

FCC 15.247 for DSSS System Report

On Behalf of

FUTABA Corporation

Radio Control

Model No. : FMT-01

FCC ID : AZPFMT01-24G

Brand: Futaba

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

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TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation
Manufacturer : FUTABA Corporation
EUT Description : Radio Control
FCC ID : **AZPFMT01-24G**
(A) Model No. : FMT-01
(B) Serial No. : N/A
(C) Brand : Futaba
(D) Power Supply : DC 7.2V
(E) Test Voltage : DC 7.2V (Via Battery)

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C, Oct 2014
(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: 2015. 02. 10 ~ 11

Date of Report: 2015. 02. 25

Producer: Sabrina Wang
(Sabrina Wang/Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

1. DESCRIPTION OF REVISION HISTORY

Edition No.	Date of Revision	Revision Summary	Report Number
0	2015. 02. 25	Original Report.	EM-F150096

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Product	Radio Control
Model Number	FMT-01
Serial Number	N/A
Brand Name	Futaba
FCC ID	AZPFMT01-24G
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	FASSTest: 2405.376MHz to 2472.960MHz (DSSS System)
Frequency Channel	FASSTest: 23 Channels
Data Transfer Rate	FASSTest: 136 kbps
Antenna	1/2λ Pencil Type Antenna, Gain: 1.5dBi
Date of Receipt of Sample	2015. 02. 09
Date Test	2015. 02. 10 ~ 11

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	$\pm 3.64\text{dB}$
	300MHz~1000MHz	$\pm 4.70\text{dB}$
	Above 1GHz	$\pm 2.94\text{dB}$

Remark : Uncertainty = $k u_c(y)$

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

3. CONDUCTED EMISSION MEASUREMENT

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

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. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
3	Amplifier	HP	8447D	2944A06305	2014. 02. 19	1 Year
4	Bilog Antenna	CHASE	CBL6112D	33821	2014. 08. 02	1 Year

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

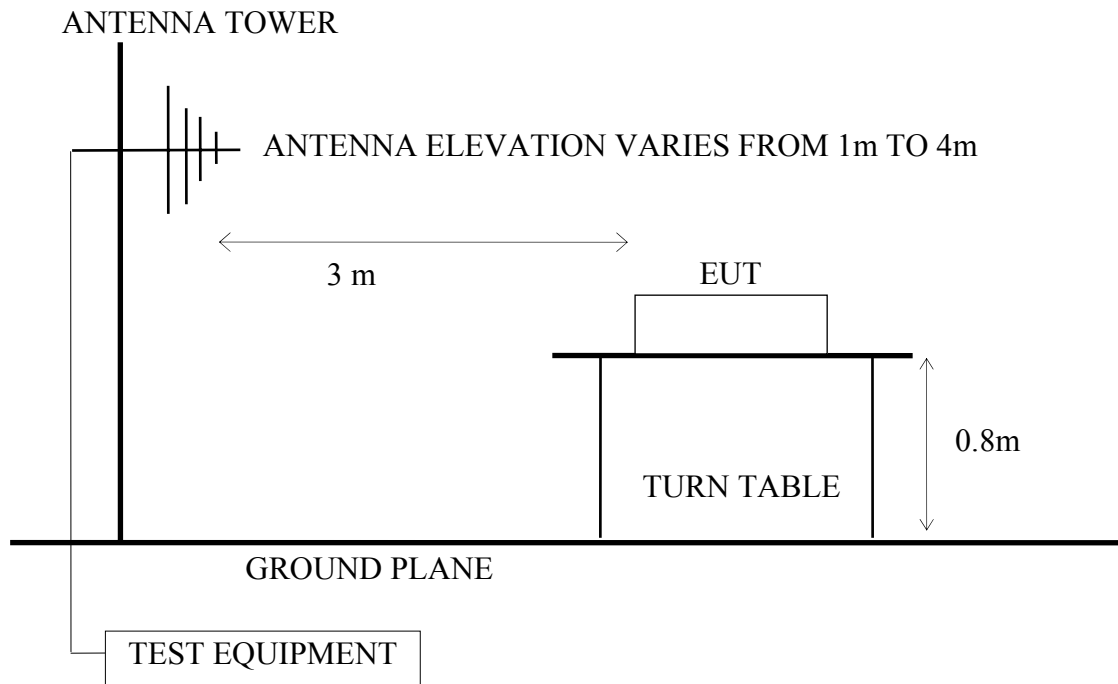
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Amplifier	Agilent	8449B	3008A02676	2014. 02. 21	1 Year
3	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
4	2.4GHz Notch Filter	K&L	7NSL10-2441. 5E130.5-00	1	2014. 06. 12	1 Year
5	3G High Pass Filter	Microwave Circuits	H3G018G1	484796	2014. 06. 12	1 Year
6	Horn Antenna	EMCO	3115	9609-4927	2014. 06. 16	1 Year
7	Horn Antenna	EMCO	3116	2653	2014. 10. 10	1 Year

4.2. Test Setup

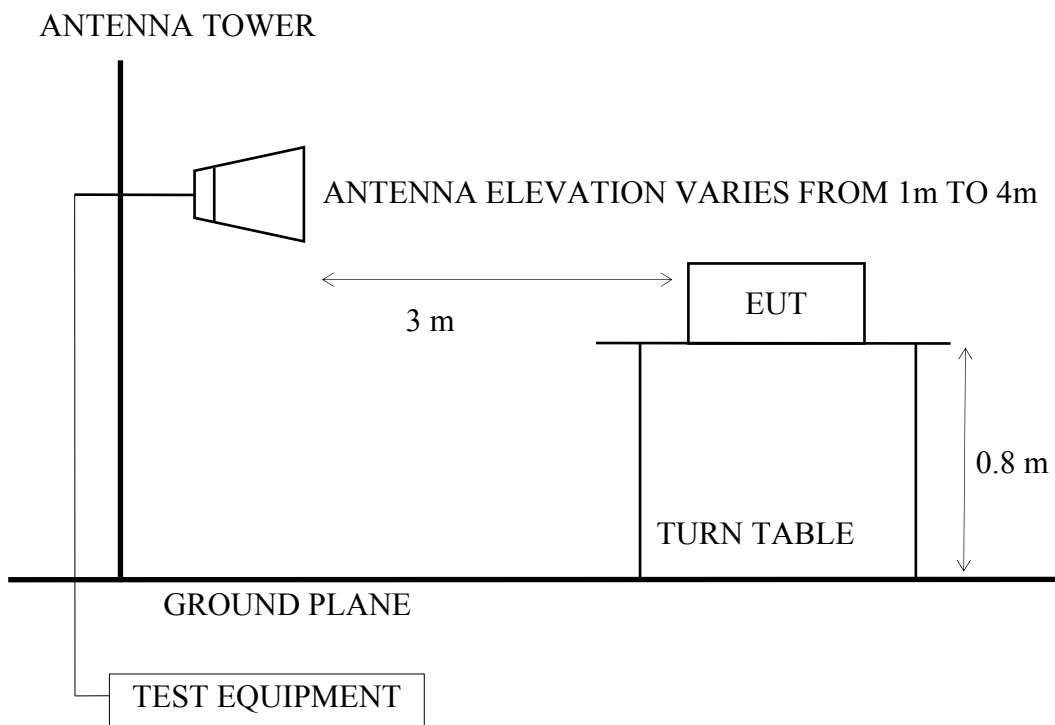
4.2.1. Block Diagram of connection between EUT and simulators

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

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

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 to continuously transmit signals at 2405.376MHz, 2439.168MHz and 2472.960MHz during testing.

4.5. Test Procedure

The EUT and was placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set to 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband 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 test receiver was set at 120kHz for frequencies below 1GHz and resolution bandwidth of spectrum analyzer was set at 1MHz for frequencies 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 18GHz to 25GHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist.

Pursuant to ANSI C63.4: 8.3.1.2, when peak value complies with the average limit, we didn't perform measurement in average detector.

4.6. Test Results

PASSED.

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

EUT : Radio Control M/N : FMT-01

Test Date : 2015. 02. 11 Temperature : 21°C Humidity : 54%

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 "Lie"** 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	Reference Test Data	
				Horizontal	Vertical
1.	CH 00	2405.376MHz	Transmit	# 14	# 13
2.	CH 11	2439.168MHz		# 14	# 13
3.	CH 22	2472.960MHz		# 14	# 13

* Above all final readings were measured with Peak detector.

For Frequency above 1GHz:

The EUT select **worst position "Lie"** and with following test modes was performed during this section testing and all the test results are listed in section 4.6.2.

Mode	Channel	Frequency	Test Mode	Test Frequency Range
1.	CH 00	2405.376MHz	Transmit	1000-2680MHz
2.				2680-4000MHz
3.				4000-5500MHz*
4.				5500-7500MHz*
5.				7500-18000MHz
6.				18000-25000MHz
7.	CH 11	2439.168MHz	Transmit	1000-2680MHz
8.				2680-4000MHz
9.				4000-5500MHz*
10.				5500-7500MHz
11.				7500-18000MHz
12.				18000-25000MHz
13.	CH 22	2472.960MHz	Transmit	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 select **worst position “Lie”** and with following test modes was performed during this section testing 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.	CH 00	2405.376MHz	Transmit	# 3 ,4	# 1, 2
2.	CH 22	2472.960MHz	Transmit	# 7, 8	# 5, 6

4.6.1. Frequency Range 30-1000MHz

Transmit, Frequency: 2405.376MHz

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

Data no. : 14
 Ant. pol. : HORIZONTAL
 Engineer : An_Kuo

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	30.97	18.07	2.34	7.40	27.81	40.00	12.19	Peak
2	249.22	12.35	4.32	6.51	23.18	46.00	22.82	Peak
3	384.05	15.20	5.51	5.37	26.08	46.00	19.92	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 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

Data no. : 13
 Ant. pol. : VERTICAL
 Engineer : An_Kuo

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	31.94	17.52	2.37	9.83	29.52	40.00	10.48	Peak
2	249.22	12.35	4.32	6.78	23.45	46.00	22.55	Peak
3	580.96	18.08	6.49	4.28	28.85	46.00	17.15	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: 2439.168MHz

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2439.168MHz

Data no. : 14
 Ant. pol. : HORIZONTAL
 Engineer : An_Kuo

	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	7.04	21.30	43.50	22.20	Peak
2	384.05	15.20	5.51	4.24	24.95	46.00	21.05	Peak
3	580.96	18.08	6.49	5.12	29.69	46.00	16.31	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 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2439.168MHz

Data no. : 13
 Ant. pol. : VERTICAL
 Engineer : An_Kuo

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	31.94	17.52	2.37	-0.52	19.37	40.00	20.63	Peak
2	165.80	9.65	3.73	3.39	16.77	43.50	26.73	Peak
3	580.96	18.08	6.49	4.22	28.79	46.00	17.21	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: 2472.960MHz

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

Data no. : 14
 Ant. pol. : HORIZONTAL
 Engineer : An_Kuo

	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	7.04	21.30	43.50	22.20	Peak
2	384.05	15.20	5.51	5.24	25.95	46.00	20.05	Peak
3	580.96	18.08	6.49	5.12	29.69	46.00	16.31	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. Peak value has been compliance with average limit, thus average detector is not reported.

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

Data no. : 13
 Ant. pol. : VERTICAL
 Engineer : An_Kuo

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	31.94	17.52	2.37	3.28	23.15	40.00	16.85	Peak
2	119.24	12.27	3.37	5.95	21.59	43.50	21.91	Peak
3	473.29	16.62	6.25	11.40	34.27	46.00	11.73	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. Peak value has been compliance with average limit, thus average detector is not reported.

4.6.2. Frequency Range above 1GHz

Transmit, Frequency: 2405.376MHz

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m 3115(4927)
 Limit : ABOVE 1GHZ(AV)
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

Data no. : 10
 Ant. pol. : HORIZONTAL
 Engineer : An_Kuo

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4811.50	33.01	8.09	9.57	50.67	54.00	3.33	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. Peak value has been compliance with average limit, thus average detector is not reported.

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m 3115(4927)
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

Data no. : 3
 Ant. pol. : VERTICAL
 Engineer : An_Kuo

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4810.00	32.98	8.09	8.34	49.41	54.00	4.59	Average
4810.00	32.98	8.09	14.05	55.12	74.00	18.88	Peak
7218.00	35.80	9.98	0.55	46.33	54.00	7.67	Average
7218.00	35.80	9.98	7.86	53.64	74.00	20.36	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: 2439.168MHz

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m 3115(4927)
 Limit : ABOVE 1GHZ(AV)
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2439.168MHz

Data no. : 10
 Ant. pol. : HORIZONTAL
 Engineer : An_Kuo

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4879.00	33.13	8.17	8.56	49.86	54.00	4.14	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. Peak value has been compliance with average limit, thus average detector is not reported.

Site no. : Audix NO.1 3m Chamber
 Dis. / Ant. : 3m 3115(4927)
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2439.168MHz

Data no. : 3
 Ant. pol. : VERTICAL
 Engineer : An_Kuo

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4879.00	33.13	8.17	7.65	48.95	54.00	5.05	Average
4879.00	33.13	8.17	12.83	54.13	74.00	19.87	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: 2472.960MHz

Date of Test : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

Test Mode : Transmit, Channel: 22, Frequency: 2472.960MHz, Horizontal

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
*4945.00	33.28	8.24	9.32	50.84	54.00	3.16
9894.00	38.03	11.92	11.52	61.47	74.00	12.53

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. Above all final readings were measured with Peak detector.
 3. "*" is peak value complies with the average limit.

Emission Frequency (MHz)	Emission Level Vertical (dBμV/m)	ERP (dBm)	Limit (dBm)
9894.00	61.47	-35.87	-6.733

Remarks: 1. ERP = Emission Level Vertical -95.2dB -2.14dB
 2. Limit = Reference Level-20dB (Reference Level refer to section 7.5)

Date of Test : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

Test Mode : Transmit, Channel: 22, Frequency: 2472.960MHz, Vertical

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
*4946.50	33.28	8.24	9.08	50.58	54.00	3.42
4946.50	33.28	8.24	14.80	56.32	74.00	17.68
9894.00	38.03	11.92	12.85	62.80	74.00	11.20

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. Above all final readings were measured with Peak detector.
 3. "*" is Average detector.

Emission Frequency (MHz)	Emission Level Vertical (dBμV/m)	ERP (dBm)	Limit (dBm)
9894.00	62.80	-34.54	-6.733

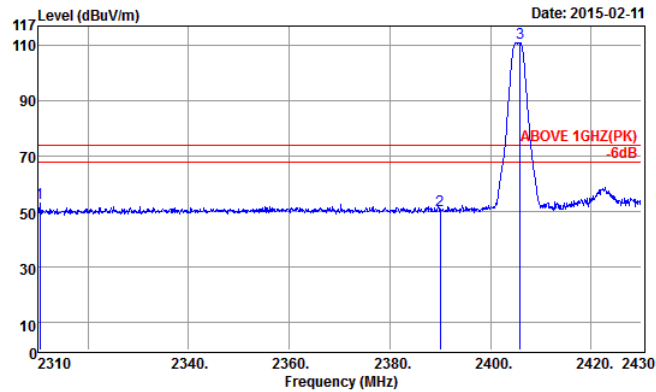
Remarks: 1. ERP = Emission Level Vertical -95.2dB -2.14dB
 2. Limit = Reference Level-20dB (Reference Level refer to section 7.5)

4.6.3. Restricted Bands Measurement Results

Date of Test : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

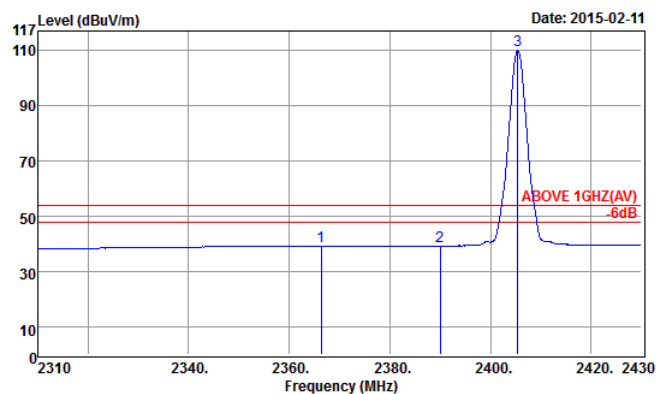
Test Mode : Transmit, Channel: 00, Frequency: 2405.376MHz



Site no. : Audix NO.1 3m Chamber Data no. : 3
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(PK) Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	2310.36	28.32	5.13	19.65	53.10	74.00	20.90	Peak
2	2390.04	28.40	5.24	16.87	50.51	74.00	23.49	Peak
3	2405.38	28.42	5.26	77.37	111.05	74.00	-37.05	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 3m Chamber Data no. : 4
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(AV) Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

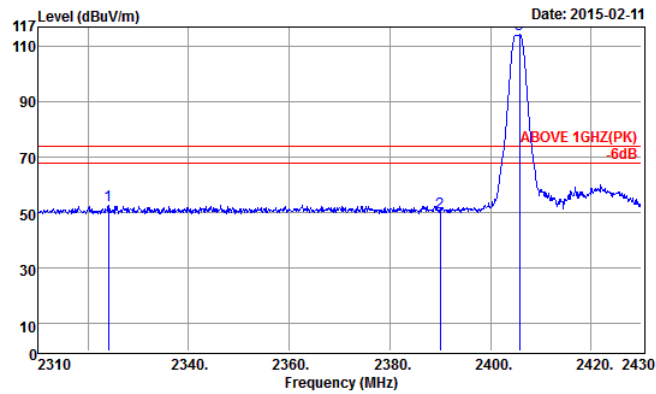
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	2310.36	28.32	5.13	19.65	53.10	54.00	14.70	Average
2	2390.04	28.40	5.24	16.87	50.51	54.00	14.73	Average
3	2405.38	28.42	5.26	77.37	111.05	54.00	-55.84	Average

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 : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

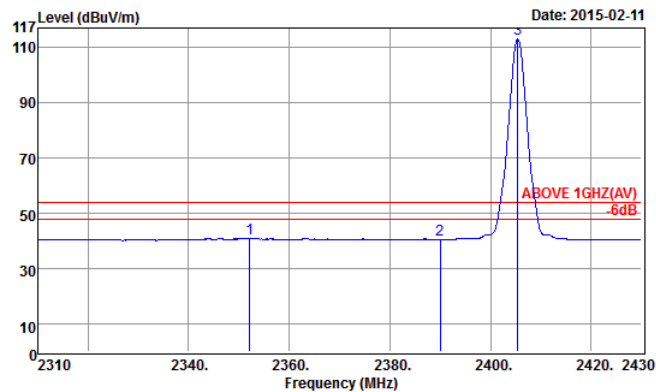
Test Mode : Transmit, Channel: 00, Frequency: 2405.376MHz



Site no. : Audix NO.1 3m Chamber Data no. : 1
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2324.04	28.34	5.15	19.27	52.78	74.00	21.24	Peak
2	2390.04	28.40	5.24	16.33	49.97	74.00	24.03	Peak
3	2405.76	28.42	5.26	80.53	114.21	74.00	-40.21	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 3m Chamber Data no. : 2
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(AV)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2405.376MHz

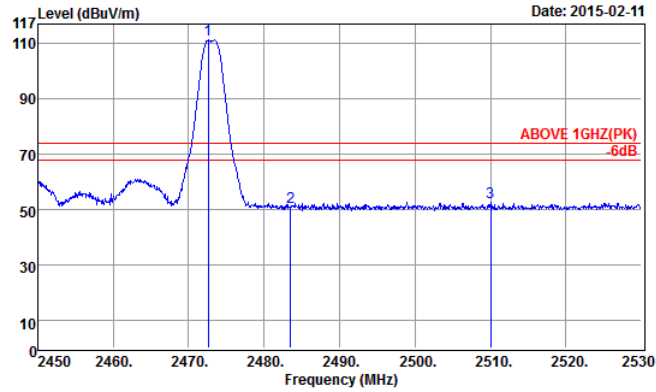
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2352.12	28.36	5.19	7.32	40.87	54.00	13.13	Average
2	2390.04	28.40	5.24	6.87	40.51	54.00	13.49	Average
3	2405.40	28.42	5.26	79.20	112.88	54.00	-58.88	Average

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 : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

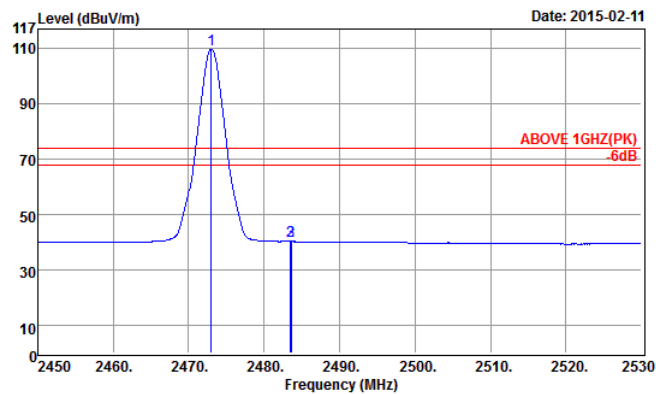
Test Mode : Transmit, Channel: 22, Frequency: 2472.960MHz



Site no. : Audix NO.1 3m Chamber Data no. : 7
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2472.56	28.47	5.35	77.33	111.15	74.00	-37.15	Peak
2	2483.52	28.49	5.37	17.01	50.87	74.00	23.13	Peak
3	2510.00	28.53	5.41	18.65	52.59	74.00	21.41	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 3m Chamber Data no. : 8
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

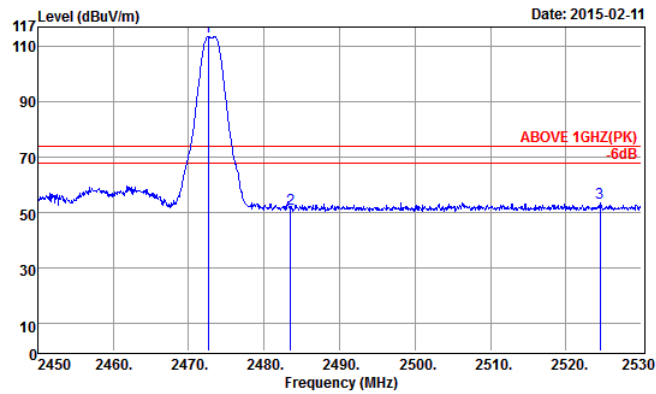
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2472.96	28.47	5.35	75.89	109.71	74.00	-35.71	Average
2	2483.52	28.49	5.37	6.55	40.41	74.00	33.59	Average
3	2483.80	28.49	5.37	6.53	40.39	74.00	33.61	Average

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 : 2015. 02. 11 Temperature : 21°C

EUT : Radio Control Humidity : 54%

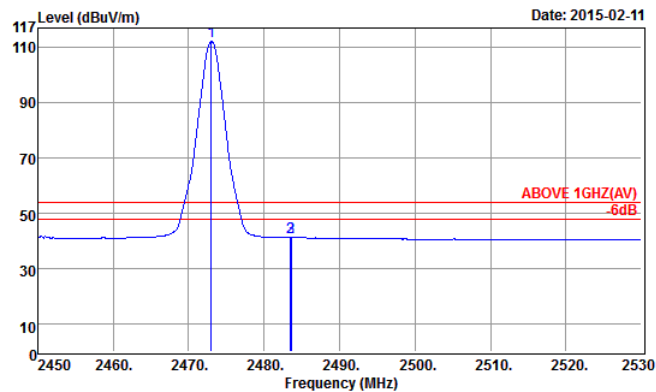
Test Mode : Transmit, Channel: 22, Frequency: 2472.960MHz



Site no. : Audix NO.1 3m Chamber Data no. : 5
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	2472.56	28.47	5.35	79.85	113.47	74.00	-39.47	Peak
2	2483.52	28.49	5.37	17.41	51.27	74.00	22.73	Peak
3	2524.56	28.58	5.44	19.56	53.58	74.00	20.42	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 3m Chamber Data no. : 6
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(AV)
 Env. / Ins. : 21°C/54% N9010A Engineer : An_Kuo
 EUT : FMT-01
 Power Rating : DC 7.2V
 Test Mode : Tx2472.960MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	2472.96	28.47	5.35	78.28	112.10	54.00	-58.10	Average
2	2483.52	28.49	5.37	7.54	41.40	54.00	12.60	Average
3	2483.80	28.49	5.37	7.50	41.36	54.00	12.64	Average

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

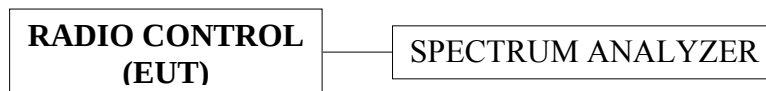
5. 6dB BANDWIDTH MEASUREMENT

5.1. Test Equipment

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

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

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 $\geq$ 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 KDB 558074 D01 DTS Meas Guidance v03r02

5.6. Test Results

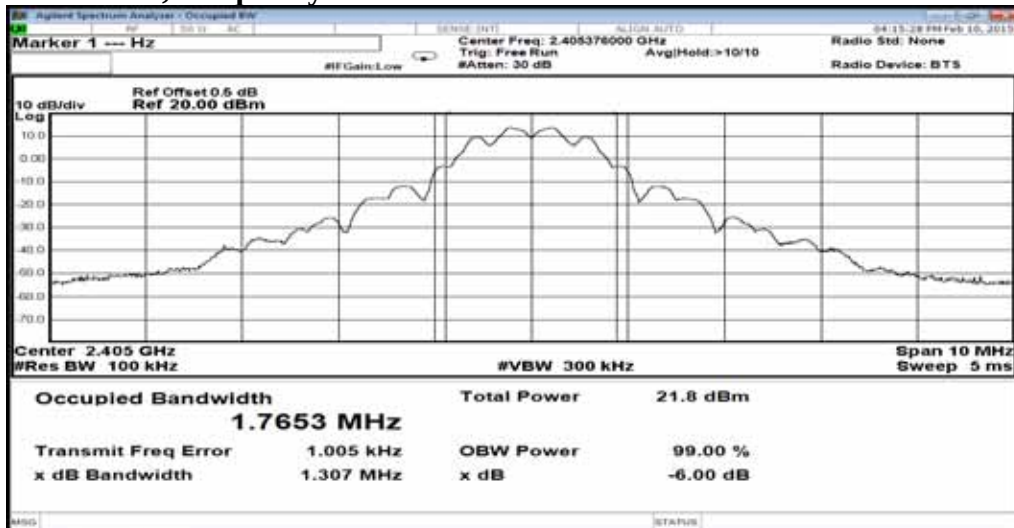
PASSED. All the test results are attached in next pages.

Test Date : 2015. 02. 10 Temperature : 24°C Humidity : 50%

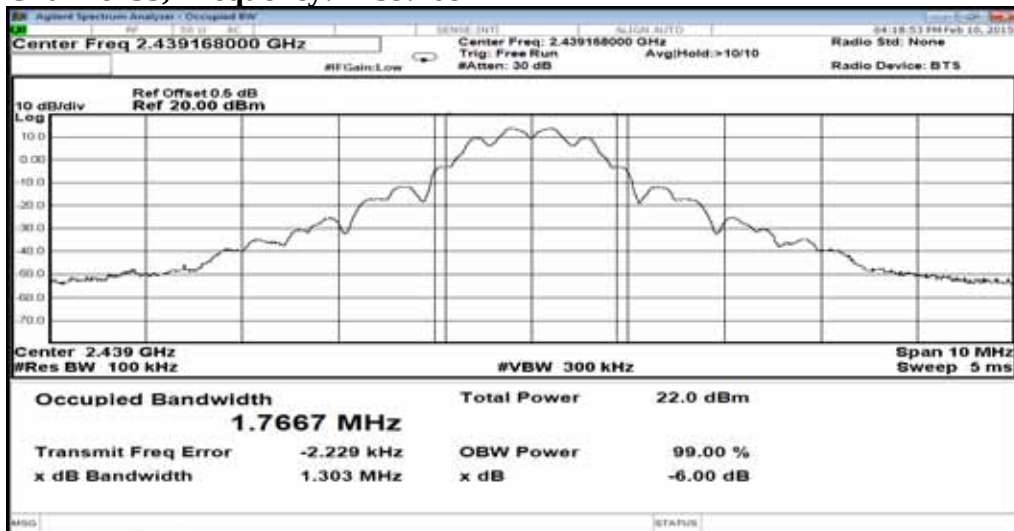
Mode	Channel	Frequency	6dB Bandwidth (MHz)
1.	CH 00	2405.376MHz	1.307
2.	CH 11	2439.168MHz	1.303
3.	CH 22	2472.960MHz	1.324

[Limit: least 500kHz]

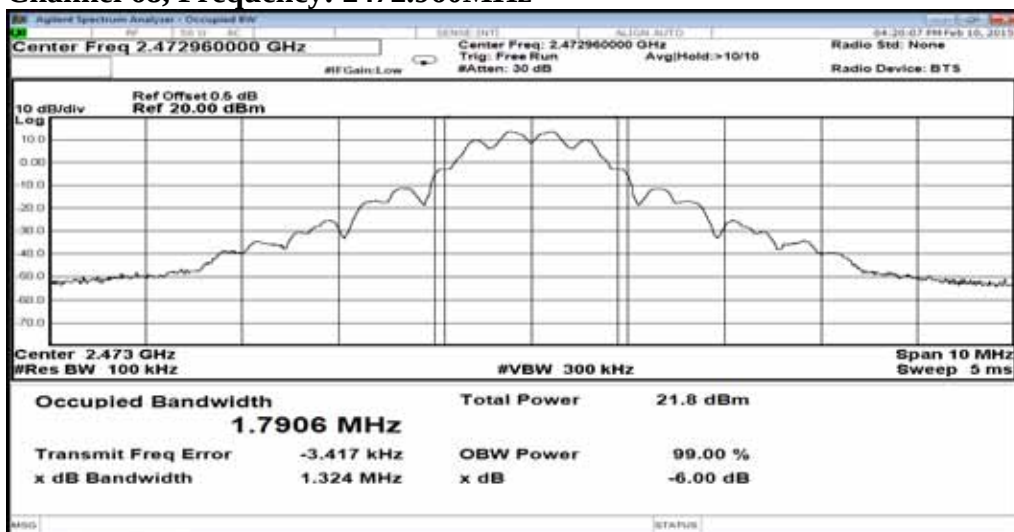
Channel 02, Frequency: 2405.376MHz



Channel 35, Frequency: 2439.168MHz



Channel 68, Frequency: 2472.960MHz



6. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

6.1. Test Equipment

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

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

6.2. Block Diagram of Test Setup

The same as section.5.2.

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 KDB 558074 D01 DTS Meas Guidance v03r02.

6.6. Test Results

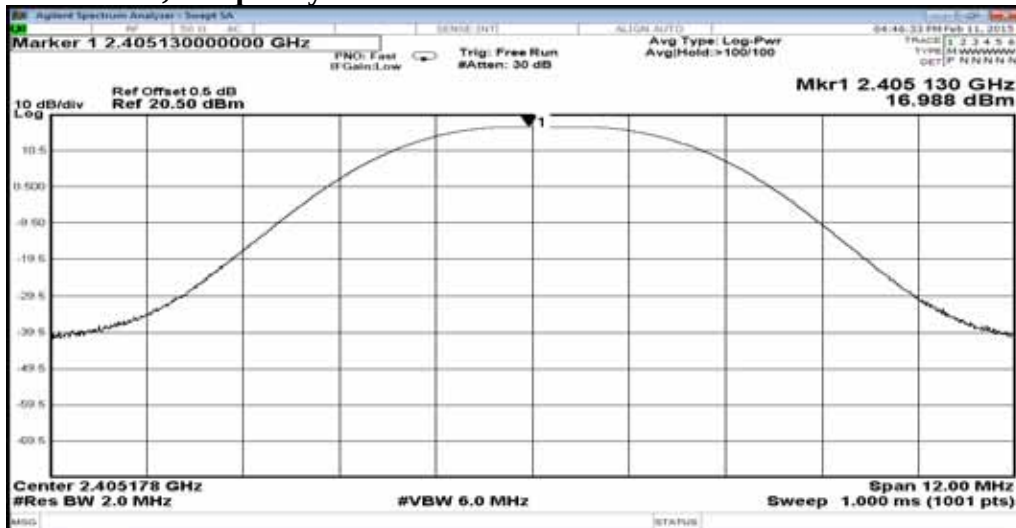
PASSED. All the test results are listed below.

Test Date : 2015. 02. 10 Temperature : 24°C Humidity : 50%

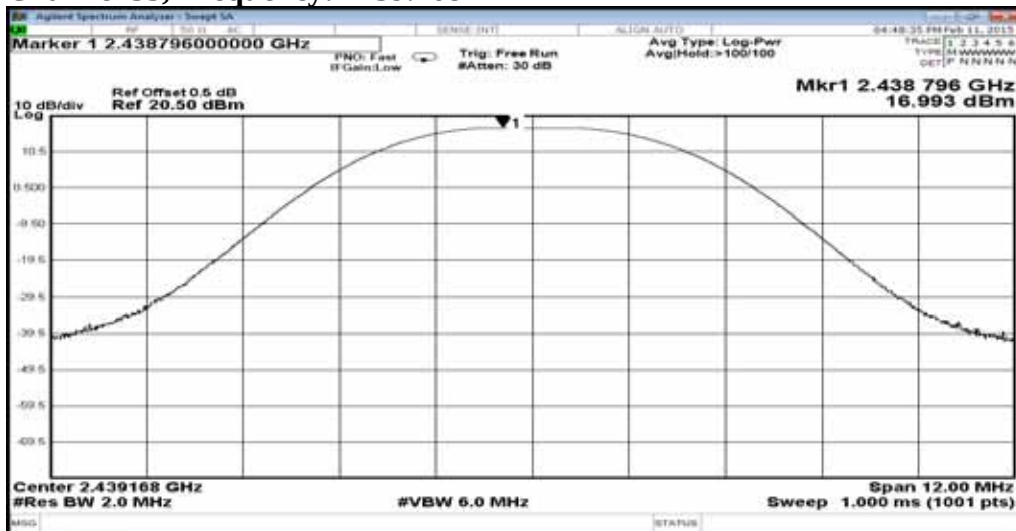
Mode	Channel	Frequency	Peak Output Power (dBm)
1.	CH 00	2405.376MHz	16.988
2.	CH 11	2439.168MHz	16.993
3.	CH 22	2472.960MHz	16.898

[Limit: 1Watt. (30dBm)]

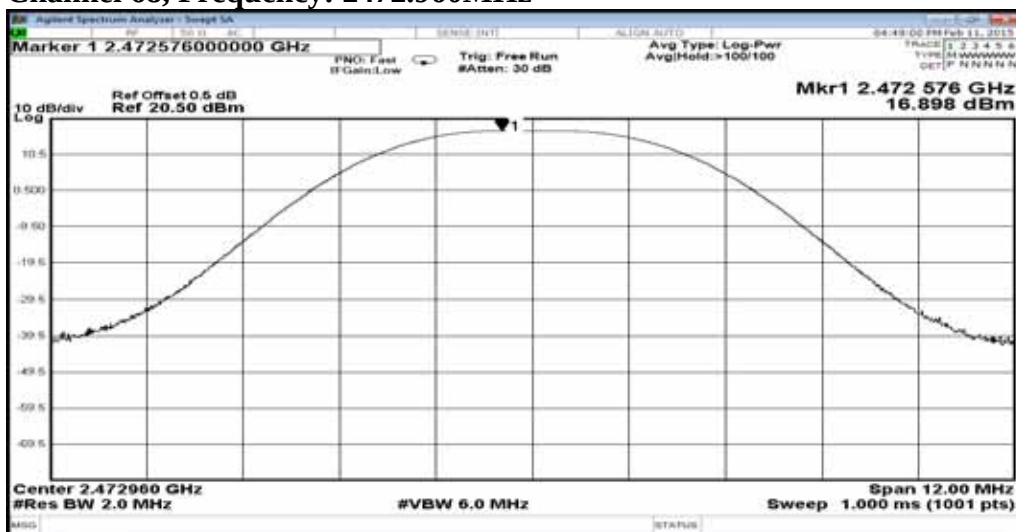
Channel 02, Frequency: 2405.376MHz



Channel 35, Frequency: 2439.168MHz



Channel 68, Frequency: 2472.960MHz



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. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

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

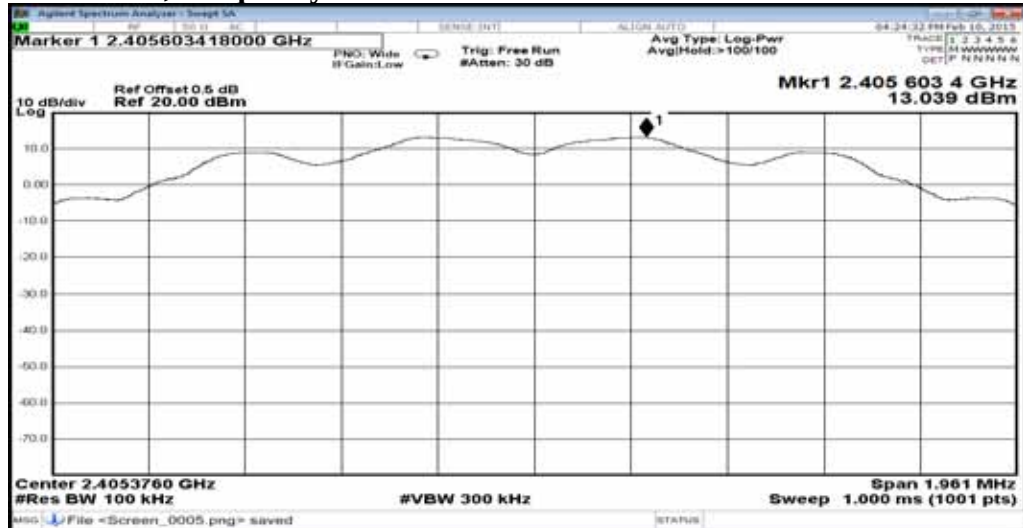
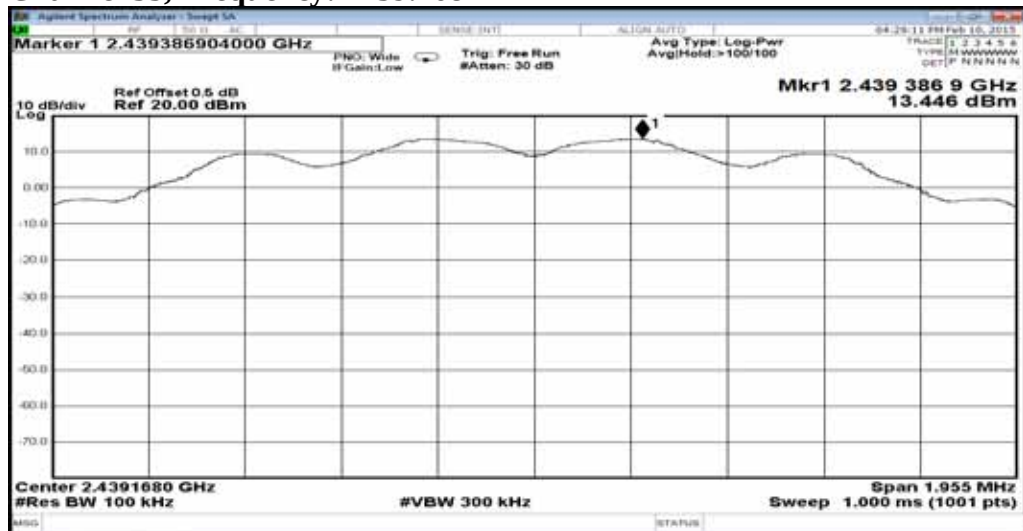
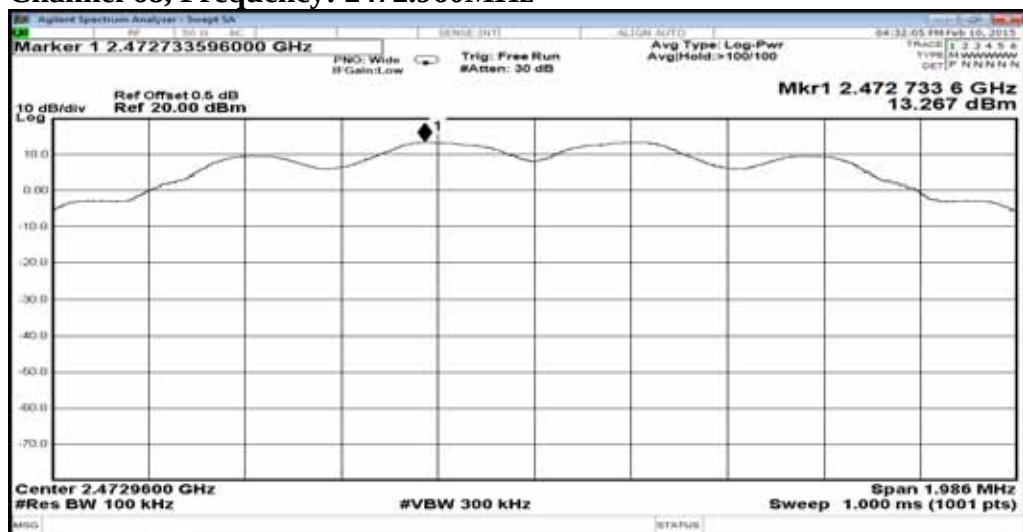
The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

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

7.5. Test Results

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

Test Date : 2015. 02. 10 Temperature : 24°C Humidity : 50%

Channel 02, Frequency: 2405.376MHz**Channel 35, Frequency: 2439.168MHz****Channel 68, Frequency: 2472.960MHz**

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. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

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.

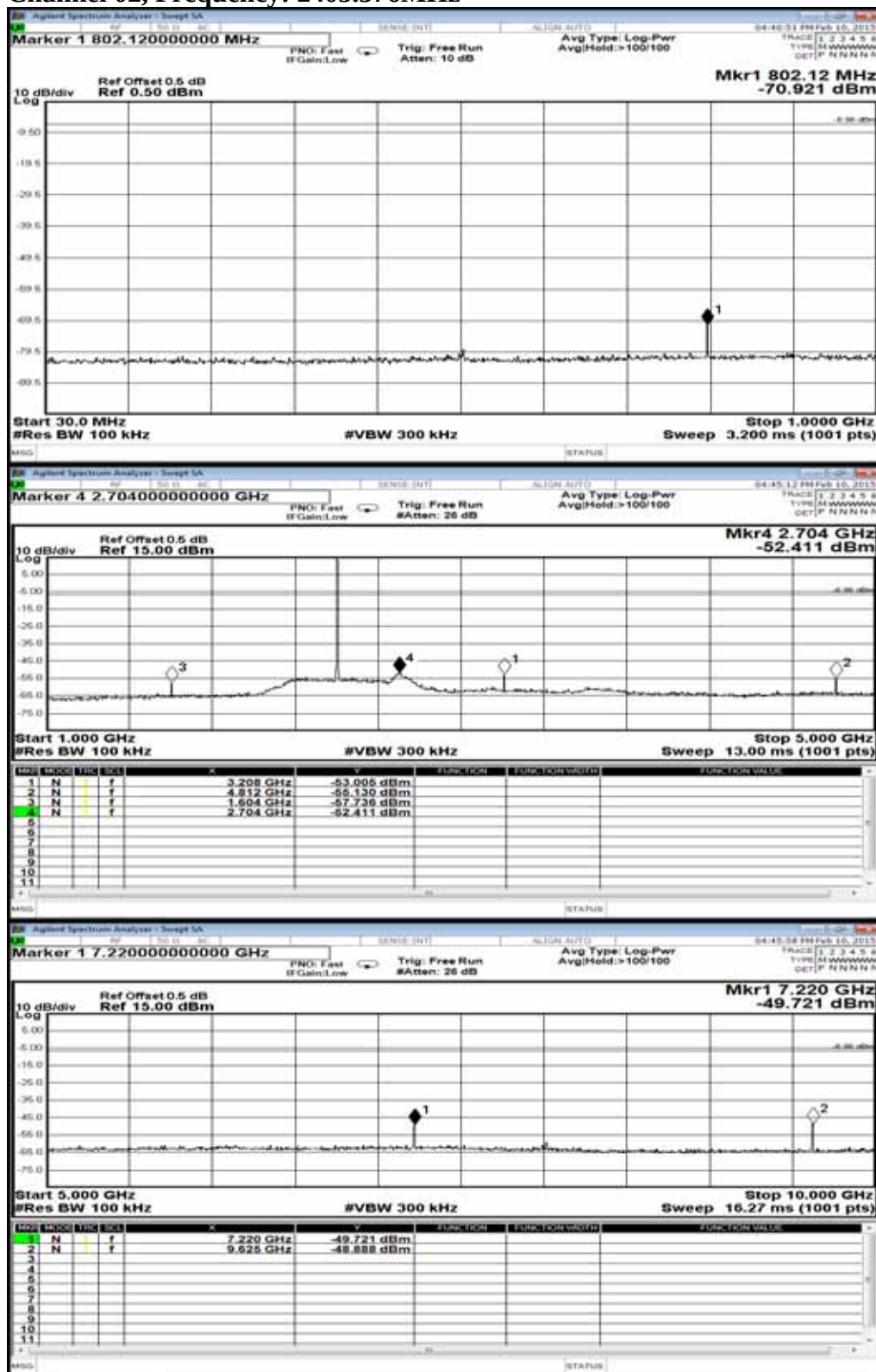
The measurement guideline was according to 558074 D01 DTS Meas Guidance v03r02.

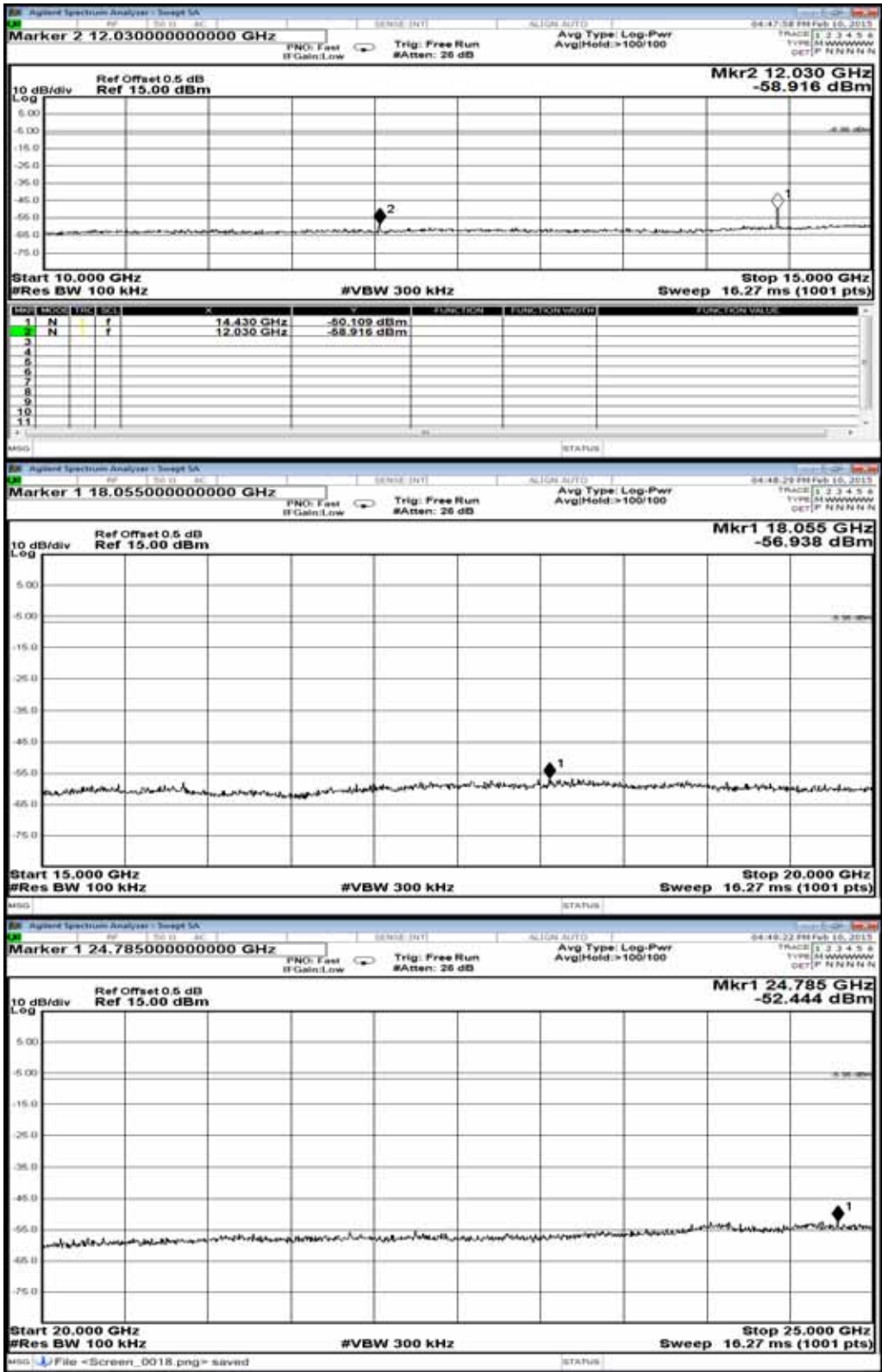
8.6. Test Results

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

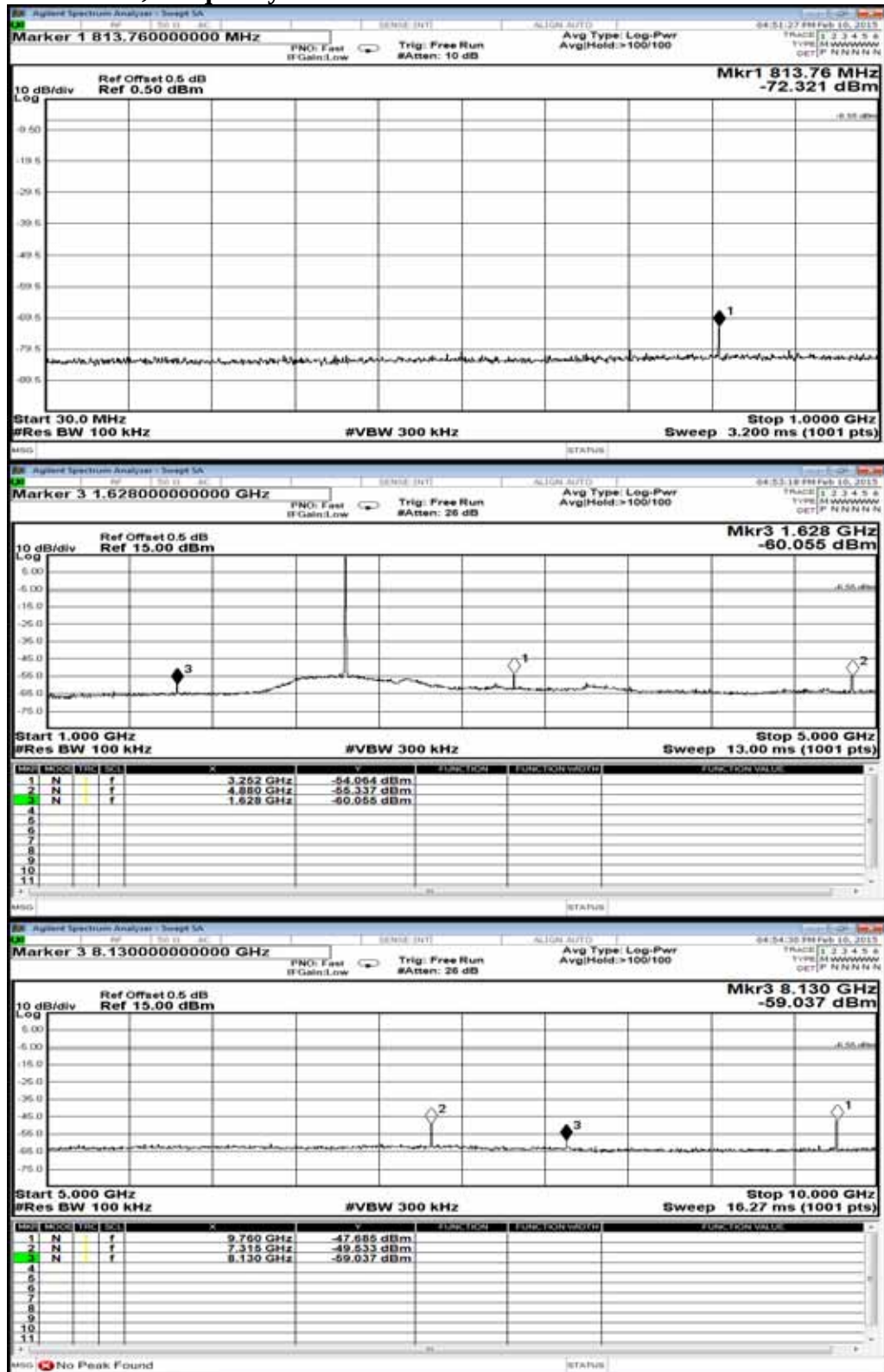
Test Date : 2015. 02. 10 Temperature : 24°C Humidity : 50%

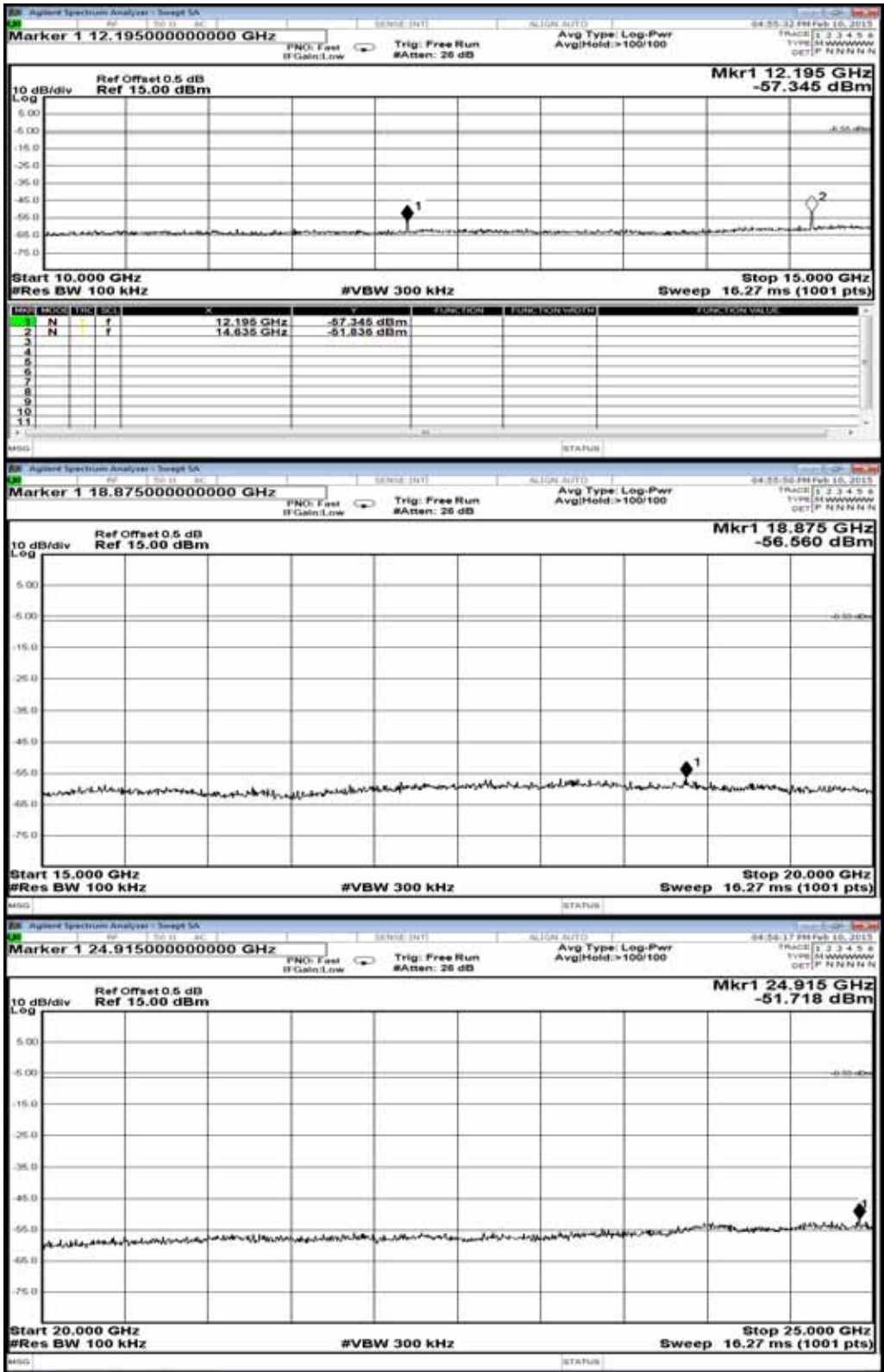
Channel 02, Frequency: 2405.376MHz



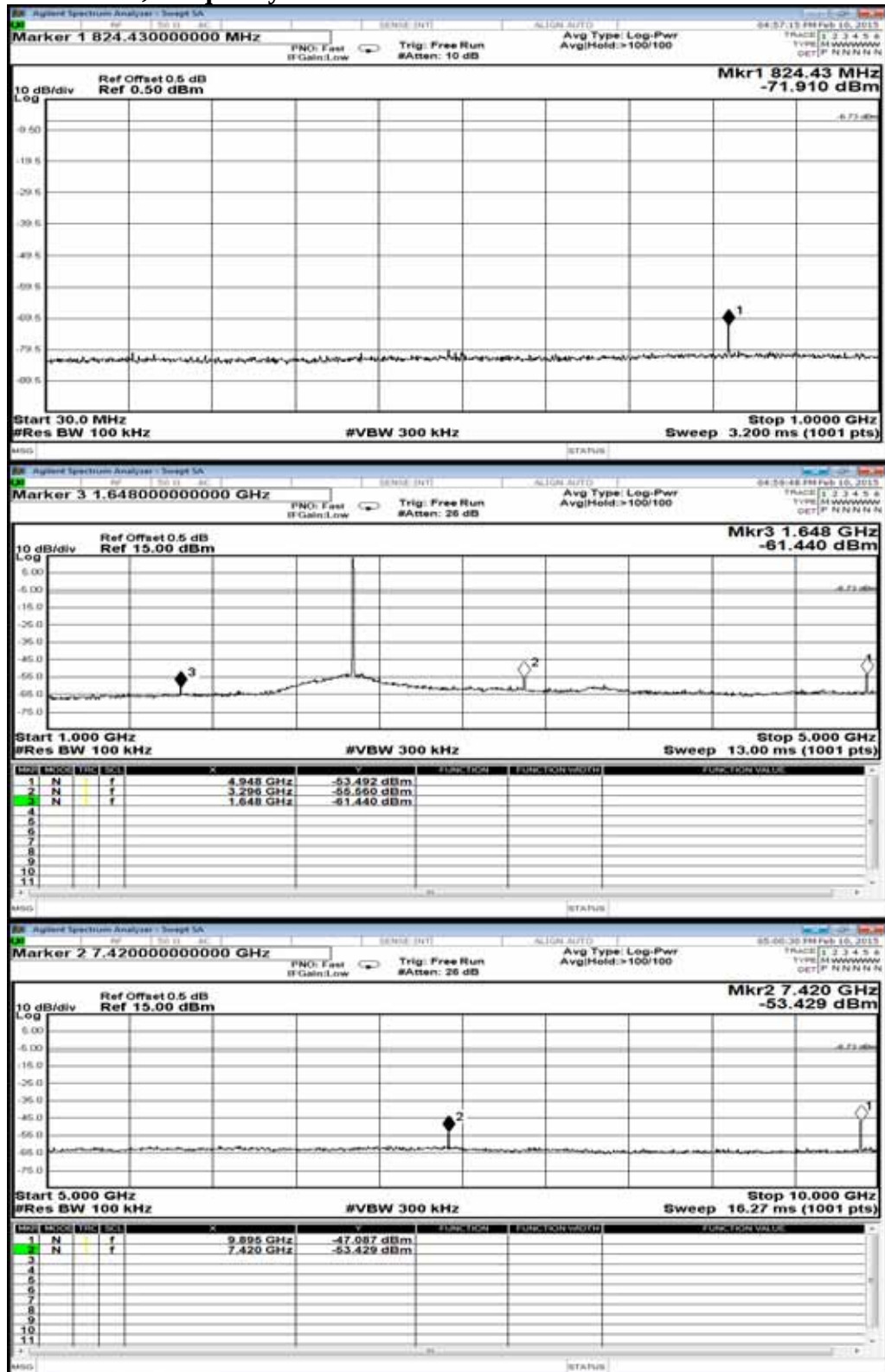


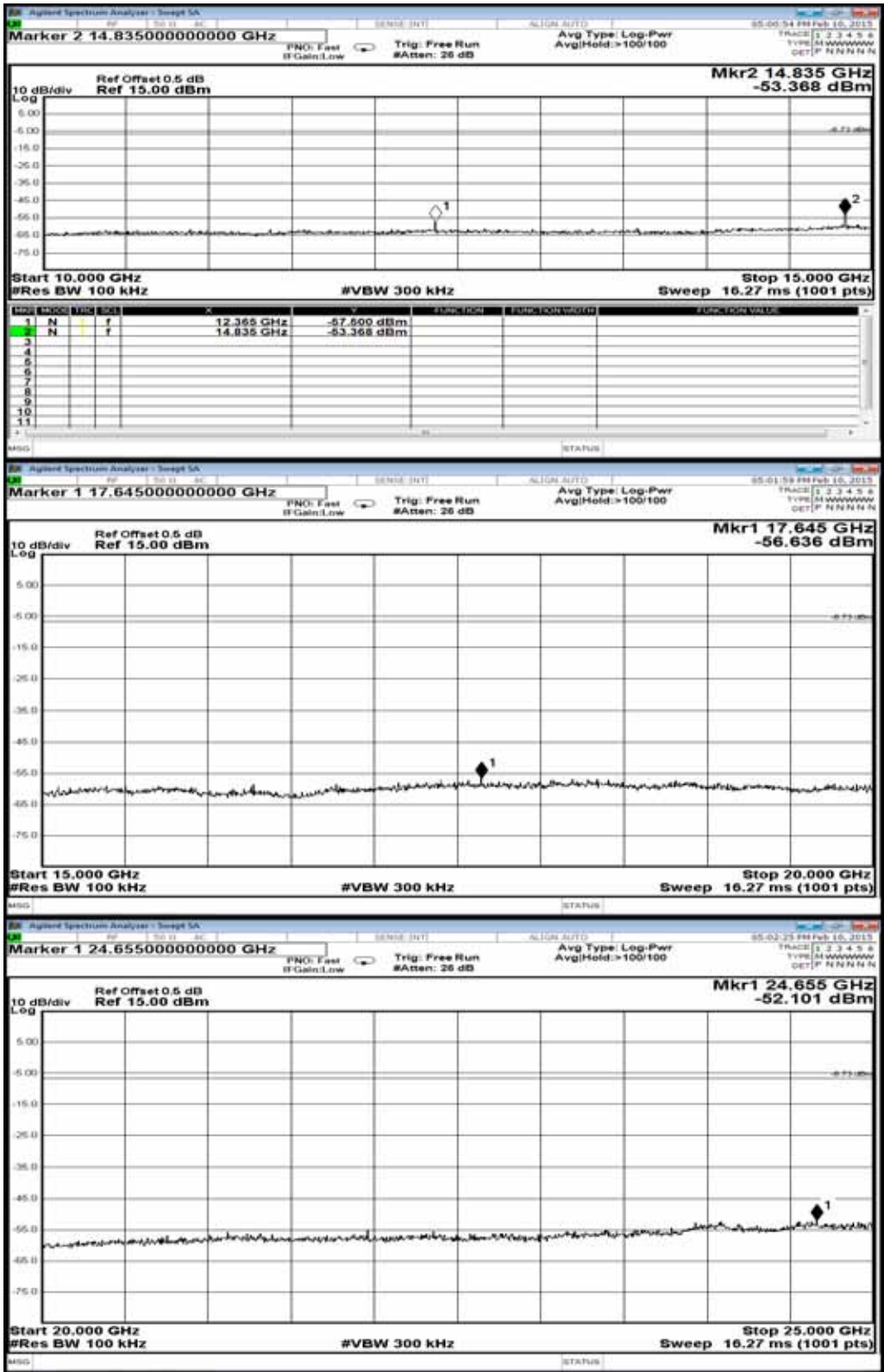
Channel 35, Frequency: 2439.168MHz





Channel 68, Frequency: 2472.960MHz





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. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

9.2. Block Diagram of Test Setup

The same as section.5.2.

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

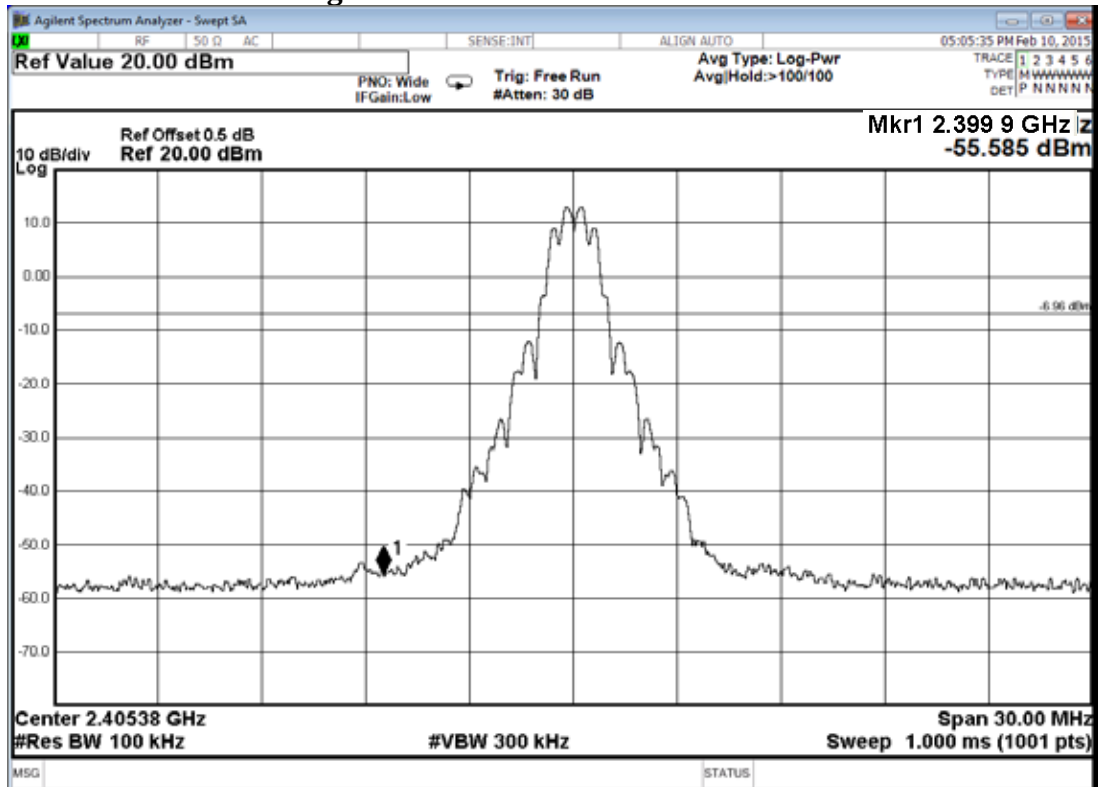
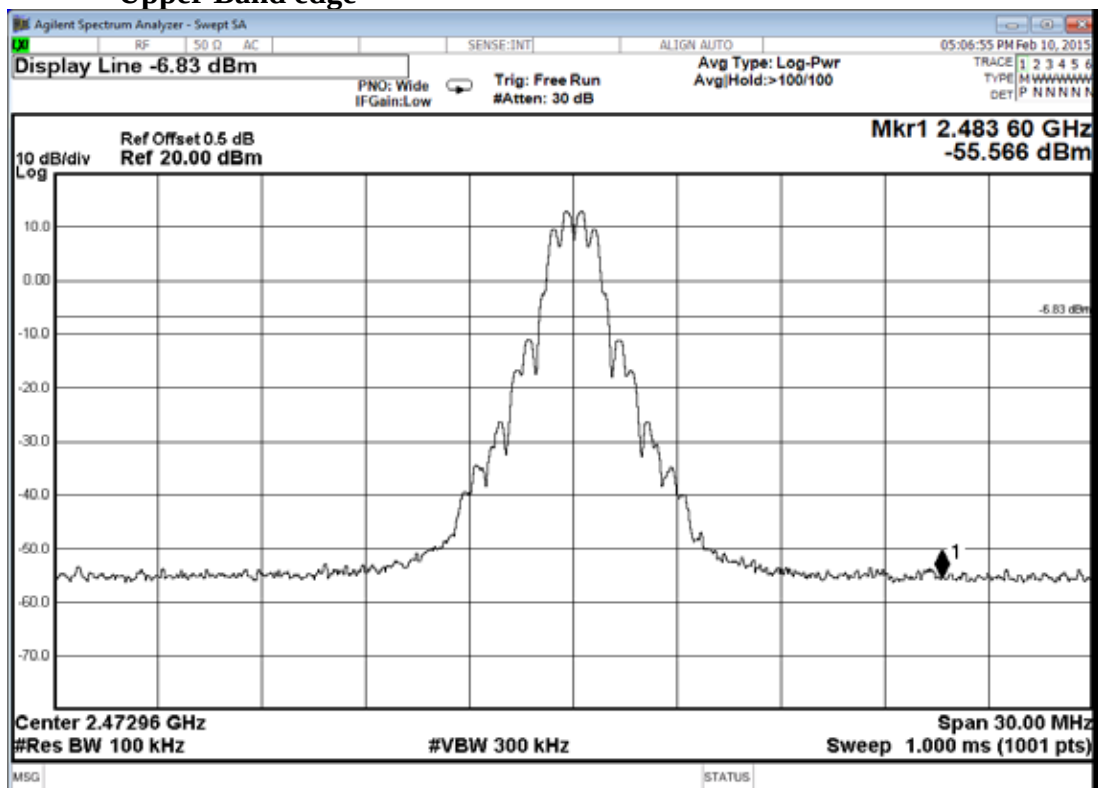
The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

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

9.6. Test Results

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

Test Date : 2015. 02. 10 Temperature : 24°C Humidity : 50%

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. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2014. 11. 08	1 Year

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 : 2015. 02. 10 Temperature : 24°C Humidity : 50%

Mode	Channel	Frequency	Power Spectral Density (dBm)
1.	CH 00	2405.376MHz	5.269
2.	CH 11	2439.168MHz	5.089
3.	CH 22	2472.960MHz	5.027

[Limit: 8dBm]

Channel 02, Frequency: 2405.376MHz



Channel 35, Frequency: 2439.168MHz



Channel 68, Frequency: 2472.960MHz



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

