### APPLICATION FOR CERTIFICATION

On Behalf of

**Futaba Corporation** 

Radio Control

Model No.: (1)TM7-2.4G (2)TM8-2.4G

FCC ID: AZPTM78-24G

Brand: Futaba

Prepared for: Futaba Corporation

1080 Yabutsuka Chosei-son Chosei-gun

Chiba, 299-4395 Japan.

Prepared by: Audix Technology Corporation

**EMC** Department

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File Number : EM960801A Report Number : EM-F960319 Date of Test : Jul. 04, 2007 Date of Report : Jul. 10, 2007

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# TEST REPORT CERTIFICATION

Applicant : Futaba Corporation

Manufacturer : Futaba Corporation

EUT Description : Radio Control FCC ID : AZPTM78-24G

(A) MODEL NO. : (1)TM7-2.4G (2)TM8-2.4G

(B) SERIAL NO. : N/A

(C) BRAND : Futaba (D) POWER SUPPLY : DC 9.6V

(E) TEST VOLTAGE : DC 9.6V (DC Power Supply)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, OCTOBER 2006 AND ANSI C63.4/2003

(FCC CFR 47 Part 15C, §15.205, §15.207, §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:	Jul. 04, 2007
Prepared by:	Monica Chang Jul. 11. 200) (Monica Chang/Administrator)
Test Engineer:	(Henning Chang/Supervisor)
Approved & Aut	thorized Signer: Deng Jul. 11. 3007 for (Leon Liu/Vice President)
Prepared by:	Monica Chang Jul. 11. 2007  (Monica Chang/Administrator)  (Monica Chang Jul. 11. 2007  (Henning Chang Jul. 11. 2007)

# 1. GENERAL INFORMATION

# 1.1. Description of Device (EUT)

Description : Radio Control (Transmitter Unit)

Model Number : (1)TM7-2.4G (2)TM8-2.4G

The different models are only for different

internal software.

Serial Number : N/A

Brand : Futaba

FCC ID : AZPTM78-24G

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

Frequency Band : 2405.376MHz ~ 2479.104MHz

Tested Frequency : 2405.376MHz (Channel 02)

2442.240MHz (Channel 38) 2479.104MHz (Channel 74)

Frequency Channel : 36 channels

Antenna (Pencil Antenna ) : Antenna Gain: 1.64dBi

Receiver : Futaba, M/N R607FS

FCC by DoC

(Report Number: EM-F960231)

Date of Receipt of Sample : Jun. 11, 2007

Date of Test : Jul. 04, 2007

# 1.2. Tested Supporting System Details

1.2.1. COMPUTERIZED AIRPLANE SYSTEM (The EUT is installed on this

device.)

Model Number : T9CAP
Serial Number : N/A
Manufacturer : FUTABA

1.2.2. PC SYSTEM

Model Number : VECTRA XE320 Serial Number : SG21101966 FCC ID : By DoC BSMI ID : 3912A318

Brand : HP

Manufacturer : First International Computer
Power Cord : Non-Shielded, Detachable, 1.8m

1.2.3. 15" LCD MONITOR

Model Number : D5063M Serial Number : CN206A6034 FCC ID : ARSLM562H

BSMI ID : R33037

Manufacturer : Top Victory Electronics (Fujian) Co., Ltd.

D-Sub Cable : Shielded, Detachable, 1.8m

Bonded two ferrite cores
Delta, M/N ADP-40TB

AC Adapter Delta, M/N ADP-40TB

BSMI ID 3892D142

Cord: Shielded, Undetachable, 1.8m

Bonded a ferrite core

Power Cord : Non-Shielded, Detachable, 1.8m

1.2.4. KEYBOARD

Model Number : SDM4700P

Serial Number : B69360HLPPD0R6

FCC ID : By DoC BSMI ID : R33018

Manufacturer : SAMSUNG (Brand: HP)

Data Cable : Non-Shielded, Undetachable, 1.8m

1.2.5. MOUSE

Model Number : M-S69

Serial Number : F6AB70S5BOY1NWZ

FCC ID : JNZ211443 BSMI ID : R41126

Manufacturer : Logitech (Brand: HP)

Data Cable : Non-Shielded, Undetachable, 1.8m

### 1.2.6. DC POWER SUPPLY (To Conversion Board)

Model Number : 3303A Serial Number : 721773 Manufacturer : TOP WARD

DC Power Cable : Non-Shielded, Detachable, 1.2m AC Power Cord : Non-Shielded, Detachable, 1.8m

### 1.2.7. CONVERSION BOARD (RS-232 Level Conversion Circuit)

Part Number : 050200006 Serial Number : N/A

Serial Number : N/A
Manufacturer : FUTABA

RS-232 Cable : Shielded, Detachable, 1.5m (To PC System)
Data Cable : Non-Shielded, Detachable, 0.25m (To EUT)

# 1.3. Description of Test Facility

Name of Firm : Audix Technology Corporation

**EMC Department** 

No. 53-11, Tin-Fu Tsun, Lin-Kou,

Taipei, Taiwan

Test Location & Facility : Semi-Anechoic Chamber

(AC)

No. 53-11, Tin-Fu Tsun, Lin-Kou,

Taipei, Taiwan.

May 15, 2006 File on

Federal Communication Commission

Registration Number: 90993

NVLAP Lab. Code : 200077-0

(NVLAP is a NATA accredited body under Mutual Recognition Agreement)

# 1.4. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB), (V/m)
	30MHz~300MHz	± 2.91dB
Radiation Test	300MHz~1000MHz	± 2.94dB
(Distance: 3m)	Above 1GHz	± 5.02dB

Remark : Uncertainty =  $ku_c(y)$ 

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

# 2. CONDUCTED EMISSION MEASUREMET

【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)

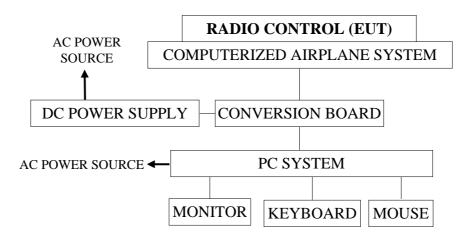
Item	Type	Manufacturer	Model No. Serial No.		Last Cal.	Next Cal.
1.	Spectrum Analyzer	HP	8593EM	3826A00272	Aug. 23, 06'	Aug. 22, 07'
2.	Test Receiver	R & S	ESCS30	100265	Sep. 19, 06'	Sep. 18, 07'
3.	Pre-Amplifier	HP	8447D	2944A06305	Mar. 03, 07'	Mar. 02, 08'
4.	Biconical Antenna	CHASE	VBA6106A	1264	Apr. 11, 07'	Apr. 10, 08'
	Log Periodic	Schwarzbeck	UHALP91	0139	Apr. 11, 07'	Apr. 10, 08'
	Antenna	Schwarzucck	08-A	0137	Apr. 11, 07	Apr. 10, 00

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	HP	8593EM	3826A00272	Aug. 23, 06'	Aug. 22, 07'
2.	Pre-Amplifier	HP	8449B	3008A01284	Jun. 22, 07'	Jun. 21, 08'
3.	Spectrum Analyzer	HP	8564EC	3946A00249	Nov. 11, 06'	Nov. 10, 07'
1 4	2.4GHz Notch Filter	EWT	EWT-14-0 070	G2	Dec. 08, 06'	Dec. 07, 07'
5.	Horn Antenna	EMCO	3115	9112-3775	May 23, 07'	May 22, 08'
6.	Horn Antenna	EMCO	3116	2653	Oct. 04, 06'	Oct. 03, 07'

# 3.2. Test Setup

### 3.2.1. Block Diagram of connection between EUT and simulators

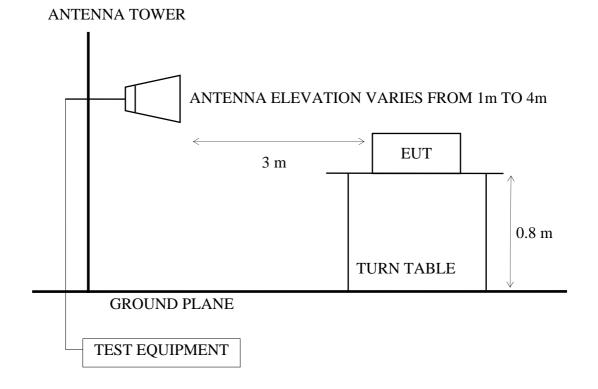


# 3.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz

# ANTENNA TOWER ANTENNA ELEVATION VARIES FROM 1m TO 4m 3 METERS EUT 0.8m

### **GROUND PLANE**

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



# 3.3. Radiated Emission Limits (§15.209)

FREQUENCY	DISTANCE	FIELD STREN	GTHS LIMITS
MHz	Meters	μV/m	dBµV/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 dBµV/m (Peak)	
		54.0 dBµV/m (Average)	

Remark: (1) Emission level ( $dB\mu V/m$ ) = 20 log Emission level ( $\mu V/m$ )

- (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. Setup the EUT and simulator as shown on 3.2.
- 3.4.2. Turned on the power of all equipment.
- 3.4.3. Set the PC system using test program "FutabaTerm".
- 3.4.4. The EUT was set to continuously transmit signals at frequency 2405.376MHz (stand), 2442.240MHz (stand) and 2479.104MHz (stand) during testing.
- 3.4.5. The EUT was set to continuously transmit signals at 2405.376MHz, 2442.240MHz and 2479.104MHz (stand, side, lying) during testing. (For frequency 2479.104MHz, the pre-testing of EUT with three attitudes (stand, side, lying) has been performed to find the worst case for the final test. The test data in this report documents the worst case stand.)

## 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 moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna 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 10<sup>th</sup> harmonics from fundamental frequency) was checked.

### 3.6. Test Results

### PASSED.

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

EUT: Radio Control M/N: TM7-2.4G

Test Date: Jul. 04, 2007 Temperature: 27 Humidity: 58%

### For Frequency Range 30MHz~1000MHz:

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

Mode	Channel	Emaguanay	Test Mode	Attitude	Reference Test Data #	
Mode		Frequency	Test Mode	Attitude	Horizontal	Vertical
1.	02	2405.376MHz	Transmitting	Stand	# 10	# 9
2.	38	2442.240MHz	Transmitting	Stand	# 9	# 10
3.	74	2479.104MHz	Transmitting	Stand	# 10	# 9
4.	38	2442.240MHz	Receiving	Stand	# 9	# 10

<sup>\*</sup> Above all final readings were measured with Quasi-Peak detector.

### For Frequency above 1GHz:

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

Mode	Channel	Frequency	Test Mode	Attitude
1.	02	2405.376MHz	Transmitting	Stand
2.	38	2442.240MHz	Transmitting	Stand
3.	74	2479.104MHz	Transmitting	Stand
4.	38	2442.240MHz	Receiving	Stand

<sup>\*</sup> Above all final readings were measured with Peak detector and Average detector.

<sup>\*</sup> For frequency 2479.104MHz, the pre-testing of EUT with three attitudes (stand, side, lying) has been performed to find the worst case for the final test. The test data in this report documents the worst case – stand.

<sup>\*</sup> For frequency 2479.104MHz, the pre-testing of EUT with three attitudes (stand, side, lying) has been performed to find the worst case for the final test. The test data in this report documents the worst case – stand.

### **For Restricted Bands:**

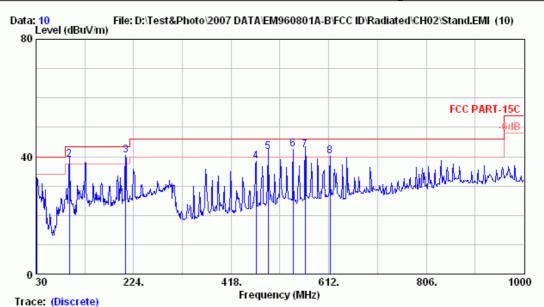
The EUT was tested in restricted bands and all the test results are listed in section 3.6.3. (The restricted bands defined in part 15.205(a))

Mode	Channel	Frequency	Test Mode
1.	02	2405.376MHz	Transmitting
2.	74	2479.104MHz	Transmitting

# 3.6.1. Frequency Range 30-1000MHz



AUDIX TECHNOLOGY Corp. EMC Laboratory No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei County, Taiwan R.O.C. Post Code:24443 Tel:+886-2-26092133 Fax:+886-2-26099303 Email:ttemc@ttemc.



Site no. : A/C Chamber
Dis. / Ant. : 3m VBA6106A/UHALP9108A Data no. : 10 Ant. pol. : HORIZONTAL

: FCC PART-15C Limit

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

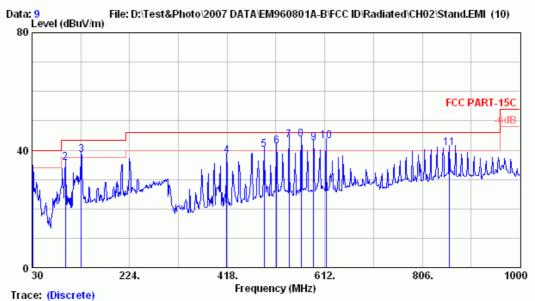
: Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH02)

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emission Level (dBµV/m)	Limits	Margin Remark (dB)
1	30.970	24.81	1.10	6.80	32.71	40.00	7.29
2	95.960	16.62	2.00	20.30	38.91	43.50	4.59
3	208.480	21.85	3.12	15.48	40.44	43.50	3.06
4	467.470	18.21	5.80	14.27	38.28	46.00	7.72
5	491.720	18.61	6.33	16.70	41.64	46.00	4.36
6	541.190	19.25	7.01	16.37	42.63	46.00	3.37
7	565.440	20.49	6.60	15.15	42.24	46.00	3.76
8	614.910	21.33	6.30	12.51	40.14	46.00	5.86

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 9

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

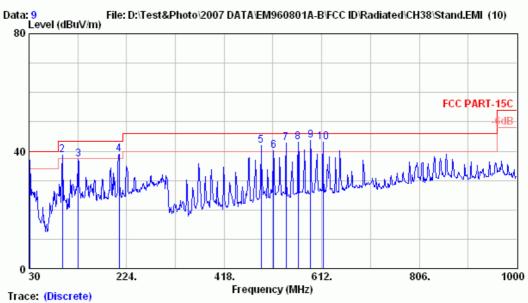
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH02)

	Freq.	Ant. Factor (dB/m)	Loss	Reading	Emission Level (dBµV/m)		Margin Remark (dB)
1	30.970	24.81	1.10	7.91	33.82	40.00	6.18
2	95.960	16.62	2.00	17.04	35.65	43.50	7.85
3	127.970	19.62	2.40	16.31	38.33	43.50	5.17
4	417.030	16.95	5.08	15.98	38.00	46.00	8.00
5	491.720	18.61	6.33	15.21	40.15	46.00	5.85
6	515.970	19.98	6.80	14.39	41.17	46.00	4.83
7	541.190	19.25	7.01	17.22	43.48	46.00	2.52
8	565.440	20.49	6.60	16.67	43.76	46.00	2.24
9	589.690	21.01	6.30	15.10	42.42	46.00	3.58
10	614.910	21.33	6.30	15.33	42.96	46.00	3.04
11	859.350	26.01	7.20	7.55	40.75	46.00	5.25

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 9

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

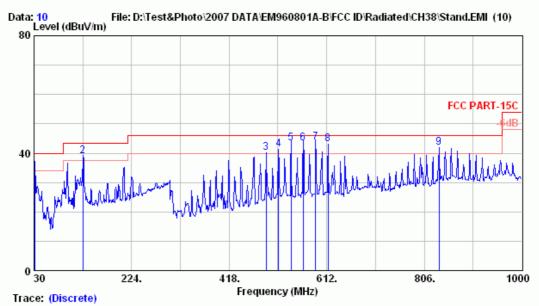
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH38)

		Ant.	Cable		Emissior	ı	
	Freq.	Factor	Loss	Reading	Level	Limits	Margin Remark
	(MHz)	(dB/m)	(dB)	(dBμV)	$(dB\mu V/m)$	$(dB\mu V/m)$	(dB)
1	30.970	24.81	1 10	11.10	37.01	40.00	2.99
Τ.			1.10				
2	95.960	16.62	2.00	20.20	38.81	43.50	4.69
3	127.970	19.62	2.40	15.32	37.34	43.50	6.16
4	209.450	21.81	3.16	14.05	39.01	43.50	4.49
5	491.720	18.61	6.33	17.07	42.01	46.00	3.99
6	515.970	19.98	6.80	13.26	40.04	46.00	5.96
7	541.190	19.25	7.01	16.44	42.70	46.00	3.30
8	565.440	20.49	6.60	16.11	43.20	46.00	2.80
9	589.690	21.01	6.30	16.32	43.64	46.00	2.36
10	614.910	21.33	6.30	15.55	43.18	46.00	2.82

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 10

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

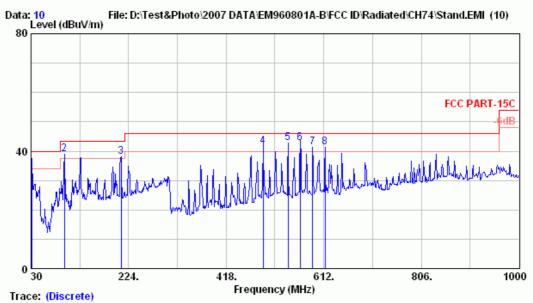
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH38)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)			Margin Remark (dB)
1	30.970	24.81	1.10	11.20	37.11	40.00	2.89
2	127.000	19.56	2.40	17.00	38.96	43.50	4.54
3	491.720	18.61	6.33	15.29	40.23	46.00	5.77
4	515.970	19.98	6.80	14.66	41.44	46.00	4.56
5	541.190	19.25	7.01	17.24	43.50	46.00	2.50
6	565.440	20.49	6.60	16.25	43.34	46.00	2.66
7	589.690	21.01	6.30	16.28	43.60	46.00	2.40
8	614.910	21.33	6.30	15.58	43.21	46.00	2.79
9	835.100	24.90	7.10	9.87	41.87	46.00	4.13

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 10

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

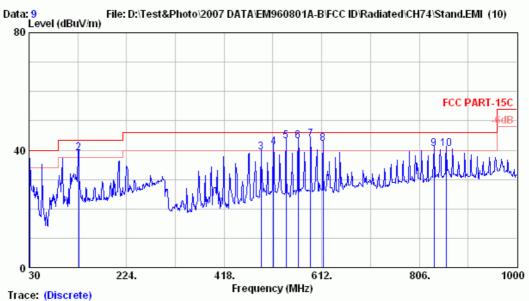
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH74)

		Ant.	Cable		Emission	1		
	Freq.	Factor	Loss	Reading	Level	Limits	Margin R	emark
	(MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBμV/m)	(dB)	
1	30.970	24.81	1.10	10.73	36.64	40.00	3.36	
2	95.960	16.62	2.00	20.36	38.98	43.50	4.52	
3	209.450	21.81	3.16	13.20	38.16	43.50	5.34	
4	491.720	18.61	6.33	16.56	41.50	46.00	4.50	
5	541.190	19.25	7.01	16.57	42.83	46.00	3.17	
6	565.440	20.49	6.60	15.63	42.72	46.00	3.28	
7	589.690	21.01	6.30	13.96	41.28	46.00	4.72	
8	614.910	21.33	6.30	13.55	41.18	46.00	4.82	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 9

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

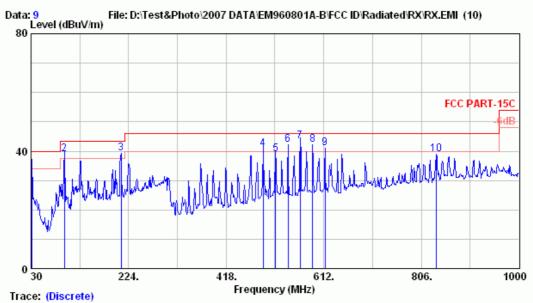
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : Stand(CH74)

Freq. Factor Loss Reading Level Limits Margin R	Remark
(MHz) (dB/m) (dB) (dB $\mu$ V) (dB $\mu$ V/m) (dB $\mu$ V/m) (dB)	
1 30.970 24.81 1.10 10.24 36.15 40.00 3.85	
2 128.940 19.66 2.40 17.04 39.10 43.50 4.40	
3 491.720 18.61 6.33 14.24 39.18 46.00 6.82	
4 515.970 19.98 6.80 14.32 41.10 46.00 4.90	
5 541.190 19.25 7.01 16.96 43.22 46.00 2.78	
6 565.440 20.49 6.60 16.04 43.13 46.00 2.87	
7 589.690 21.01 6.30 16.23 43.55 46.00 2.45	
8 614.910 21.33 6.30 14.60 42.23 46.00 3.77	
9 835.100 24.90 7.10 8.32 40.32 46.00 5.68	
10 859.350 26.01 7.20 7.13 40.33 46.00 5.67	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 9

Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

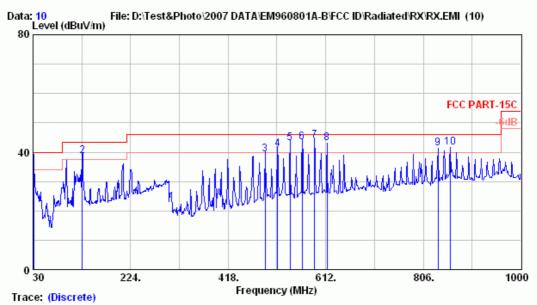
EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : RX

		Ant.	Cable		Emissior	1	
	Freq.	Factor	Loss	Reading	Level	Limits	Margin Remark
	(MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBμV/m)	(dB)
1	30.970	24.81	1.10	10.41	36.32	40.00	3.68
2	95.960	16.62	2.00	20.39	39.00	43.50	4.50
3	209.450	21.81	3.16	14.16	39.12	43.50	4.38
4	491.720	18.61	6.33	15.79	40.73	46.00	5.27
5	515.970	19.98	6.80	12.33	39.11	46.00	6.89
6	541.190	19.25	7.01	16.05	42.31	46.00	3.69
7	565.440	20.49	6.60	16.34	43.43	46.00	2.57
8	589.690	21.01	6.30	14.75	42.07	46.00	3.93
9	614.910	21.33	6.30	13.32	40.95	46.00	5.05
10	835.100	24.90	7.10	7.04	39.04	46.00	6.96

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.





Site no. : A/C Chamber Data no. : 10
Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL

Limit : FCC PART-15C

Env. / Ins. : 8593EM 27\*C/58% Engineer : Alvin\_Yang

EUT : Radio Control M/N:TM7-2.4G

Power Rating : DC9.6V Test Mode : RX

		Ant.	Cable		Emission	1	
	Freq.	Factor	Loss	Reading	Level	Limits	Margin Remark
	(MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBμV/m)	(dB)
1	30.970	24.81	1.10	11.50	37.41	40.00	2.59
2	127.970	19.62	2.40	16.64	38.66	43.50	4.84
3	491.720	18.61	6.33	14.29	39.23	46.00	6.77
4	515.970	19.98	6.80	14.13	40.91	46.00	5.09
5	541.190	19.25	7.01	16.96	43.22	46.00	2.78
6	565.440	20.49	6.60	16.18	43.27	46.00	2.73
7	589.690	21.01	6.30	16.50	43.82	46.00	2.18
8	614.910	21.33	6.30	15.58	43.21	46.00	2.79
9	835.100	24.90	7.10	9.18	41.18	46.00	4.82
10	859.350	26.01	7.20	8.30	41.50	46.00	4.50

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.

# 3.6.2. Frequency Range Above 1GHz Measurement Results

Date of Test: Jul. 04, 2007 Temperature: 27

EUT: Radio Control Humidity: 58%

Test Mode: Transmitting, Channel: 02 (Frequency: 2405.376MHz), Attitude: Stand

H	Ioriz	zontal								
		Freq.	Factor		Reading (dBµV)	Emission Level (dBµV/m)	Limits	_	Remark	
	_		25.34 25.39	4.91 5.31	6.30 7.44	36.55 38.14	74.00 74.00	37.45 35.86		_
			25.95	6.18	5.03	37.15	74.00	36.85		

4 1855.120 27.18 6.62 2.81 36.61 74.00 37.39 Peak

Verti	ical	Ant.	Cable		Emissior	1		
	Freq. (MHz)			Reading (dBµV)	Level (dBµV/m)		Margin (dB)	Remark
_		25.29	4.56		39.05	74.00	34.95	
3		25.39 25.95	5.31 6.18	6.61 6.96	37.31 39.08	74.00 74.00		Peak Peak

Horiz	zontal							
		Ant.	Cable		Emissior	1		
	Freq.	Factor	Loss	Reading	Level	Limits	Margin	Remark
	(MHz)	(dB/m)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	(dB)	
1	1325.920	25.34	4.91	-1.70	28.55	54.00	25.45	Average
2	1456.960	25.39	5.31	-0.56	30.14	54.00	23.86	Average
3	1603.120	25.95	6.18	-2.97	29.15	54.00	24.85	Average
4	1855.120	27.18	6.62	-4.19	29.61	54.00	24.39	Average

Verti	cal							
		Ant.	Cable		Emission	1		
	Freq.	Factor	Loss	Reading	Level	Limits	Margin	Remark
	(MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBuV/m)	(dB)	
1	1191.520	25.29	4.56	1.20	31.05	54.00	22.95	Average
2	1460.320	25.39	5.31	-1.39	29.31	54.00	24.69	Average
3	1603.120	25.95	6.18	-1.04	31.08	54.00	22.92	Average

TT .1 1

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

Date of Test: Jul. 04, 2007 Temperature: 27

EUT: Radio Control Humidity: 58%

Test Mode: Transmitting, Channel: 38 (Frequency: 2442.240MHz), Attitude: Stand

### Horizontal

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emission Level (dBµV/m)	Limits	Margin (dB)	Remark
1	1062.160	25.23	4.31	5.53	35.07	74.00	38.93	Peak
2	1325.920	25.34	4.91	5.49	35.74	74.00	38.26	Peak
3	1465.360	25.39	5.33	6.65	37.36	74.00	36.64	Peak
4	1628.320	26.10	6.36	4.54	37.00	74.00	37.00	Peak

### Vertical

		Ant.	Cable		Emission	1		
	Freq. (MHz)	Factor (dB/m)		Reading (dBµV)	Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	1062.160	25.23	4.31	10.27	39.81	74.00	34.19	Peak
2	1132.720	25.26	4.46	6.26	35.98	74.00	38.02	Peak
3	1191.520	25.29	4.56	6.82	36.67	74.00	37.33	Peak
4	1460.320	25.39	5.31	5.39	36.09	74.00	37.91	Peak
5	1628.320	26.10	6.36	5.75	38.21	74.00	35.79	Peak

# Horizontal

		Ant.	Cable		Emission	ı		
	Freq. (MHz)	Factor (dB/m)		Reading (dBµV)	Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	1062.160	25.23	4.31	-2.47	27.07	54.00	26.93	Average
2	1325.920	25.34	4.91	-2.51	27.74	54.00	26.26	Average
3	1465.360	25.39	5.33	-1.35	29.36	54.00	24.64	Average
4	1628.320	26.10	6.36	-3.46	29.00	54.00	25.00	Average

### Vertical

V CI t	ioui	Ant.	Cable		Emission	1		
	Freq. (MHz)	Factor (dB/m)	Loss (dB)	Reading (dBµV)	Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	1062.160	25.23	4.31	2.27	31.81	54.00	22.19	Average
2	1132.720	25.26	4.46	-1.74	27.98	54.00	26.02	Average
3	1191.520	25.29	4.56	-1.18	28.67	54.00	25.33	Average
4	1460.320	25.39	5.31	-2.61	28.09	54.00	25.91	Average
5	1628.320	26.10	6.36	-2.25	30.21	54.00	23.79	Average

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

Date of Test: Jul. 04, 2007 Temperature: 27

EUT: Radio Control Humidity: 58%

Test Mode: Transmitting, Channel: 74 (Frequency: 2479.104MHz), Attitude: Stand

### Horizontal

Freq. (MHz)	Factor		Reading (dBµV)			Margin (dB)	Remark
	25.29 25.39 26.22	4.58 5.31 6.52	5.52 9.48 6.96	35.39 40.18 39.70	74.00 74.00 74.00		Peak Peak Peak

### Vertical

Freq. (MHz)	Factor		_	Emission Level (dBµV/m)		_	Remark
1 1191.520 2 1653.520 3 2322.160	26.22	4.56 6.52 6.25	8.63	35.60 41.37 42.96	74.00 74.00 74.00	38.40 32.63 31.04	

### Horizontal

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emission Level (dBµV/m)	Limits	Margin (dB)	Remark
2		25.29 25.39 26.22	4.58 5.31 6.52		27.39 32.18 31.70	54.00 54.00 54.00	21.82	Average Average Average

### Vertical

	Freq. (MHz)			Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	_	Remark
2	1653.520	25.29 26.22 28.46	4.56 6.52 6.25	-2.25 0.63 0.25	27.60 33.37 34.96	54.00 54.00 54.00	20.63	Average Average Average

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

Date of Test: Jul. 04, 2007 Temperature: 27

EUT: Radio Control Humidity: 58%

Test Mode: Receiving, Channel: 38 (Frequency: 2442.240MHz), Attitude: Stand

### Horizontal

	Freq. (MHz)	Factor		Reading (dBµV)		Limits (dBµV/m)		Remark
2	1006.720 1465.360 1729.120	25.39	4.19 5.33 7.04	5.03 9.54 2.32	34.43 40.25 35.93	74.00 74.00 74.00	39.57 33.75 38.07	Peak

### Vertical

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emission Level (dBµV/m)	Limits	Margin (dB)	Remark
1	1129.360	25.26	4.45	7.39	37.10	74.00	36.90	Peak
2	1196.560	25.29	4.58	6.89	36.76	74.00	37.24	Peak
3	1263.760	25.32	4.71	6.25	36.28	74.00	37.72	Peak
4	1737.520	26.62	7.07	2.12	35.82	74.00	38.18	Peak

# Horizontal

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emission Level (dBµV/m)	Limits	Margin (dB)	Remark
2	1465.360	25.20 25.39 26.58	5.33	-2.97 1.54 -5.68	26.43 32.25 27.93	54.00 54.00 54.00	21.75	Average Average Average

### Vertical

	Freq. (MHz)	Ant. Factor (dB/m)		Reading (dBµV)	Emissior Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1 2 3	1129.360 1196.560 1263.760	25.26 25.29 25.32	4.45 4.58 4.71	-1.11	29.10 28.76 28.28	54.00 54.00 54.00		Average Average Average
-	1737.520	26.62	7.07		27.82	54.00		Average

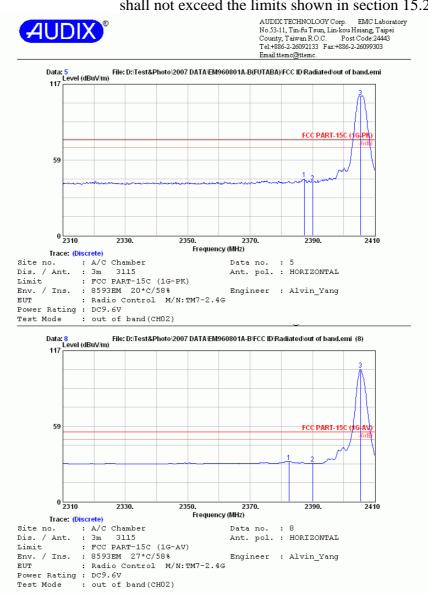
Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

### 3.6.3. Restricted Bands Measurement Results

	Date of Test:		Ju	ıl. 04, 2007	Tem	perature:_	27
	EUT:		Ra	adio Control	Н	[umidity:_	58%
	Test Mode:		Transm	nitting, Channel: 0	2, Frequency:	2405.376MI	Нz
	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBµV	Emission Leve Horizontal dBµV/m	el Limits dBµV/m	Margin dB
Peak *	2387.400	28.59	6.33	8.79	43.71	74.00	30.29
Average *	2382.400	28.58	6.33	-4.12	30.79	54.00	23.21

Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

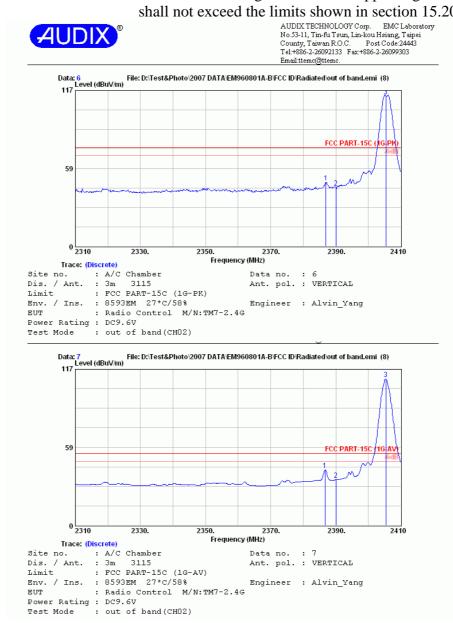
- 2. Low frequency section (spurious in the restricted band 2310-2390MHz).
- 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



	Date of Test:	Jul. 04, 2007		Te	Temperature:		
	EUT:	Radio Control			Humidity:	58%	
	Test Mode:	Transmit, Channel: 02, Frequency: 2405.376MHz					
	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBµV	Emission Le Vertical dBµV/m	vel Limits dBµV/m	Margin dB
Peak *	2386.900	28.59	6.33	13.10	48.02	74.00	25.98
Average *	2386.700	28.59	6.33	6.70	41.62	54.00	12.38

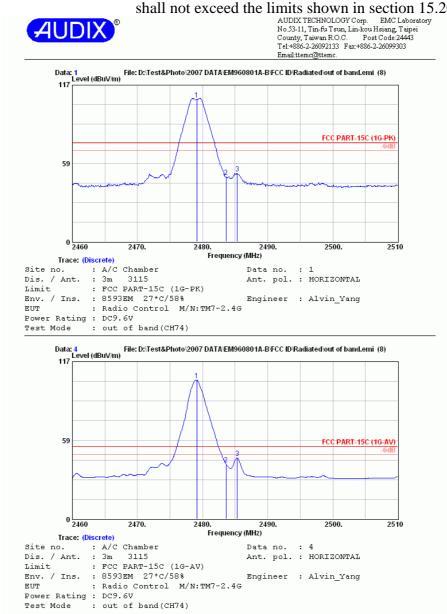
Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.

- 2. Low frequency section (spurious in the restricted band 2310-2390MHz).
- 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



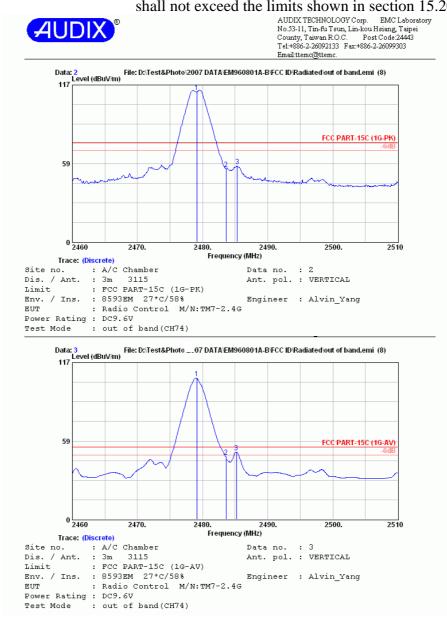
	Date of Test:	Jul. 04, 2007		Tem	Temperature:		
	EUT:	Radio Control			Н	umidity:	58%
	Test Mode:		Transmit, Channel: 74, Frequency: 2479.104MHz				
	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBµV	Emission Leve Horizontal dBµV/m	l Limits dBμV/m	Margin dB
Peak *	2485.350	28.77	6.45	15.89	51.11	74.00	22.89
Average *	2485.350	28.77	6.45	10.11	45.33	54.00	8.67

- Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
  - 2. High frequency section (spurious in the restricted band 2483.5-2500MHz).
  - 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



	Date of Test:	Jul. 04, 2007		Ter	nperature:		
	EUT:	Radio Control				Humidity:	58%
	Test Mode:		Transmit, Channel: 74, Frequency: 2479.104MHz				
	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBµV	Emission Lev Vertical dBµV/m	vel Limits dBµV/m	Margin dB
Peak *	2485.350	28.77	6.45	21.27	56.49	74.00	17.51
Average *	2485.200	28.77	6.45	15.01	50.23	54.00	3.77

- Remark: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
  - 2. High frequency section (spurious in the restricted band 2483.5-2500MHz).
  - 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



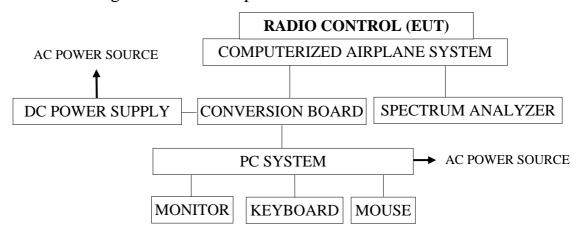
# 4. 6dB BANDWIDTH MEASUREMENT

# 4.1. Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 11, 06'	Aug. 10, 07'

# 4.2. Block Diagram of Test Setup



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

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

# 4.4. Operating Condition of EUT

The test program "Futaba Term" was used to enable the EUT to transmit data at different channel frequency individually.

### 4.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 100kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

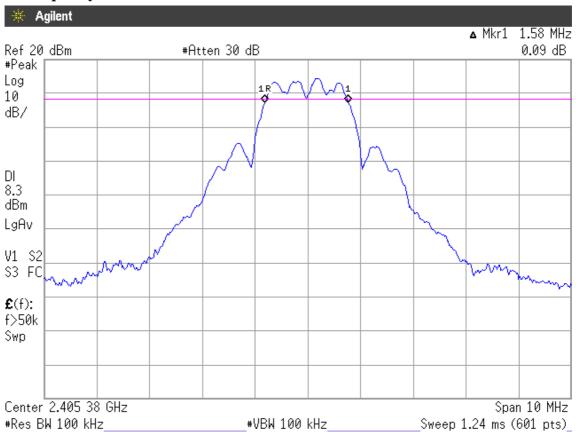
# 4.6. Test Results

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

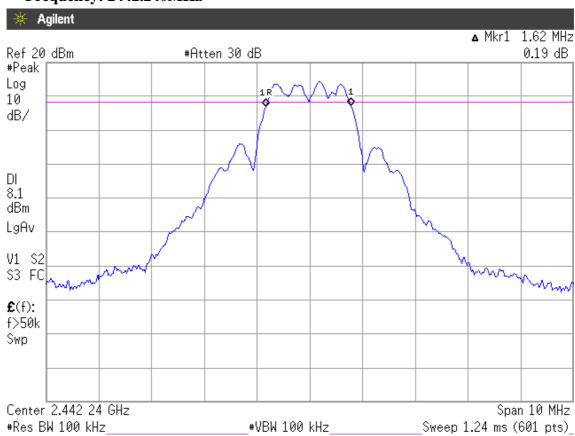
Test Date: Jul. 04, 2007 Temperature: 25 Humidity: 63 %

Channel	Frequency	6dB Bandwidth
0	2405.376MHz	1.58MHz
38	2442.240MHz	1.62MHz
74	2479.104MHz	1.68MHz

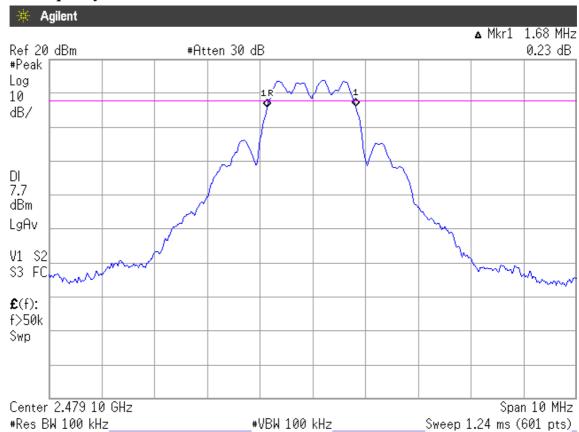
## Frequency: 2405.376MHz



## Frequency: 2442.240MHz



# Frequency: 2479.104MHz



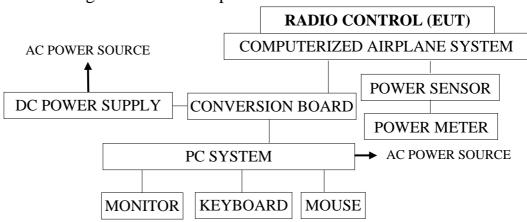
# 5. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

# 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	Jan. 10, 07'	Jan. 09, 08'
2.	Power Sensor	Anritsu	MA2491A	030873	Jan. 10, 07'	Jan. 09, 08'

# 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

The test program "Futaba Term" was used to enable the EUT to transmit data at different channel frequency individually.

### 5.5. Test Procedure

The transmitter output was connected to the power meter that was designed to detect peak value automatically.

# 5.6. Test Results

**PASSED.** All the test results are listed below.

Test Date: Jul. 04, 2007 Temperature: 25 Humidity: 63 %

Channel	Frequency	Peak Output Power	Limit
02	2405.376MHz	17.32dBm	30dBm
38	2442.240MHz	17.75dBm	30dBm
74	2479.104MHz	17.78dBm	30dBm

### 6. EMISSION LIMITATIONS MEASUREMENT

# 6.1. Test Equipment

The following test equipment was used during the emission limitations test:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 11, 06'	Aug. 10, 07'

# 6.2. Block Diagram of Test Setup

The same as section.4.2.

# 6.3. Specification Limits (§15.247(c))

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).( This test result attaching to §3.6.3)

# 6.4. Operating Condition of EUT

The test program "Futaba Term" was used to enable the EUT to transmit data at different channel frequency individually.

### 6.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 100kHz VBW.

### 6.6. Test Results

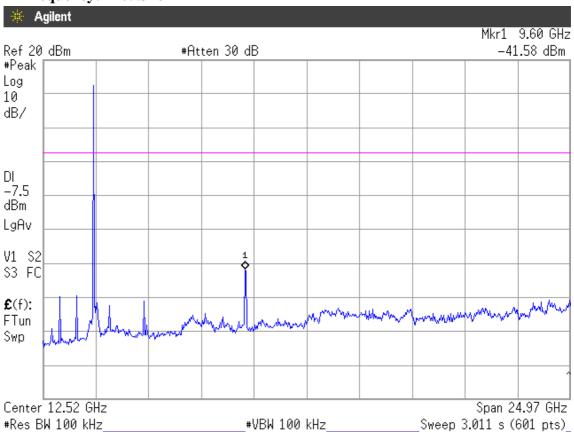
**PASSED.** The testing data was attached in the next pages.

Test Date: Jul. 04, 2007 Temperature: 25 Humidity: 63 %

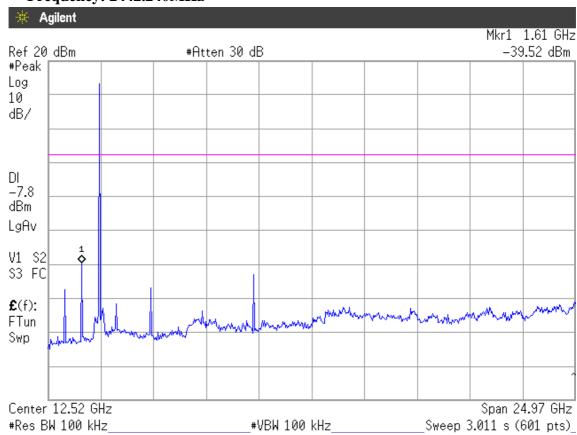
- 1. 2405.376MHz: During 30MHz~25GHz bandwidth. In the 9.60GHz, the -41.58dBm is max value that is lower than 20dB of primary channel.
- 2. 2442.240MHz: During 30MHz~25GHz bandwidth. In the 1.61GHz, the -39.52dBm is max value that is lower than 20dB of primary channel.
- 3. 2479.104MHz: During 30MHz~25GHz bandwidth. In the 1.65GHz, the -34.88dBm is max value that is lower than 20dB of primary channel.

Note: The peak above the limit line is the carrier frequency.

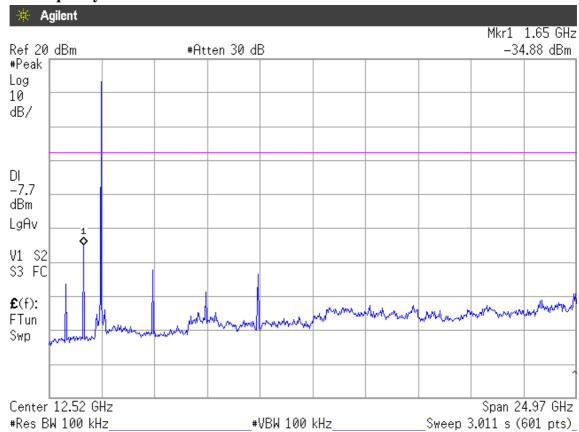
Frequency: 2405.376MHz



Frequency: 2442.240MHz



# Frequency: 2479.104MHz



# 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	E4446A	US44300366	Aug. 11, 06'	Aug. 10, 07'

# 7.2. Block Diagram of Test Setup

The same as section.4.2.

# 7.3. Specification Limits (§15.247(c))

The highest level should be at least 20 dB below that in the 100kHz bandwidth.

# 7.4. Operating Condition of EUT

The test program "Futaba Term" was used to enable the EUT to transmit data at different channel frequency individually.

### 7.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge.

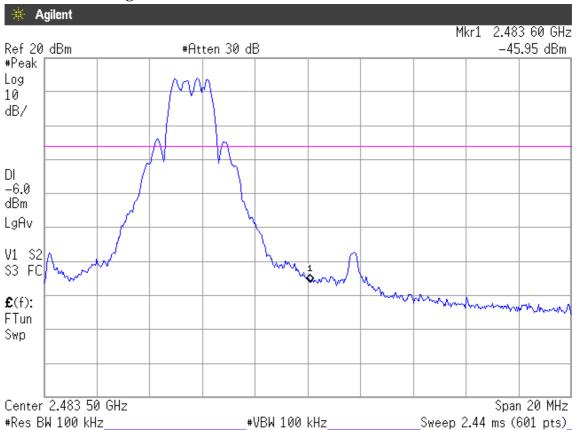
# 7.6. Test Results

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

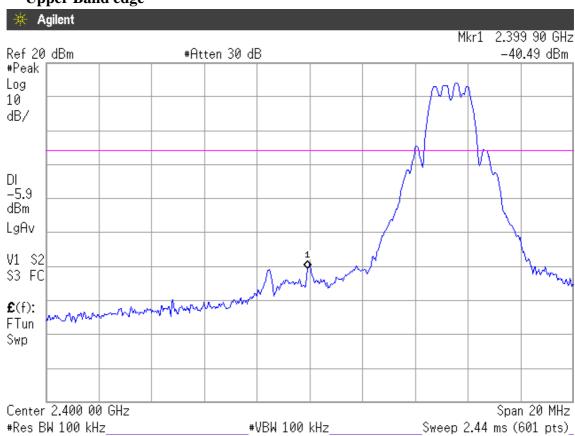
Test Date: Jul. 04, 2007 Temperature: 25 Humidity: 63 %

- 1. Below Band edge: The highest emission level is -45.95dBm on 2.48360GHz<sub>o</sub>
- 2. Upper Band edge: The highest emission level is -40.49dBm on 2.39990GHz.

## **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	E4446A	US44300366	Aug. 11, 06'	Aug. 10, 07'

# 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

The test program "Futaba Term" was used to enable the EUT to transmit data at different channel frequency individually.

### 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 30kHz VBW, set sweep time = span/300kHz.

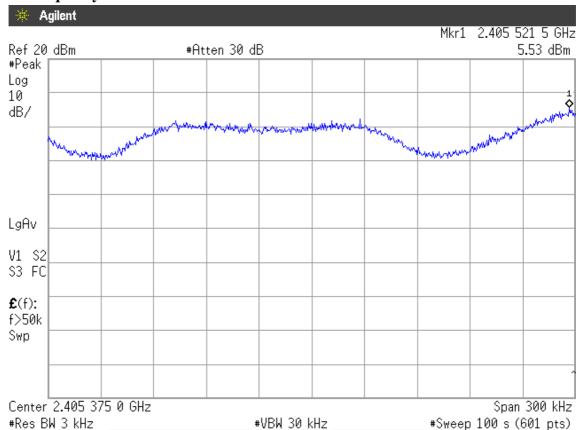
### 8.6. Test Results

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

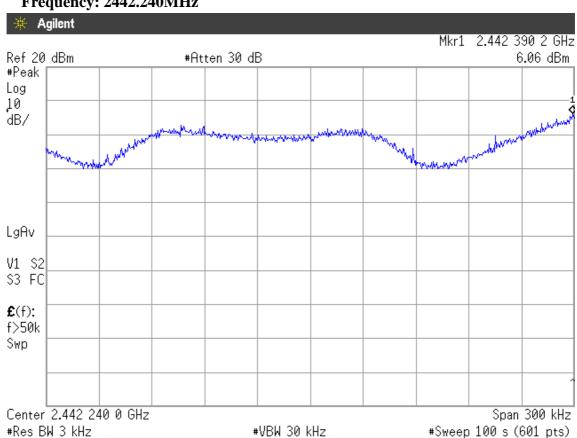
Test Date: Jul. 04, 2007 Temperature: 25 Humidity: 63 %

Channel	Frequency	<b>Power Spectral Density</b>	Limit
02	2405.376MHz	5.53dBm	8dBm
38	2442.240MHz	6.06dBm	8dBm
74	2479.104MHz	5.57dBm	8dBm

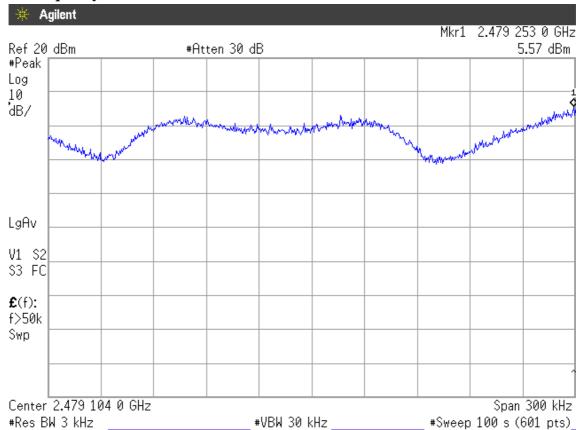
# Frequency: 2405.376MHz



# Frequency: 2442.240MHz



# Frequency: 2479.104MHz



# 9. DEVIATION TO TEST SPECIFICATIONS

[NONE]