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

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TEST REPORT CERTIFICATION

Applicant	:	FUTABA Corporation
Manufacturer	:	FUTABA Corporation
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
(Tina Huang/Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

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	1/2λ 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	± 2.74dB
	Above 1GHz	± 5.02dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dBm
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:

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

Item	Type	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)

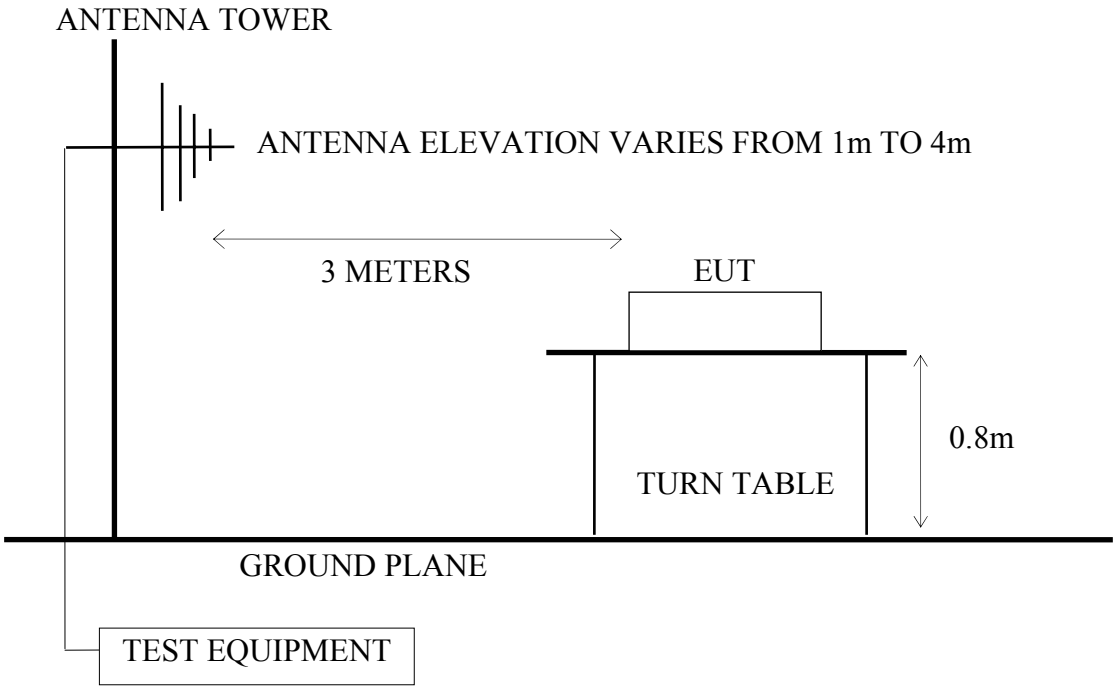
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 07. 24
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 23
3.	Pre-Amplifier	HP	8449B	3008A00529	2015. 01. 23
4.	2.4GHz Notch Filter	K&L	7NSL10-2441.5E 130.5-00	1	2015. 06. 12
5.	3G High Pass 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

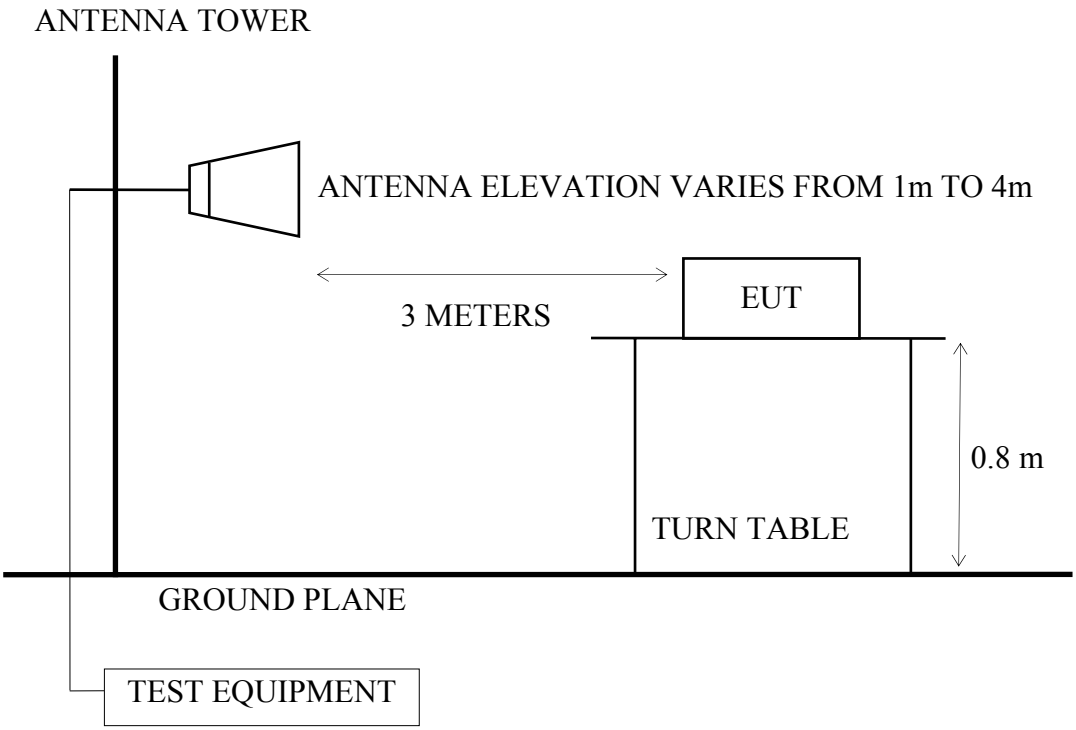
4.2.1. Block Diagram of connection between EUT and simulators

RADIO CONTROL (EUT)

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



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



4.3. Radiated Emission Limits (§15.209)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		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 (dBμV/m) = 20 log Emission level (μV/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 10^{th} 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.

Mode	Channel	Frequency	Test Mode	Position	Reference Test Data	
					Horizontal	Vertical
1.	02	2405.376MHz	Transmit	Stand	# 1	# 2
2.	36	2440.192MHz		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.	02	2405.376MH	Transmit	Stand	1000-2680MHz
2.					2680-4000MHz
3.					4000-5500MHz
4.					5500-7500MHz
5.					7500-18000MHz
6.					18000-25000MHz
7.	36	2440.192MHz	Transmit	Stand	1000-2680MHz
8.					2680-4000MHz
9.					**4000-5500MHz***
10.					5500-7500MHz
11.					7500-18000MHz
12.					18000-25000MHz
13.	72	2477.056MHz	Transmit	Stand	1000-2680MHz
14.					2680-4000MHz
15.					4000-5500MHz
16.					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	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

4.6.1. Frequency Range 30-1000MHz

Transmit, Frequency: 2405.376MHz

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376(FASST)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	101.78	11.03	3.23	11.15	25.41	43.50	18.09	Peak
2	256.01	12.48	4.37	17.59	34.44	46.00	11.56	Peak
3	315.18	13.54	4.83	14.96	33.33	46.00	12.67	Peak
4	381.14	15.15	5.49	14.29	34.93	46.00	11.07	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. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376(FASST)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	55.22	7.22	2.68	25.91	35.81	40.00	4.19	Peak
2	144.46	10.93	3.56	27.05	41.54	43.50	1.96	Peak
3	230.79	11.28	4.20	22.08	37.56	46.00	8.44	Peak
4	521.79	17.27	6.45	18.19	41.91	46.00	4.09	Peak

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

Transmit, Frequency: 2440.192MHz

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2440.192(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	4.32	21.11	37.78	46.00	8.22	Peak
2	389.87	15.32	5.56	12.83	33.71	46.00	12.29	Peak
3	560.59	17.82	6.48	12.99	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.

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2440.192(FASST)

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

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

Transmit, Frequency: 2477.056MHz

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(FASST)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	101.78	11.03	3.23	11.05	25.31	43.50	18.19	Peak
2	183.26	9.15	3.86	12.39	25.40	43.50	18.10	Peak
3	256.01	12.48	4.37	19.04	35.89	46.00	10.11	Peak
4	374.35	15.00	5.43	14.08	34.51	46.00	11.49	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. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(FASST)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	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

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

4.6.2. Frequency Range 4000-5500MHz

Transmit, Frequency: 2440.192MHz

Site no. : Audix NO.1 Chamber Data no. : 7
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2440.192(FASST)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	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.

Site no. : Audix NO.1 Chamber Data no. : 8
Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2440.192(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

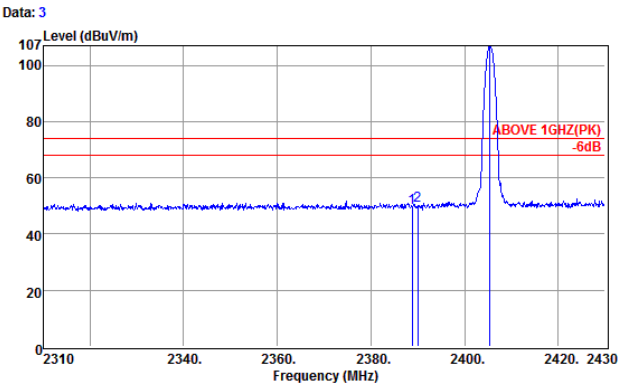
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

4.6.3. Restricted Bands Measurement Results

Date of Test： 2014. 07. 24 Temperature： 23℃

EUT： Radio Control Humidity： 42%

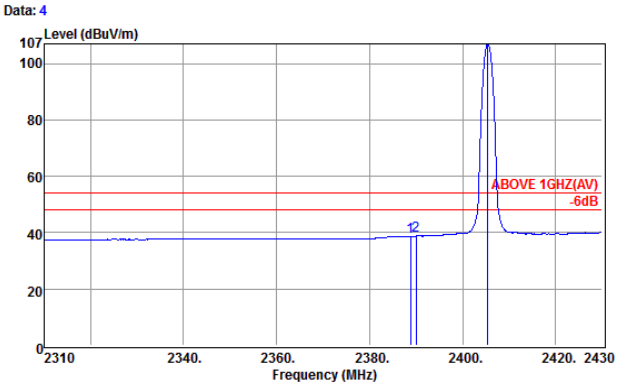
Test Mode： Transmit, Channel: 02, Frequency: 2405.376MHz



Site no. : Audix NO.1 Chamber Data no. : 3
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376 (T-FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2388.84	28.20	5.24	15.83	49.27	74.00	24.73	Peak
2	2390.04	28.20	5.24	16.59	50.03	74.00	23.97	Peak
3	2405.40	28.22	5.26	73.47	106.95	74.00	-32.95	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. : Audix NO.1 Chamber Data no. : 4
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
Limit : ABOVE 1GHZ(AV)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376 (T-FHSS)

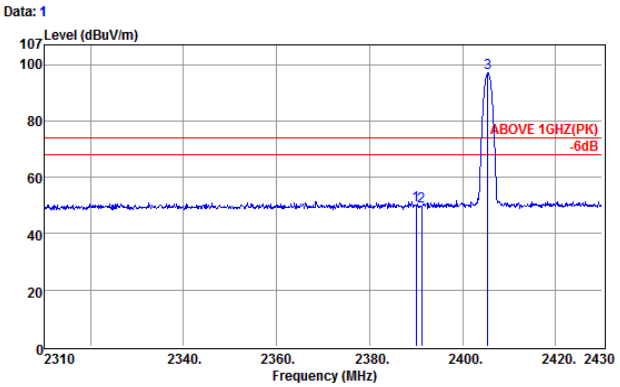
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2388.84	28.20	5.24	5.14	38.58	54.00	15.42	Average
2	2390.04	28.20	5.24	5.38	38.82	54.00	15.18	Average
3	2405.40	28.22	5.26	73.43	106.91	54.00	-52.91	Average

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： 2014. 07. 24 Temperature： 23℃

EUT： Radio Control Humidity： 42%

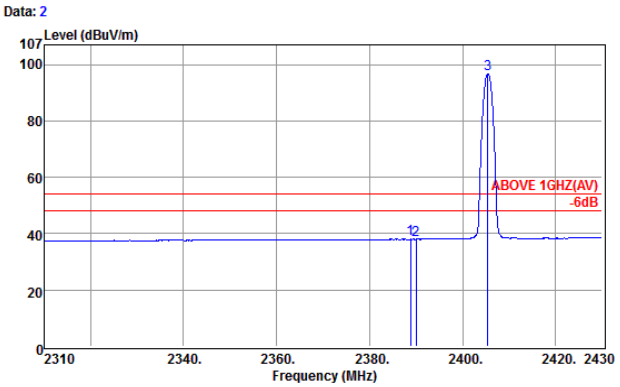
Test Mode： Transmit, Channel: 02, Frequency: 2405.376MHz



Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376 (T-FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2390.04	28.20	5.24	16.79	50.23	74.00	23.77	Peak
2	2391.24	28.20	5.24	16.27	49.71	74.00	24.29	Peak
3	2405.40	28.22	5.26	63.43	96.91	74.00	-22.91	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. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(AV)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2405.376 (T-FHSS)

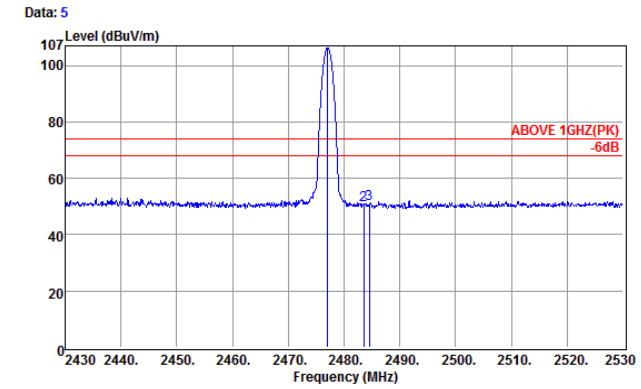
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2388.84	28.20	5.24	4.55	37.99	54.00	16.01	Average
2	2390.04	28.20	5.24	4.55	37.99	54.00	16.01	Average
3	2405.40	28.22	5.26	63.29	96.77	54.00	-42.77	Average

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： 2014. 07. 24 Temperature： 23℃

EUT： Radio Control Humidity： 42%

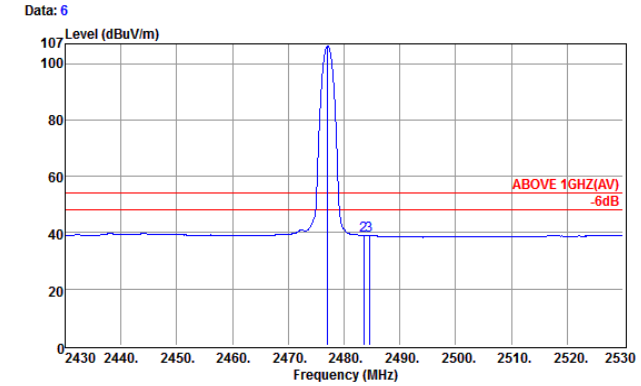
Test Mode： Transmit, Channel: 72, Frequency: 2477.056MHz



Site no. : Audix NO.1 Chamber Data no. : 5
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(T-FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2477.10	28.28	5.36	72.80	106.24	74.00	-32.24	Peak
2	2483.50	28.29	5.37	16.70	50.36	74.00	23.64	Peak
3	2484.50	28.29	5.37	17.21	50.87	74.00	23.13	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. : Audix NO.1 Chamber Data no. : 6
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
Limit : ABOVE 1GHZ(AV)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(T-FHSS)

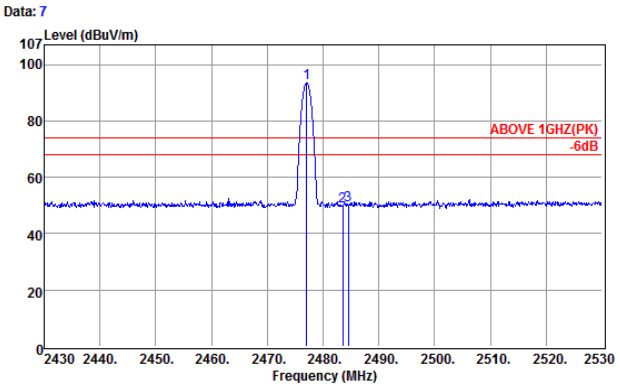
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2477.10	28.28	5.36	72.48	106.12	54.00	-52.12	Average
2	2483.50	28.29	5.37	5.26	38.92	54.00	15.08	Average
3	2484.50	28.29	5.37	5.14	38.80	54.00	15.20	Average

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： 2014. 07. 24 Temperature： 23℃

EUT： Radio Control Humidity： 42%

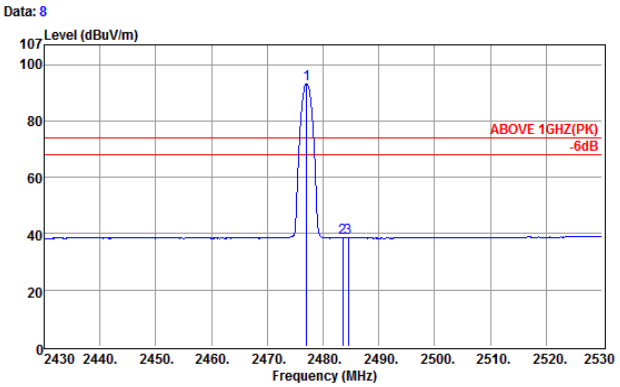
Test Mode： Transmit, Channel: 72, Frequency: 2477.056MHz



Site no. : Audix NO.1 Chamber Data no. : 7
Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(T-FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2477.10	28.28	5.36	59.73	93.37	74.00	-19.37	Peak
2	2483.50	28.29	5.37	16.06	49.72	74.00	24.28	Peak
3	2484.50	28.29	5.37	16.48	50.14	74.00	23.86	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. : Audix NO.1 Chamber Data no. : 8
Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 23*C/42% N9030A(140) Engineer : ken_chen
EUT : T4PX
Power Rating : DC 6.6V
Test Mode : Tx2477.056(T-FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2477.10	28.28	5.36	59.59	93.23	74.00	-19.23	Average
2	2483.50	28.29	5.37	4.77	38.43	74.00	35.57	Average
3	2484.50	28.29	5.37	4.77	38.43	74.00	35.57	Average

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

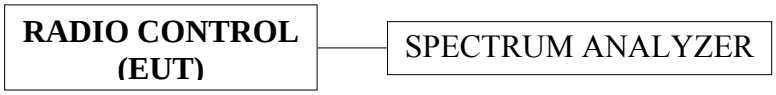
5. 6dB BANDWIDTH MEASUREMENT

5.1. Test Equipment

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

Item	Type	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



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≥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

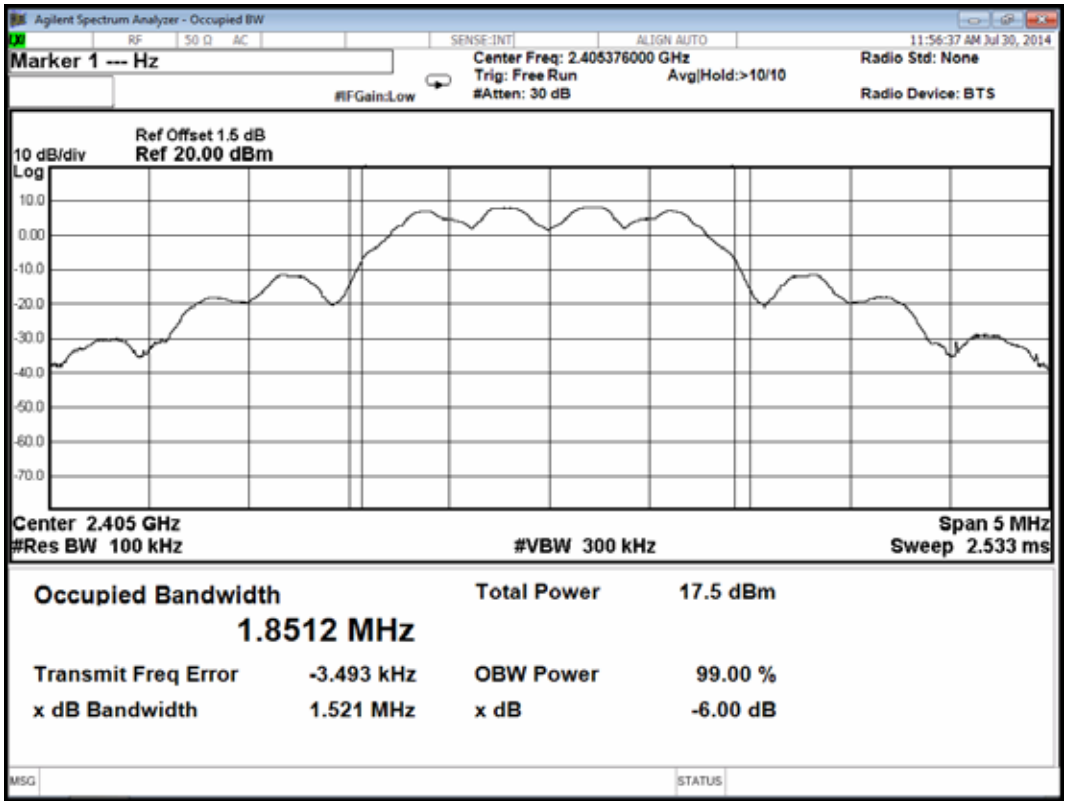
PASSED. All the test results are attached in next pages.

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

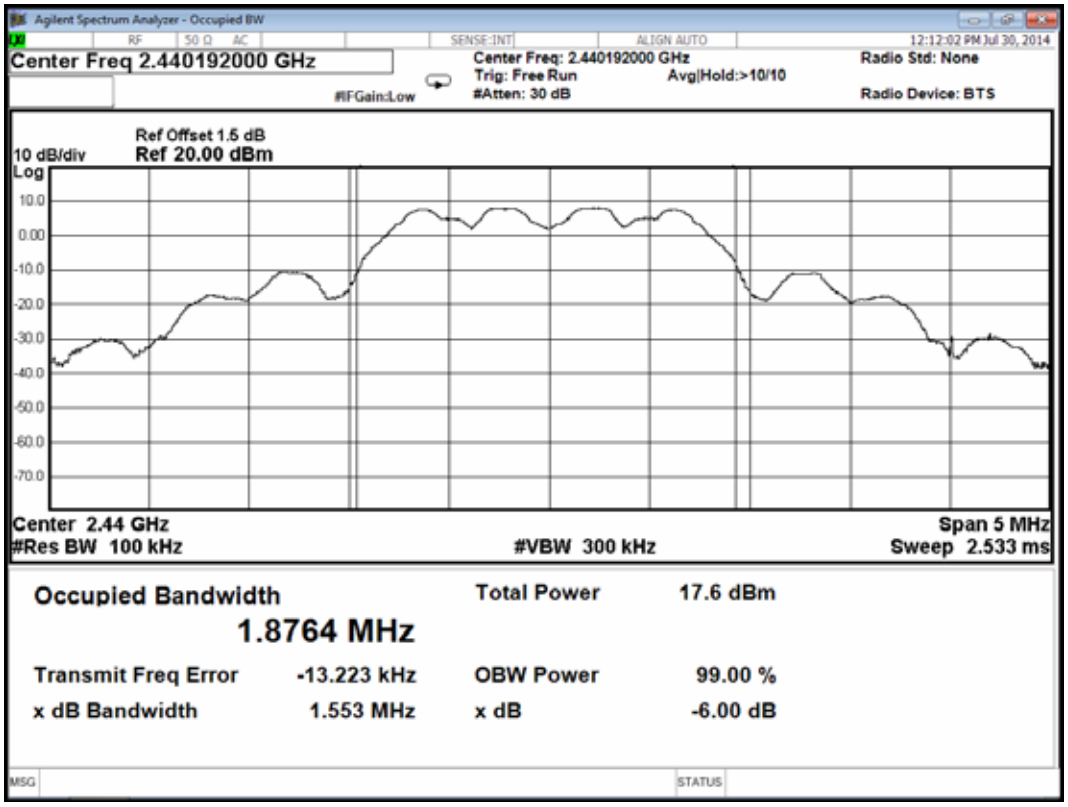
Mode	Channel	Frequency	**6dB Bandwidth (MHz)**
1.	CH 02	2405.376MHz	**1.521**
2.	CH 36	2440.192MHz	**1.553**
3.	CH 72	2477.056MHz	**1.596**

[Limit: least 500kHz]

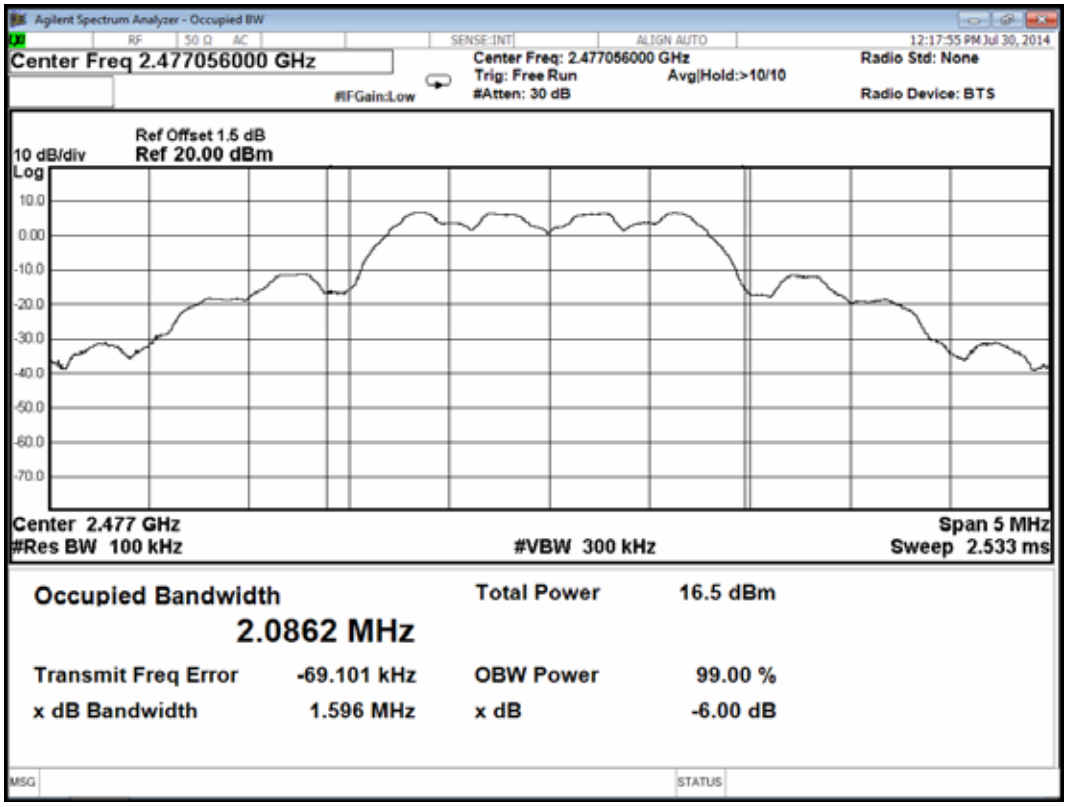
Channel 02, Frequency: 2405.376MHz



Channel 36, Frequency: 2440.192MHz



Channel 72, Frequency: 2477.056MHz



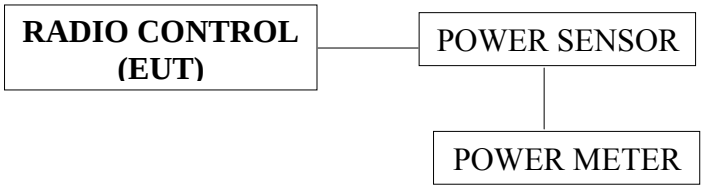
6. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

6.1. Test Equipment

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

Item	Type	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	Type	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.

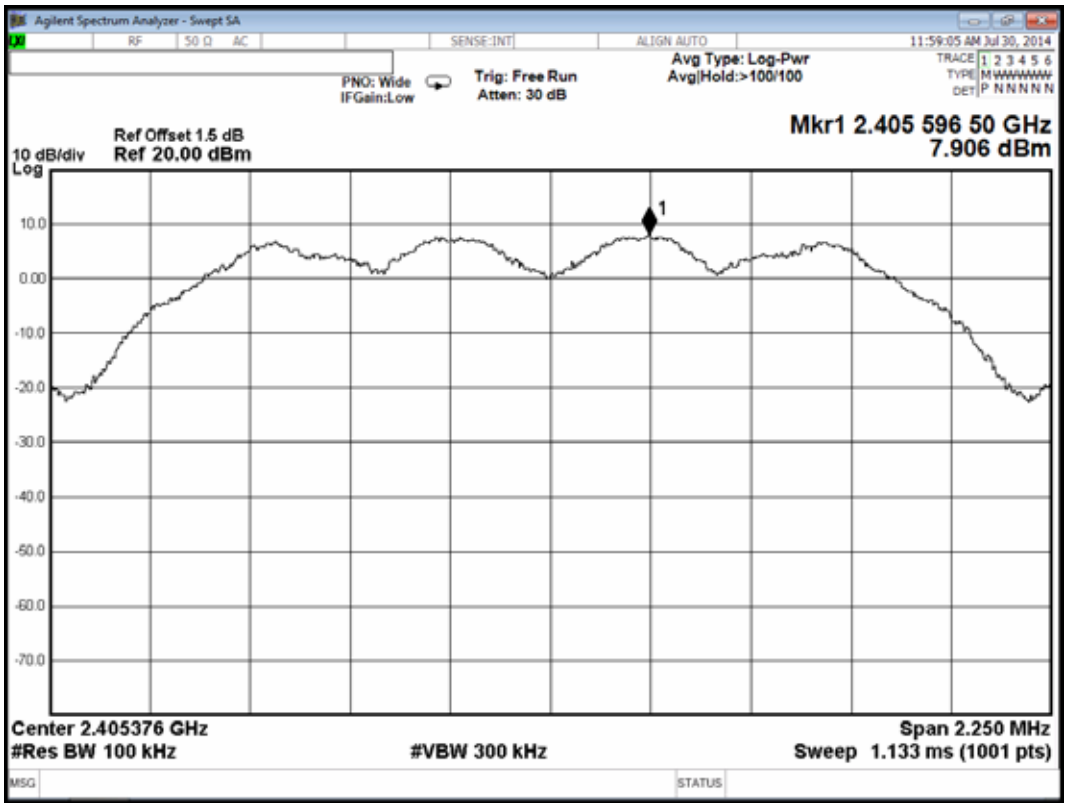
The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

7.5. Test Results

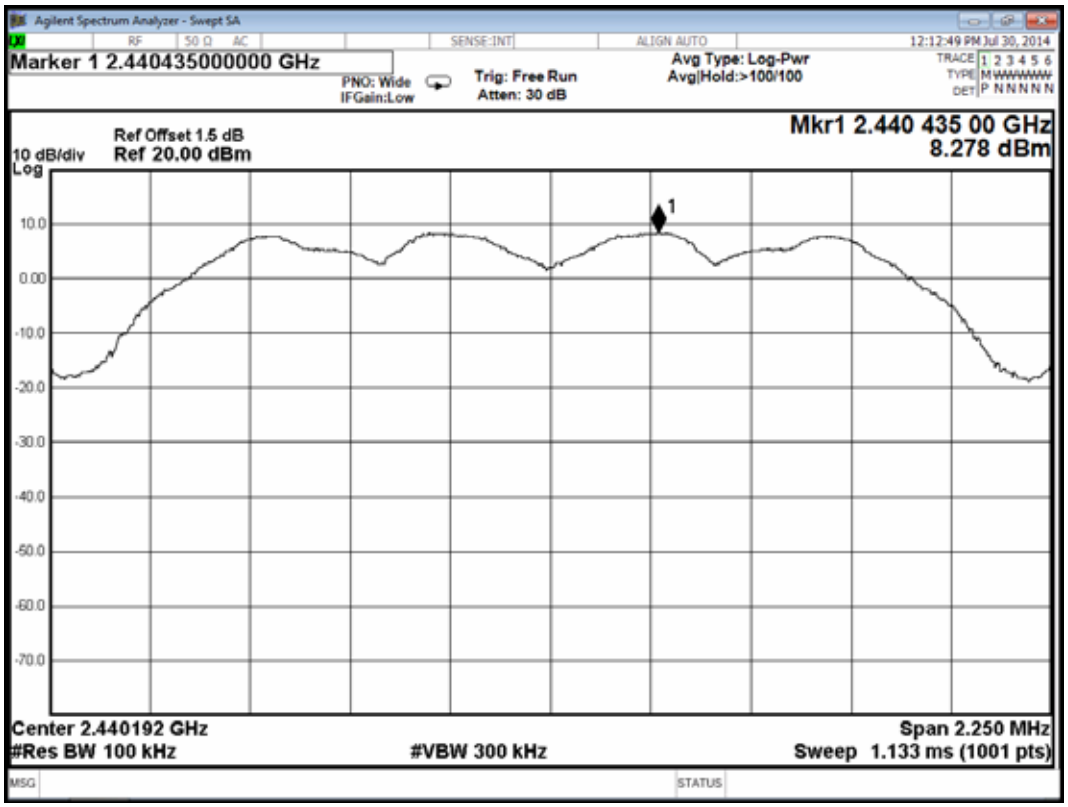
PASSED. All the test results are attached in next pages.

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

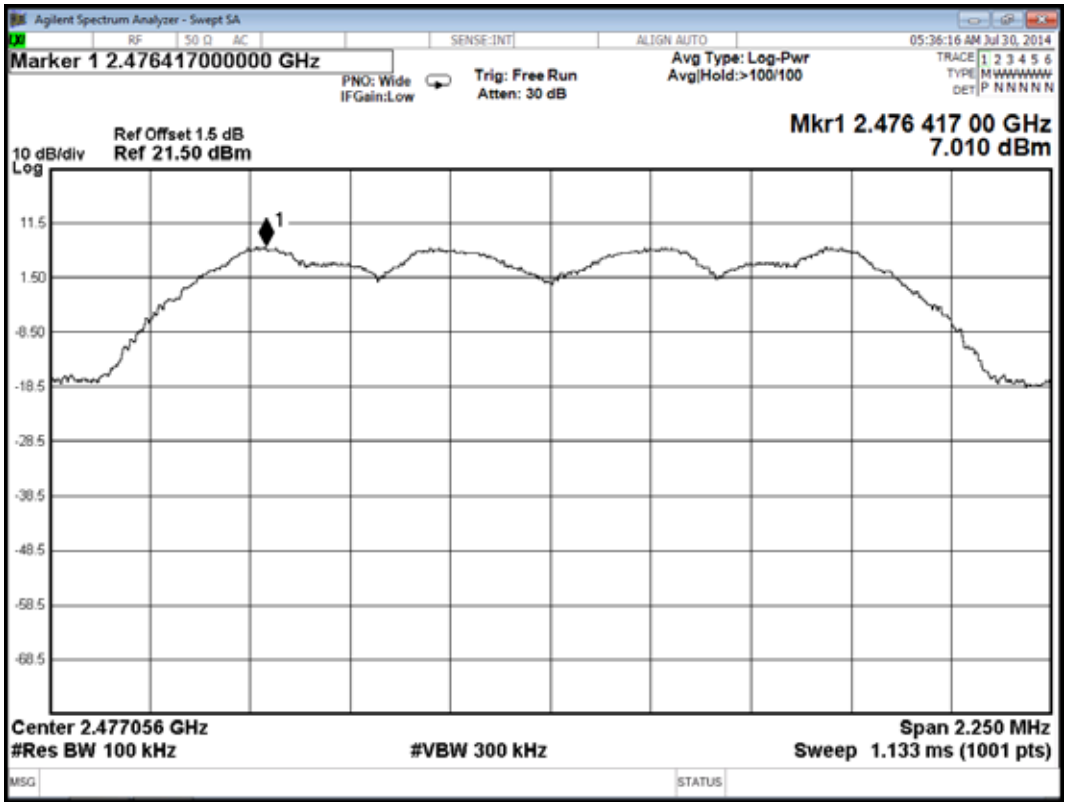
Channel 02, Frequency: 2405.376MHz



Channel 36, Frequency: 2440.192MHz



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	Type	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 15.209(a) (See 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.

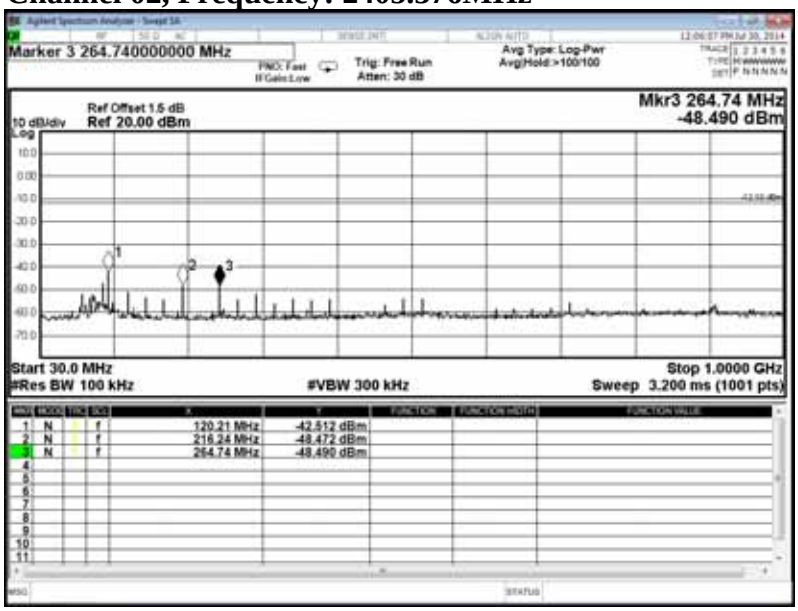
The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

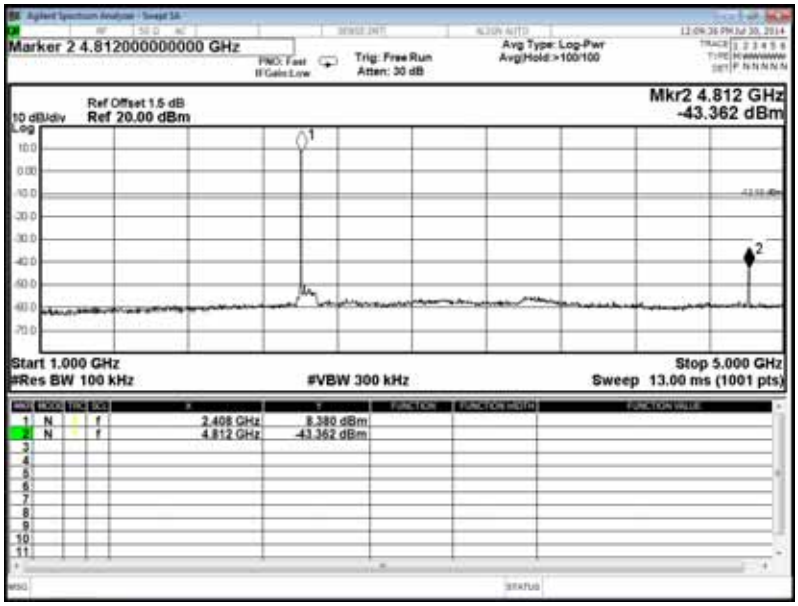
8.6. Test Results

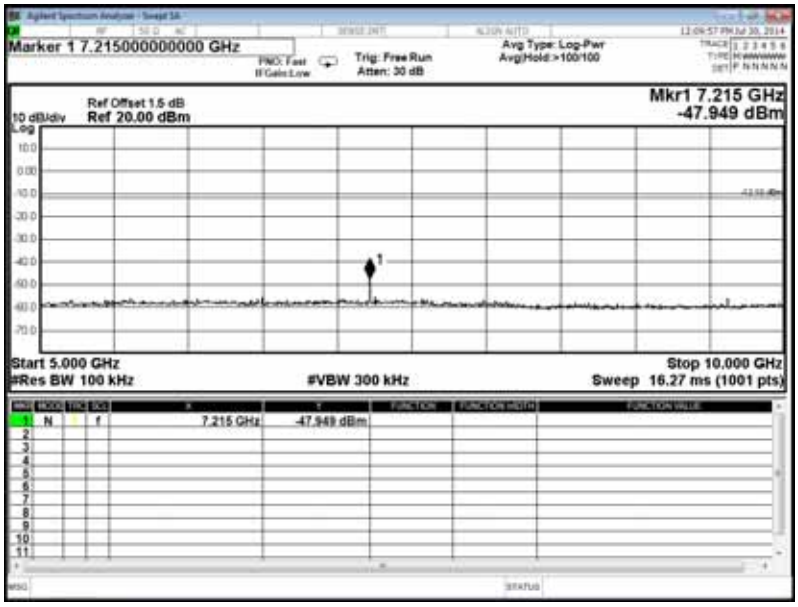
PASSED. The testing data was attached in the next pages.

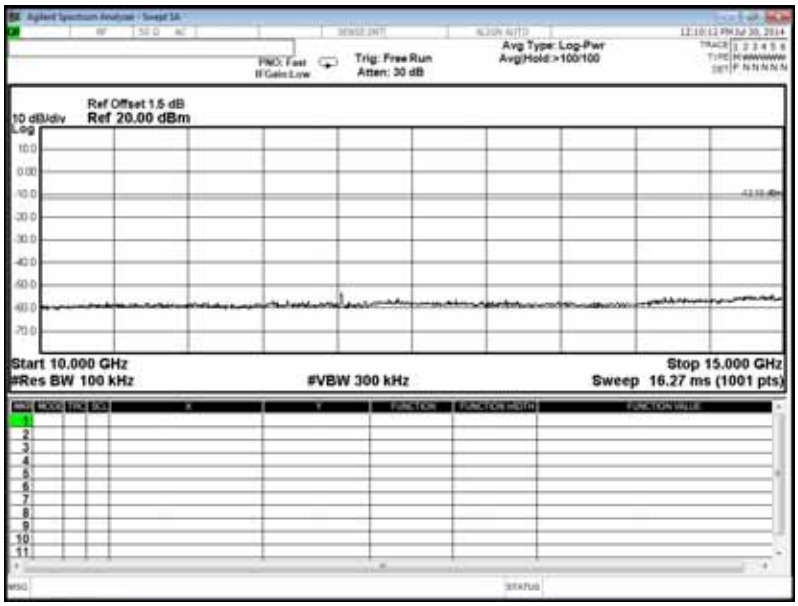
Test Date : 2014. 07. 30 Temperature : 25℃ Humidity : 46%

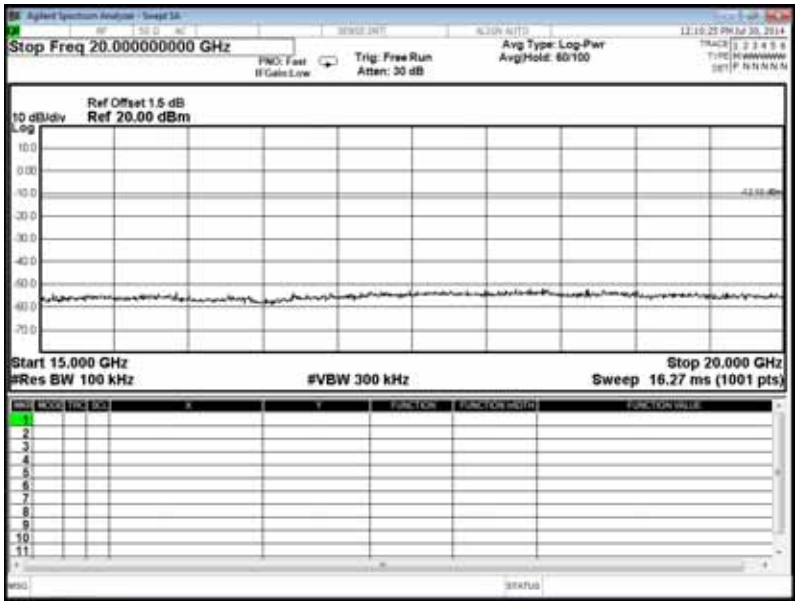
Channel 02, Frequency: 2405.376MHz

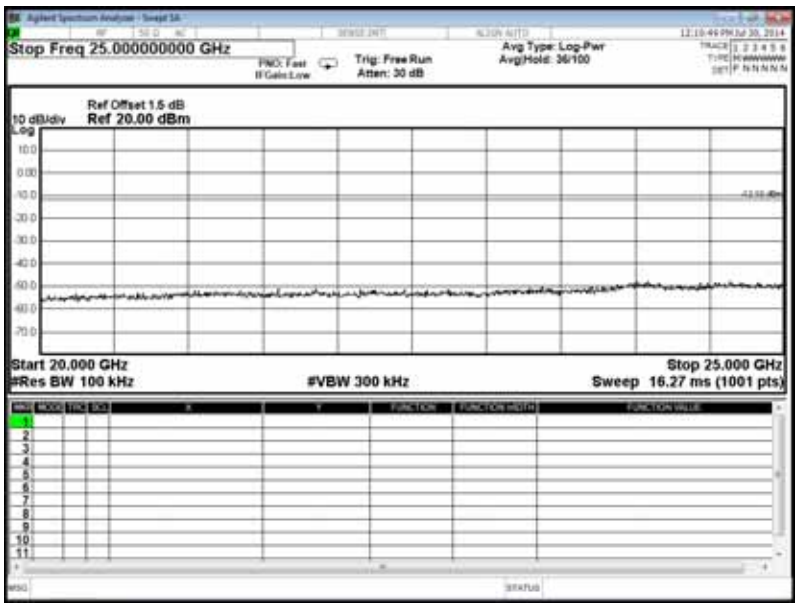




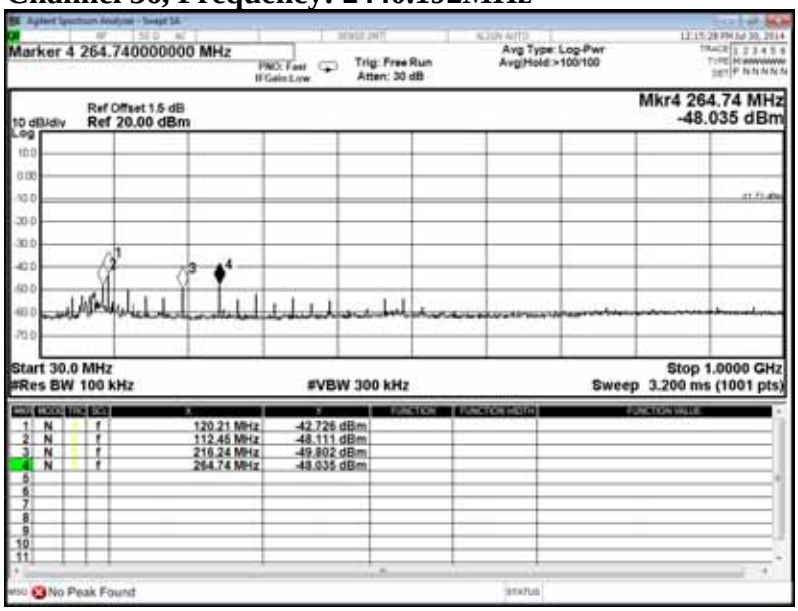


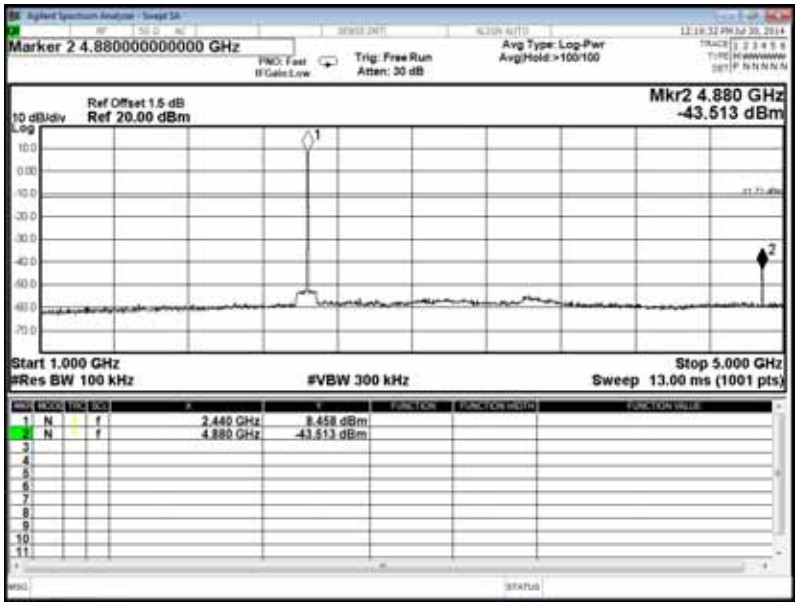

Avg Type: Log-Pwr
Avg|Hold:>100/100
Trig: Free Run
Atten: 30 dB
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 15.000 GHz
Sweep 16.27 ms (1001 pts)

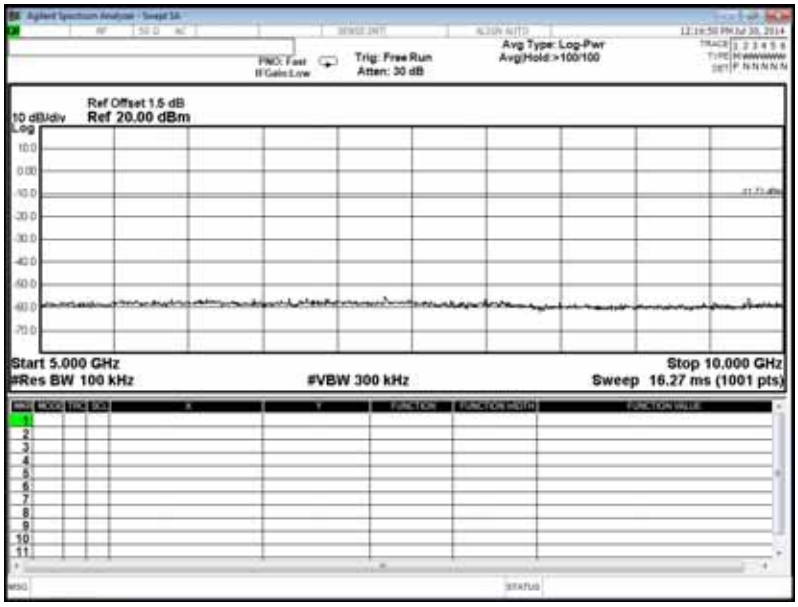

Stop Freq 20.000000000 GHz
Avg Type: Log-Pwr
Avg|Hold: 60/100
Trig: Free Run
Atten: 30 dB
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 20.000 GHz
Sweep 16.27 ms (1001 pts)

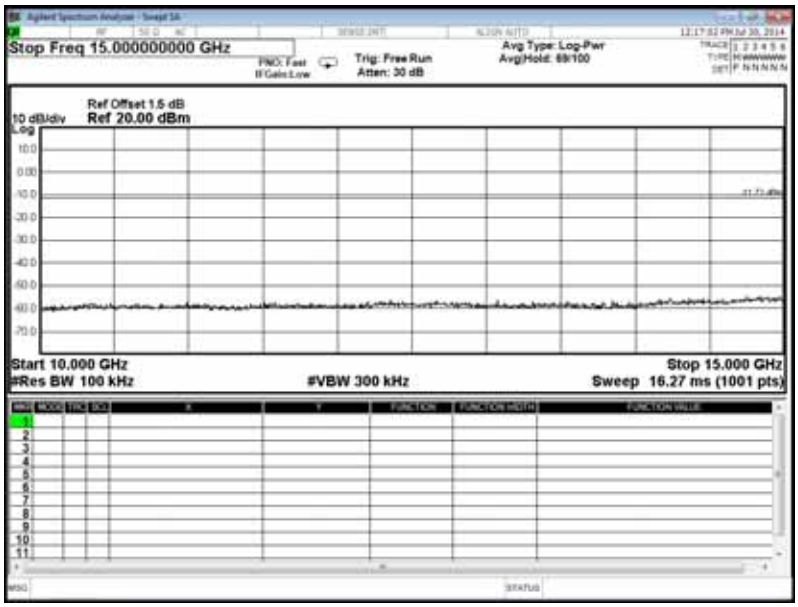

Stop Freq 25.000000000 GHz
Avg Type: Log-Pwr
Avg|Hold: 36/100
Trig: Free Run
Atten: 30 dB
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Start 20.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 16.27 ms (1001 pts)

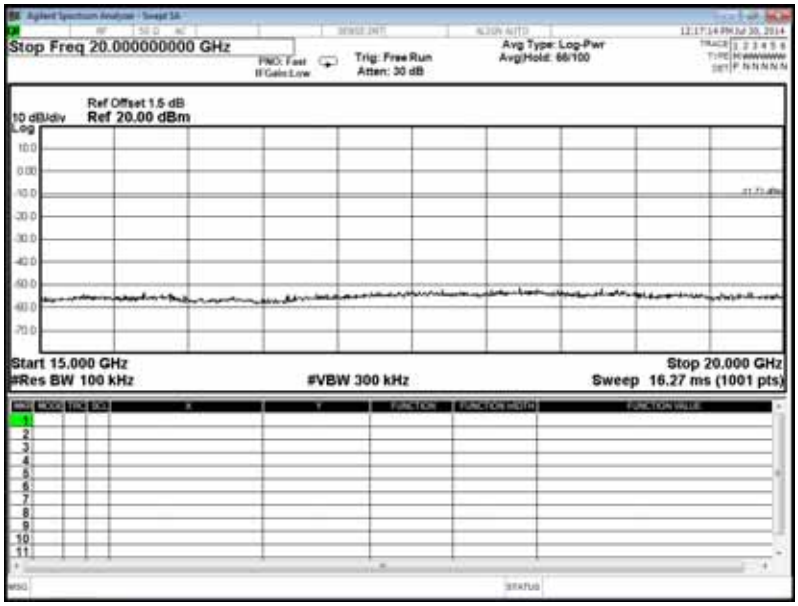
Channel 36, Frequency: 2440.192MHz

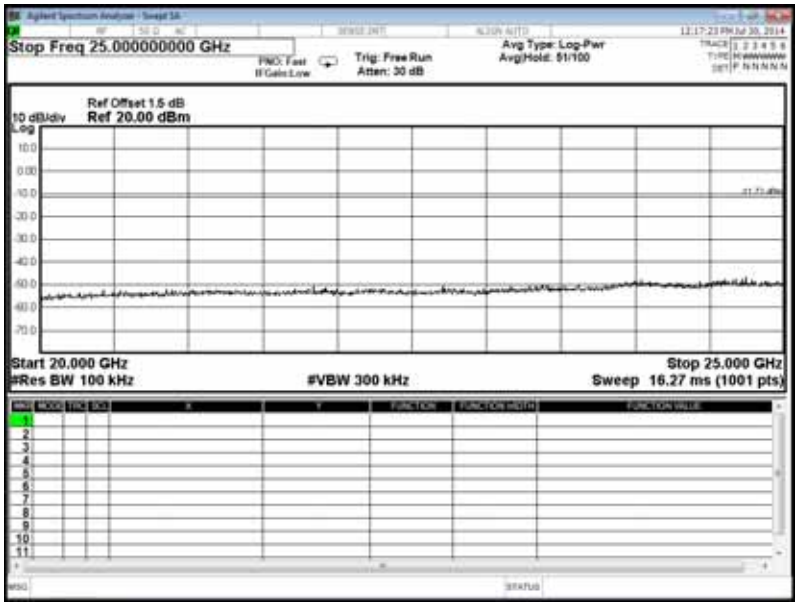




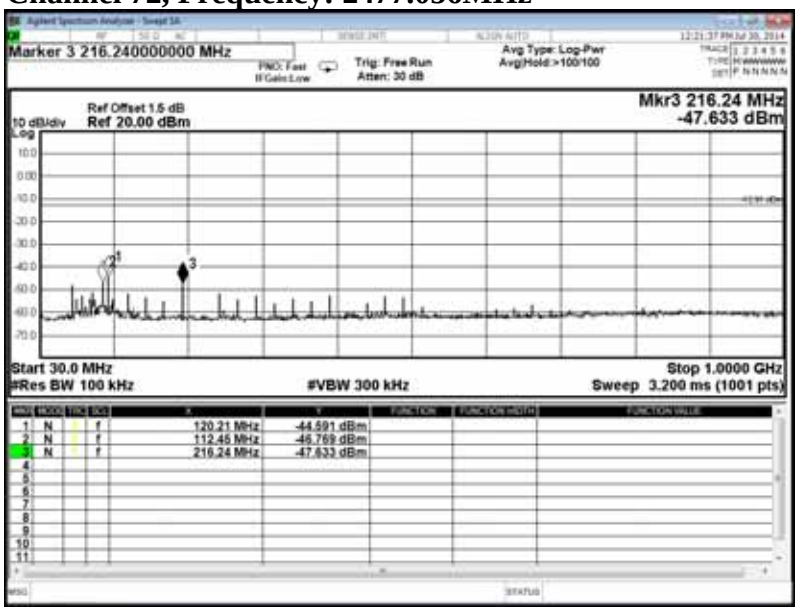


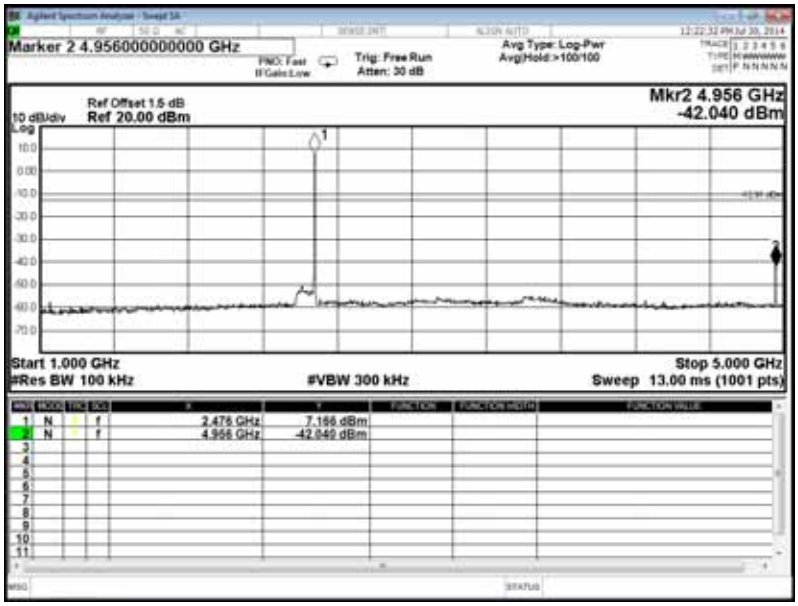

Stop Freq 15.000000000 GHz
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 69/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 15.000 GHz
Sweep 16.27 ms (1001 pts)

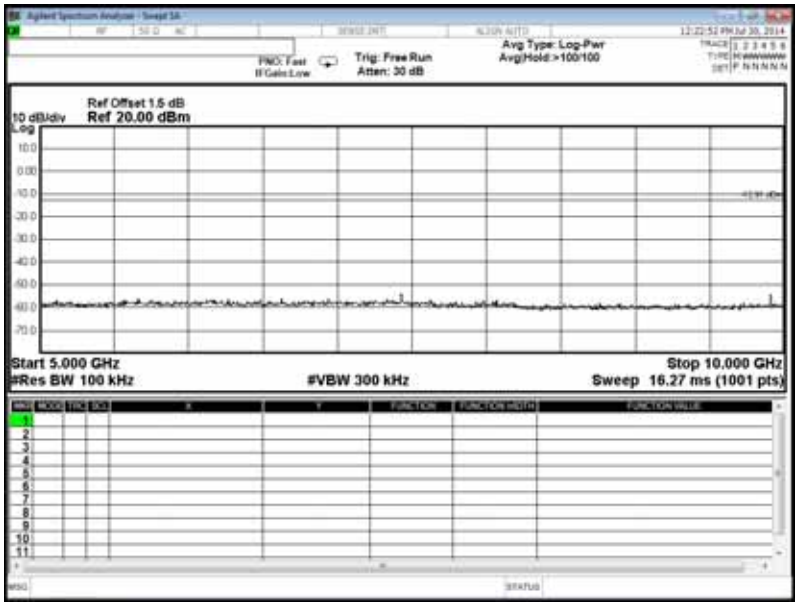

Stop Freq 20.000000000 GHz
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 66/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 20.000 GHz
Sweep 16.27 ms (1001 pts)

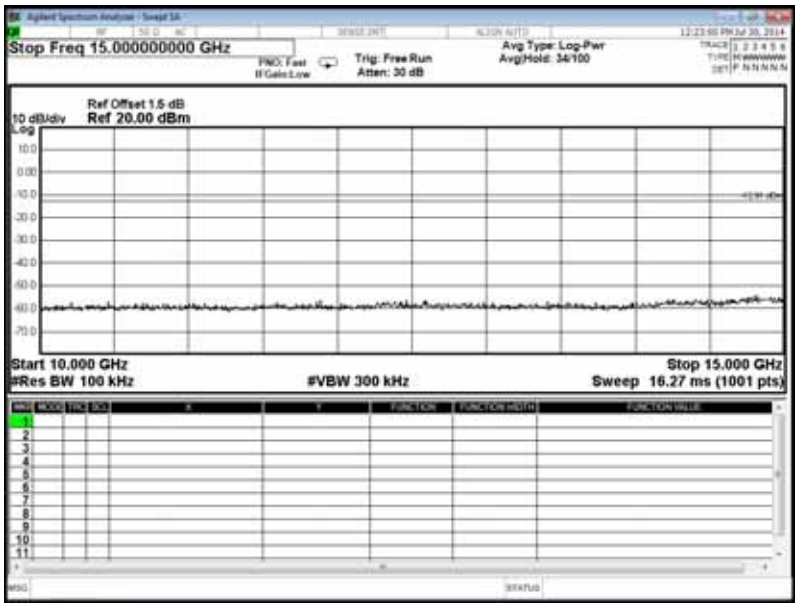

Stop Freq 25.000000000 GHz
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 51/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 20.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 16.27 ms (1001 pts)

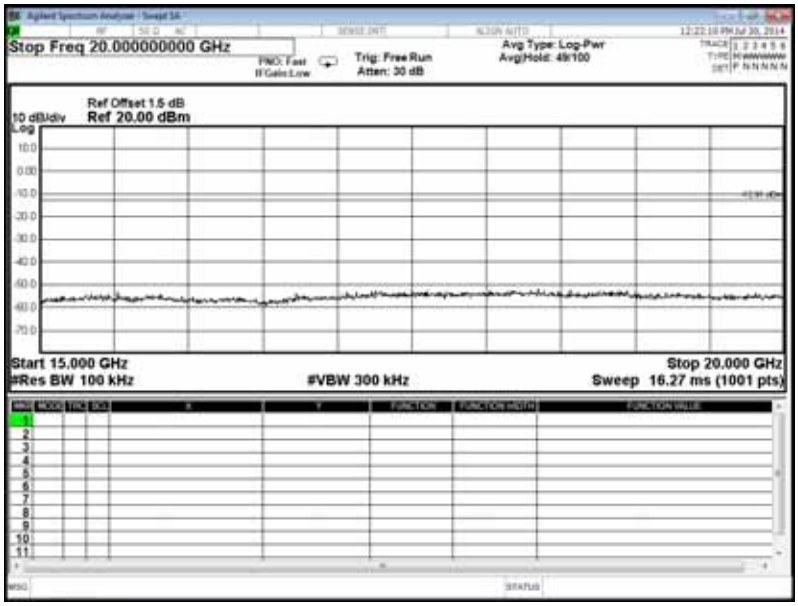
Channel 72, Frequency: 2477.056MHz

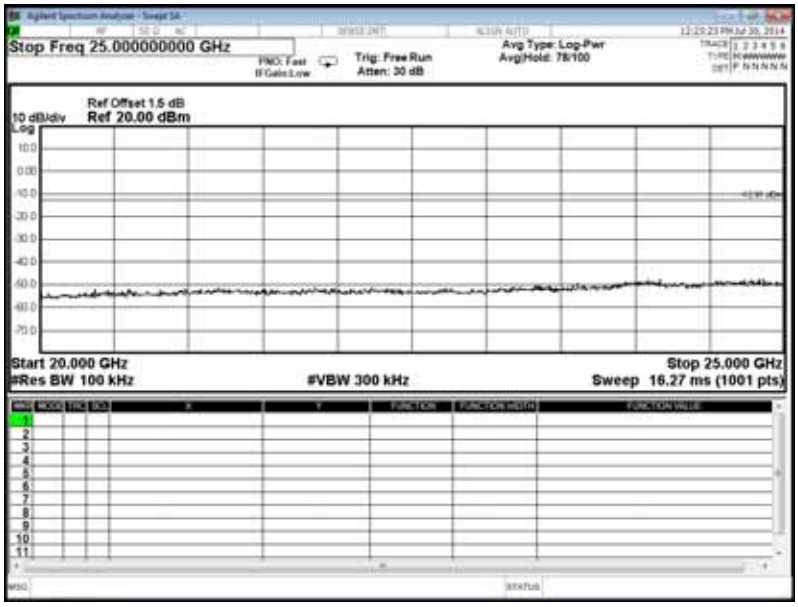







Stop Freq 15.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 34/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 15.000 GHz
Sweep 16.27 ms (1001 pts)


Stop Freq 20.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 49/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 20.000 GHz
Sweep 16.27 ms (1001 pts)


Stop Freq 25.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 78/100
Ref Offset 1.5 dB
10 dB/div
Ref 20.00 dBm
Log
Start 20.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 16.27 ms (1001 pts)

9. BAND EDGES MEASUREMENT

9.1. Test Equipment

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

Item	Type	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.

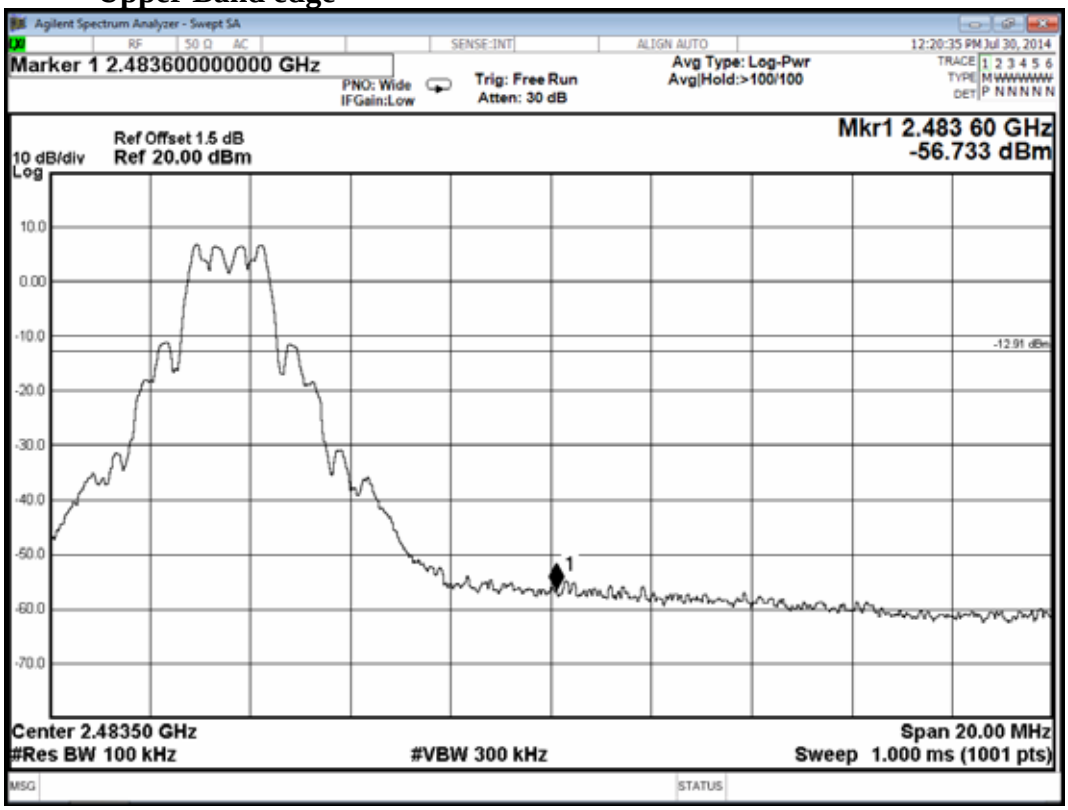
9.6. Test Results

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	Type	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.

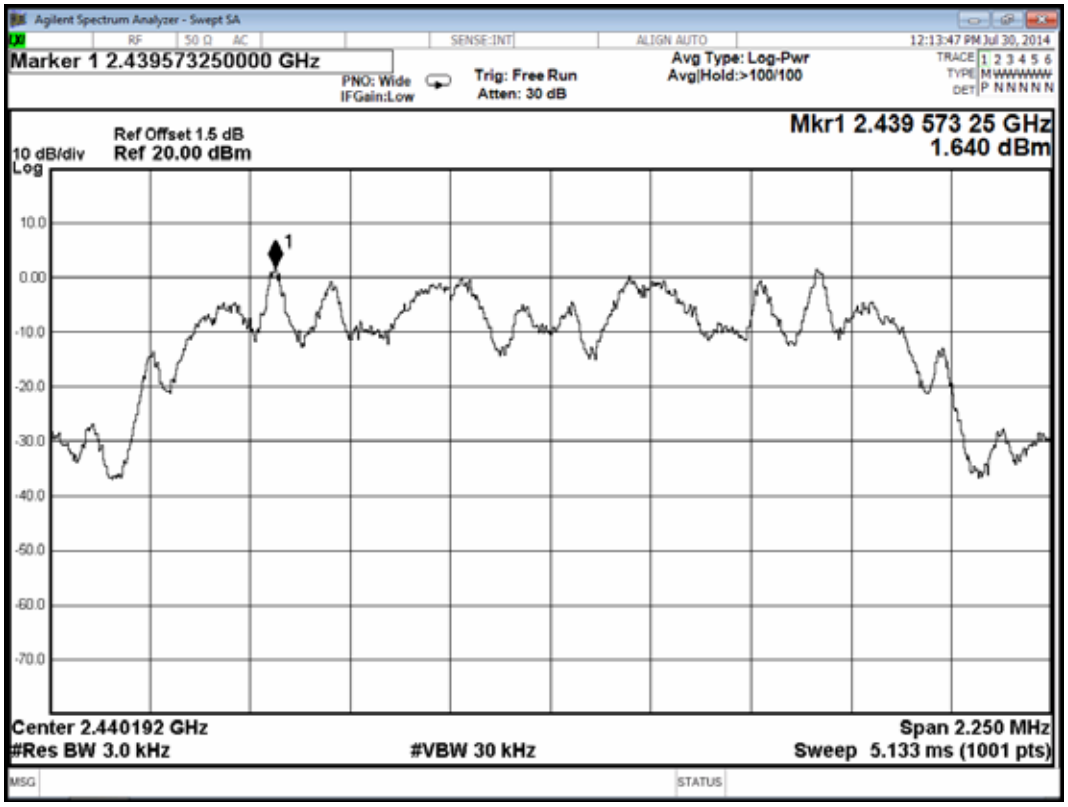
Test Date : 2014. 07. 30 Temperature : 25℃ Humidity : 46%

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**

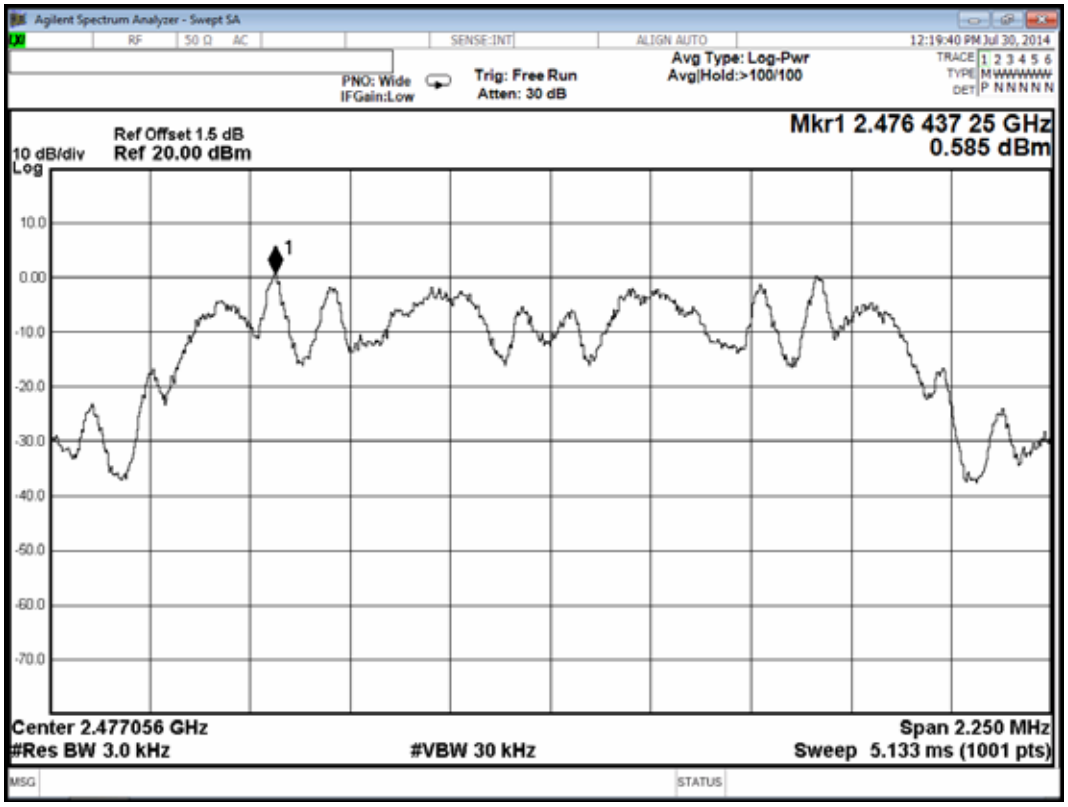
[Limit: 8dBm]

Channel 02, Frequency: 2405.376MHz

Channel 36, Frequency: 2440.192MHz



Channel 72, Frequency: 2477.056MHz



11. DEVIATION TO TEST SPECIFICATIONS

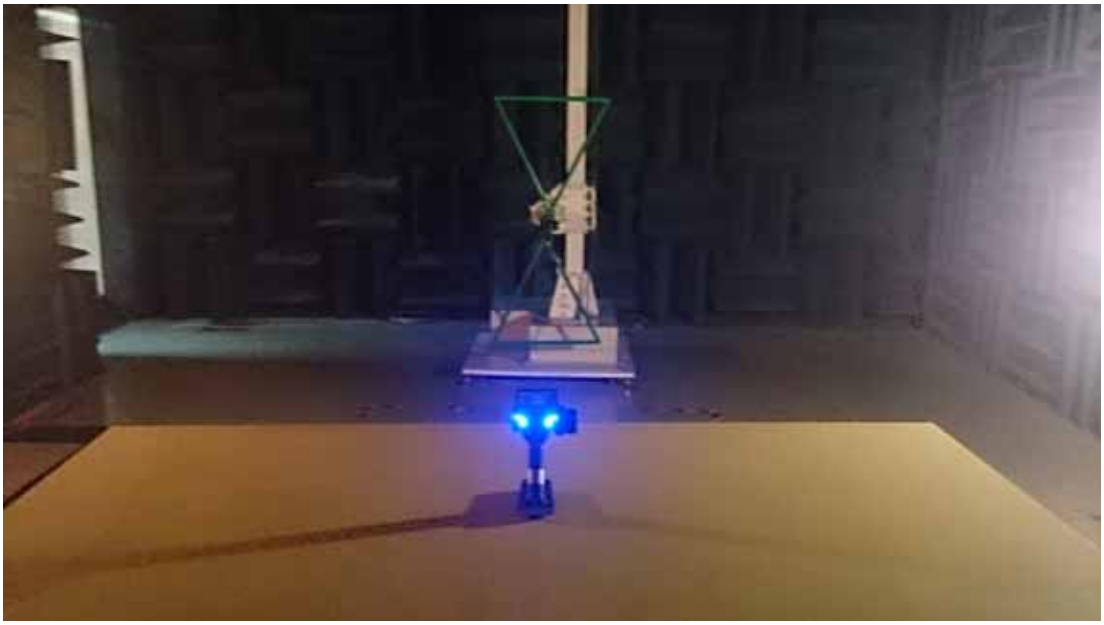
【NONE】

12. PHOTOGRAPHS

12.1. Photos of Radiated Measurement at Semi-Anechoic Chamber

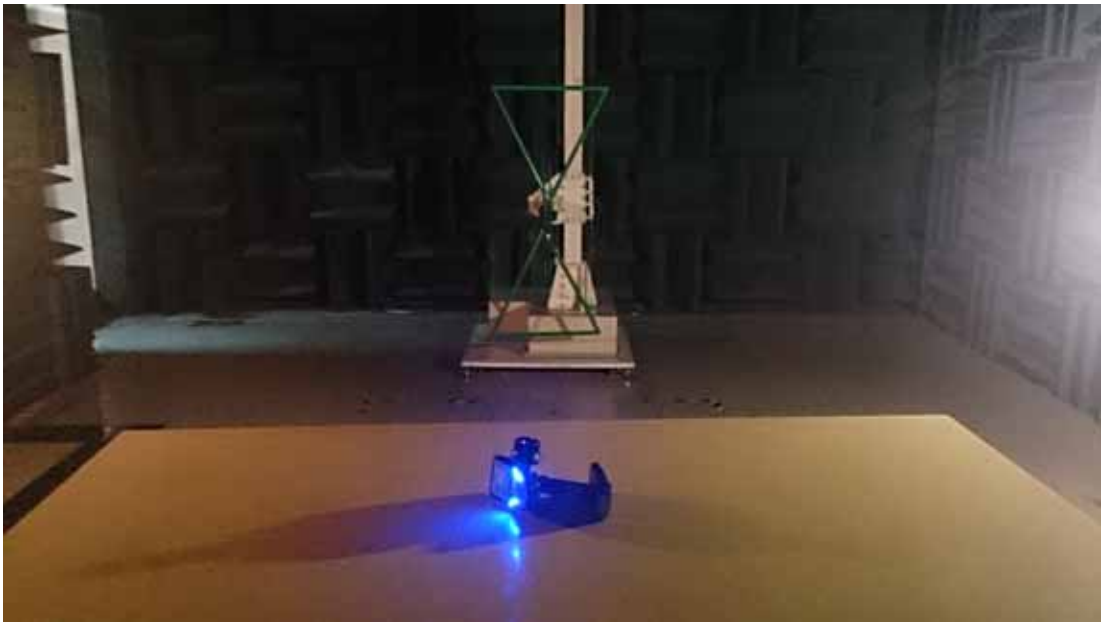
12.1.1. Frequency Range 30MHz~1GHz,

Test Position: Stand



Test Position: Side

Test Position: Lie



12.1.2.Frequency Range Above 1GHz

Test Position: Stand

Test Position: Side

Test Position: Lie

12.2.Photo of Section RF Conducted Measurement