

APPLICATION FOR CERTIFICATION

On Behalf of
FUTABA Corporation
Radio Control
Model No. : FX-20
FCC ID : AZPFX-20-24G
Brand: Futaba

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

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File Number : C1M1211004
Report Number : EM-F1011003
Date of Test : Nov. 28 ~ Dec. 24, 2012
Date of Report : Dec. 26, 2012

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TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation
 Manufacturer : FUTABA Corporation
 EUT Description : Radio Control
 FCC ID : AZPFX-20-24G
 (A) Model No. : FX-20
 (B) Serial No. : N/A
 (C) Brand : Futaba
 (D) Power Supply : DC 7.2V
 (E) Test Voltage : DC 7.2V (Via Battery)

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 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 : Nov. 28 ~ Dec. 24 , 2012 Date of Report : Dec. 26, 2012

Producer : 
 (Julie Hsu/Administrator)

Signatory : 
 (Leon Liu/Deputy General Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	Radio Control
Model Number	:	FX-20
Serial Number	:	N/A
FCC ID	:	AZPFX-20-24G
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.
Modulation System	:	DSSS
Frequency Band	:	2405.376MHz ~ 2477.056MHz
Tested Frequency	:	2405.376MHz (Channel 02) 2440.240MHz (Channel 38) 2477.056MHz (Channel 72)
Frequency Channel	:	36 channels
Antenna	:	Antenna Gain: 1.5dBi
Ni-MH Battery	:	Futaba, M/N HT6F1700B 7.2VDC-1700mAh
Date of Receipt of Sample	:	Nov. 01, 2012
Date of Test	:	Nov. 28 ~ Dec. 24, 2012

1.2. 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 11, 2012 Renewal on Federal Communication Commission Registration Number: 90993
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724

1.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Radiation Test (Distance: 3m)	30MHz~300MHz	±2.91dB
	300MHz~1000MHz	±2.94dB
	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 DC 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)

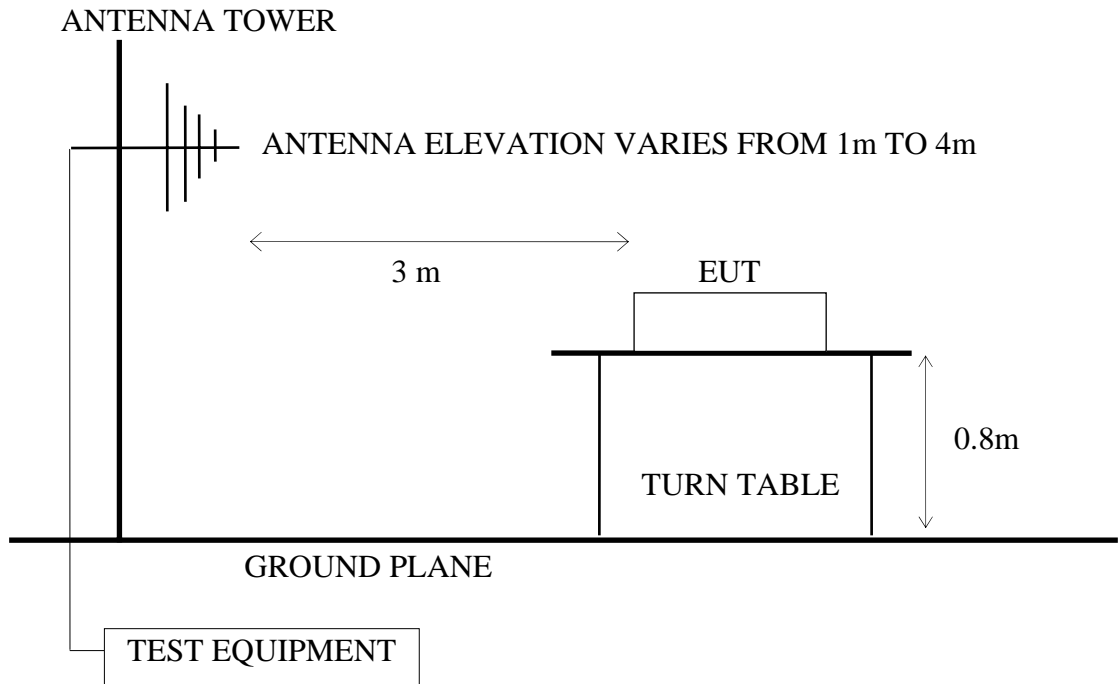
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Test Receiver	R & S	ESCS30	100339	Mar. 08, 12'	Mar. 07, 13'
3.	Amplifier	HP	8449B	3008A02678	Mar. 07, 12'	Mar. 06, 13'
4.	Horn Antenna	EMCO	3115	9609-4927	Jul. 05, 12'	Jul. 04, 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	Feb. 14, 12'	Feb. 12, 13'
7.	3.5GHz High Pass Filter	HP	84300-80038	005	Jan. 04, 12'	Jan. 03, 13'

3.2. Test Setup

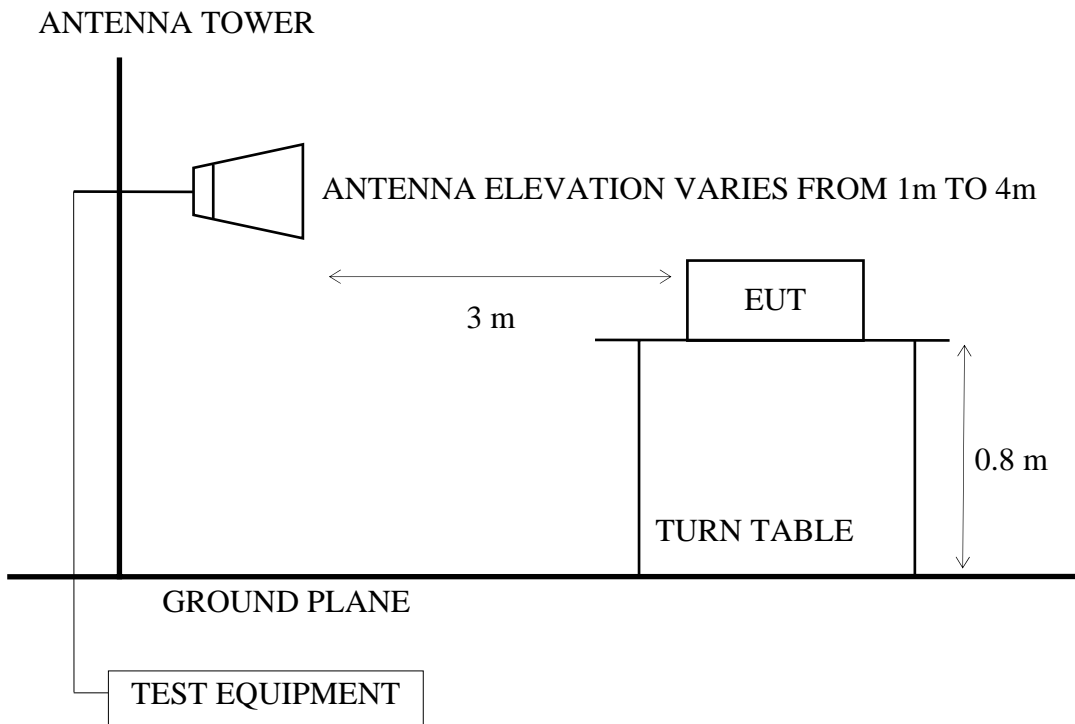
3.2.1. Block Diagram of connection between EUT and simulators

RADIO CONTROL (EUT)

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.
(Note: The PC system is not EUT's accessory, It's only test EUT on test.)
- 3.4.4. The EUT was set to continuously transmit signals at 2405.376MHz, 2442.240MHz and 2477.056MHz 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 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. 30MHz to 1000MHz was measured with Quasi-Peak detector. Pursuant to ANSI 4.2.2, peak detector is an alternate option for frequency from 30MHz to 1000MHz.

Above 1GHz was measured with peak and average detector. For frequency from 10GHz 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 : FX-20

Test Date : Dec. 24, 2012 Temperature : 24 Humidity : 62%

For Frequency Range 30MHz~1000MHz:

The EUT emitted the fundamental frequency with data code at the stand, side and lying conditions.

The EUT select **worst position "stand"** and 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	Position	Reference Test Data	
					Horizontal	Vertical
1.	02	2405.376MHz	Transmit	Stand	# 2	# 1
2.	38	2442.240MHz		Stand	# 1	# 2
3.	72	2477.056MHz		Stand	# 2	# 1

Note 1: * Above all final readings were measured with Quasi-Peak detector.

For Frequency above 1GHz:

The EUT select **worst position “stand ”** and 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	Position	Test Frequency Range
1.	02	2405.376MHz	Transmit	Stand	1000-2680MHz*
2.					2680-4000MHz*
3.					4000-5500MHz*
4.					5500-7500MHz
5.					7500-10000MHz
6.					10000-12000MHz
7.					12000-18000MHz
8.					18000-25000MHz
9.	38	2442.240MHz	Transmit	Stand	1000-2680MHz*
10.					2680-4000MHz*
11.					4000-5500MHz*
12.					5500-7500MHz
13.					7500-10000MHz
14.					10000-12000MHz
15.					12000-18000MHz
16.					18000-25000MHz
17.	72	2477.056MHz	Transmit	Stand	1000-2680MHz*
18.					2680-4000MHz*
19.					4000-5500MHz*
20.					5500-7500MHz
21.					7500-10000MHz
22.					10000-12000MHz
23.					12000-18000MHz
24.					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	# 3, # 4	#1, # 2
2.	72	2477.056MHz	Transmit	# 5, # 6	# 7, # 8

3.6.1. Frequency Range 30-1000MHz

Frequency: 2405.376MHz

Site no. : A/C Chamber site Data no. : 2
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	102.750	17.40	2.10	9.52	29.02	43.50	14.48	Peak
2	360.770	16.24	4.43	11.19	31.86	46.00	14.14	Peak
3	672.140	22.85	6.40	9.12	38.37	46.00	7.63	Peak
4	719.670	22.30	6.60	9.60	38.50	46.00	7.50	Peak
5	778.840	24.15	6.80	8.30	39.25	46.00	6.75	Peak
6	863.230	26.09	7.20	3.28	36.57	46.00	9.43	Peak

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 site Data no. : 1
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	56.190	14.11	1.60	16.23	31.95	40.00	8.05	Peak
2	385.990	17.41	4.70	14.21	36.32	46.00	9.68	Peak
3	576.110	21.05	6.40	10.50	37.95	46.00	8.05	Peak
4	672.140	22.85	6.40	9.92	39.17	46.00	6.83	Peak
5	863.230	26.09	7.20	5.11	38.40	46.00	7.60	Peak
6	957.320	26.33	7.60	4.77	38.70	46.00	7.30	Peak

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

Frequency: 2442.240MHz

Site no. : A/C Chamber site Data no. : 1
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2442.240 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	102.750	17.40	2.10	9.59	29.09	43.50	14.41	Peak
2	360.770	16.24	4.43	11.32	31.99	46.00	14.01	Peak
3	672.140	22.85	6.40	8.27	37.52	46.00	8.48	Peak
4	719.670	22.30	6.60	9.49	38.39	46.00	7.61	Peak
5	767.200	23.86	6.80	8.71	39.37	46.00	6.63	Peak
6	813.760	23.98	7.00	6.00	36.98	46.00	9.02	Peak

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 site Data no. : 2
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2442.240 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	61.040	12.55	1.60	10.60	24.75	40.00	15.25	Peak
2	385.990	17.41	4.70	14.75	36.86	46.00	9.14	Peak
3	576.110	21.05	6.40	10.24	37.69	46.00	8.31	Peak
4	672.140	22.85	6.40	10.10	39.35	46.00	6.65	Peak
5	813.760	23.98	7.00	7.81	38.79	46.00	7.21	Peak
6	957.320	26.33	7.60	3.36	37.29	46.00	8.71	Peak

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

Frequency: 2477.056MHz

Site no. : A/C Chamber site Data no. : 2
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	102.750	17.40	2.10	9.62	29.12	43.50	14.38	Peak
2	360.770	16.24	4.43	11.55	32.22	46.00	13.78	Peak
3	385.990	17.41	4.70	10.17	32.28	46.00	13.72	Peak
4	672.140	22.85	6.40	8.41	37.66	46.00	8.34	Peak
5	719.670	22.30	6.60	8.94	37.84	46.00	8.16	Peak
6	778.840	24.15	6.80	8.77	39.72	46.00	6.28	Peak

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 site Data no. : 1
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

	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	8.95	27.67	40.00	12.33	Peak
2	385.990	17.41	4.70	14.91	37.02	46.00	8.98	Peak
3	576.110	21.05	6.40	10.34	37.79	46.00	8.21	Peak
4	672.140	22.85	6.40	9.96	39.21	46.00	6.79	Peak
5	813.760	23.98	7.00	7.42	38.40	46.00	7.60	Peak
6	957.320	26.33	7.60	3.43	37.36	46.00	8.64	Peak

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

3.6.2. Above 1GHz Frequency Range Measurement Results

Date of Test : Dec. 24, 2012 Temperature : 24

EUT : Radio Control Humidity : 62%

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	25.93	58.18	74.00	15.82
3206.680	30.77	7.36	21.33	59.46	74.00	14.54
4813.000	33.06	9.14	16.63	58.83	74.00	15.17

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.

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	20.31	52.56	54.00	1.44
3206.680	30.77	7.36	13.47	51.60	54.00	2.40
4811.500	33.06	9.14	10.25	52.45	54.00	1.55

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 Average values.

Date of Test : Dec. 24, 2012 Temperature : 24

EUT : Radio Control Humidity : 62%

Test Mode : Transmitting Mode, Frequency: 2405.376MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1603.120	26.08	6.18	27.73	59.98	74.00	14.02
3210.640	30.77	7.36	22.81	60.94	74.00	13.06
4813.000	33.06	9.14	16.97	59.17	74.00	14.83

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.

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1603.120	26.08	6.18	20.07	52.32	54.00	1.68
3211.960	30.77	7.37	14.51	52.65	54.00	1.35
4819.000	33.09	9.14	11.32	53.55	54.00	0.45

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 Average values.

Date of Test : Dec. 24, 2012 Temperature : 24
 EUT : Radio Control Humidity : 62%
 Test Mode : Transmitting Mode, Frequency: 2442.240MHz

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	18.38	50.95	74.00	23.05
3259.480	30.87	7.40	20.48	58.74	74.00	15.26
4070.500	32.58	8.53	9.75	50.87	74.00	23.13
4888.000	33.21	9.16	15.17	57.55	74.00	16.45

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.

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1630.000	26.21	6.36	14.89	47.46	54.00	6.54
3259.480	30.87	7.40	13.17	51.43	54.00	2.57
4888.000	33.21	9.16	8.73	51.11	54.00	2.89

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 Average values.

Date of Test : Dec. 24, 2012 Temperature : 24
 EUT : Radio Control Humidity : 62%
 Test Mode : Transmitting Mode, Frequency: 2442.240MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1628.320	26.21	6.36	21.98	54.55	74.00	19.45
3256.840	30.87	7.40	21.44	59.71	74.00	14.29
4066.000	32.59	8.54	12.91	54.03	74.00	19.97
4888.000	33.21	9.16	15.89	58.27	74.00	15.73

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.

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1628.320	26.21	6.36	18.28	50.85	54.00	3.15
3256.840	30.87	7.40	13.94	52.20	54.00	1.80
4066.000	32.59	8.54	9.91	51.03	54.00	2.97
4888.000	33.21	9.16	9.89	52.27	54.00	1.73

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 Average values.

Date of Test : Dec. 24, 2012 Temperature : 24
 EUT : Radio Control Humidity : 62%
 Test Mode : Transmitting Mode, Frequency: 2477.056MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1653.520	26.27	6.52	20.54	53.33	74.00	20.67
3305.680	30.96	7.47	14.88	53.31	74.00	20.69
4130.500	32.57	8.54	10.19	51.31	74.00	22.69
4958.500	33.34	9.10	10.99	53.43	74.00	20.57

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.

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1653.520	26.27	6.52	16.69	49.49	54.00	4.51
3305.680	30.96	7.47	9.11	47.54	54.00	6.46
4130.500	32.57	8.54	9.60	50.72	54.00	3.28
4958.500	33.34	9.10	9.16	51.60	54.00	2.40

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 Average values.

Date of Test : Dec. 24, 2012 Temperature : 24

EUT : Radio Control Humidity : 62%

Test Mode : Transmitting Mode, Frequency: 2477.056MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1653.520	26.27	6.52	21.72	54.51	74.00	19.49
2709.040	29.44	6.80	10.55	46.79	74.00	27.21
3305.680	30.96	7.47	18.45	56.88	74.00	17.12
4130.500	32.57	8.54	10.47	51.59	74.00	22.41
4955.500	33.34	9.10	12.29	54.73	74.00	19.27

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.

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1653.520	26.27	6.52	17.39	50.18	54.00	3.82
2713.000	29.44	6.80	8.47	44.71	54.00	9.29
3305.680	30.96	7.47	11.18	49.61	54.00	4.39
4130.500	32.57	8.54	9.28	50.40	54.00	3.60
4955.500	33.34	9.10	9.36	51.80	54.00	2.20

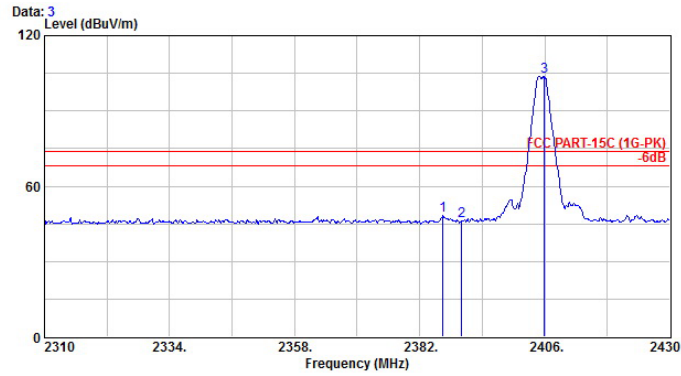
Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Average values.

3.6.3. Restricted Bands Measurement Results

Date of Test : Dec. 24, 2012 Temperature : 24°C

EUT : Radio Control Humidity : 62%

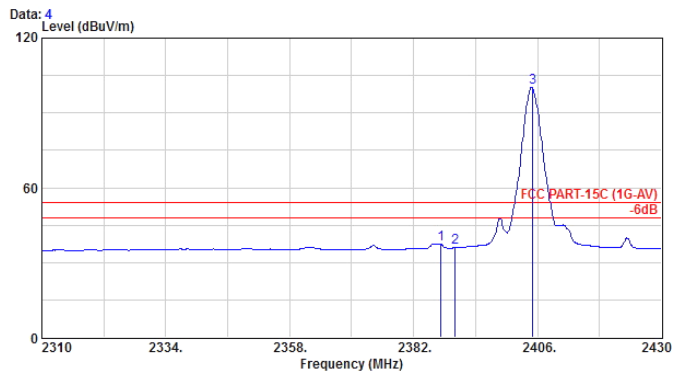
Test Mode : Transmit, Channel: 02 Frequency: 2405.376MHz



Site no. : A/C Chamber site Data no. : 3
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1 2386.440	28.47	6.33	13.55	48.35	74.00	25.65	Peak
2 2390.040	28.47	6.34	11.35	46.17	74.00	27.83	Peak
3 2405.880	28.51	6.36	68.97	103.84	74.00	-29.84	Peak

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

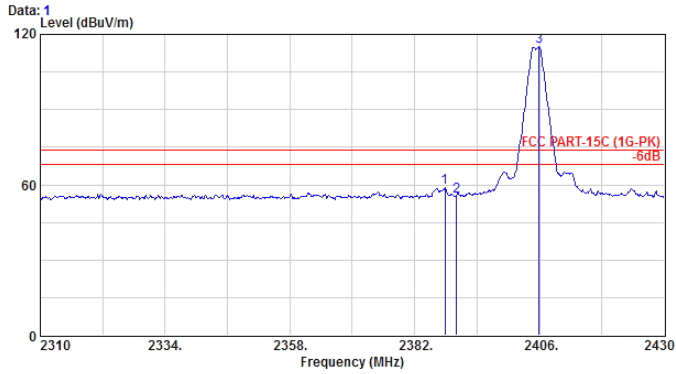


Site no. : A/C Chamber site Data no. : 4
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1 2387.280	28.47	6.33	2.68	37.49	54.00	16.51	Average
2 2390.040	28.47	6.34	1.03	35.85	54.00	18.15	Average
3 2405.040	28.51	6.36	65.41	100.28	54.00	-46.28	Average

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

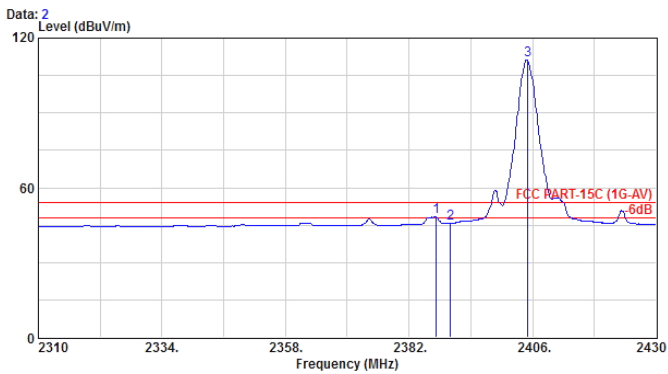
Date of Test : Dec. 24, 2012 Temperature : 24°C
 EUT : Radio Control Humidity : 62%
 Test Mode : Transmit, Channel: 02, Frequency: 2405.376MHz



Site no. : A/C Chamber site Data no. : 1
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2387.880	28.47	6.34	24.19	59.00	74.00	15.00	Peak
2	2390.040	28.47	6.34	20.73	55.55	74.00	18.45	Peak
3	2405.880	28.51	6.36	80.17	115.04	74.00	-41.04	Peak

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 site Data no. : 2
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2405.376 MHz

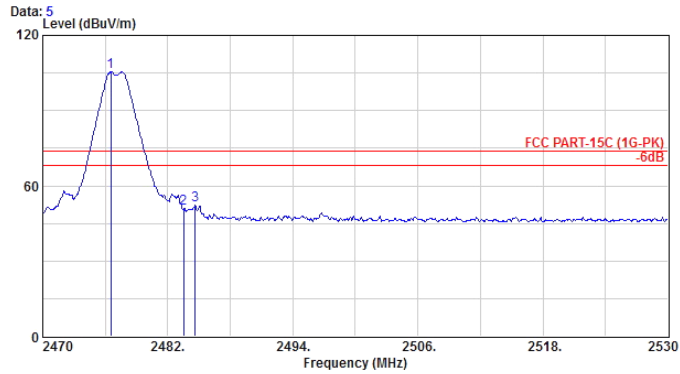
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2387.280	28.47	6.33	13.45	48.26	54.00	5.74	Average
2	2390.040	28.47	6.34	10.99	45.81	54.00	8.19	Average
3	2405.040	28.51	6.36	76.38	111.25	54.00	-57.25	Average

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 : Dec. 24, 2012 Temperature : 24°C

EUT : Radio Control Humidity : 62%

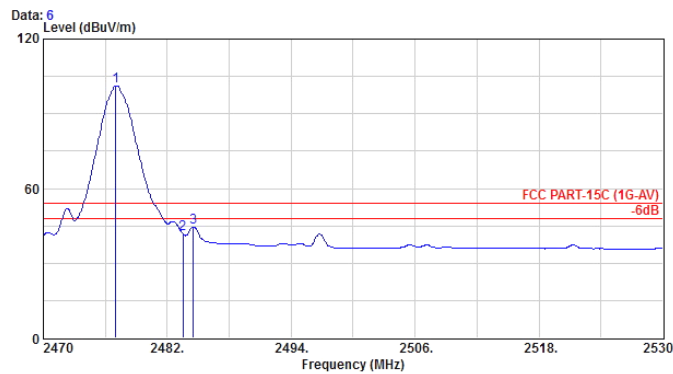
Test Mode : Transmit, Channel: 72, Frequency: 2477.056MHz



Site no. : A/C Chamber site Data no. : 5
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBUV)	Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Remark
1	28.66	6.44	70.39	105.49	74.00	-31.49	Peak
2	28.66	6.45	15.66	50.77	74.00	23.23	Peak
3	28.66	6.45	17.33	52.44	74.00	21.56	Peak

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

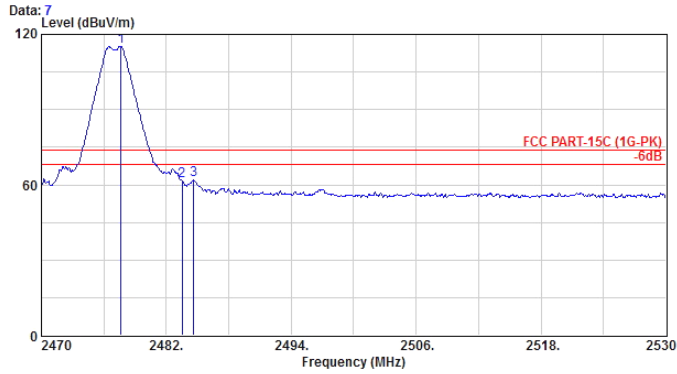


Site no. : A/C Chamber site Data no. : 6
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBUV)	Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Remark
1	28.66	6.44	66.20	101.30	54.00	-47.30	Average
2	28.66	6.45	6.73	41.84	54.00	12.16	Average
3	28.66	6.45	9.43	44.54	54.00	9.46	Average

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

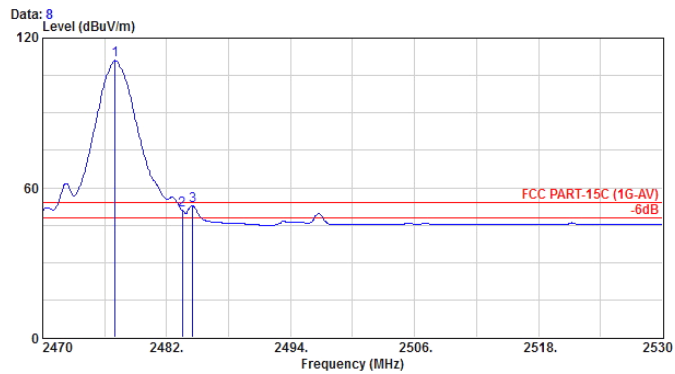
Date of Test : Dec. 24, 2012 Temperature : 26°C
 EUT : Radio Control Humidity : 61%
 Test Mode : Transmit, Channel: 72, Frequency: 2477.056MHz



Site no. : A/C Chamber site Data no. : 7
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1 2477.620	28.66	6.44	79.95	115.06	74.00	-41.06	Peak
2 2483.500	28.66	6.45	26.58	61.69	74.00	12.31	Peak
3 2484.640	28.66	6.45	26.82	61.93	74.00	12.07	Peak

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 site Data no. : 8
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : E4446A 24°C/62% Vic Fong
 EUT : FX-20
 Power Rating : DC 7.2V
 Test Mode : TX2477.056 MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1 2477.020	28.66	6.44	75.91	111.01	54.00	-57.01	Average
2 2483.500	28.66	6.45	15.87	50.98	54.00	3.02	Average
3 2484.520	28.66	6.45	17.60	52.71	54.00	1.29	Average

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

4. 6dB BANDWIDTH MEASUREMENT

4.1. 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'

4.2. Block Diagram of Test Setup

The same as section.4.2.

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

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

4.4. Operating Condition of EUT

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

4.4.2. To turn on the power of all equipment.

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

4.5. 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.

4.6. Test Results

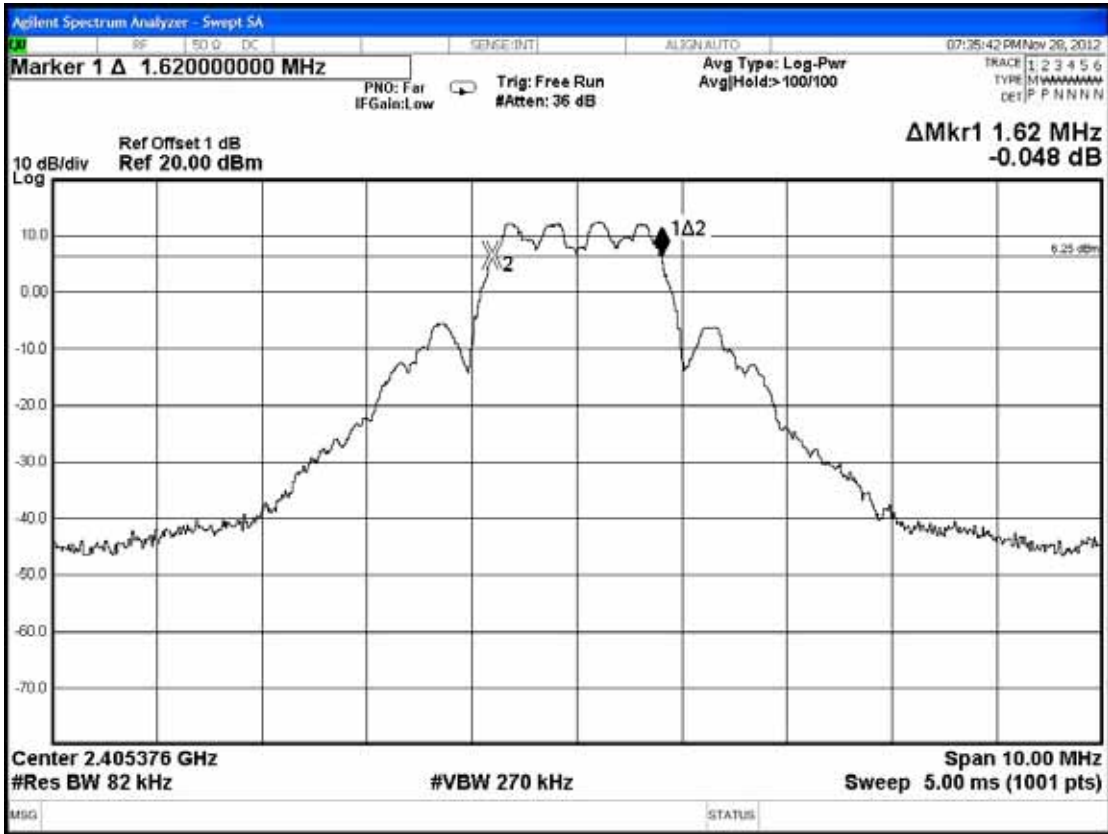
PASSED. All the test results are attached in next pages.

(Test Date: Nov. 28, 2012 Temperature : 23 Humidity : 60%)

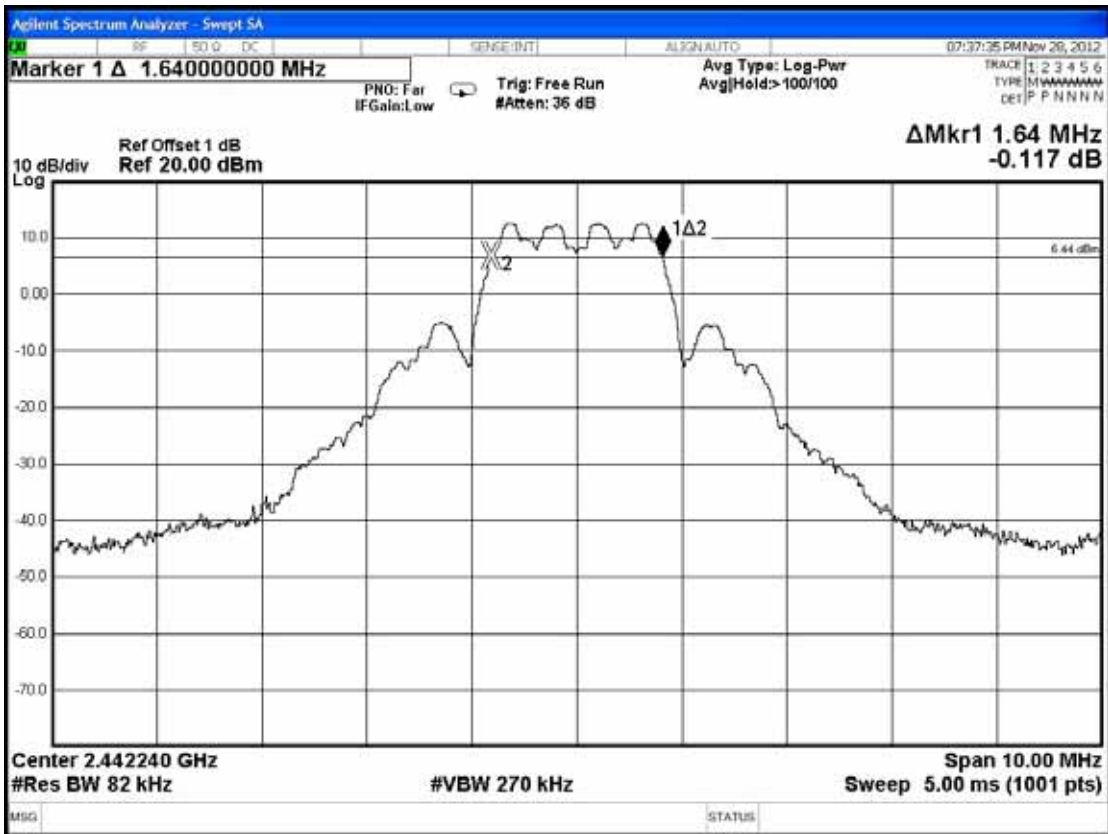
Mode	Channel	Frequency	6dB Bandwidth
1.	CH 02	2405.376MHz	1.62MHz
2.	CH 38	2442.240MHz	1.64MHz
3.	CH 72	2477.056MHz	1.63MHz

[Limit: least 270kHz]

4.6.1. Channel 02, Frequency: 2405.376MHz



4.6.2. Channel 38, Frequency: 2442.240MHz



4.6.3. Channel 72, Frequency: 2477.056MHz



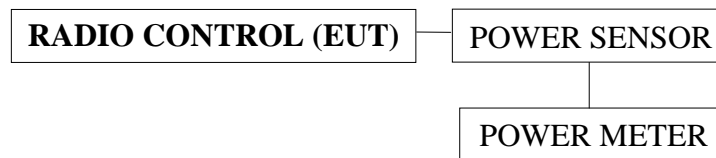
5. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

5.1. 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	ML2487A	6K00005406	Feb. 13, 12'	Feb. 12, 13'
2.	Power Sensor	Anritsu	MA2491A	030873	Feb. 13, 12'	Feb. 12, 13'

5.2. Block Diagram of Test Setup



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

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

5.4. 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.

5.5. 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.

5.6. Test Results

PASSED. All the test results are listed below.

(Test Date: Dec. 04, 2012 Temperature : 23 Humidity : 60%)

No.	Channel	Test Frequency	Peak Output Power	Limit
1.	CH 02	2405.376MHz	15.51dBm	30dBm
2.	CH 36	2442.240MHz	15.88dBm	30dBm
3.	CH 72	2477.056MHz	16.01dBm	30dBm

6. EMISSION LIMITATIONS MEASUREMENT

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

7. BAND EDGES MEASUREMENT

7.1. 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'

7.2. Block Diagram of Test Setup

The same as section.4.2.

7.3. Specification Limits (§15.247(c))

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

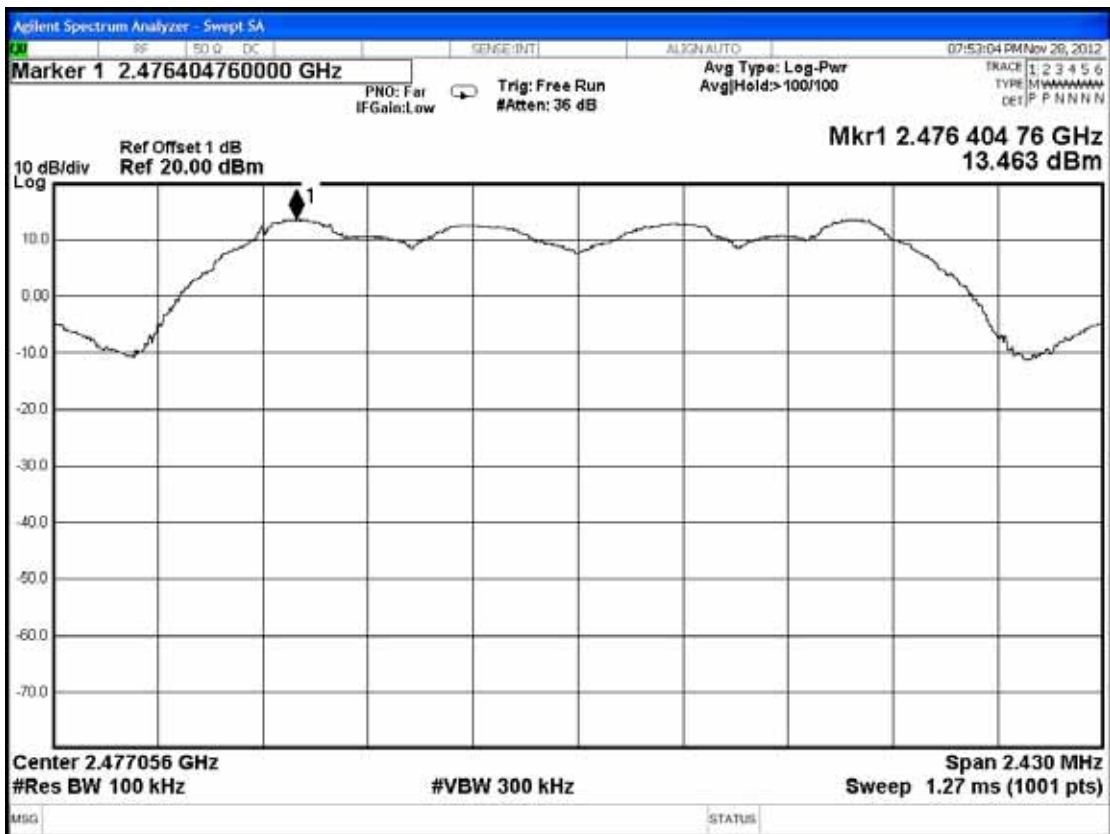
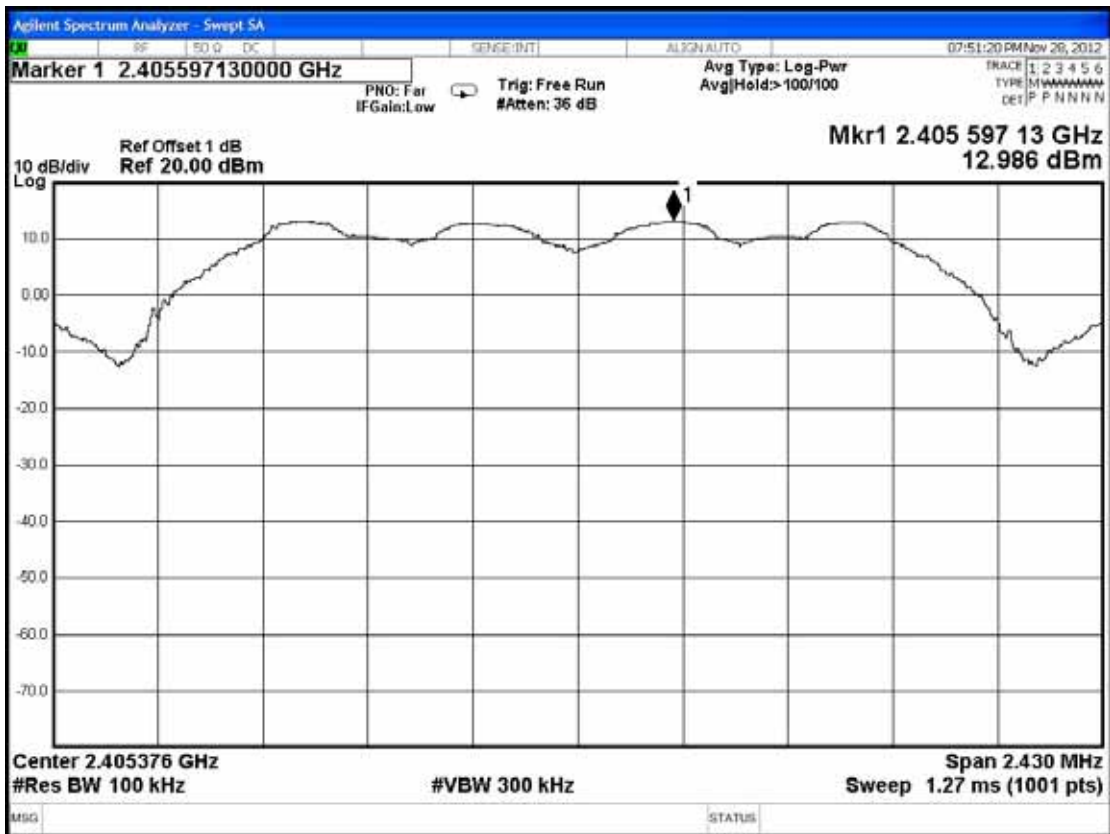
7.4. Operating Condition of EUT

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

7.5. Test Procedure

- 7.5.1. 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.
- 7.5.2. 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

7.6. Reference Level



7.7. Test Results

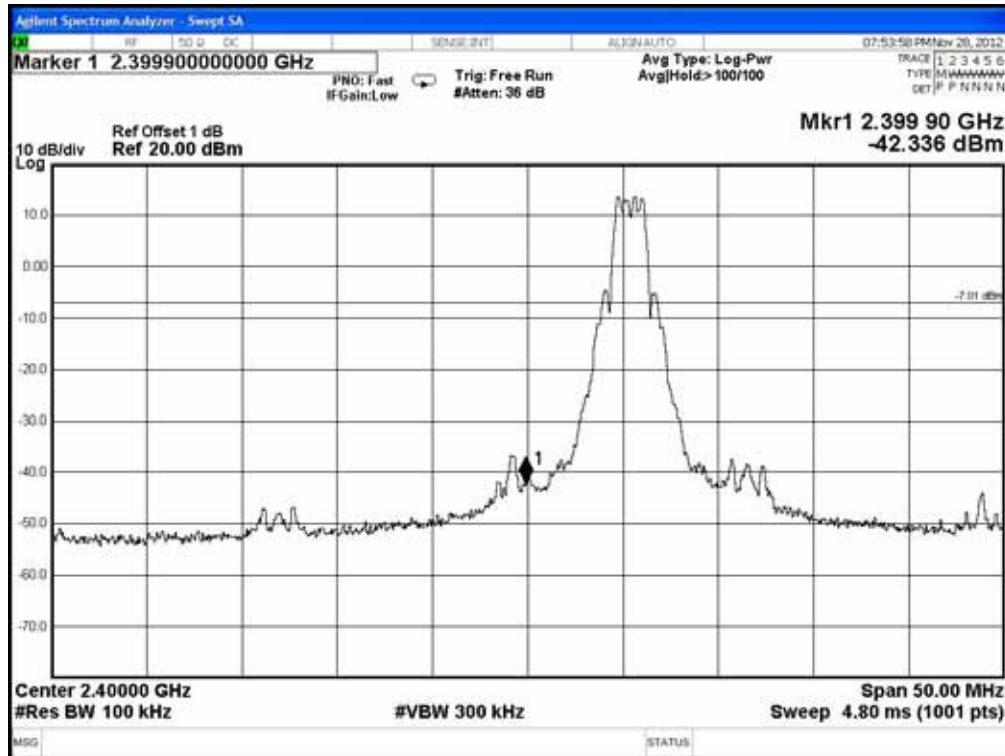
PASSED. All the test results are attached in next pages.

(Test Date: Nov. 28, 2012 Temperature : 23 Humidity : 60%)

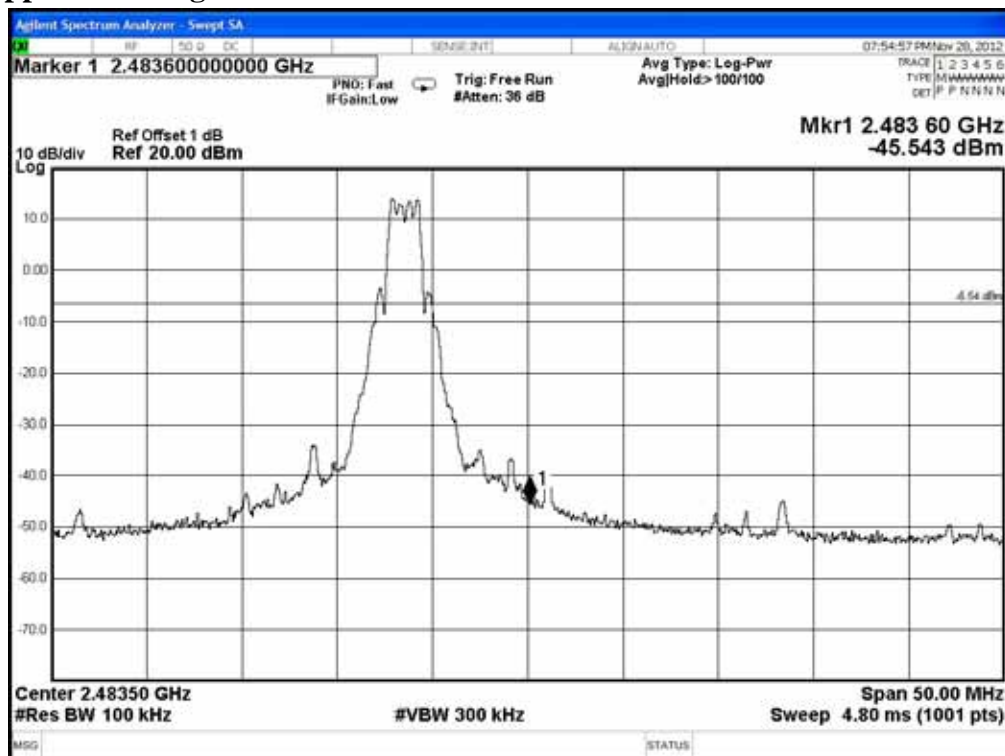
Below Band edge: The highest emission level is -42.336dBm on 2.39990GHz .

Upper Band edge: The highest emission level is -45.543dBm on 2.48360GHz .

Below Band edge



Upper Band edge



8. POWER SPECTRAL DENSITY MEASUREMENT

8.1. 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'

8.2. Block Diagram of Test Setup

The same as section.4.2.

8.3. 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.

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 9.2.

8.5. 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.

8.6. Test Results

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

(Test Date: Nov. 28, 2012 Temperature : 23 Humidity : 60%)

No.	Channel	Test Frequency	Power Spectral Density	Limit
1.	CH 02	2405.376MHz	3.642dBm	8dBm
2.	CH 38	2442.240MHz	3.855dBm	8dBm
3.	CH 72	2477.056MHz	5.672dBm	8dBm

8.6.1. Channel 02, Frequency: 2405.376MHz



8.6.2. Channel 38, Frequency: 2442.240MHz



8.6.3. Channel 72, Frequency: 2477.056MHz



9. DEVIATION TO TEST SPECIFICATIONS

【NONE】