FCC 15.247 for DSSS System Report On Behalf of FUTABA Corporation Radio Control Model No. : T4PX FCC ID : AZPT4PX-24G Brand: Futaba

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

Prepared by : AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan

> Tel : (02) 2609-9301, 2609-2133 Fax: (02) 2609-9303

File Number	:	C1M1405229
Report Number	:	EM-F140437
Date of Test	:	2014. 07. 24 ~ 30
Date of Report	:	2014. 07. 30

TABLE OF CONTENTS

D	Description Page			
T	EST !	REPORT CERTIFICATION	4	
1.	DE	SCRIPTION OF REVISION HISTORY	5	
2.	GE	NERAL INFORMATION	6	
		Description of Device (EUT)		
		Description of Test Facility		
		Measurement Uncertainty.		
3.	CO	NDUCTED EMISSION MEASUREMET	8	
4.	RA	DIATED EMISSION MEASUREMENT	9	
	4.1.	Test Equipment	9	
		Test Setup		
		Radiated Emission Limits (§15.209)		
		Operating Condition of EUT		
		Test Results		
5.		B BANDWIDTH MEASUREMENT		
		Test Equipment		
	5.2.			
	5.3.			
	5.4.	Operating Condition of EUT		
		Test Procedure Test Results		
6		XIMUM PEAK OUTPUT POWER MEASUREMENT		
0.				
		Test Equipment		
	6.2. 6.3.			
		Specification Limits (§15.247(b)-(3)) Operating Condition of EUT		
		Test Procedure		
		Test Results		
7		FERENCE LEVEL		
7.		Test Equipment		
		Block Diagram of Test Setup		
		Operating Condition of EUT		
		Test Procedure		
		Test Results		
8.	EM	ISSION LIMITATIONS MEASUREMENT		
	8.1.	Test Equipment		
	8.2.	Block Diagram of Test Setup		
	8.3.			
		Operating Condition of EUT		
		Test Procedure		
		Test Results		
9.		ND EDGES MEASUREMENT		
		Test Equipment		
	9.2.			
	9.3.	Specification Limits [§15.247(c)]		
		Operating Condition of EUT		
	9.3.	Test Procedure		

FCC ID: AZPT4PX-24G

	Page 3 of 46
9.6. Test Results	
10. POWER SPECTRAL DENSITY MEASUREMENT	
10.1. Test Equipment	
10.2. Block Diagram of Test Setup	
10.3. Specification Limits [§15.247(d)]	
10.4. Operating Condition of EUT	

	10.4. Operating Condition of EUT	.39
	10.5. Test Procedure	.39
	10.6. Test Results	.40
11.	DEVIATION TO TEST SPECIFICATIONS	42
12.	PHOTOGRAPHS	43
	12.1. Photos of Radiated Measurement at Semi-Anechoic Chamber	.43
	12.2. Photo of Section RF Conducted Measurement	

TEST REPORT CERTIFICATION

Applicant	:	FUTABA Corporation			
Manufacturer	:	FUTABA Corporati	on		
EUT Description	:	Radio Control			
FCC ID	:	AZPT4PX-24G			
		(A) Model No.	:	T4PX	
		(B) Serial No.	:	N/A	
		(C) Brand	:	Futaba	
		(D) Power Supply	:	DC 6.6V	
		(E) Test Voltage	:	DC 6.6V (Via Battery)	

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C, Oct 2013 (FCC 47 CFR Part 15C, §15.205 and §15.207 and §15.209 and §15.247) And ANSI C63.4:2003

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 requirements of FCC standard.

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: 2014. 07. 24~ 30

Date of Report: 2014. 07. 30

Producer:

(Tina Huang/Administrator) Signatory:

1. DESCRIPTION OF REVISION HISTORY

Edition No.	Date of Revision	Revision Summary	Report Number
0	2014. 07. 30	Original Report.	EM-F140437

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Product	Radio Control
Model Number	T4PX
Serial Number	N/A
Brand Name	Futaba
FCC ID	AZPT4PX-24G
Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Manufacturer	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Radio Technology	T-FHSS: 2407.500MHz ~ 2467.500MHz (FHSS System) S-FHSS: 2403.250MHz ~ 2447.500MHz (FHSS System) FASST: 2405.376MHz ~ 2477.056MHz (DSSS System)
Frequency Channel	T-FHSS: 31 Channels S-FHSS: 60 Channels FASST: 36 Channels
Data Transfer Rate	T-FHSS: 384 kbps S-FHSS: 128 kbps FASST: 136 kbps
Antenna	1/2 di-pole type, Antenna Gain: 2.14dBi
Date of Receipt of Sample	2014. 05. 26
Date Test	2014. 07. 24 ~ 30

2.2. Description of Test Facility

Name of Firm	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility (AC)	:	Semi-Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan May 11, 2012 File on Federal Communication Commission Registration Number: 90993
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724

2.3. Measurement Uncertainty

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

Remark : Uncertainty = $ku_c(y)$

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

3. CONDUCTED EMISSION MEASUREMET

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

4. RADIATED EMISSION MEASUREMENT

4.1. Test Equipment

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

		ieg range 501			
tem	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 23
3.	Amplifier	HP	8447D	2944A06305	2015. 02. 17
4.	Bilog Antenna	TESEQ	CBL6112D	33821	2014. 08. 07

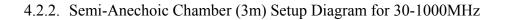
4.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

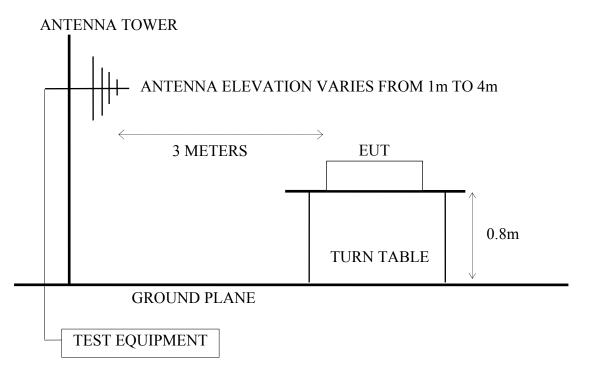
Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 23
3.	Pre-Amplifier	HP	8449B	3008A00529	2015.01.23
4.	2.4GHz Notch Filter	K&L	7NSL10-2441.5E 130.5-00	1	2015. 06. 12
5.	3G High Pass Filter	Microware Circuits	H3G018G1	484796	2015. 06. 12
6.	Horn Antenna	EMCO	3115	9609-4927	2014. 06. 16
7.	Horn Antenna	EMCO	3116	2653	2014. 10. 10

4.2. Test Setup

4.2.1. Block Diagram of connection between EUT and simulators

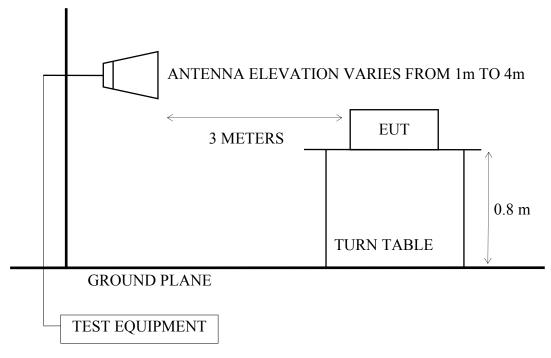
RADIO CONTROL
(EUT)





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





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)		

4.3. Radiated Emission Limits (§15.209)

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).

4.4. Operating Condition of EUT

- 4.4.1. Set up the EUT (Radio Control) and simulator as shown on 4.2.
- 4.4.2. To turn on the power of all equipments.
- 4.4.3. The EUT was set the PC system using test program "Futaba Term" (Note: The PC system is not EUT's accessory, It's only test EUT on test.)
- 4.4.4. The EUT was set to continuously transmit signals at 2405.376MHz, 2440.192MHz and 2477.056MHz during testing.

4.5. 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 ANSI C63.4-2003 regulation.

The bandwidth of the R&S Test Receiver 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 63.4:4.2, peak detector is an alternate option for frequency from 30MHz to 1000MHz.

Above 1GHz was measured with peak and average detector. For frequency from 1GHz to 4GHz and 5.5GHz 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.

4.6. Test Results

PASSED.

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

EUT : Radio Control	M/N:T4PX	

Test Date : 2014. 07. 24 Temperature : 23 Humidity : 42%

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 4.6.1.

Mada	Channel	Fraguanay	Test Mode	Desition	Reference Test Data		
Mode	Channel	Frequency	Test Mode	FOSILIOII	Horizontal	Vertical	
1.	02	2405.376MHz		Stand	# 1	# 2	
2.	36	2440.192MHz	Transmit	Stand	# 2	# 1	
3.	72	2477.056MHz		Stand	# 2	# 1	

Note: Above all final readings were measured with 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 4.6.2.

Mode	Chnnel	Frequency	Test Mode	Position	Test Frequency Range
1.					1000-2680MHz
2.					2680-4000MHz
3.	02	2405.376MH	Transmit	Stand	4000-5500MHz
4.	02	2403.370IVIH	Transmit	Stand	5500-7500MHz
5.					7500-18000MHz
6.					18000-25000MHz
7.					1000-2680MHz
8.	36	2440.192MHz	Transmit	Stand	2680-4000MHz
9.					4000-5500MHz*
10.					5500-7500MHz
11.					7500-18000MHz
12.					18000-25000MHz
13.					1000-2680MHz
14.					2680-4000MHz
15.	72	2477.056MHz	Transmit	Stand	4000-5500MHz
16.		24//.030IVINZ	11411511111	Stand	5500-7500MHz
17.					7500-18000MHz
18.					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 4.6.3. (The restricted bands defined in part 15.205(a))

Mode	Channal	Fraguanau	Test Mode	Reference Test Data		
	Channel	Frequency	Test Mode	Horizontal	Vertical	
1.	02	2405.376MHz	Transmit	# 3, # 4	# 1, # 2	
2.	72	2477.056MHz	Transmit	# 5, # 6	# 7, # 8	

4.6.1. Frequency Range 30-1000MHz

Transmit, Frequency: 2405.376MHz

Site no. Dis. / Ant.	: Audix NO.1 : 3m CBL611	Ant. p	Data no ol. : HOB	
Limit Env. / Ins. EUT Power Rating Test Mode	: T4PX : DC 6.6V	Engin	eer : ke	en_chen

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1 2 3 4	101.78 256.01 315.18 381.14	11.03 12.48 13.54 15.15	$3.23 \\ 4.37 \\ 4.83 \\ 5.49$	11.15 17.59 14.96 14.29	25.41 34.44 33.33 34.93	43.50 46.00 46.00 46.00	18.09 11.56 12.67 11.07	Peak Peak Peak Peak Peak

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

	: Audix NO.1 Chamber : 3m CBL6112D 33821 : 30M-1G	Data no. : 2 Ant. pol. : VERTICAL
Env. / Ins.	: 23*C/42% N9O3OA(14O) : T4PX	Engineer : ken_chen
	: T×2405.376(FASST)	

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Readin; (dBµ∀)	Emission g Level (dBµV/m)	Limits (dBµV/m	Margin) (dB)	Remark
1 55.22 2 144.40 3 230.79 4 521.79	10.93 11.28	2.68 3.56 4.20 6.45	25.91 27.05 22.08 18.19	$35.81 \\ 41.54 \\ 37.56 \\ 41.91$	$\begin{array}{r} 40.00\ 43.50\ 46.00\ 46.00\end{array}$	$\begin{array}{r} 4.19 \\ 1.96 \\ 8.44 \\ 4.09 \end{array}$	Peak Peak Peak Peak Peak

Transmit, Frequency: 2440.192MHz

	: Audix NO.1 Chamber : 3m CBL6112D 33821	Data no. : 2 Ant. pol. : HORIZONTAL
Limit Env. / Ins. EUT	: 30M-1G : 23*C/42% N9030A(140) : T4P%	Engineer : ken_chen
Power Rating	: DC 6.6V : T×2440.192(FASST)	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	249.22	12.35	$\begin{array}{c} 4.32 \\ 5.56 \\ 6.48 \end{array}$	21.11	37.78	46.00	8.22	Peak
2	389.87	15.32		12.83	33.71	46.00	12.29	Peak
3	560.59	17.82		12.99	37.29	46.00	8.71	Peak

Data no. : 1 Ant. pol. : VERTICAL

Engineer : ken_chen

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

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµ V/m)	Margin (dB)	Remark
1 2 3	210.42 296.75 534.40	10.00 13.09 17.45	$\begin{array}{c} 4.06 \\ 4.64 \\ 6.46 \end{array}$	26.08 21.59 18.13	40.14 39.32 42.04	43.50 46.00 46.00	3.36 6.68 3.96	Peak Peak Peak Peak

Transmit, Frequency: 2477.056MHz

	: 3	udix NO.1 Chamber M CBL6112D 33821		ta no. : 2 : HORIZONTAL
EUT Power Rating	: 2 : T : D	10M-1G 13*C/42% N9030A(140) 4PX 10 6.6V 1×2477.056(FASST)	Engineer	: ken_chen

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµ∀)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark	
1 2 3 4	101.78 183.26 256.01 374.35	11.03 9.15 12.48 15.00	3.23 3.86 4.37 5.43	11.05 12.39 19.04 14.08	25.31 25.40 35.89 34.51	43.50 43.50 46.00 46.00	18.19 18.10 10.11 11.49	Peak Peak Peak Peak 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. Dis. / Ant. Limit Env. / Ins. EUT Power Rating	: : : : :	Audix NO.1 Chamber 3m CBL6112D 33821 30M-1G 23*C/42% N9030A(140) T4P% DC 6.6V
Test Mode	:	Tx2477.056(FASST)

Ant.	Da pol.		no. /ERTI	
Engi	neer	:	ken_	chen

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµ∀)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	68.80	6.60	2.88	26.48	35.96	40.00	4.04	Peak
2	183.26	9.15	3.86	25.56	38.57	43.50	4.93	Peak
3	230.79	11.28	4.20	22.74	38.22	46.00	7.78	Peak
4	534.40	17.45	6.46	17.81	41.72	46.00	4.28	Peak

4.6.2. Frequency Range 4000-5500MHz

Transmit, Frequency: 2440.192MHz

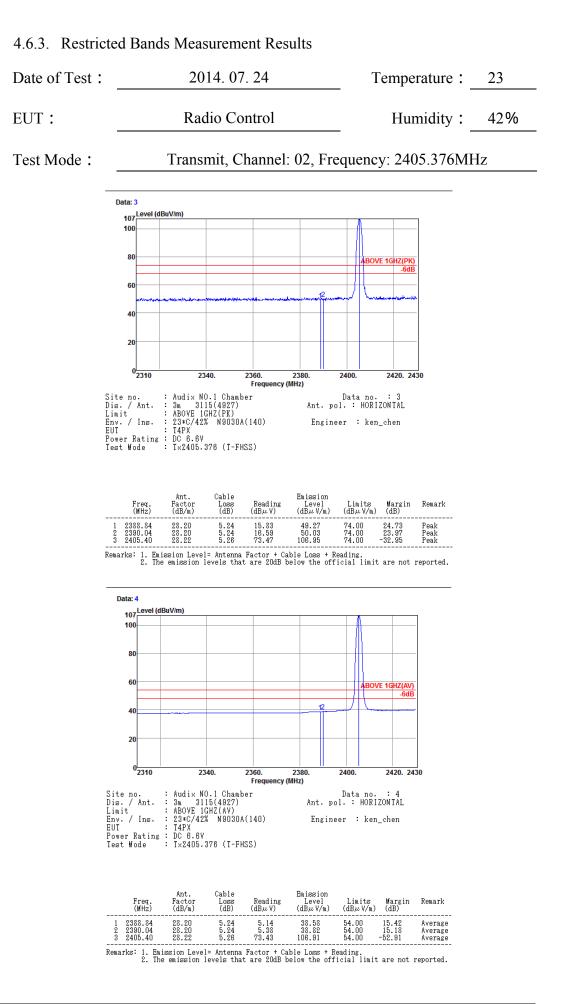
		udix NO.1 Chamber			tano. : 7
· · · · · · ·		m 3115(4927)	Ant.	pol.	HORIZONTAL
Limit Fau / Iaa		BOVE 1GHZ(PK)	E		• hh
		3*C/42% N9O3OA(14O) 4PX	Eng	ineer	: ken_chen
Power Rating	-	11 11			
		×2440.192(FASST)			
iest mode	• 1	(Laan1)26(rna)			

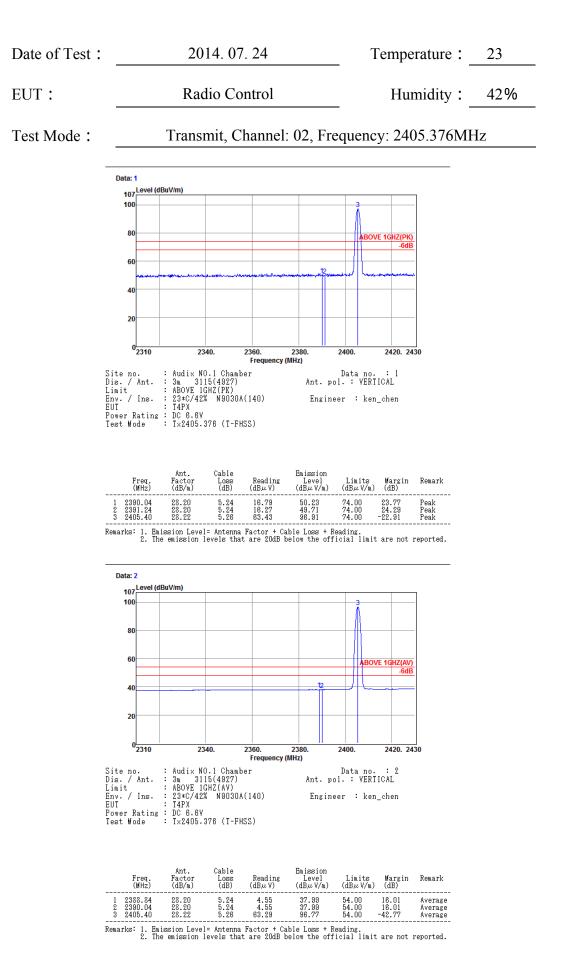
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµ∀)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	4879.00	32.88	8.17	8.73	49.78	54.00	4.22	Average
2	4879.00	32.88	8.17	23.35	64.40	74.00	9.60	Peak

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

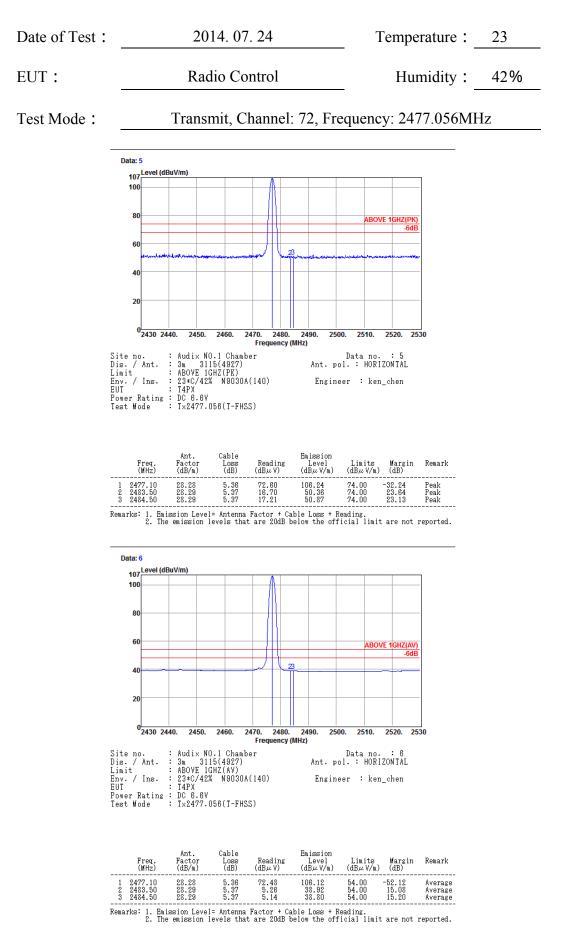
Limit Env. / Ins. EUT Power Rating			pol.	: \	no. : 8 VERTICAL ken_chen
Power Kating	:	DC 6.6V			
Test Mode	:	T×2440.192(FASST)			

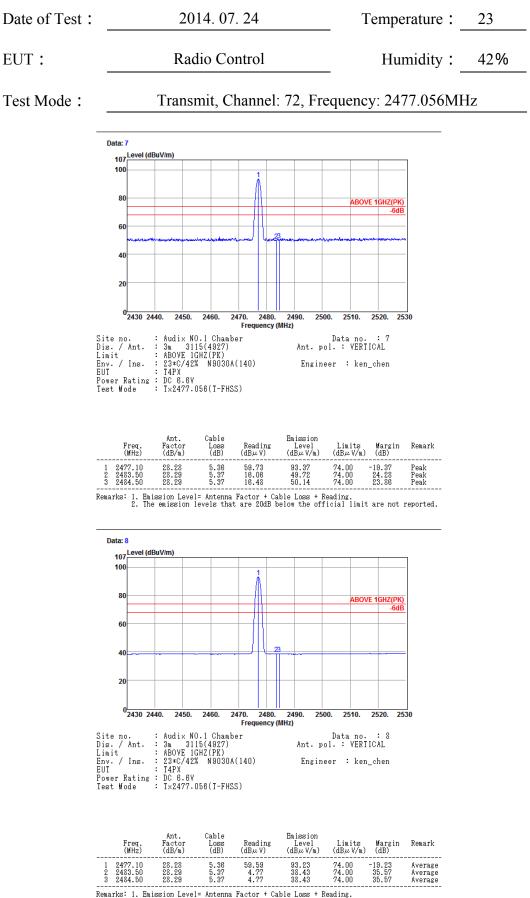
Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1 4882.00	32.91	8.17	9.12	50.20	54.00	3.80	Average
2 4882.00	32.91	8.17	23.53	64.61	74.00	9.39	Peak





FCC ID: AZPT4PX-24G Page 20 of 46





5. 6dB BANDWIDTH MEASUREMENT

5.1. Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24

5.2. Block Diagram of Test Setup

RADIO CONTROL	SPECTRUM ANALYZER
(EUT)	SI LE IKOWI MWAL I ZEK

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

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

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 spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 1.5% EBW, VBW \geq 3xRBW. 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 558074 D01 DTS Meas Guidance v03r02

5.6. Test Results

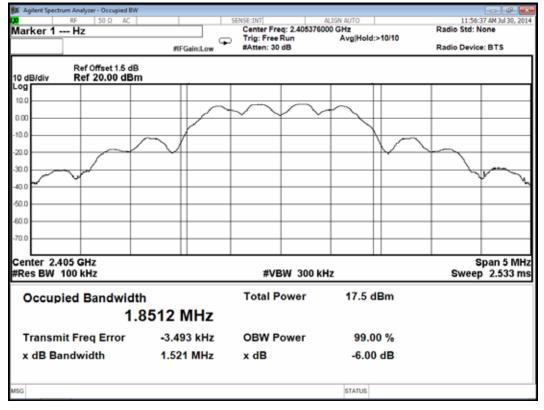
PASSED. All the test results are attached in next pages.

Test Date : 2014. 07. 30 Temperature : 25 Humidity : 46%

Mode	Channel	Frequency	6dB Bandwidth (MHz)
1.	СН 02	2405.376MHz	1.521
2.	CH 36	2440.192MHz	1.553
3.	CH 72	2477.056MHz	1.596

[Limit: least 500kHz]

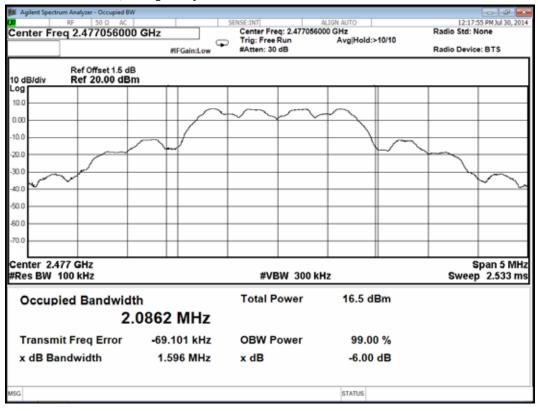
Channel 02, Frequency: 2405.376MHz



Agilent Spectrum Analyzer - Occupied		crace and		
Center Freq 2.4401920		SENSE:INT Center Freq: 2.4401920		12:12:02 PM Jul 30, 2014 Radio Std: None
		Trig: Free Run #Atten: 30 dB	Avg Hold:>10/10	Radio Device: BTS
10 dB/div Ref Offset 1.5 Ref 20.00 d				
10.0				
0.00				
-10.0				
-20.0	K Y L			
-30.0				
-40.0				V ~
-50.0				
-60.0				
-70.0				
Center 2.44 GHz #Res BW 100 kHz		#VBW 300 k		Span 5 MHz Sweep 2.533 ms
				011000 110
Occupied Bandwi		Total Power	17.6 dBm	
	1.8764 MHz			
Transmit Freq Error	-13.223 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.553 MHz	x dB	-6.00 dB	
MSG			STATUS	

Channel 36, Frequency: 2440.192MHz

Channel 72, Frequency: 2477.056MHz



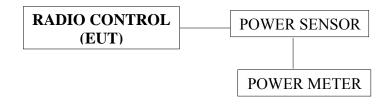
6. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

6.1. Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Power Meter	Anritsu	ML2495A	1145008	2014. 10. 22
2.	Power Sensor	Anritsu	MA2411B	1126096	2014. 10. 22

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 & 5725-5850MHz is : 1Watt. (30dBm)

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 power sensor and record the reading of power meter.

The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

6.6. Test Results

PASSED. All the test results are listed below.

Test Date : 2014. 07. 26 Temperature : 25 Humidity : 46%

Mode	Channel	Frequency	Peak Output Power (dBm)
1.	CH 02	2405.376MHz	14.54
2.	CH 36	2440.192MHz	14.57
3.	CH 72	2477.056MHz	13.33

[Limit: 1Watt. (30dBm)]

7. REFERENCE LEVEL

7.1. Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24

7.2. Block Diagram of Test Setup

The same as section.5.2.

7.3. Operating Condition of EUT

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

7.4. Test Procedure

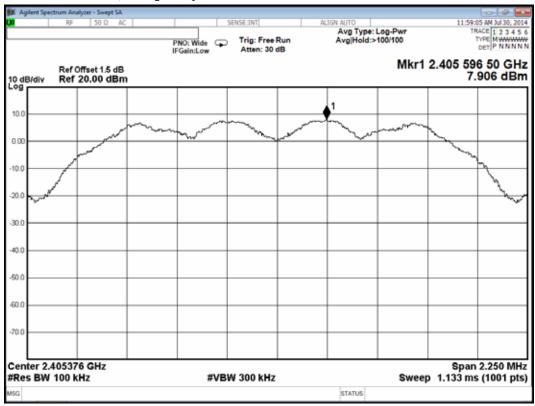
The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

7.5. Test Results

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

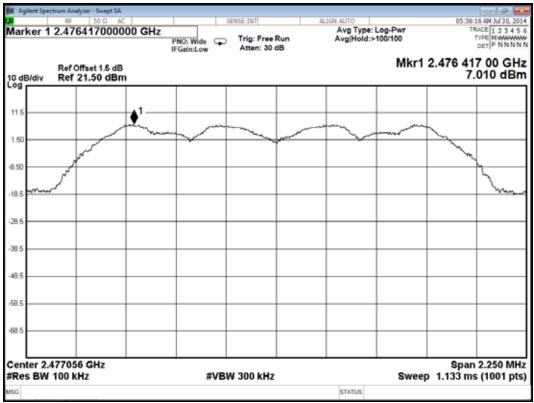
Test Date : 2014. 07. 30 Temperature : 25 Humidity : 46%



Channel 02, Frequency: 2405.376MHz

Channel 36, Frequency: 2440.192MHz

00	trum Analyzer - Swept SA RF 50 Ω AC			SENSE:INT	AL	IGN AUTO		12:12:4	🕞 🕼 🔜
Marker 1	2.4404350000	P	NO: Wide 😱	Trig: Free F Atten: 30 d		Avg Type: Avg Hold:>	Log-Pwr 100/100	TR T	ACE 1 2 3 4 5 6 VPE NWWWWW DET P NNNNN
10 dB/div	Ref Offset 1.5 dB Ref 20.00 dBm	1					Mkr1 2	2.440 43 8.	5 00 GHz 278 dBm
10.0						≜ 1			
0.00			\checkmark			~			
-10.0								- Sandar	
-20.0	<i>.</i> ,								han
-30.0									
-40.0									
-50.0									
-60.0									
-70.0									
Center 2.4 #Res BW	440192 GHz 100 kHz		#VB	W 300 kHz			Sweep	Span 1.133 ms	2.250 MHz (1001 pts)
MSG						STATUS			



Channel 72, Frequency: 2477.056MHz

8. EMISSION LIMITATIONS MEASUREMENT

8.1. Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24

8.2. Block Diagram of Test Setup

The same as section.5.2

8.3. Specification Limits [§15.247(c)]

- 8.3.1. 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 15.205(c)).
- 8.3.2. The reference level for determining limit of emission limitations is according to the value measured indicated in plots at section 7.6.

8.4. Operating Condition of EUT

Test program "Futaba Term" is used for enabling the EUT transmitting continuing.

8.5. Test Procedure

The RF output of EUT was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 300kHz VBW.

The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

8.6. Test Results

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

Test Date : 2014. 07. 30 Temperature : 25 Humidity : 46%

Channel 02, Frequency: 2405.376MHz

12.06.07 PM Ja 20, 20 17.402 1 2 3 4 1 17.402 1 2 3 4 1 17.402 1 2 3 4 1	e Log-Pwr I>100100	Avg Type Avg Hold	tuin	Trig: Free Atten: 30		FM	74000000		
Mkr3 264.74 MH -48.490 dBr							20.00 dBn		o deu
411.4									
	مرجعه	1.1.1.1	l			2 •3	1 	Lal.	0.0 000 000
Stop 1.0000 GH	Swee	1.000.000		300 kH	#VBW 3		Hz	30.0 MHz BW 1001	
125605970		000000		m	42,512 dBm 48,472 dBm 48,490 dBm	120.21 MHz 216.24 MHz 264.74 MHz			1 1
									6 7 8 9 0 1
		atatua	16						44

a Aginet Spectrum	N SI D	54- 16	T sease a	in .	A39 AITP		11.09	36 PM Jul 30, 21
Marker 24.	81200000	FNC		: Free Run en: 30 dB	Avg Type Avg/Hold	>100/100		Set PANAN
10 dBJdiv F	tef Offset 1.5 Ref 20.00 d					_		.812 GH 362 dBn
100			Q1					
000						-		41.11.4
0.0							-	
0.0								▲2
0.0	_		la la	_		-		
0.0			and Determined	Rawlin Arter	- Arrison and a state of the st		*****	
tart 1.000 (Res BW 10			#VBW 30	0 kHz		Swee	Stop p 13.00 mit	5.000 Gi (1001 pt
	1	2.408 GHz	8.380 dBm	FURSTOR.	1000000000		CONTRACTOR OF THE	
3	-	4.812 GHz	43.362 dBm					
5 6 7	-							
8								
	_	1						1.14
KG					atafua			

SE Aginet's	chun Andytai Tan	ept SA	1 1010	1	620V 6/10		12 (54 57 79) (4 3	
Marker 1	7.2150000	000000 GHz	Test CD TH	g: Free Run ten: 30 dB		Log-Pwr >100/100	TRACE 3.2 Type How Set P N	141.
10 dBJdiv	Ref Offset 1 Ref 20.00						Mkr1 7.215 (-47.949 d	
10.0						-		-
0.00	-					-		-
30.0				_		-		-
30.0								
40.0		_		v—	_	-		-
-50.0								
-00.0	Selected Ballington		okenen Prist	and the second second	terrer all all all and a second		فجيلج ومحدة	-
Start 5.0							Oto - 10 000	-
	100 GH2		#VBW 30	0 kHz		Sweep	Stop 10.000 16.27 ms (1001	
1 N		7.215 GHz	47,949 dBm	TIRE I GR	Consideration of the		CARGARINE.	
2								3
4 5 6 7								=
7								=
8 9 10								킛
11	1.1	-						-
etsi3					atefua			

C Aginet Spectra	W SED A			THE INT	A20VAITD	1		1 #14 34 30, 21
			FNO: Fast IGaint.ow	Trig: Free Run Atten: 30 dB	Avg Typ Avg(Hold	e Log-Pwr I>100/100		ICE 1 2 3 4 3 ICE HOMMONY ICE PANNS
	Ref Offset 1.5 dE Ref 20.00 dBr							
10.0	_					-		
00	-							
0.0	_						-	44,94.4
0.0						+	-	
0.0	-	-			_	-		
0.0	-	-			_		-	
0.0								
0.0	Paral Par	and destroys	and and a straight		******	and the second second		
20		1			-			
tart 10.00 Res BW 1			≠vBW	300 kHz		Swee	Stop 1 p 16.27 ms	5.000 GH (1001 pt
	100			Fight los	FIRETON HERE		ORCTON VALUE.	
2								
4								
6				_				
8				-				
9		_						
					1			1.14
44					aterus			

E Aphiet ly	utturn Analyzar I Sove	er SA	1 1 10	a Mit	ALCON AUTO		00	0.21 PH Jul 20, 21
Stop Fre	eq 20.00000	0000 GHz	PNC Fast	Trig: Free Run Atten: 30 dB	Avg Typ Avg/Hold	e Log-Pwr 50/100		THE LUBAN
O dEMain	Ref Offset 1. Ref 20.00							
10.0	-	-			_	-	-	-
0.00								41.914
0.0	_	_			_	-	-	-
0.0			+ +			-	-	
0.0								
		-dolumente	monterio					- warm
00			_				-	
	000 GHz / 100 kHz		¢∨BW	300 kHz		Swee	Stop p 16.27 m	20.000 GH
			_	Factor	Responsible		FUNCTION VALUE	_
2	++		-	-				
6								
7 8								
9								
11	1.1		1		10			
86					atenus			

	25.000000000 GHz		ur Jam Trig: Free Run	ADDV AITD Avg Typ Avg Hold	e Log-Pwr 36/100	12:10:49	PH 10 30 21
	Ref Offset 1.5 dB		Atten: 30 dB			3	n P.444A
10 dEUdiv F	Ref 20.00 dBm	-			1		
0.00				-	-		
0.0							41,91
0.0							
0.0 		an and a second second	-			+	
0.0				-	-		_
tart 20.000 Res BW 10		#VBW	300 kHz		Swee	Stop 25 p 16.27 ms (
Non training		_	1025102	165300TESIO		SCADOLOUIN	
2		-					
4 6 7 8							
9 0 1							
	24	2	-	374740			_

Channel 36, Frequency: 2440.192MHz

larker 4 264.7400	19		g: Free Run ten: 30 dB	Avg Typ Avg/Hold	e Log-Pwr 1>100/100		28 PH Jul 30, 291 Hugg 1, 2, 3, 4, 5 Total House Set P NNNN
o dBJdiv Ref 20.00							4.74 MH
0.00			_	_	-		
0.0			_		-		0.754
	4						
· G	0. •						
1.1.5	1 11	2 1 2 1 ····	1.1		- Concept		www.
00 - welder March	Harder	والمعالمة المعالمة الم		euroren (warner		******
an and Ministry	-	ئىد لىلىلىك #VBW 30		4 -1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		Stop p 3.200 m	1.0000 GH
tart 30.0 MHz Res BW 100 kHz	120.21 Mer	-	0 kHz		Swee	Stop sp 3.200 m	1.0000 GH Is (1001 pt
art 30.0 MHz Res BW 100 kHz I N r I N r I N r	120.21 MHz 124.5 MHz 210.24 MHz 254.74 MHz	#VBW 30 #VBW 30 42.726.dBm 48.011 dBm 49.802.dBm 48.035.dBm	0 kHz		Swee	ep 3.200 m	1.0000 GI s (1001 p
tart 30.0 MHz Res BW 100 kHz	112,45 MHz 216,24 MHz	42.726 dBm 48.111 dBm 49.802 dBm	0 kHz		Swee	ep 3.200 m	1,0000 Gł

E Aglait lyn	ettern Analyzak - Sole	pr SA	1 10011		A30VAITD		1000	2 PH IN 30, 211
Marker 2	2 4.8800000	PM	Test Co Trig	: Free Run en: 30 dB	Avg Type Avg/Hold	Log-Pwr 100/100	18	12345 12345 100 F M M N
10 dBJdiv	Ref Offset 1. Ref 20.00						Mkr2 4. -43.0	880 GH2 513 dBm
10.0			Q1					
0.00								0.0.0
20.0	_	_			_			
40.0							-	
50.0			Anna		man			
20.0	i i i i i i i i i i i i i i i i i i i					-		
tart 1.00 Res BW	00 GHz / 100 kHz		#VBW 30	0 kHz		Swee	Stop p 13.00 ms	5.000 GH (1001 pt
1 N 2 N 3		2.440 GHz 4.880 GHz	8.458 dBm 43.513 dBm	ractor			JACTON WILLE	
4 5 6								
7 8 9								
10	11							- +
90					atetua			

R Aglert Spectrum Analyze	STO AC	1 1 10	(1.14T)	ADDV AITD		12.1+31 PK/M 30.211
		PRO Last (C)	Trig: Free Run Atten: 30 dB	Avg Type Avg Hold	Log-Pwr 100/100	THE REAL
	et 1.5 dB .00 dBm					
10.0		-		-		
0.00						
NG.D						0.75.4
0.0						
40.0						
90.0						
0.0		-and Marken		man		
70.0						
Start 5.000 GHz Res BW 100 kHz	15	#VBW	300 kHz		Sweep	Stop 10.000 GH 16.27 ms (1001 pt
1000 1000 1000			100100	Concentration Inc.	100	1021200
2		-				
4 5 6 7						
7		-				
8		-				
10						
				atetus	_	
				10100		

E' Agèlet Spectrum Analysi	a - Sweet SA	1 1 10	41 JAT	AJON AITD		1217-61-2614 20.10
Stop Freq 15.00	0000000 GHz		Trig: Free Run Atten: 30 dB	Avg Typ Avg/Hold	Elizabilitation	194428 3 2 3 4 7.992 H 49444 3821 F 16 16 M
	set 1.5 dB 0.00 dBm					
10.0					-	
0.00					-	
0.0				_		4.0.4
0.0				_	-	
0.0		+ +		_	+	
0.0				_	-	
0.0				_	-	
0.0			ALCONTROL OF		all the second shirt	and the second s
00		-		_	-	
tart 10.000 GHz Res BW 100 kH		¢vbw	300 kHz		Swee	Stop 15.000 GF p 16.27 ms (1001 pt
21 COO 112 CO			Tate Los	CONTRACTOR OF		CONTRACTOR NO.
2						
4						
5						
5 7 8						
9						
ii		-				
and line			w11-5	atatua		

E' Agiled Spectrum A	F SED AC	1 1 100	1.01	4304 A/T2		12.17	14 294 34 30, 211
top Freq 20	0.000000000 GHz	INCLUS CO.	Trig: Free Run Atten: 30 dB		Log-Pwr 66/100	. 10	INTER DUILAN
	f Offset 1.5 dB f 20.00 dBm						
10.0					-	-	-
0.00							0.74
0.0				_	-		
0.0		-		-	-		
0.0							
0.0	- warden the man	mensensen				-	
0.0				_		-	
tart 15.000 G Res BW 100		#VBW	300 kHz		Swee	Stop 2 p 16.27 ms	0.000 GH (1001 pt
		-	Function	TANKING MUTO		COAD CHURCH	
3		-	-				
6							
7 8		-					
9							
ni 1 1	1	1		0			1.19
46				385×568			

E Aglert Sportrum Analyzer - S	longer S.R						1.2.5
Stop Freq 25.0000	and the second sec	PACIENT (C)	trig: Free Run Atten: 30 dB	Avg Typ Avg Hold	e Log-Pwr 51/100	19408	1 2 3 4 5 F NNNN
to dB/div Ref 20.00							
10.0					-		_
10.0				_			0.7.4
0.0							
40.0	w. Harrison and the second second						
40.0							
Start 20.000 GHz #Res BW 100 kHz		#VBW	300 kHz		Swee	Stop 25.0 p 16.27 ms (1	000 GH
1		-	1025102	anter sectors of		ACRONAL D	
4			-				_
6 7 8							_
9 10 11							
		<u></u>		10			1.14

Apiert Sportrum Analyze - Swee	r34	1 mail		ADD AITD		11.20	37 PH M 30, 211
Marker 3 216.24000	PM.	Test Co Tri	p Free Run en: 30 dB	Avg Typ	e Log-Pwr I>100'100	+	THE PANAN
Ref Offset 1.5 10 dB/div Ref 20.00 d							6.24 MH 633 dBn
10.0							
10.0			_	_	-		-119-15
0.0					-		
800 LIA	1 111		1.1		-		
00.0	لناجحه فارجلها	التحو الدام الم	out-selentese			-	
atart 30.0 MHz Res BW 100 kHz		#VBW 30	0 kHz		Swee	Stop p 3.200 mit	1.0000 GH
	120.21 MHz	-44.591 dBm	10001000	BARROOTENIO		CONTRACTOR NAME	
	112.45 MHz 216.24 MHz	44.591 dBm 46.769 dBm 47.633 dBm					
5 6 7 8							
9 50 51							
60				atetua	1		- *

	NY 151	0 10	. I wast	in .	NJIN AITD		ili	17.31 PH Io 30, 21
larker 2	4.956000	000000 GHz		: Free Run en: 30 dB	Avg Type Avg/Hold	Log-Pwr >100/100		TRACE 3 2 3 4 1 TOTE HOMMON SET F N N N N
0 dBJdiv	Ref Offset						Mkr2 -4	4.956 GH 2.040 dBr
00			0 ¹			-		
00						-	-	-
0							-	-1.97
10						-		
i 0				-		-	-	-
10			Manne					1
10 4.00	andres							
tart 1.00 Res BW	00 GHz 100 kHz		#VBW 30	0 kHz		Swe	Sto ep 13.00 m	p 5.000 Gi ns (1001 p
1 (1000 H	3103	2.476 GHz	7.166 dBm	10001000	Tank on Falls		CONTRACTOR OF	_
N N	1	4.966 GHz	42.049 dBm					
5								
6: 7 8							_	
9								
1	1.1	1			10			
6	_				387×FUB			

. W	SED NC .	1, 11	THE RM	4304 AIT2	per Log-Pwr	12/22/52 PHONE 30: 2 THURK (1, 2, 3, 4
		PNC: Fast	Trig: Free R Atten: 30 dl	un Avg/Ho	pe: Log-Pwr (d:>100/100	TIPE HONOR
o dBldiv Ref 20.	et 1.5 dB .00 dBm					
100					-	
00						
0.0					-	
0.0					-	
0.0		-				
0.0						
0.0					-	-
	A state of the state of the state	and and served	an and shaked age	- market and	minun	
0.0						
0.0					-	
tart 5.000 GHz			W 300 kHz		Swee	
art 5.000 GHz Res BW 100 KHz				CR FUNCTOR HOTS		
tart 5.000 GHz Res BW 100 kHz				con Punction Addre		p 16.27 ms (1001 p
tart 5.000 GHz Res BW 100 kHz						p 16.27 ms (1001 p
tart 5.000 GHz Res BW 100 kHz						p 16.27 ms (1001 p
tart 5.000 GHz Res BW 100 kHz				Com Lensensed		Stop 10,000 G p 16.27 ms (1001 p
tart 5.000 GHz Res BW 100 kHz						p 16.27 ms (1001 p
tart 5.000 GHz Res BW 100 KHz						p 16.27 ms (1001 p

E Aglast Spectrum Analyza	Sweet SA	1	10.000	A30A4/0		12274	PH Ju 30, 21
Stop Freq 15.000		PNC Fait	Trig: Free Run Atten: 30 dB		Log-Pwr 34/100	10	E P NNAT
Ref Offse 0 dBJdiv Ref 20.							
100					-		
0.000					-		_
0.0					-		-1914
0.0					-		
0.0				-	-		
0.0				_			
0.0				meretaniana			-
0.0			Appression				
	100						
tart 10.000 GHz Res BW 100 kHz		#VBW	300 kHz		Swee	Stop 15 p 16.27 ms	.000 GH
21 1000 100 100			Factor	Transportation	-	CONTRACTOR OF	
2							
4 5 7 8							
8		-					
9							
511 I I I		-					1.14
De				atatua			

E Aginet lyn	ettern Analysis Son	arsa.	1	NO. 141	ALCON AUTO		11/22	11 PN IN 30, 21
top Fre	eq 20.00000	0000 GHz	PNC Fast G	Trig: Free Run Atten: 30 dB		Log-Pwr 49/100		THE HOME
o dBJdiv	Ref Offset 1 Ref 20.00							
10.0					-	-		-
0.00								-139.4
0.0	-	-			-	-	-	
0.0					-			
0.0								
0.0	and the second	*******		haloud to an a start of the	-			
00		10	-			1		
	000 GHz / 100 kHz		#VBW	/ 300 kHz		Swee	Stop p 16.27 m	20.000 GH s (1001 pt
	12122		-	Partice	10050011000	_	CONTRACTOR IN	
2			-					
6								
7								
9			-					
-			2					- 198
-					354750			

SE Aglast Spec	thum Analyzes Swept SA	5	and the second sec					
Stop Fre	q 25.0000000	PM	Ter (7)	Trig: Free Run Atten: 30 dB	Avg Tys Avg Hol	e Log-Pwr £ 78/100	10	12 PH 16 30, 211 UCR 1 2 3 4 5 SET F NNNN
10 dBJdiv	Ref Offset 1.5 dB Ref 20.00 dBr							
0.00			-			-		
10.0						-	-	-114-00
30.0								
-00			_			-	0.22	-
40.0								
70.0								
Start 20.0 #Res BW			#VBW	300 kHz		Swee	Stop 2 p 16.27 ms	5.000 GH
120 1200 10	3150			10001000	Time on Hello		ISSN035588	_
2 3 4								_
4 5 7 8 9		_						_
8								_
10	11	1			1 1			
ersil.					atefua			

9. BAND EDGES MEASUREMENT

9.1. Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24

9.2. Block Diagram of Test Setup

The same as section.4.2.

9.3. Specification Limits [§15.247(c)]

The highest level should be at least 20 dB below of reference level.

9.4. Operating Condition of EUT

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

9.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

9.6. Test Results

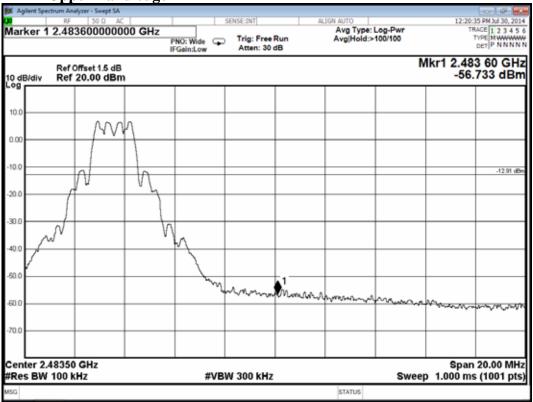
PASSED. All the test results are attached in next pages.

Test Date : 2014. 07. 30 Temperature : 25 Humidity : 46%



Below Band edge

Upper Band edge



10. POWER SPECTRAL DENSITY MEASUREMENT

10.1.Test Equipment

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

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24

10.2.Block Diagram of Test Setup

The same as section.5.2.

10.3.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.

10.4. Operating Condition of EUT

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

10.5.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.

The measurement guideline was according to KDB 558074 D01 DTS Meas Guidance is v03r02.

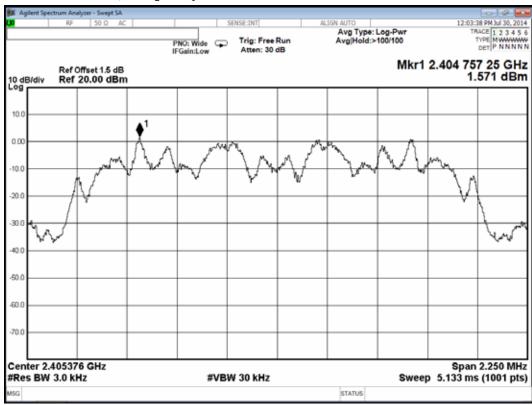
10.6.Test Results

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

Test Date : 2014. 07. 30 Temperature : 25

Mode	Channel	Frequency	Power Spectral Density (dBm)
1.	CH 02	2405.376MHz	1.571
2.	CH 36	2440.192MHz	1.640
3.	CH 72	2477.056MHz	0.585

[Limit: 8dBm]



Channel 02, Frequency: 2405.376MHz



Channel 36, Frequency: 2440.192MHz

Channel 72, Frequency: 2477.056MHz



11.DEVIATION TO TEST SPECIFICATIONS

[NONE]

12.PHOTOGRAPHS

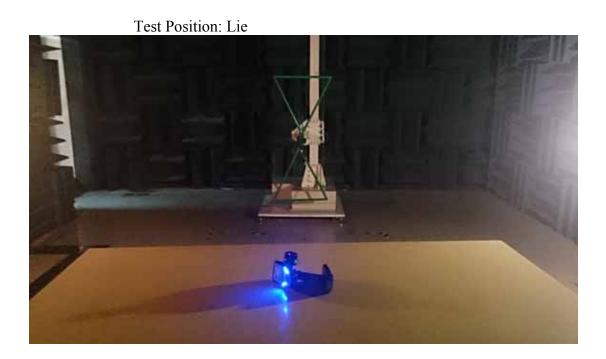
12.1.Photos of Radiated Measurement at Semi-Anechoic Chamber 12.1.1.Frequency Range 30MHz~1GHz,

Test Position: Stand



Test Position: Side





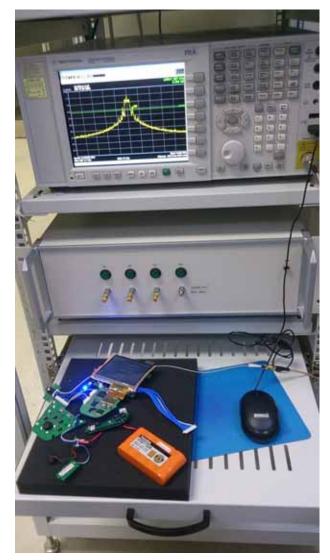
12.1.2.Frequency Range Above 1GHz Test Position: Stand





Test Position: Lie





12.2.Photo of Section RF Conducted Measurement