

APPLICATION FOR CERTIFICATION

On Behalf of
Futaba Corporation
Radio Control
Model No. : T14SG
FCC ID : AZPT14SG-24G
Brand: Futaba

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

Prepared by : AUDIX Technology Corporation
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Date of Test : Jan. 23 ~ 28, 2013
Date of Report : Jan. 29, 2013

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TEST REPORT CERTIFICATION

Applicant : Futaba Corporation
 Manufacturer : Futaba Corporation
 EUT Description : Radio Control
 FCC ID : AZPT14SG-24G
 (A) Model No. : T14SG
 (B) Serial No. : N/A
 (C) Brand : Futaba
 (D) Power Supply : DC 6V

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, Oct. 2012
AND ANSI C63.4/2003

(FCC CFR 47 Part 15C, §15.207 and §15.209 and §15.247)

The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart B & C limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test : Jan. 23 ~ 28, 2013

Date of Report : Jan. 29, 2013

Producer : 
 (Julie Hsu/Administrator)

Signatory :  (for)
 (Ben Cheng/Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	Radio Control (Transmitter)
Model Number	:	T14SG
Serial Number	:	N/A
FCC ID	:	AZPT14SG-24G
Applicant	:	Futaba Corporation 1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.
Manufacturer	:	Futaba Corporation 1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.
Radio Technology	:	FASSTest, FASST , S-FHSS (FHSS) Modulation The S-FHSS (FHSS) Modulation is test and recorded in this report, the FASSTest, FASST Modulation are recorded in another report of EM-F1020091.
Frequency Band	:	FASSTest: 2405.376MHz ~ 2472.960MHz FASST: 2405.376MHz ~ 2477.056MHz S-FHSS (FHSS): 2403.250MHz ~ 2447.500MHz
Frequency Channel	:	FASSTest: 23 channel FASST : 36 channels S-FHSS (FHSS): 60 channels
Tested Frequency	:	S-FHSS (FHSS): 2403.250MHz (Channel 01) 2425.000MHz (Channel 30) 2447.500MHz (Channel 60)
Antenna (Pencil Antenna)	:	Antenna Gain: 1.5dBi
Date of Receipt of Sample	:	Oct. 15, 2013
Date of Test	:	Jan. 23 ~ 28, 2013

1.2. Description of Test Facility

Name of Firm : **AUDIX Technology Corporation**
EMC Department
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan, R.O.C.

Test Location & Facility (AC) : **Semi-Anechoic Chamber**
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan, R.O.C.
 May 11, 2012 Renewal on
 Federal Communication Commission
 Registration Number: 90993

NVLAP Lab. Code : 200077-0

TAF Accreditation No : 1724

1.3. Measurement Uncertainty

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

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
20dB Bandwidth	± 0.2kHz
Carrier Frequency Separation	± 0.2kHz
Time Of Occupancy	± 0.03sec
Maximum peak Output power	± 0.52dBm
Emission Limitations	± 0.13dB
Band Edges	± 0.13dB

2. CONDUCTED EMISSION MEASUREMENT

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

3. RADIATED EMISSION MEASUREMENT

3.1. Test Equipment

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

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Test Receiver	R & S	ESCS30	100338	Jul. 04, 12'	Jul. 03, 13'
3.	Amplifier	Agilent	8447D	2944A06305	Feb. 13, 12'	Feb. 12, 13'
4.	Log Periodic Antenna	Schwarzbeck	UHALP 9108-A	0810	Mar. 03, 12'	Mar. 02, 13'
5.	Biconical Antenna	CHASE	VBA6106A	1264	Mar. 03, 12'	Mar. 02, 13'

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

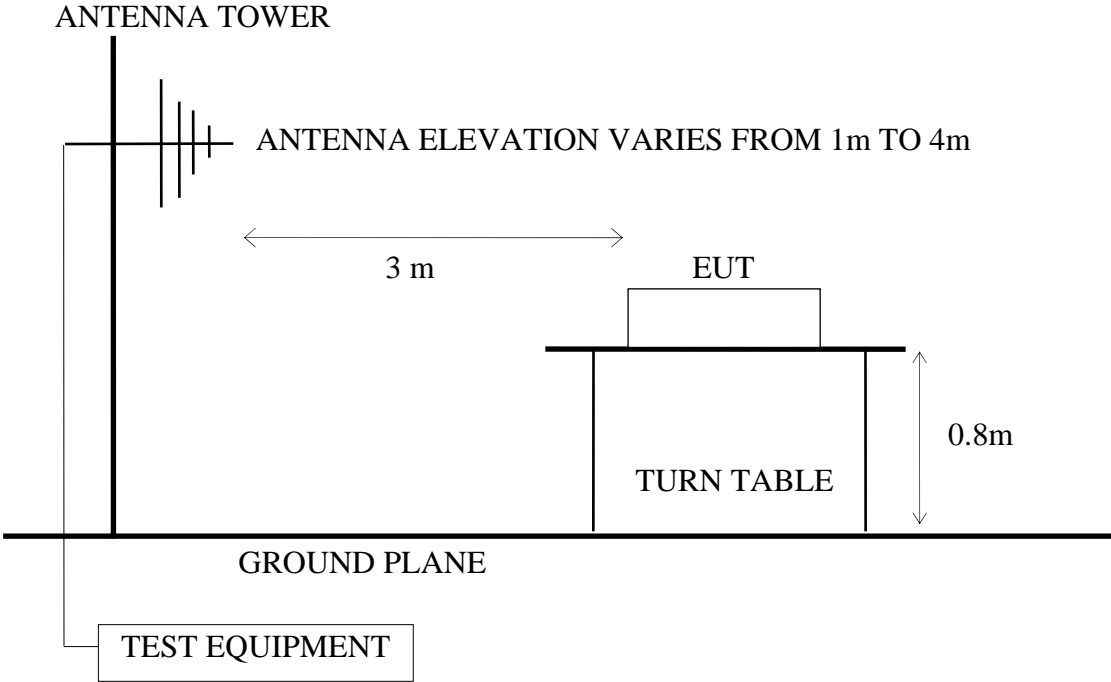
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Pre-Amplifier	HP	8449B	3008A02678	Mar. 07, 12'	Mar. 06, 13'
3.	3.5G High Pass Filter	HP	84300-80038	005	Jan. 03, 13'	Jan. 02, 14'
4.	2.4G Notch Filter	EWT	EWT-14-007 0-R1	G2	Feb. 14, 12'	Feb. 13, 13'
5.	Horn Antenna	EMCO	3115	9112-3775	May 09, 12'	May 08, 13'
6.	Horn Antenna	EMCO	3116	2653	Oct. 15, 12'	Oct. 14, 13'
7.	Signal Generator	HP	83732B	US34490489	May 16, 12'	May 15, 13'

3.2. Test Setup

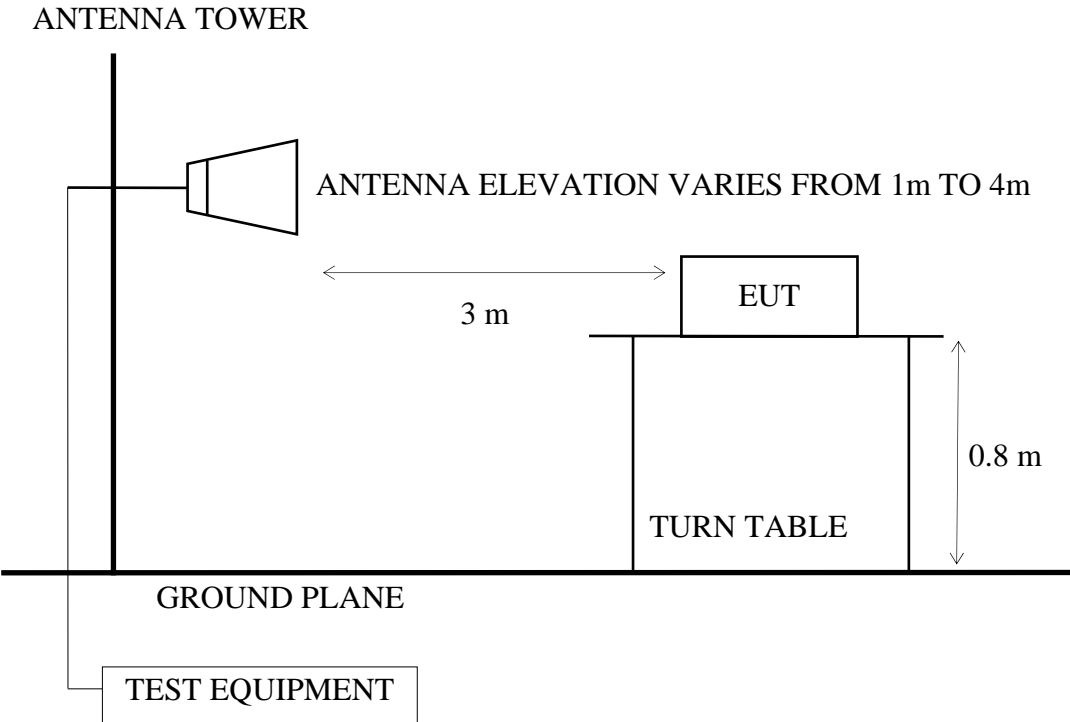
3.2.1. Block Diagram of connection between EUT and simulators

RADIO CONTROL (EUT)

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



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



3.3. Radiated Emission Limits (§15.209)

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

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

3.4. Operating Condition of EUT

- 3.4.1. Set up the EUT (Radio Control) as shown on 3.2.
- 3.4.2. To turn on the power of all equipment.
- 3.4.3. The EUT was set to continuously transmit signals at 2403.250MHz, 2425.000MHz and 2447.500MHz during testing.

3.5. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log-periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The resolution bandwidth of test spectrum analyzer is 1MHz and the video bandwidth is 10Hz for average detection (AV) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to 10th harmonics from fundamental frequency) was checked.

Above 1GHz was measured with peak and average detector. For frequency from 7.5GHz 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.

3.6. Radiated Emission Measurement Results

PASSED.

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

EUT : Radio Control M/N : T14SG

Test Date : Jan. 28, 2013 Temperature : 24 Humidity : 66%

For Frequency Range 30MHz~1000MHz:

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

The EUT select **worst position "stand"** and with following test modes was performed during this section testing and all the test results are listed in section 3.6.1.

Mode	Channel	Frequency	Test Mode	Position	Reference Test Data	
					Horizontal	Vertical
1.	01	2403.250MHz	Transmit	Stand	# 10	# 9
2.	30	2425.000MHz		Stand	# 10	# 9
3.	60	2447.500MHz		Stand	# 10	# 9

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

For Frequency above 1GHz:

The EUT select **worst position "stand"** and with following test modes was performed during this section testing and all the test results are listed in section 3.6.2.

Mode	Channel	Frequency	Position
1.	01	2403.250MHz	Stand
2.	30	2425.000MHz	Stand
3.	60	2447.500MHz	Stand

* Above all final readings were measured with Peak detector and Average detector.

For Restricted Bands:

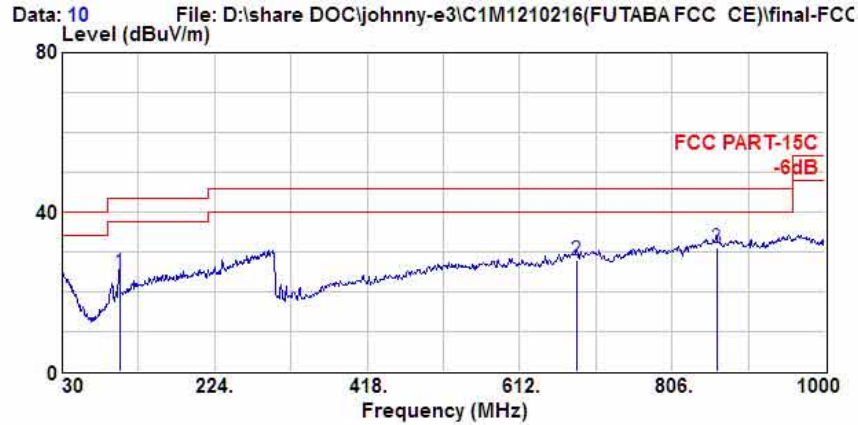
The EUT select **worst position “stand”** and was tested in restricted bands and all the test results are listed in section 3.6.3. (The restricted bands defined in part 15.205(a))

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	01	2403.250MHz	Transmit	# 2	# 1
2.	60	2447.500MHz	Transmit	# 4	# 3

3.6.1. Frequency Range 30-1000MHz



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Site no. : A/C Chamber Data no. : 10
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2403.25MHz (FHSS)

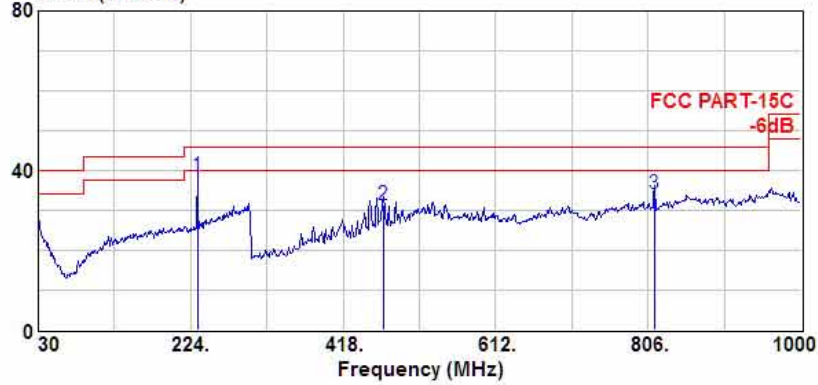
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	102.750	17.40	2.10	5.19	24.69	43.50	18.81	QP
2	684.750	23.11	6.49	-1.76	27.85	46.00	18.15	QP
3	863.230	26.09	7.20	-2.27	31.02	46.00	14.98	QP

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



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Data: 9 File: D:\share DOC\johnny-e3\C1M1210216(FUTABA FCC CE)\final-FCC
 Level (dBuV/m)



Site no. : A/C Chamber Data no. : 9
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2403.25MHz (FHSS)

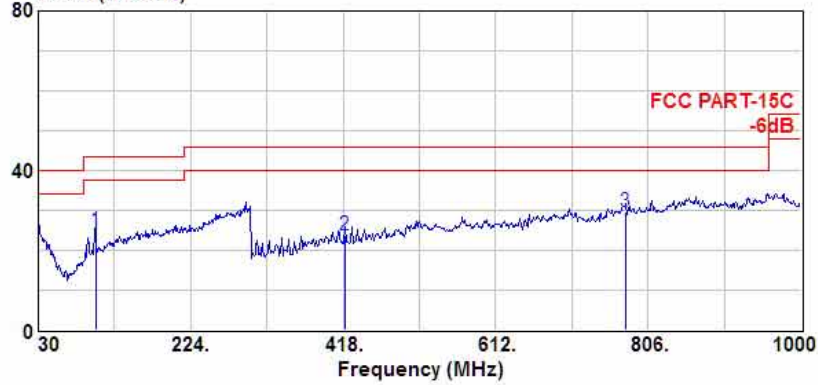
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	232.730	22.36	3.30	12.99	38.65	46.00	7.35	QP
2	469.410	18.29	5.80	7.41	31.50	46.00	14.50	QP
3	813.760	23.98	7.00	3.28	34.26	46.00	11.74	QP

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



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Data: 10 File: D:\share DOC\johnny-e3\C1M1210216(FUTABA FCC CE)\final-FCC
 Level (dBuV/m)



Site no. : A/C Chamber Data no. : 10
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2425MHz (FHSS)

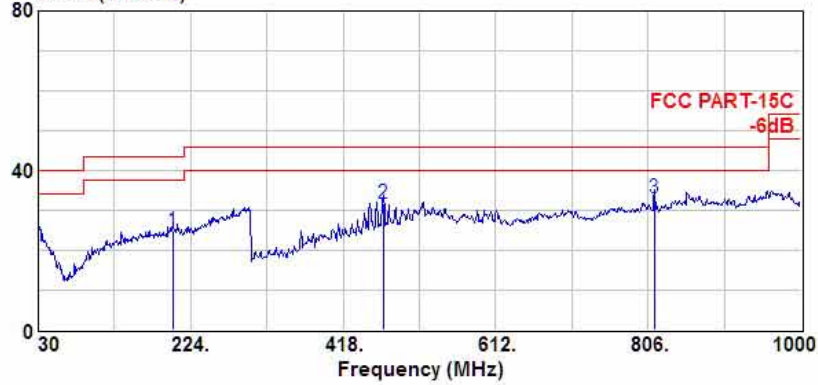
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	102.750	17.40	2.10	5.20	24.70	43.50	18.80	QP
2	420.910	17.00	5.01	1.84	23.85	46.00	22.15	QP
3	777.870	24.18	6.80	-1.25	29.74	46.00	16.26	QP

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



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Data: 9 File: D:\share DOC\johnny-e3\C1M1210216(FUTABA FCC CE)\final-FCC
 Level (dBuV/m)



Site no. : A/C Chamber Data no. : 9
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2425MHz (FHSS)

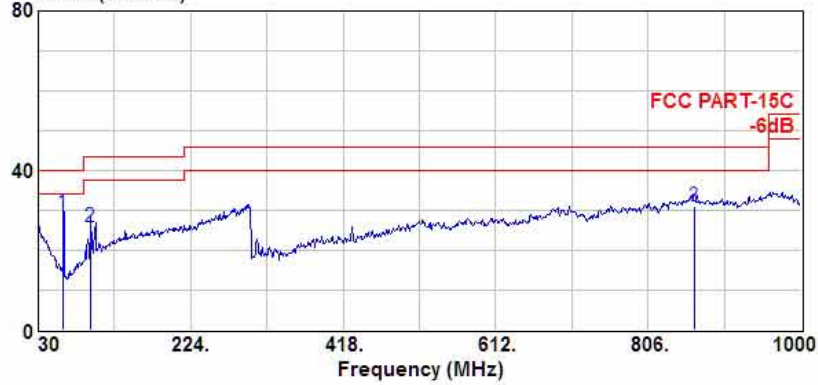
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	200.720	22.08	3.00	-0.12	24.96	43.50	18.54	QP
2	469.410	18.29	5.80	7.72	31.81	46.00	14.19	QP
3	813.760	23.98	7.00	2.21	33.19	46.00	12.81	QP

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



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Data: 10 File: D:\share DOC\johnny-e3\C1M1210216(FUTABA FCC CE)\final-FCC
 Level (dBuV/m)



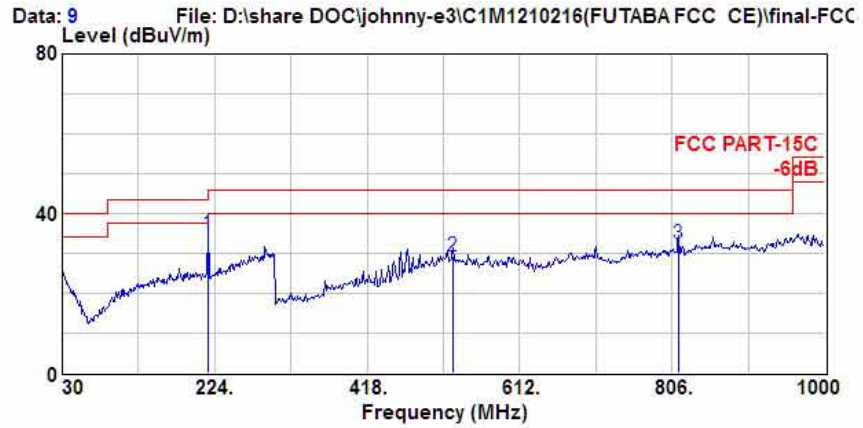
Site no. : A/C Chamber Data no. : 10
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2447.5MHz (FHSS)

	Freq.	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
	(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1	62.010	12.28	1.60	15.28	29.17	40.00	10.83	QP
2	96.930	16.75	2.05	6.94	25.74	43.50	17.76	QP
3	865.170	26.00	7.20	-2.15	31.05	46.00	14.95	QP

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



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Site no. : A/C Chamber Data no. : 9
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL
 Limit : FCC PART-15C
 Env. / Ins. : E4446A 24*C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2447.5MHz (FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	216.240	21.86	3.20	9.61	34.68	46.00	11.32	QP
2	526.640	19.67	6.90	2.74	29.31	46.00	16.69	QP
3	813.760	23.98	7.00	1.36	32.34	46.00	13.66	QP

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

3.6.2. Above 1GHz Frequency Range Measurement Results

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2403.250MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4808.500	33.06	9.14	14.72	56.92	74.00	17.08

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4808.50	56.92	-30.30	26.62	54.00	27.38

- Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.
 4. *: Measured at 1m and limit is transformed to 63.54dBμV/m by adding a factor 9.5 which is calculated from 20log(3/1).

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2403.250MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Vertical; (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4808.500	33.06	9.14	8.95	51.15	74.00	22.85

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4808.50	56.92	-30.30	26.62	54.00	27.38

- Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2425.000MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4850.500	33.12	9.15	13.87	56.14	74.00	17.86

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4850.500	56.14	-30.30	25.84	54.00	28.16

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2425.000MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4850.500	33.12	9.15	8.90	51.17	74.00	22.83

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4850.500	51.17	-30.30	20.87	54.00	33.13

- Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2447.500MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4895.500	33.21	9.16	12.92	55.30	74.00	18.70

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4895.500	55.30	-30.30	25.00	54.00	29.00

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.

Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmitting Mode, Frequency: 2447.500MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading Horizontal (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4895.500	33.21	9.16	9.48	51.86	74.00	22.14

- Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.
 3. All final readings of measurement were with Peak values.
 4. If the Average limit is met when using a Peak detector, the Average detector is unnecessary

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Vertical (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4895.500	51.86	-30.30	21.56	54.00	32.44

- Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. All final readings of measurement were with Average values.

3.6.3. Restricted Bands Measurement Results

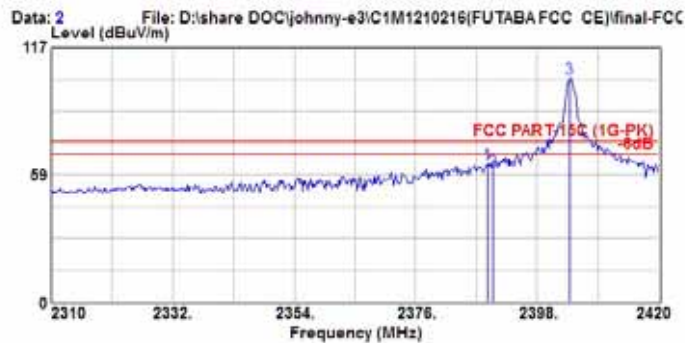
Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmit, Channel: 01, Frequency: 2403.250MHz



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Site no. : A/C Chamber Data no. : 2
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2404MHz (FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
*	2389.090	28.47	6.34	28.74	63.55	74.00	10.45	Peak
	2390.000	28.47	6.34	25.76	60.58	74.00	13.42	Peak
	2403.940	28.51	6.36	68.01	102.88	74.00	-28.68	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. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

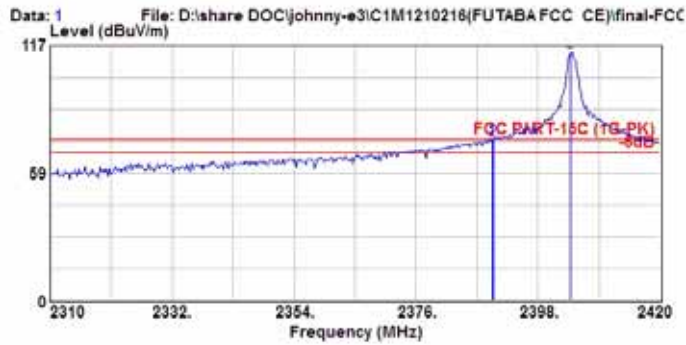
Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2389.090	63.55	-30.30	33.25	54.00	20.75

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. Low frequency section (spurious in the restricted band 2310-2420MHz).
 4. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

Date of Test : Jan. 28, 2013 Temperature : 24
 EUT : Radio Control Humidity : 66%
 Test Mode : Transmit, Channel: 01, Frequency: 2403.250MHz



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Site no. : A/C Chamber Data no. : 1
 Dis. / Ant. : 3m 3115 (4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2404MHz (FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
* 1	2389.860	28.47	6.34	38.74	73.55	74.00	0.45	Peak
2	2390.000	28.47	6.34	38.72	73.53	74.00	0.47	Peak
3	2403.940	28.51	6.36	79.05	113.92	74.00	-39.92	Peak

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

3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.090	7.55	-30.30	43.25	54.00	10.75

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30

2. Average value=Peak value+Duty Cycle Factor

3. Low frequency section (spurious in the restricted band 2310-2420MHz).

4. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

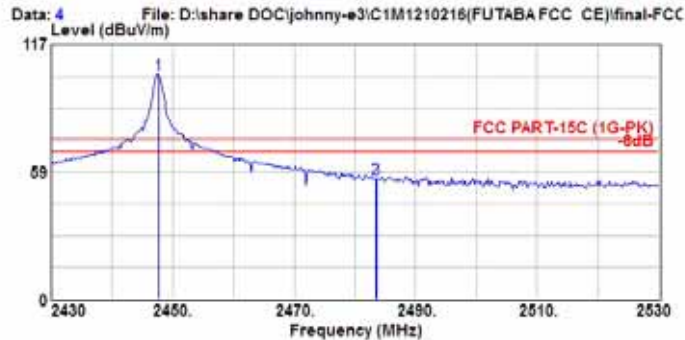
Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmit, Channel: 60 Frequency: 2447.500MHz



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Site no. : A/C Chamber Data no. : 4
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/66% Engineer : Johnny_Hsueh
 EUT : T14SG
 Power Rating : DC 6V
 Test Mode : Tx2447.5MHz (FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2447.700	28.59	6.41	68.31	103.30	74.00	-29.30	Peak
*	2483.500	28.66	6.45	20.43	55.54	74.00	18.46	Peak
3	2483.600	28.66	6.45	20.37	55.49	74.00	18.51	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. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2483.500	55.54	-30.30	25.24	54.00	28.76

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30
 2. Average value=Peak value+Duty Cycle Factor
 3. Low frequency section (spurious in the restricted band 2310-2420MHz).
 4. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

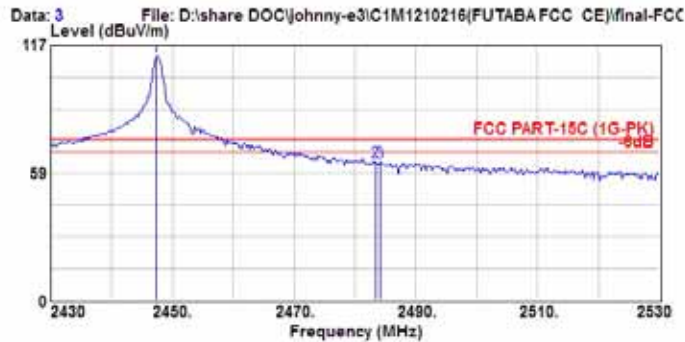
Date of Test : Jan. 28, 2013 Temperature : 24

EUT : Radio Control Humidity : 66%

Test Mode : Transmit, Channel: 60 Frequency: 2447.500MHz



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Site no. : A/C Chamber Data no. : 3
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : E4446A 24°C/66% Engineer : Johnny_Hsueh
 EUT : T148G
 Power Rating : DC 6V
 Test Mode : Tx2447.5MHz (FHSS)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2447.400	28.59	6.41	76.87	111.87	74.00	-37.87	Peak
2	2483.500	28.66	6.45	28.42	63.53	74.00	10.47	Peak
*3	2484.200	28.66	6.45	28.46	63.58	74.00	10.42	Peak

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

3. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2484.200	63.58	-30.30	33.28	54.00	20.72

Remarks: 1. DCF=20log(dwell time/100ms)=20log(3.04ms/100ms)=-30.30

2. Average value=Peak value+Duty Cycle Factor

3. Low frequency section (spurious in the restricted band 2310-2420MHz).

4. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

4. 20dB BANDWIDTH MEASUREMENT

4.1. Test Equipment

The following test equipment was used during the 20dB bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

4.2. Block Diagram of Test Setup



4.3. Specification Limits (§15.247(a)(1))

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

4.4. Operating Condition of EUT

- 4.4.1. Set up the EUT and simulator as shown on 4.2.
- 4.4.2. To turn on the power of all equipment.
- 4.4.3. EUT (Radio Control) was on transmitting frequency function during the testing.

4.5. Test Procedure (DA 00-705)

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 2.7kHz RBW and 2.7kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

RBW=1% of the 20dB bandwidth
 VBW=RBW

4.6. Test Results

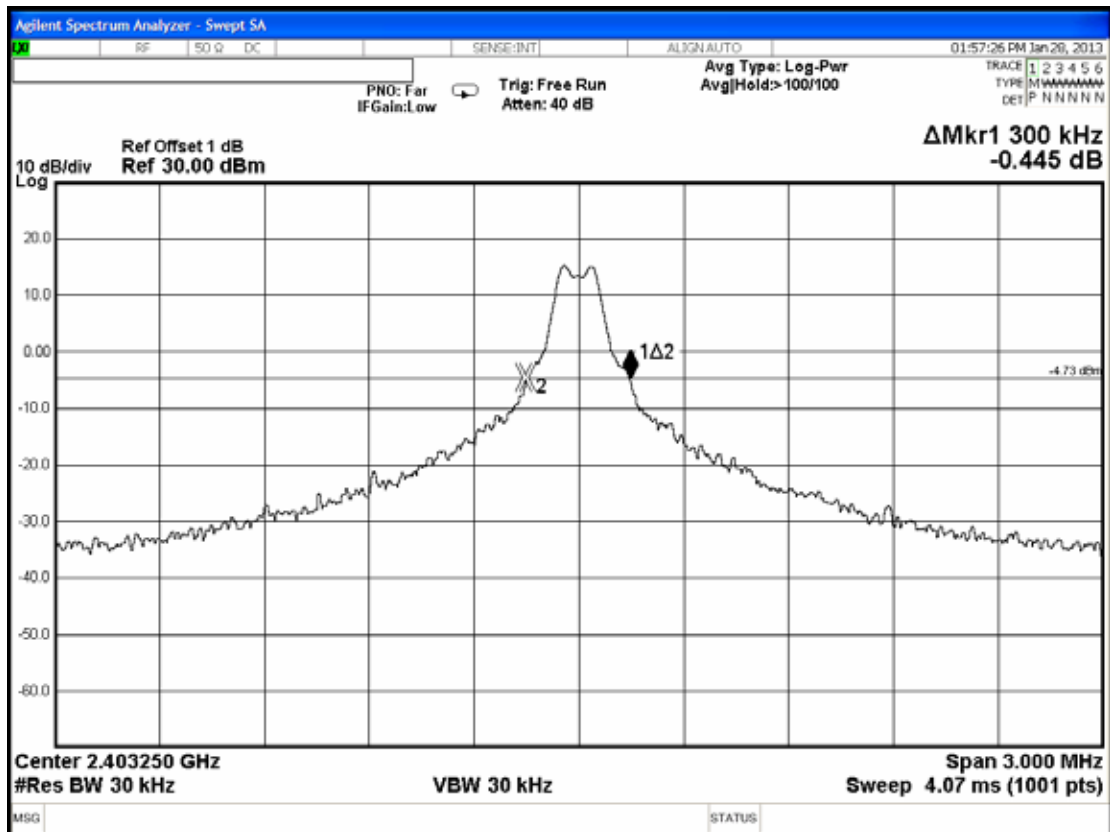
PASSED. All the test results are attached in next pages.

Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

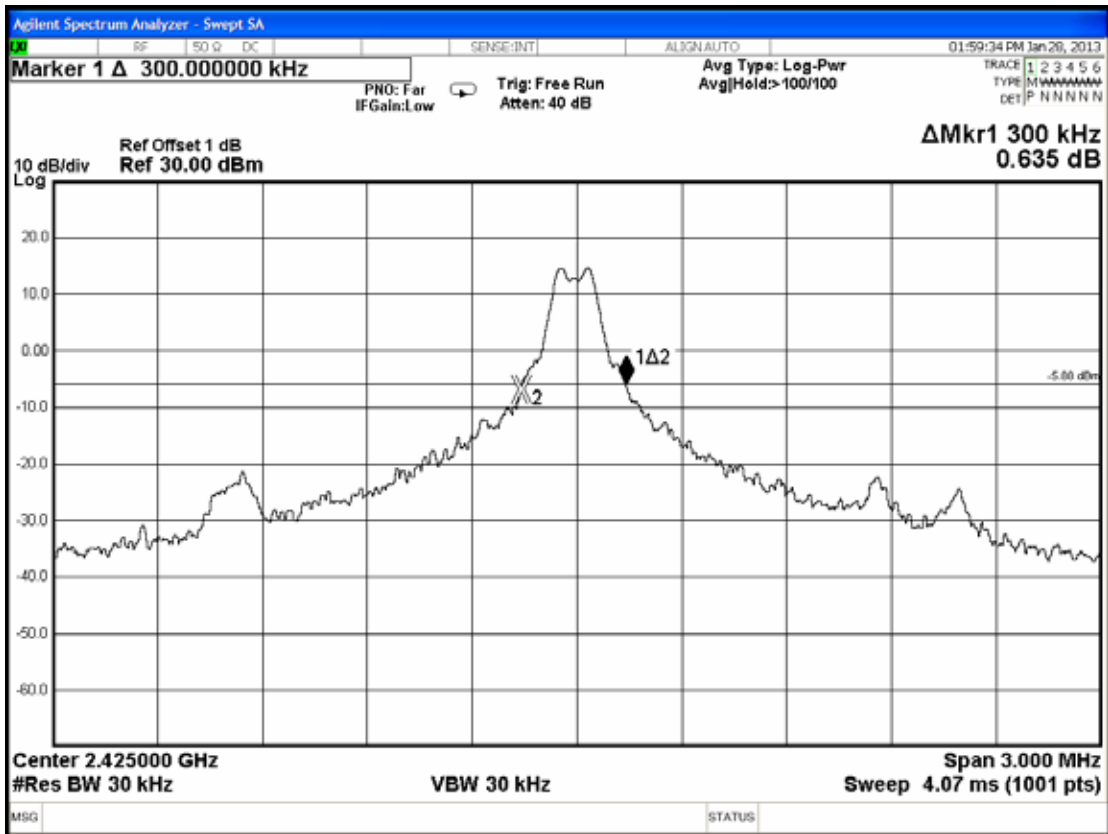
No.	Channel	Test Frequency	20dB Bandwidth	2/3 (20dB Bandwidth)
1.	01	2403.250MHz	300kHz	100kHz
2.	30	2425.000MHz	300kHz	100kHz
3.	60	2447.500MHz	306kHz	102kHz

The maximum two-thirds of the 20dB bandwidth shall be at maximum 102kHz.

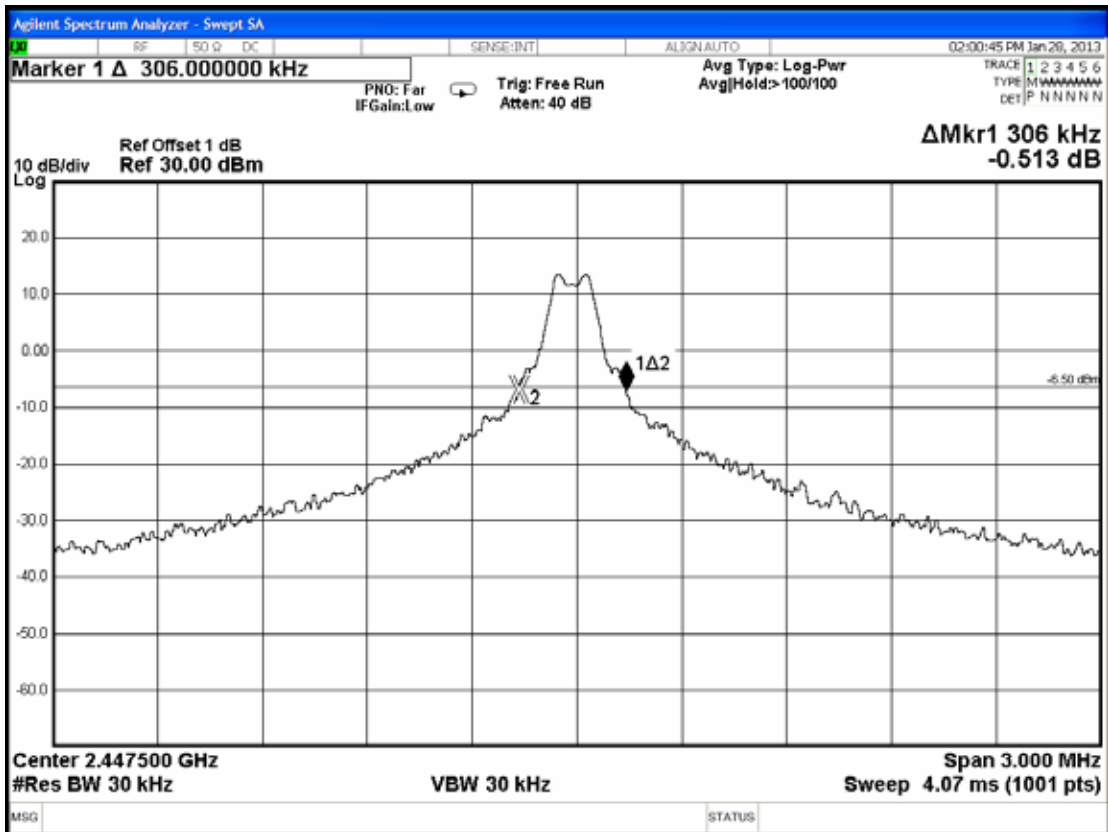
4.6.1. Channel 01, Frequency: 2403.250MHz



4.6.2. Channel 31, Frequency: 2425.000MHz



4.6.3. Channel 60, Frequency: 2447.500MHz



5. CARRIER FREQUENCY SEPARATION MEASUREMENT

5.1. Test Equipment

The following test equipment was used during the carrier frequency separation measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

5.2. Block Diagram of Test Setup

The same as section.4.2.

5.3. Specification Limits (§15.247(a)(1))

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

5.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in section 4.4.

5.5. Test Procedure (DA 00-705)

The transmitter output was connected to the spectrum analyzer. The channel separation was measure by spectrum analyzer with 30kHz RBW and 30kHz VBW. The video bandwidth not to be smaller than resolution bandwidth, the peak was mark on adjacent bandwidth, the between of peak is carrier frequency separation.

RBW=1% Span

VBW=RBW

5.6. Test Results

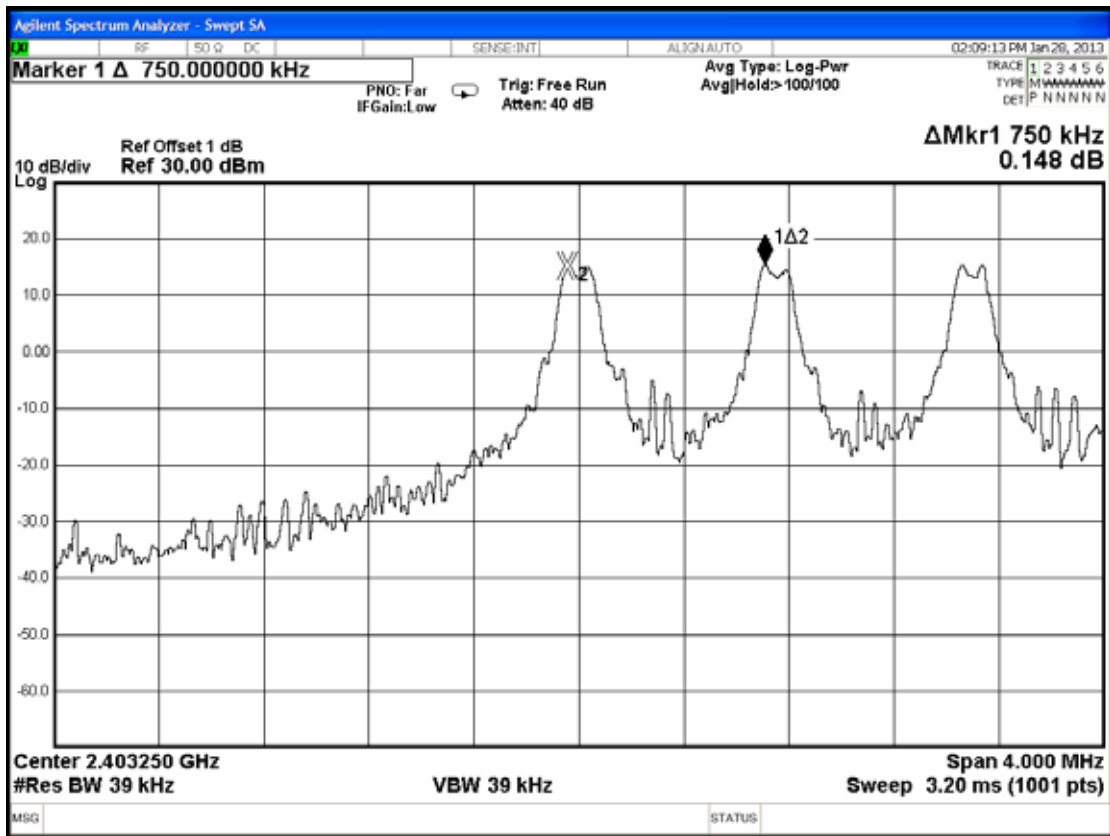
PASSED. All the test results are attached in next pages.

Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

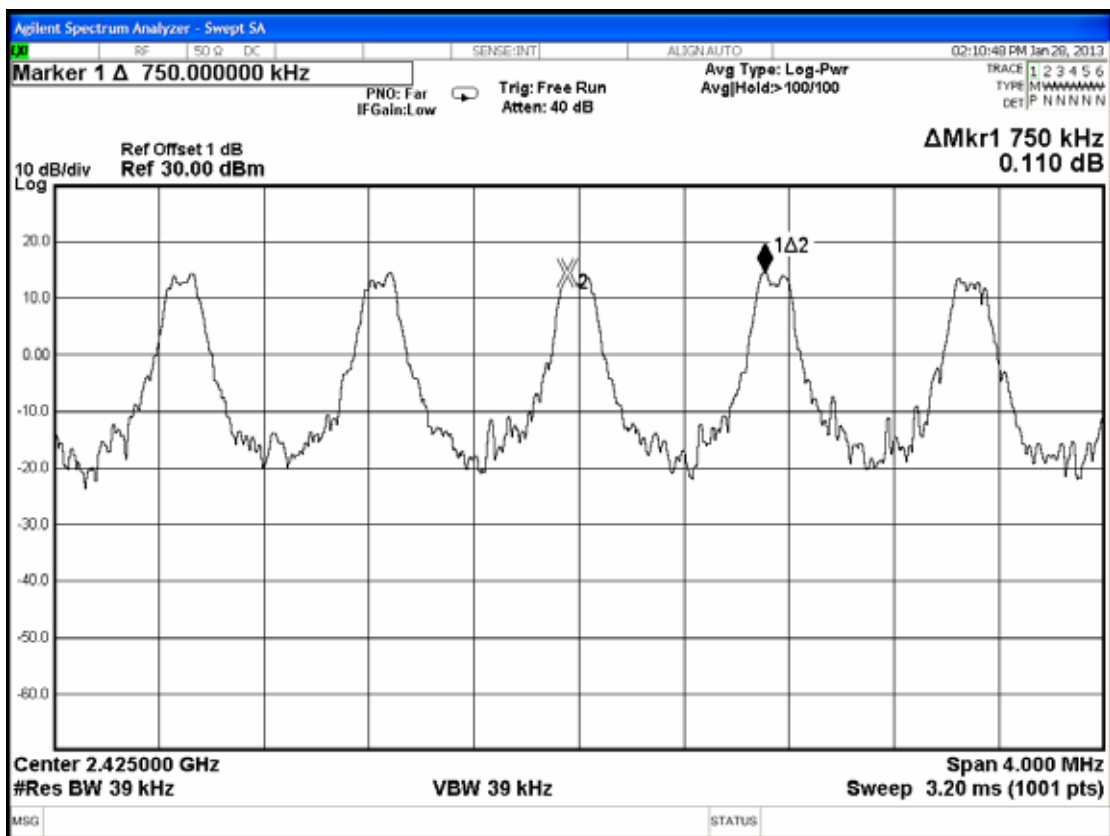
The minimum adjacent channel carrier frequency separation: 750kHz。

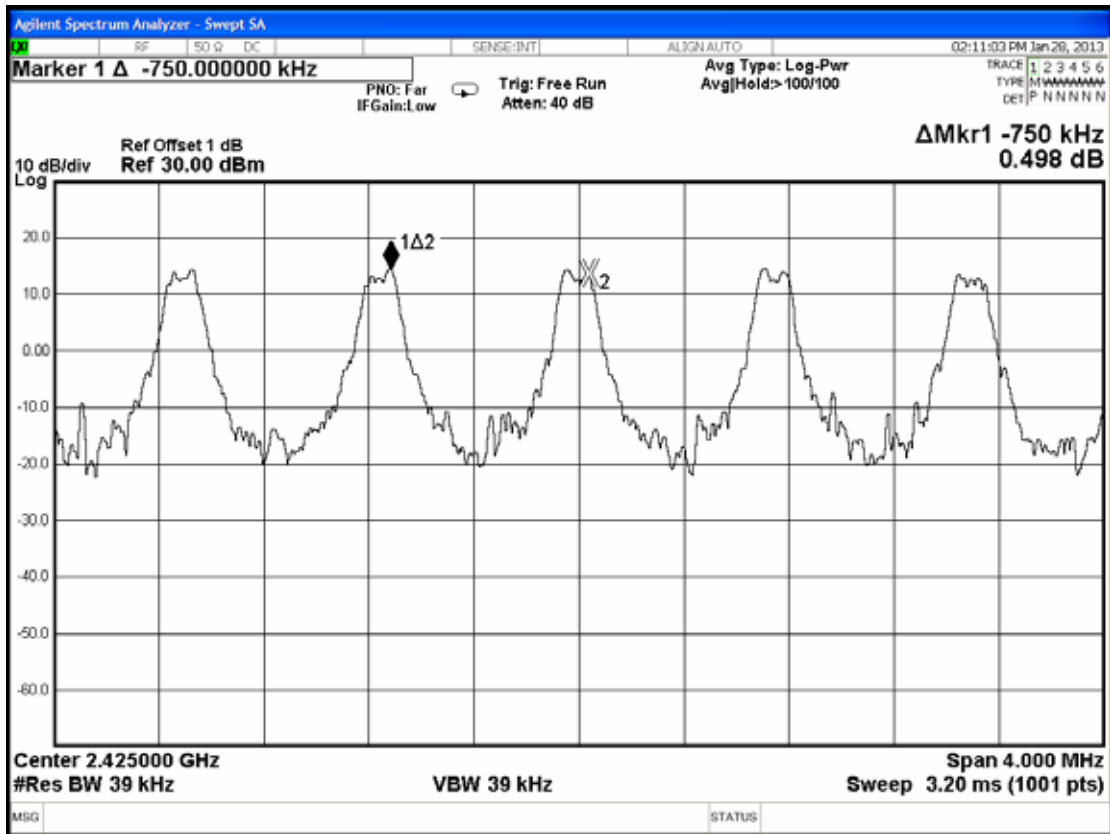
[Above values have met the requirement as specified in section 4.3: frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.]

5.6.1. Channel 01, Test Frequency: 2403.250MHz

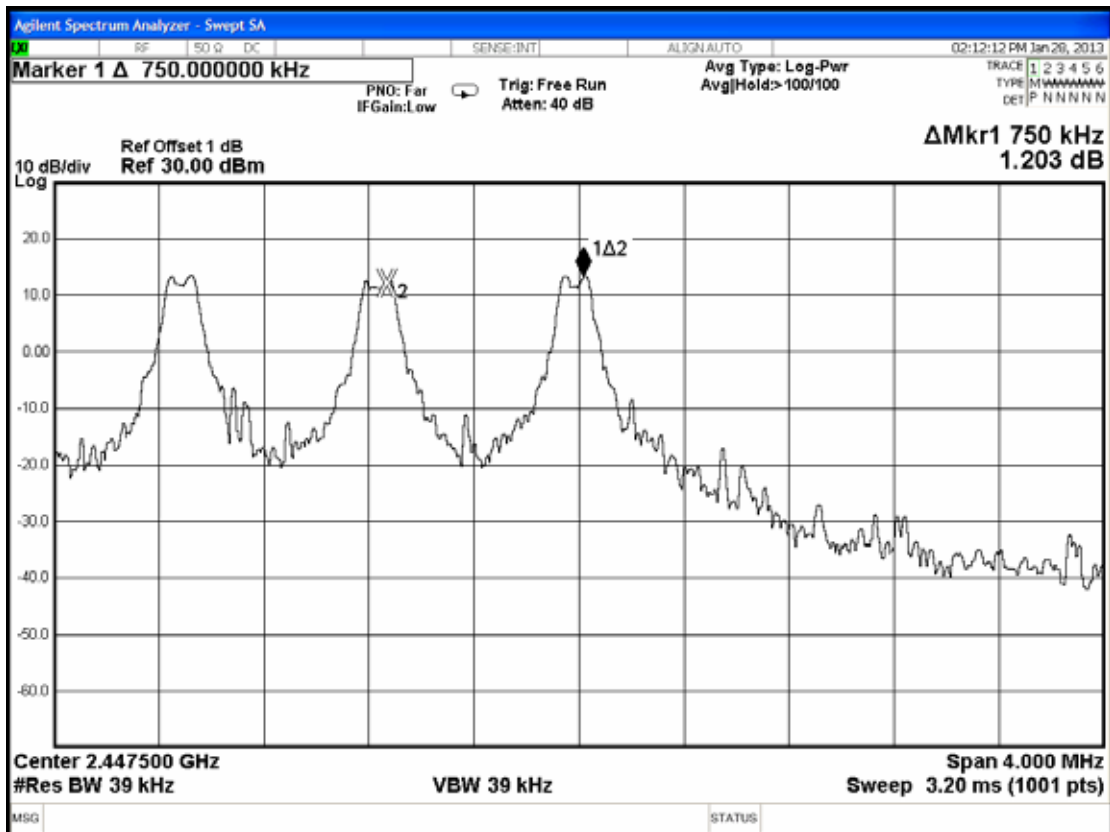


5.6.2. Channel 31, Test Frequency: 2425.000MHz





5.6.3. Channel 60, Test Frequency: 2447.500MHz



6. TIME OF OCCUPANCY MEASUREMENT

6.1. Test Equipment

The following test equipment was used during the time of occupancy measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

6.2. Block Diagram of Test Setup

The same as section.4.2.

6.3. Specification Limits (§15.247(a)(1)(iii))

Frequency hopping systems in the 2400-2483.5MHz shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by number of hopping channels employed.

6.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in section 4.4.

6.5. Test Procedure (DA 00-705)

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 1MHz RBW and 1MHz VBW. $VBW \geq RBW$; Span=zero span.

Centered on a hopping channel sweep=as necessary to capture the entire dwell time per hopping channel ; Detector function=peak ; Trace=Max hold

6.6. Test Results

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

Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

Duty cycle: 60 channels*0.4 seconds = 24 seconds

Test Frequency: 2403.250MHz

For per second of 5 channels appearance, the longest time of occupancy for each of 24 seconds is:

5 channels*24 seconds* 3.03ms = 363.60ms (<400ms)

Test Frequency: 2425.000MHz

For per second of 5 channels appearance, the longest time of occupancy for each of 24 seconds is:

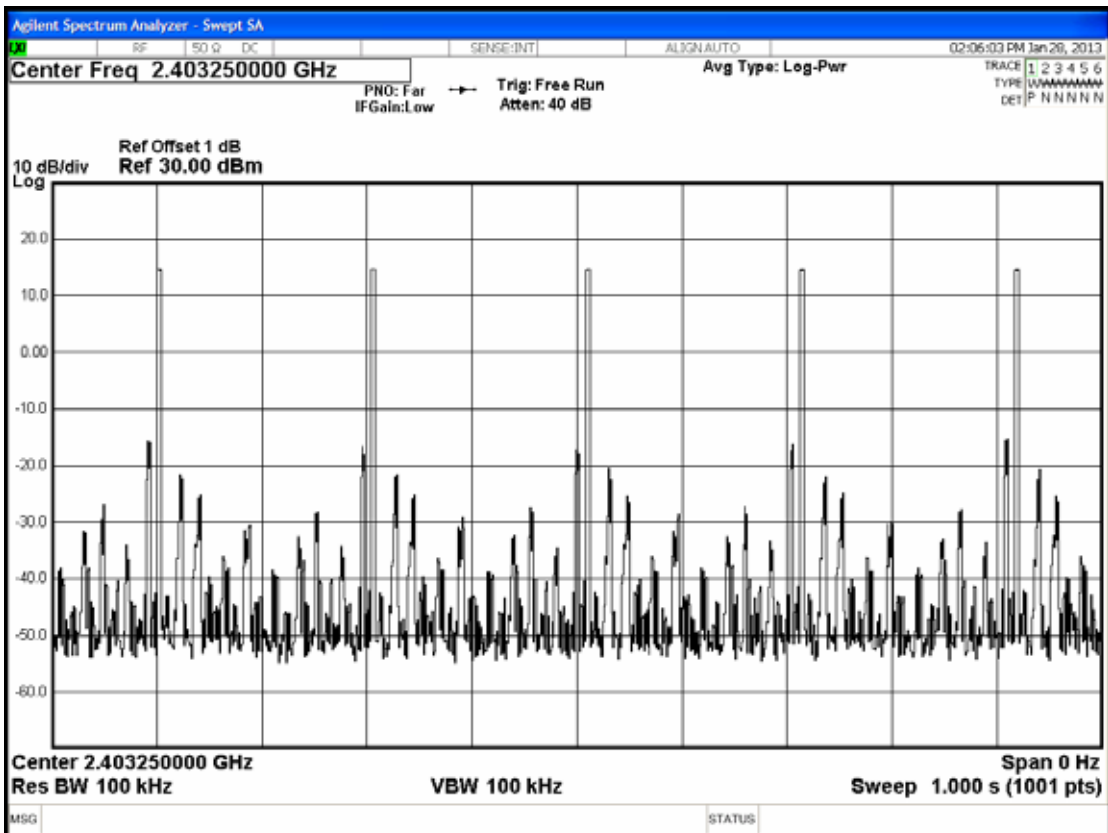
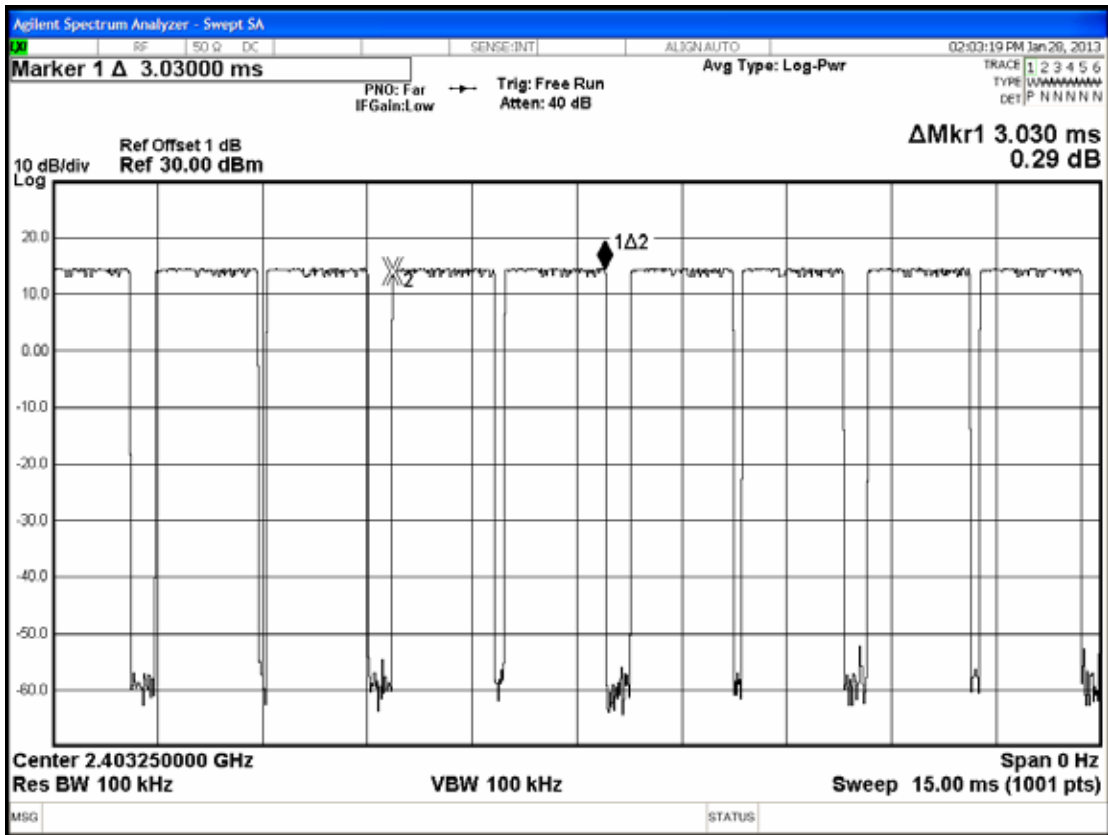
5 channels*24 seconds* 3.03ms = 363.60ms (<400ms)

Test Frequency: 2447.500MHz

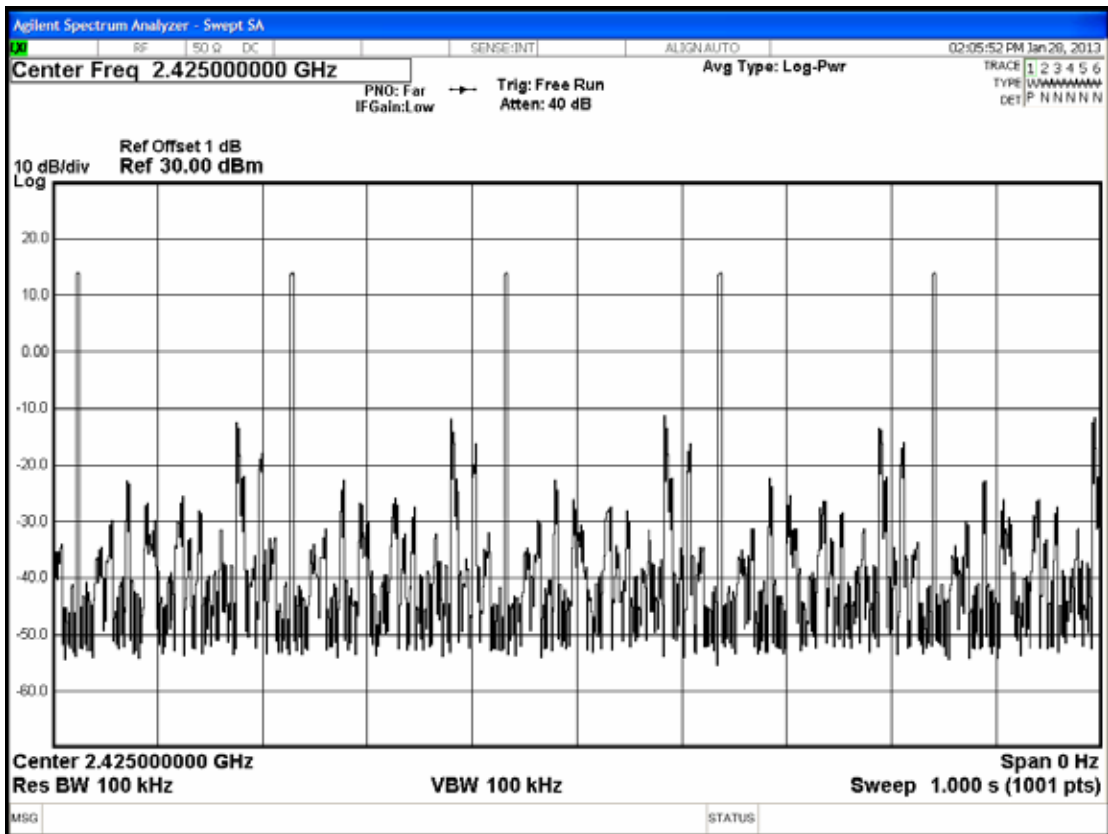
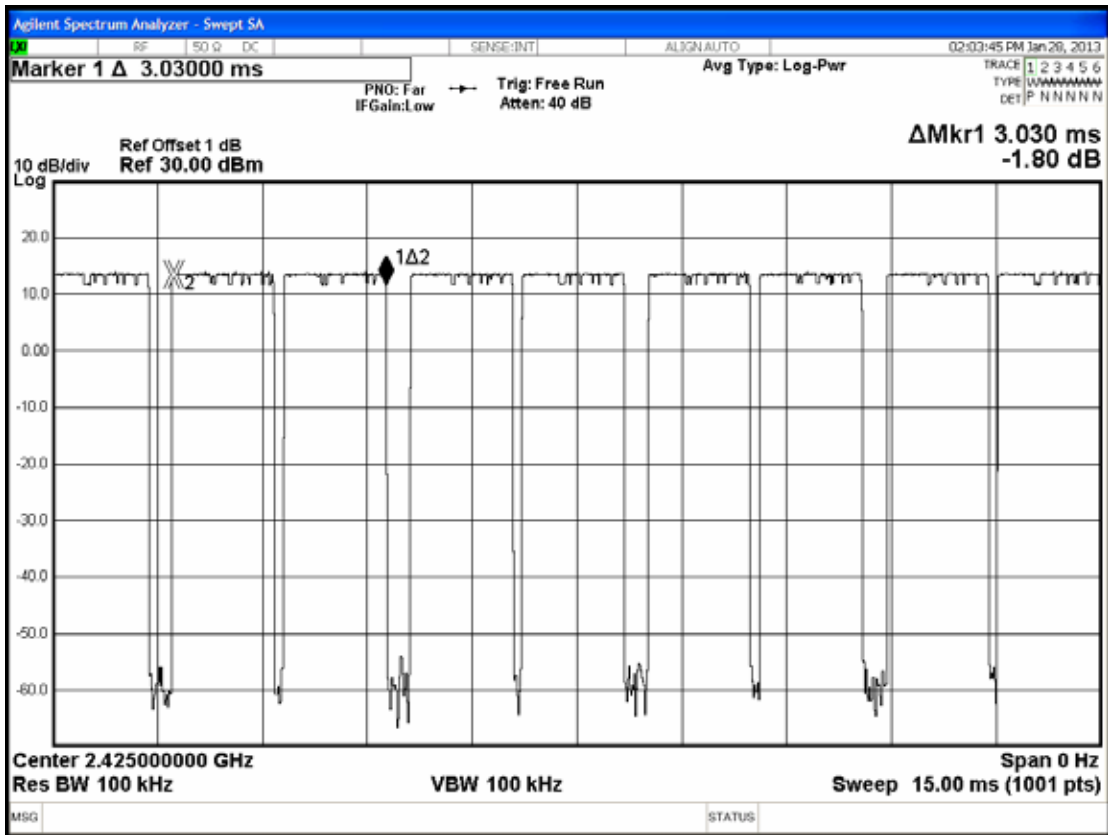
For per second of 5 channels appearance, the longest time of occupancy for each of 24 seconds is:

5 channels*24 seconds* 3.03ms = 363.60ms (<400ms)

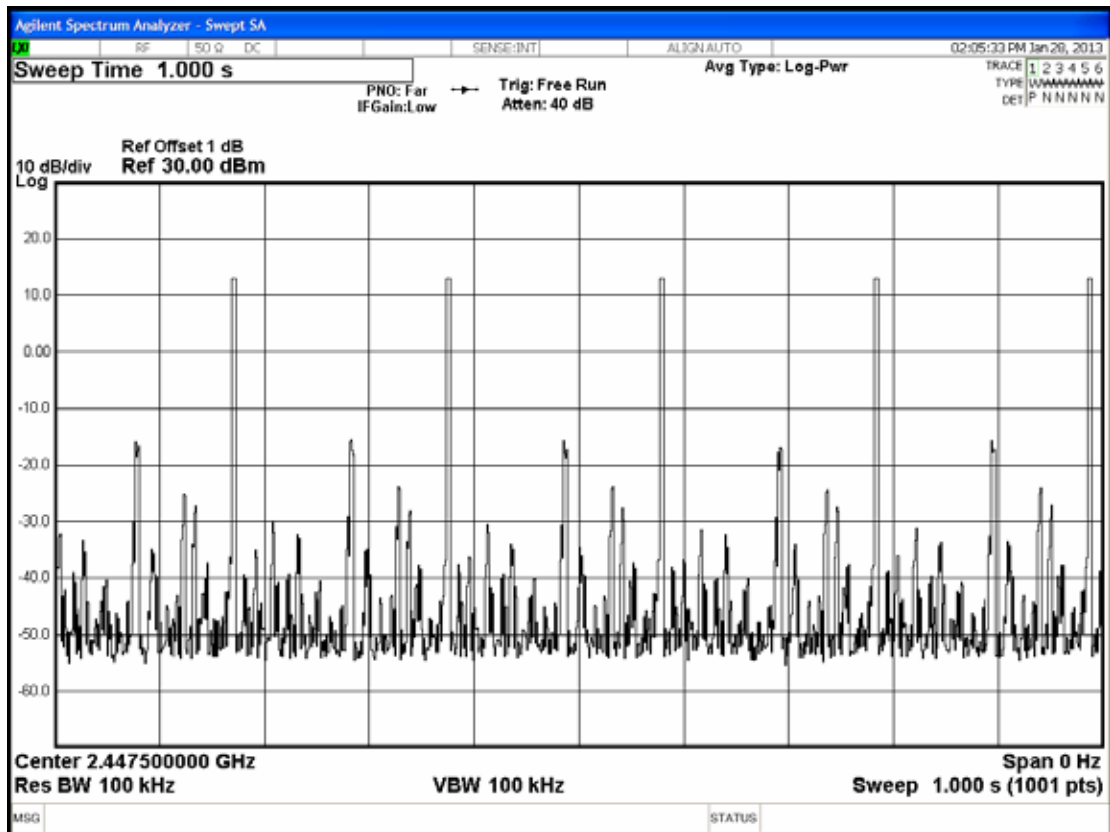
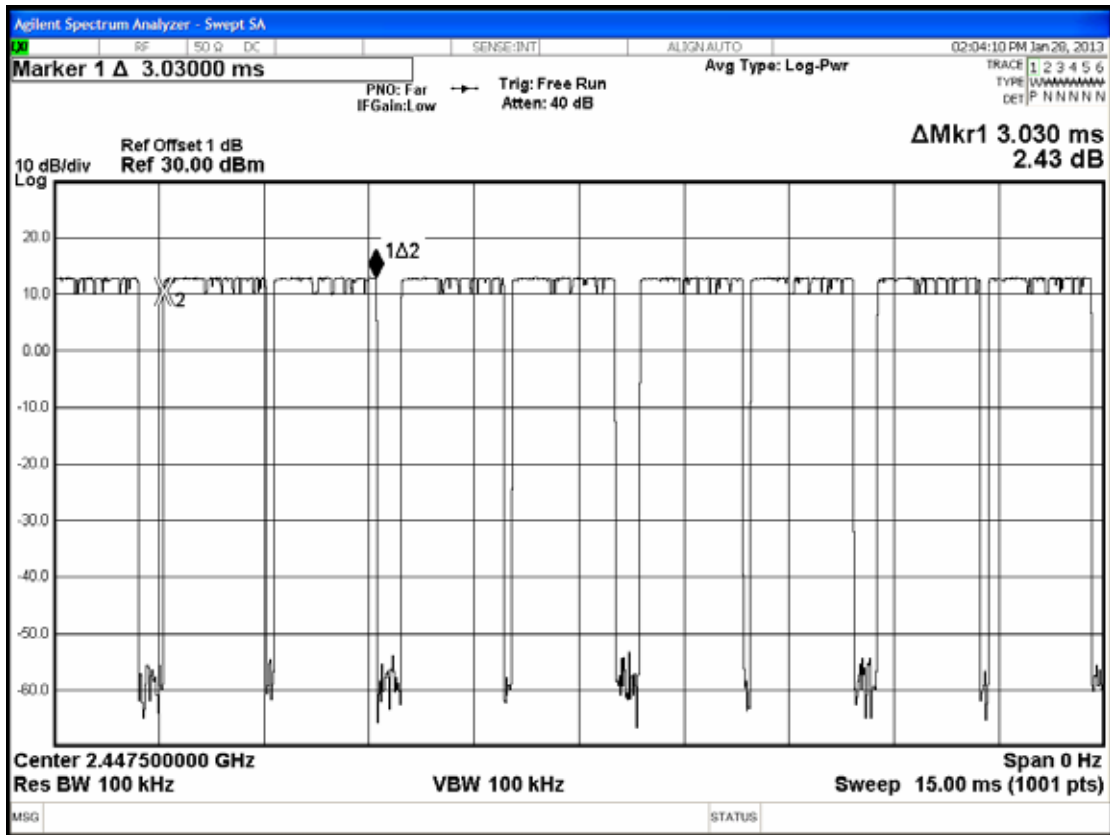
6.6.1. Channel 01, Test Frequency: 2403.250MHz



6.6.2. Channel 31, Test Frequency: 2425.000MHz



6.6.3. Channel 60, Test Frequency: 2447.500MHz



7. NUMBER OF HOPPING CHANNELS MEASUREMENT

7.1. Test Equipment

The following test equipment was used during the number of hopping channels measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

7.2. Block Diagram of Test Setup

The same as section.4.2.

7.3. Specification Limits (§15.247(a)(1)(iii))

Frequency hopping systems which use fewer than 20 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels.

7.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in section 4.4.

7.5. Test Procedure (DA 00-705)

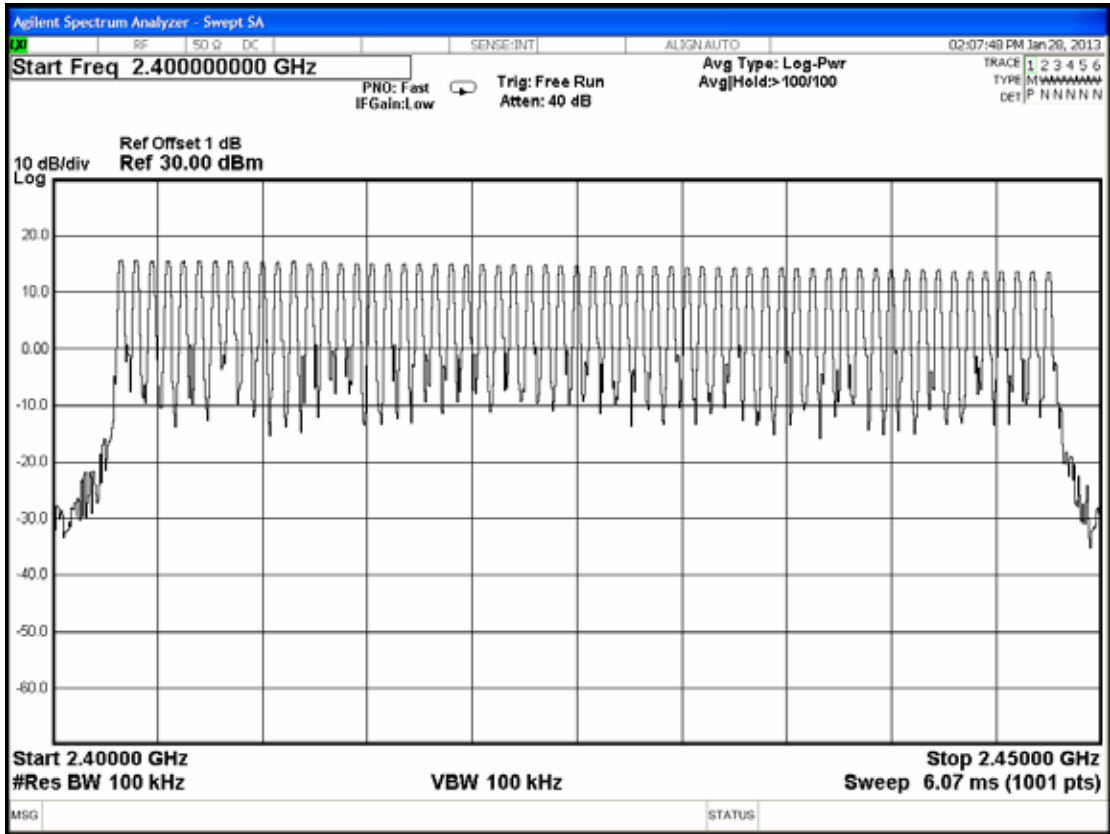
The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 100kHz VBW. Sweep=Auto ; Detector function=peak ; Trace=Max hold

7.6. Test Results

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

Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

The number hopping channel is 60.



8. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

8.1. Test Equipment

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

8.2. Block Diagram of Test Setup

The same as section.4.2.

8.3. Specification Limits (§15.247(b)-(1))

The Limits of maximum Peak Output Power for frequency hopping systems in 2400-2483.5MHz is: 0.125Watt. (21dBm)

8.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in 4.4 except the test set up replaced by section 8.2.

8.5. Test Procedure (DA 00-705)

Setting the spectrum span to encompass the EBW, RBW=1MHz and VBW=1MHz.
The find the peak value
The measurement guideline was according to KDB 558074.

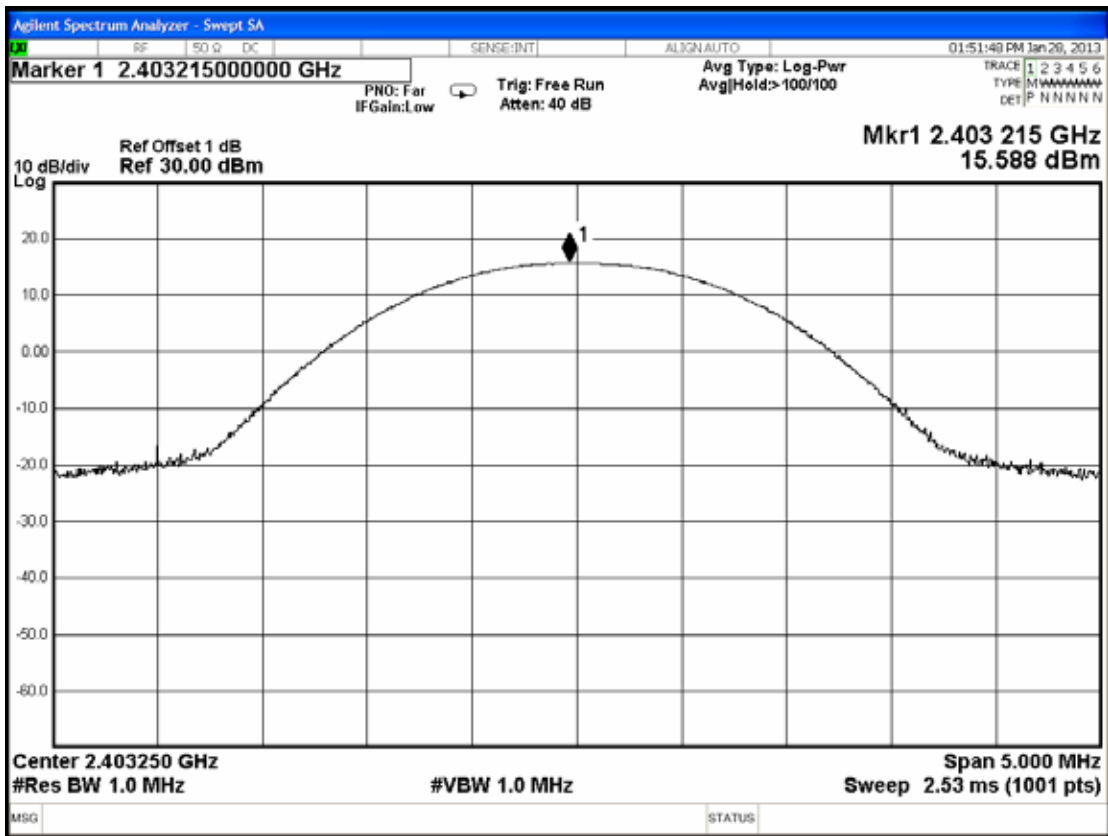
8.6. Test Results

PASSED. All the test results are listed below.

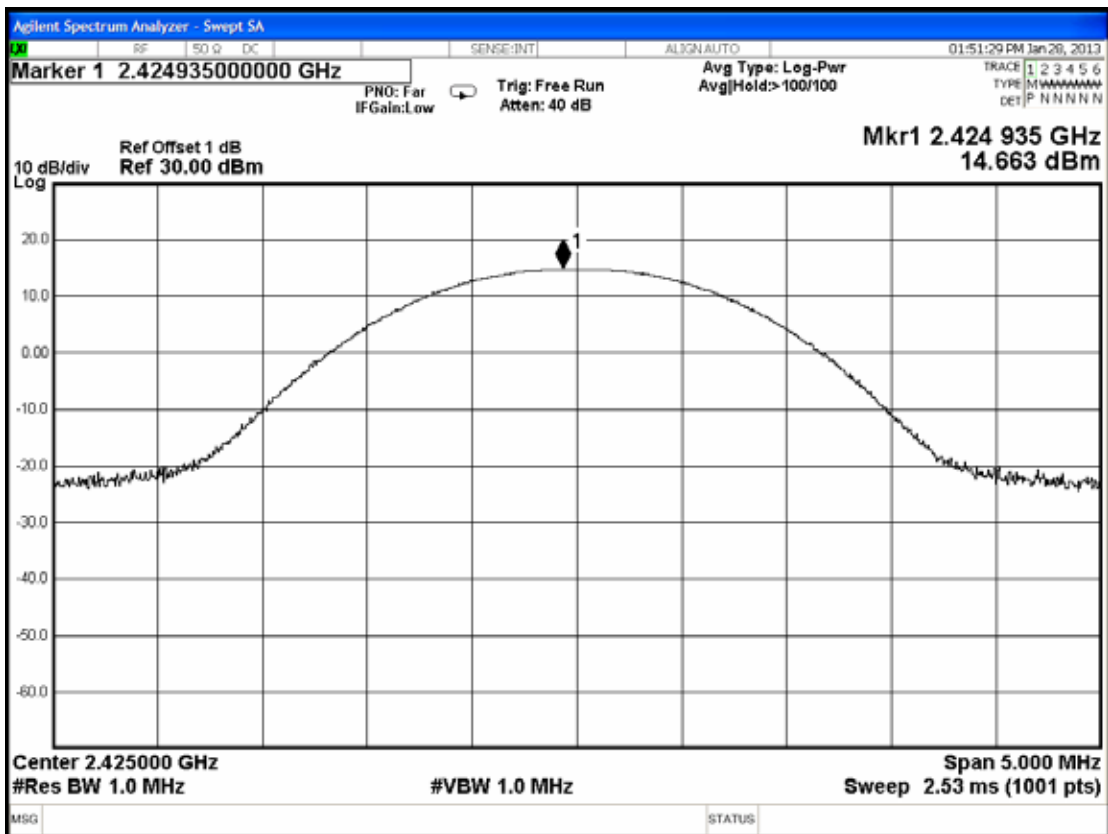
Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

No.	Channel	Test Frequency	Peak Output Power	Limit
1.	01	2403.250MHz	15.588dBm	21dBm
2.	31	2425.000MHz	14.663dBm	21dBm
3.	60	2447.500MHz	13.647dBm	21dBm

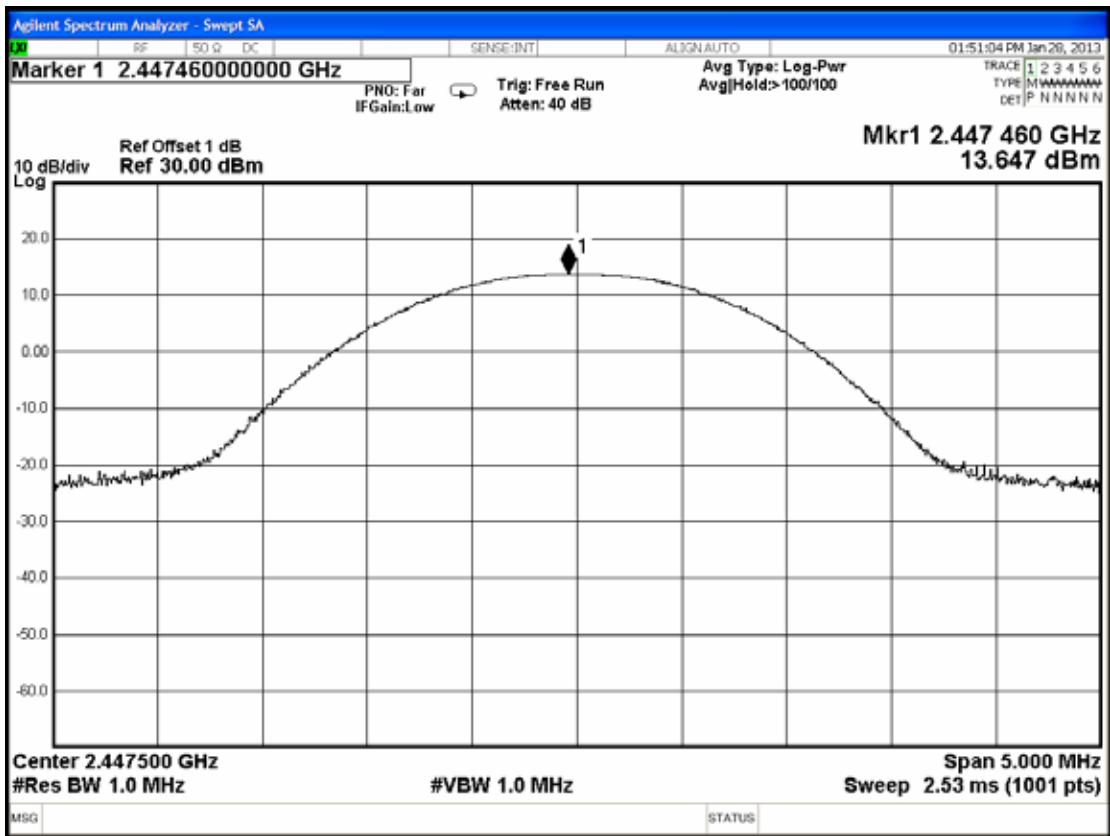
8.6.1. Channel 01, Test Frequency: 2403.250MHz



8.6.2. Channel 31, Test Frequency: 2425.000MHz



8.6.3. Channel 60, Test Frequency: 2447.500MHz



9. EMISSION LIMITATIONS MEASUREMENT

9.1. Test Equipment

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

9.2. Block Diagram of Test Setup

The same as section.4.2.

9.3. Specification Limits (§15.247(c))

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

9.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in section 4.4.

9.5. Test Procedure (DA 00-705)

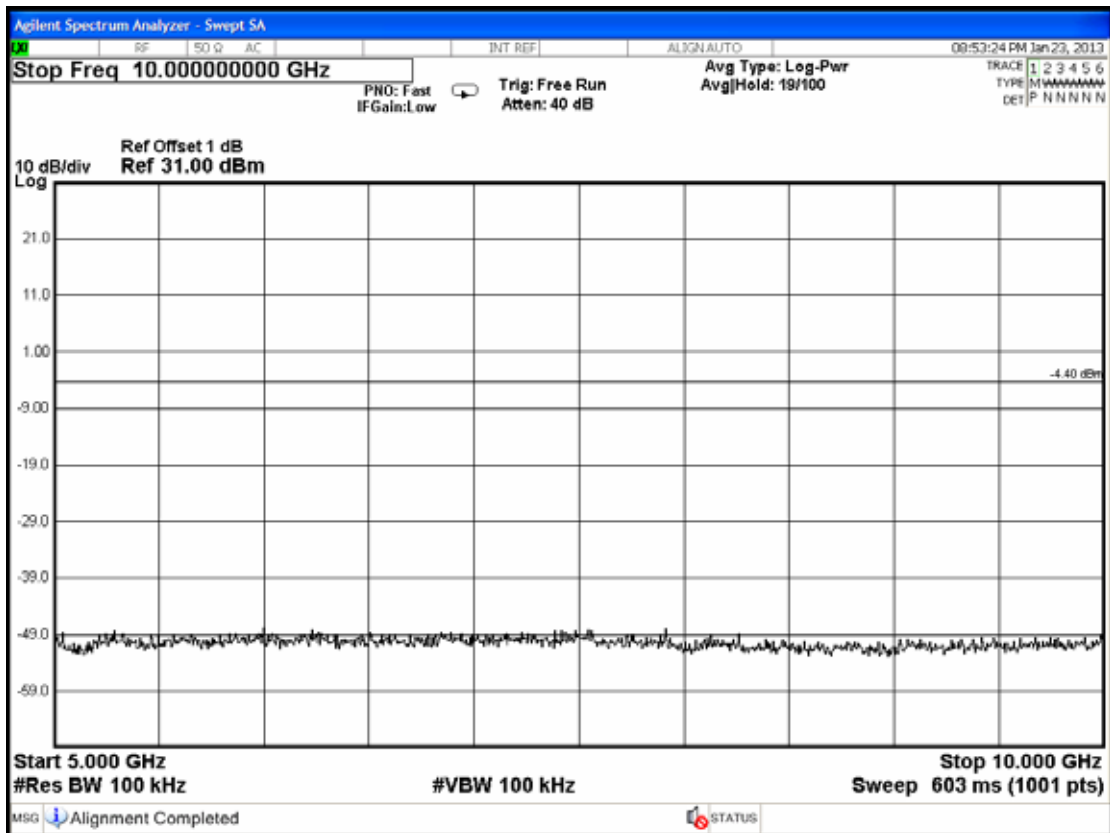
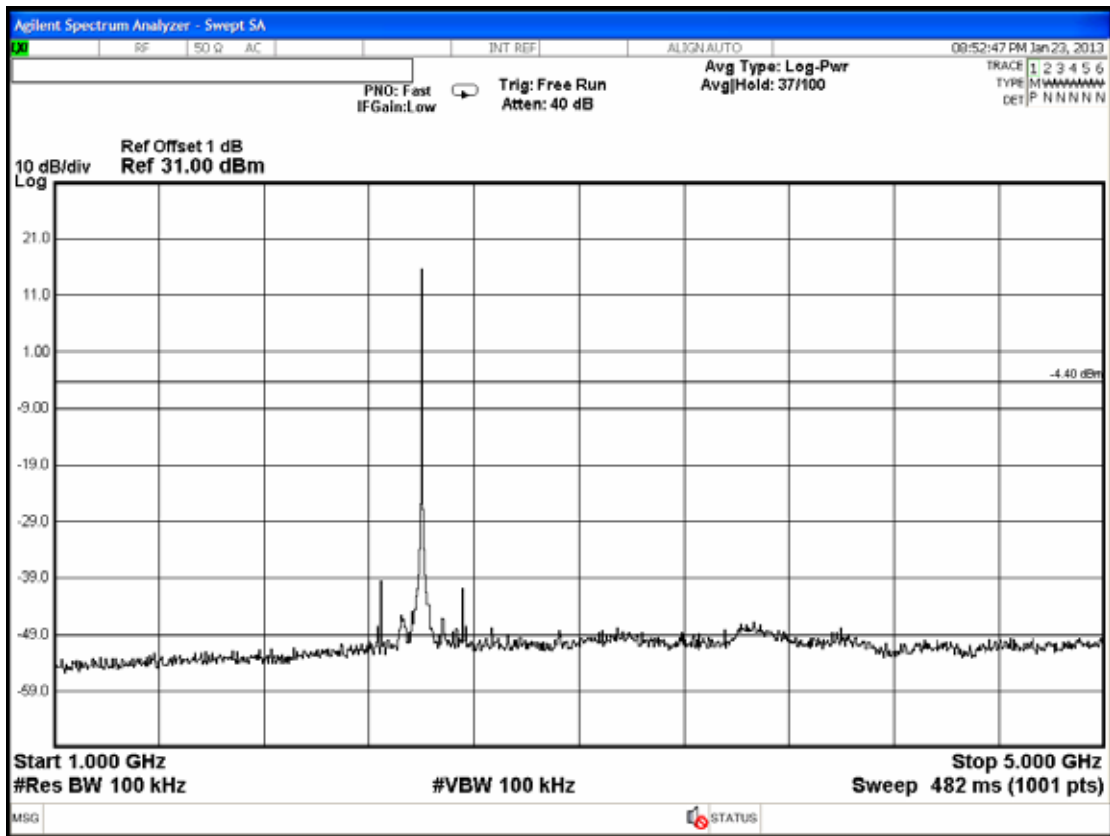
The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with frequency range from 30MHz to 25GHz.

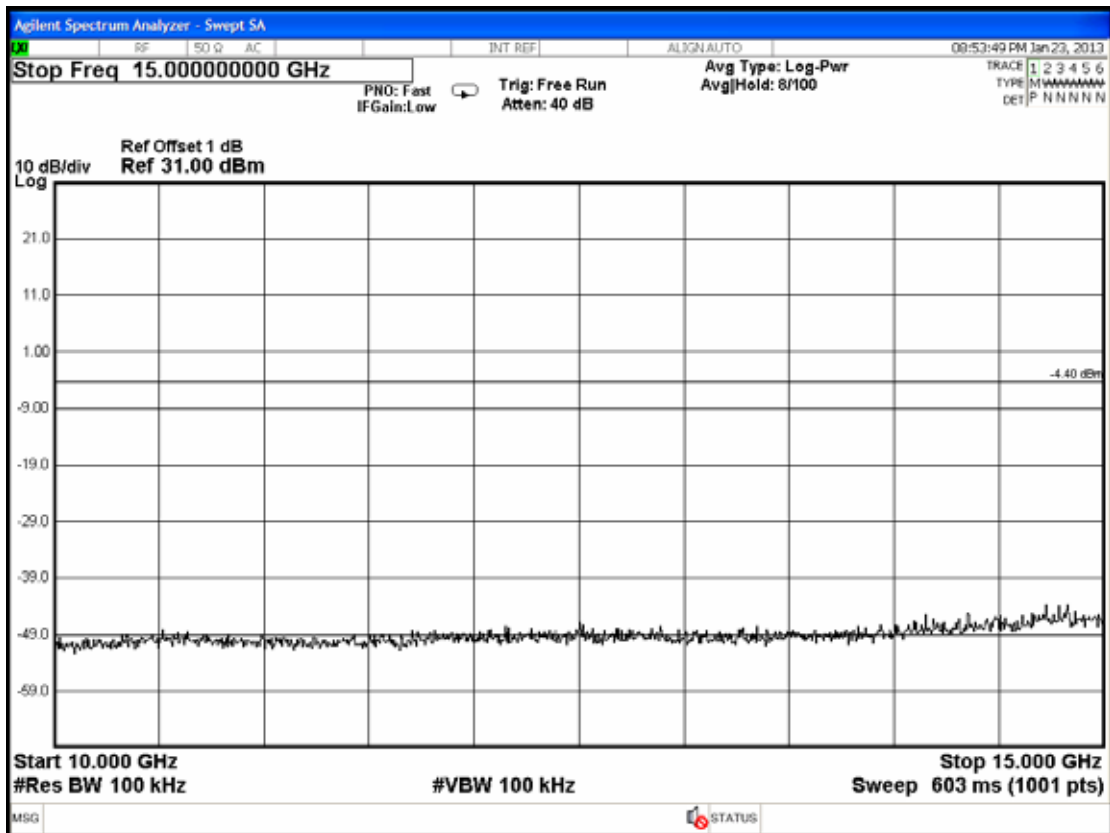
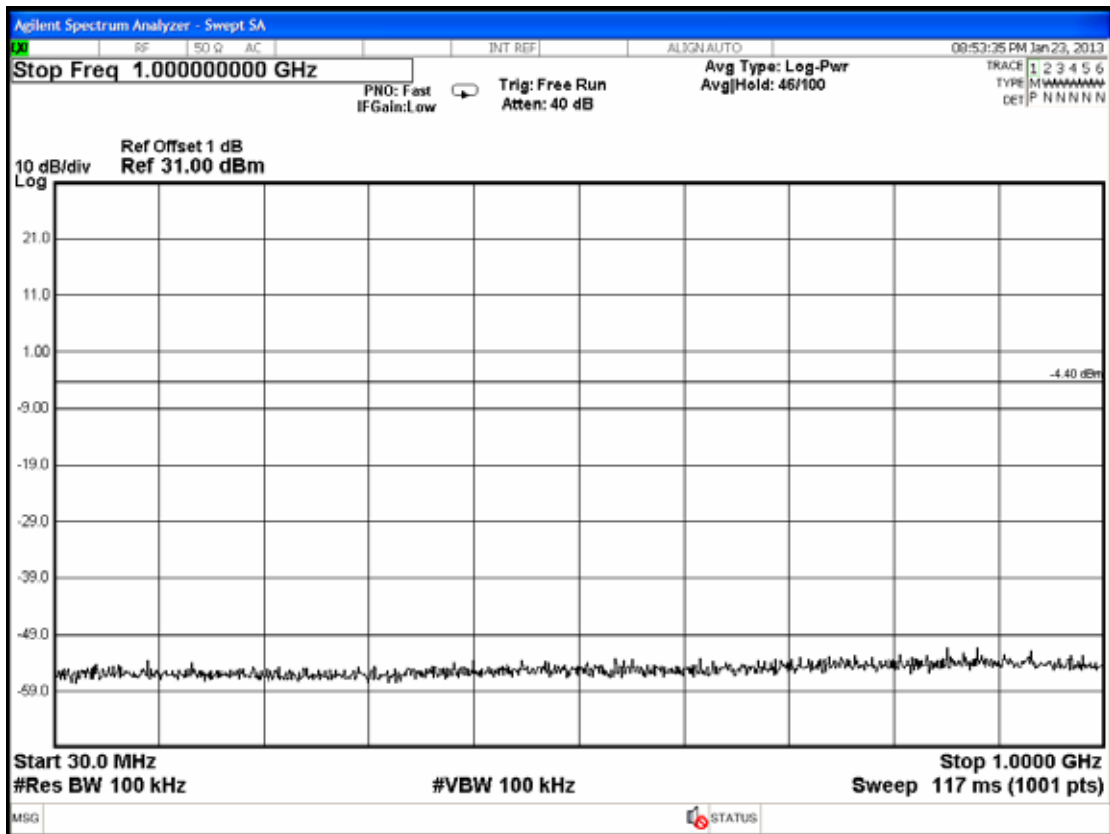
9.6. Test Results

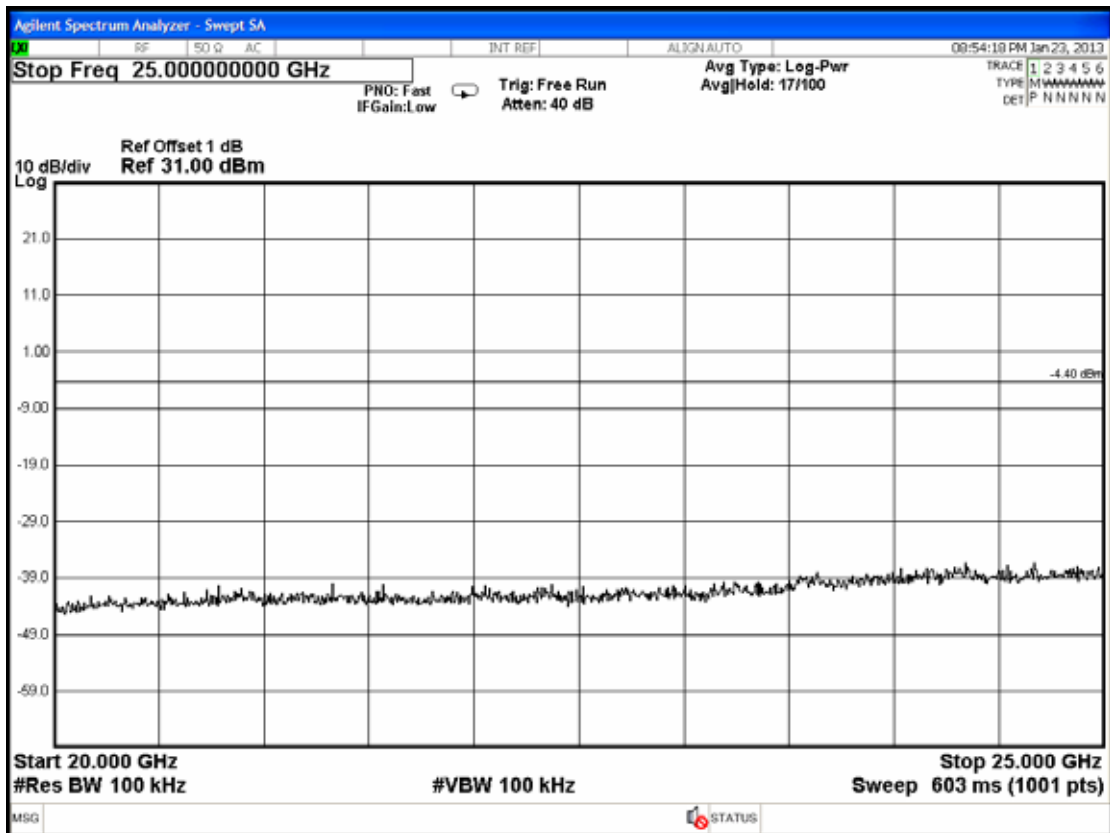
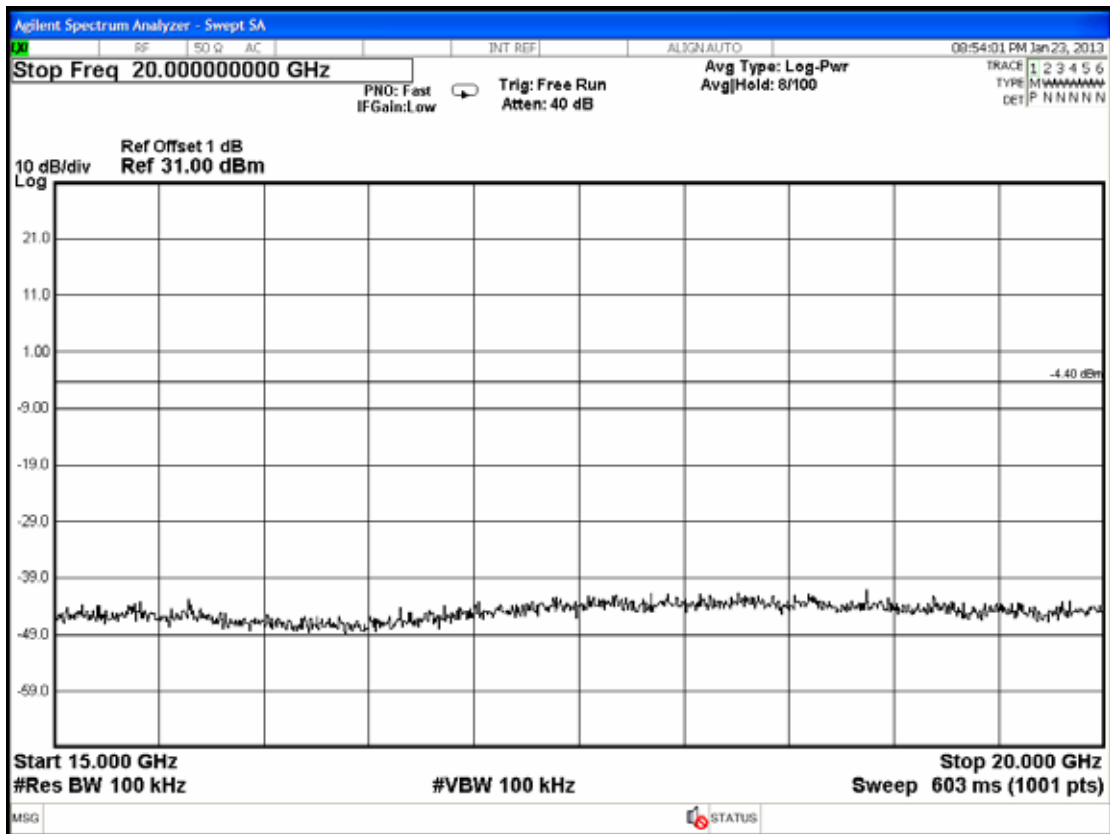
PASSED. All the test results are attached in next pages.

Test Date : Jan. 23, 2013 Temperature :26 Humidity : 58%

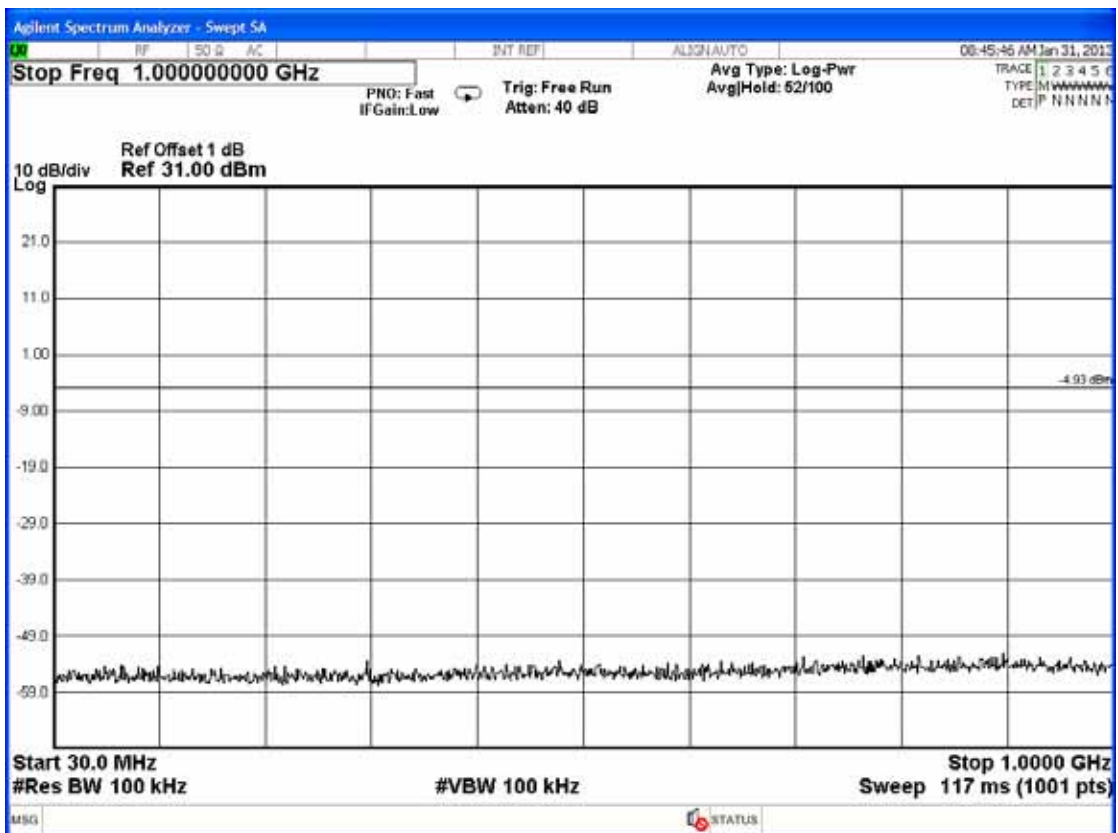
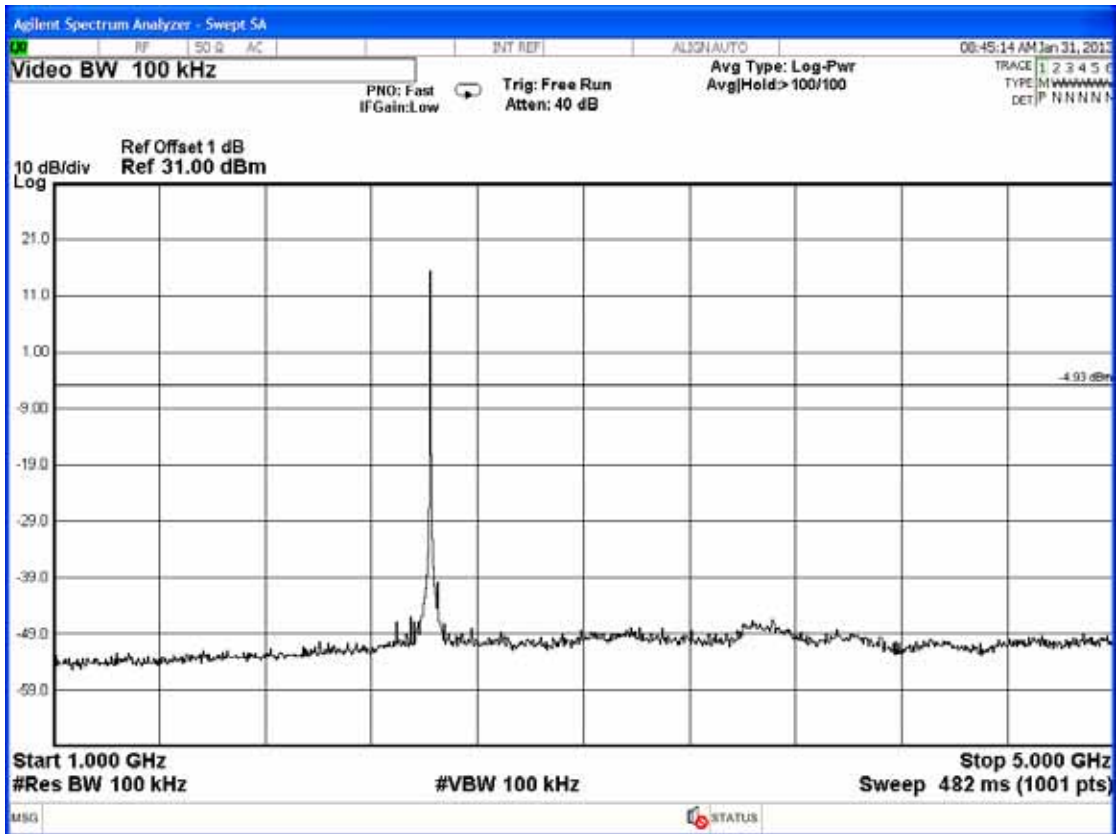
9.6.1. Channel 01, Frequency: 2403.250MHz

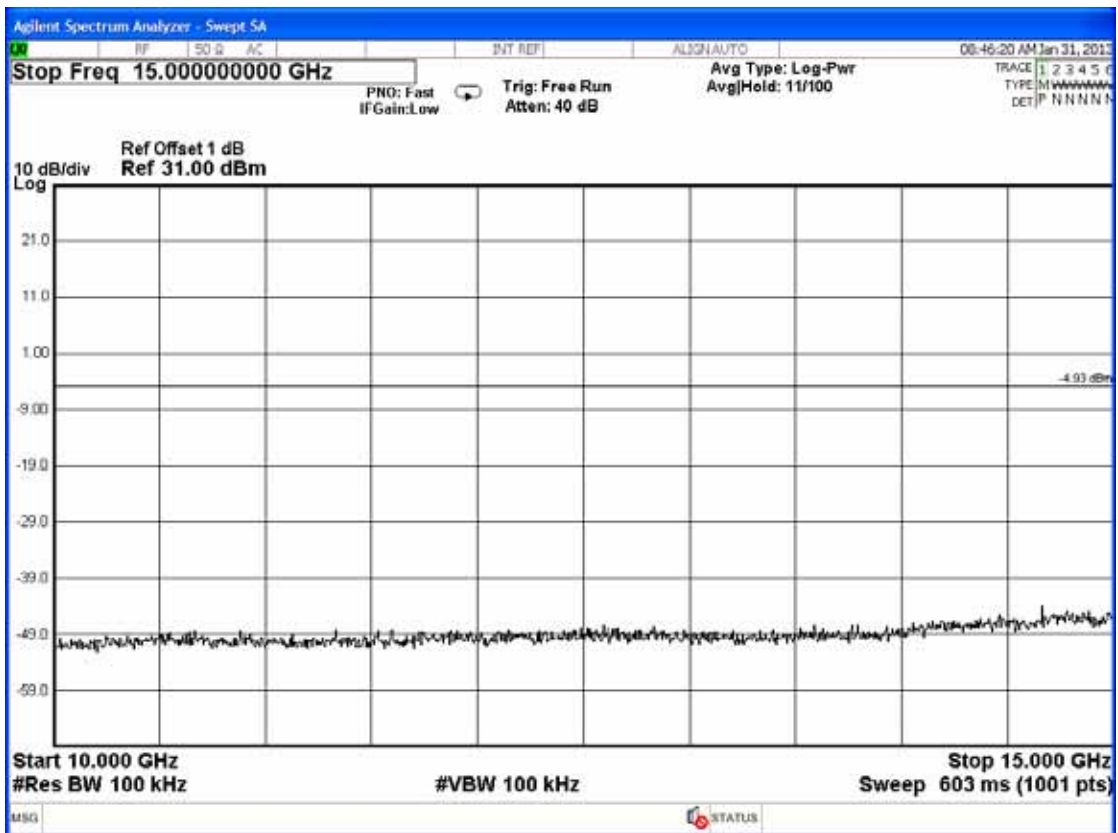
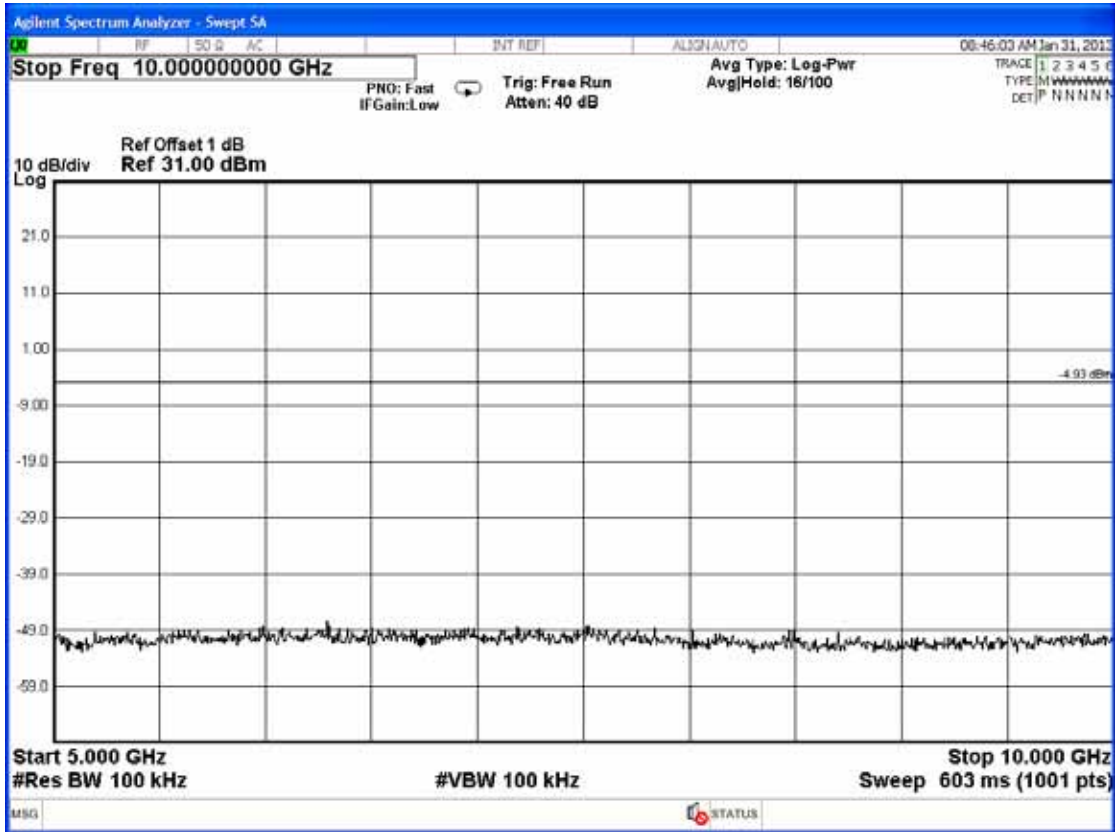


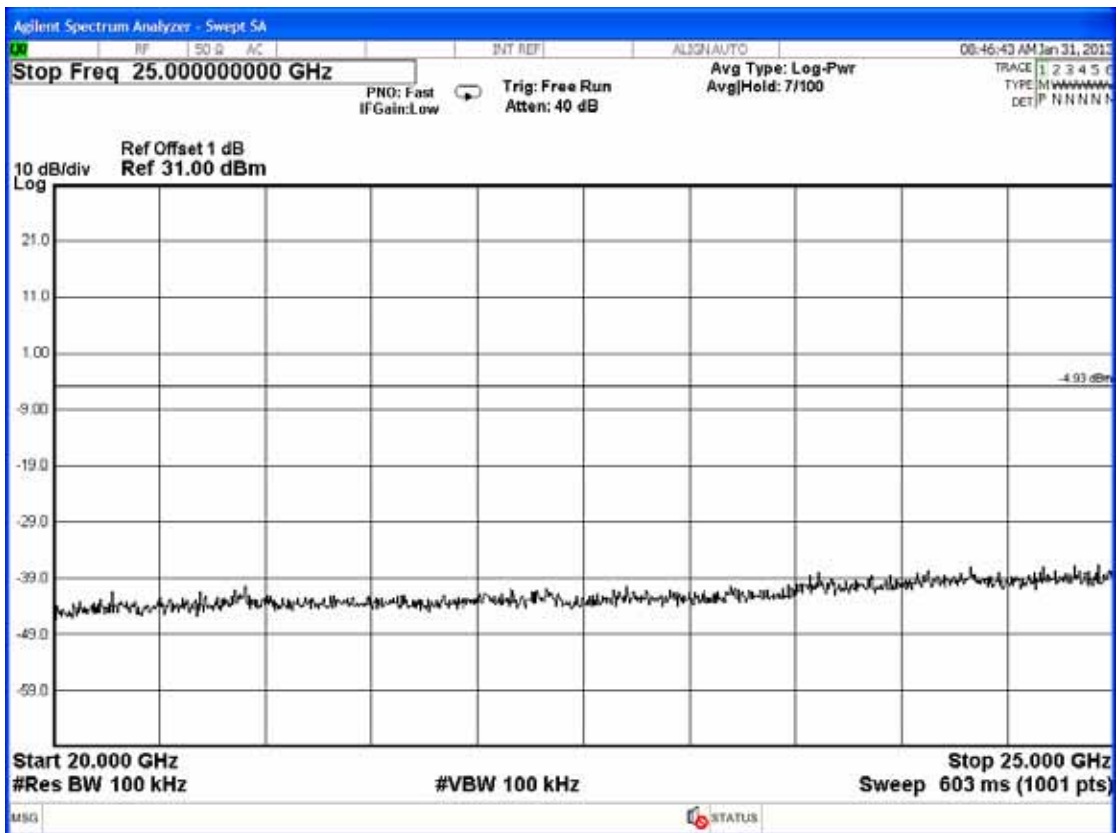
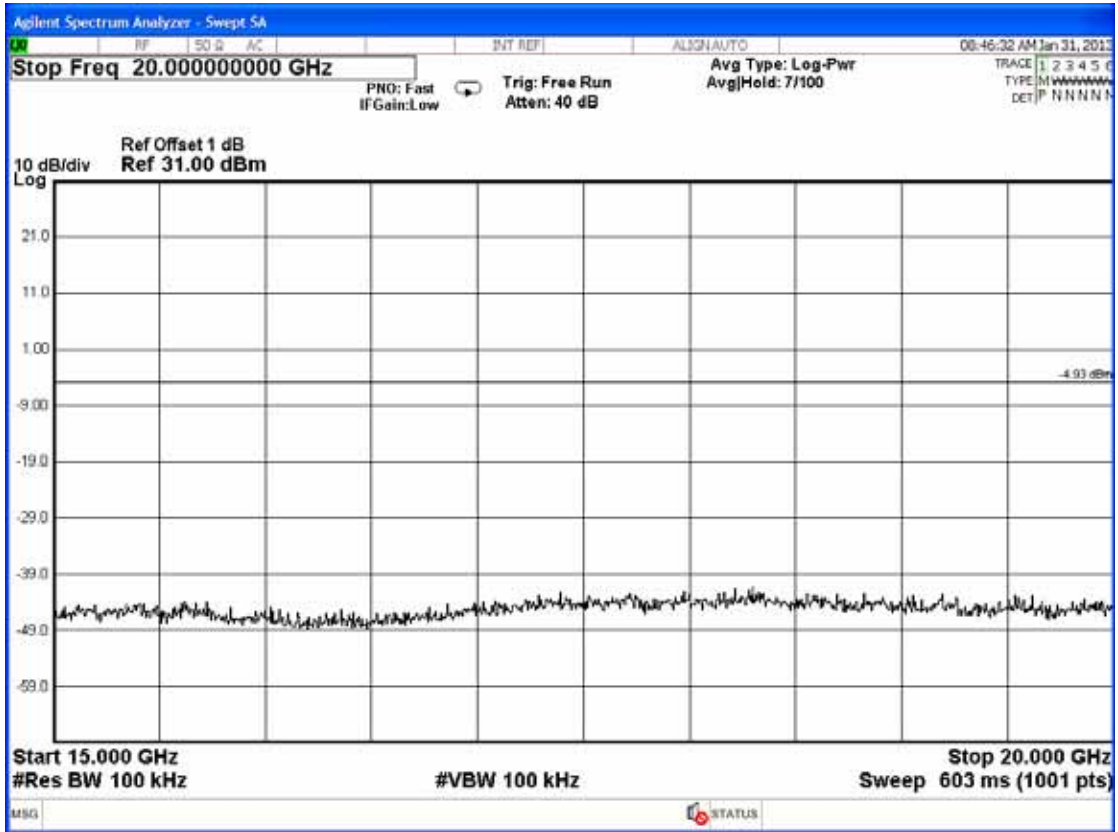




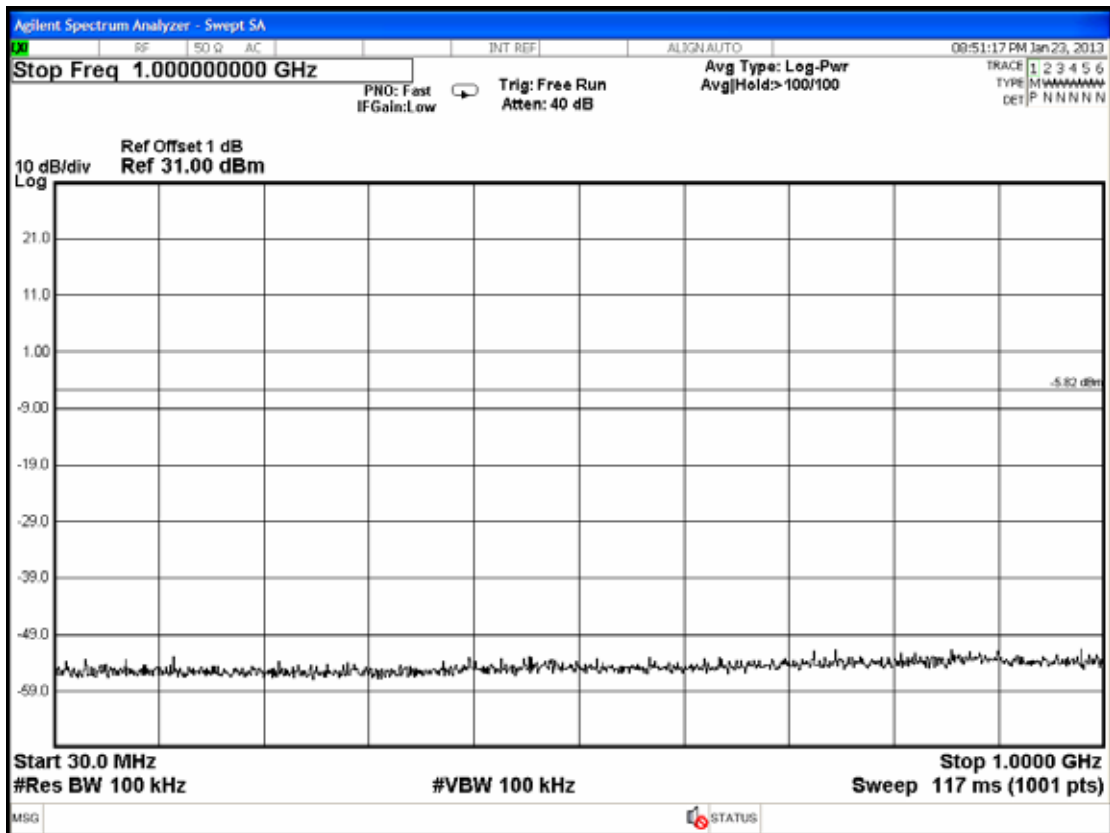
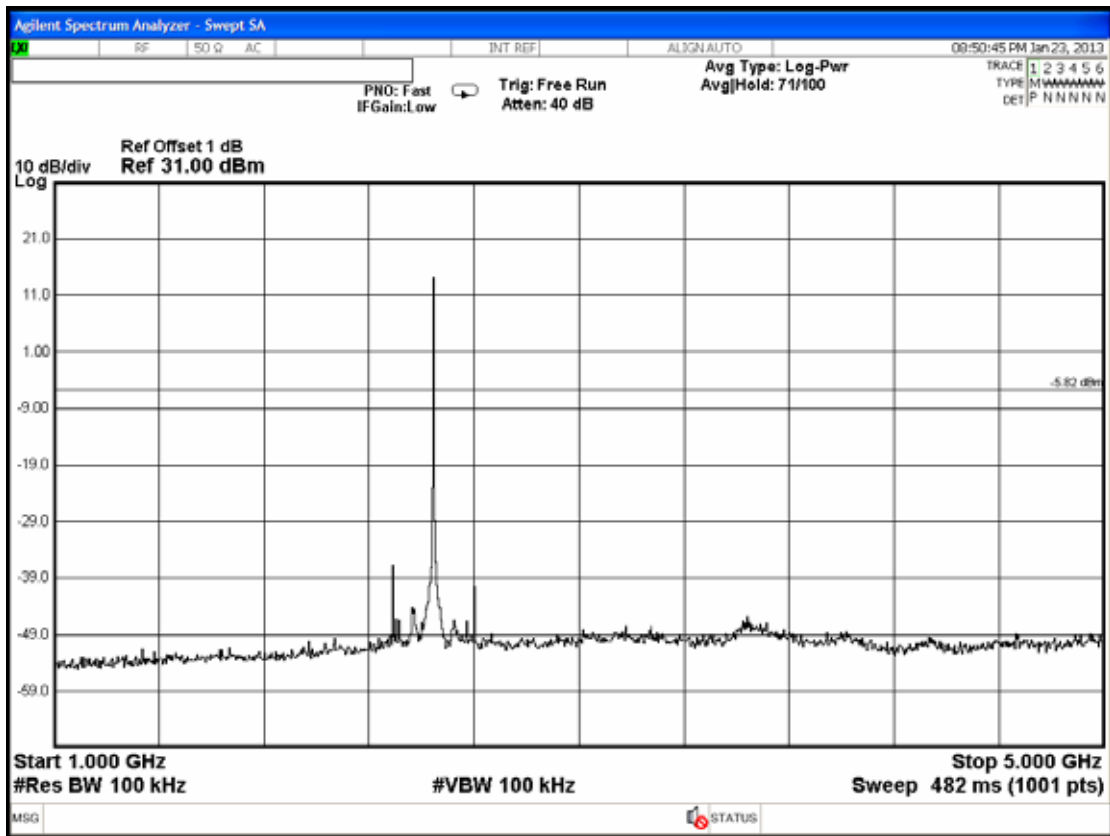
9.6.2. Channel 31, Frequency: 2425.000MHz

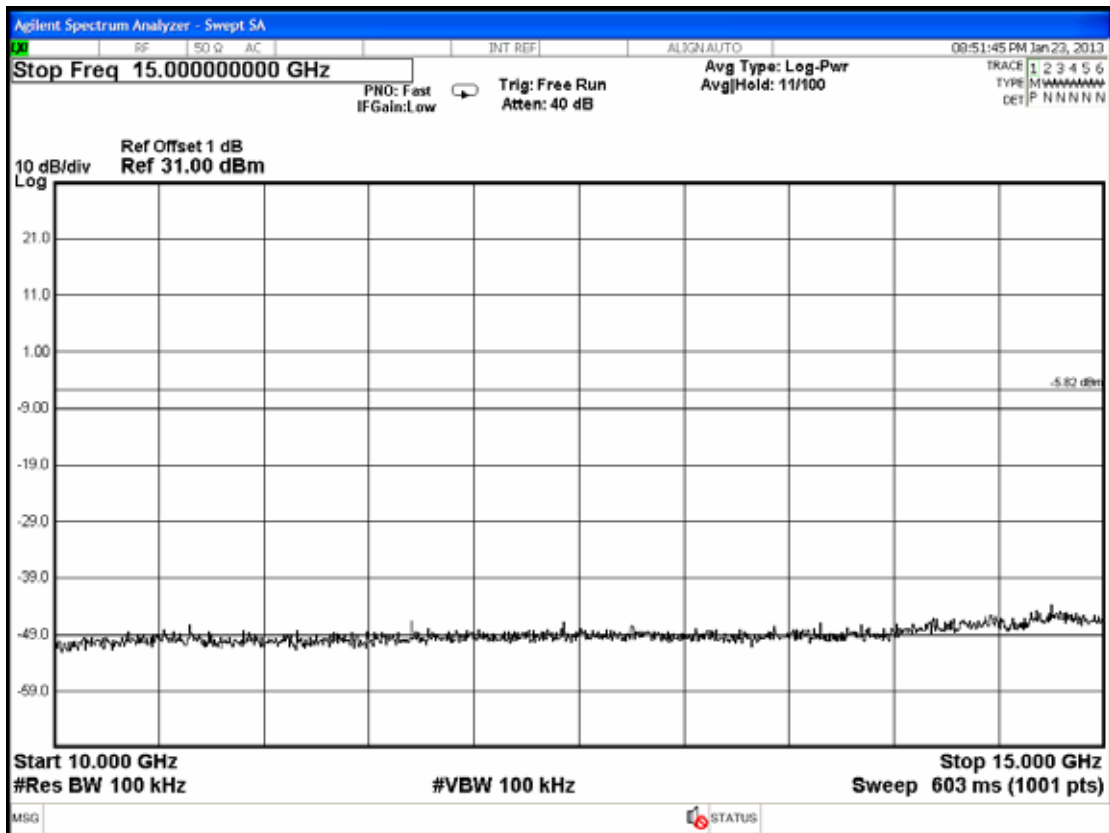
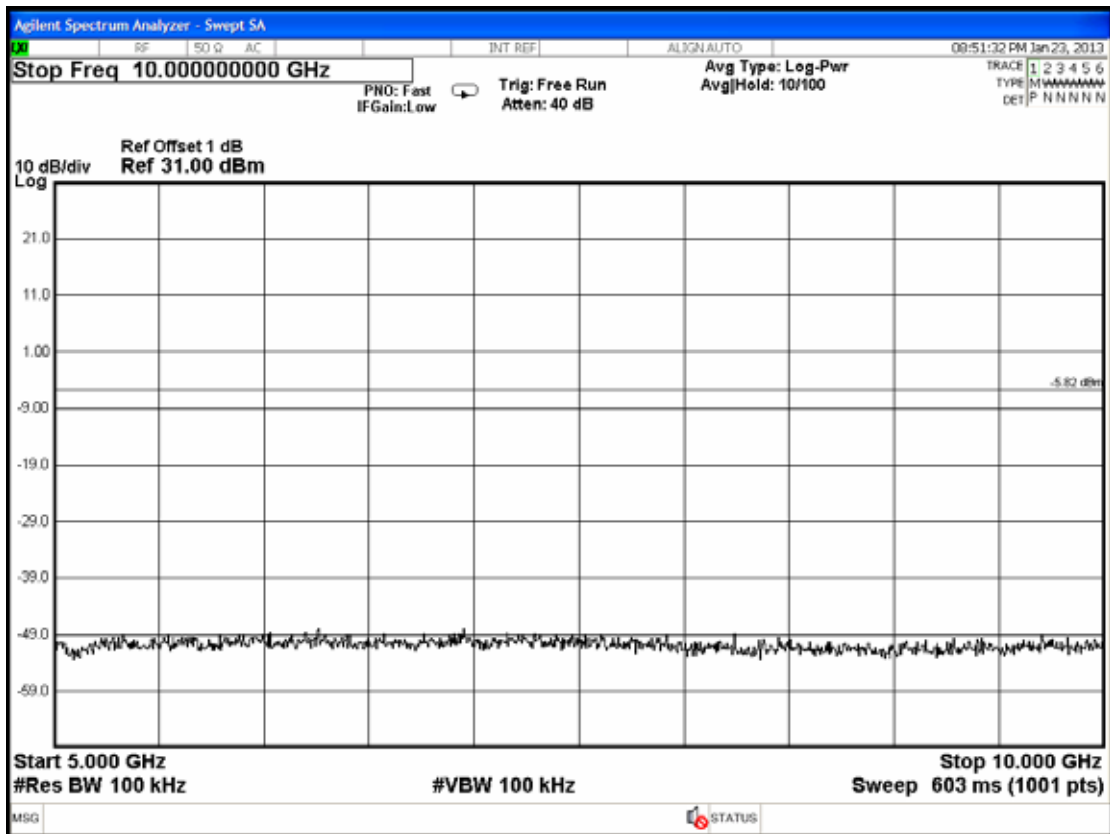


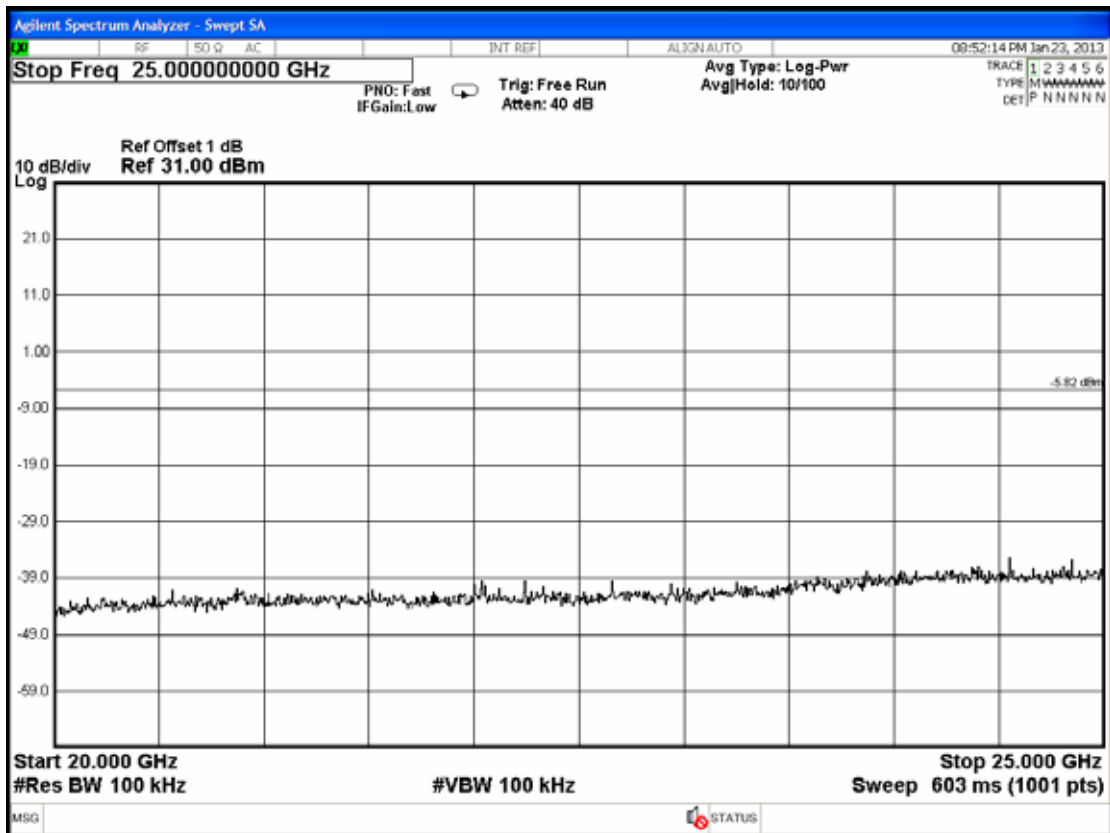
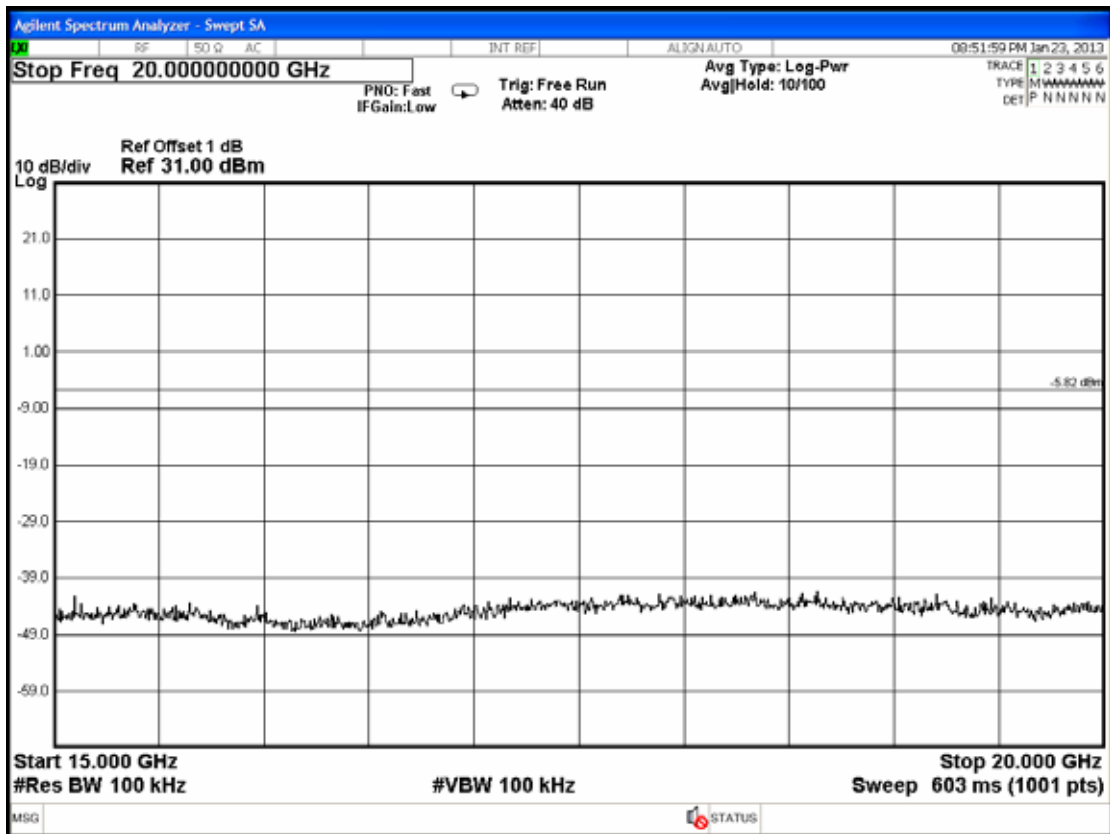




9.6.3. Channel 60, Frequency: 2447.500MHz







10. BAND EDGES MEASUREMENT

10.1. Test Equipment

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

10.2. Block Diagram of Test Setup

The same as section.4.2.

10.3. Specification Limits (§15.247(c))

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

10.4. Operating Condition of EUT

Same as carrier frequency separation measurement which was listed in section 4.4.

10.5. Test Procedure (DA 00-705)

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

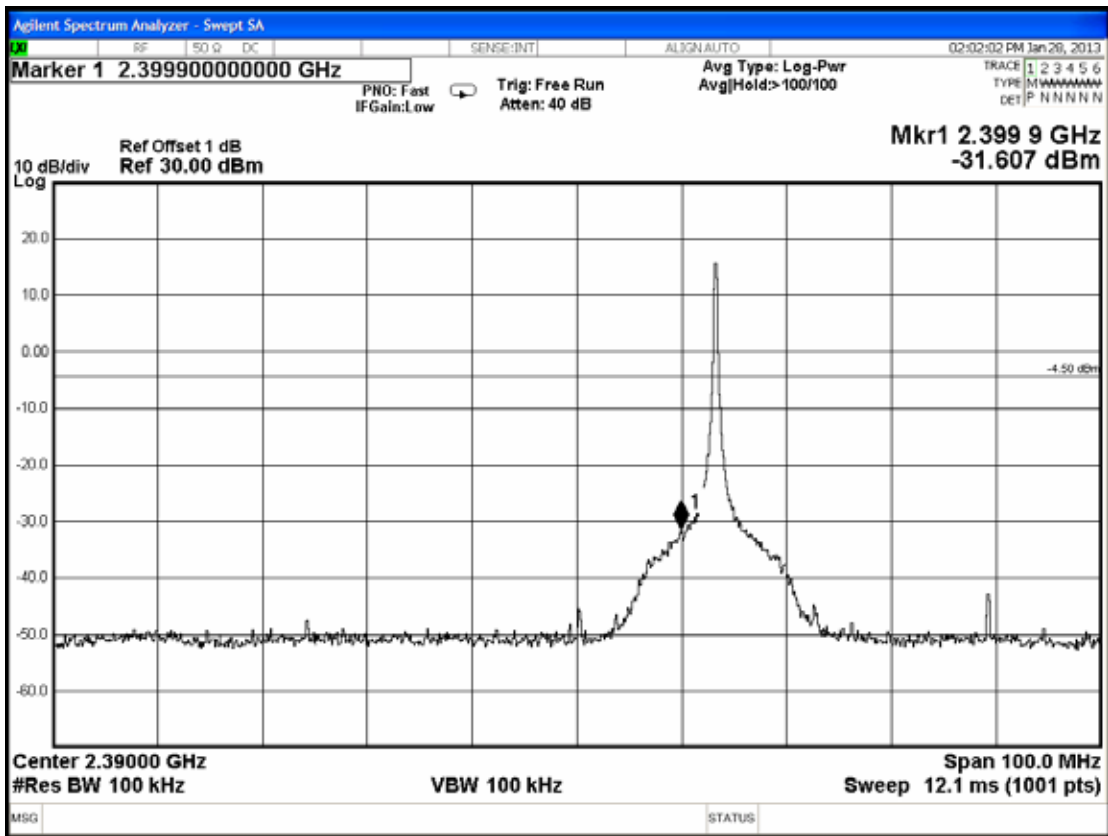
10.6. Test Results

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

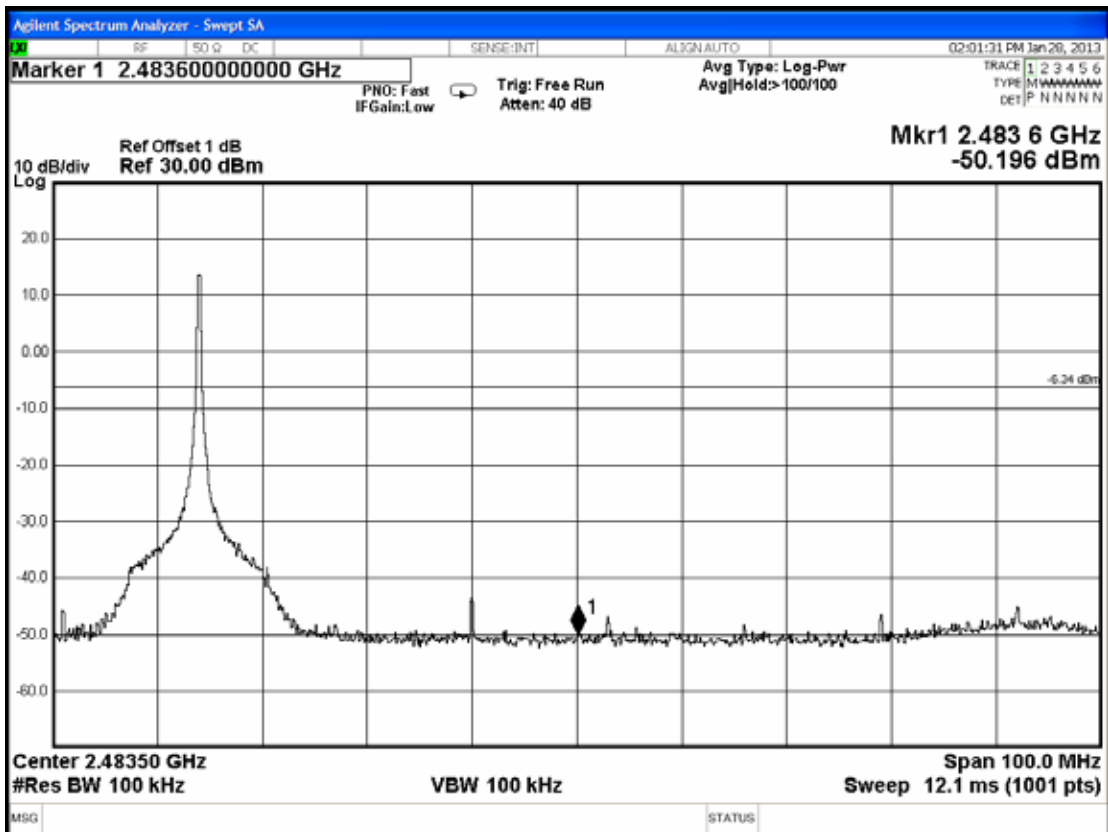
Test Date : Jan. 28, 2013 Temperature :26 Humidity : 49%

1. Below Band edge : The highest emission level is -31.607dBm at 2.39999GHz.
2. Upper Band edge: The highest emission level is -50.196dBm at 2.48360GHz.

10.6.1. Below Band edge



10.6.2. Upper Band edge



11.DEVIATION TO TEST SPECIFICATIONS

【NONE】