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FCC 15.247 & RSS-247
2.4 GHz Test Report

for

FUTABA Corporation

1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN

Product Name	**:**	**Radio Control**
Model Name	**:**	**CGY760R**
Brand	**:**	**Futaba**
FCC ID	**:**	**AZPCGY760R-24G**
IC	**:**	**2914D-CGY760R**

Prepared by: **:** **AUDIX Technology Corporation, EMC Department**

Testing Laboratory
1724

TESTING
NVLAP LAB CODE 200077-0

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, TAF or any government agencies.

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TEST REPORT CERTIFICATION

Applicant	:	FUTABA Corporation
Factory	:	FUTABA Corporation
EUT Description		
(1) Product	:	Radio Control
(2) Model	:	CGY760R
(3) Brand	:	Futaba
(4) Power Rating	:	DC 6.6V

Applicable Standards:

47 CFR FCC Part 15 Subpart C
RSS-Gen (Issue 4), November 2014
RSS-247 (Issue 2), February 2017
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.
Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2018. 03. 20

Reviewed by: Sabrina Wang (Sabrina Wang/Administrator)

Approved by: Ben Cheng (Ben Cheng/Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2018. 03. 20	Original Report	EM-F180115

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2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	**N/A, Note**
15.247(d)/15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and Radiated Spurious Emission	**PASS**
15.247(a)(1)	RSS-247 §5.1(2)	20dB Bandwidth	**PASS**
15.247(a)(1)	RSS-247 §5.1(2)	Carrier Frequency Separation	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Time of Occupancy	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Number of Hopping Channels	**PASS**
15.247(b)(1)	RSS-247 §5.1(2)	Maximum Peak Output Power	**PASS**
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	**PASS**
15.203	RSS-Gen §8.3	Antenna Requirement	**Compliance**
Note: The EUT only employs battery power for operation, so it is unnecessary to test.			

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Factory	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Product	Radio Control
Model	CGY760R
Brand	Futaba

3.2. Description of EUT

Test Model	CGY760R
Serial Number	N/A
Power Rating	DC 6.6V
Firmware Version	N/A
Sample Status	Production
RF Features	• DSSS (FASSTest) • FHSS (T-FHSS)
Date of Receipt	2018. 01. 12
Date of Test	2018. 01. 22 ~ 03. 19
Interface Ports of EUT	None
Accessories Supplied	None

3.3. Antenna Information

Antenna Part Number	Manufacture	Antenna Type	Frequency (GHz)	Max Gain (dBi)
JA1R0227A	Wanshih	1/4λ antenna	2.4	Ant A: -5.16 Ant B: -5.16

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3.4. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
FHSS	2407.500 to 2467.500	31	T-FHSS	128

Mode: T-FHSS					
Channel List					
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2407.5	12	2429.5	23	2451.5
2	2409.5	13	2431.5	24	2453.5
3	2411.5	14	2433.5	25	2455.5
4	2413.5	15	2435.5	26	2457.5
5	2415.5	16	2437.5	27	2459.5
6	2417.5	17	2439.5	28	2461.5
7	2419.5	18	2441.5	29	2463.5
8	2421.5	19	2443.5	30	2465.5
9	2423.5	20	2445.5	31	2467.5
10	2425.5	21	2447.5		
11	2427.5	22	2449.5		

3.5. Description of Key Components

None

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3.6. Test Configuration

Mode	T (ms)	Duty Cycle Factor (dB)
T-FHSS	1.580	-36.03

Note: Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/100ms)

Item		Modulation	Test Channel
Radiated Test Case	Radiated Band Edge Note1, 3	T-FHSS	01/31
	Radiated Spurious Emission Note1,2,3	T-FHSS	01/16/31
Conducted Test Case Note2	20dB Bandwidth	T-FHSS	01/16/31
	Carrier Frequency Separation	T-FHSS	01/16/31
	Time of Occupancy	T-FHSS	01/16/31
	Number of Hopping Channels Note 3	T-FHSS	01/31
	Maximum Peak Output Power	T-FHSS	01/16/31
	Band Edges	T-FHSS	01/31
	Spurious Emission Note 3	T-FHSS	01/16/31

Note 1: ■Mobile Device
□Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: □ Lie □ Side□ Stand

Note 2: Low, mid, and high channels were measured, only the worst channel of each modulation was presented in this report.

Note 3: The worst antenna A was tested on this test item.

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3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

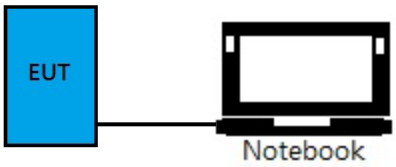
No.	Product	Brand	Model No.	Serial No.	Approval
1.	DC Power Supply	TOP WARD	3303A	N/A	N/A
2.	Notebook PC	acer	MS2343	N/A	Contains FCC ID: (1)PPD-AAR5B22 (2)HLZ-AR5B97
3.	Digital Servo #1 ~ #7	Futaba	S3003	N/A	N/A
4.	Battery (DC 6.6V)	Futaba	FT2F2100BV2	N/A	N/A

3.7.2. Cable Lists

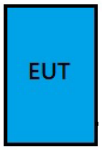
No.	Cable Description Of The Above Support Units
1.	USB Jig Cable: Unshielded, Detachable, 0.5m DC Power Cord*2: Unshielded, Detachable, 0.7m AC Power Cord: Unshielded, Undetectable, 1.8m
2.	Adapter: Chicony, M/N CPA09-A065N1 AC Power Cord: Shielded, Detachable, 1.8m DC Power Cord: Unshielded, Undetectable, 1.8m, Bonded a ferrite core
3.	Power Wire: Unshielded, Undetectable, 0.20m*7
4.	Power Wire: Unshielded, Undetectable, 0.50m*2

3.8. Setup Configuration

3.8.1. EUT Configuration for Radiated Emission



3.8.2. EUT Configuration for RF Conducted Test Items



3.9. Operating Condition of EUT

Test program “Futaba Term” is used for enabling EUT RF function under continues transmitting and choosing channel.

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3.10.Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724 (3) FCC OET Designation No. TW1004 & TW1090 & TW1724
Test Facilities	(1) Semi-Anechoic Chamber (IC Test Site Registration No.: 5183B-1) (2) Fully Anechoic Chamber (IC Test Site Registration No.: 5183B-4)

3.11.Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

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	± 0.52dB
Conducted Emission Limitations	± 0.13dB

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4. MEASUREMENT EQUIPMENT LIST

4.1. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2017. 09. 13	1 Year
2.	Spectrum Analyzer	Agilent	N9010A-526	MY52220368	2017. 11. 18	1 Year
3.	Amplifier	HP	8447D	2944A06305	2018. 01. 30	1 Year
4.	Amplifier	Agilent	8449B	3008A02678	2018. 03. 06	1 Year
5.	Test Receiver	R&S	ESCS30	100338	2017. 06. 19	1 Year
6.	Bilog Antenna	CHASE	CBL6112D	33821	2018. 01. 21	1 Year
7.	Horn Antenna	ETS-Lindgren	3117	00135902	2018. 03. 07	1 Year
8.	Horn Antenna	EMCO	3116	2653	2017. 12. 19	1 Year
9.	2.4GHz Notch Filter	K&L	7NSL10-2441. 5E130.5-00	1	2017. 07. 26	1 Year
10.	3GHz Notch Filter	Microwave	H3G018G1	484798	2017. 08. 25	1 Year
11.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF-02	2017. 04. 21	1 Year
12.	Digital Thermo-Hygro Meter	IMax	HTC-1	No.1 3m A/C	2017. 04. 21	1 Year
13.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2017. 06. 20	1 Year

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5. CONDUCTED EMISSION

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC 15.207 and RSS-Gen §8.8】

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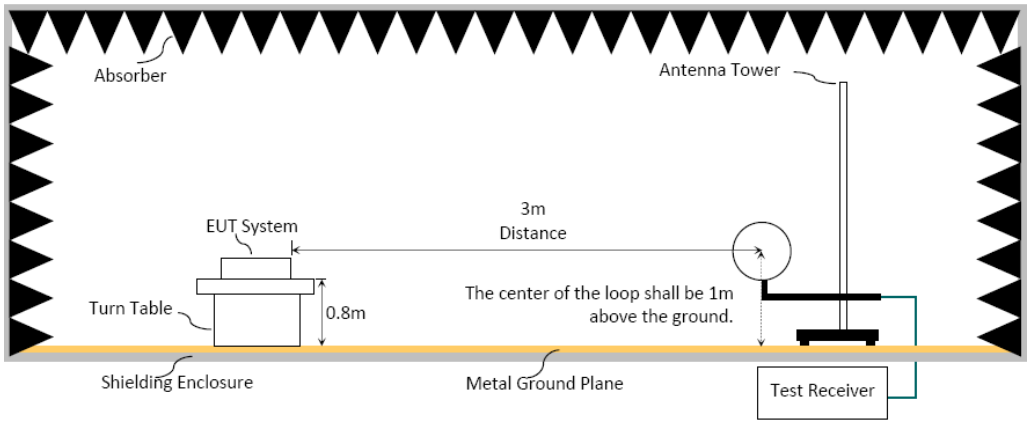
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

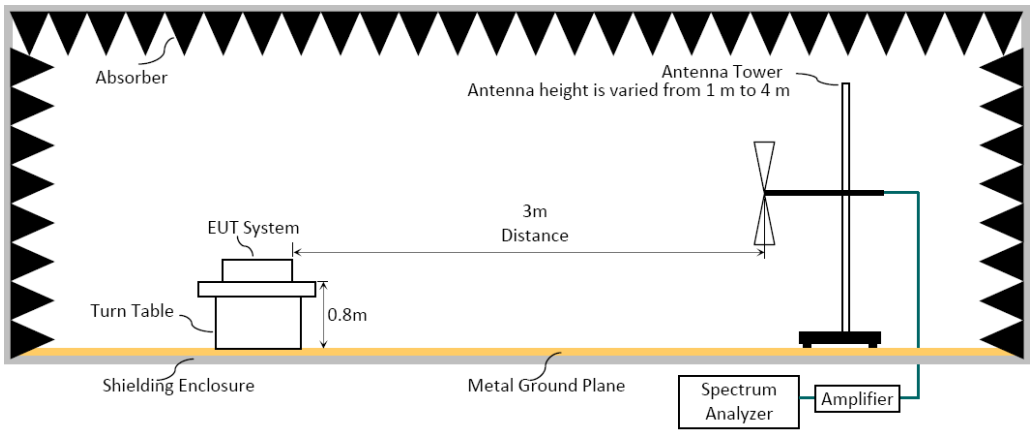
6.1.1. Block Diagram of EUT

Indicated as section 3.8

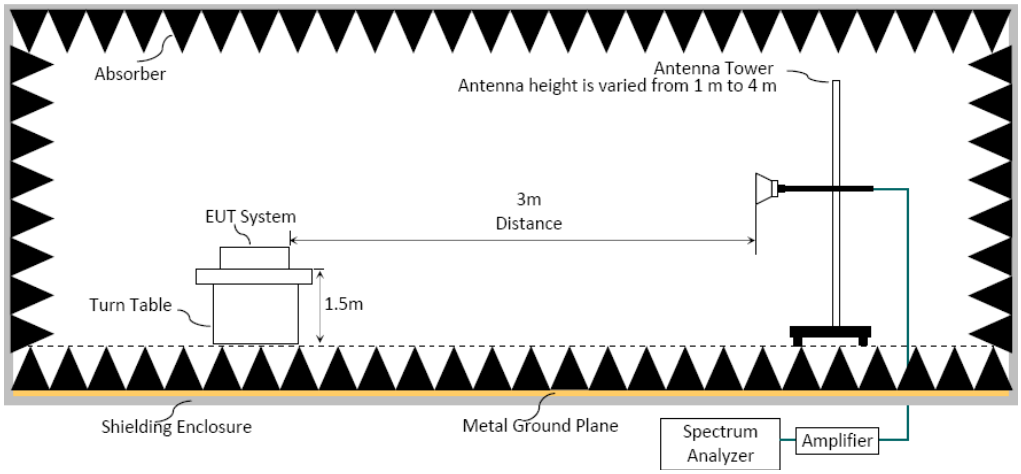
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



6.1.4. Setup Diagram for above 1GHz



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6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)
(2) The tighter limit applies to 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) Fundamental and emission fall within operation band are exempted from this section.
(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

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6.3. Test Procedure

Frequency Range 9kHz~30MHz:
The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level.
In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.
(2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:
The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:
Spectrum Analyzer is used for pre-testing with following setting:
(1)RBW = 120KHz
(2)VBW ≥ 3 x RBW.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.
(7)When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. detector for final measurement.

Frequency above 1GHz to 10th harmonic (up to 25 GHz):
Peak Detector:
(1)RBW = 1MHz
(2)VBW ≥ 3 x RBW.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.
(7)When peak-detected value is lower than limit that the measurement using the average detector is not required, Otherwise using average detector for final measurement.

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Average Detector:

☐**Option 1:**

(1)RBW = 1MHz
(2)VBW ≥ 1/ T.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.

■**Option 2:**

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading

☐Average Emission Level l=Antenna Factor + Cable Loss + Meter Reading

■Average Emission Level= Peak Emission Level+ DCCF

Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/TX_{on+off}) presented in section 3.6

☐ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

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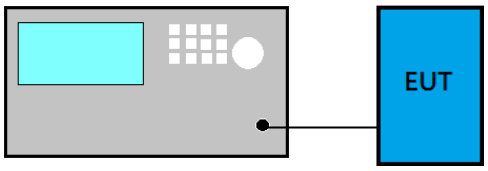
7. 20dB BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

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.

7.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Set RBW close to1% to 5% of OBW.
(2) Set VBW≥3RBW.
(3) Detector = Peak.
(4) Trace mode = Max hold.
(5) Sweep = Auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

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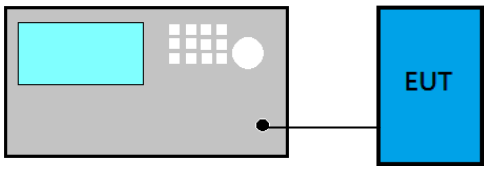
8. CARRIER FREQUENCY SEPARATION

8.1. Block Diagram of Test Setup



8.2. Specification Limits

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, provided the systems operate with an output no greater than 125mW.

8.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Span = Wide enough to capture the peaks of two adjacent channels
(2) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
(3) VBW = RBW
(4) Sweep = Auto
(5) Detector function = Peak
(6) Trace = Max hold
(7) Allow the trace to stabilize.

8.4. Test Results

Please refer to Appendix A

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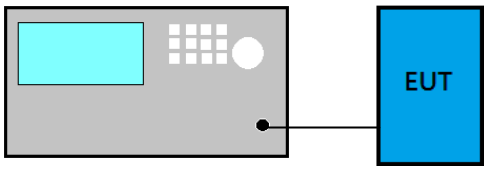
9. TIME OF OCCUPANCY

9.1. Block Diagram of Test Setup



9.2. Specification Limits

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.

9.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Span: Zero span, centered on a hopping channel.
(2) RBW shall be ≤ channel spacing and where possible RBW should be set > 1/T, where T is the expected dwell time per channel.
(3) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
(4) Detector function = Peak
(5) Trace = Max hold

9.4. Test Results

Please refer to Appendix A

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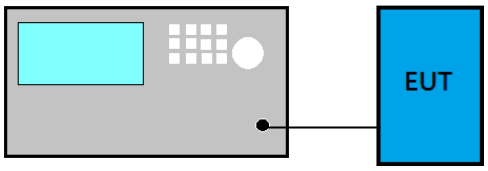
10. NUMBER OF HOPPING CHANNELS

10.1. Block Diagram of Test Setup



10.2. Specification Limits

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.

10.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
(2) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
(3) VBW ≥ RBW
(4) Sweep = Auto
(5) Detector function = Peak
(6) Trace = m=Max hold
(7) Allow the trace to stabilize.

10.4. Test Results

Please refer to Appendix A

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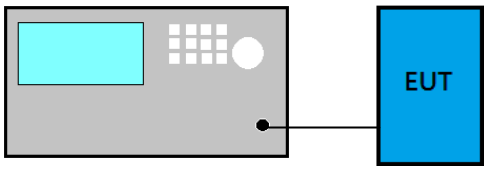
11. MAXIMUM PEAK OUTPUT POWER

11.1. Block Diagram of Test Setup



11.2. Specification Limits

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

11.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
(2) RBW ≥ 1% of the span
(3) VBW ≥ RBW
(4) Sweep = Auto
(5) Detector function = Peak
(6) Trace = Max hold

11.4. Test Results

Please refer to Appendix A

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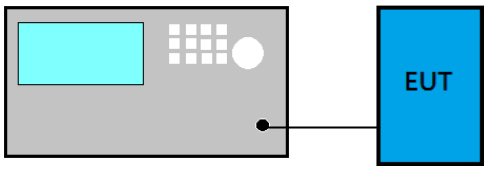
12. EMISSION LIMITATIONS

12.1. Block Diagram of Test Setup



12.2. Specification Limits

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

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)).

12.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(1) Set span wide enough to capture the peak level of the in-band emission and all spurious emissions; up to 10^{th} harmonic.
(2) RBW = 100 kHz
(3) VBW ≥ RBW
(4) Sweep = Auto
(5) Detector function = Peak
(6) Trace = Max hold

12.4. Test Results

Please refer to Appendix A

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13. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPDNDIX A

TEST DATA AND PLOTS

(Model: CGY760R)

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AUDIX Technology Corp.
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A.1 RADIATED EMISSION

Test Date	2018/03/16	Temp./Hum.	23℃/50%
Test Voltage	DC 6.6V (via Battery)		

A.1.1 Emissions within Restricted Frequency Bands

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1 GHz

Mode	T-FHSS	Frequency	TX 2437.5MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
30.97	24.27	1.22	0.28	25.77	40.00	14.23	Peak
118.27	18.72	2.48	0.23	21.43	43.50	22.07	Peak
242.43	18.68	3.74	2.92	25.34	46.00	20.66	Peak
405.39	22.14	5.61	0.79	28.54	46.00	17.46	Peak
567.38	24.18	6.65	1.41	32.24	46.00	13.76	Peak
873.90	26.60	8.04	1.57	36.21	46.00	9.79	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	17.60	2.29	6.43	26.32	43.50	17.18	Peak
325.85	20.21	4.66	3.96	28.83	46.00	17.17	Peak
543.13	23.83	6.57	0.81	31.21	46.00	14.79	Peak
733.25	25.25	7.27	1.71	34.23	46.00	11.77	Peak
856.44	26.44	7.94	0.89	35.27	46.00	10.73	Peak
951.50	27.35	8.52	1.40	37.27	46.00	8.73	Peak

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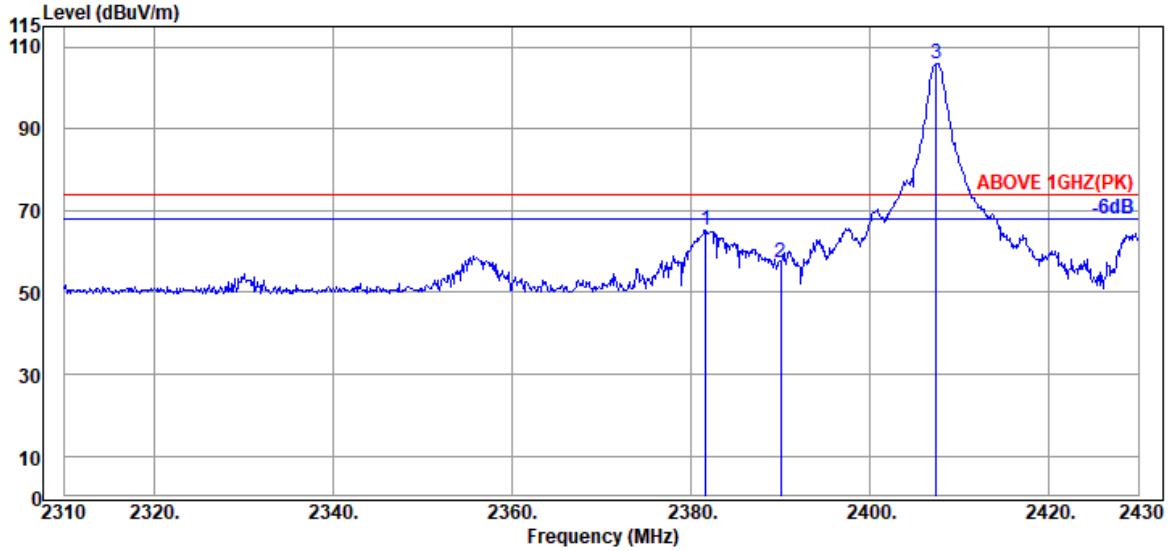
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

Band Edge:

Mode	T-FHSS	Frequency	TX 2407.5MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2381.64	32.12	6.55	26.72	65.39	74.00	8.61	Peak
2390.04	32.13	6.57	18.51	57.21	74.00	16.79	Peak
2407.44	32.16	6.59	67.16	105.91	---	---	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2381.64	65.39	-36.03	29.36	54.00	24.64	Average
2390.04	57.21	-36.03	21.18	54.00	32.82	Average

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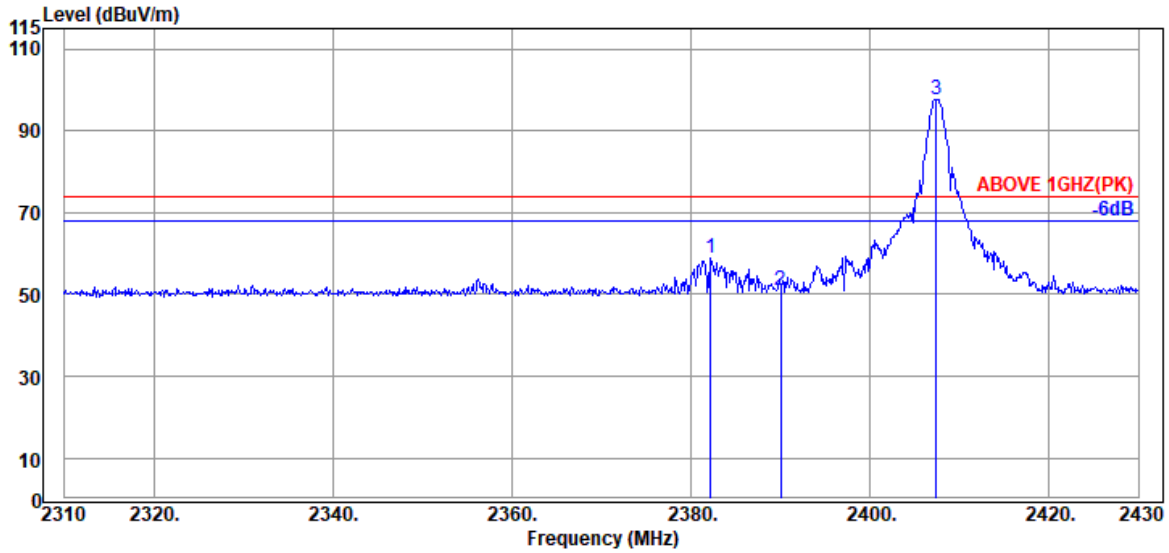
Mode	T-FHSS	Frequency	TX 2407.5MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2382.24	32.12	6.55	20.20	58.87	74.00	15.13	Peak
2390.04	32.13	6.57	12.28	50.98	74.00	23.02	Peak
2407.44	32.16	6.59	58.98	97.73	---	---	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2382.24	58.87	-36.03	22.84	54.00	31.16	Average
2390.04	50.98	-36.03	14.95	54.00	39.05	Average

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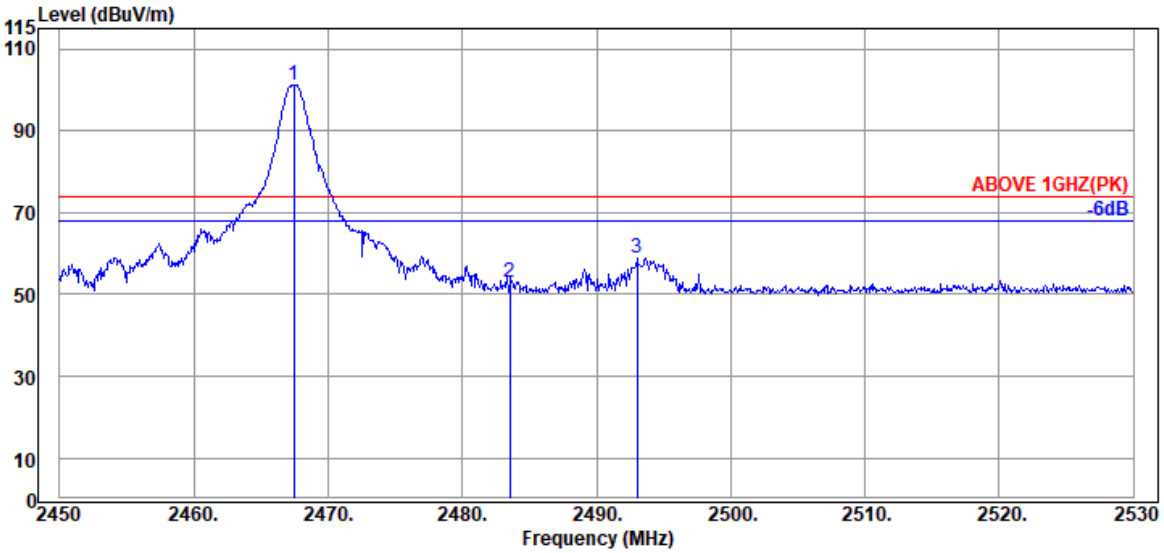
Mode	T-FHSS	Frequency	TX 2467.5MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.44	32.25	6.65	62.24	101.14	---	---	Peak
2483.52	32.28	6.67	13.95	52.90	74.00	21.10	Peak
2493.04	32.29	6.69	19.98	58.96	74.00	15.04	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.52	52.90	-36.03	16.87	54.00	37.13	Average
2493.04	58.96	-36.03	22.93	54.00	31.07	Average

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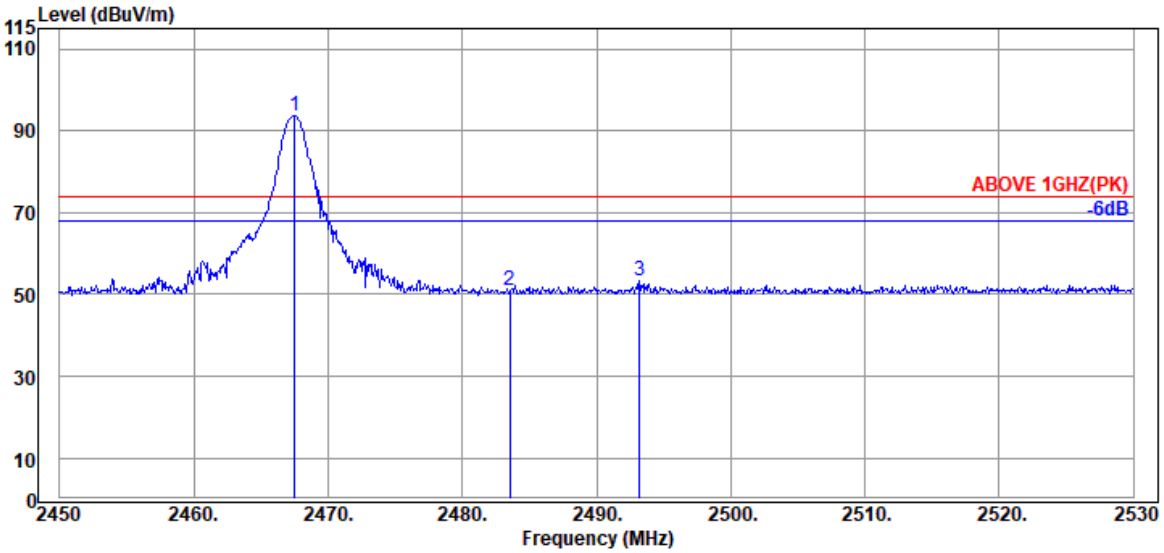
Mode	T-FHSS	Frequency	TX 2467.5MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	32.25	6.65	54.63	94.13	---	---	Peak
2483.52	32.28	6.67	12.09	48.76	74.00	25.24	Peak
2493.20	32.29	6.69	14.32	48.98	74.00	25.02	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.52	48.76	-36.03	12.73	54.00	41.27	Average
2493.20	48.98	-36.03	12.95	54.00	41.05	Average

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A.1.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	T-FHSS	Frequency	TX 2407.5MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4815.00	34.09	9.54	13.63	57.26	74.00	16.74	Peak
7225.00	35.85	11.82	15.50	63.17	74.00	10.83	Peak
9630.00	36.87	15.30	1.72	53.89	74.00	20.11	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4815.00	57.26	-36.03	21.23	54.00	32.77	Average
7225.00	63.17	-36.03	27.14	54.00	26.86	Average
9630.00	53.89	-36.03	17.86	54.00	36.14	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4815.00	34.09	9.54	10.97	54.60	74.00	19.40	Peak
7220.00	35.85	11.82	14.69	62.36	74.00	11.64	Peak
9630.00	36.87	15.30	-1.49	50.68	74.00	23.32	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4815.00	54.60	-36.03	18.57	54.00	35.43	Average
7220.00	62.36	-36.03	26.33	54.00	27.67	Average
9630.00	50.68	-36.03	14.65	54.00	39.35	Average

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Mode	T-FHSS	Frequency	TX 2437.5MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4875.00	34.13	9.56	12.56	56.25	74.00	17.75	Peak
7310.00	35.84	11.90	16.29	64.03	74.00	9.97	Peak
9750.00	37.00	15.47	1.15	53.62	74.00	20.38	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4875.00	56.25	-36.03	20.22	54.00	33.78	Average
7310.00	64.03	-36.03	28.00	54.00	26.00	Average
9750.00	53.62	-36.03	17.59	54.00	36.41	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4875.00	34.13	9.56	7.36	51.05	74.00	22.95	Peak
7315.00	35.84	11.90	14.52	62.26	74.00	11.74	Peak
9750.00	37.00	15.47	-1.52	50.95	74.00	23.05	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4875.00	51.05	-36.03	15.02	54.00	38.98	Average
7315.00	62.26	-36.03	26.23	54.00	27.77	Average
9750.00	50.95	-36.03	14.92	54.00	39.08	Average

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Mode	T-FHSS	Frequency	TX 2467.5MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4935.00	34.16	9.58	13.03	56.77	74.00	17.23	Peak
7400.00	35.82	11.99	16.50	64.31	74.00	9.69	Peak
9870.00	37.13	15.64	-2.27	50.50	74.00	23.50	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4935.00	56.77	-36.03	20.74	54.00	33.26	Average
7400.00	64.31	-36.03	28.28	54.00	25.72	Average
9870.00	50.50	-36.03	14.47	54.00	39.53	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4935.00	34.16	9.58	6.80	50.54	74.00	23.46	Peak
7405.00	35.82	12.01	13.26	61.09	74.00	12.91	Peak
9870.00	37.13	15.64	-1.80	50.97	74.00	23.03	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4935.00	50.54	-36.03	14.51	54.00	39.49	Average
7405.00	61.09	-36.03	25.06	54.00	28.94	Average
9870.00	50.97	-36.03	14.94	54.00	39.06	Average

A.1.3 Emissions in Non-restricted Frequency Bands:

All emission levels below the 15.209 & RSS-Gen §8.9 general radiated emissions limits is not required.

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A.2 20dB BANDWIDTH

Test Date	2018/01/22	Temp./Hum.	23℃/55%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

A.2.1 20dB Bandwidth Result

Mode	Centre Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz) (Reference only)	2/3 (20dB Bandwidth)
T-FHSS	2407.5	0.2464	0.22568	0.164
	2437.5	0.2588	0.22785	0.173
	2467.5	0.2328	0.22496	0.155

Remark: The maximum two-thirds of the 20dB bandwidth is the limit for carrier frequency separation presented.

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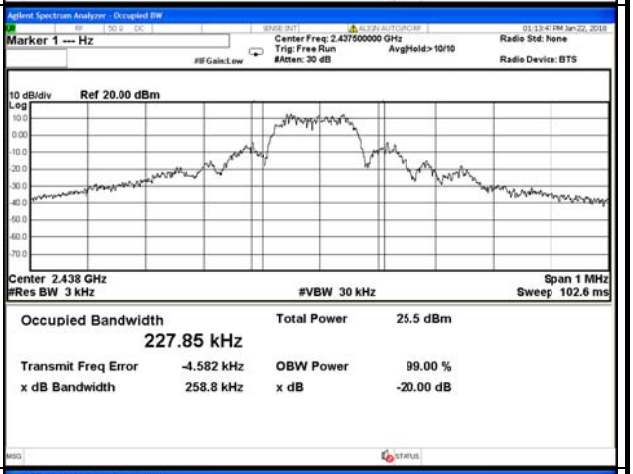
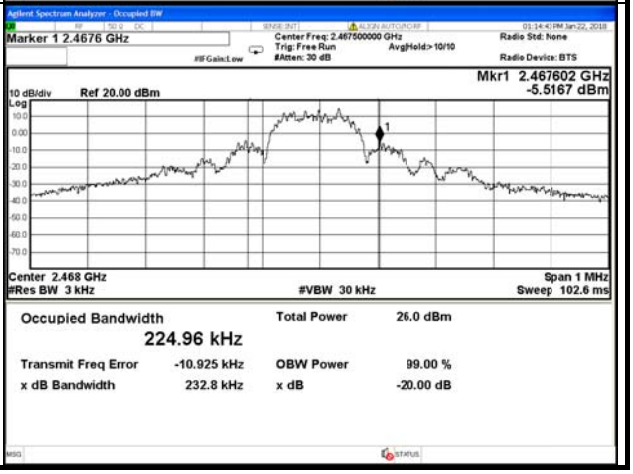
A.2.2 Measurement Plots

T-FHSS





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A.3 CARRIER FREQUENCY SEPARATION

Test Date	2018/01/22	Temp./Hum.	23℃/55%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

<table>
<tr><td colspan="2">T-FHSS</td></tr>
<tr><td>2407.5MHz</td><td>2437.5MHz
adjacent channel of left carrier frequency</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>2437.5MHz
adjacent channel of right carrier frequency</td><td>2467.5MHz</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

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A.4 TIME OF OCCUPANCY

Test Date	2018/01/22	Temp./Hum.	23℃/55%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

A.4.1 Time of Occupancy

Mode	Centre Frequency (MHz)	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy	Limit (ms)
T-FHSS	2407.5	2	1.580	39.184	<400
	2437.5	2	1.560	38.688	<400
	2467.5	2	1.580	39.184	<400

Observation Period:

31 channels **0.4** seconds= **12.4** seconds

Test Frequency 2407.5 MHz

For each observation of **2** transmission appearance,the longest time of occupancy for each of **12.4** seconds is:

2 transmission* **12.4** seconds* **1.580** ms= **39.184** ms (<400ms)

Test Frequency 2437.5 MHz

For each observation of **2** transmission appearance,the longest time of occupancy for each of **12.4** seconds is:

2 transmission* **12.4** seconds* **1.560** ms= **38.688** ms (<400ms)

Test Frequency 2467.5 MHz

For each observation of **2** transmission appearance,the longest time of occupancy for each of **12.4** seconds is:

2 transmission* **12.4** seconds* **1.580** ms= **39.184** ms (<400ms)

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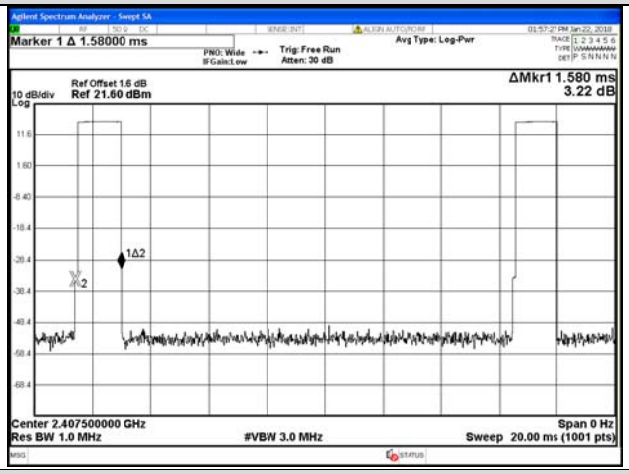
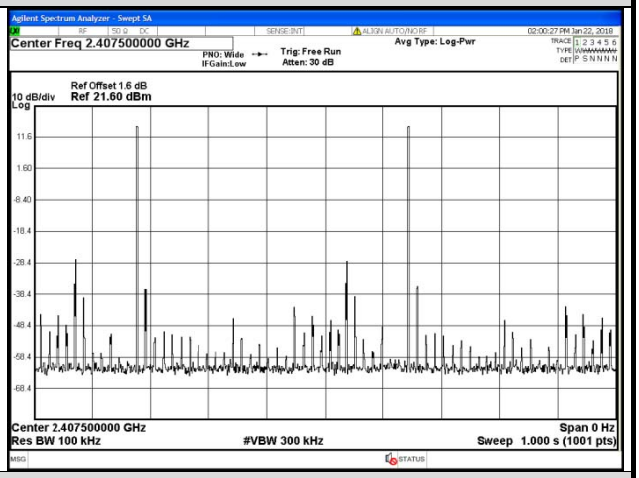
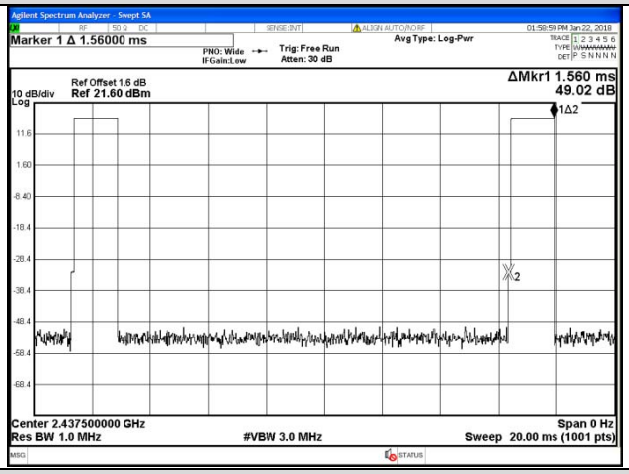
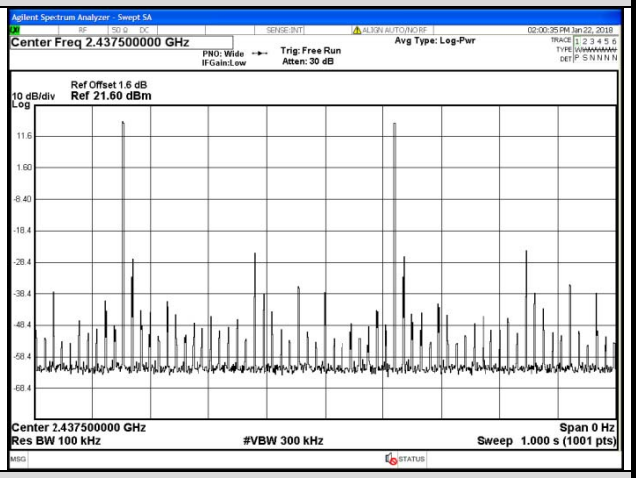
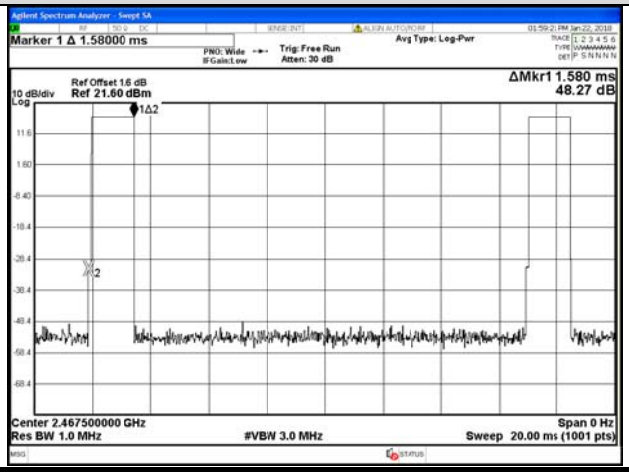
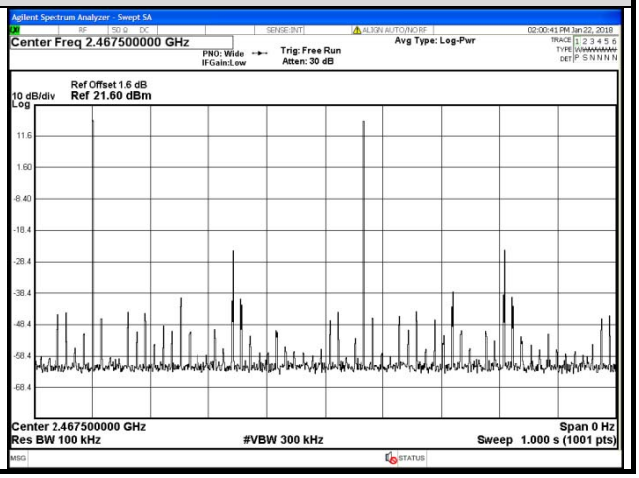
- Measurement Plots

T-FHSS	
2407.5MHz	
	
2437.5MHz	
	
2467.5MHz	
	

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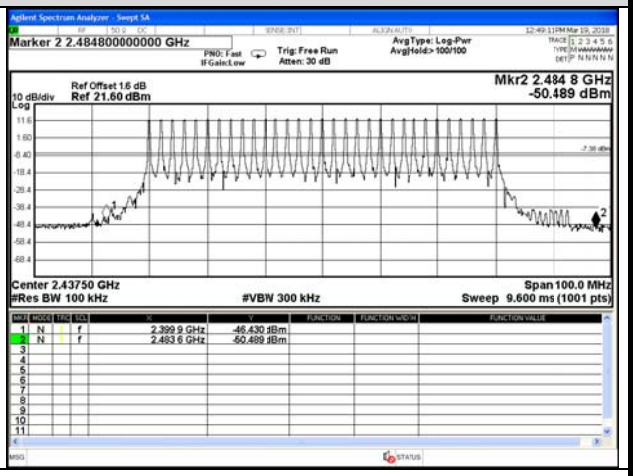
A.5 NUMBER OF HOPPING CHANNELS

Test Date	2018/03/19	Temp./Hum.	22℃/55%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

T-FHSS

The number hopping channel is 31.

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A.6 MAXIMUM PEAK OUTPUT POWER

Test Date	2018/03/09	Temp./Hum.	21℃/57%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

A.6.1 Maximum Peak Output Power

Mode	Centre Frequency (MHz)	Maximum Peak Output Power		Limit
		dBm	W	
T-FHSS (Ant A)	2407.5	11.979	0.0158	21dBm (0.125W)
	2437.5	11.835	0.0153	
	2467.5	11.397	0.0138	
T-FHSS (Ant B)	2407.5	11.921	0.0158	21dBm (0.125W)
	2437.5	11.924	0.0153	
	2467.5	11.571	0.0138	

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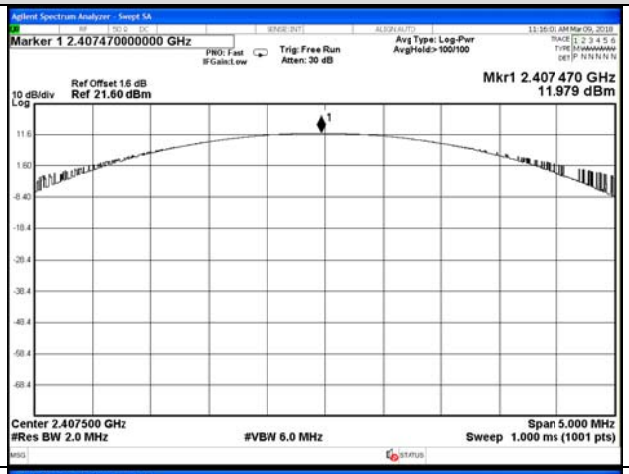
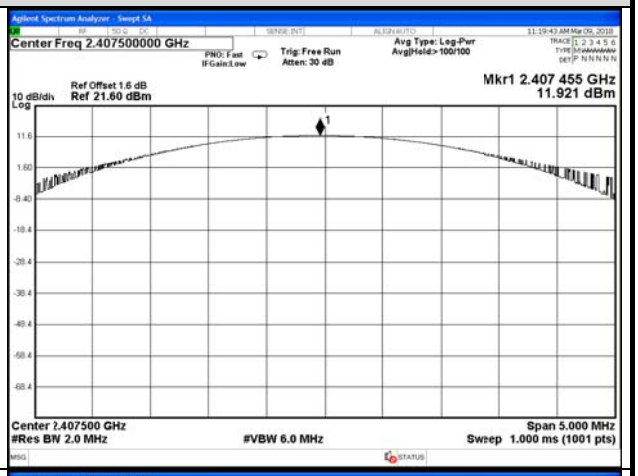
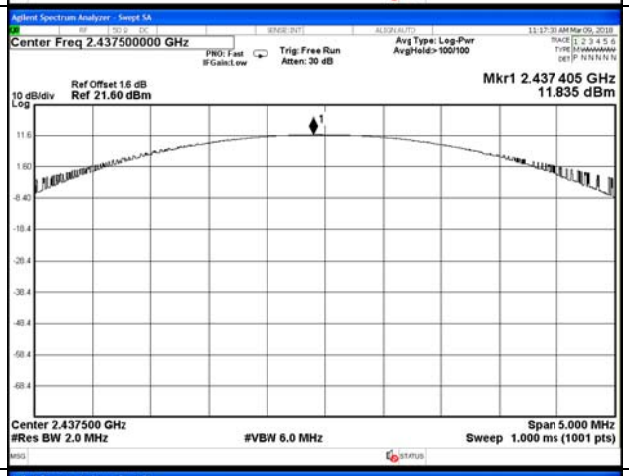
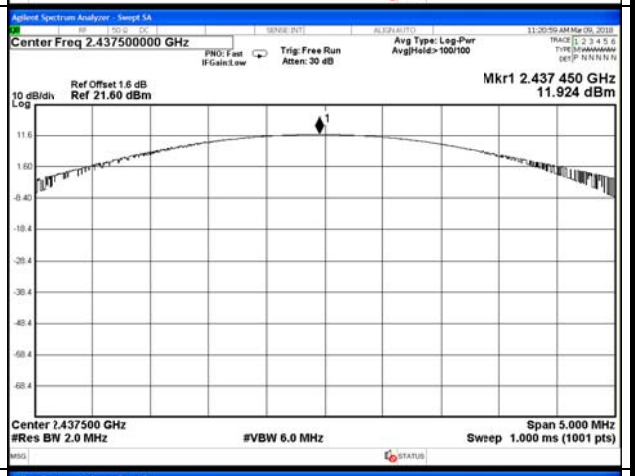
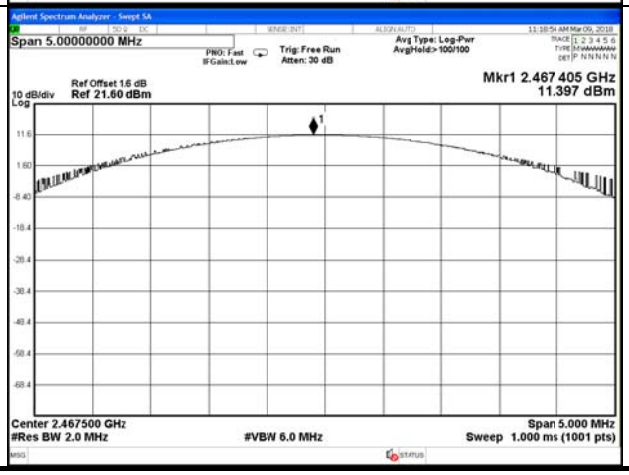
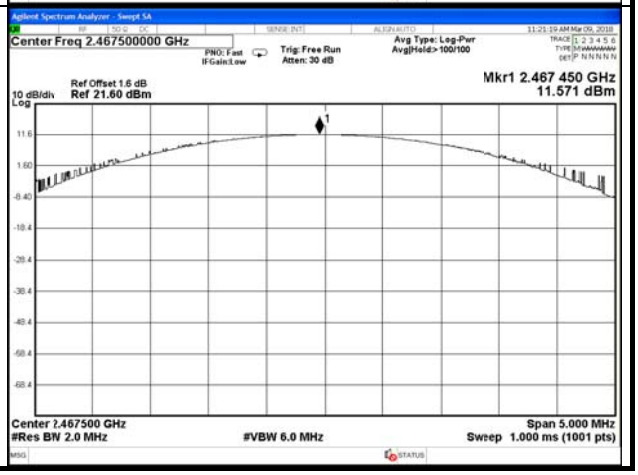
A.6.2 Measurement Plots

T-FHSS	
Ant A	Ant B
	
	
	

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A.7 EMISSION LIMITATIONS MEASUREMENT

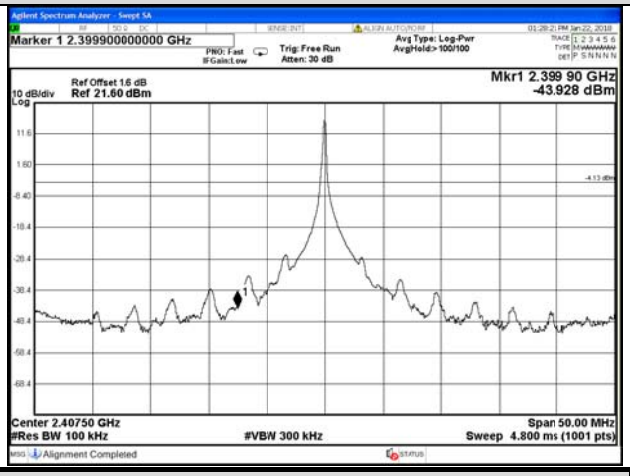
Test Date	2018/01/22 ~ 03/19	Temp./Hum.	21~22℃/55~57%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

A.7.1 Band Edge

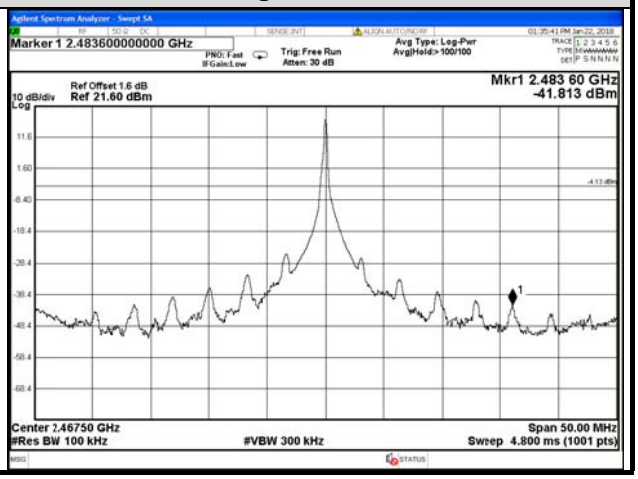
T-FHSS

Single Channel

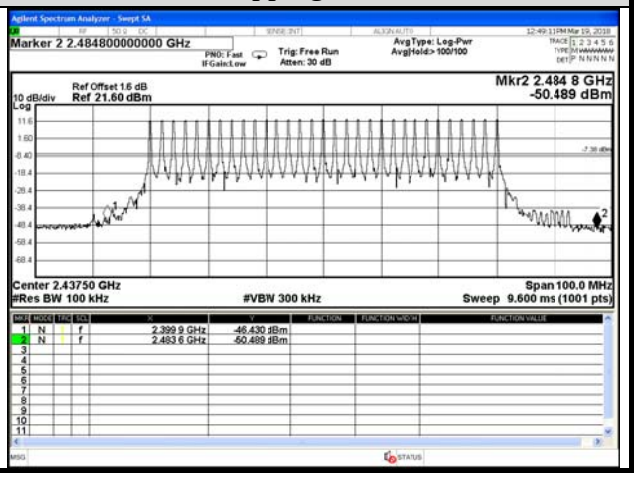
Low channel



High channel



Hopping Mode



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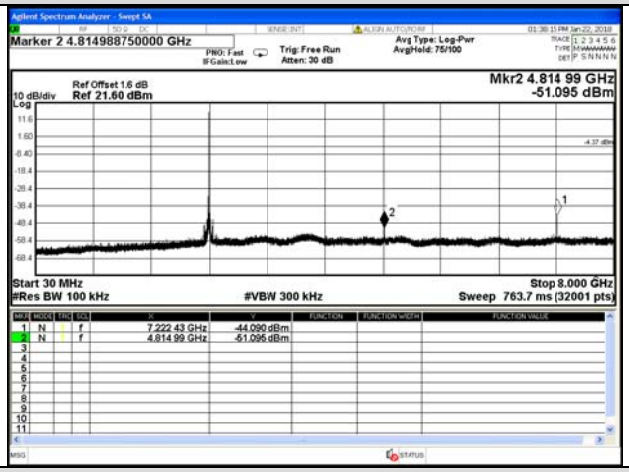
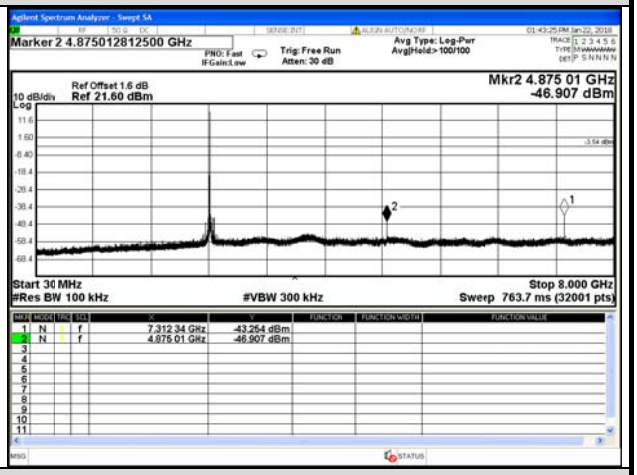
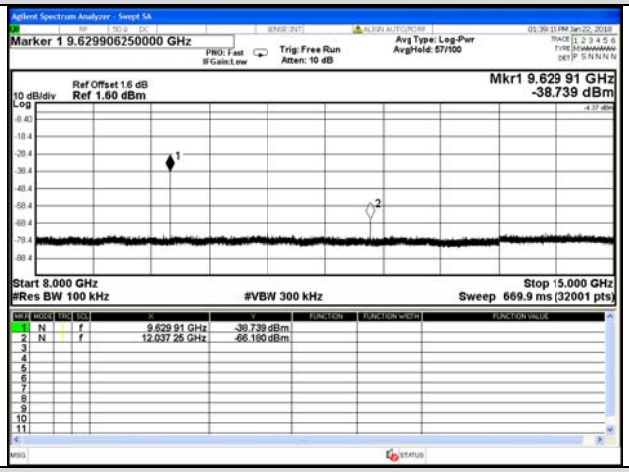
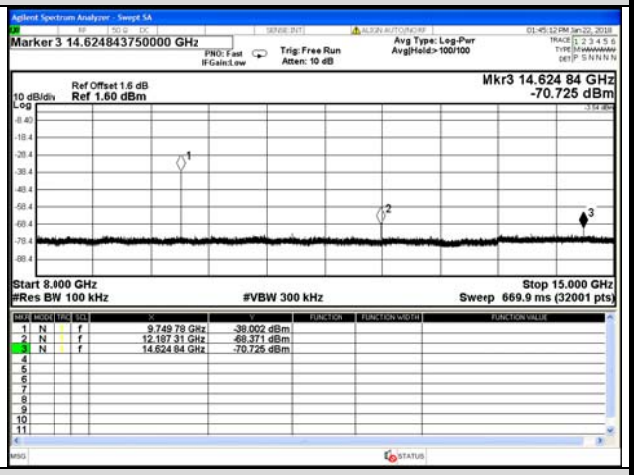
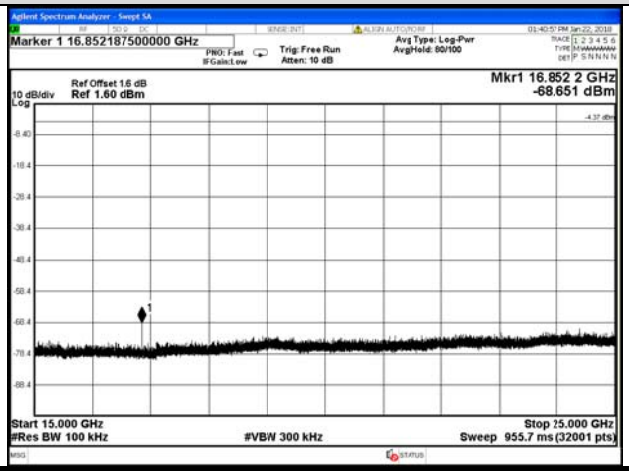
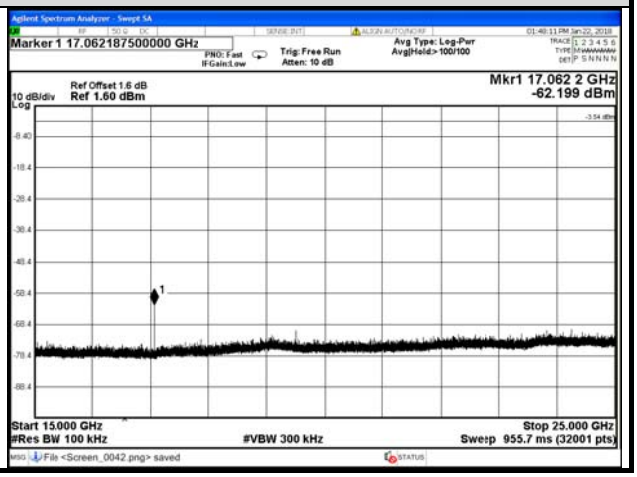
A.7.2 Spurious Emission

Test Date	2018/01/22	Temp./Hum.	21℃/57%
Cable Loss	1.6dB	Test Voltage	DC 6.6V (via Battery)

T-FHSS	
Centre Frequency: 2407.5MHz	Centre Frequency: 2437.5MHz
30MHz – 8GHz	30MHz – 8GHz
	
8GHz – 15GHz	8GHz – 15GHz
	
15GHz – 25GHz	15GHz – 25GHz
	

Note: All results have been included cable loss.

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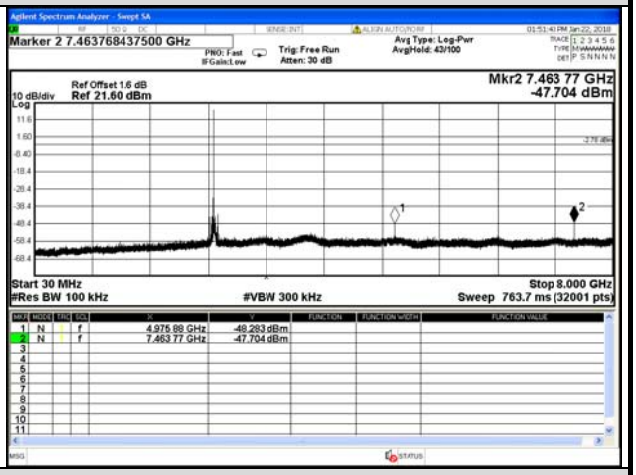
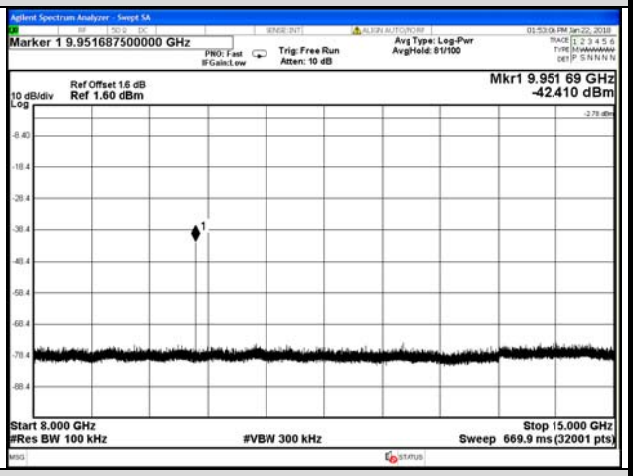
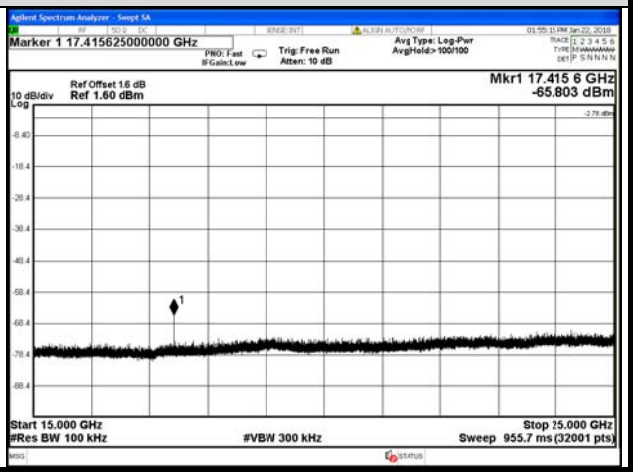
T-FHSS
Centre Frequency: 2467.5MHz
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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APPDNDIX B

TEST PHOTOGRAPHS

(Model: CGY760R)