FCC Test Report

Product Name	Wireless Module
Model No.	BM03R8645
FCC ID.	JFZBM03R8645

Applicant	Audio-Technica Corporation
Address	2-46-1 Nishi-naruse, Machida, Tokyo,194-8666

Date of Receipt	Nov. 22, 2017
Issued Date	Dec. 04, 2017
Report No.	17B0393R-RFUSP01V00
Report Version	V1.0

Testing Laboratory
3023

Test Report

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Product Name	Wireless Module
Applicant	Audio-Technica Corporation
Address	2-46-1 Nishi-naruse, Machida, Tokyo,194-8666
Manufacturer	Audio-Technica Corporation
Model No.	BM03R8645
FCC ID.	JFZBM03R8645
EUT Rated Voltage	DC 3.7V
EUT Test Voltage	DC 3.7V
Trade Name	Audio-Technica Corporation
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Rita Huang

(Senior Adm. Specialist / Rita Huang)

Tested By : Xiao Chen

(Engineer / Xiao Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Module
Trade Name	Audio-Technica Corporation
Model No.	BM03R8645
FCC ID.	JFZBM03R8645
Frequency Range	2402-2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	MITSUBISHI	AM03DP-ST01	Chip	1.2 dBi for 2.4 GHz

Note:

1. The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

Note:

1. The EUT is a Wireless Module with a built-in Bluetooth V3.0, V2.1+EDR transceiver.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test
4. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - 1Mbps (GFSK) Mode 2: Transmit - 3Mbps (8DPSK)

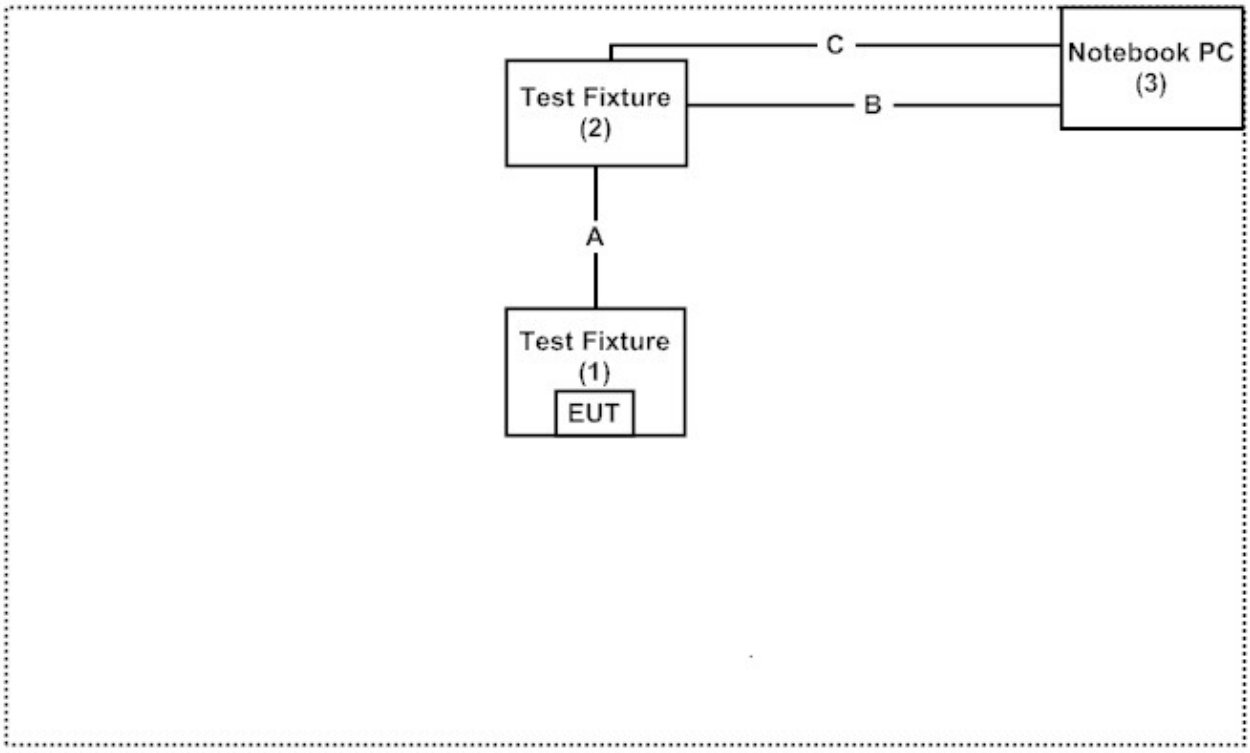
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Test Fixture	DCJ	N/A	N/A	N/A
2	Test Fixture	DCJ	N/A	N/A	N/A
3	Notebook PC	DELL	Latitude E5440	HG26TZ1	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description
A	Fixture Cable	Non-Shielded, 0.15m
B	USB Cable	Non-Shielded, 1.0m
C	RS-232 Cable	Shielded, 0.6m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software ” CSR v2.6.2” on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2017/11/28	2018/11/27
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2017/7/22	2018/7/21
X	Power Meter	Anritsu	ML2495A	6K00003357	2017/6/23	2018/6/22
X	Pulse power sensor	Anritsu	MA2411B	0846193	2017/6/23	2018/6/22
X	EMI Test Receiver	R&S	ESCS 30	100369	2017/10/13	2018/10/12
X	LISN	R&S	ESH3-Z5	836679/017	2017/1/18	2018/1/17
X	LISN	R&S	ENV216	100097	2017/1/18	2018/1/17
X	Coaxial Cable	QTK(Arnist)	RG 400	LC018-RG	2017/6/25	2018/6/24

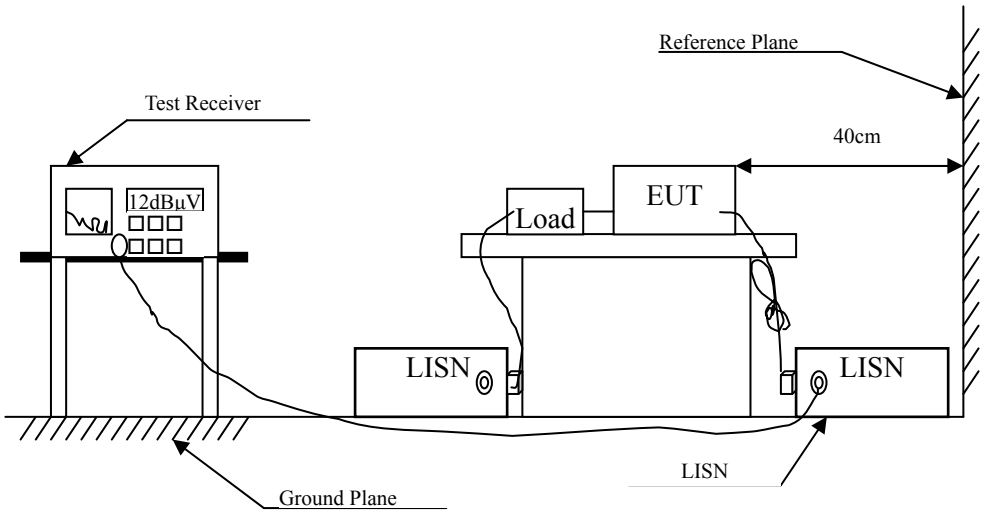
For Radiated measurements /Site3/CB8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSP40	100170	2017/1/18	2018/1/17
X	Loop Antenna	Teseq	HLA6121	37133	2017/3/18	2018/3/17
X	Bi-Log Antenna	Schaffner Chase	CBL6112B	2707	2017/6/11	2018/6/10
X	Horn Antenna	ETS-Lindgren	3117	00135205	2017/4/6	2018/4/5
X	Horn Antenna	Schwarzbeck	BBHA9170	209	2017/4/14	2018/4/13
X	Pre-Amplifier	QTK	AP/0100A	CHM/0901069	2017/6/23	2018/6/22
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2017/1/26	2018/1/24
	Pre-Amplifier	NARDA WE	DBL-1840N506	013	2017/9/30	2018/9/29
X	Filter	MicroTRON	BRM50701	019	2017/11/2	2018/11/1
	Filter	Microwave Circuits	N0257881	36681	2017/1/3	2018/1/2
X	EMI Test Receiver	R&S	ESR26	101385	2017/9/29	2018/9/28
X	Coaxial Cable	QTK(Arnist)	SUCOFLEX 106	L1606-015C	2017/6/23	2018/6/22
X	EMI Test Receiver	R&S	ESCS 30	838251/001	2017/7/21	2018/7/20
X	Coaxial Cable	QTK(Arnist)	RG 214	LC003-RG	2017/6/16	2018/6/15
X	Coaxial signal switch	Anritsu	MP59B	6201415889	2017/6/16	2018/6/15

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version :QuieTek EMI 2.0 V2.1.113.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Wireless Module
Test Item : Conducted Emission Test
Power Line : Line 1
Test date : 2017/12/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 1					
Quasi-Peak					
0.158	9.751	40.540	50.291	-15.480	65.771
0.193	9.772	27.820	37.592	-27.179	64.771
0.232	9.770	27.620	37.390	-26.267	63.657
0.373	9.742	32.000	41.742	-17.887	59.629
0.591	9.747	18.860	28.607	-27.393	56.000
6.642	9.940	29.100	39.040	-20.960	60.000
Average					
0.158	9.751	18.300	28.051	-27.720	55.771
0.193	9.772	11.560	21.332	-33.439	54.771
0.232	9.770	12.280	22.050	-31.607	53.657
0.373	9.742	20.620	30.362	-19.267	49.629
0.591	9.747	9.090	18.837	-27.163	46.000
6.642	9.940	15.590	25.530	-24.470	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Wireless Module
Test Item : Conducted Emission Test
Power Line : Line 2
Test date : 2017/12/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

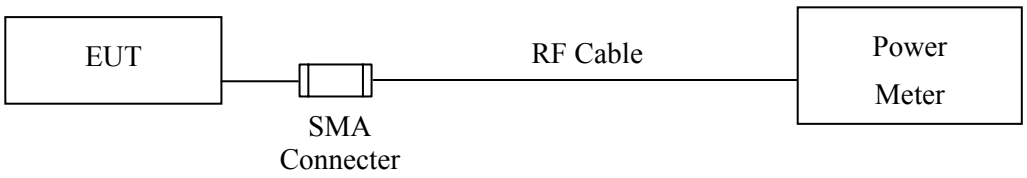
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 2					
Quasi-Peak					
0.166	9.709	33.220	42.929	-22.614	65.543
0.189	9.741	30.960	40.701	-24.185	64.886
0.373	9.763	31.120	40.883	-18.746	59.629
0.427	9.767	24.420	34.187	-23.899	58.086
0.560	9.799	20.300	30.099	-25.901	56.000
6.670	10.011	28.900	38.911	-21.089	60.000
Average					
0.166	9.709	15.590	25.299	-30.244	55.543
0.189	9.741	19.630	29.371	-25.515	54.886
0.373	9.763	20.520	30.283	-19.346	49.629
0.427	9.767	12.870	22.637	-25.449	48.086
0.560	9.799	10.620	20.419	-25.581	46.000
6.670	10.011	15.400	25.411	-24.589	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

Product : Wireless Module
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2017/12/02
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	3.48	1 Watt= 30 dBm	Pass
Channel 39	2441.00	7.02	1 Watt= 30 dBm	Pass
Channel 78	2480.00	6.78	1 Watt= 30 dBm	Pass

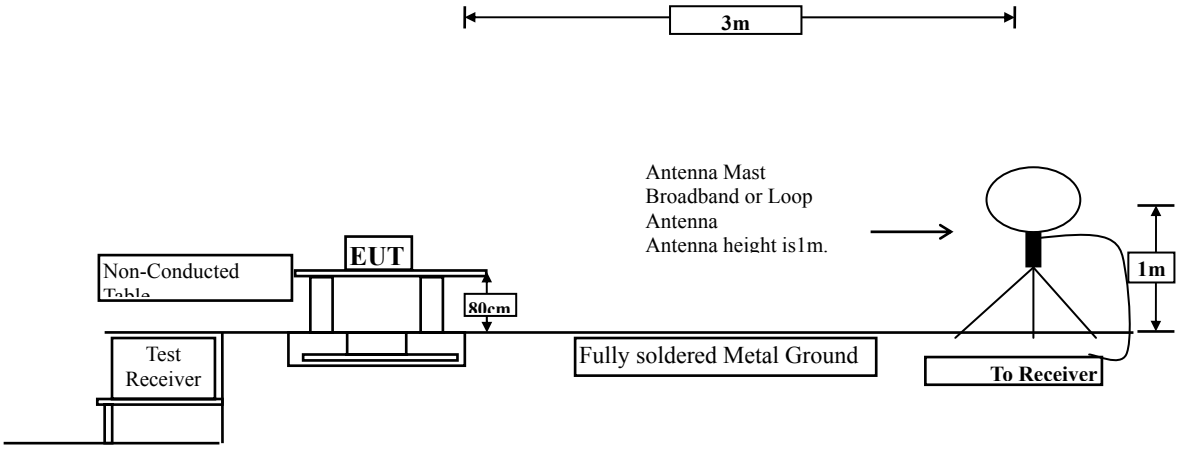
Product : Wireless Module
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2017/12/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	2.96	1 Watt= 30 dBm	Pass
Channel 39	2441.00	6.09	1 Watt= 30 dBm	Pass
Channel 78	2480.00	6.03	1 Watt= 30 dBm	Pass

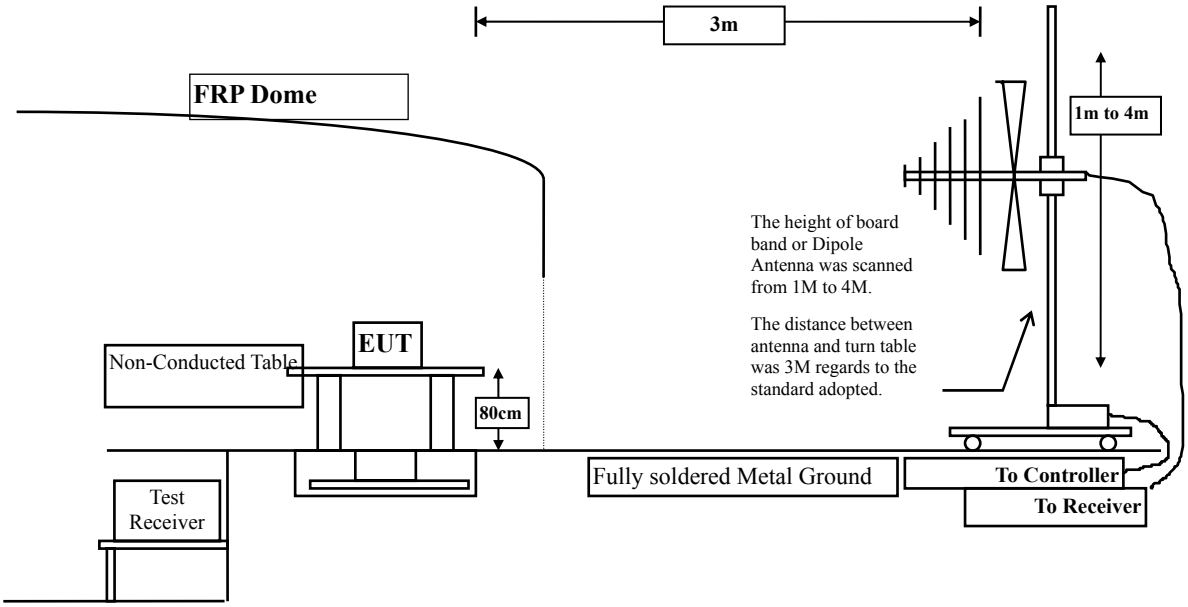
4. Radiated Emission

4.1. Test Setup

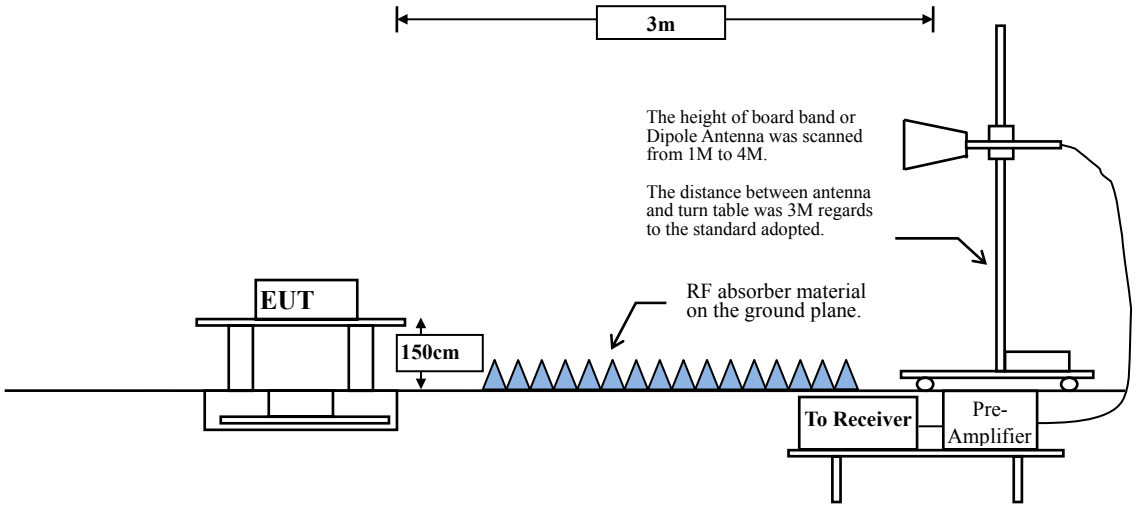
Under 30MHz



Below 1GHz



Above 1GHz



4.2. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

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.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : Wireless Module
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2402MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4804.000	2.511	48.429	50.939	-23.061	74.000
7206.000	9.511	38.267	47.778	-26.222	74.000
9608.000	10.394	36.818	47.212	-26.788	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	2.923	47.740	50.662	-23.338	74.000
7206.000	9.988	38.462	48.451	-25.549	74.000
9608.000	10.847	36.148	46.995	-27.005	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2017/11/30
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4882.000	2.025	50.510	52.535	-21.465	74.000
7323.000	9.762	39.217	48.978	-25.022	74.000
9764.000	9.682	38.114	47.795	-26.205	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4882.000	2.488	51.964	54.452	-19.548	74.000
7323.000	10.375	40.835	51.209	-22.791	74.000
9764.000	10.315	37.096	47.411	-26.589	74.000
Average					
Detector:					
4882.000	2.488	44.451	46.939	-7.061	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2017/11/30
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2480MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4960.000	2.582	48.513	51.095	-22.905	74.000
7440.000	10.555	39.395	49.950	-24.050	74.000
9920.000	10.206	37.801	48.007	-25.993	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	3.398	51.059	54.458	-19.542	74.000
7440.000	11.214	39.660	50.874	-23.126	74.000
9920.000	11.245	37.914	49.159	-24.841	74.000
Average Detector:					
4960.000	3.398	43.634	47.033	-6.967	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2017/11/30
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)(2402MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4804.000	2.511	44.494	47.004	-26.996	74.000
7206.000	9.511	38.040	47.551	-26.449	74.000
9608.000	10.394	36.632	47.026	-26.974	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	2.923	45.574	48.496	-25.504	74.000
7206.000	9.988	38.369	48.358	-25.642	74.000
9608.000	10.847	36.644	47.491	-26.509	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Module
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4882.000	2.025	47.505	49.530	-24.470	74.000
7323.000	9.762	37.982	47.743	-26.257	74.000
9764.000	9.682	37.359	47.040	-26.960	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4882.000	2.488	47.830	50.318	-23.682	74.000
7323.000	10.375	38.447	48.821	-25.179	74.000
9764.000	10.315	37.680	47.995	-26.005	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2017/11/30
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4960.000	2.582	45.235	47.817	-26.183	74.000
7440.000	10.555	37.241	47.796	-26.204	74.000
9920.000	10.206	36.947	47.153	-26.847	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4960.000	3.398	46.660	50.059	-23.941	74.000
7440.000	11.214	38.242	49.456	-24.544	74.000
9920.000	11.245	37.419	48.664	-25.336	74.000
Average					
Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Module
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
175.500	-9.792	48.354	38.562	-4.938	43.500
263.770	-5.493	45.391	39.898	-6.102	46.000
384.050	1.268	37.624	38.892	-7.108	46.000
544.100	4.373	34.498	38.871	-7.129	46.000
702.210	2.753	34.191	36.944	-9.056	46.000
1000.000	9.564	27.111	36.675	-17.325	54.000
Vertical					
179.380	-0.824	41.111	40.287	-3.213	43.500
239.520	-6.138	37.642	31.504	-14.496	46.000
381.140	0.816	28.812	29.628	-16.372	46.000
476.200	-3.462	35.206	31.744	-14.256	46.000
687.660	2.292	25.727	28.019	-17.981	46.000
797.270	2.633	30.431	33.065	-12.935	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Module
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

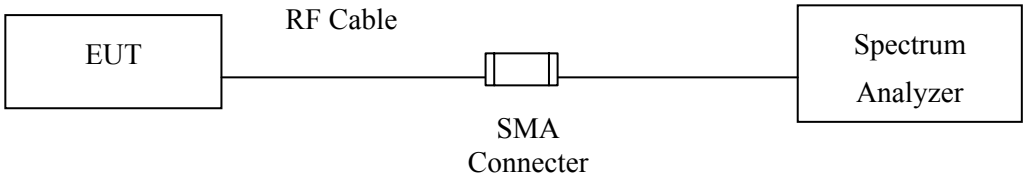
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
128.940	-7.390	42.398	35.008	-8.492	43.500
216.240	-10.271	51.672	41.401	-4.599	46.000
359.800	-0.226	39.865	39.639	-6.361	46.000
540.220	3.499	35.939	39.438	-6.562	46.000
702.210	2.753	33.797	36.550	-9.450	46.000
839.950	6.032	29.154	35.186	-10.814	46.000
Vertical					
123.120	-3.630	36.061	32.431	-11.069	43.500
239.520	-6.138	37.975	31.837	-14.163	46.000
372.410	-0.129	29.372	29.243	-16.757	46.000
476.200	-3.462	36.109	32.647	-13.353	46.000
603.270	1.965	26.815	28.780	-17.220	46.000
796.300	2.639	30.192	32.831	-13.169	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product	:	Wireless Module
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2017/12/02
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 00:

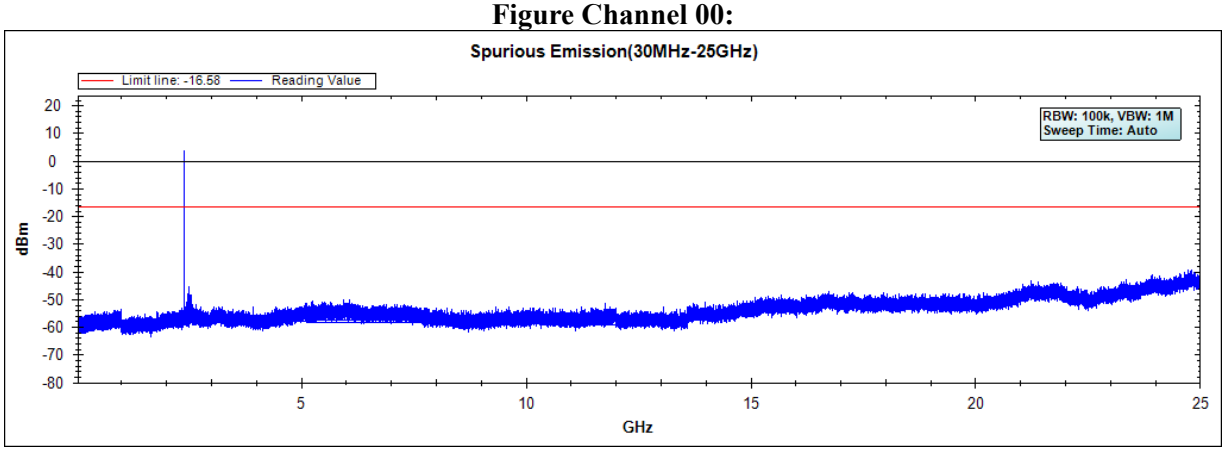


Figure Channel 39:

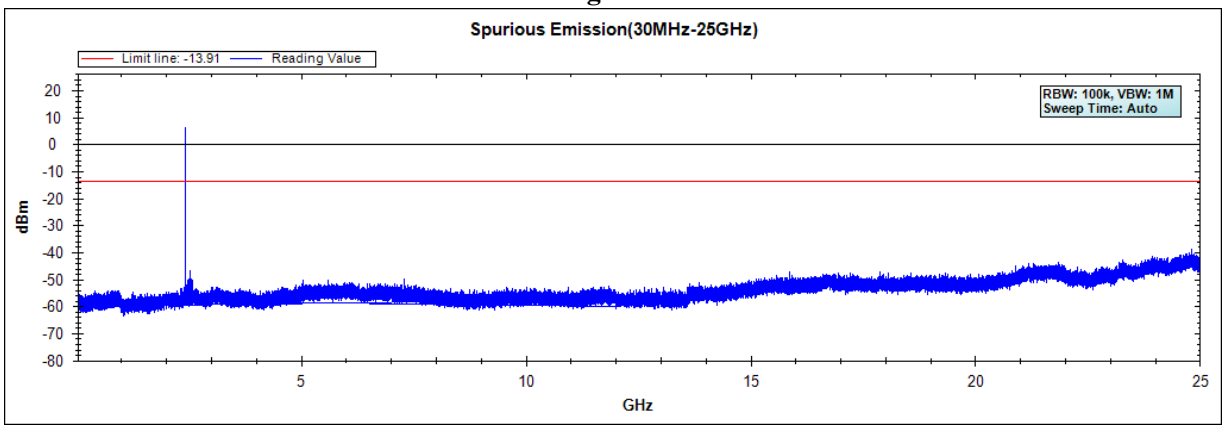
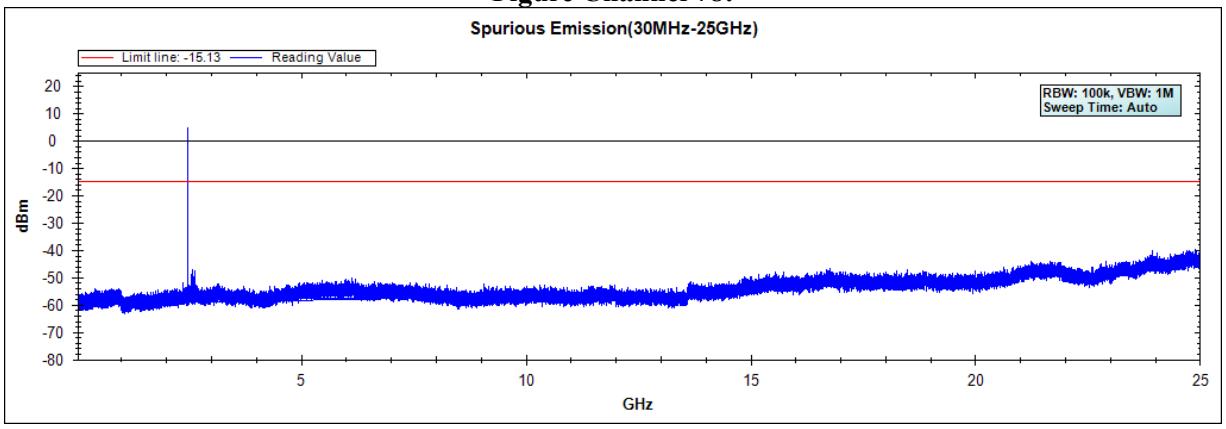


Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	Wireless Module
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2017/12/02
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

Figure Channel 00:

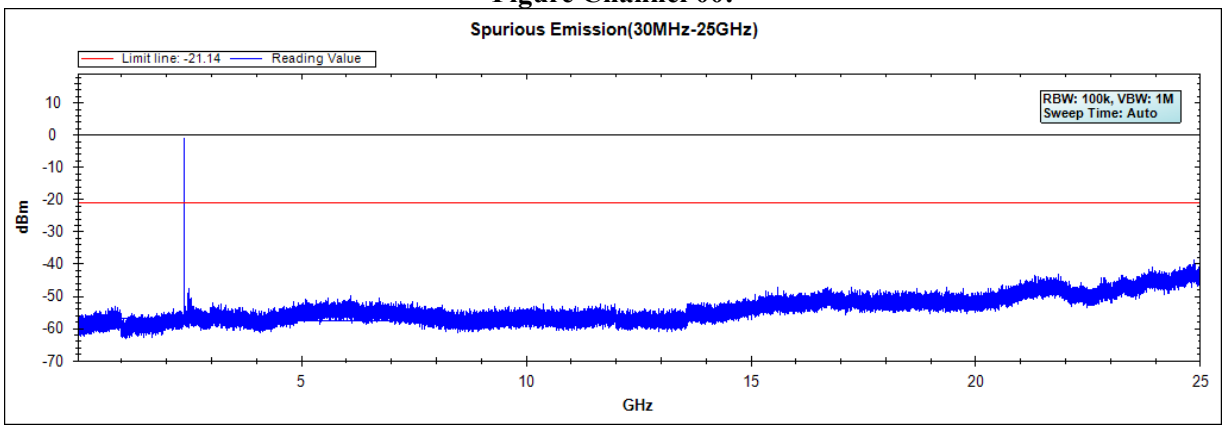


Figure Channel 39:

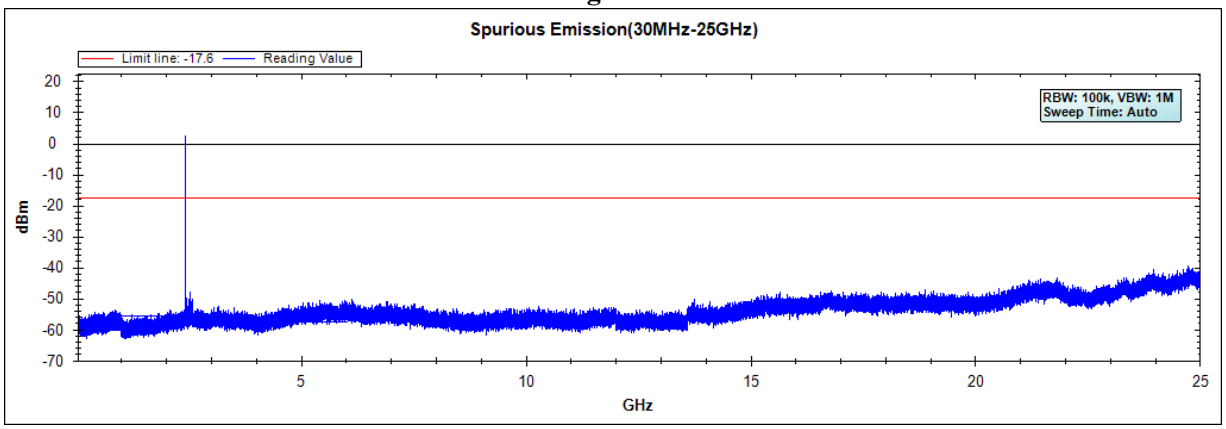
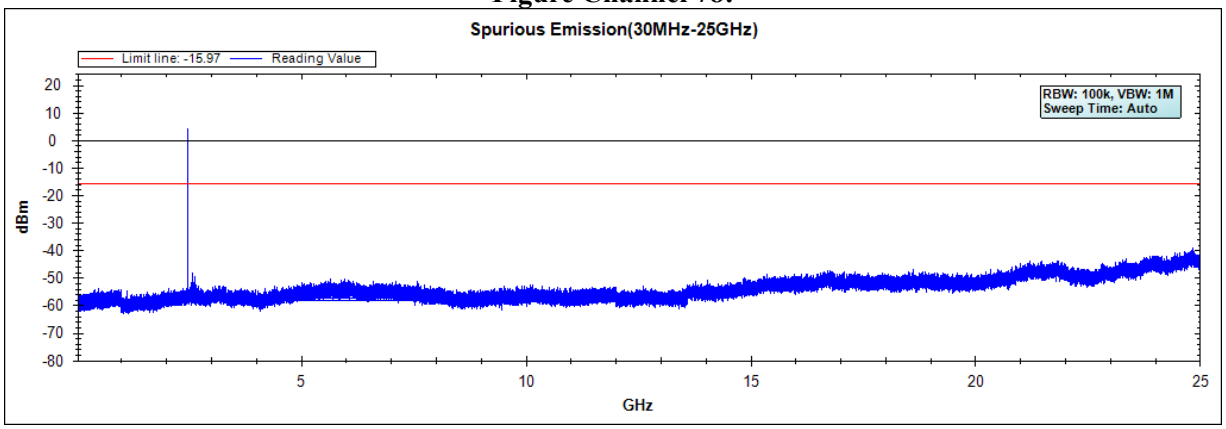


Figure Channel 78:



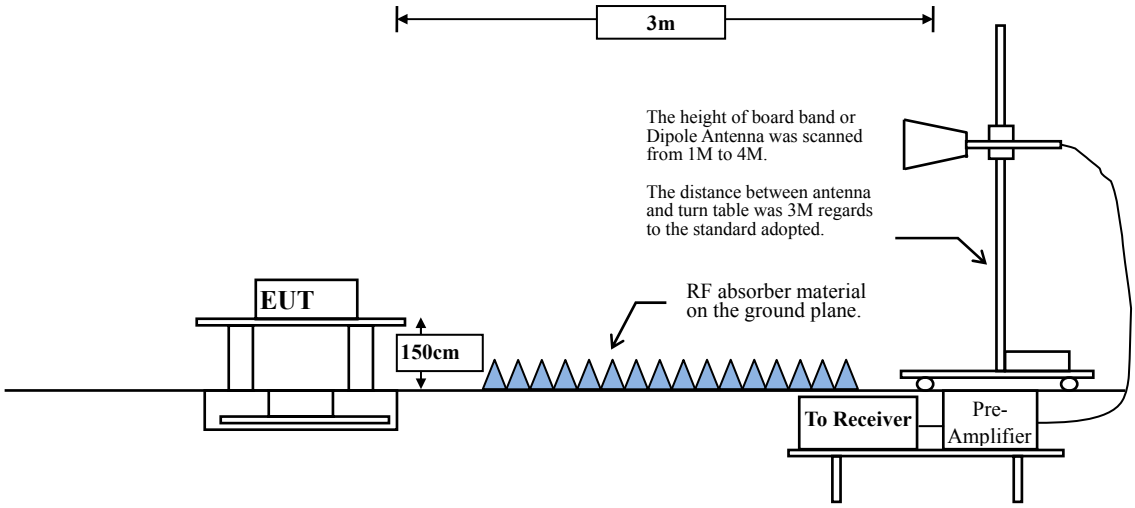
Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

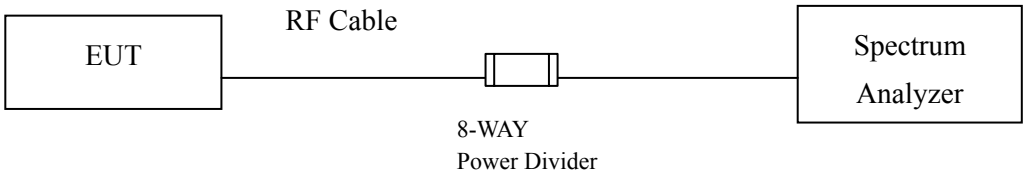
6.1. Test Setup

RF Radiated Measurement:

Above 1GHz



RF Conducted Measurement



6.2. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz 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 the 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)).

6.3. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

6.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
00 (Peak)	2389.800	-2.688	52.473	49.785	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	49.646	46.959	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	58.830	56.170	--	--	--
00 (Peak)	2402.200	-2.657	98.134	95.477	--	--	--
00 (Average)	2390.000	-2.687	38.265	35.578	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	46.094	43.434	--	--	--
00 (Average)	2402.100	-2.657	85.730	83.073	--	--	--

Figure Channel 00: Horizontal (Peak)

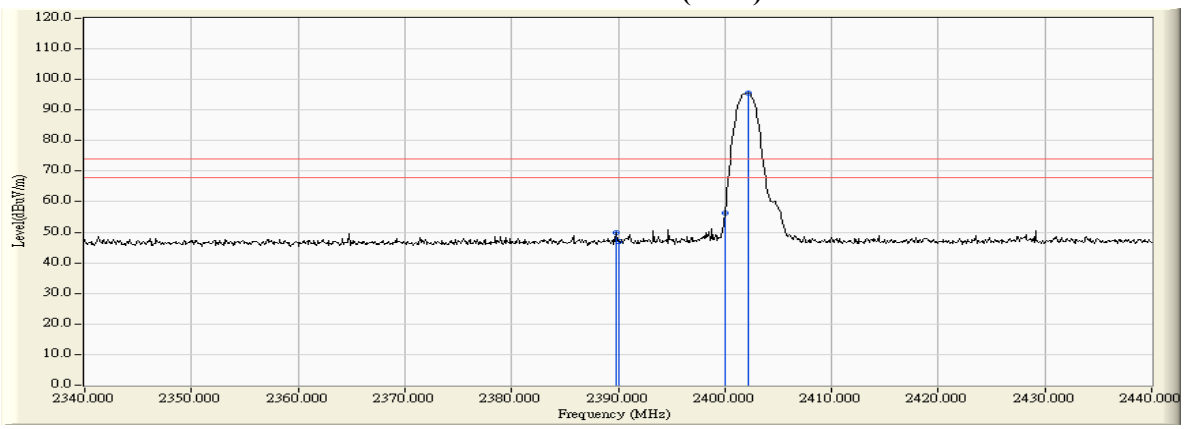
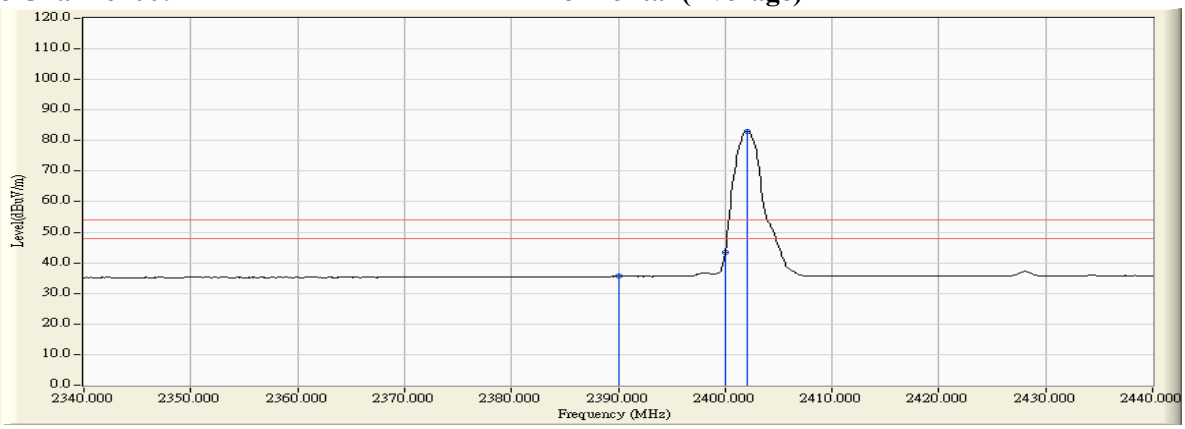


Figure Channel 00: Horizontal (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
00 (Peak)	2390.000	-4.159	51.350	47.191	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	60.270	56.099	--	--	--
00 (Peak)	2402.200	-4.171	99.676	95.505	--	--	--
00 (Average)	2390.000	-4.159	38.219	34.060	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	47.347	43.176	--	--	--
00 (Average)	2402.100	-4.171	86.990	82.819	--	--	--

Figure Channel 00: VERTICAL (Peak)

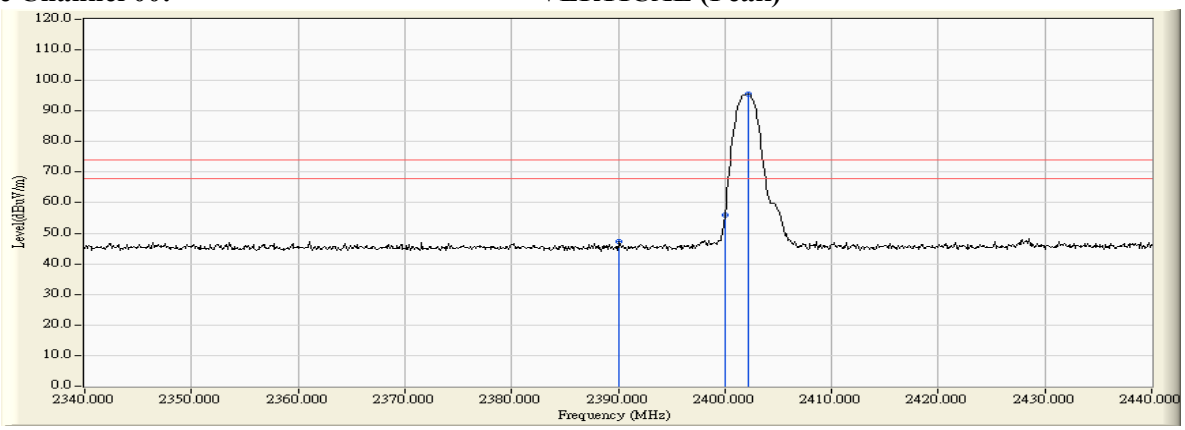
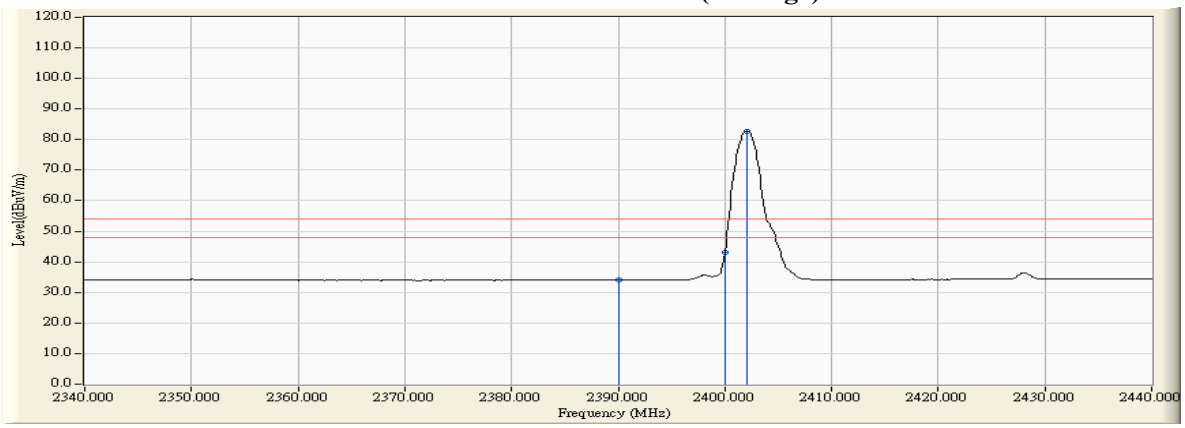


Figure Channel 00: VERTICAL (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
78 (Peak)	2479.800	-2.605	104.469	101.864	--	--	Pass
78 (Peak)	2483.500	-2.601	55.346	52.744	74.00	54.00	Pass
78 (Average)	2480.000	-2.605	90.887	88.282	--	--	Pass
78 (Average)	2483.500	-2.601	44.792	42.190	74.00	54.00	Pass
78 (Average)	2532.000	-2.815	45.070	42.256	74.00	54.00	Pass

Figure Channel 78: Horizontal (Peak)

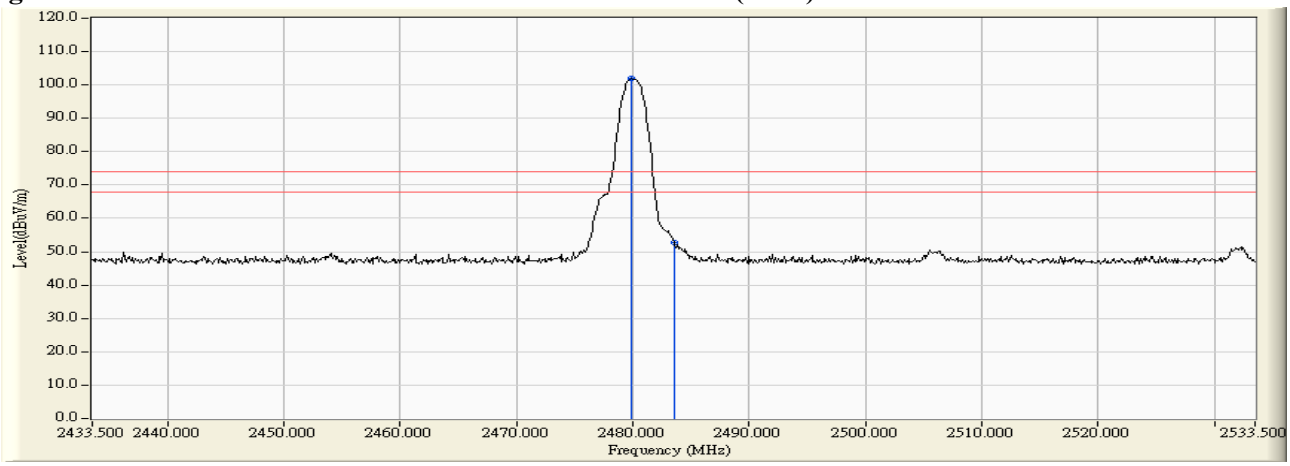
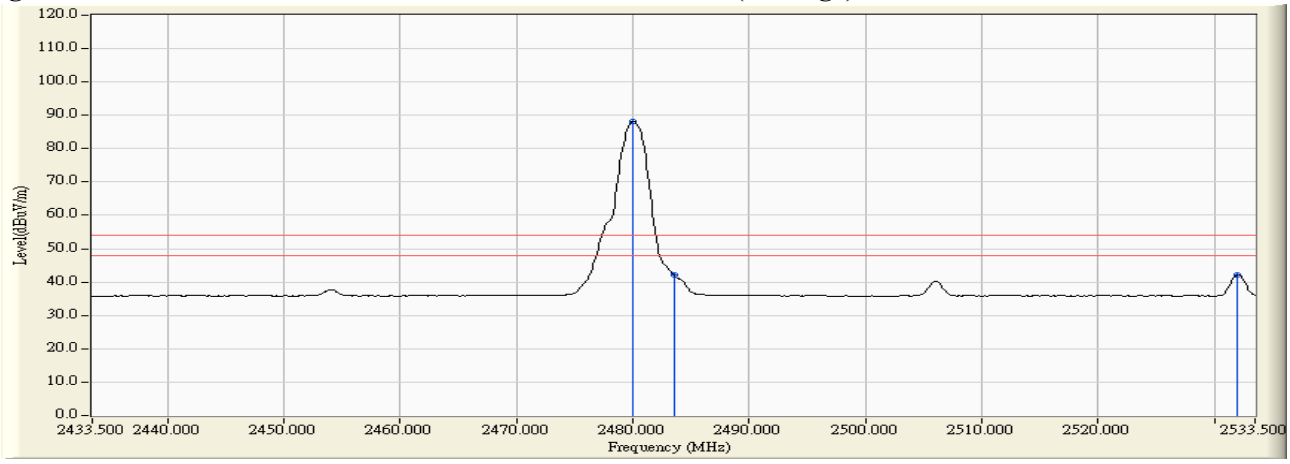


Figure Channel 78: Horizontal (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
78 (Peak)	2479.900	-3.978	107.869	103.891	--	--	Pass
78 (Peak)	2483.500	-3.966	58.069	54.102	74.00	54.00	Pass
78 (Average)	2480.000	-3.978	93.653	89.675	--	--	Pass
78 (Average)	2483.500	-3.966	47.117	43.150	74.00	54.00	Pass

Figure Channel 78: VERTICAL (Peak)

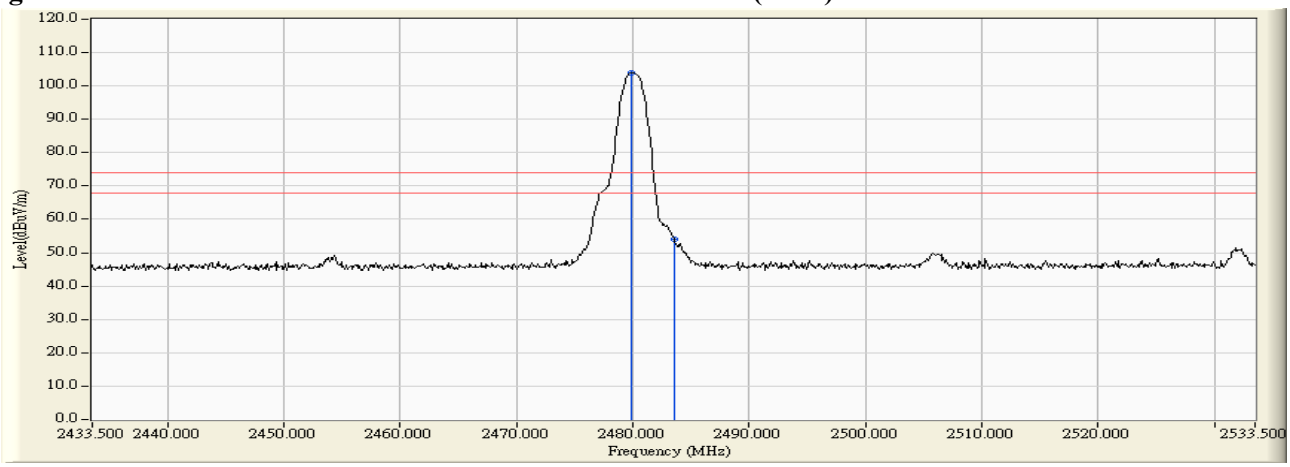
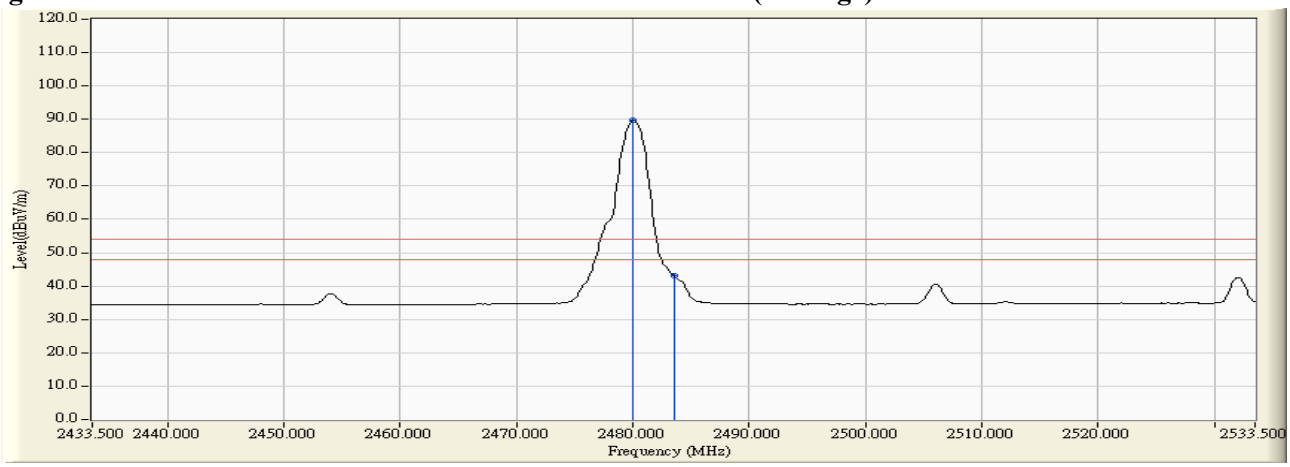


Figure Channel 78: VERTICAL (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
00 (Peak)	2387.300	-2.698	51.154	48.455	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	50.151	47.464	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	69.377	66.717	--	--	--
00 (Peak)	2402.200	-2.657	97.691	95.034	--	--	--
00 (Average)	2390.000	-2.687	38.321	35.634	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	51.859	49.199	--	--	--
00 (Average)	2402.100	-2.657	83.266	80.609	--	--	--

Figure Channel 00: Horizontal (Peak)

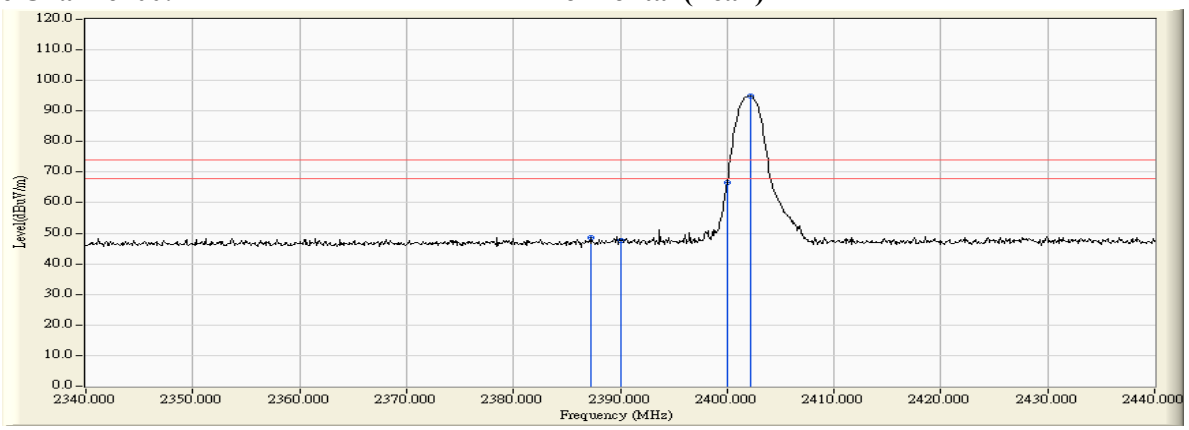
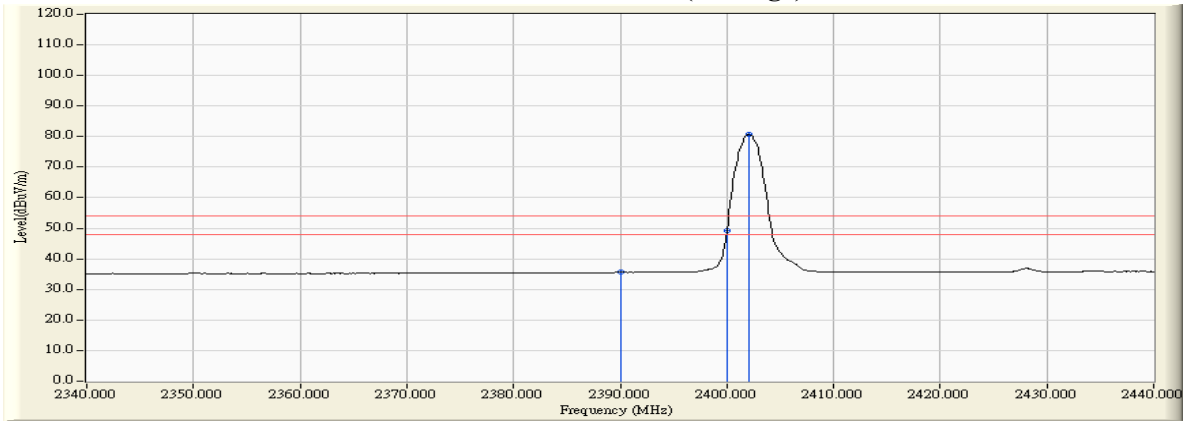


Figure Channel 00: Horizontal (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
00 (Peak)	2387.200	-4.149	52.114	47.965	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	49.431	45.272	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	70.722	66.551	--	--	--
00 (Peak)	2402.200	-4.171	99.266	95.095	--	--	--
00 (Average)	2390.000	-4.159	38.220	34.061	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	53.182	49.011	--	--	--
00 (Average)	2402.100	-4.171	84.609	80.438	--	--	--

Figure Channel 00: VERTICAL (Peak)

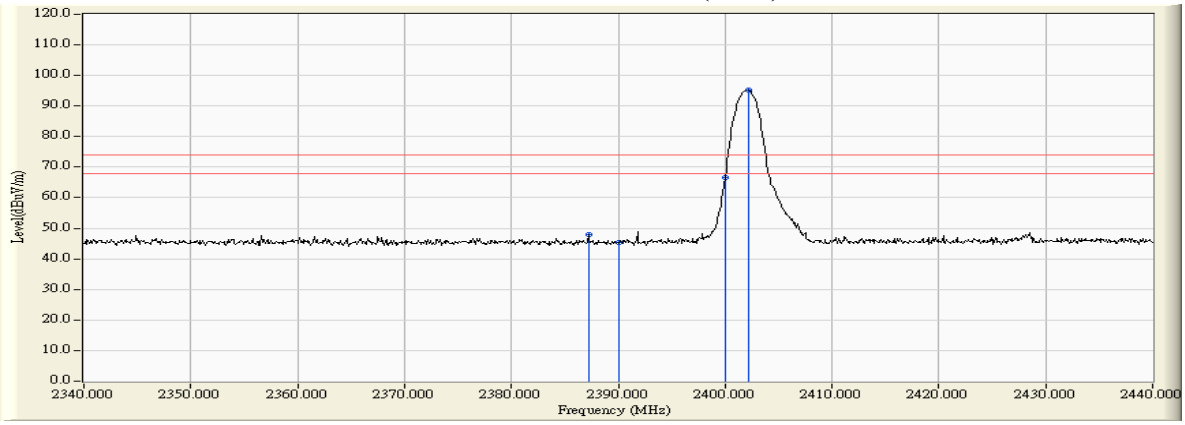
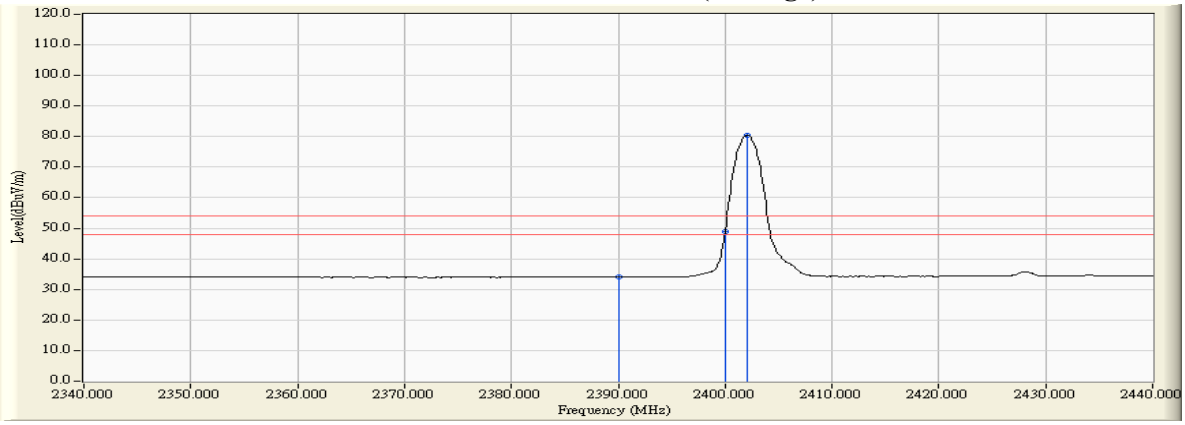


Figure Channel 00: VERTICAL (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
78 (Peak)	2479.800	-2.605	103.881	101.276	--	--	Pass
78 (Peak)	2483.500	-2.601	60.977	58.375	74.00	54.00	Pass
78 (Average)	2480.100	-2.605	88.489	85.884	--	--	Pass
78 (Average)	2483.500	-2.601	44.929	42.327	74.00	54.00	Pass

Figure Channel 00: Horizontal (Peak)

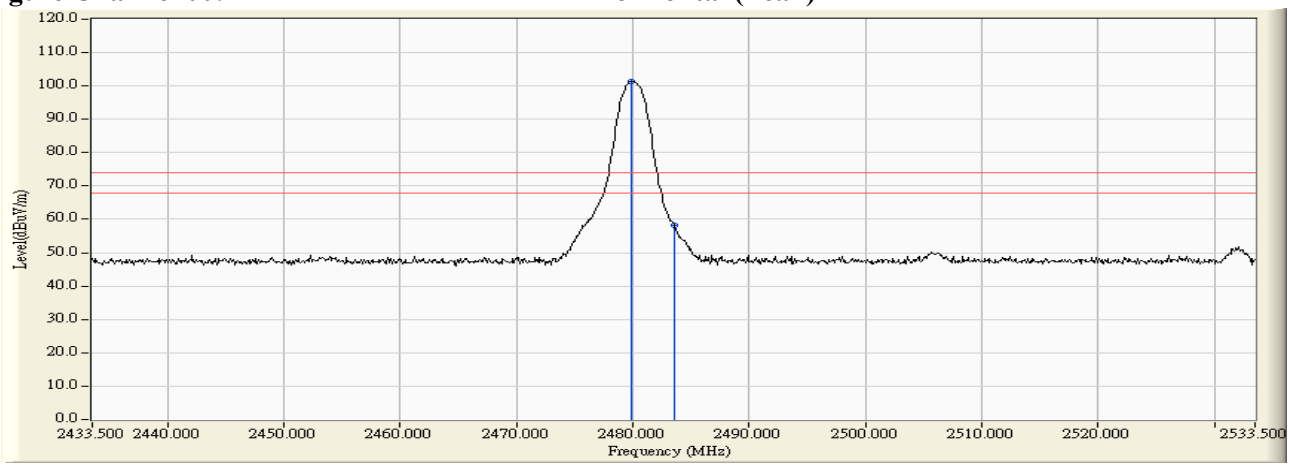
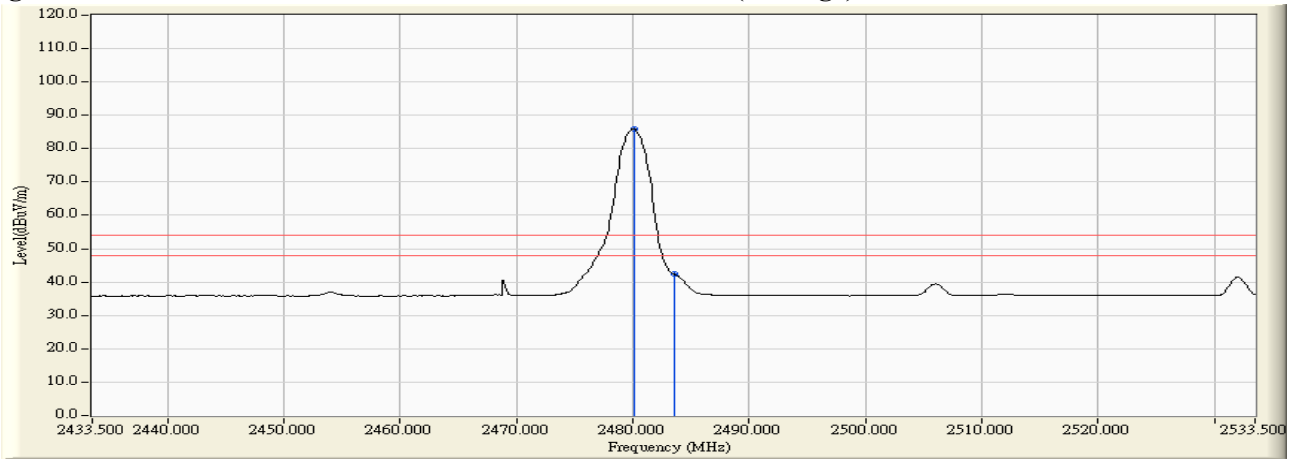


Figure Channel 00: Horizontal (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/11/30
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Arerage Limit (dBμV/m)	Result
78 (Peak)	2479.800	-3.978	107.275	103.297	--	--	Pass
78 (Peak)	2483.500	-3.966	64.773	60.806	74.00	54.00	Pass
78 (Average)	2480.100	-3.977	91.182	87.205	--	--	Pass
78 (Average)	2483.500	-3.966	47.221	43.254	74.00	54.00	Pass

Figure Channel 78: VERTICAL (Peak)

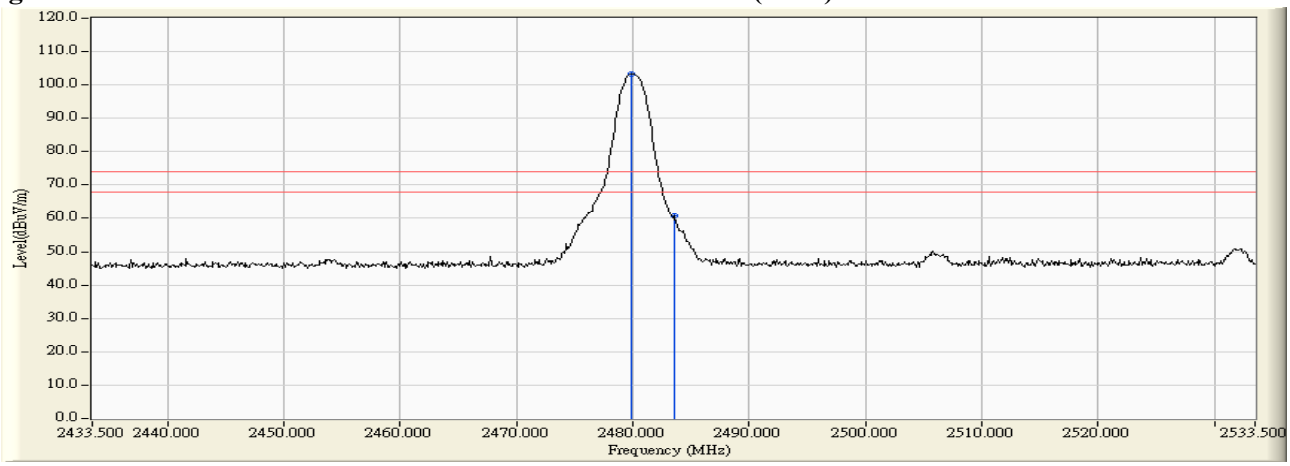
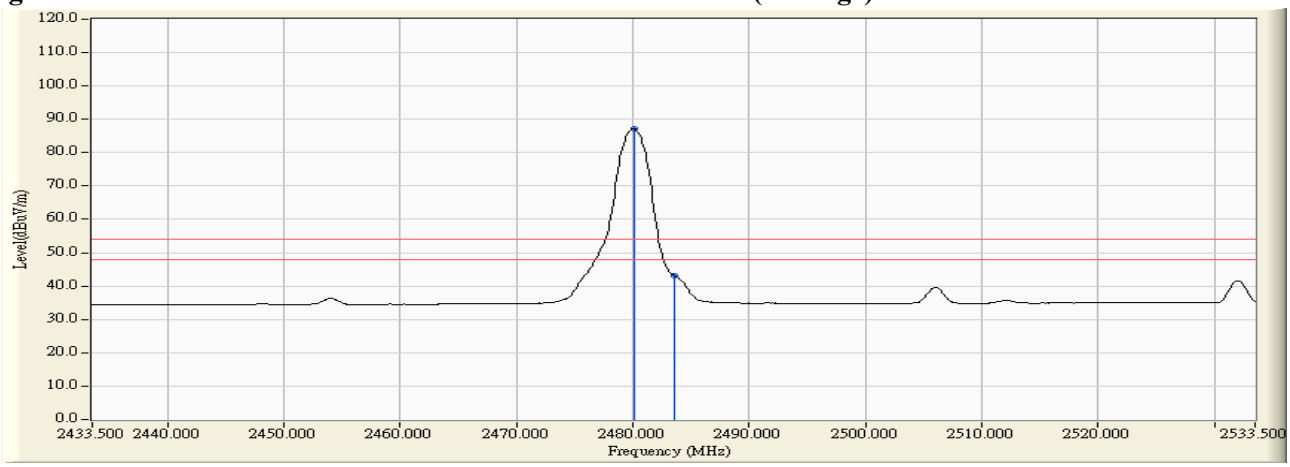


Figure Channel 78: VERTICAL (Average)



Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

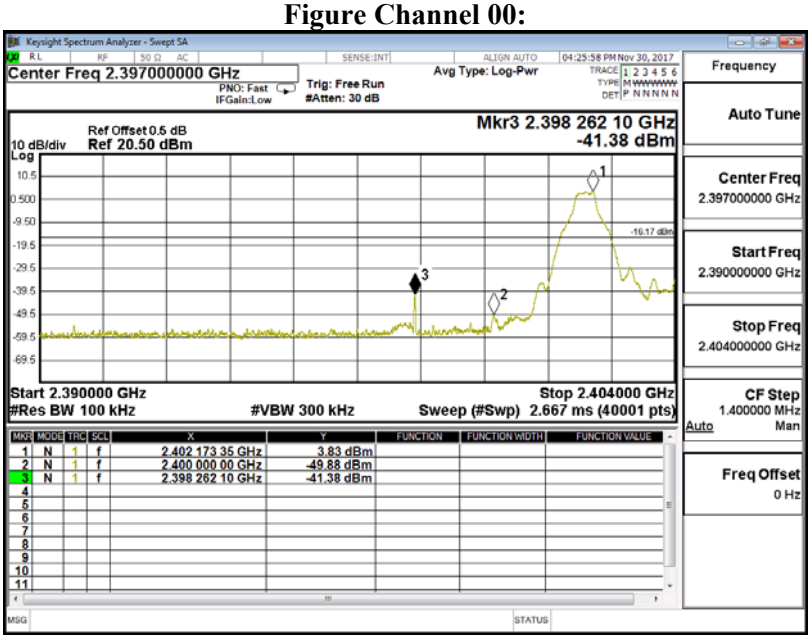
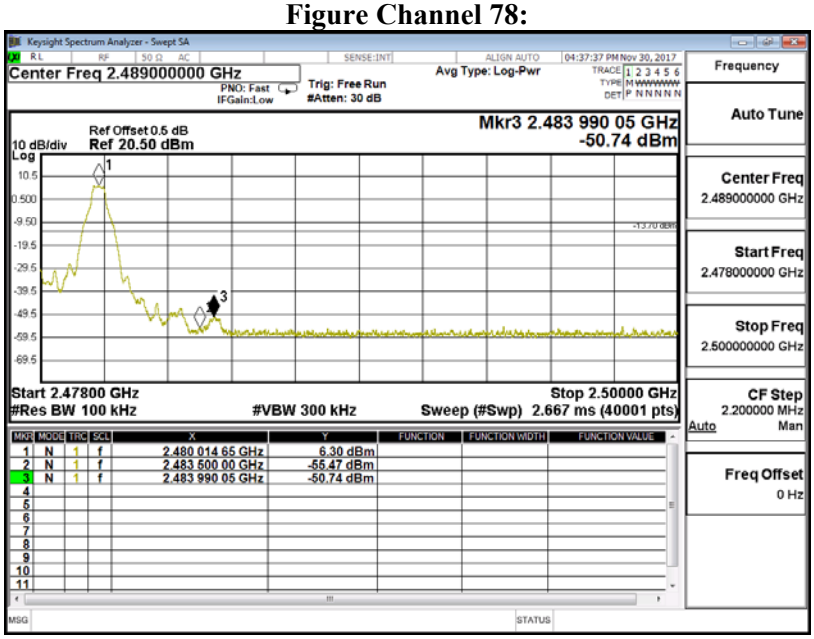


Figure Channel 78:



Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

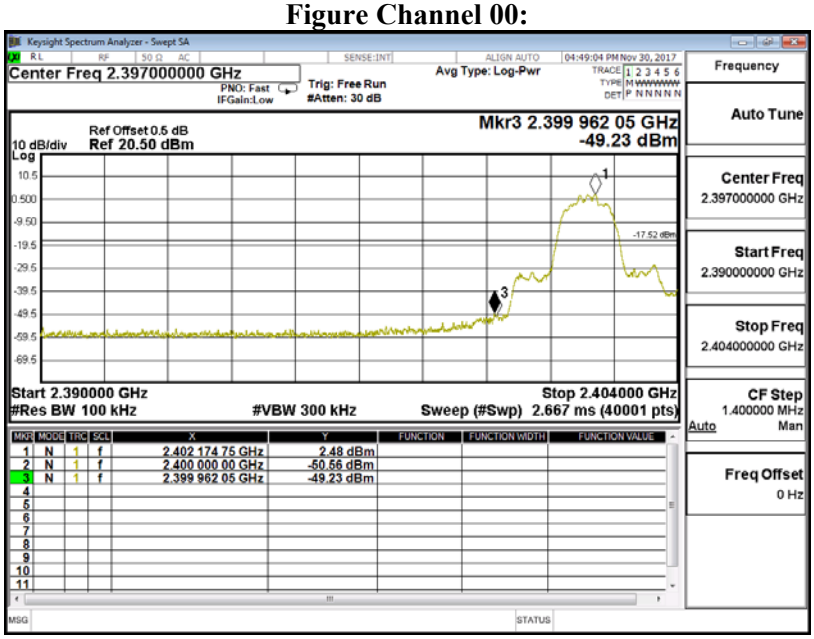
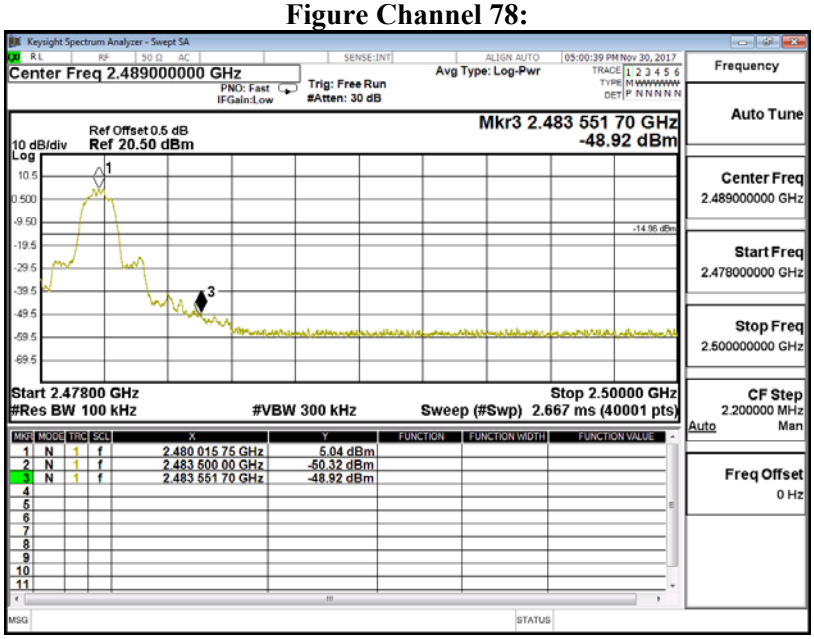


Figure Channel 78:



Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:

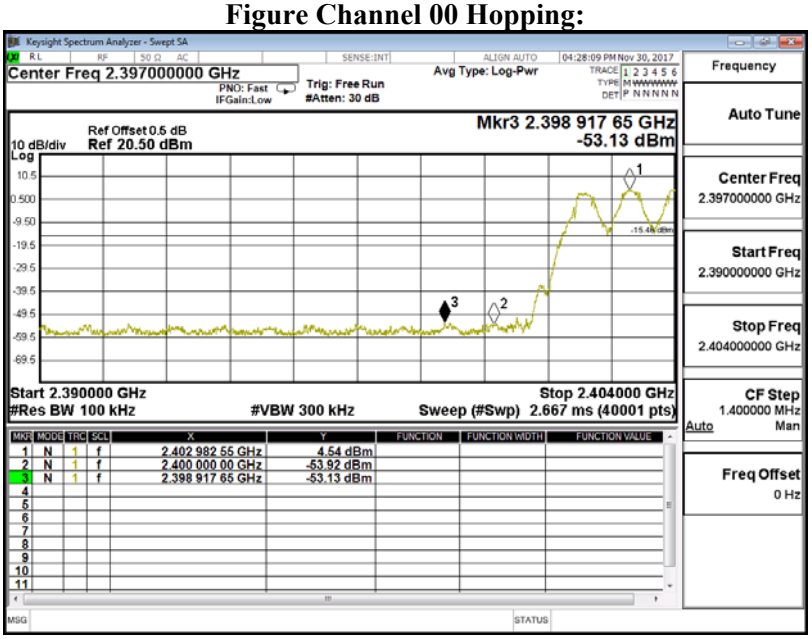
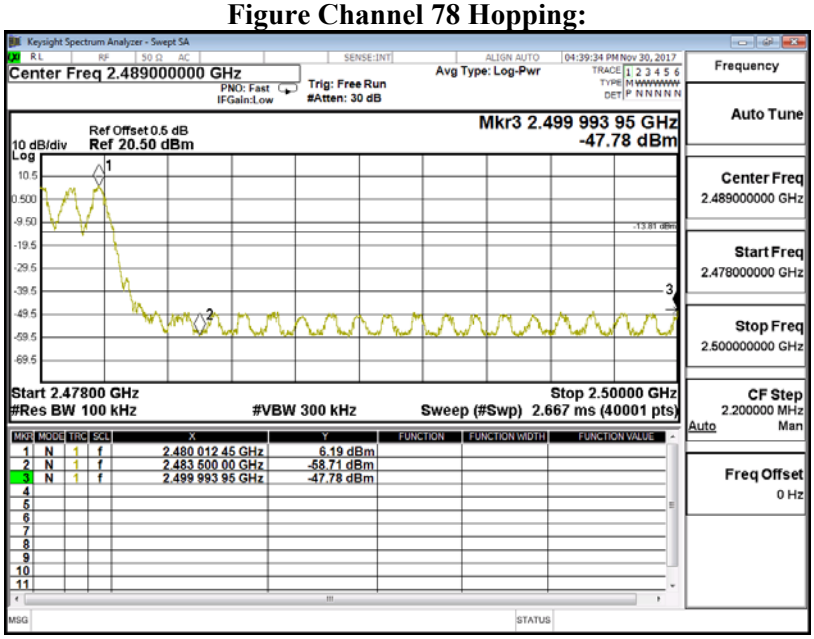


Figure Channel 78 Hopping:



Product : Wireless Module
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:

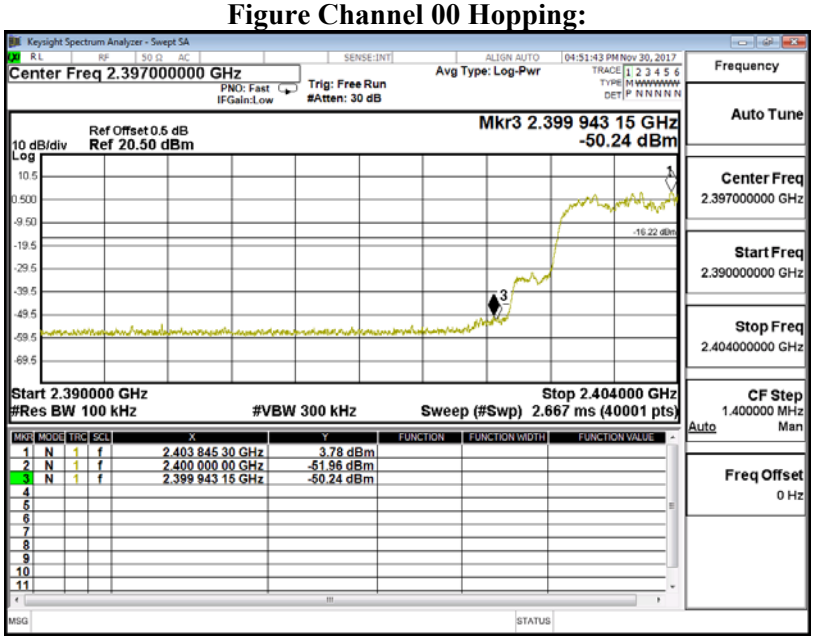
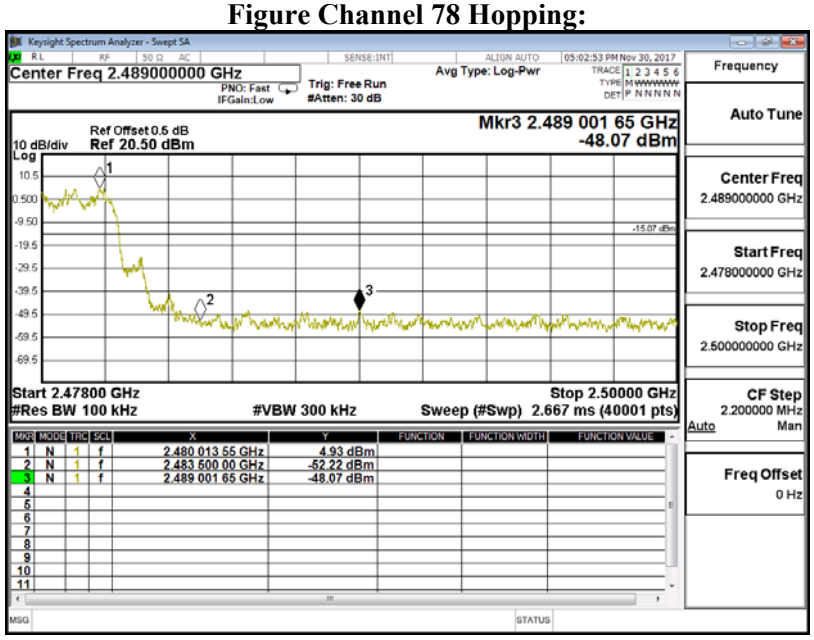
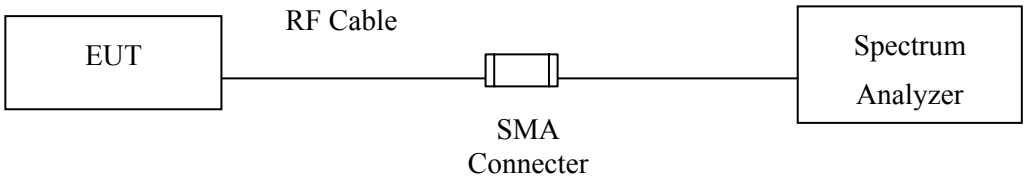


Figure Channel 78 Hopping:



7. Channel Number

7.1. Test Setup



7.2. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

7.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

7.4. Uncertainty

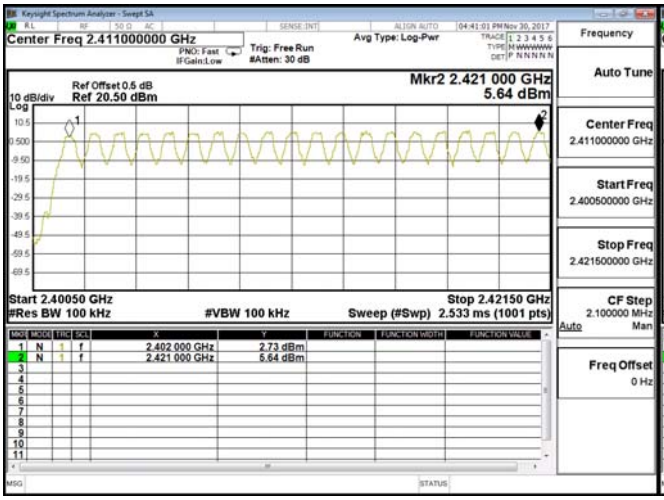
N/A

7.5. Test Result of Channel Number

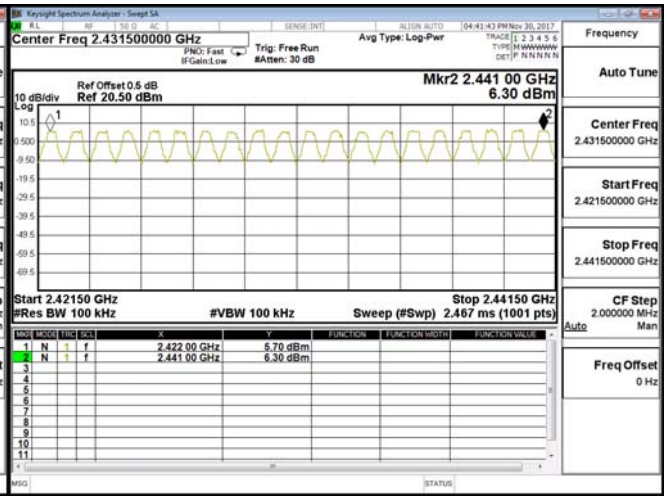
Product : Wireless Module
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

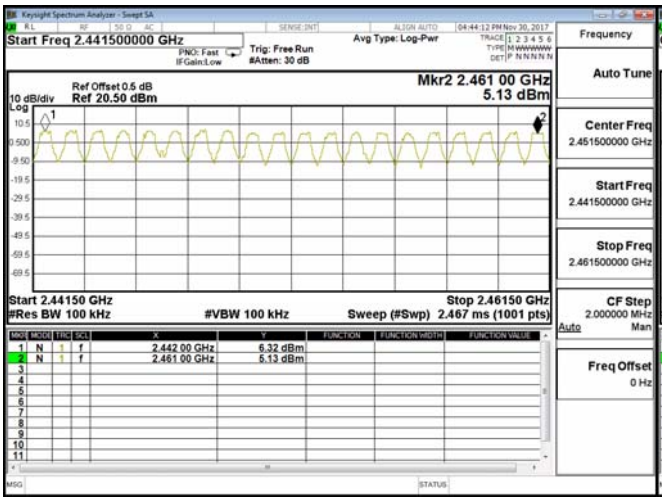
2402-2421MHz



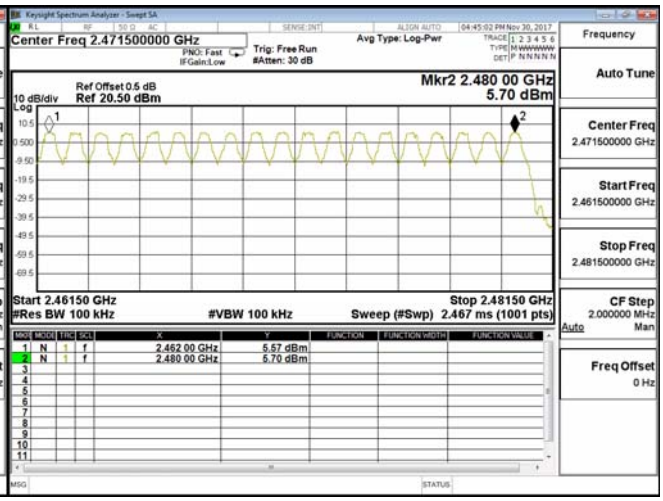
2422-2441MHz



2442-2461MHz



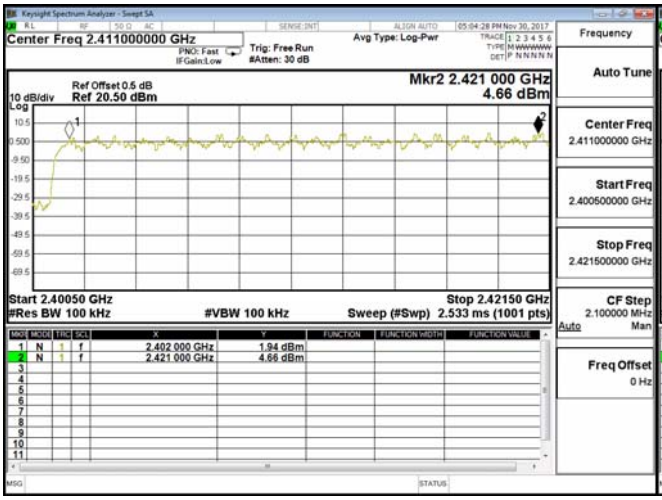
2462-2480MHz



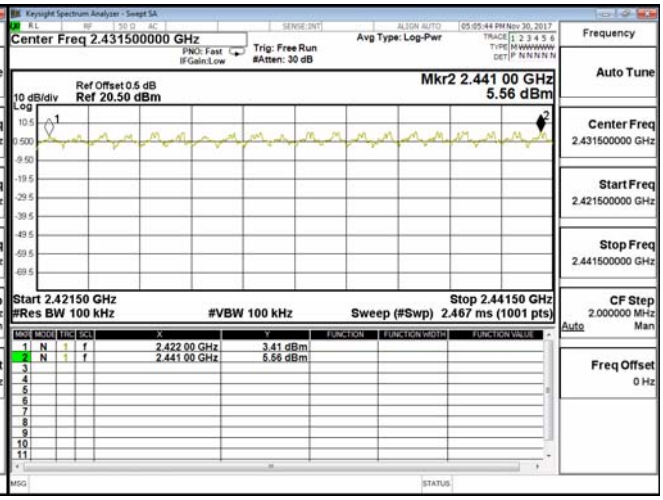
Product : Wireless Module
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

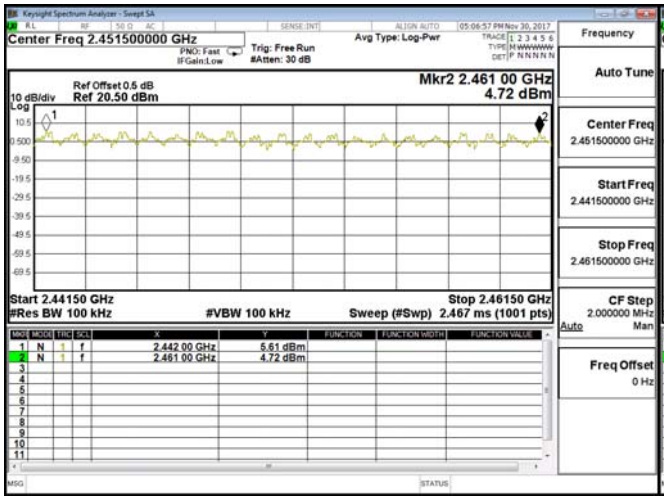
2402-2421MHz



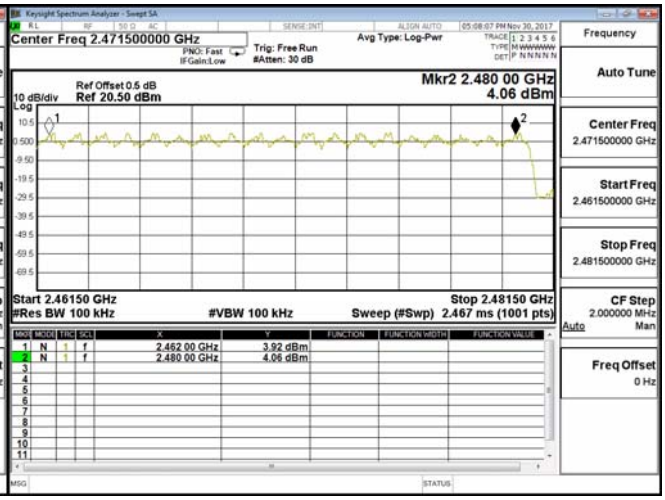
2422-2441MHz



2442-2461MHz

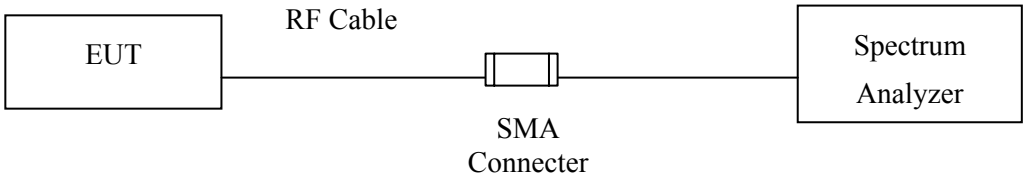


2462-2480MHz



8. Channel Separation

8.1. Test Setup



8.2. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

8.4. Uncertainty

± 283Hz

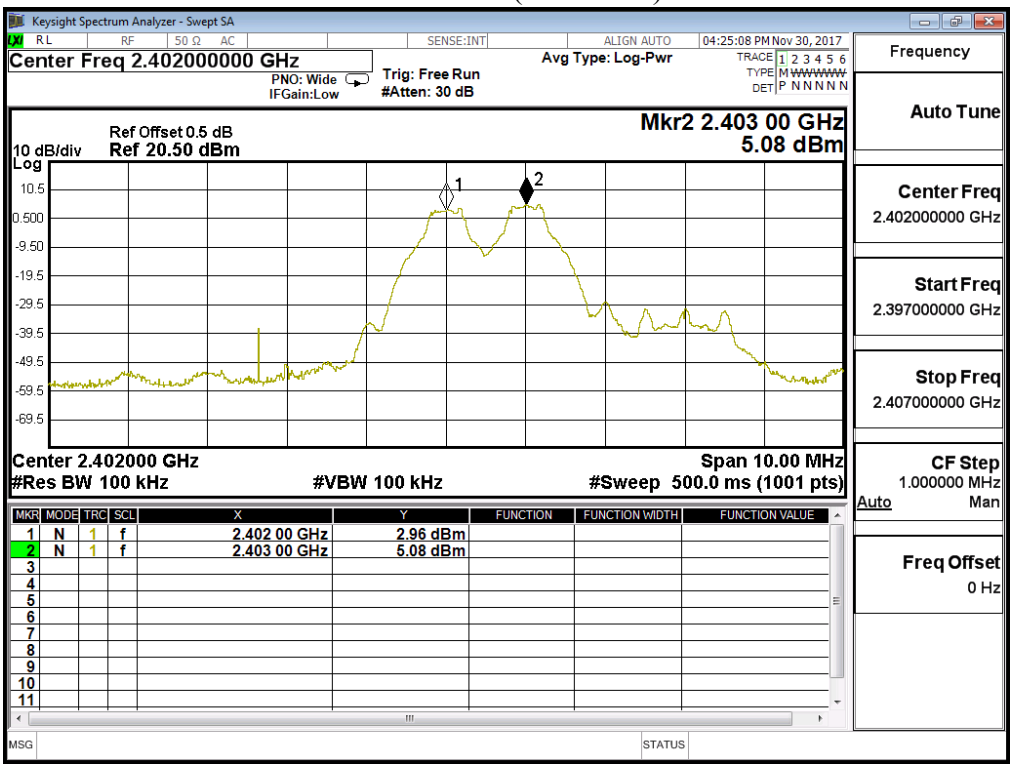
8.5. Test Result of Channel Separation

Product : Wireless Module
Test Item : Channel Separation
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

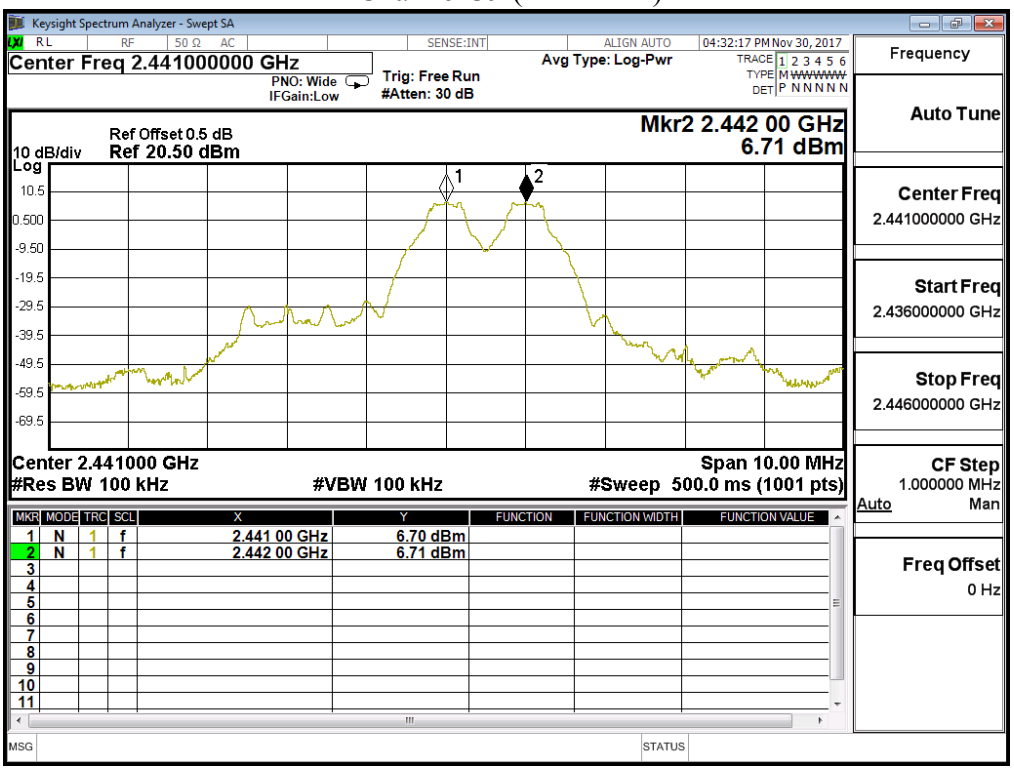
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	634.0	Pass
39	2441	1000	>25 kHz	634.0	Pass
78	2480	1000	>25 kHz	634.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

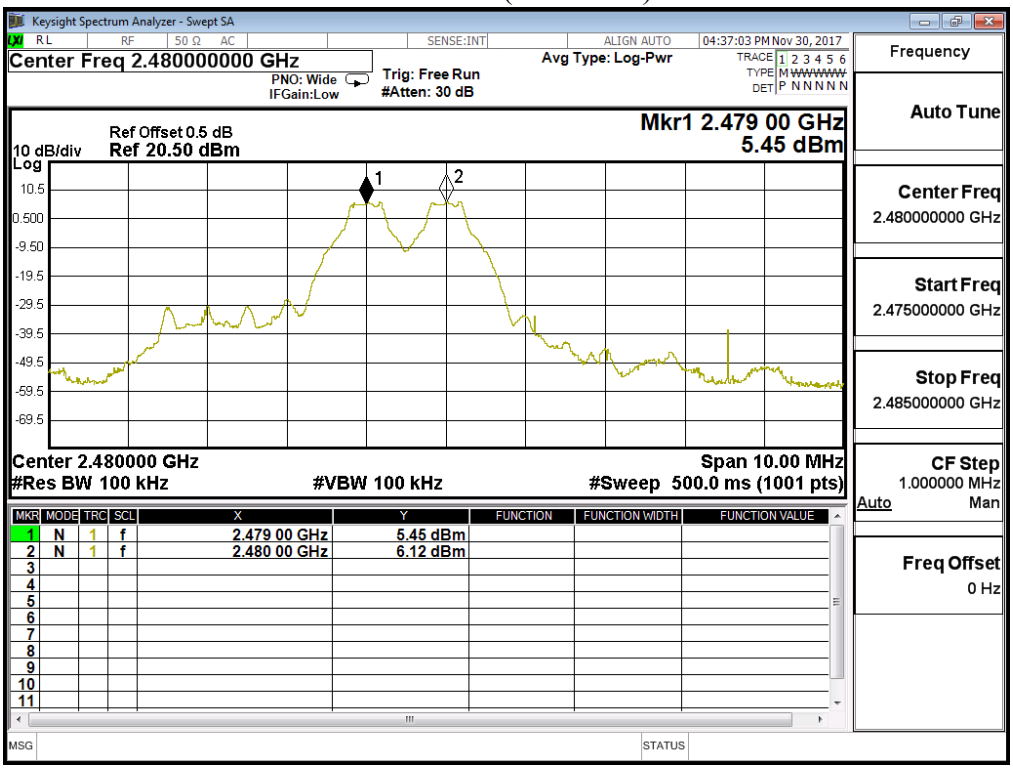
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)

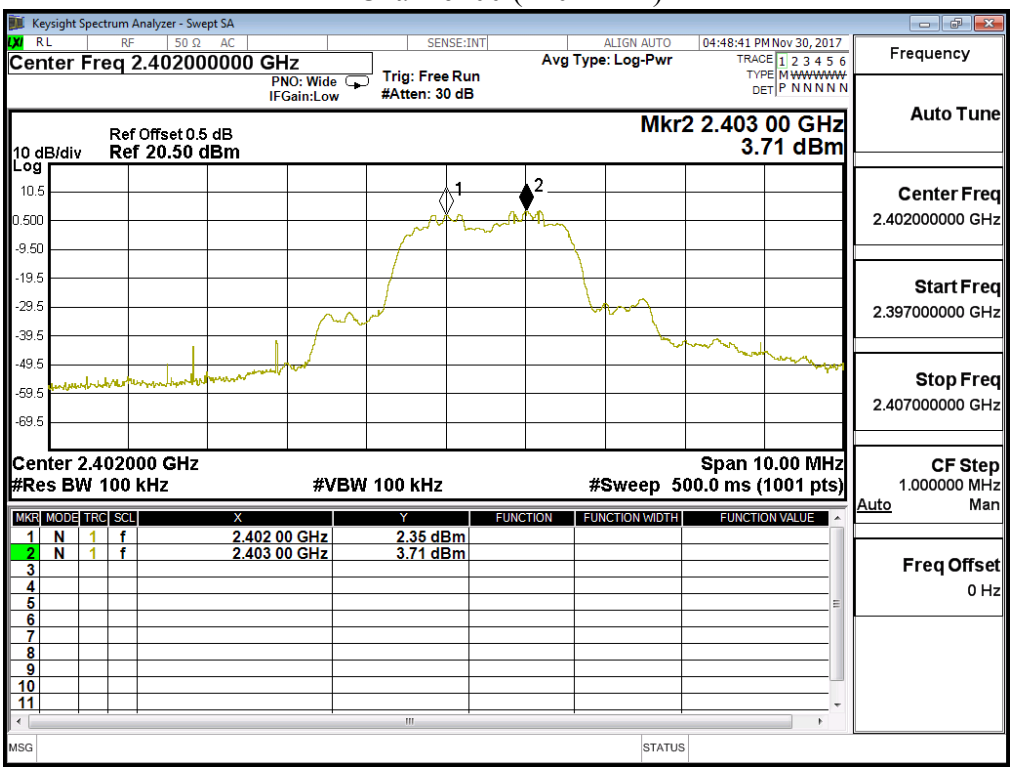


Product : Wireless Module
Test Item : Channel Separation
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

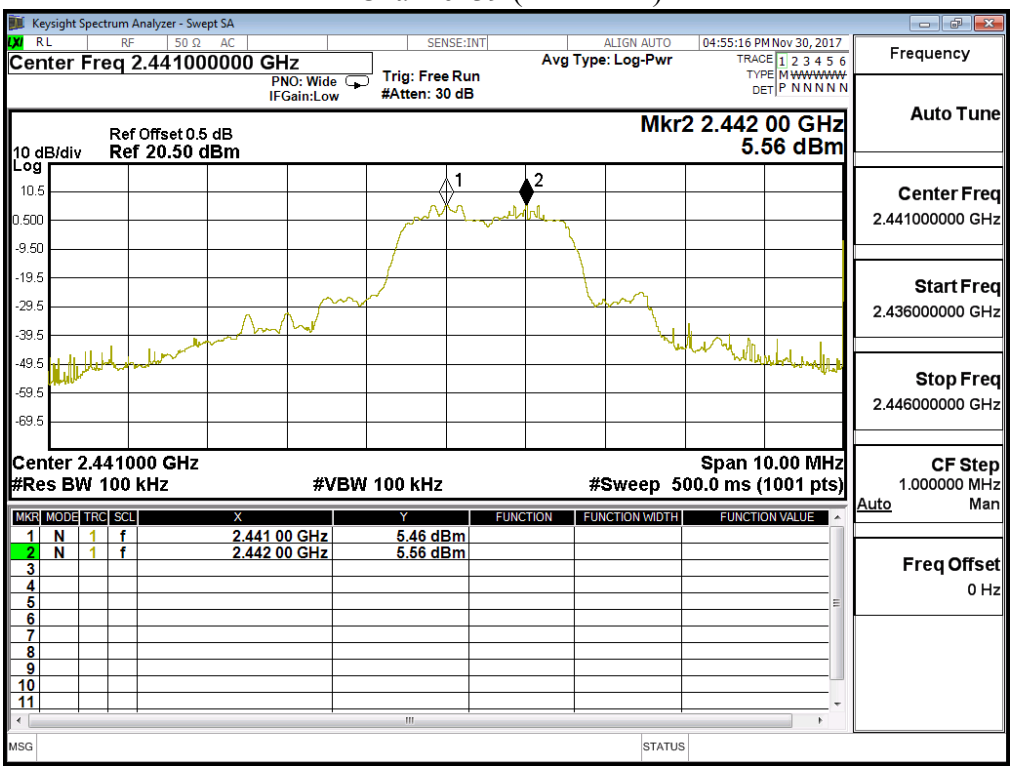
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	860.0	Pass
39	2441	1000	>25 kHz	848.0	Pass
78	2480	1000	>25 kHz	846.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

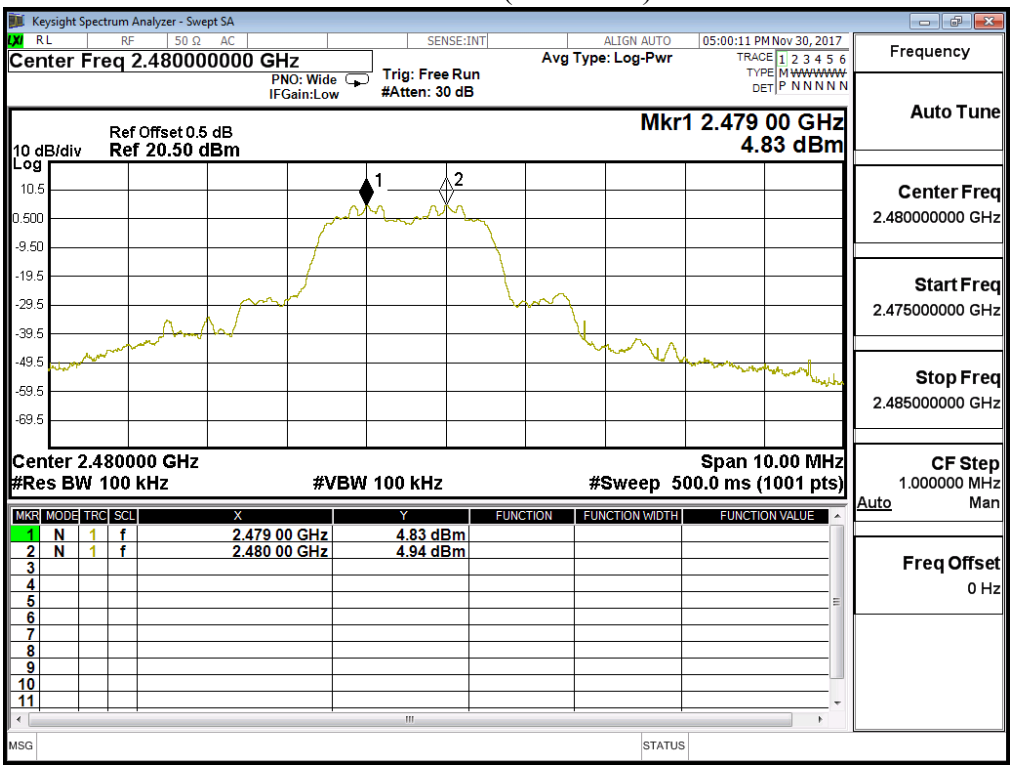
Channel 00 (2402MHz)



Channel 39 (2441MHz)

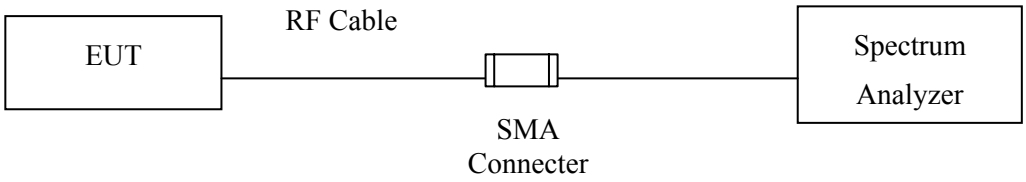


Channel 78 (2480MHz)



9. Dwell Time

9.1. Test Setup



9.2. Limit

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 the number of hopping channels employed.

9.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

9.4. Uncertainty

± 25msec

9.5. Test Result of Dwell Time

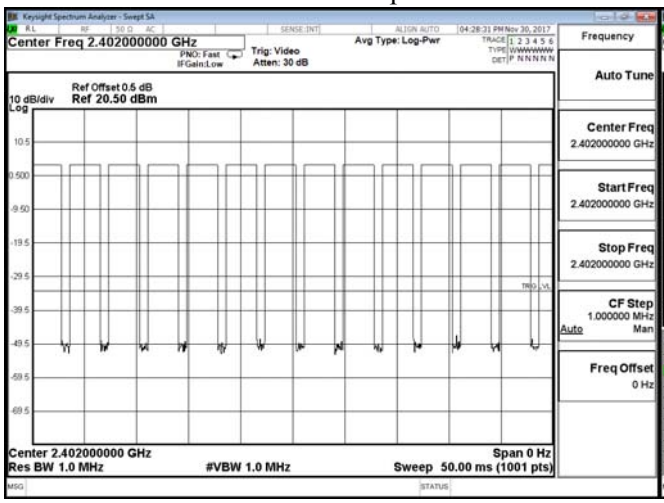
Product : Wireless Module
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.887	13	50	0.75	0.300	0.4	Pass
2441	2.887	13	50	0.75	0.300	0.4	Pass
2480	2.887	13	50	0.75	0.300	0.4	Pass

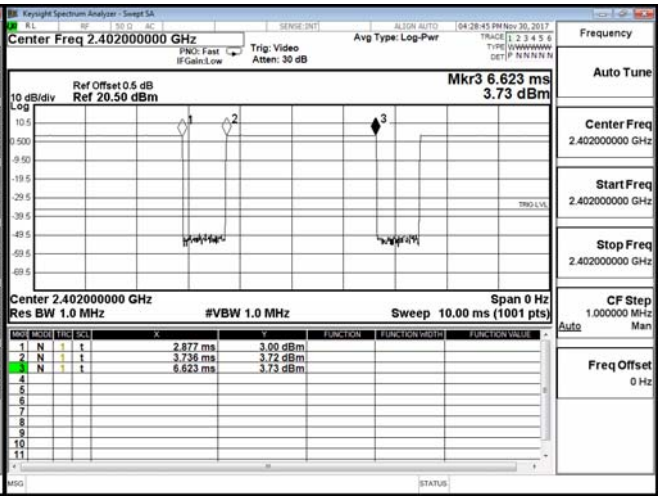
Duty cycle = ((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

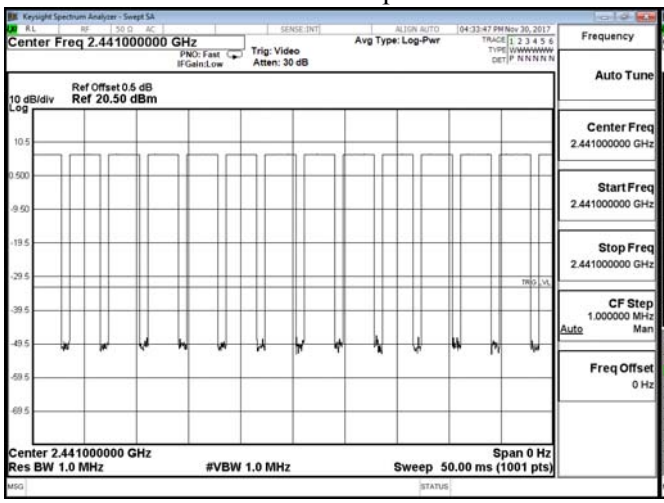
CH 00 Time Interval between hops



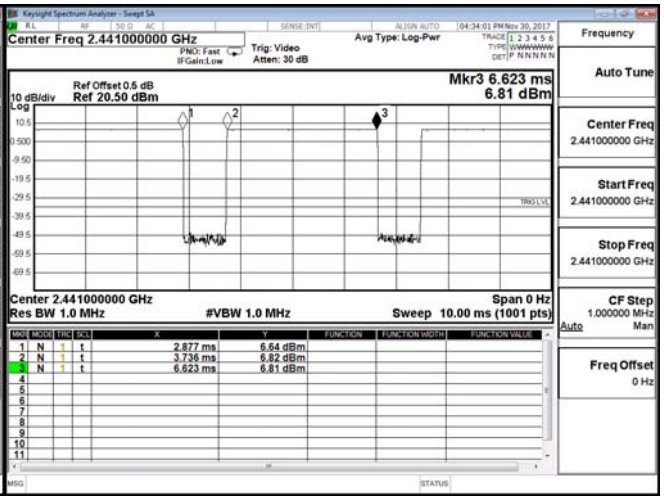
CH 00 Transmission Time



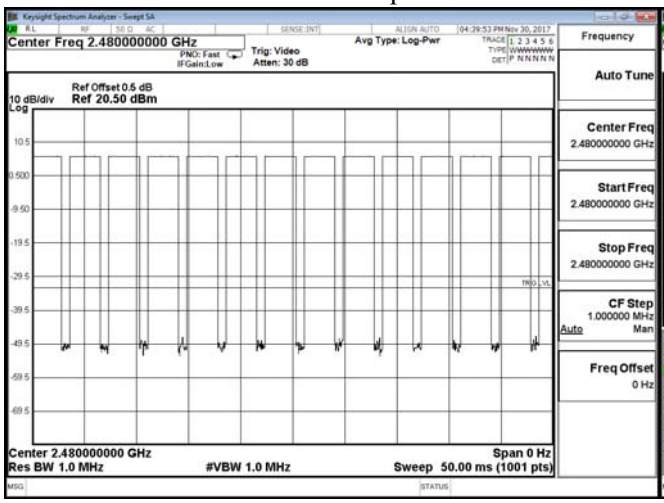
CH39 Time Interval between hops



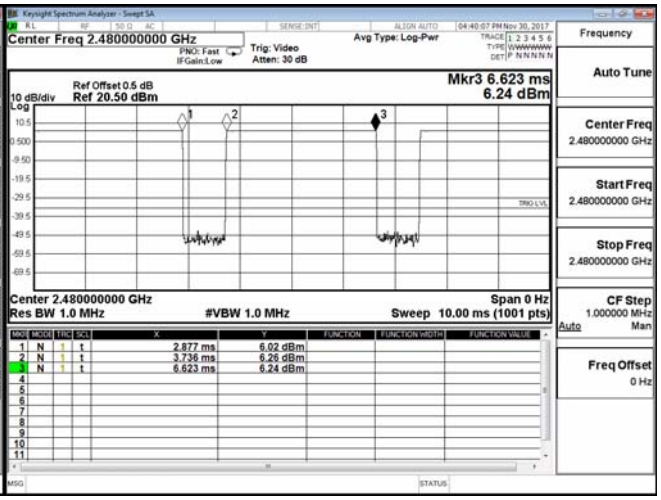
CH 39Transmission Time



CH 78 Time Interval between hops



CH 78 Transmission Time



Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

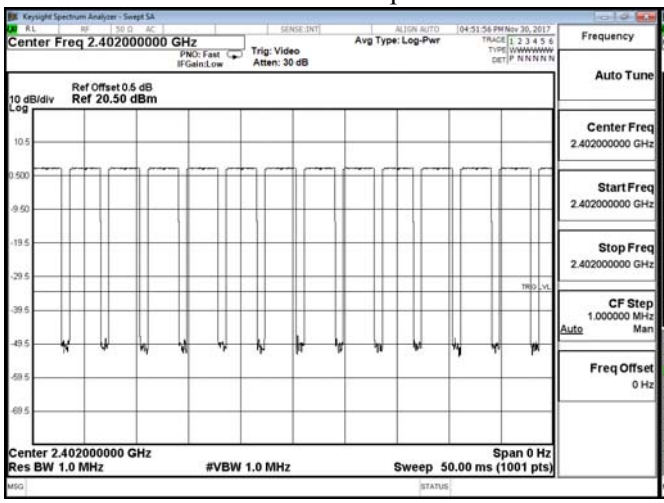
Product : Wireless Module
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.907	13	50	0.76	0.302	0.4	Pass
2441	2.907	13	50	0.76	0.302	0.4	Pass
2480	2.907	13	50	0.76	0.302	0.4	Pass

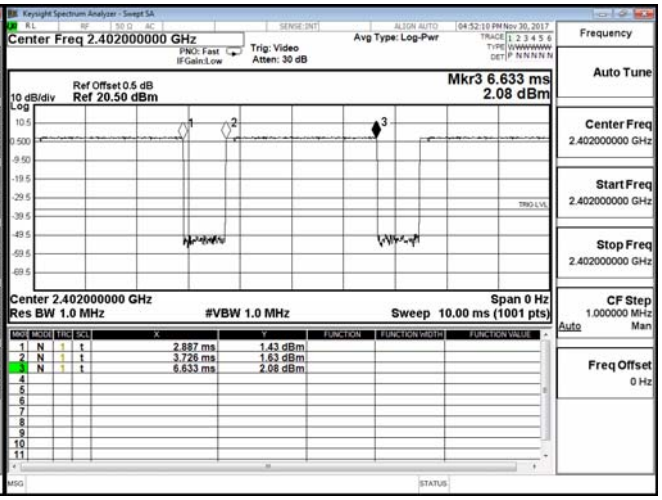
Duty cycle =((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

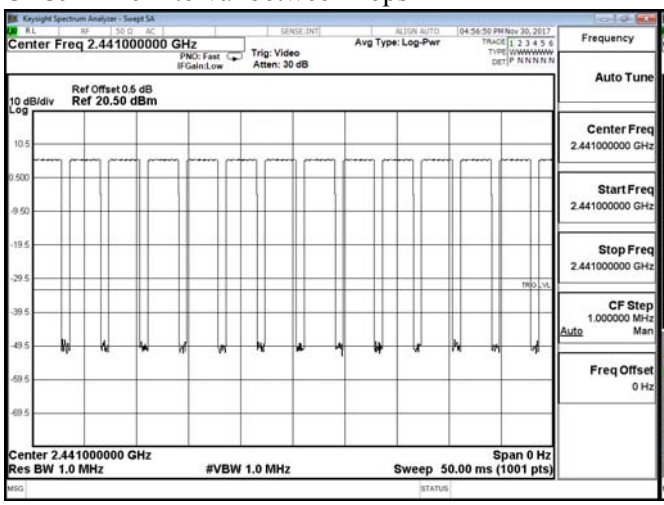
CH 00 Time Interval between hops



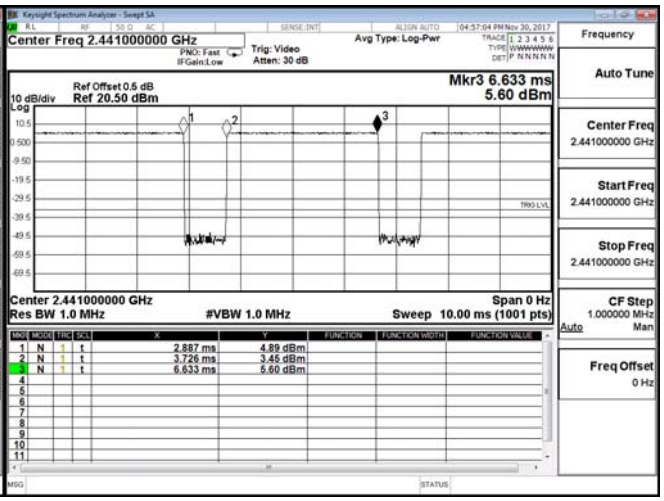
CH 00 Transmission Time



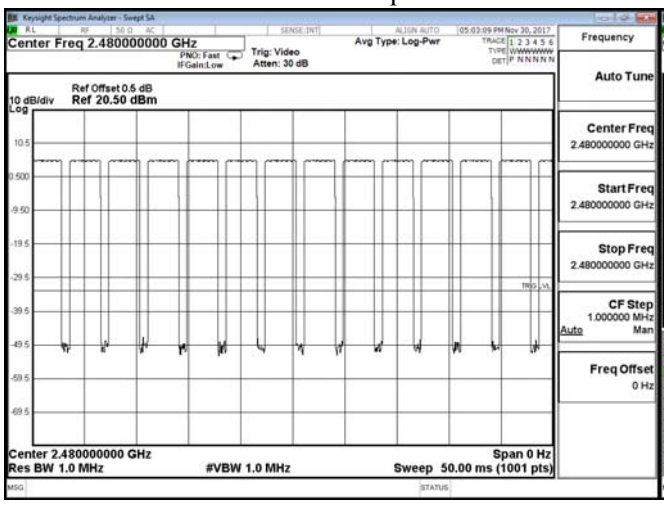
CH39 Time Interval between hops



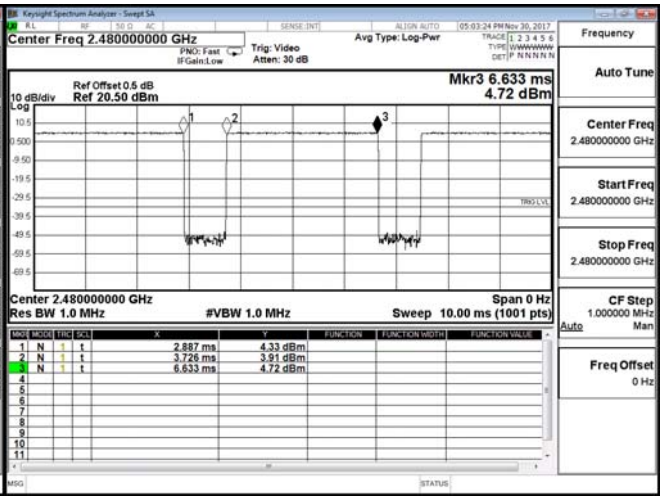
CH 39Transmission Time



CH 78 Time Interval between hops



CH 78 Transmission Time

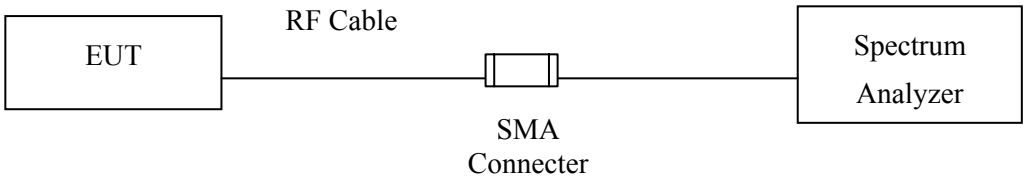


Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

10. Occupied Bandwidth

10.1. Test Setup



10.2. Limits

N/A

10.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

10.4. Uncertainty

± 283Hz

10.5. Test Result of Occupied Bandwidth

Product : Wireless Module
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	951	--	NA
39	2441	951	--	NA
78	2480	951	--	NA

Figure Channel 00:

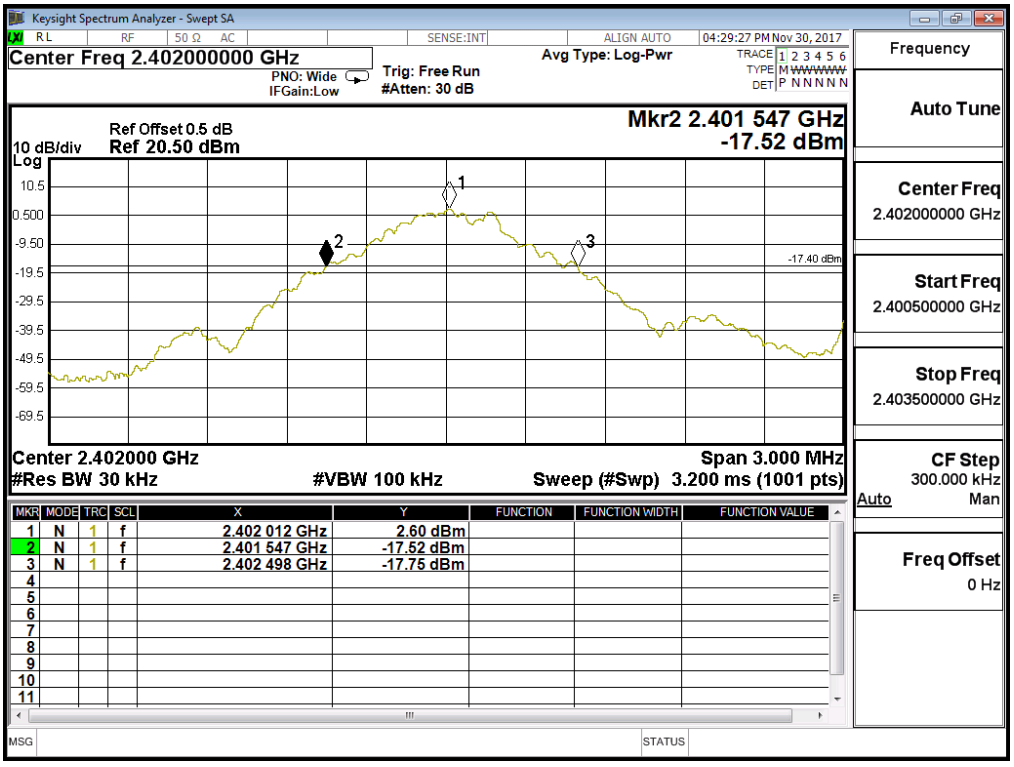


Figure Channel 39:

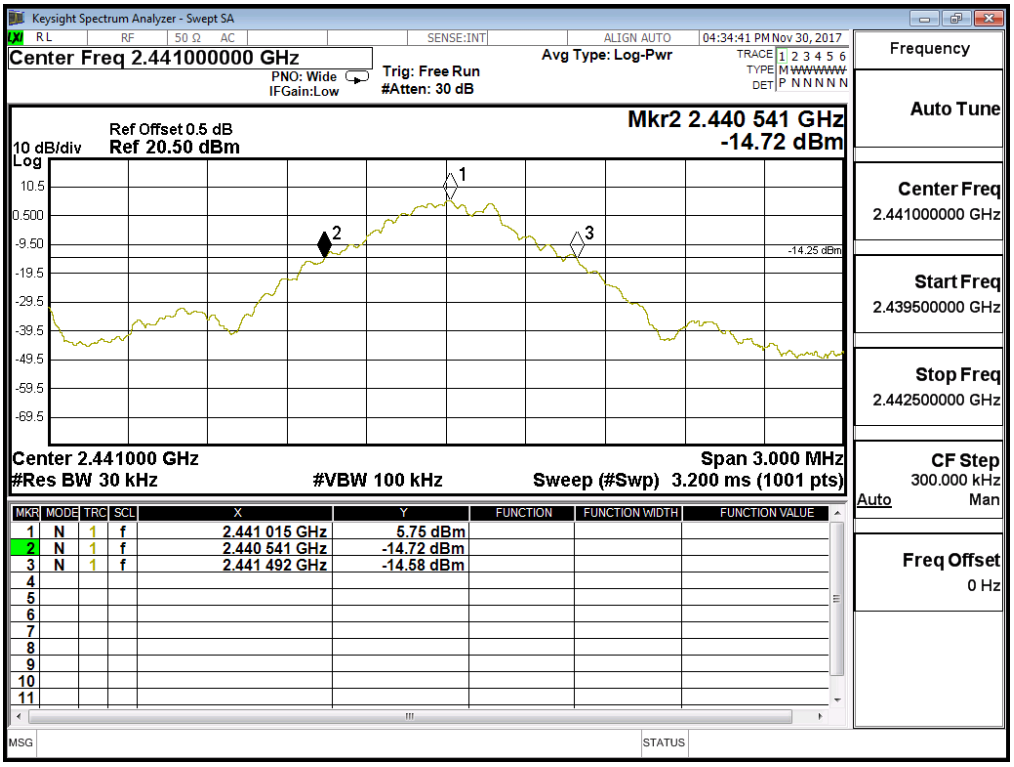
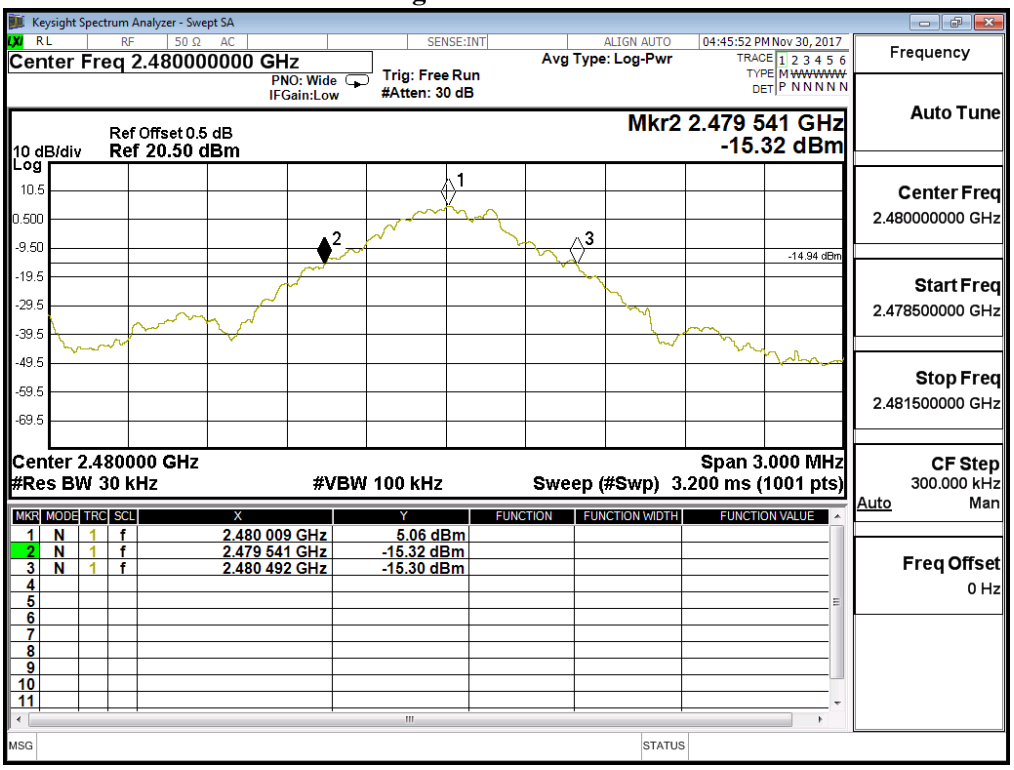


Figure Channel 78:



Product : Wireless Module
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1290	--	NA
39	2441	1272	--	NA
78	2480	1269	--	NA

Figure Channel 00:

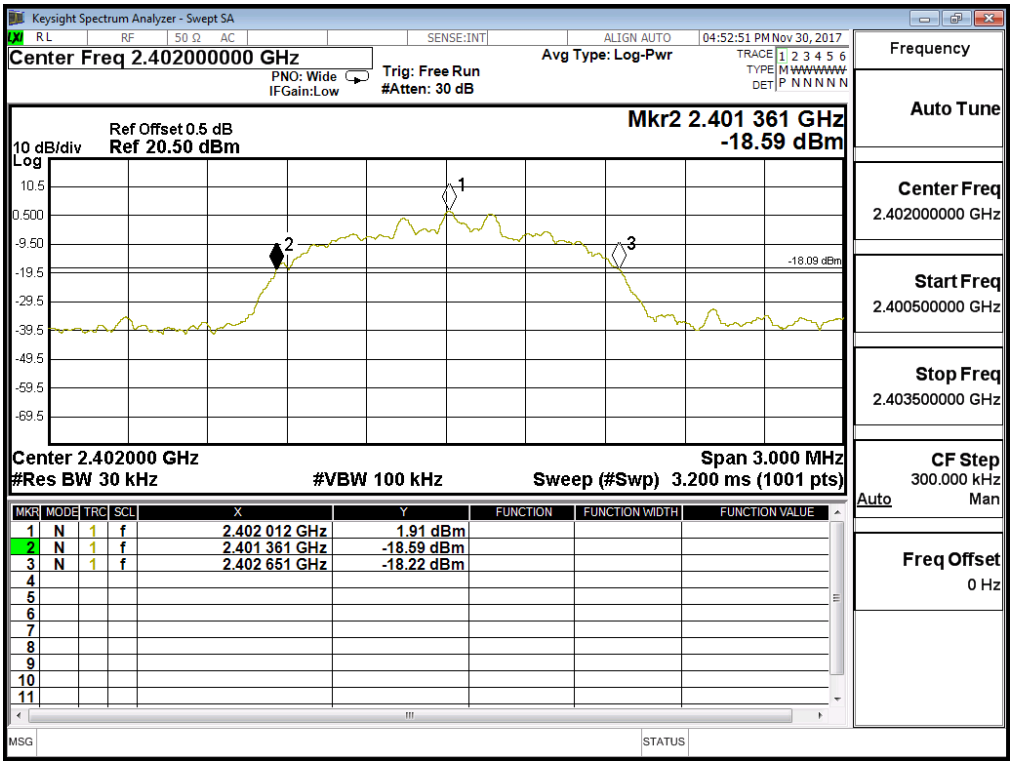


Figure Channel 39:

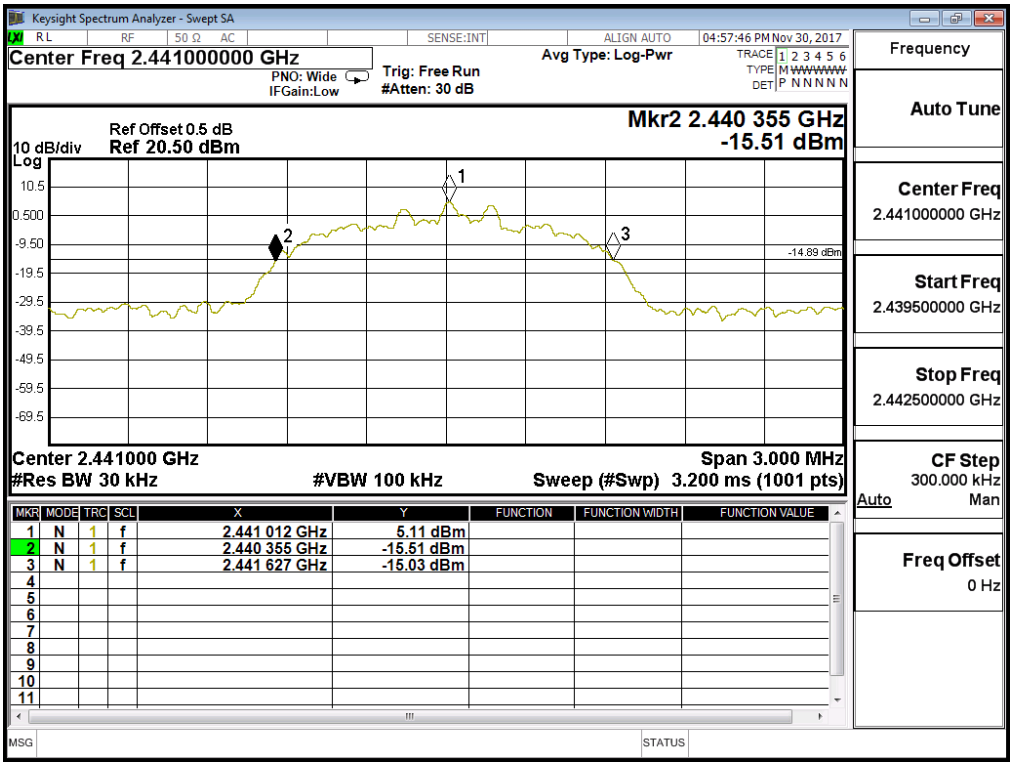
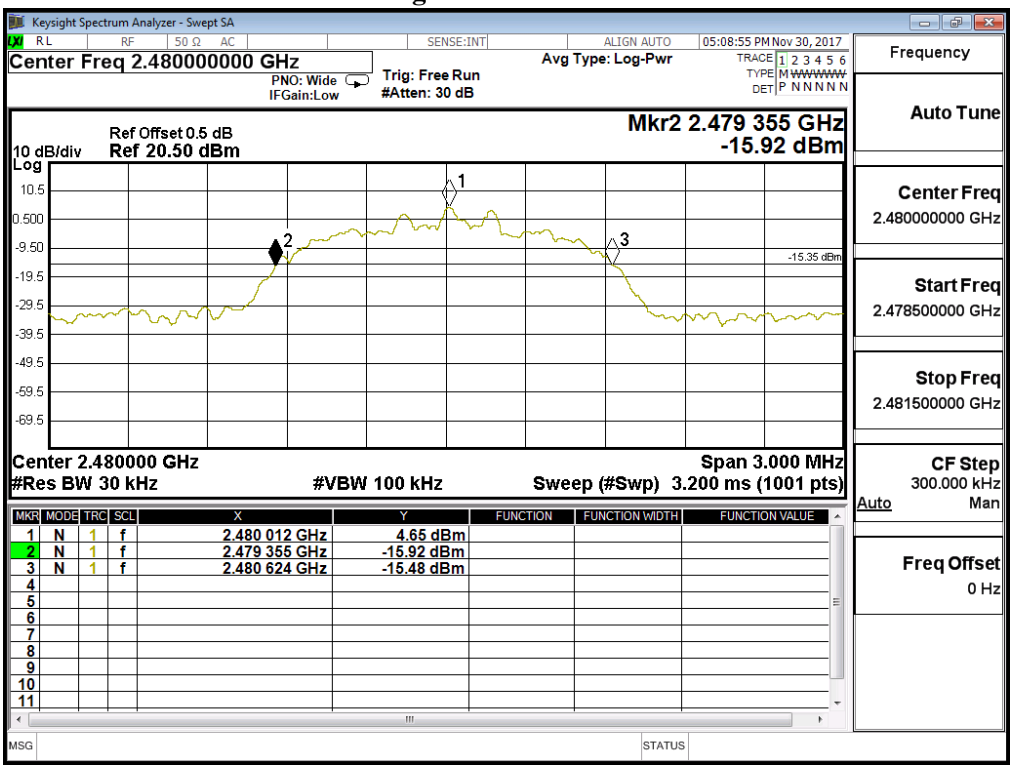


Figure Channel 78:



11. EMI Reduction Method During Compliance Testing

No modification was made during testing.