

# FCC Test Report

Product Name	Wi-Fi Module
Model No	WSDB-741
FCC ID.	W2Z-02100006

Applicant	FUJIFILM CORPORATION
Address	7-3, Akasaka 9-chome, Minato-ku, Tokyo 107-0052, Japan

Date of Receipt	Oct. 12, 2017
Issue Date	Nov. 15, 2017
Report No.	17A0124R-RFUSP73V00-B
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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# Test Report

Issue Date: Nov. 15, 2017

Report No.: 17A0124R-RFUSP73V00-B



Product Name	Wi-Fi Module
Applicant	FUJIFILM CORPORATION
Address	7-3,Akasaka 9-chome,Minato-ku,Tokyo 107-0052,Japan
Manufacturer	VIEWQUEST Technologies(china)Inc.
Model No.	WSDB-741
FCC ID.	W2Z-02100006
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	DC 3.3V
Trade Name	FUJIFILM
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

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Approved By : Vincent Lin  
( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Wi-Fi Module
Trade Name	FUJIFILM
Model No.	WSDB-741
FCC ID.	W2Z-02100006
Frequency Range	2412-2462MHz for 802.11b/g/n-20BW
Number of Channels	802.11b/g/n-20MHz: 11
Data Speed	802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 65Mbps
Type of Modulation	802.11b:DSSS (DBPSK, DQPSK, CCK) 802.11g/n:OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	Chip Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	YAGEO	8010 Ceramic Chip Antenna	Chip Antenna	5.88dBi for 2.4 GHz

Note: 1. The antenna of EUT conforms to FCC 15.203.

802.11b/g/n-20MHz Center Frequency of Each Channel:

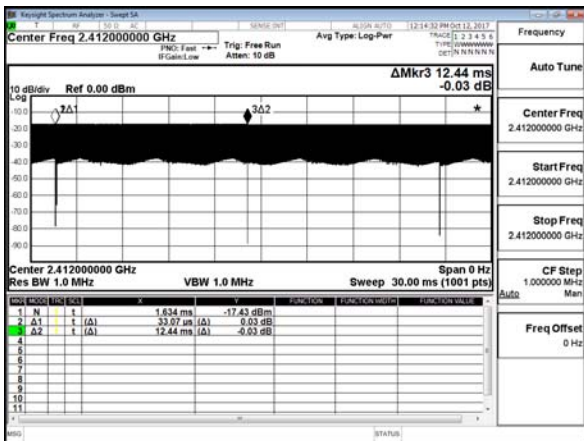
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2412 MHz	Channel 02:	2417 MHz	Channel 03:	2422 MHz	Channel 04:	2427 MHz
Channel 05:	2432 MHz	Channel 06:	2437 MHz	Channel 07:	2442 MHz	Channel 08:	2447 MHz
Channel 09:	2452 MHz	Channel 10:	2457 MHz	Channel 11:	2462 MHz		

Duty Cycle:

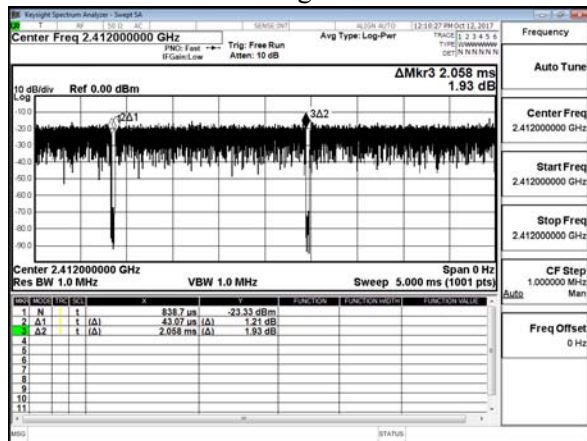
802.11b	99.76%
802.11g	97.95%
802.11n-20	96.79%

\*Duty cycle = Ton / (Ton + Toff)

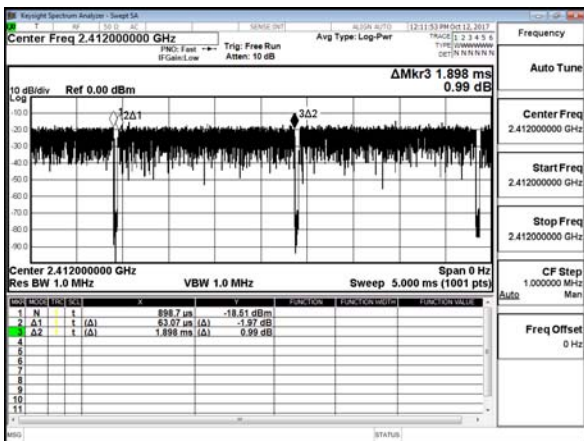
802.11b:



802.11g:



802.11n-20:



## Note:

1. The EUT is a Wi-Fi Module with a built-in WLAN&Bluetooth transceiver, this report for WLAN.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. At result of pretests, module supports dual-channel transmission, only the worst case is shown in the report.
4. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.  
(802.11b is 1Mbps 、 802.11g is 6Mbps and 802.11n(20M-BW) is 7.2Mbps)
5. These tests are conducted on a sample for the purpose of demonstrating compliance of 802.11b/g/n transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.
6. 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 (802.11b 1Mbps)
	Mode 2: Transmit (802.11g 6Mbps)
	Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

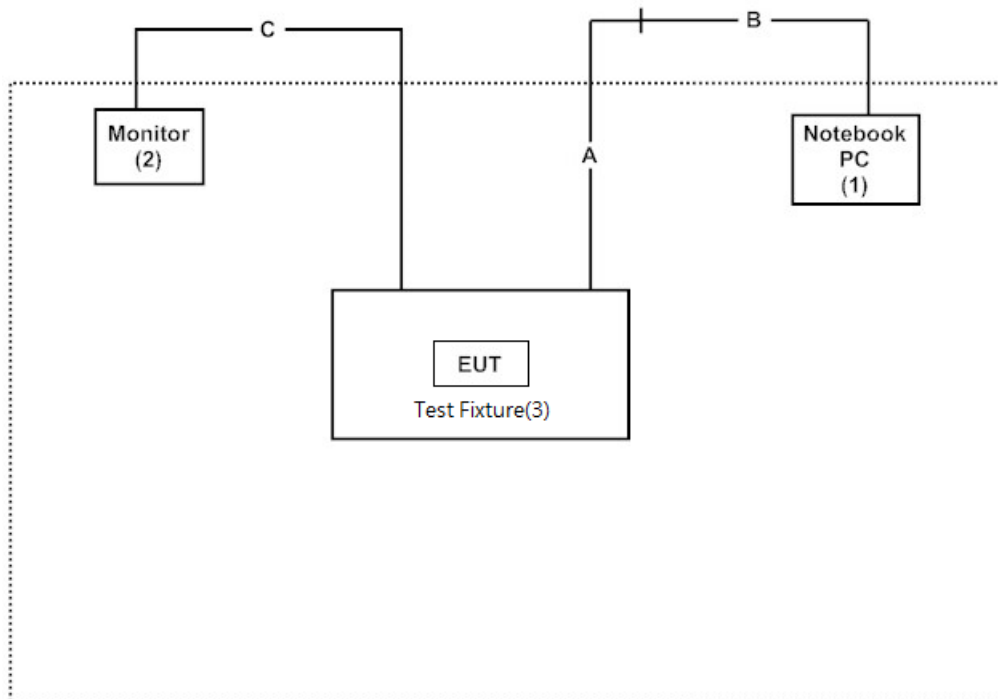
### 1.3. Tested System Details

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	Notebook PC	DELL	Latitude E5440	FS9TK32	Non-Shielded, 1.8m
2	LED Monitor	ViewSonic	VX2257-mhd	UFY163502150	Non-Shielded, 1.8m
3	Test Fixture	FUJIFILM	N/A	N/A	N/A

Signal Cable Type	Signal cable Description	
A	Micro USB to USB Cable	Shielded, 0.5m, with one ferrite core bonded.
B	Micro USB Cable	Shielded, 1.8m
C	HDMI Cable	Shielded, 1.8m

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software” Vendor Command Read/Write V01.05.20060915.OD” 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	50-65
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>

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E-Mail : [info.tw@dekra.com](mailto: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. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2016/11/28	2017/11/27
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

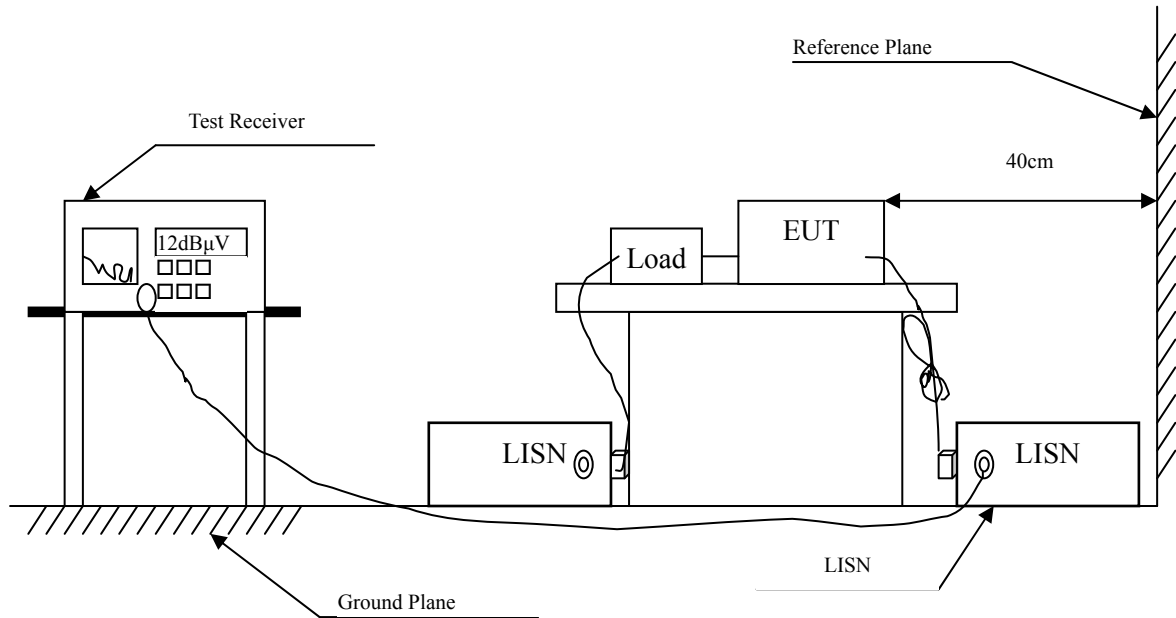
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2017/1/18	2018/1/17
X	Loop Antenna	Teseq	HLA6121	37133	2017/3/18	2018/3/17
X	Bi-Log Antenna	Schaffner Chase	CBL6112B	2707	2017/6/11	2018/6/10
X	Horn Antenna	ETS-Lindgren	3117	00135205	2017/4/6	2018/4/5
X	Horn Antenna	Schwarzbeck	BBHA9170	9170430	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
X	Pre-Amplifier	NARDA WE	DBL-1840N506	013	2017/9/30	2018/9/29
X	Filter	MicroTRON	BRM50701	019	2017/11/2	2018/11/1
X	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 (dB $\mu$ V) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

## 2.3. Test Procedure

The EUT and simulators 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 refers 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 of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

## 2.4. Uncertainty

$\pm 2.26$  dB

## 2.5. Test Result of Conducted Emission

Product : Wi-Fi Module  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Date : 2017/10/30  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>Line 1</b>					
<b>Quasi-Peak</b>					
0.166	9.754	40.540	50.294	-15.249	65.543
0.232	9.770	35.710	45.480	-18.177	63.657
0.466	9.739	34.150	43.889	-13.082	56.971
0.541	9.744	30.800	40.544	-15.456	56.000
3.474	9.859	22.960	32.819	-23.181	56.000
9.451	9.956	23.960	33.916	-26.084	60.000
<b>Average</b>					
0.166	9.754	28.120	37.874	-17.669	55.543
0.232	9.770	23.770	33.540	-20.117	53.657
0.466	9.739	19.390	29.129	-17.842	46.971
0.541	9.744	15.100	24.844	-21.156	46.000
3.474	9.859	13.380	23.239	-22.761	46.000
9.451	9.956	18.330	28.286	-21.714	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 : Wi-Fi Module  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test Date : 2017/10/30  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

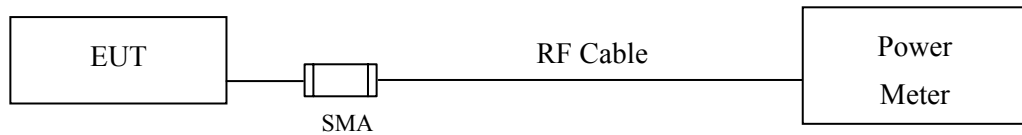
Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>Line 2</b>					
<b>Quasi-Peak</b>					
0.173	9.719	38.800	48.520	-16.823	65.343
0.232	9.754	33.300	43.054	-20.603	63.657
0.341	9.761	30.150	39.911	-20.632	60.543
0.502	9.785	30.920	40.706	-15.294	56.000
3.701	9.954	25.500	35.454	-20.546	56.000
4.681	9.994	21.160	31.154	-24.846	56.000
<b>Average</b>					
0.173	9.719	25.500	35.220	-20.123	55.343
0.232	9.754	19.890	29.644	-24.013	53.657
0.341	9.761	17.110	26.871	-23.672	50.543
0.502	9.785	14.970	24.756	-21.244	46.000
3.701	9.954	14.070	24.024	-21.976	46.000
4.681	9.994	10.260	20.254	-25.746	46.000

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. Limits

The maximum peak power shall be less 1 Watt.

#### 3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

#### 3.4. Uncertainty

$\pm 1.19$  dB

### 3.5. Test Result of Peak Power Output

Product : Wi-Fi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)				Peak Power	Required Limit	Result
		1	2	5.5	11	1		
		Measurement Level (dBm)						
01	2412	10.87	--	--	--	13.48	<30dBm	Pass
06	2437	10.85	10.79	10.71	10.62	13.45	<30dBm	Pass
11	2462	10.83	--	--	--	13.35	<30dBm	Pass

Note: Peak Power Output Value = Reading value on power meter + cable loss



Product : Wi-Fi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		6	9	12	18	24	36	48	54			
		Measurement Level (dBm)										
01	2412	10.87	--	--	--	--	--	--	--	20.98	<30dBm	Pass
06	2437	10.82	10.71	10.65	10.59	10.51	10.46	10.42	10.35	20.96	<30dBm	Pass
11	2462	10.89	--	--	--	--	--	--	--	21.02	<30dBm	Pass

Note: Peak Power Output Value = Reading value on power meter + cable loss

Product : Wi-Fi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

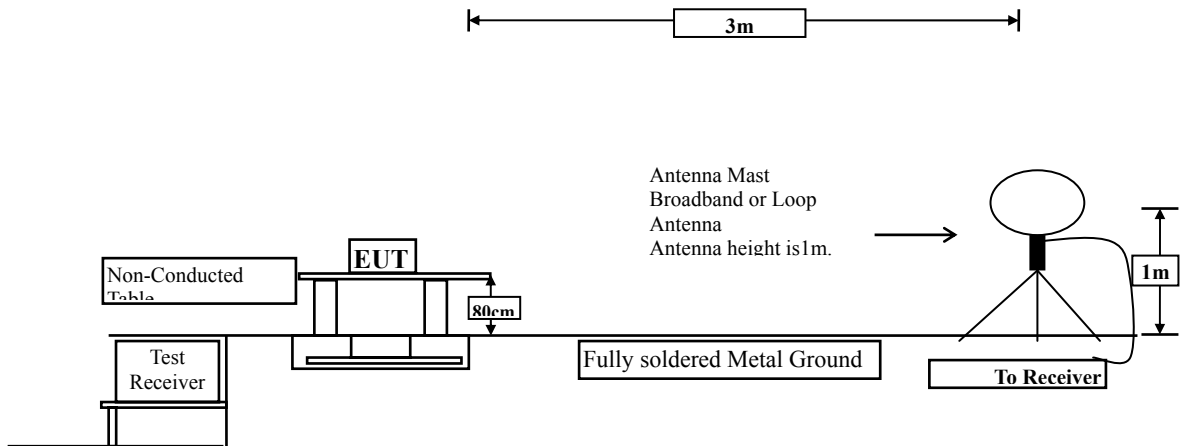
Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		HT0	HT1	HT2	HT3	HT4	HT5	HT6	HT7	HT0		
		Measurement Level (dBm)										
01	2412	10.94	--	--	--	--	--	--	--	20.98	<30dBm	Pass
06	2437	10.96	10.91	10.82	10.75	10.68	10.63	10.54	10.47	21.03	<30dBm	Pass
11	2462	10.83	--	--	--	--	--	--	--	20.88	<30dBm	Pass

Note: Peak Power Output Value = Reading value on power meter + cable loss

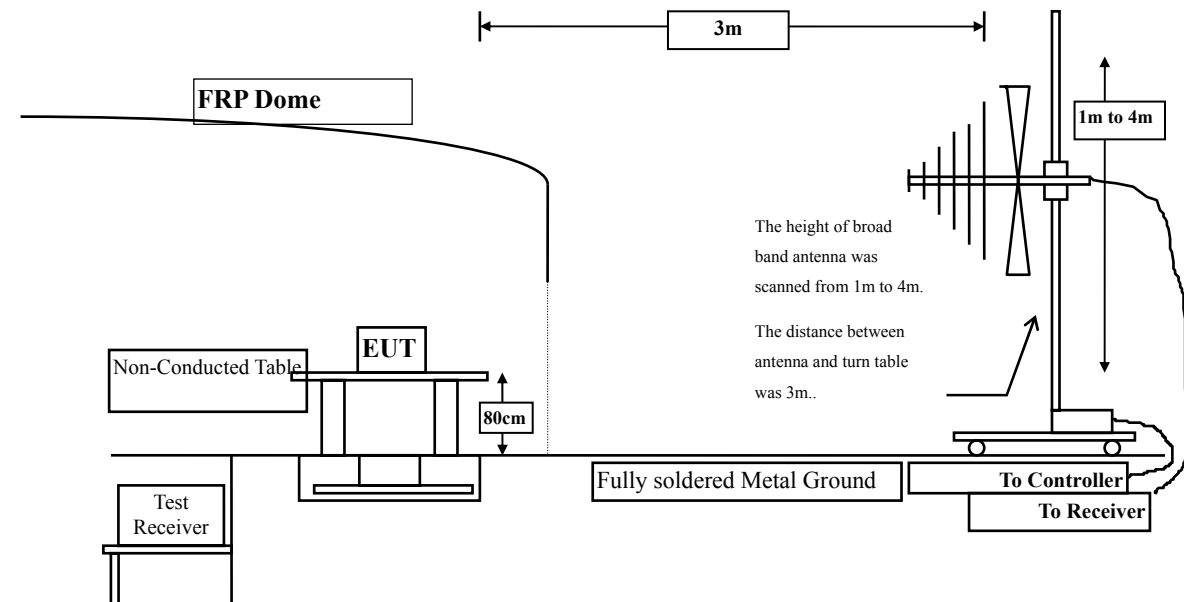
## 4. Radiated Emission

### 4.1. Test Setup

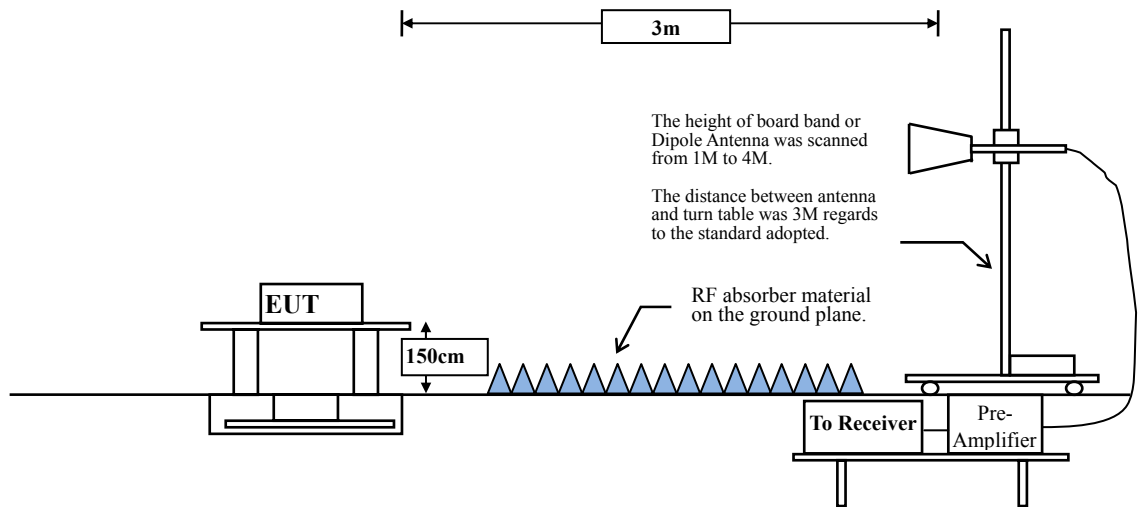
#### Radiated Emission Under 30MHz



#### Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. 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(a) 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: E field strength (dBµV/m) = 20 log E field strength (uV/m)

### 4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for 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 from 9kHz - 10th Harmonic of fundamental was investigated.

The average measurement tested according to KDB 558074 section 12.2.5.3. Reduced VBW averaging across on- and off-times of the EUT transmissions with max hold.

$VBW \geq 1/T$ :

Mode	Duty Cycle	T	1/T	VBW Setting(Hz)
802.11b	99.76%	----	----	10
802.11g	97.95%	2.0580	486	1K
802.11n20	96.79%	1.8980	527	1K

#### 4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

#### 4.5. Test Result of Radiated Emission

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	2.428	42.095	44.524	-29.476	74.000
7236.000	9.177	40.336	49.513	-24.487	74.000
9648.000	10.019	39.562	49.582	-24.418	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	2.836	42.687	45.524	-28.476	74.000
7236.000	9.676	40.280	49.956	-24.044	74.000
9648.000	10.556	38.967	49.524	-24.476	74.000
<b>Average Detector:</b>					
--					

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 : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	2.076	42.148	44.225	-29.775	74.000
7311.000	9.512	40.157	49.669	-24.331	74.000
9748.000	9.630	38.620	48.250	-25.750	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	2.532	42.315	44.847	-29.153	74.000
7311.000	10.089	38.770	48.859	-25.141	74.000
9748.000	10.266	36.418	46.685	-27.315	74.000
<b>Average Detector:</b>					
--					

## Note:

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



Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	2.191	42.333	44.524	-29.476	74.000
7386.000	10.373	39.180	49.554	-24.446	74.000
9848.000	9.964	40.091	50.055	-23.945	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	2.805	43.847	46.652	-27.348	74.000
7386.000	11.180	38.672	49.852	-24.148	74.000
9848.000	10.801	39.213	50.014	-23.986	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	2.428	42.095	44.524	-29.476	74.000
7236.000	9.177	39.677	48.854	-25.146	74.000
9648.000	10.019	39.664	49.684	-24.316	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	2.836	43.010	45.847	-28.153	74.000
7236.000	9.676	40.308	49.984	-24.016	74.000
9648.000	10.556	38.339	48.896	-25.104	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	2.076	42.475	44.552	-29.448	74.000
7311.000	9.512	40.329	49.841	-24.159	74.000
9748.000	9.630	38.620	48.250	-25.750	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	2.532	42.065	44.597	-29.403	74.000
7311.000	10.089	39.547	49.636	-24.364	74.000
9748.000	10.266	38.507	48.774	-25.226	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	2.191	42.368	44.559	-29.441	74.000
7386.000	10.373	39.273	49.647	-24.353	74.000
9848.000	9.964	39.031	48.995	-25.005	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	2.805	42.399	45.204	-28.796	74.000
7386.000	11.180	37.976	49.156	-24.844	74.000
9848.000	10.801	39.257	50.058	-23.942	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)(2412MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	2.428	41.265	43.694	-30.306	74.000
7236.000	9.177	39.781	48.958	-25.042	74.000
9648.000	10.019	39.634	49.654	-24.346	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	2.836	41.890	44.727	-29.273	74.000
7236.000	9.676	39.972	49.648	-24.352	74.000
9648.000	10.556	39.314	49.871	-24.129	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	2.076	41.810	43.887	-30.113	74.000
7311.000	9.512	39.342	48.854	-25.146	74.000
9748.000	9.630	38.211	47.841	-26.159	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	2.532	42.082	44.614	-29.386	74.000
7311.000	10.089	38.785	48.874	-25.126	74.000
9748.000	10.266	38.482	48.749	-25.251	74.000
<b>Average Detector:</b>					
--					

## Note:

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

Product : Wi-Fi Module  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/28  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2462 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	2.191	40.968	43.159	-30.841	74.000
7386.000	10.373	38.450	48.824	-25.176	74.000
9848.000	9.964	39.961	49.925	-24.075	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	2.805	40.449	43.254	-30.746	74.000
7386.000	11.180	38.645	49.825	-24.175	74.000
9848.000	10.801	39.786	50.587	-23.413	74.000
<b>Average Detector:</b>					
--					

## 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 = 1 KHz, 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 : Wi-Fi Module  
 Test Item : General Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)(2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
155.130	-8.139	36.366	28.227	-15.273	43.500
250.190	-6.134	44.542	38.409	-7.591	46.000
400.540	0.942	29.664	30.606	-15.394	46.000
547.010	4.217	24.438	28.655	-17.345	46.000
698.330	3.095	24.135	27.230	-18.770	46.000
793.390	6.386	24.727	31.113	-14.887	46.000
<b>Vertical</b>					
104.690	-4.842	36.904	32.063	-11.437	43.500
150.280	-5.350	36.981	31.631	-11.869	43.500
257.950	-4.952	34.441	29.489	-16.511	46.000
389.870	-0.732	27.399	26.666	-19.334	46.000
610.060	2.087	24.781	26.868	-19.132	46.000
755.560	2.829	25.126	27.955	-18.045	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.



Product : Wi-Fi Module  
 Test Item : General Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)(2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
104.690	-7.862	36.904	29.043	-14.457	43.500
179.380	-11.904	45.715	33.811	-9.689	43.500
227.880	-8.769	42.320	33.552	-12.448	46.000
367.560	0.592	29.911	30.502	-15.498	46.000
515.000	3.191	24.325	27.516	-18.484	46.000
702.210	2.753	26.331	29.084	-16.916	46.000
<b>Vertical</b>					
149.310	-5.372	34.774	29.402	-14.098	43.500
268.620	-6.222	31.999	25.777	-20.223	46.000
409.270	-4.434	31.480	27.046	-18.954	46.000
610.060	2.087	24.781	26.868	-19.132	46.000
755.560	2.829	25.518	28.347	-17.653	46.000
902.030	1.638	24.778	26.416	-19.584	46.000

## Note:

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

Product : Wi-Fi Module  
 Test Item : General Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/27  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)(2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
240.490	-6.662	43.208	36.545	-9.455	46.000
299.660	-4.751	39.282	34.531	-11.469	46.000
419.940	-0.254	31.589	31.335	-14.665	46.000
468.440	3.544	29.897	33.441	-12.559	46.000
596.480	3.587	22.671	26.258	-19.742	46.000
737.130	3.138	30.290	33.428	-12.572	46.000
<b>Vertical</b>					
189.080	-5.617	35.337	29.720	-13.780	43.500
215.270	-5.945	36.638	30.693	-12.807	43.500
334.580	-2.253	33.495	31.242	-14.758	46.000
468.440	-3.566	30.178	26.612	-19.388	46.000
624.610	0.387	24.144	24.531	-21.469	46.000
807.940	3.361	27.372	30.733	-15.267	46.000

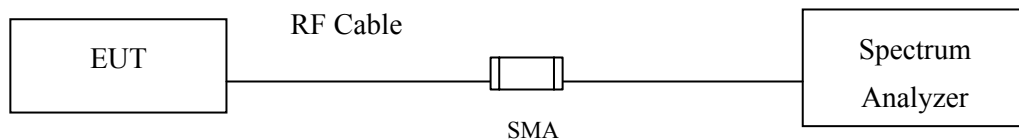
## Note:

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 = 1 KHz, 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

#### RF antenna Conducted Measurement:



### 5.2. Limits

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)).

### 5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

### 5.4. Uncertainty

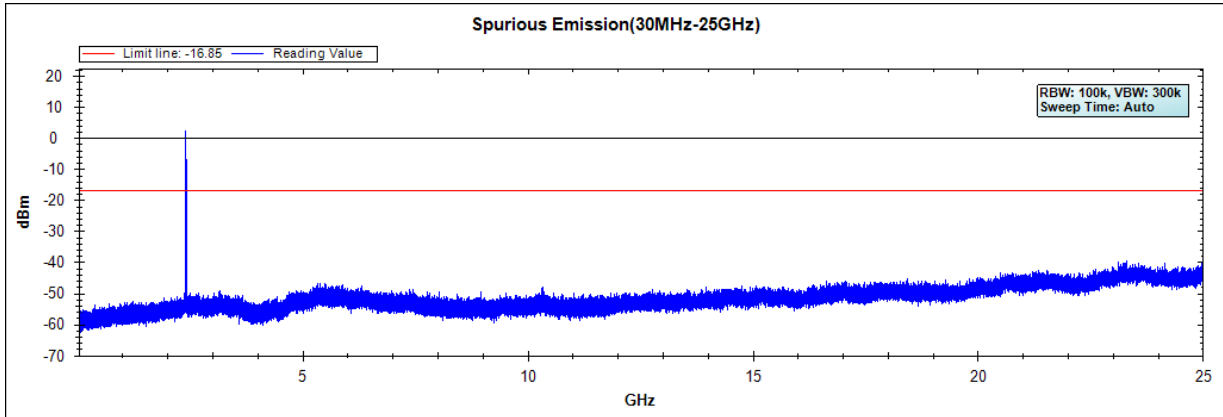
The measurement uncertainty

Conducted is defined as  $\pm 1.20\text{dB}$

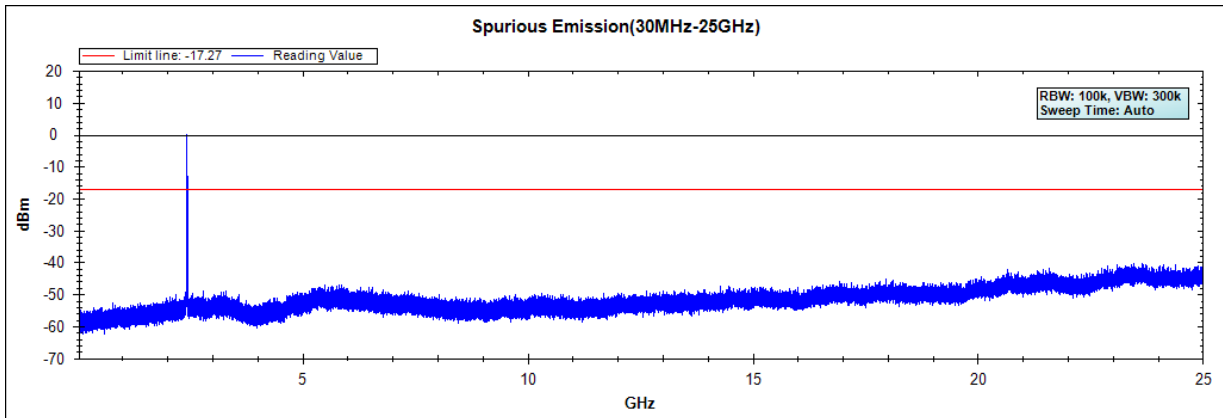
**5.5. Test Result of RF antenna conducted test**

Product : Wi-Fi Module  
 Test Item : RF antenna conducted test  
 Test Site : No.3 OATS  
 Test Date : 2017/10/25  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

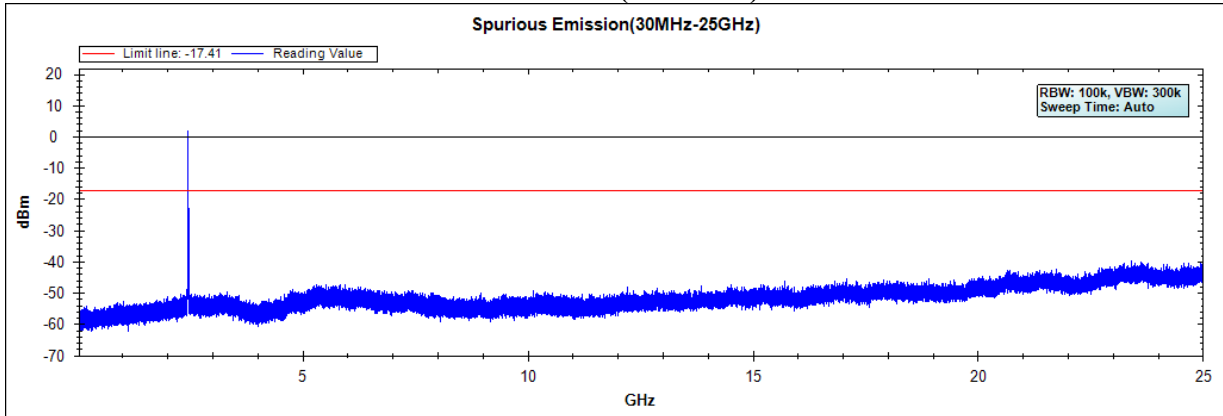
**Channel 01 (2412MHz)**



**Channel 06 (2437MHz)**



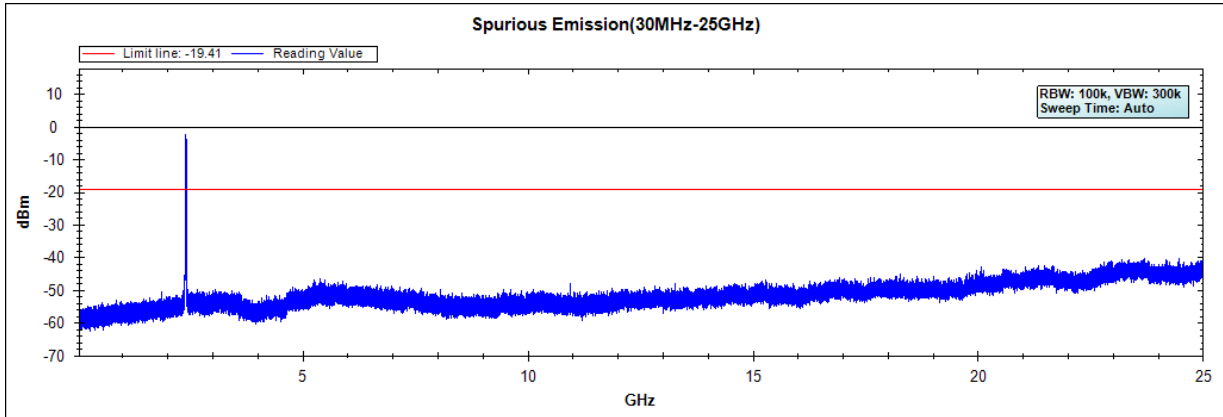
**Channel 11 (2462MHz)**



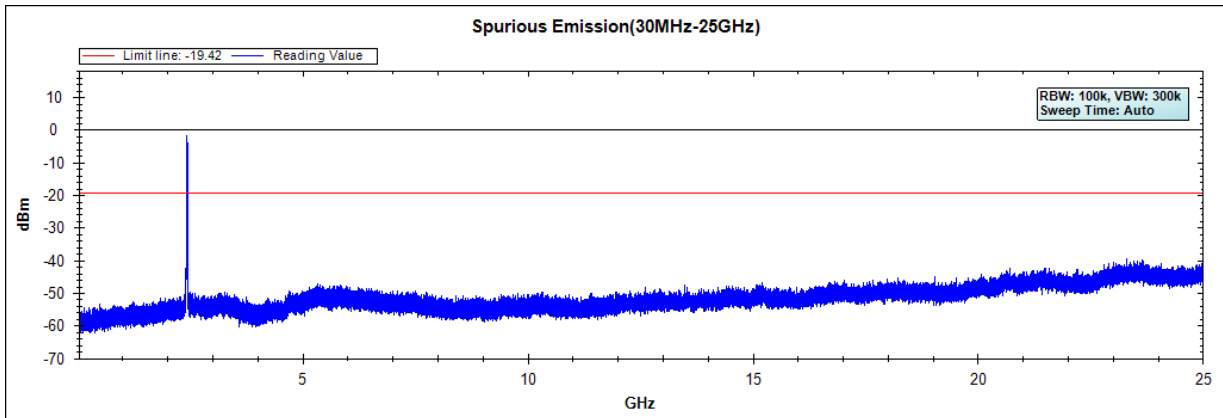
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : Wi-Fi Module  
Test Item : RF Antenna Conducted Spurious  
Test Site : No.3 OATS  
Test Date : 2017/10/25  
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

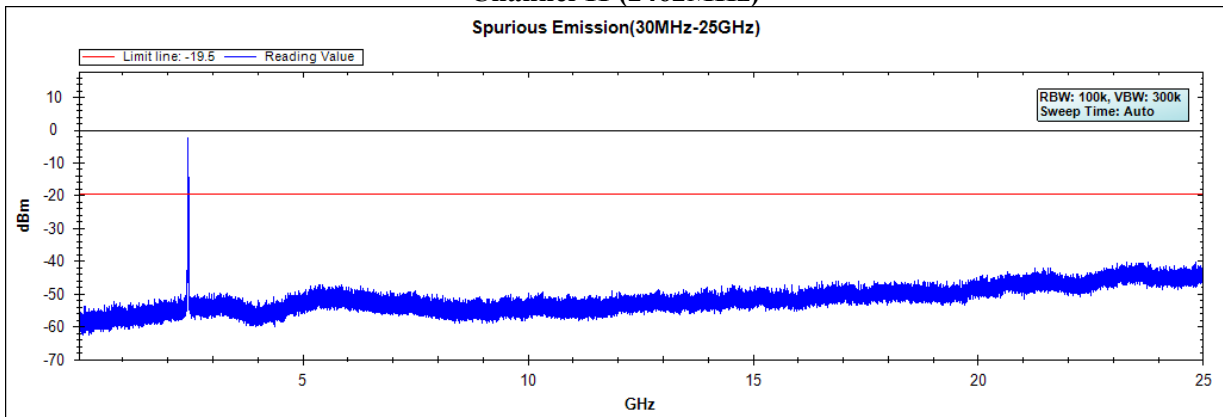
**Channel 01 (2412MHz)**



**Channel 06 (2437MHz)**



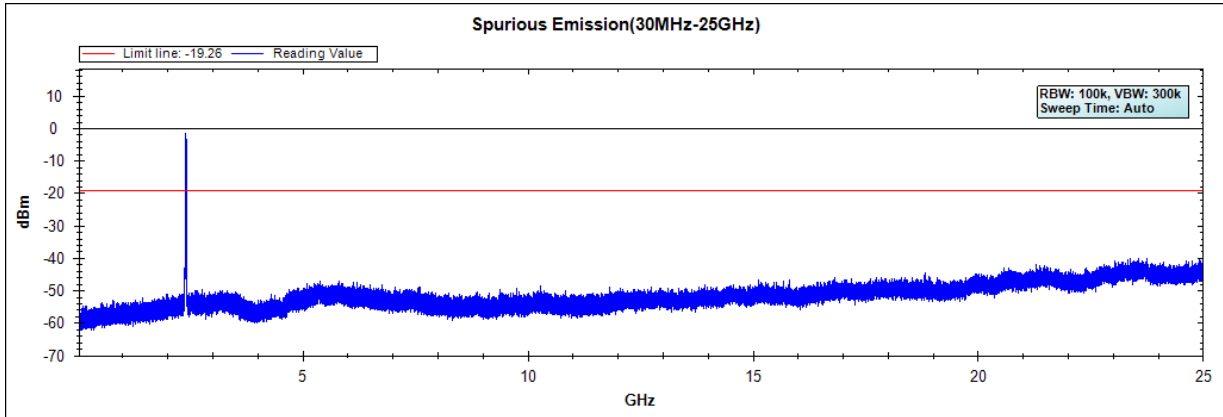
**Channel 11 (2462MHz)**



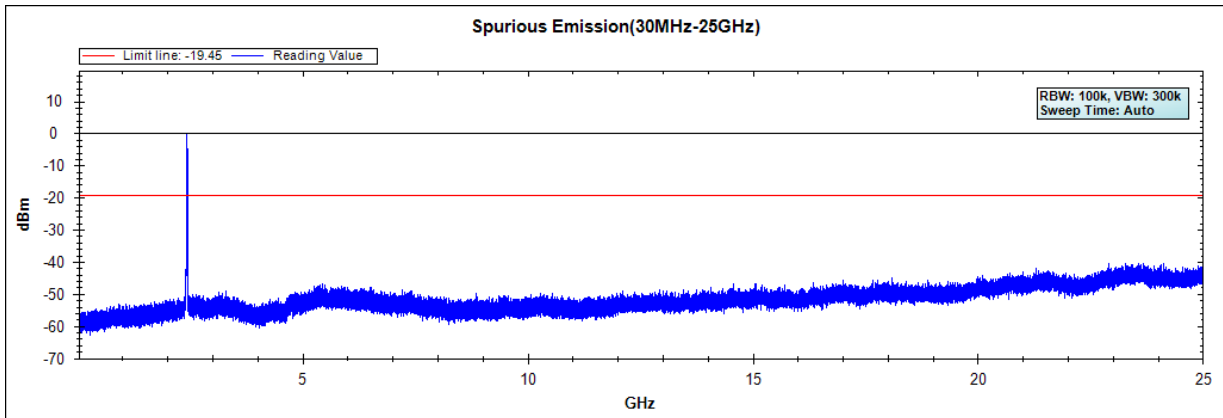
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : Wi-Fi Module  
Test Item : RF Antenna Conducted Spurious  
Test Site : No.3 OATS  
Test Date : 2017/10/25  
Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

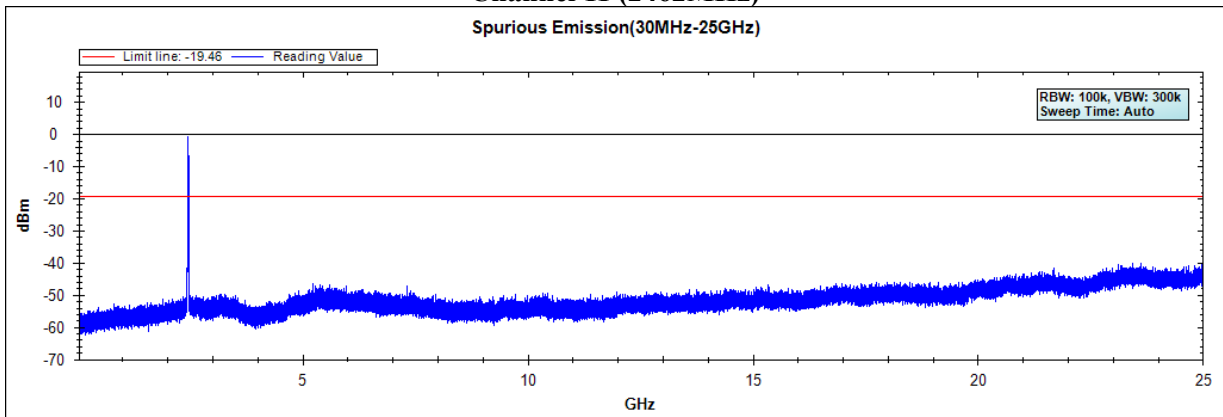
**Channel 01 (2412MHz)**



**Channel 06 (2437MHz)**



**Channel 11 (2462MHz)**

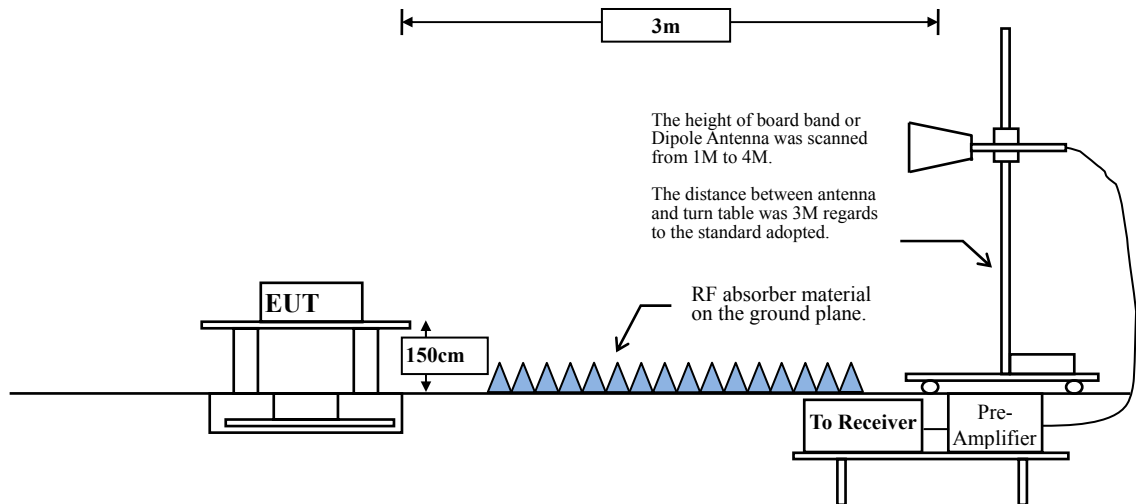


Note: The above test pattern is synthesized by multiple of the frequency range.

## 6. Band Edge

### 6.1. Test Setup

#### RF Radiated Measurement:



### 6.2. 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.

### 6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

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 from 1 meter to 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 average measurement tested according to KDB 558074 section 12.2.5.3. Reduced VBW averaging across on- and off-times of the EUT transmissions with max hold.

$VBW \geq 1/T$ :

Mode	Duty Cycle	T	1/T	VBW Setting(Hz)
802.11b	99.76%	----	----	10
802.11g	97.95%	2.0580	486	1K
802.11n20	96.79%	1.8980	527	1K

#### 6.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz



### 6.5. Test Result of Band Edge

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

#### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2387.400	-2.698	44.940	42.242	74.00	54.00	Pass
01 (Peak)	2390.000	-2.687	43.148	40.461	74.00	54.00	Pass
01 (Peak)	2399.300	-2.661	49.214	46.553	--	--	--
01 (Peak)	2400.000	-2.660	48.463	45.803	--	--	--
01 (Peak)	2413.000	-2.642	90.250	87.607	--	--	--
01 (Average)	2388.800	-2.692	31.571	28.879	74.00	54.00	Pass
01 (Average)	2390.000	-2.687	31.406	28.719	74.00	54.00	Pass
01 (Average)	2399.800	-2.661	41.693	39.032	--	--	--
01 (Average)	2400.000	-2.660	41.478	38.818	--	--	--
01 (Average)	2411.300	-2.643	87.405	84.762	--	--	--

Figure Channel 01: Horizontal (Peak)

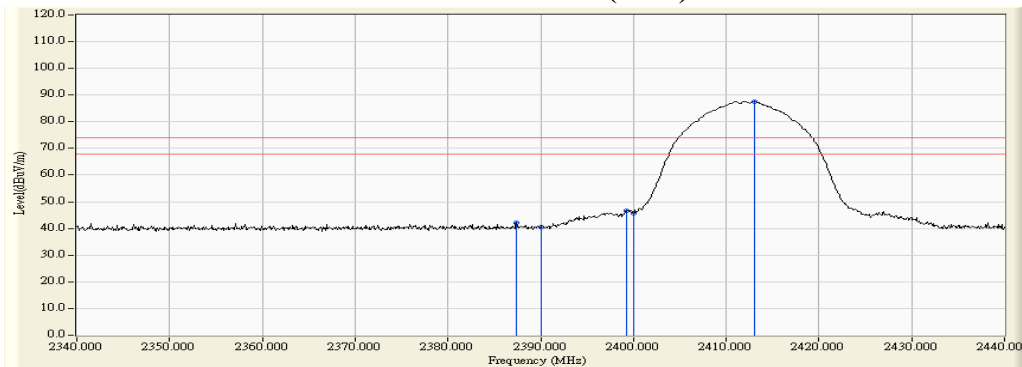
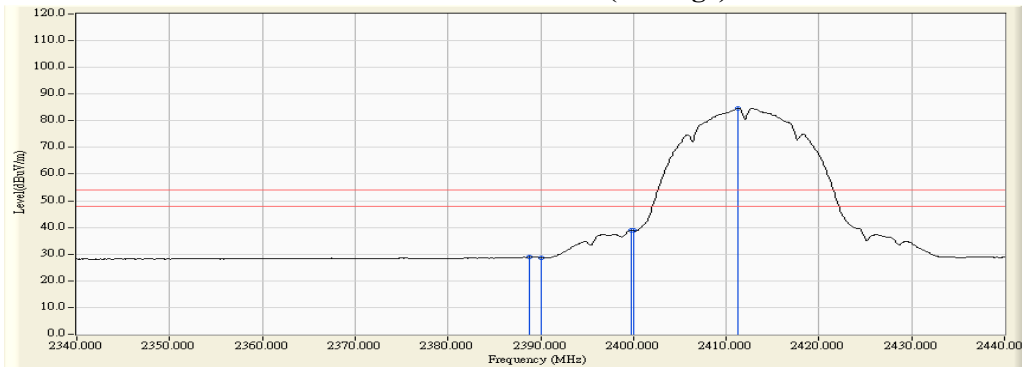


Figure Channel 01: Horizontal (Average)



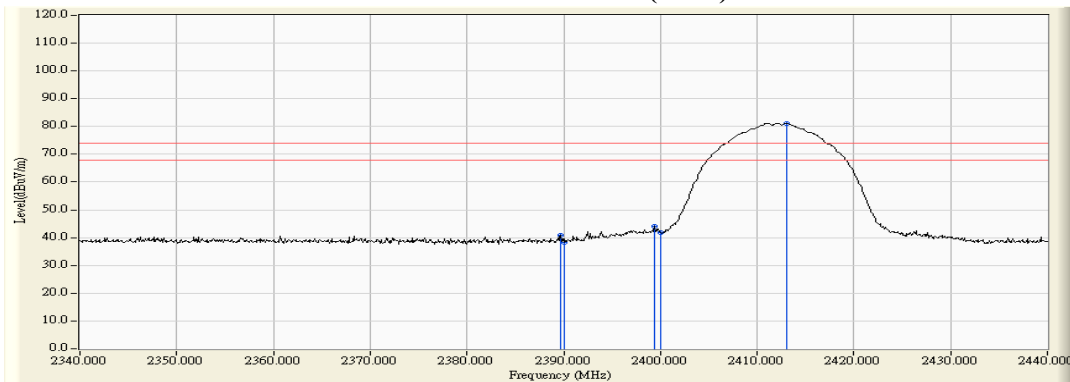
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

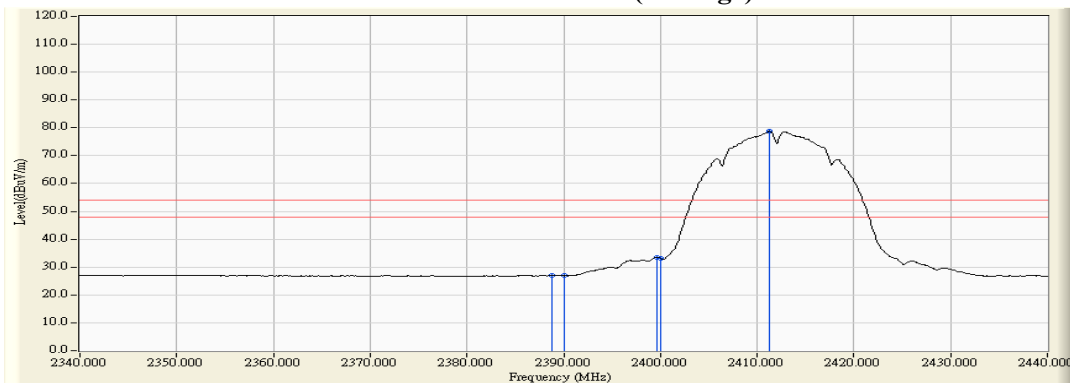
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2389.700	-4.157	44.973	40.815	74.00	54.00	Pass
01 (Peak)	2390.000	-4.159	42.496	38.337	74.00	54.00	Pass
01 (Peak)	2399.400	-4.171	48.207	44.036	--	--	--
01 (Peak)	2400.000	-4.171	46.088	41.917	--	--	--
01 (Peak)	2413.000	-4.163	85.322	81.158	--	--	--
01 (Average)	2388.800	-4.155	31.203	27.048	74.00	54.00	Pass
01 (Average)	2390.000	-4.159	31.152	26.993	74.00	54.00	Pass
01 (Average)	2399.600	-4.171	37.779	33.608	--	--	--
01 (Average)	2400.000	-4.171	37.399	33.228	--	--	--
01 (Average)	2411.300	-4.167	82.886	78.718	--	--	--

**Figure Channel 01: VERTICAL (Peak)**



**Figure Channel 01: VERTICAL (Average)**



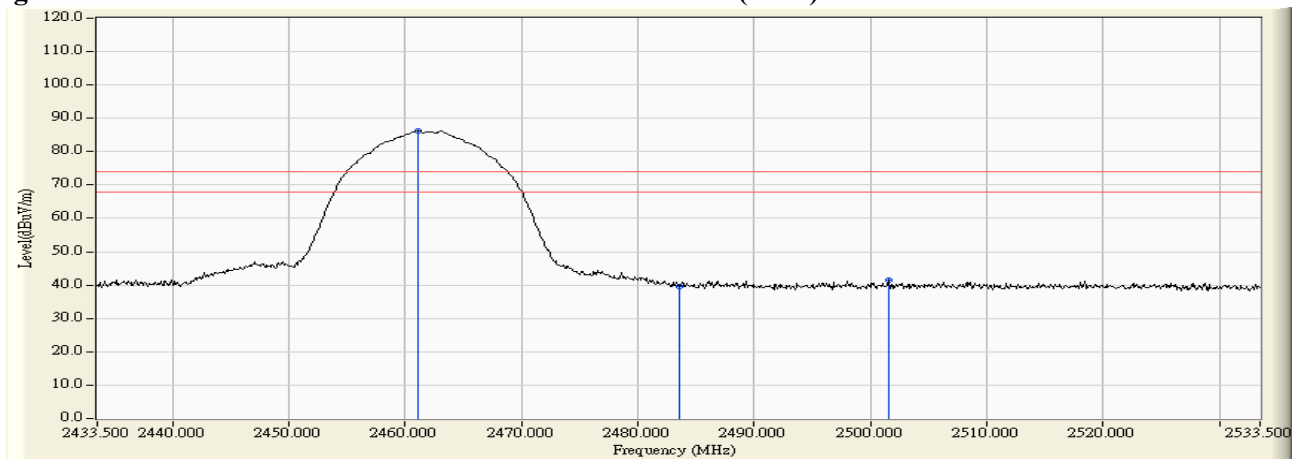
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

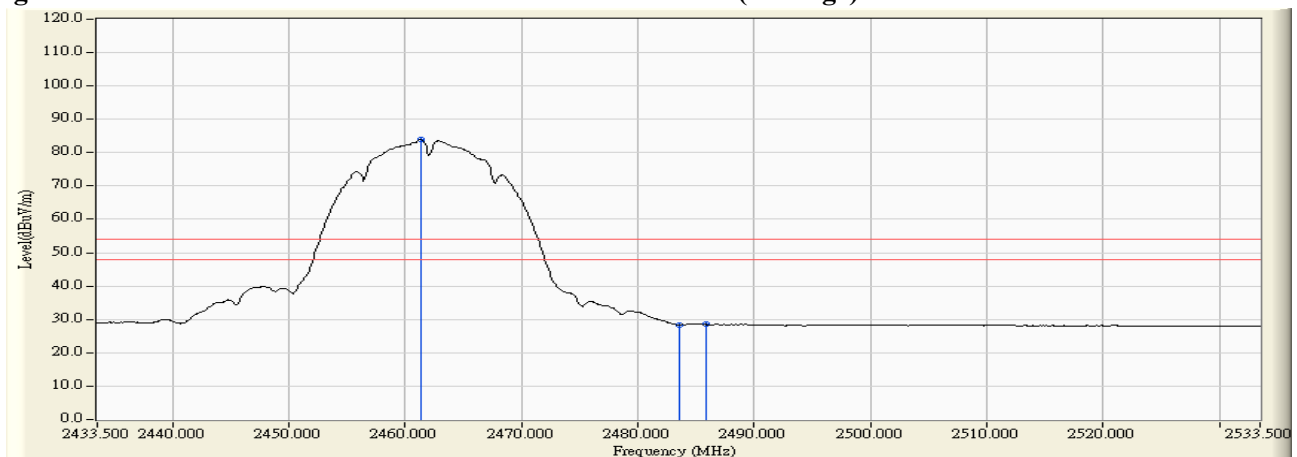
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2461.100	-2.623	88.920	86.297	--	--	--
11 (Peak)	2483.500	-2.601	42.215	39.613	74.00	54.00	Pass
11 (Peak)	2501.600	-2.620	44.006	41.386	74.00	54.00	Pass
11 (Average)	2461.300	-2.624	86.482	83.859	--	--	--
11 (Average)	2483.500	-2.601	31.014	28.412	74.00	54.00	Pass
11 (Average)	2485.800	-2.600	31.122	28.522	74.00	54.00	Pass

**Figure Channel 11: Horizontal (Peak)**



**Figure Channel 11: Horizontal (Average)**



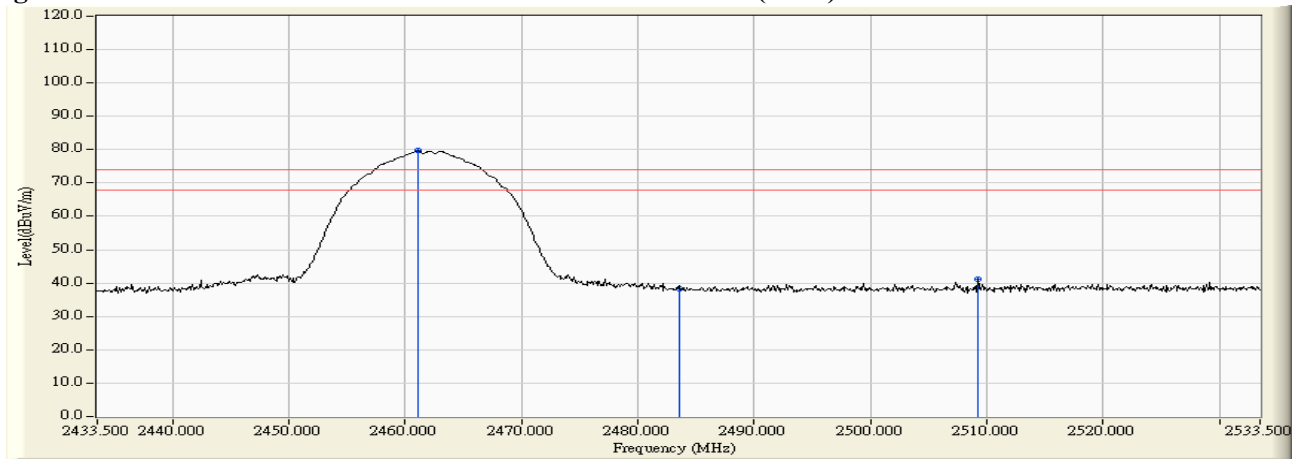
- Note:1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

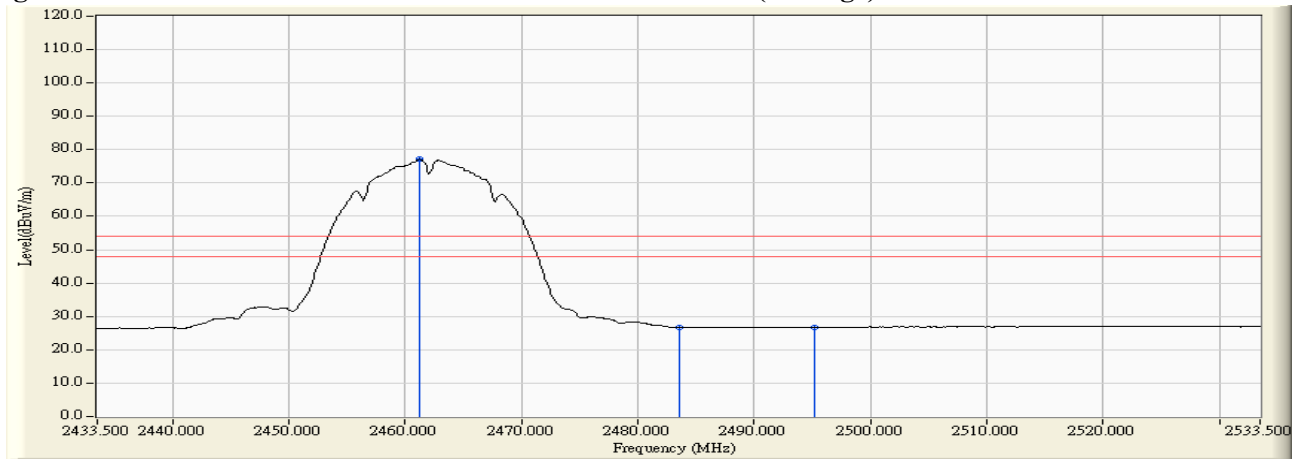
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2461.100	-4.037	83.670	79.633	--	--	--
11 (Peak)	2483.500	-3.966	42.231	38.264	74.00	54.00	Pass
11 (Peak)	2509.200	-3.866	44.889	41.022	74.00	54.00	Pass
11 (Average)	2461.200	-4.036	81.104	77.067	--	--	--
11 (Average)	2483.500	-3.966	30.739	26.772	74.00	54.00	Pass
11 (Average)	2495.200	-3.930	30.741	26.811	74.00	54.00	Pass

**Figure Channel 11: VERTICAL (Peak)**



**Figure Channel 11: VERTICAL (Average)**



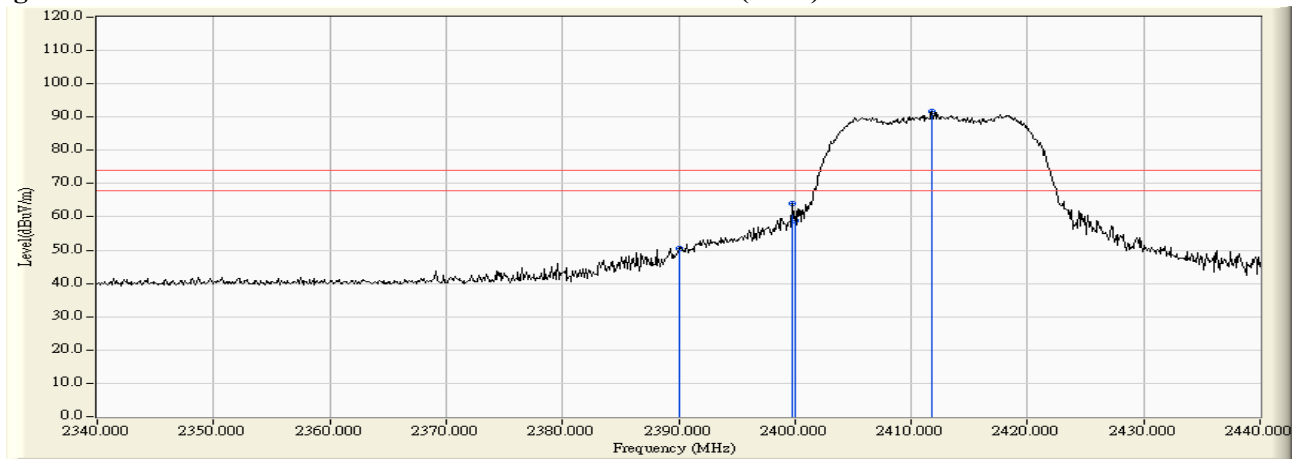
- Note:1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

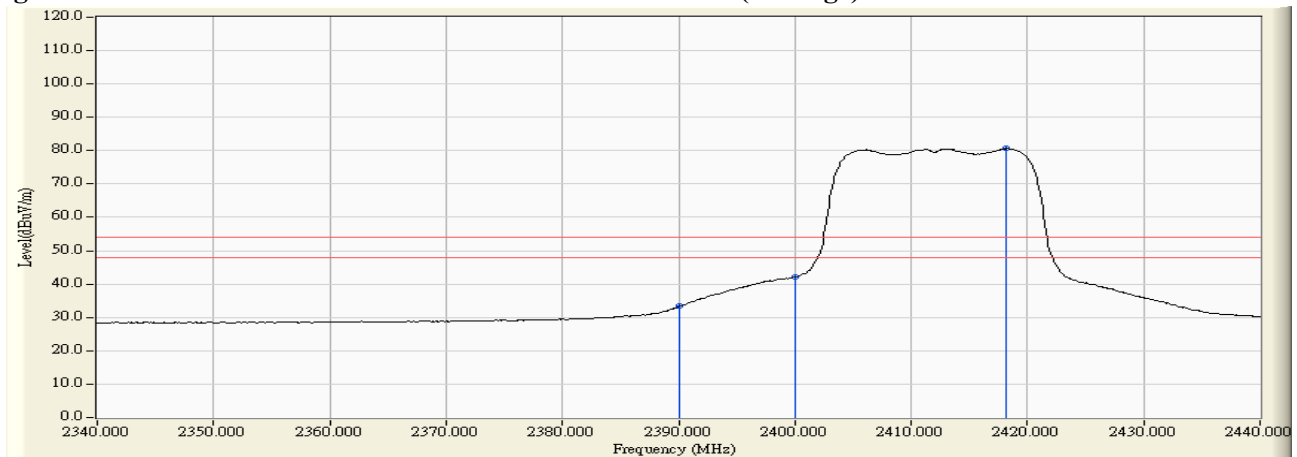
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2390.000	-2.687	53.176	50.489	74.00	54.00	Pass
01 (Peak)	2399.800	-2.661	66.741	64.080	--	--	--
01 (Peak)	2400.000	-2.660	61.552	58.892	--	--	--
01 (Peak)	2411.800	-2.644	94.470	91.827	--	--	--
01 (Average)	2390.000	-2.687	36.015	33.328	74.00	54.00	Pass
01 (Average)	2400.000	-2.660	44.761	42.101	--	--	--
01 (Average)	2418.100	-2.641	83.237	80.595	--	--	--

**Figure Channel 01: Horizontal (Peak)**



**Figure Channel 01: Horizontal (Average)**



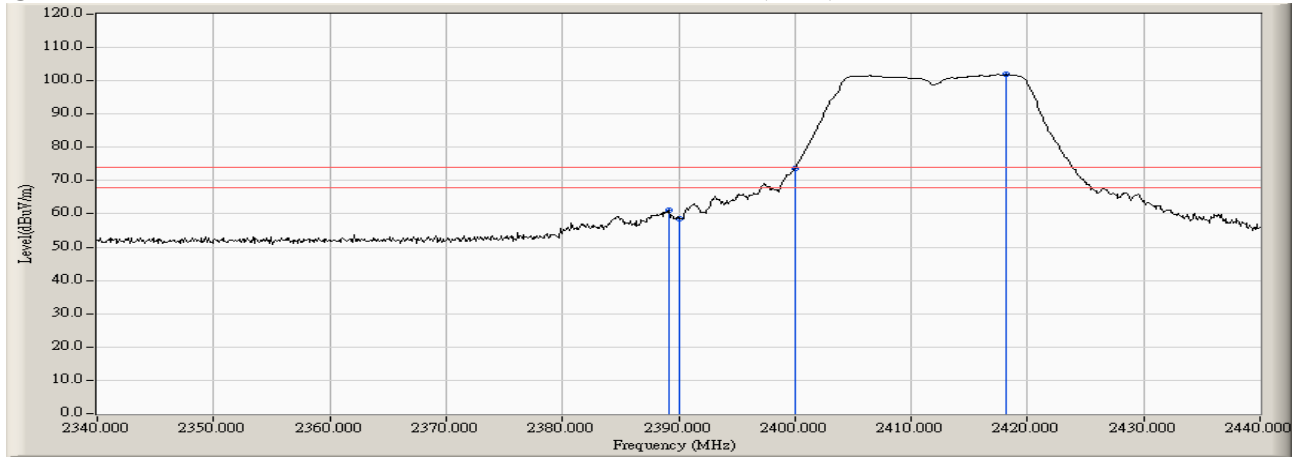
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

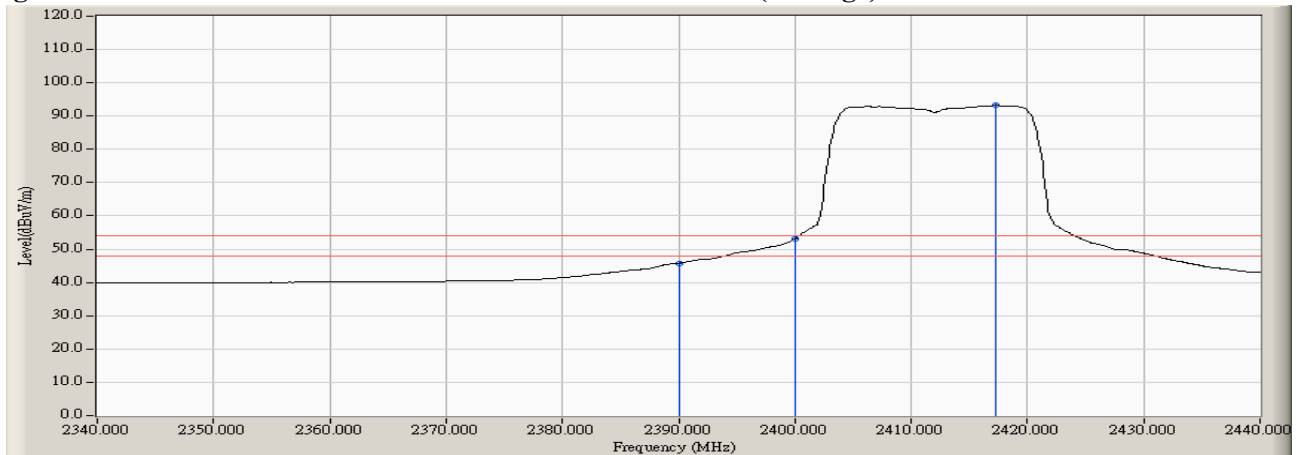
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2389.200	-4.156	49.114	44.958	74.00	54.00	Pass
01 (Peak)	2390.000	-4.159	48.199	44.040	74.00	54.00	Pass
01 (Peak)	2400.000	-4.171	58.076	53.905	--	--	--
01 (Peak)	2411.900	-4.167	89.445	85.279	--	--	--
01 (Average)	2390.000	-4.159	33.601	29.442	74.00	54.00	Pass
01 (Average)	2400.000	-4.171	40.857	36.686	--	--	--
01 (Average)	2405.800	-4.170	78.428	74.258	--	--	--

**Figure Channel 01: VERTICAL (Peak)**



**Figure Channel 01: VERTICAL (Average)**



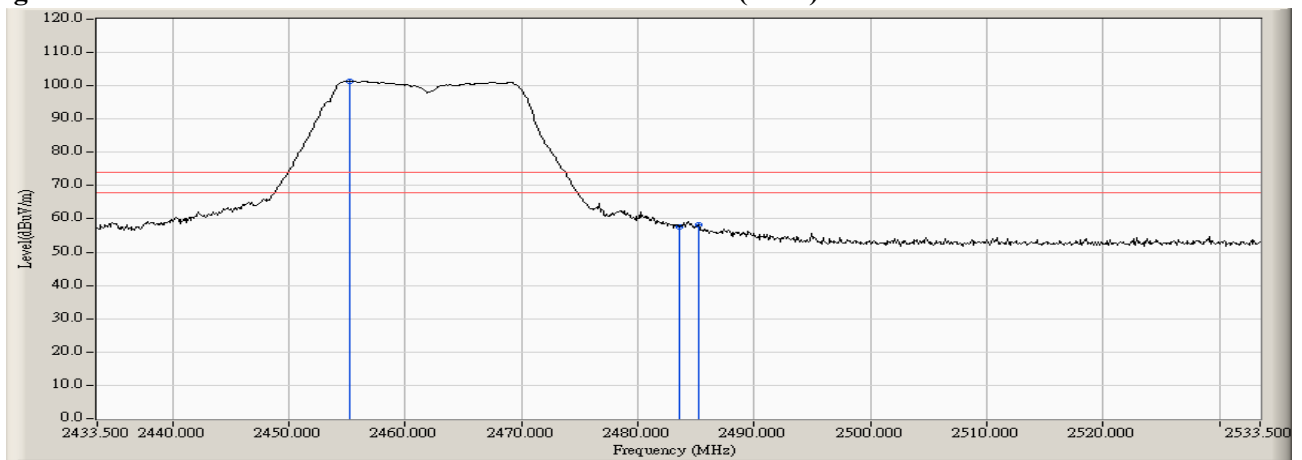
- Note:1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

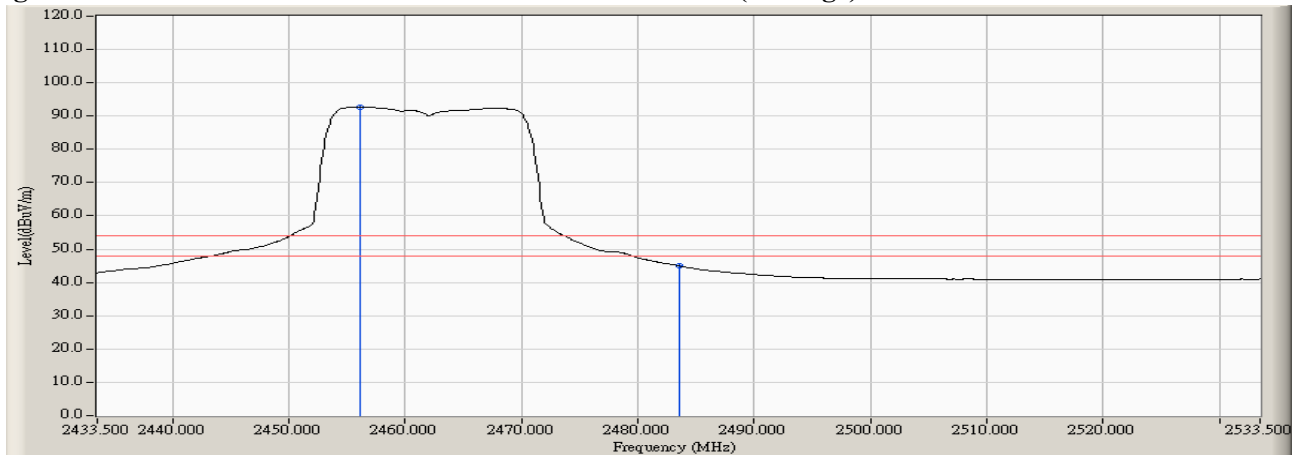
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2462.000	-2.623	93.429	90.806	--	--	--
11 (Peak)	2483.500	-2.601	46.179	43.577	74.00	54.00	Pass
11 (Peak)	2484.500	-2.601	48.741	46.140	74.00	54.00	Pass
11 (Average)	2455.900	-2.627	82.833	80.206	--	--	--
11 (Average)	2483.500	-2.601	33.846	31.244	74.00	54.00	Pass

**Figure Channel 11: Horizontal (Peak)**



**Figure Channel 11: Horizontal (Average)**



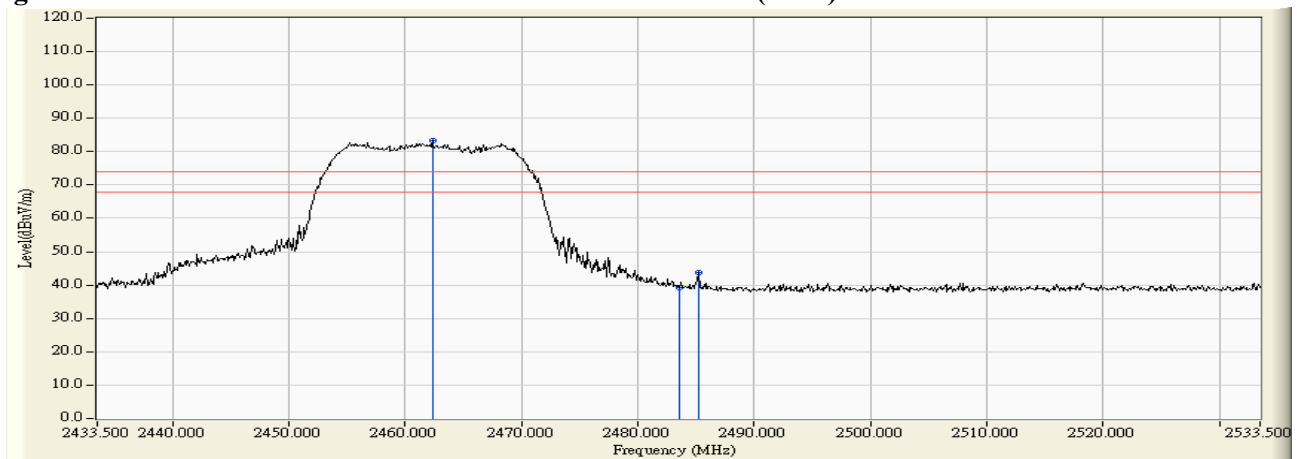
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

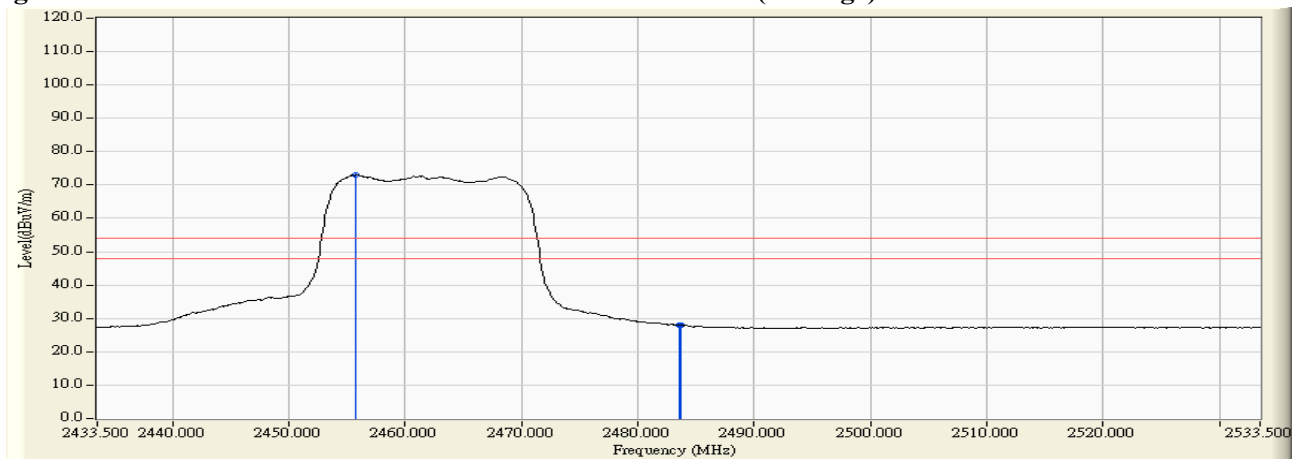
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2462.300	-4.033	87.358	83.324	--	--	--
11 (Peak)	2483.500	-3.966	43.342	39.375	74.00	54.00	Pass
11 (Peak)	2485.200	-3.961	47.762	43.801	74.00	54.00	Pass
11 (Average)	2455.700	-4.054	77.147	73.093	--	--	--
11 (Average)	2483.500	-3.966	31.824	27.857	74.00	54.00	Pass
11 (Average)	2483.700	-3.966	31.958	27.992	74.00	54.00	Pass

**Figure Channel 11: VERTICAL (Peak)**



**Figure Channel 11: 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 = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement Level = Reading Level + Correct Factor.  
 6. The average measurement was not performed when the peak measured data under the limit of average detection.

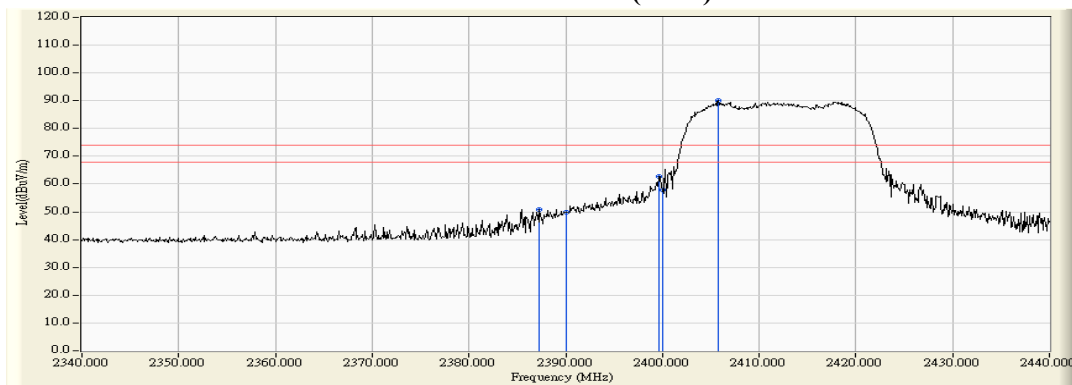


Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2412MHz)

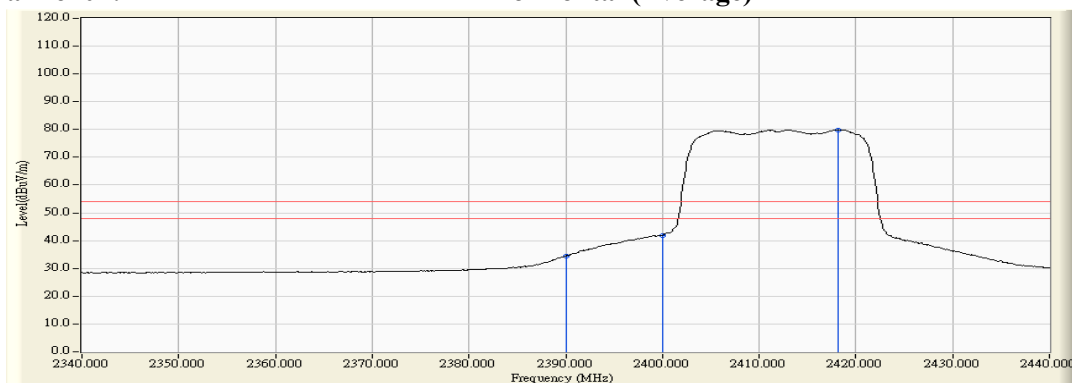
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2387.200	-2.699	53.661	50.962	74.00	54.00	Pass
01 (Peak)	2390.000	-2.687	52.676	49.989	74.00	54.00	Pass
01 (Peak)	2399.700	-2.661	65.462	62.801	--	--	--
01 (Peak)	2400.000	-2.660	60.685	58.025	--	--	--
01 (Peak)	2405.800	-2.652	92.575	89.923	--	--	--
01 (Average)	2390.000	-2.687	37.022	34.335	74.00	54.00	Pass
01 (Average)	2400.000	-2.660	44.629	41.969	--	--	--
01 (Average)	2418.200	-2.641	82.574	79.932	--	--	--

**Figure Channel 01: Horizontal (Peak)**



**Figure Channel 01: Horizontal (Average)**



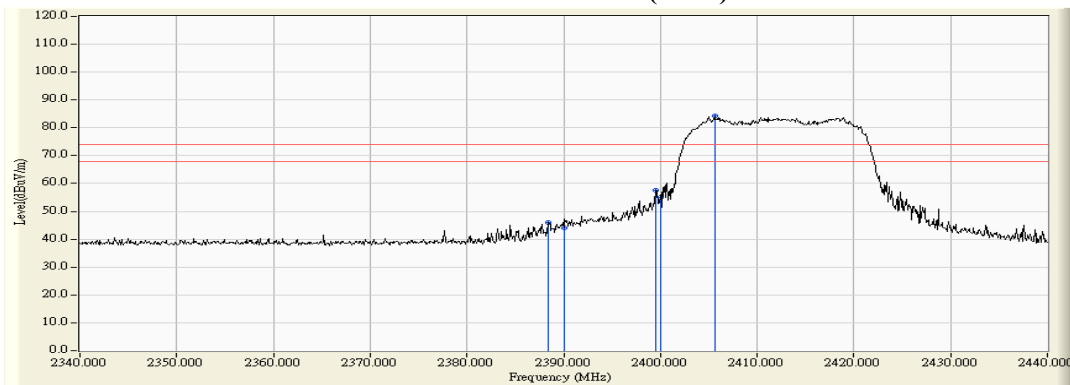
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2412MHz)

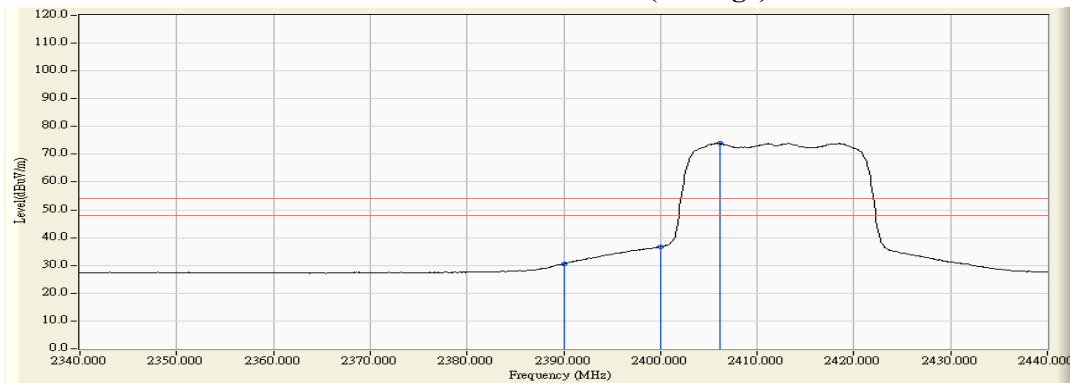
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2388.400	-4.154	50.108	45.955	74.00	54.00	Pass
01 (Peak)	2390.000	-4.159	48.121	43.962	74.00	54.00	Pass
01 (Peak)	2399.500	-4.171	61.747	57.576	--	--	--
01 (Peak)	2400.000	-4.171	59.174	55.003	--	--	--
01 (Peak)	2405.600	-4.170	88.392	84.222	--	--	--
01 (Average)	2390.000	-4.159	34.767	30.608	74.00	54.00	Pass
01 (Average)	2400.000	-4.171	40.911	36.740	--	--	--
01 (Average)	2406.100	-4.170	78.094	73.924	--	--	--

**Figure Channel 01: VERTICAL (Peak)**



**Figure Channel 01: VERTICAL (Average)**



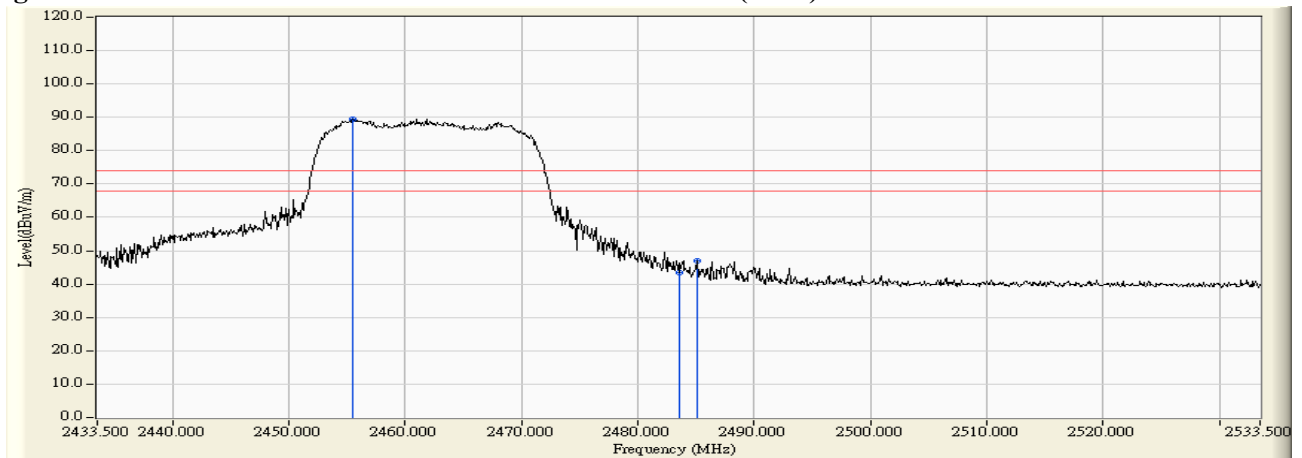
- Note: 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2462MHz)

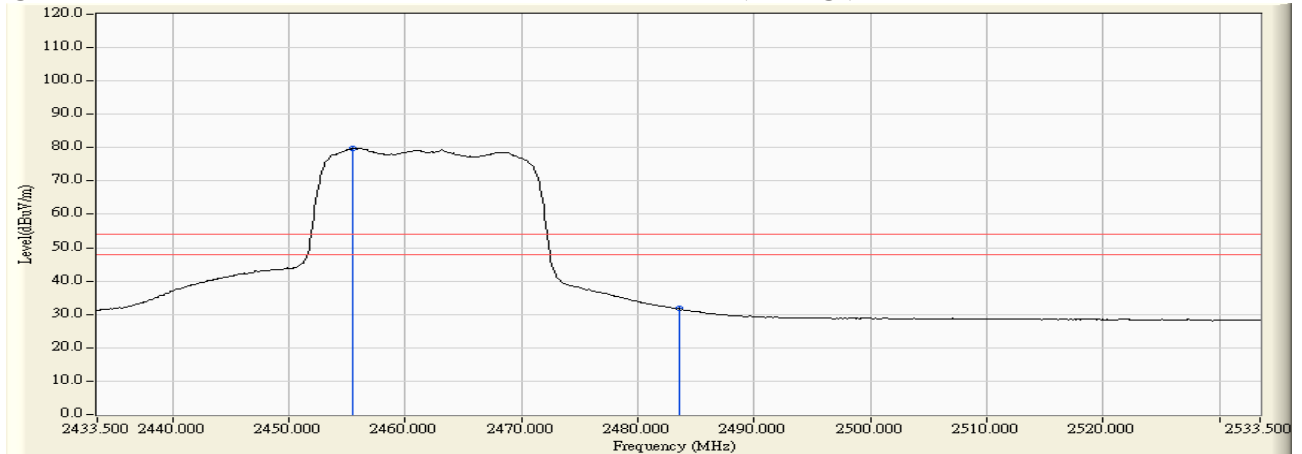
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2455.500	-2.627	92.092	89.465	--	--	--
11 (Peak)	2483.500	-2.601	46.093	43.491	74.00	54.00	Pass
11 (Peak)	2485.100	-2.600	49.553	46.953	74.00	54.00	Pass
11 (Average)	2455.500	-2.627	82.377	79.750	--	--	--
11 (Average)	2483.500	-2.601	34.306	31.704	74.00	54.00	Pass

**Figure Channel 11: Horizontal (Peak)**



**Figure Channel 11: Horizontal (Average)**



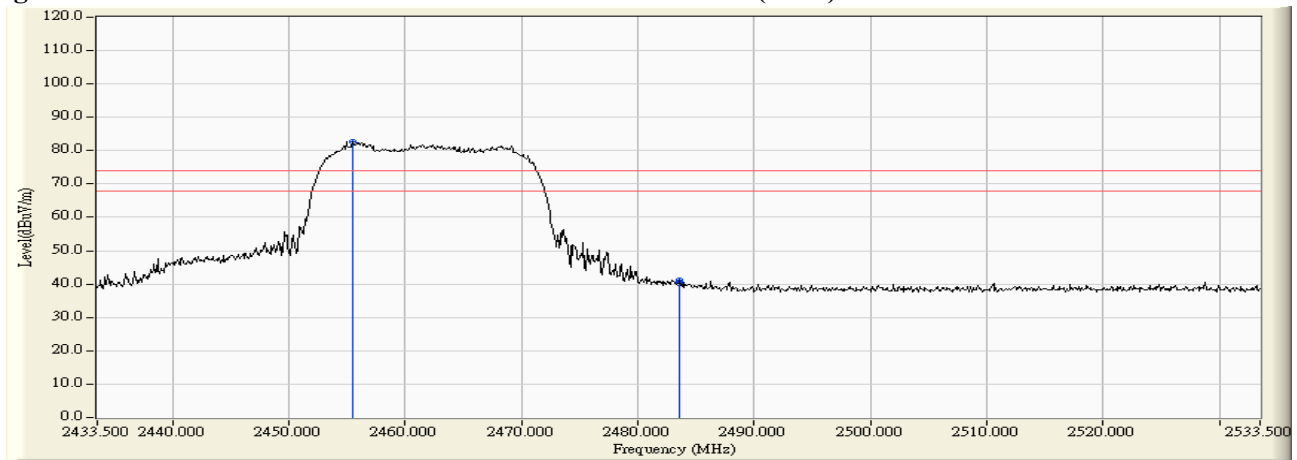
- Note:1. All readings above 1GHz are performed with peak and/or average measurements as necessary.  
 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.  
 3. Average measurements: RBW = 1MHz, VBW = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement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

Product : Wi-Fi Module  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Date : 2017/10/12  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2462MHz)

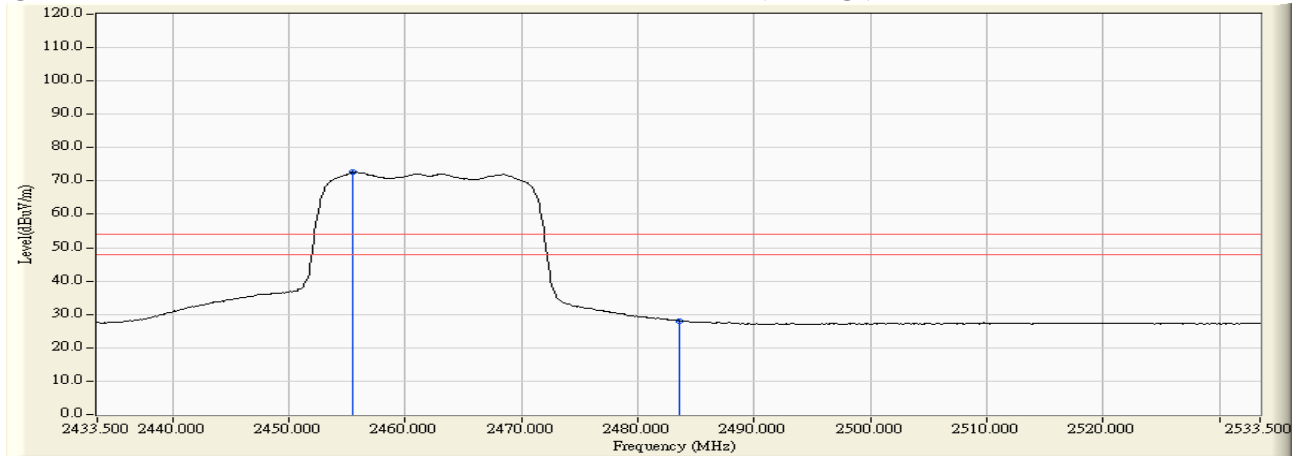
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2455.500	-4.054	86.844	82.790	--	--	--
11 (Peak)	2483.500	-3.966	44.252	40.285	74.00	54.00	Pass
11 (Peak)	2483.600	-3.966	45.219	41.253	74.00	54.00	Pass
11 (Average)	2455.500	-4.054	76.724	72.670	--	--	--
11 (Average)	2483.500	-3.966	32.043	28.076	74.00	54.00	Pass

**Figure Channel 11: VERTICAL (Peak)**



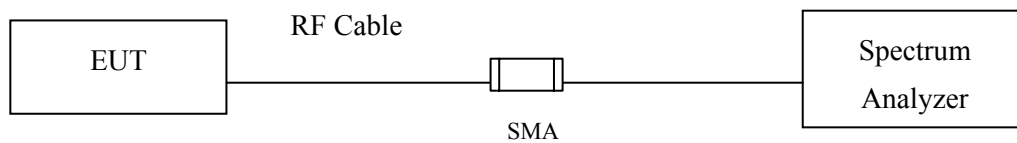
**Figure Channel 11: VERTICAL (Average)**



- 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 = 1 KHz, Sweep: Auto.  
 4. “ \* ”, means this data is the worst emission level.  
 5. Measurement Level = Reading Level + Correct Factor.  
 6. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. 6dB Bandwidth

### 7.1. Test Setup



### 7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

### 7.3. Test Procedure

The EUT was setup according to ANSI C63.4: 2014; tested according to DTS test procedure of Jan KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 7.4. Uncertainty

$\pm 283\text{Hz}$

### 7.5. Test Result of 6dB Bandwidth

Product : Wi-Fi Module  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	9150	>500	Pass
06	2437	9150	>500	Pass
11	2462	9150	>500	Pass

Figure Channel 01:

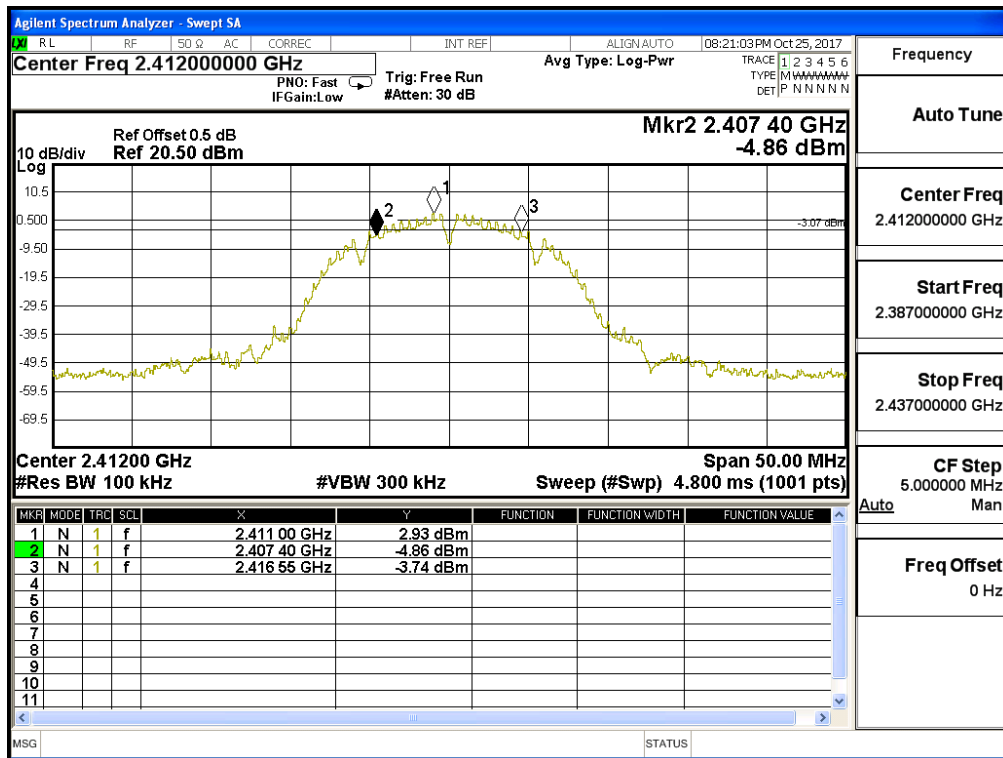


Figure Channel 06:

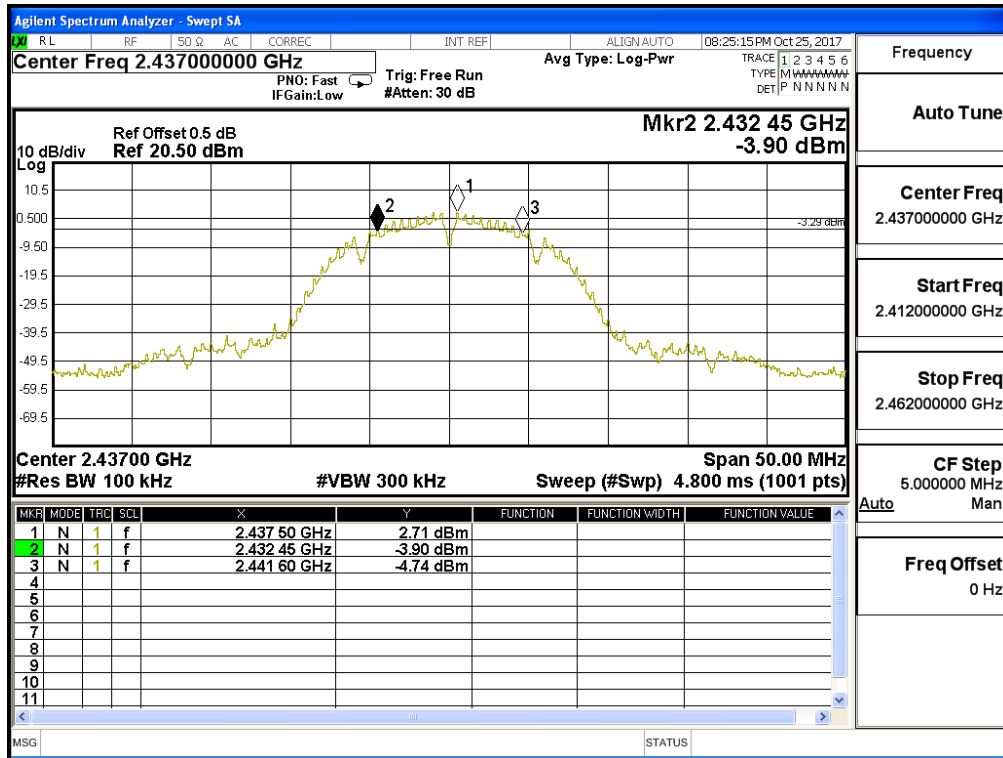
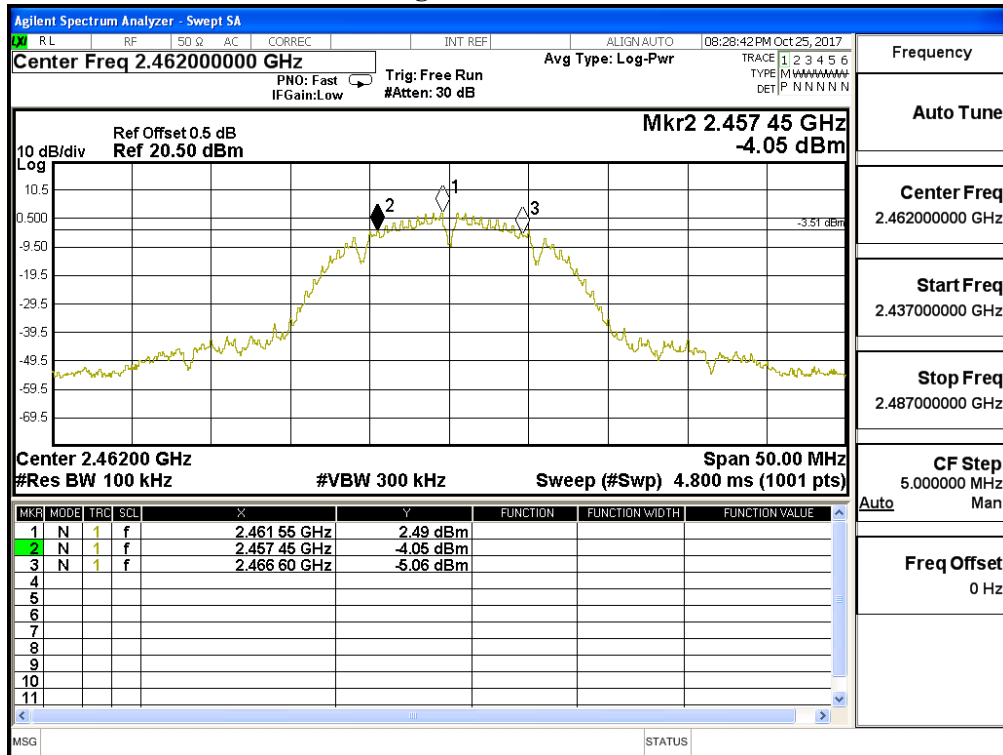


Figure Channel 11:



Product : Wi-Fi Module  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	15950	>500	Pass
06	2437	16000	>500	Pass
11	2462	15800	>500	Pass

Figure Channel 01:

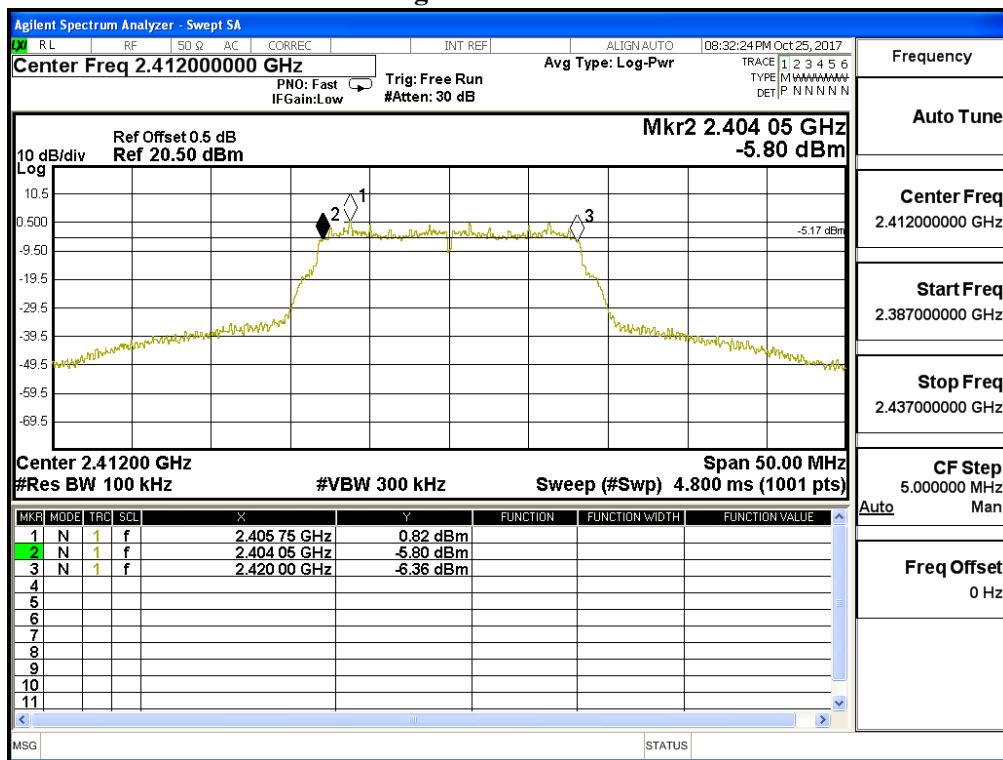




Figure Channel 06:

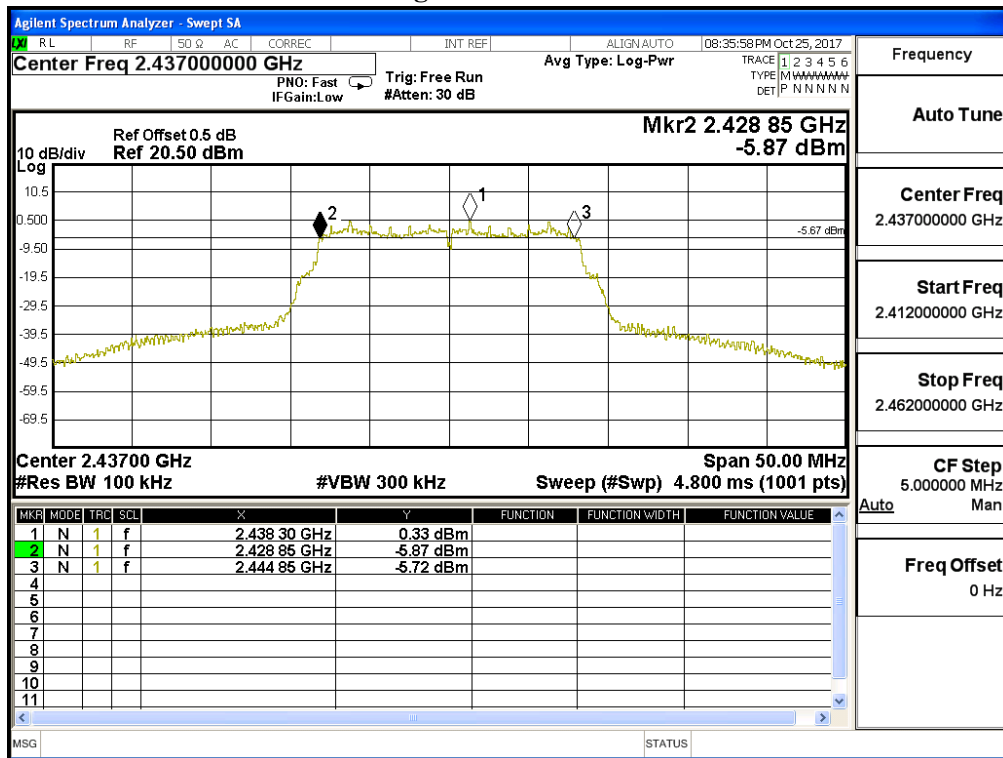
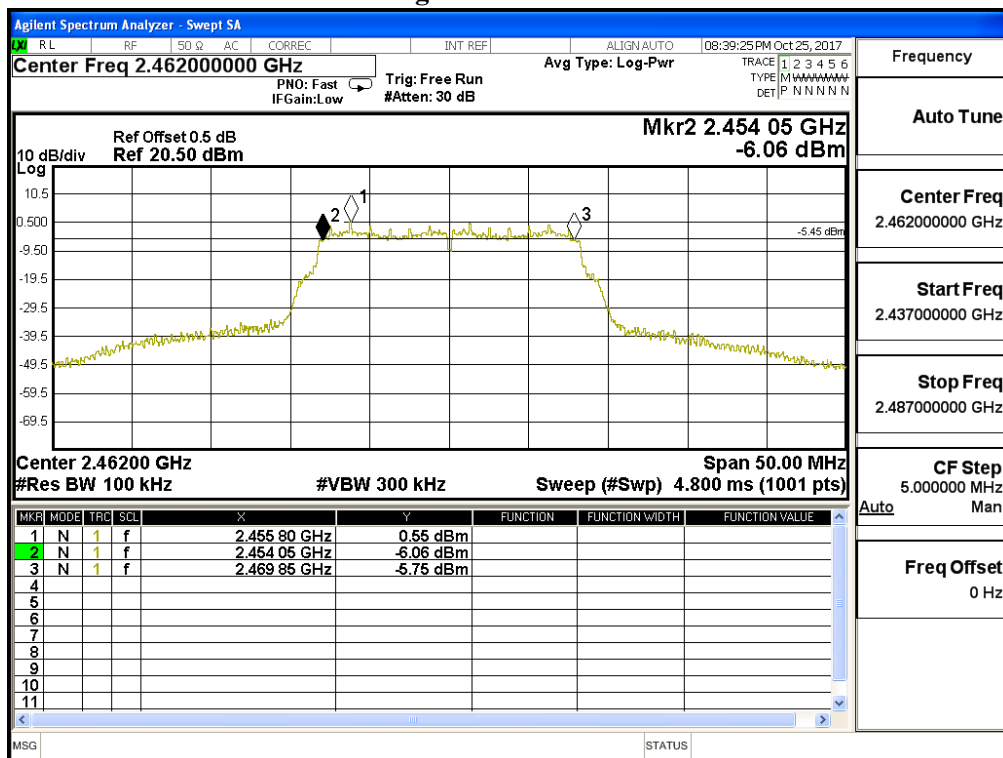


Figure Channel 11:



Product : Wi-Fi Module  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	17650	>500	Pass
06	2437	17250	>500	Pass
11	2462	17250	>500	Pass

Figure Channel 01:

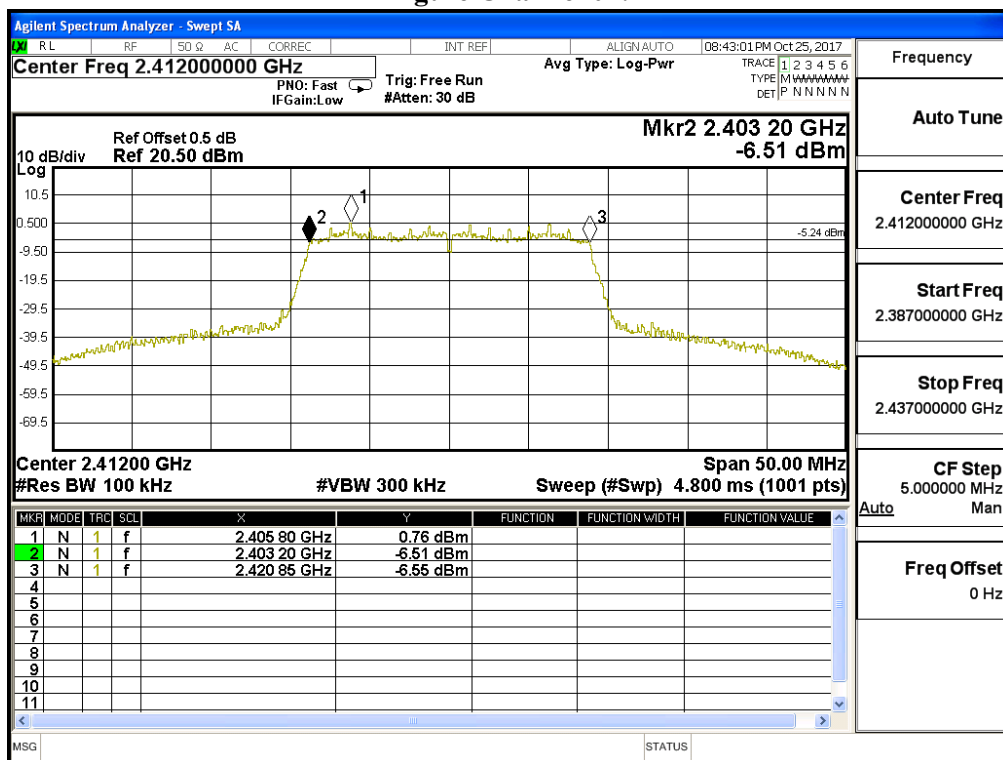


Figure Channel 06:

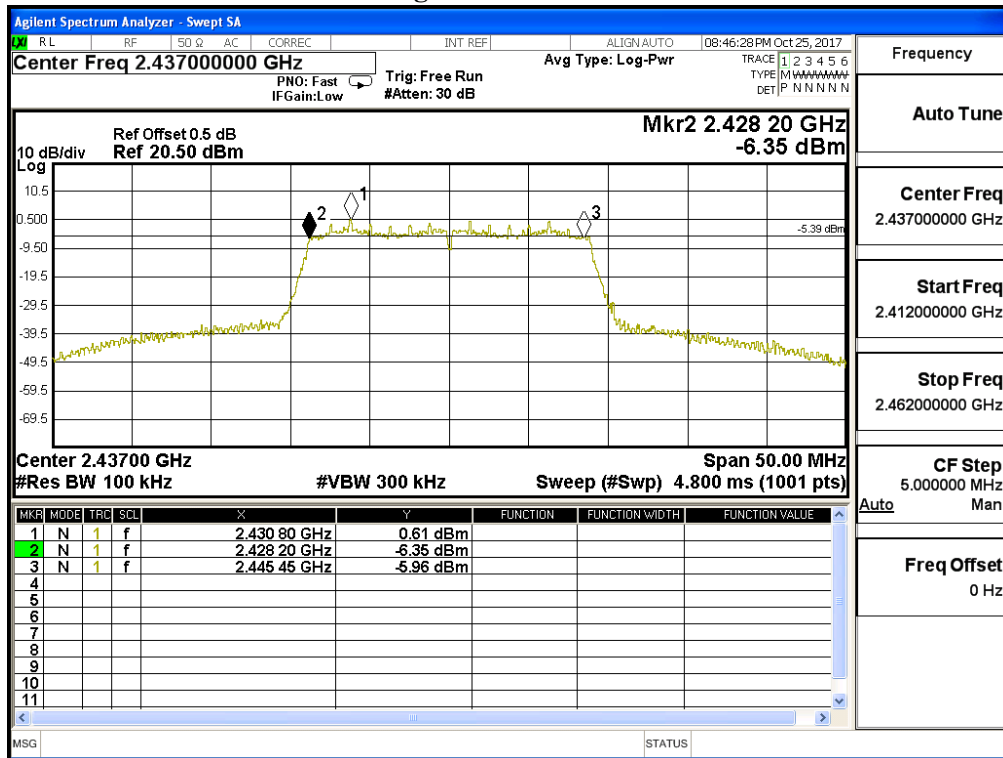
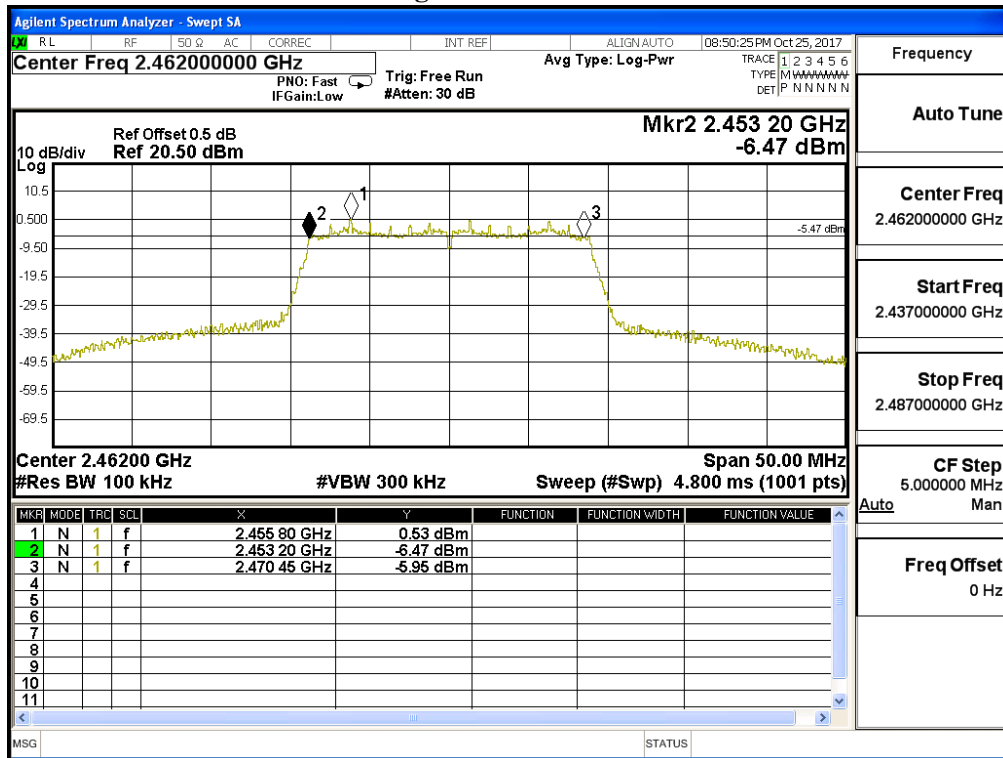
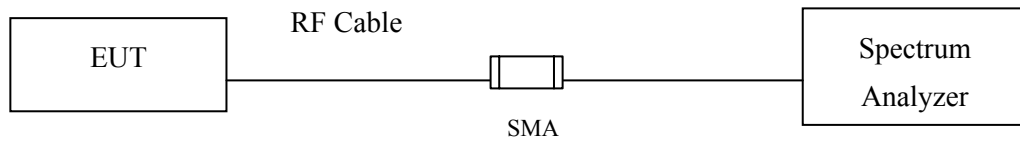


Figure Channel 11:



## 8. Power Density

### 8.1. Test Setup



### 8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

### 8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

### 8.4. Uncertainty

$\pm 1.20$  dB

### 8.5. Test Result of Power Density

Product : Wi-Fi Module  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2412	3.150	≤ 8dBm	Pass
06	2437	2.730	≤ 8dBm	Pass
11	2462	2.590	≤ 8dBm	Pass

Figure Channel 01:

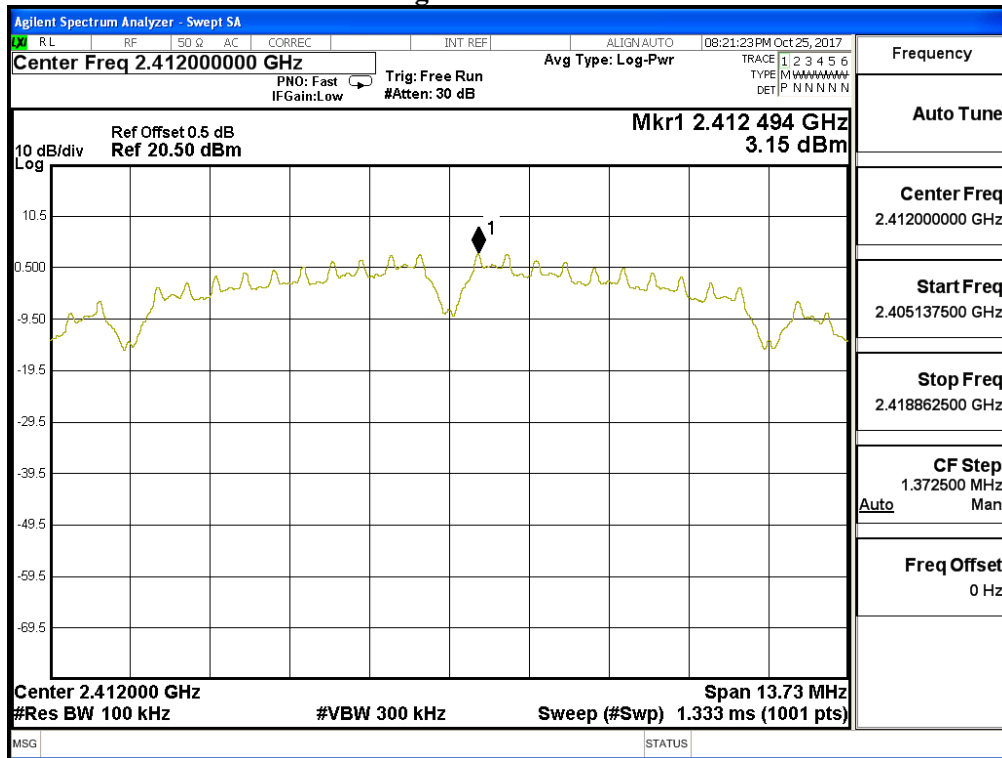


Figure Channel 06:

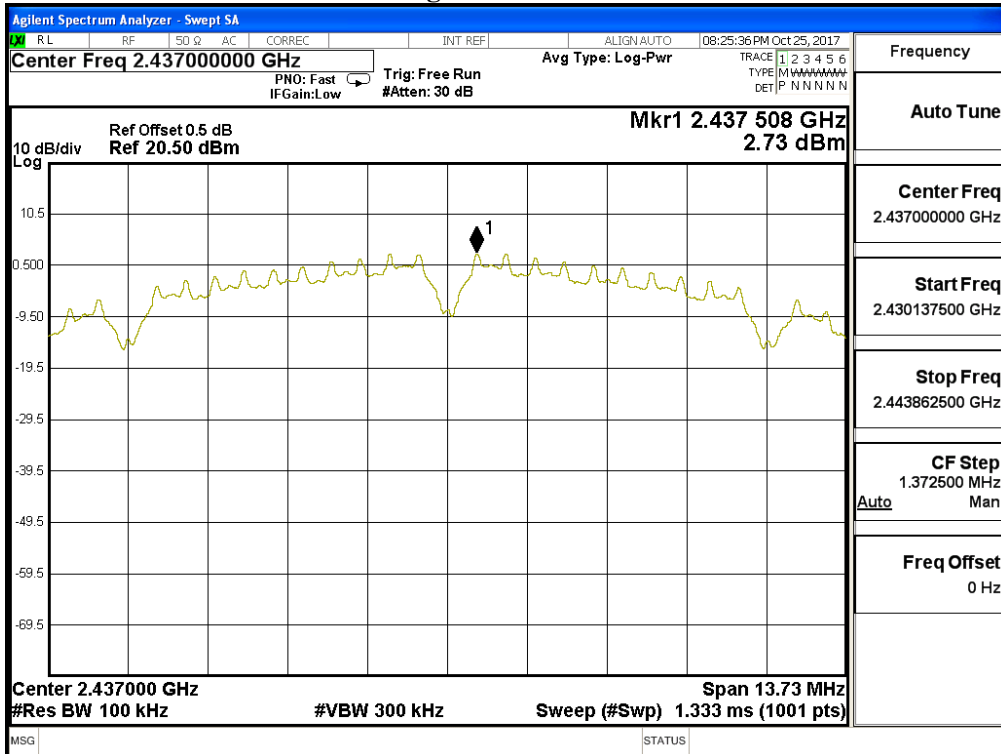
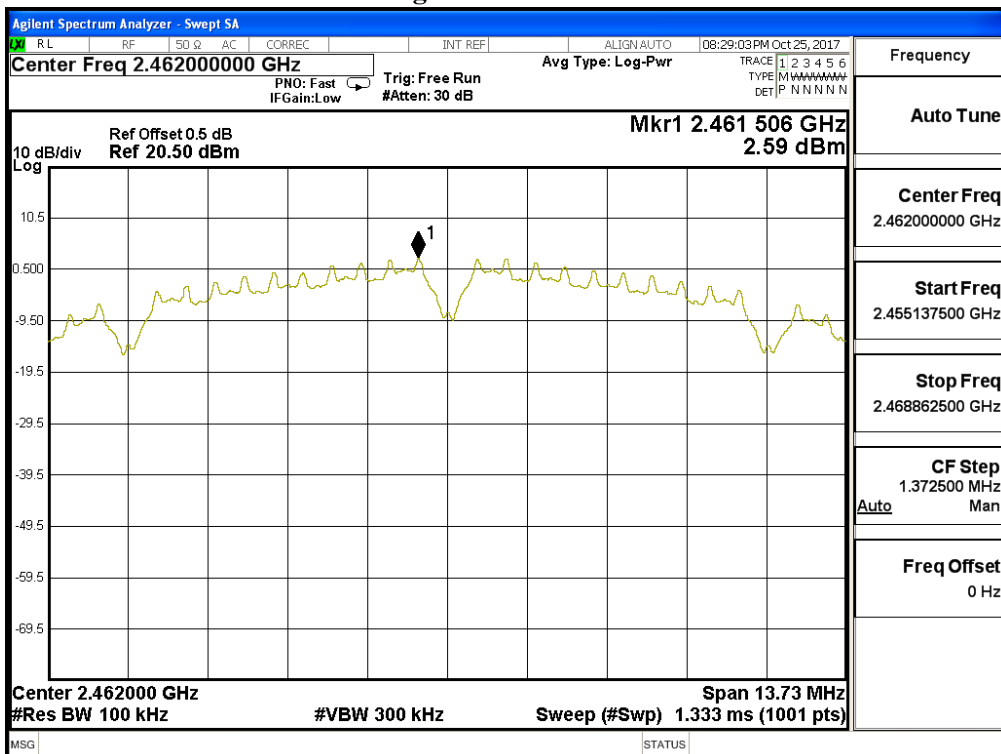


Figure Channel 11:



Product : Wi-Fi Module  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2412	0.590	≤ 8dBm	Pass
06	2437	0.580	≤ 8dBm	Pass
11	2462	0.500	≤ 8dBm	Pass

Figure Channel 01:

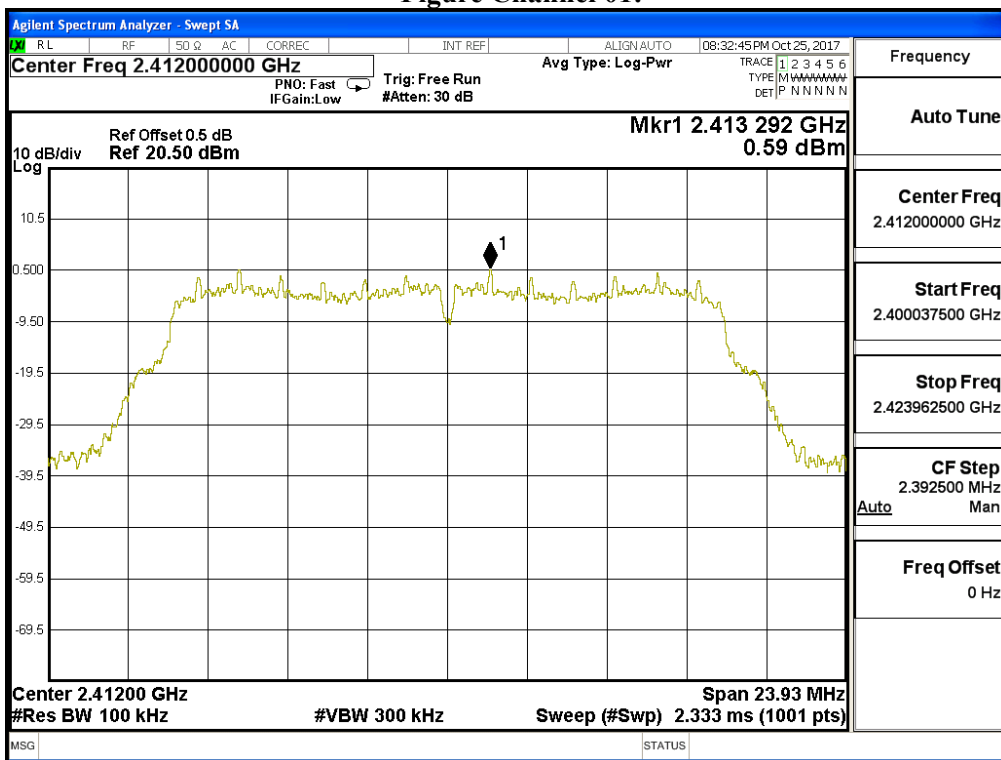


Figure Channel 06:

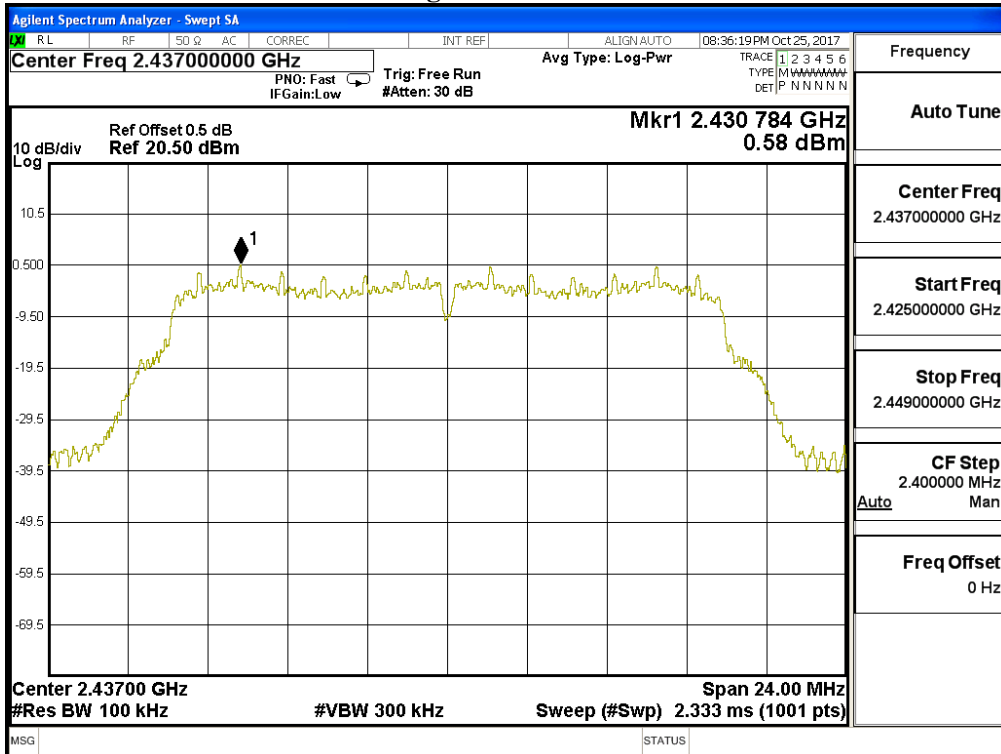
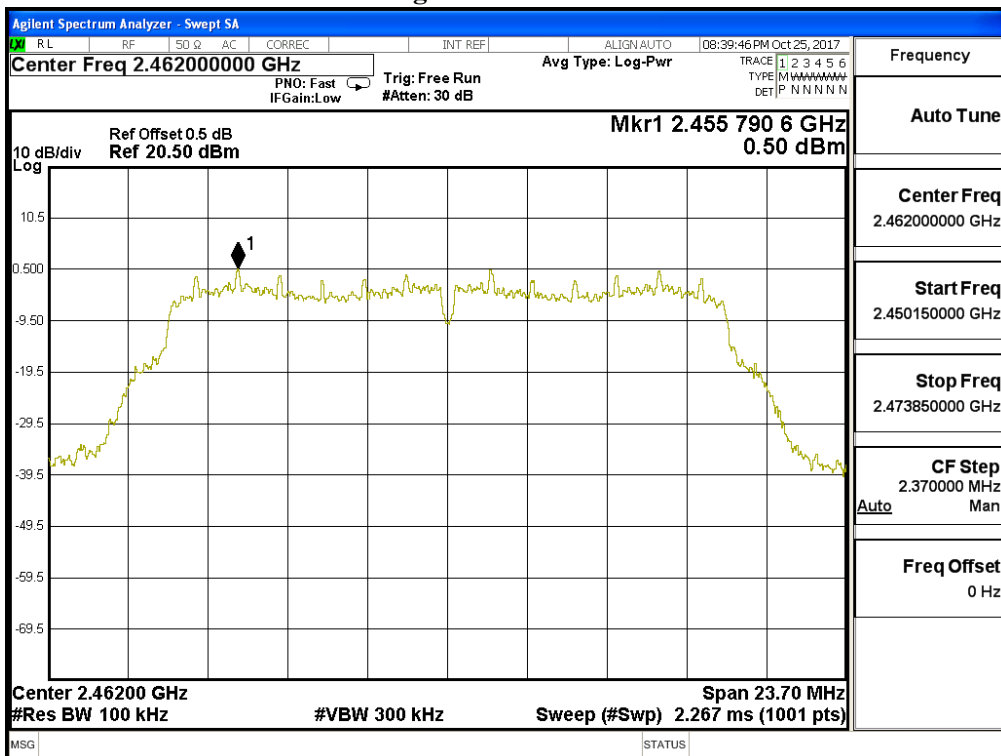


Figure Channel 11:





Product : Wi-Fi Module  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2412	0.740	≤ 8dBm	Pass
06	2437	0.550	≤ 8dBm	Pass
11	2462	0.530	≤ 8dBm	Pass

Figure Channel 01:

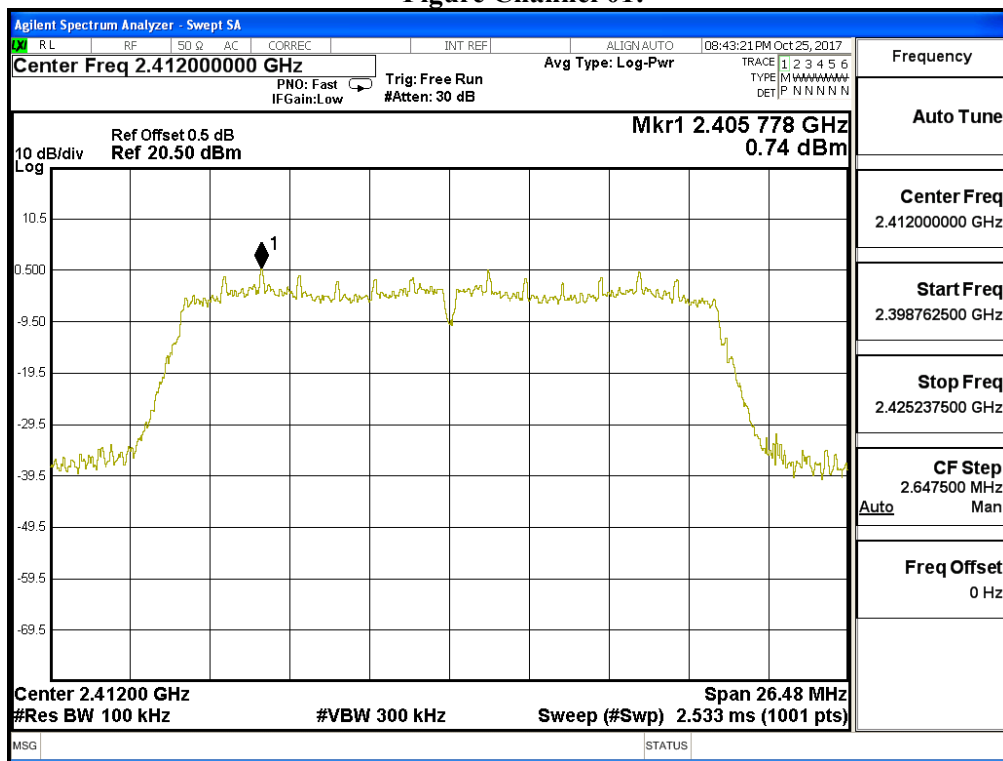


Figure Channel 06:

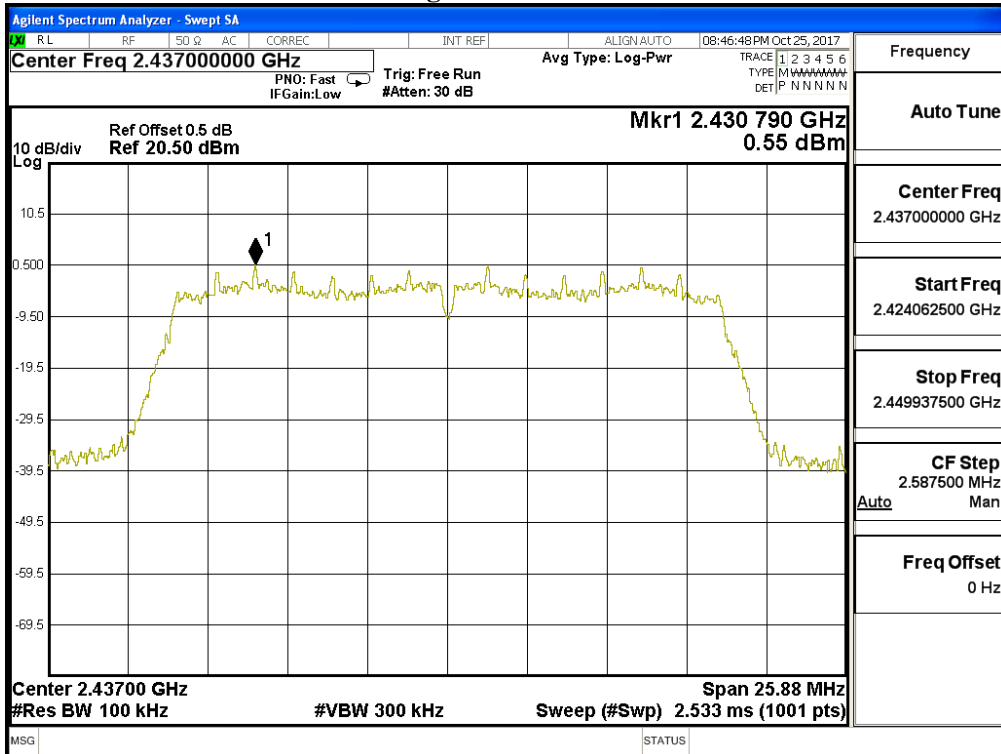
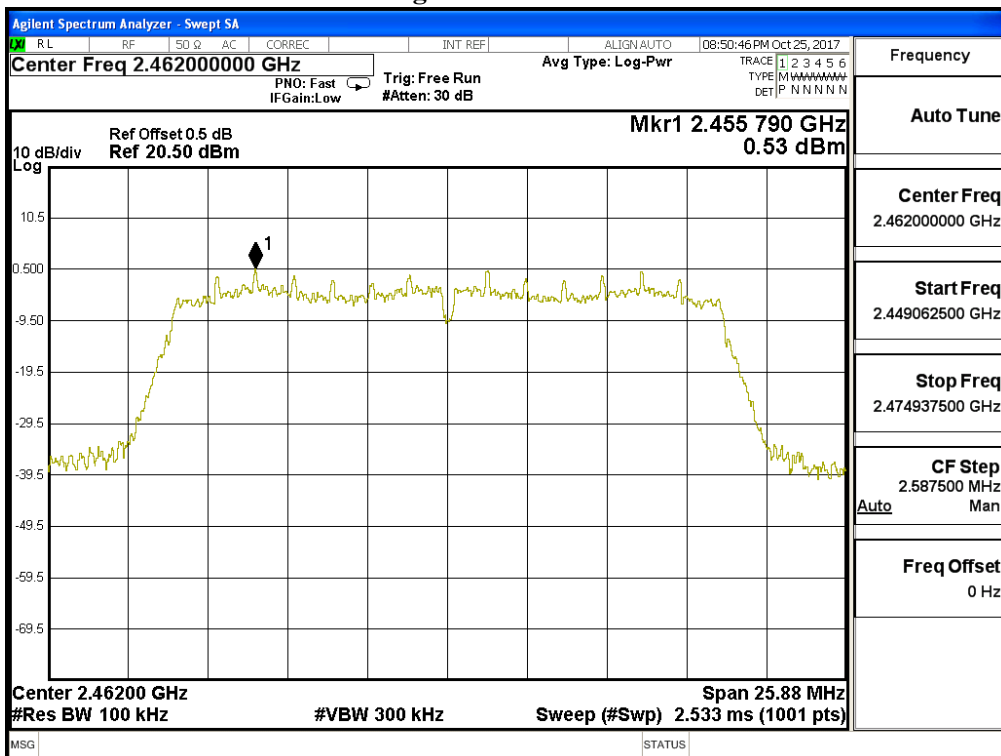


Figure Channel 11:



## **9. EMI Reduction Method During Compliance Testing**

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs