 2310-2430MHz).
 4. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



Site no. : A/C Chamber Data no. : 4
 Dis. / Ant. : 3m 3115 (4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2472.960MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2472.390	28.66	6.43	64.11	99.20	74.00	-25.20	Peak
2	2483.500	28.66	6.45	9.09	44.20	74.00	29.80	Peak
3	2483.590	28.66	6.45	8.77	43.89	74.00	30.11	Peak

- Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

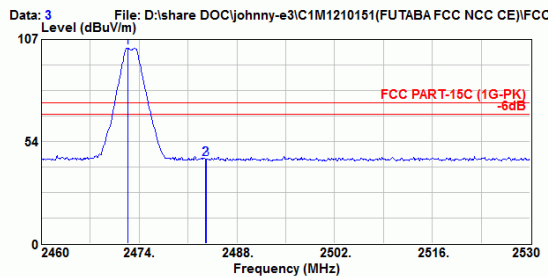
Date of Test : Oct. 26, 2012 Temperature : 20
 EUT : Radio Control Humidity : 56%
 Test Mode : Transmit, Channel: 68, Frequency: 2472.960MHz

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Peak*	2483.50	28.66	6.45	9.30	44.41	74.00	29.59

Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

	Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Average*	2483.50	44.41	-36.92	7.49	54.00	46.51

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on}/T) = 20\log(1.425\text{ms}/100\text{ms}) = -36.92$
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
 2. Average value = Peak value + Duty Cycle Correction Factor
 3. Low frequency section (spurious in the restricted band 2310-2430MHz).
 4. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



Site no. : A/C Chamber Data no. : 3
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E446A 20°C/56% Engineer : jianlun-hung
 EUT : R7003SB
 Power Rating : DC 4.8V
 Test Mode : Tx 2472.960MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2472.390	28.66	6.43	67.51	102.60	74.00	-28.60	Peak
2	2483.500	28.66	6.45	9.30	44.41	74.00	29.59	Peak
3	2483.590	28.66	6.45	9.24	44.36	74.00	29.64	Peak

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

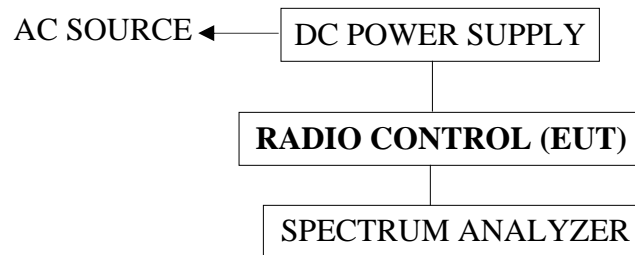
4. DUTY CYCLE CORRECTION FACTOR

4.1. Test Equipment

The following test equipment was used during the duty cycle factor measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

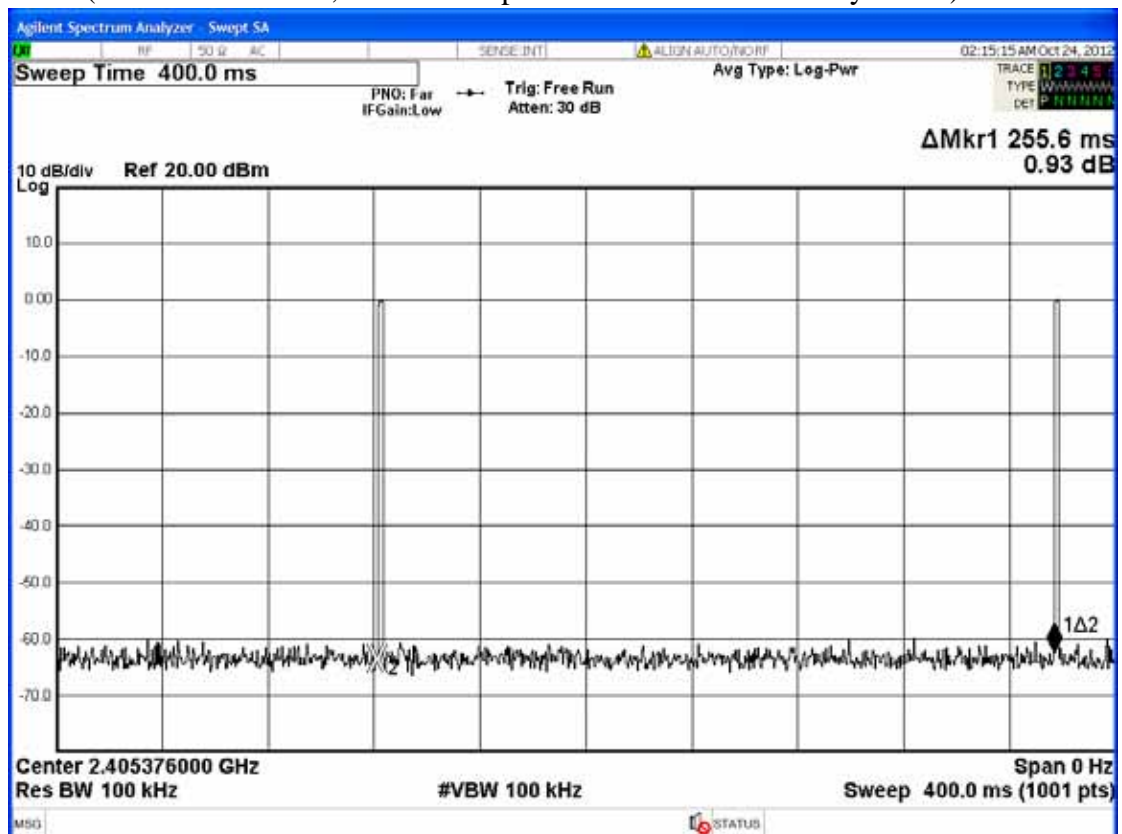
4.2. Block Diagram of Test Setup

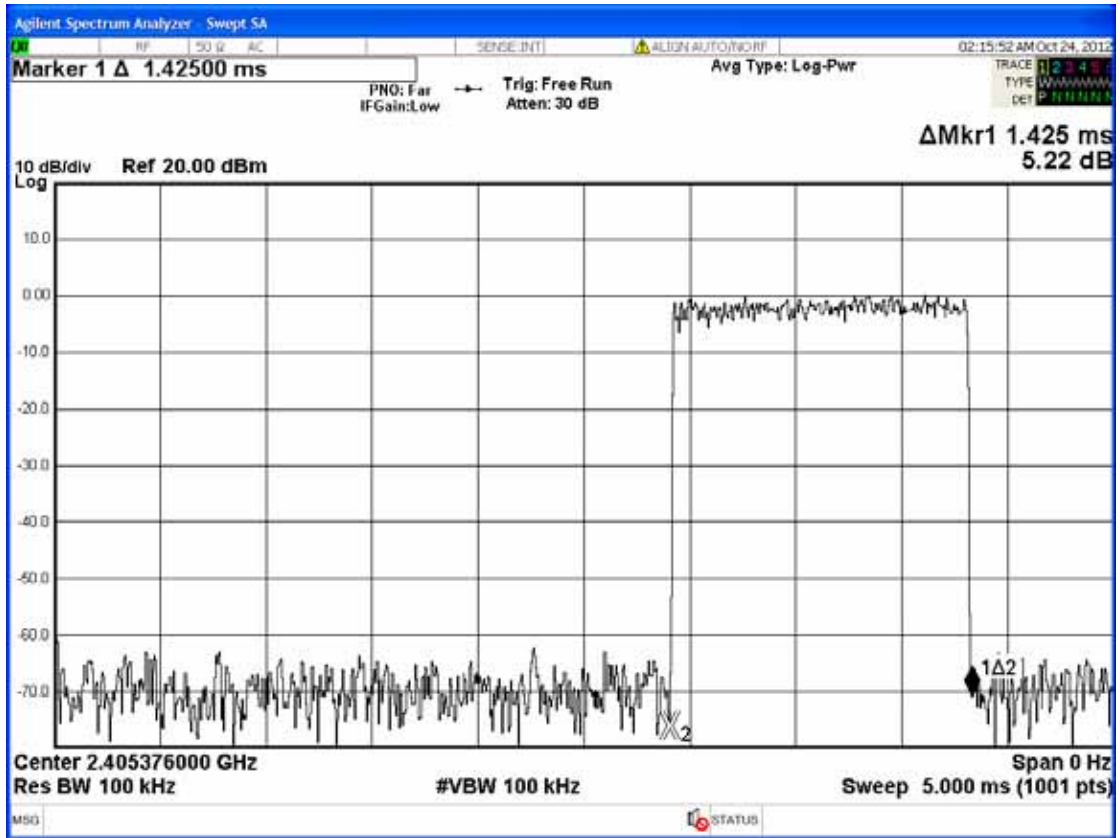


4.3. Test Results

PASSED.

(Test Date: Oct. 24, 2012 Temperature : 20 Humidity : 55%)





Duty Cycle Factor= $20\log(\text{cumulative on}/T)=20\log(1.425/100)=-36.92$

T: The period of the pulse train or 100ms if the pulse train length is greater than 100ms

5. 6dB BANDWIDTH MEASUREMENT

5.1. Test Equipment

The following test equipment was used during the 20dB bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

5.2. Block Diagram of Test Setup

The same as section.4.2.

5.3. Specification Limits (§15.247(a)(2))

The minimum 6dB bandwidth shall be at least 500kHz.

5.4. Operating Condition of EUT

5.4.1. Set up the EUT and simulator as shown on 5.2.

5.4.2. To turn on the power of all equipment.

5.4.3. EUT (Radio Control) was on transmitting frequency function during the testing.

5.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer and RBW=1-5% of OBW and VBW > 3*RBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

The measurement guideline was according to KDB 558074 D02.

5.6. Test Results

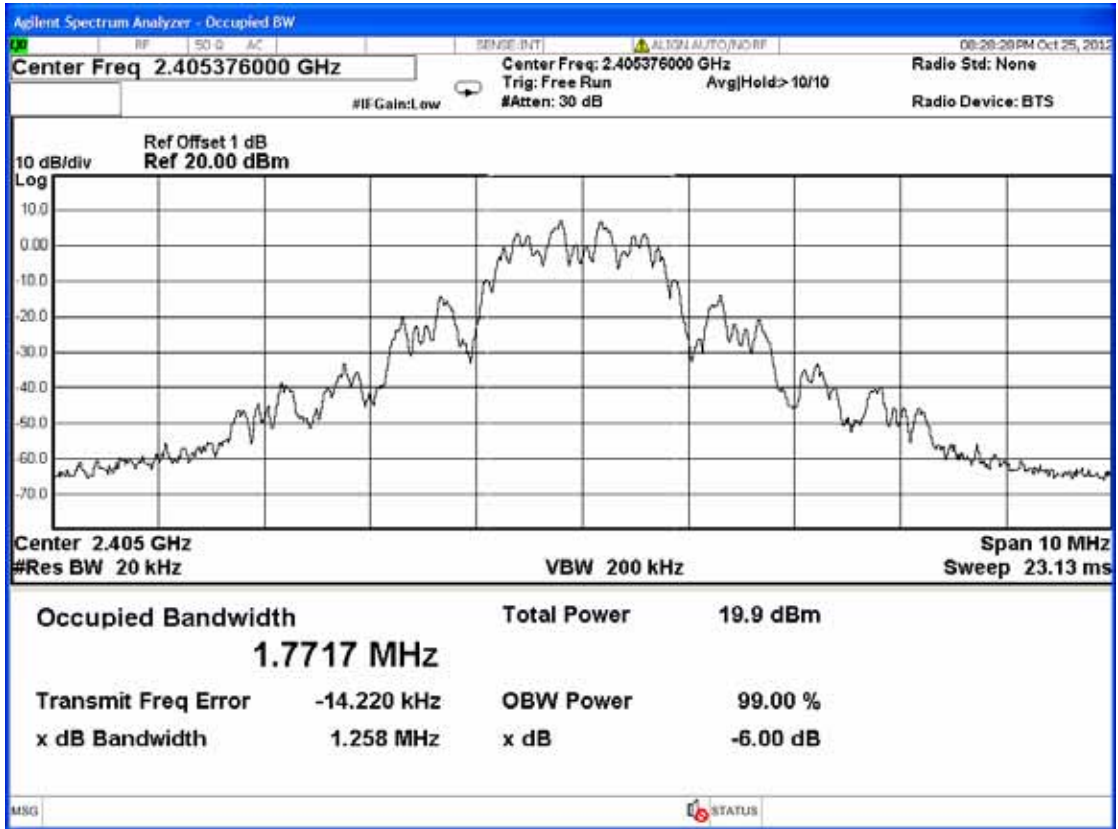
PASSED. All the test results are attached in next pages.

(Test Date: Oct. 25, 2012 Temperature : 20 Humidity : 56%)

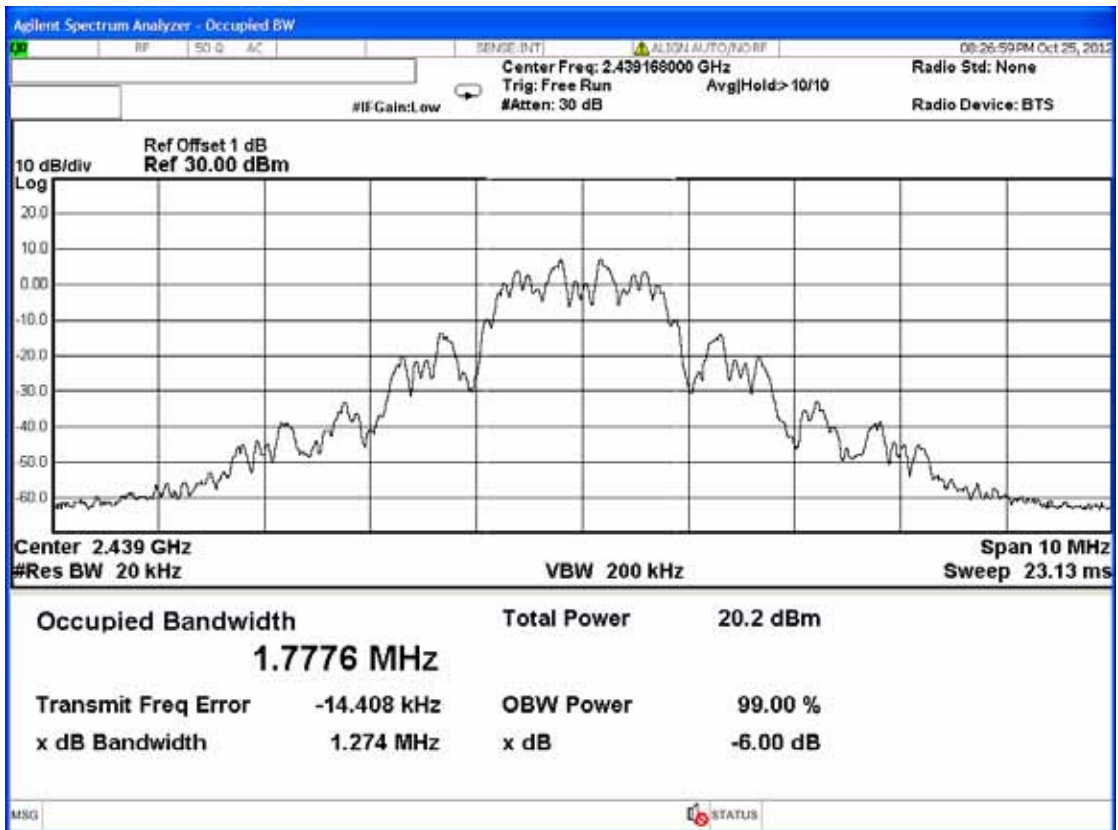
Mode	Channel	Frequency	6dB Bandwidth
1.	CH 02	2405.376MHz	1.258MHz
2.	CH 35	2439.168MHz	1.274MHz
3.	CH 68	2472.960MHz	1.484MHz

[Limit: least 500kHz]

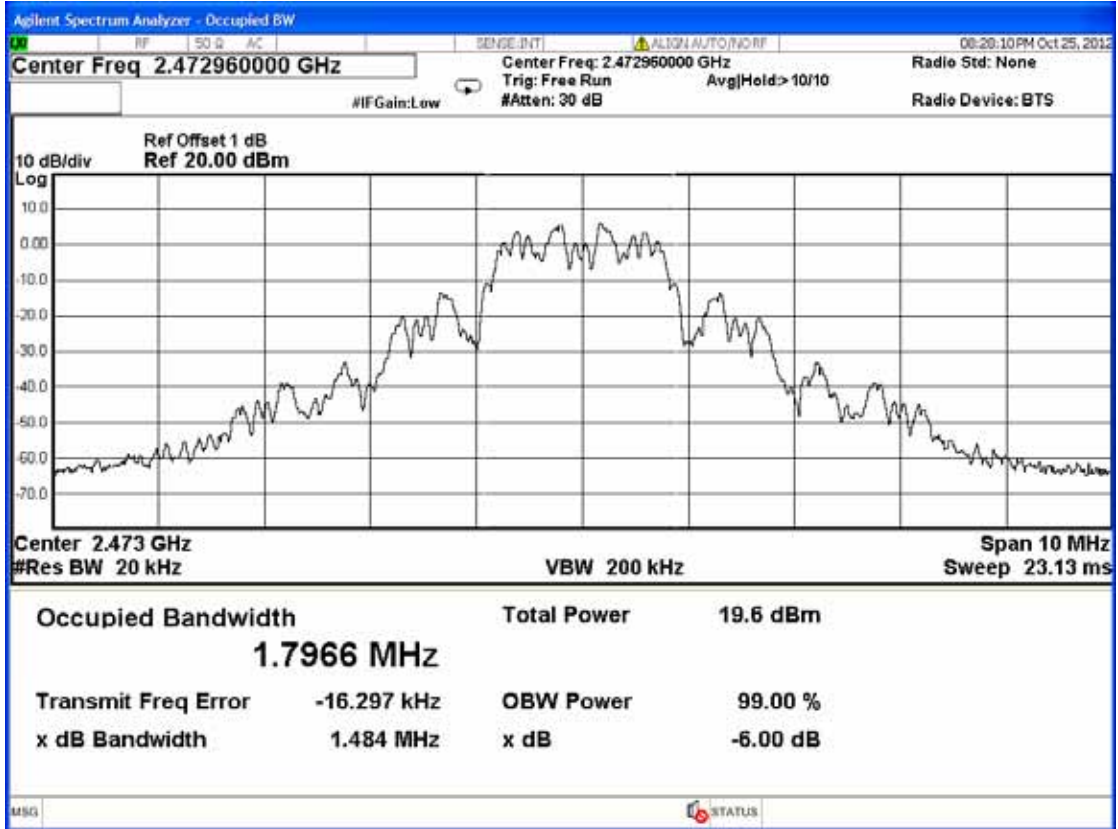
5.6.1. Channel 02, Frequency: 2405.376MHz



5.6.2. Channel 35, Frequency: 2439.168MHz



5.6.3. Channel 68, Frequency: 2472.960MHz



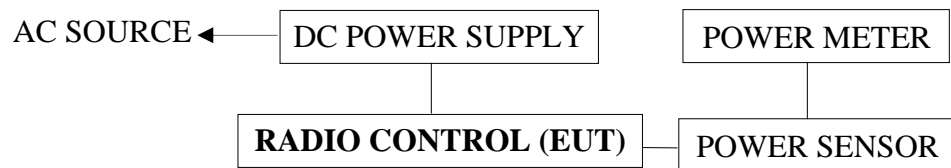
6. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

6.1. Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Power Meter	Anritsu	ML2495A	1145008	Oct. 30, 12'	Oct. 29, 13'
2.	Power Sensor	Anritsu	MA2411B	1126096	Oct. 30, 12'	Oct. 29, 13'

6.2. Block Diagram of Test Setup



6.3. Specification Limits (§15.247(b)-(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm)

6.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in 5.4 except the test set up replaced by section 6.2.

6.5. Test Procedure

The transmitter output was connected to the power sensor and record the reading of power meter.

The measurement guideline was according to KDB 558074 D02.

6.6. Test Results

PASSED. All the test results are listed below.

(Test Date: Oct. 25, 2012 Temperature : 20 Humidity : 56%)

No.	Channel	Test Frequency	Peak Output Power	Limit
1.	CH 02	2405.376MHz	13.00dBm	30dBm
2.	CH 35	2439.168MHz	12.32dBm	30dBm
3.	CH 68	2472.960MHz	11.58dBm	30dBm

7. EMISSION LIMITATIONS MEASUREMENT

Pursuant to KDB558074 D02 that emission levels below limits specified in 15.209 would not be required.

8. BAND EDGES MEASUREMENT

8.1. Test Equipment

The following test equipment was used during the band edges measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

8.2. Block Diagram of Test Setup

The same as section.4.2.

8.3. Specification Limits (§15.247(c))

- 8.3.1. The highest level should be at least 20 dB below that in the 100kHz bandwidth.
- 8.3.2. The reference level for determining limit of emission limitations is according to the value measured indicated in plots at section 8.6.

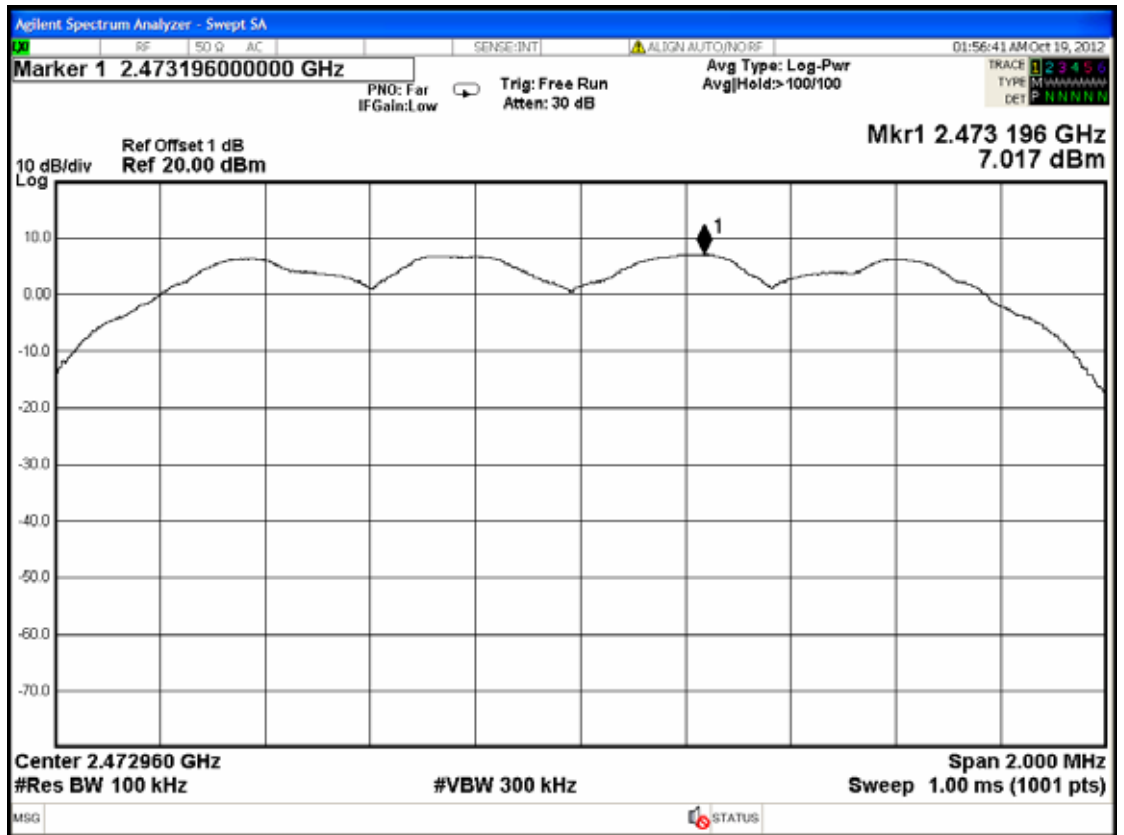
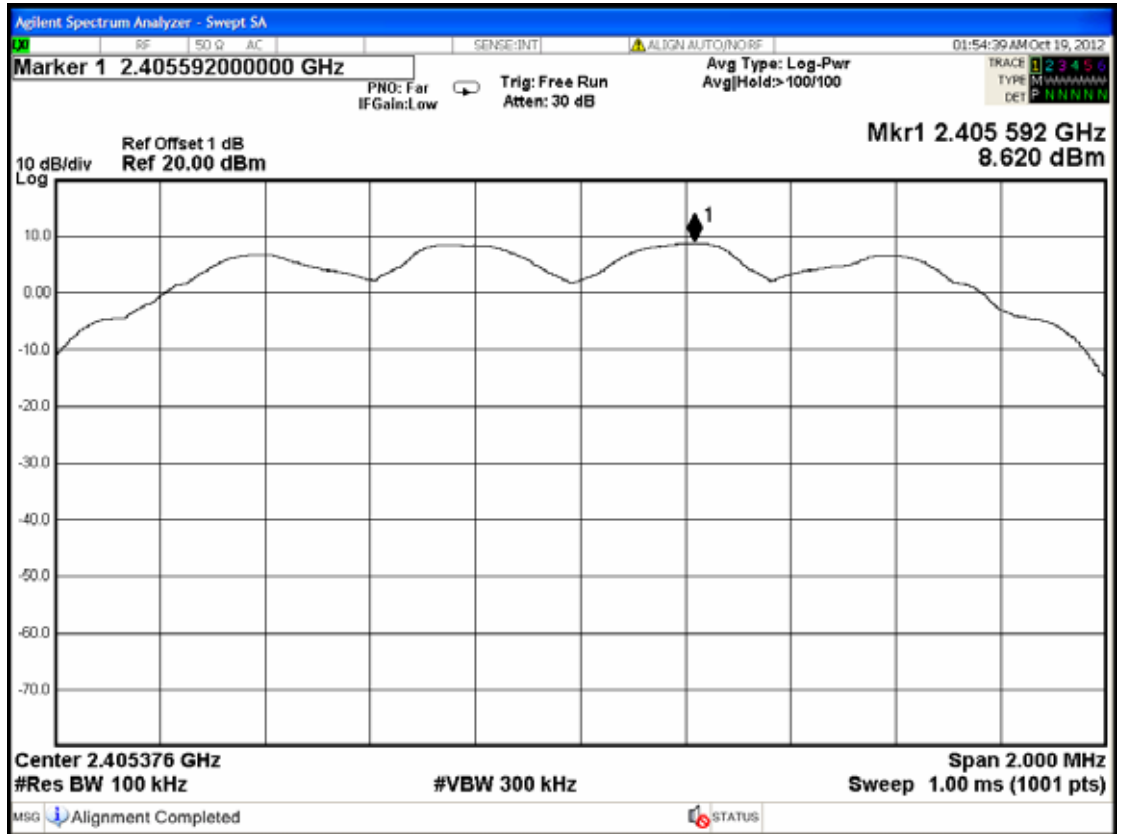
8.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in 5.4 except the test set up replaced by section 8.2.

8.5. Test Procedure

- 8.5.1. Reference Level: The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 100kHz RBW and 300kHz VBW, set sweep time = Auto.
- 8.5.2. The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 300kHz bandwidth from band edge.
The measurement guideline was according to KDB 558074 D02

8.6. Reference Level



8.7. Test Results

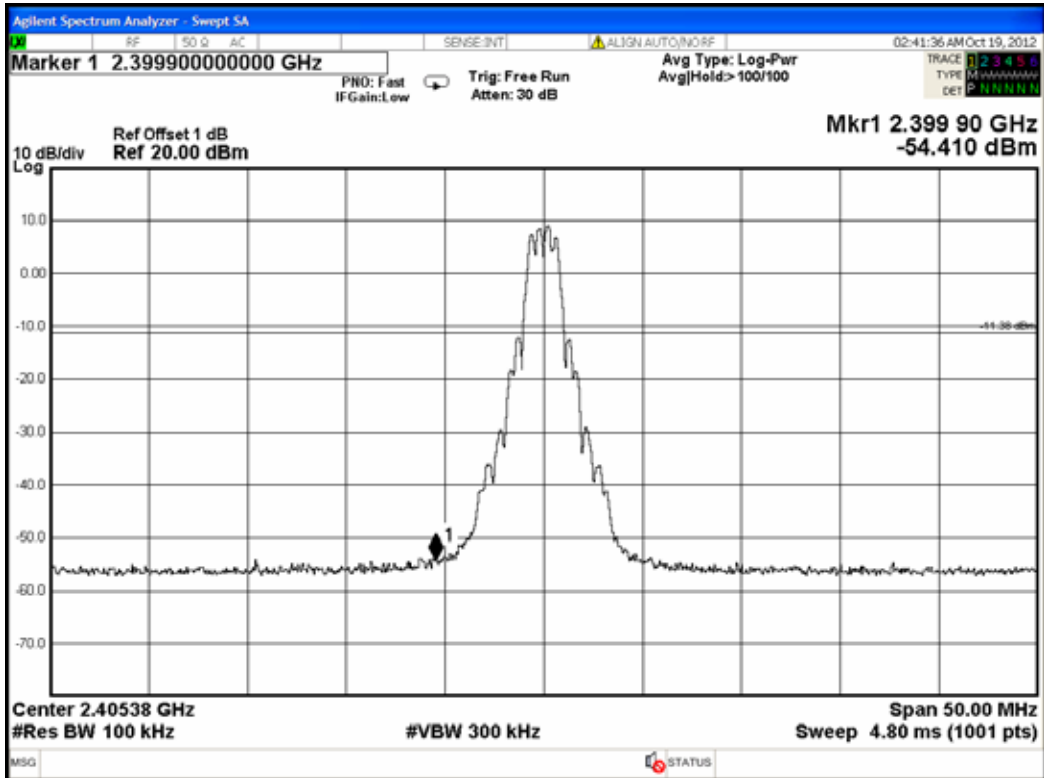
PASSED. All the test results are attached in next pages.

(Test Date: Oct. 19, 2012 Temperature : 21 Humidity : 55%)

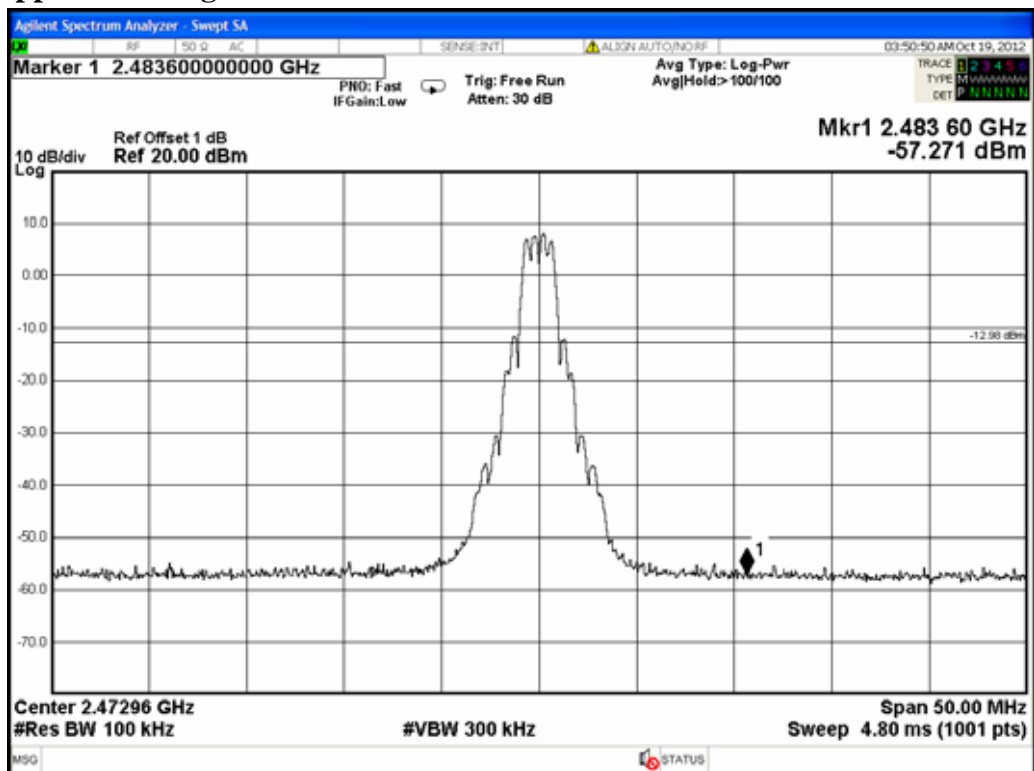
Below Band edge: The highest emission level is -54.410dBm on 2.39990GHz .

Upper Band edge : The highest emission level is -57.271dBm on 2.48360GHz .

Below Band edge



Upper Band edge



9. POWER SPECTRAL DENSITY MEASUREMENT

9.1. Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

9.2. Block Diagram of Test Setup

The same as section.4.2.

9.3. Specification Limits (§15.247(d))

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

9.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in 5.4 except the test set up replaced by section 9.2.

9.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and VBW RBW, set sweep time = Auto.

The measurement guideline was according to KDB 558074 D02.

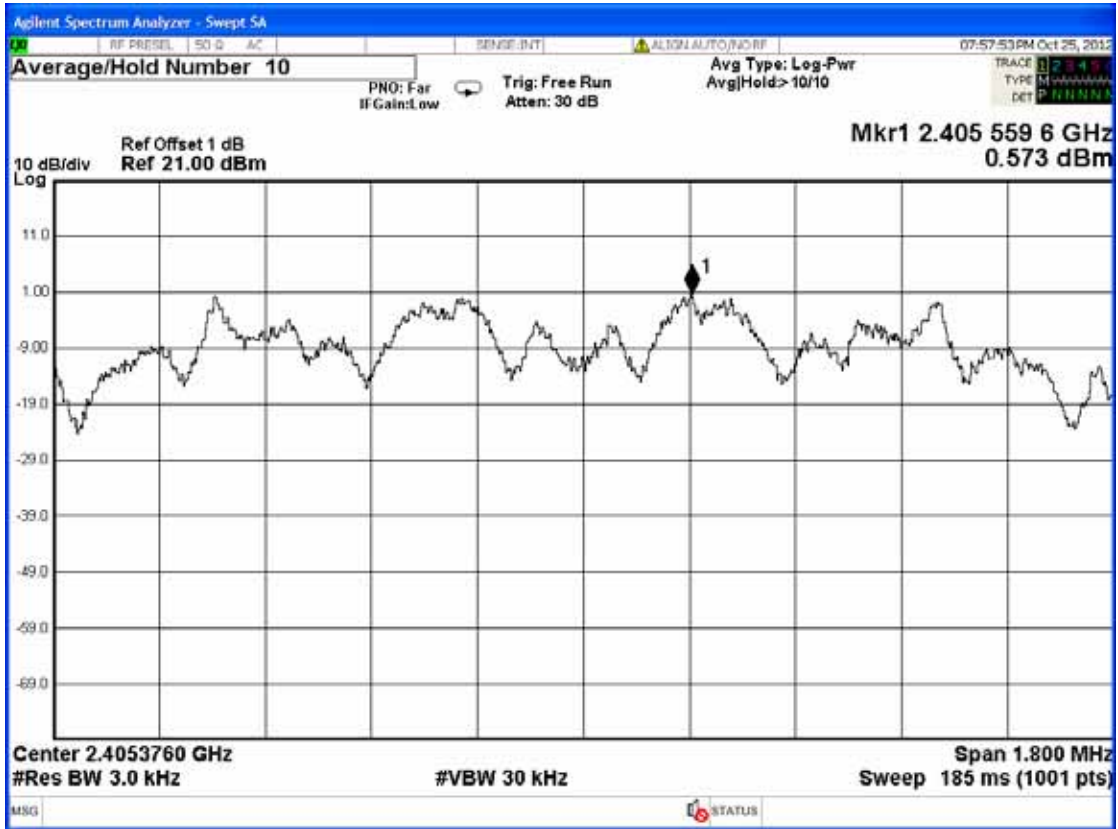
9.6. Test Results

PASSED. All the test results are attached in next pages.

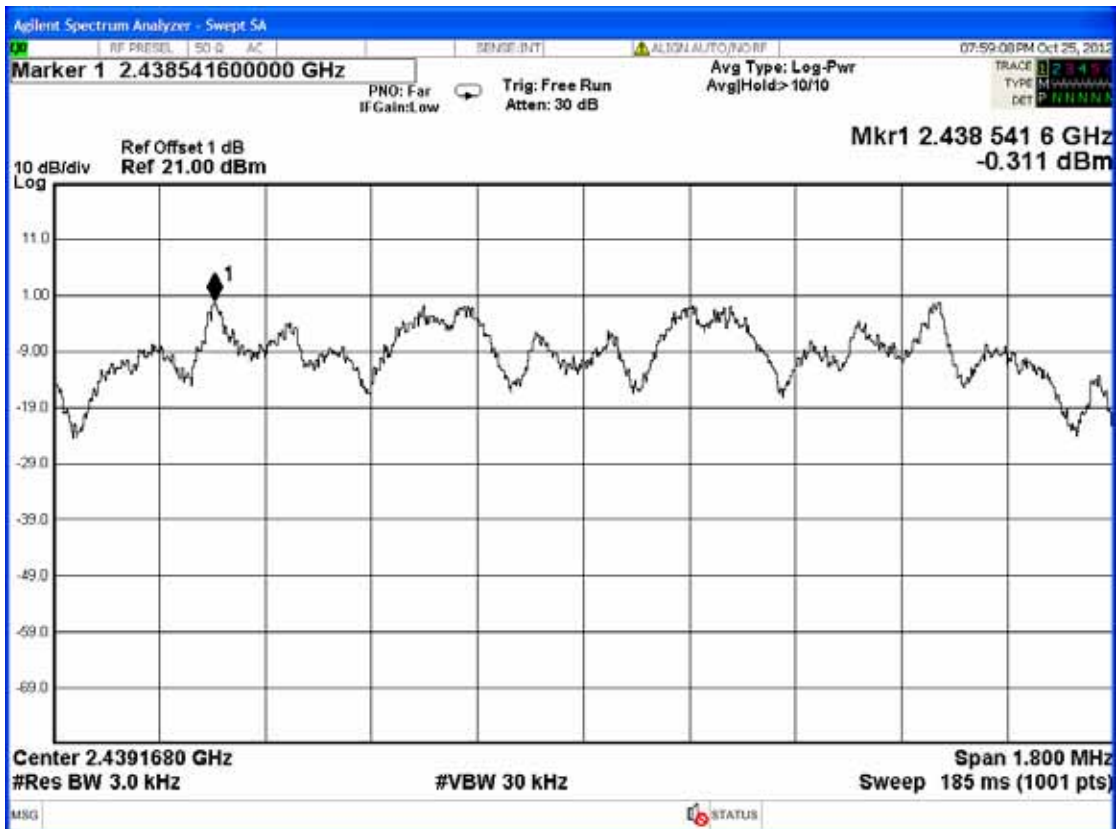
(Test Date: Oct. 25, 2012 Temperature : 20 Humidity : 56%)

No.	Channel	Test Frequency	Power Spectral Density	Limit
1.	CH 02	2405.376MHz	0.573dBm	8dBm
2.	CH 35	2439.168MHz	-0.311dBm	8dBm
3.	CH 68	2472.960MHz	-0.184dBm	8dBm

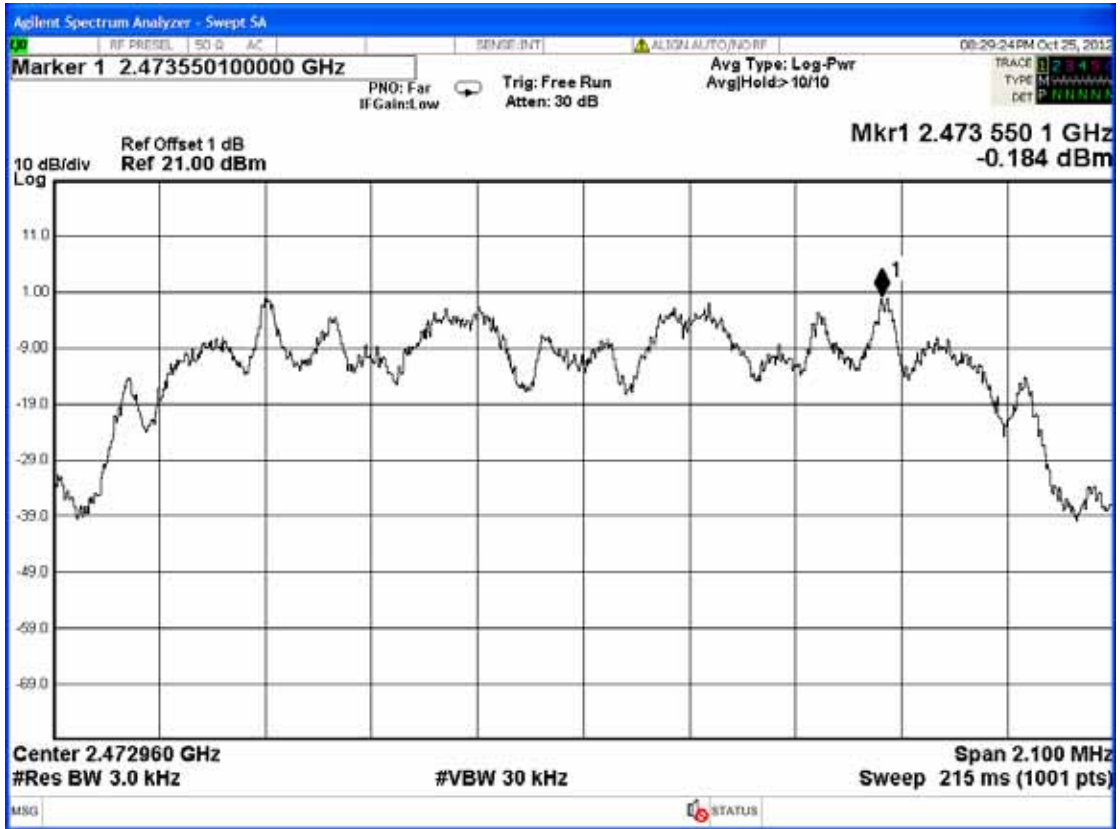
9.6.1. Channel 02, Frequency: 2405.376MHz



9.6.2. Channel 35, Frequency: 2439.168MHz



9.6.3. Channel 68, Frequency: 2472.960MHz



10.DEVIATION TO TEST SPECIFICATIONS

【NONE】

11. PHOTOGRAPHS

11.1. Photos of Radiated Measurement at Semi-Anechoic Chamber

11.1.1. Frequency Range 30MHz~1GHz



11.1.2. Frequency Range Above 1GHz



11.2. Photo of RF Conducted Measurement

