

FCC Test Report (Class II Permissive Change)

Product Name	IEEE 802.11a/b/g miniPCI module
Model No	WAPA003
FCC ID.	SLE-WAPA003

Applicant	MOXA Inc.
Address	FL.4, NO. 135. LANE 235, BAOQIAO RD. XINDIAN DIST.,NEW TAIPEI CITY, TAIWAN

Date of Receipt	Feb. 16, 2015
Issue Date	Apr. 01, 2016
Report No.	1620261R-RFUSP25V00
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: Apr. 01, 2016

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Product Name	IEEE 802.11 a/b/g miniPCI module
Applicant	MOXA Inc.
Address	FL.4, NO. 135. LANE 235, BAOQIAO RD. XINDIAN DIST.,NEW TAIPEI CITY, TAIWAN
Manufacturer	MOXA Inc.
Model No.	WAPA003
EUT Rated Voltage	DC 3.3V (Power by PCI-E)
EUT Test Voltage	AC 120V/60Hz
Trade Name	MOXA
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2014 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v03r04
Test Result	Complied

Documented By : Jinn Chen
(Senior Adm. Specialist / Jinn Chen)

Tested By : Bill Lin
(Engineer / Bill Lin)

Approved By : [Signature]
(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	IEEE 802.11a/b/g miniPCI module
Trade Name	MOXA
Model No.	WAPA003
FCC ID.	SLE-WAPA003
Frequency Range	2412-2462MHz
Number of Channels	11
Data Speed	5MHz BW:1.5-13.5Mbps, 10MHz BW:3-27Mbps
Channel separation	5 /10MHz BW: 5 MHz
Antenna Type	Panel Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Model No.	Antenna Type	Peak Gain
1	KINSUN	SMA-Male-RP (main)(aux)	Dipole	2dBi for 2.4GHz
2	KINSUN	ANT-WSB-ANM-05 (main)(aux)	Dipole	5dBi for 2.4GHz
3	KINSUN	ANT-WDB-ANM-0609 (main)(aux)	Dipole	6dBi for 2.4GHz
4	Antenna Technology	AT1515	Panel	11dBi for 2.4GHz
5	Antenna Technology	AT1524	Panel	8dBi for 2.4GHz
6	Antenna Technology	AT1539	Panel	14dBi for 2.4GHz
7	DIAMOND	TK2632	Panel	14dBi for 2.4GHz

- Note: 1. The antenna of EUT is conform to FCC 15.203
2. Only the higher gain antenna was tested and recorded in this report.

5M /10M Bandwidth 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		

Note:

1. This device is an IEEE 802.11a/b/g miniPCI module with a built-in 2.4GHz OFDM transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. The device is applied for modular approval.
4. At result of pretests, module supports dual-channel transmission, only the worst case is shown in the report.
5. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report. (5MHz BW is 1.5Mbps, 10MHz BW is 3 Mbps).
6. These tests are conducted on a sample for the purpose of demonstrating compliance of OFDM transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.
7. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
8. This is requesting a Class II permissive change for FCC ID: SLE-WAPA003. originally granted on 01/04/2016

The major change filed under this application is:

Change #1: adding OFDM (5M / 10M) Bandwidth Test.

Test Mode:	Mode 1: Transmit-5MHz BW
	Mode 2: Transmit-10MHz BW

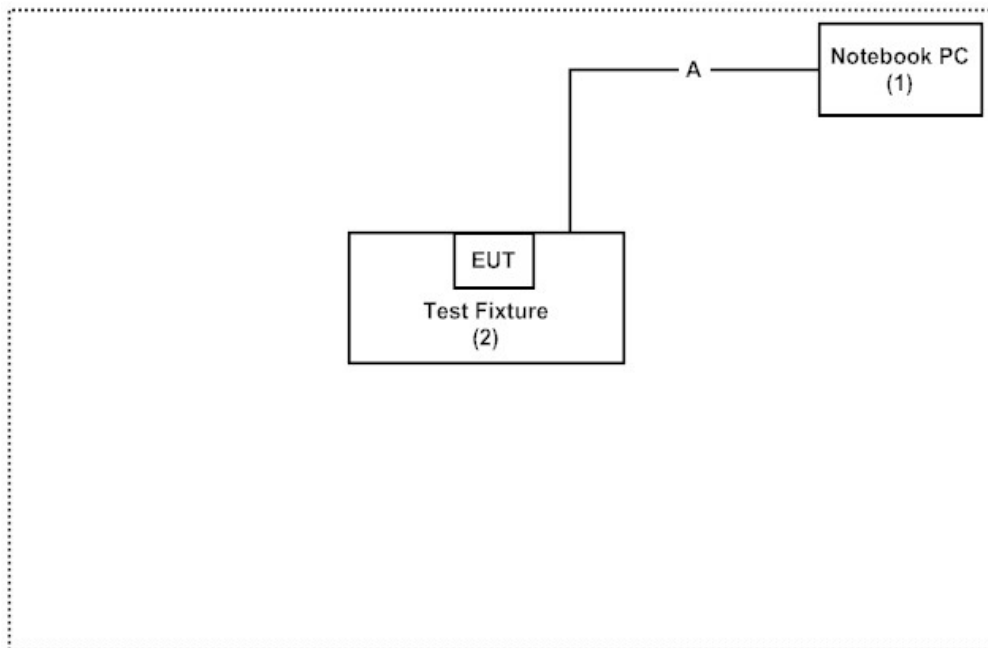
1.3. Tested System Details

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	M65	CG098	Non-Shielded, 0.8m
2	Test Fixture	MOXA	N/A	N/A	N/A

Signal Cable Type	Signal cable Description	
A	LAN Cable	Non-Shielded, 1m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “Tera Term V4.67” on the EUT.
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 Quietek Corporation's Web Site : <http://www.quietek.com/chinese/about/certificates.aspx?bval=5>
The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
Site Address: No. 5-22, Rueishu Keng, Linkou Dist.,
New Taipei City 24451
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Maximum Conducted Power

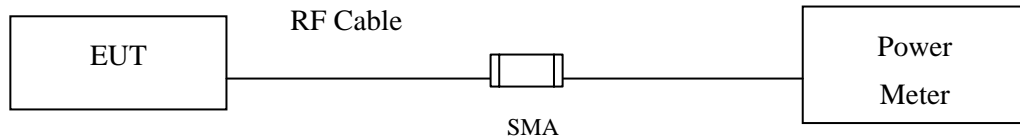
2.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2015
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2015
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2015
	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

2.2. Test Setup



2.3. Limits

The maximum average power shall be less 1 Watt. (Section 15.247 (b)(3))

2.4. Test Procedure

The EUT was 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 D01 DTS Meas Guidance v03r04 section 9.1.2 PKPM1 Peak power meter method.

2.5. Uncertainty

± 1.27 dB

2.6. Test Result of Maximum Conducted Power

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Maximum Conducted Power
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		1.5	2	3	4.5	6	9	12	13.5			
		Measurement Level (dBm)										
01	2412	7.12	--	--	--	--	--	--	--	16.44	<28dBm	Pass
02	2417	13.64	--	--	--	--	--	--	--	23.02	<28dBm	Pass
06	2437	13.65	13.61	13.55	13.51	13.47	13.42	13.38	13.33	23.11	<28dBm	Pass
10	2457	12.56	--	--	--	--	--	--	--	21.66	<28dBm	Pass
11	2462	7.26	--	--	--	--	--	--	--	16.78	<28dBm	Pass

Note:

1. Peak Power Output Value = Reading value on power meter + cable loss
2. Required Limit = $30\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 28\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements. (fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Maximum Conducted Power
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		3	4.5	6	9	12	18	24	27			
		Measurement Level (dBm)										
01	2412	7.05	--	--	--	--	--	--	--	16.43	<28dBm	Pass
02	2417	13.57	--	--	--	--	--	--	--	22.94	<28dBm	Pass
06	2437	13.78	13.72	13.61	13.52	13.45	13.35	13.24	13.17	23.07	<28dBm	Pass
10	2457	12.56	--	--	--	--	--	--	--	21.61	<28dBm	Pass
11	2462	7.43	--	--	--	--	--	--	--	16.72	<28dBm	Pass

Note:

1. Peak Power Output Value = Reading value on power meter + cable loss
2. Required Limit = $30\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 28\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements. (fixed point to point operation)

3. Radiated Emission

3.1. Test Equipment

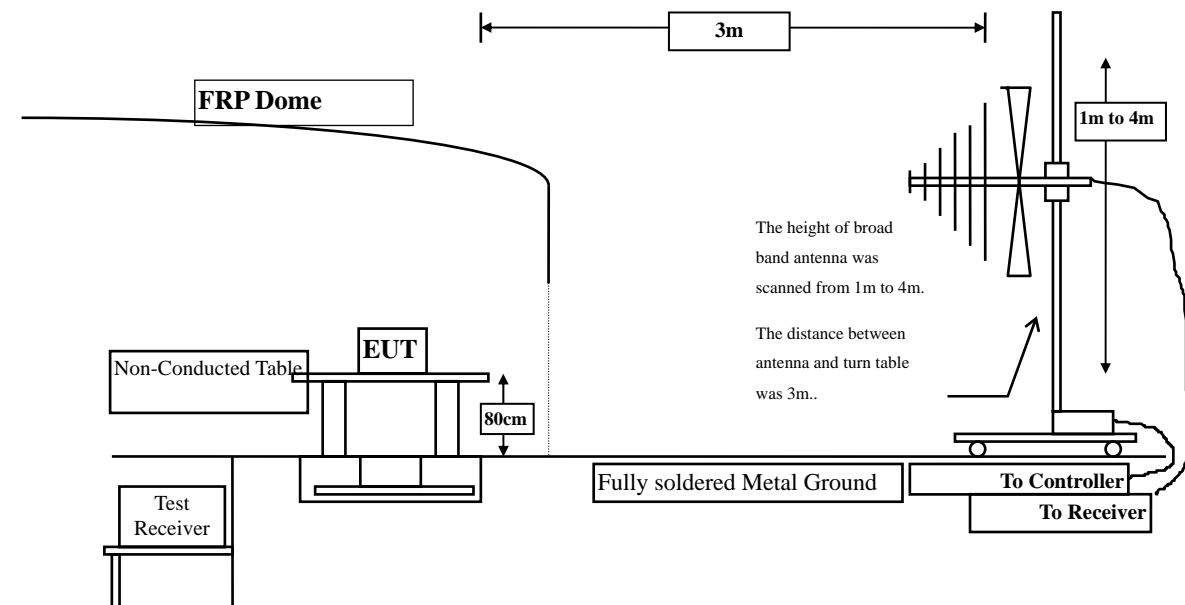
The following test equipments are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	
Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun, 2015
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun, 2015
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun, 2015
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun, 2015

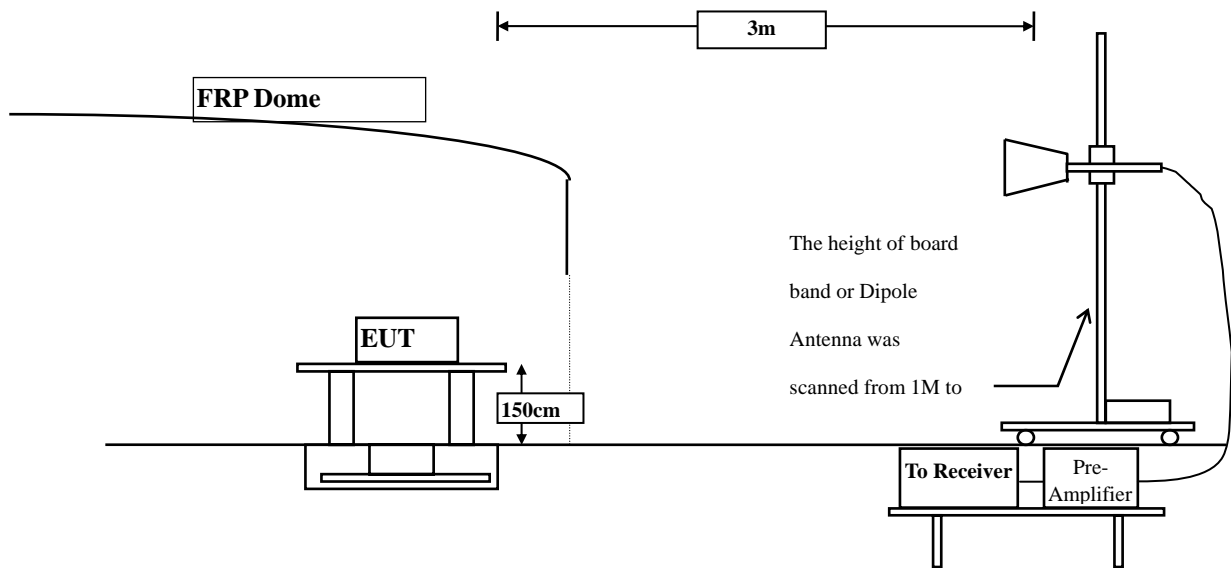
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

3.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 30dB 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 (dBuV/m) = 20 log E field strength (uV/m)

3.4. 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.

3.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2412MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4824.000	2.428	45.900	48.329	-25.671	74.000
7236.000	9.177	39.950	49.127	-24.873	74.000
9648.000	10.019	39.890	49.910	-24.090	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4824.000	2.836	41.570	44.407	-29.593	74.000
7236.000	9.676	40.150	49.826	-24.174	74.000
9648.000	10.556	39.700	50.257	-23.743	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4874.000	2.076	43.260	45.337	-28.663	74.000
7311.000	9.513	39.880	49.392	-24.608	74.000
9748.000	9.630	39.490	49.119	-24.881	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	2.532	41.920	44.452	-29.548	74.000
7311.000	10.090	40.590	50.679	-23.321	74.000
9748.000	10.266	39.720	49.986	-24.014	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2462 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4924.000	2.191	45.170	47.361	-26.639	74.000
7386.000	10.374	39.690	50.064	-23.936	74.000
9848.000	9.964	39.080	49.045	-24.955	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	2.805	41.130	43.935	-30.065	74.000
7386.000	11.181	39.020	50.200	-23.800	74.000
9848.000	10.801	39.630	50.431	-23.569	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2412MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4824.000	2.428	41.980	44.409	-29.591	74.000
7236.000	9.177	39.650	48.827	-25.173	74.000
9648.000	10.019	39.650	49.670	-24.330	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4824.000	2.836	42.130	44.967	-29.033	74.000
7236.000	9.676	39.540	49.216	-24.784	74.000
9648.000	10.556	39.830	50.387	-23.613	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4874.000	2.076	41.820	43.897	-30.103	74.000
7311.000	9.513	39.700	49.212	-24.788	74.000
9748.000	9.630	39.070	48.699	-25.301	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	2.532	41.570	44.102	-29.898	74.000
7311.000	10.090	40.830	50.919	-23.081	74.000
9748.000	10.266	39.910	50.176	-23.824	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2462 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4924.000	2.191	41.620	43.811	-30.189	74.000
7386.000	10.374	39.440	49.814	-24.186	74.000
9848.000	9.964	39.370	49.335	-24.665	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	2.805	41.230	44.035	-29.965	74.000
7386.000	11.181	39.190	50.370	-23.630	74.000
9848.000	10.801	39.600	50.401	-23.599	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
396.660	0.771	38.008	38.779	-7.221	46.000
499.480	1.991	39.177	41.167	-4.833	46.000
660.500	1.889	39.524	41.413	-4.587	46.000
693.480	3.608	37.838	41.446	-4.554	46.000
792.420	6.391	38.252	44.643	-1.357	46.000
858.380	6.685	37.430	44.115	-1.885	46.000
Vertical					
55.220	-10.927	41.541	30.614	-9.386	40.000
396.660	-2.039	36.561	34.522	-11.478	46.000
660.500	-1.111	39.740	38.629	-7.371	46.000
693.480	1.748	37.924	39.672	-6.328	46.000
792.420	2.681	36.474	39.155	-6.845	46.000
924.340	3.149	31.588	34.737	-11.263	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 : IEEE 802.11a/b/g miniPCI module
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2437 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
396.660	0.771	39.778	40.549	-5.451	46.000
462.620	3.589	38.037	41.626	-4.374	46.000
693.480	3.608	38.498	42.106	-3.894	46.000
792.420	6.391	38.230	44.621	-1.379	46.000
813.760	6.296	37.476	43.772	-2.228	46.000
924.340	6.589	35.574	42.163	-3.837	46.000
Vertical					
47.460	-11.425	39.557	28.132	-11.868	40.000
396.660	-2.039	37.695	35.656	-10.344	46.000
528.580	1.164	30.586	31.750	-14.250	46.000
693.480	1.748	37.985	39.733	-6.267	46.000
792.420	2.681	37.372	40.053	-5.947	46.000
924.340	3.149	32.548	35.697	-10.303	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.

4. RF Antenna conducted test

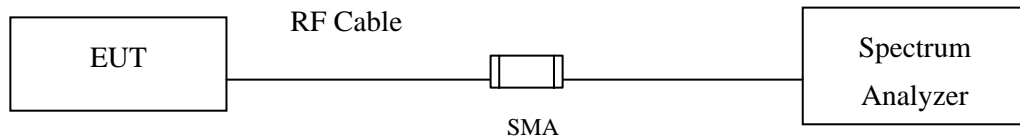
4.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

4.2. Test Setup

RF antenna Conducted Measurement:



4.3. 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 30 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)).

4.4. 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.

4.5. Uncertainty

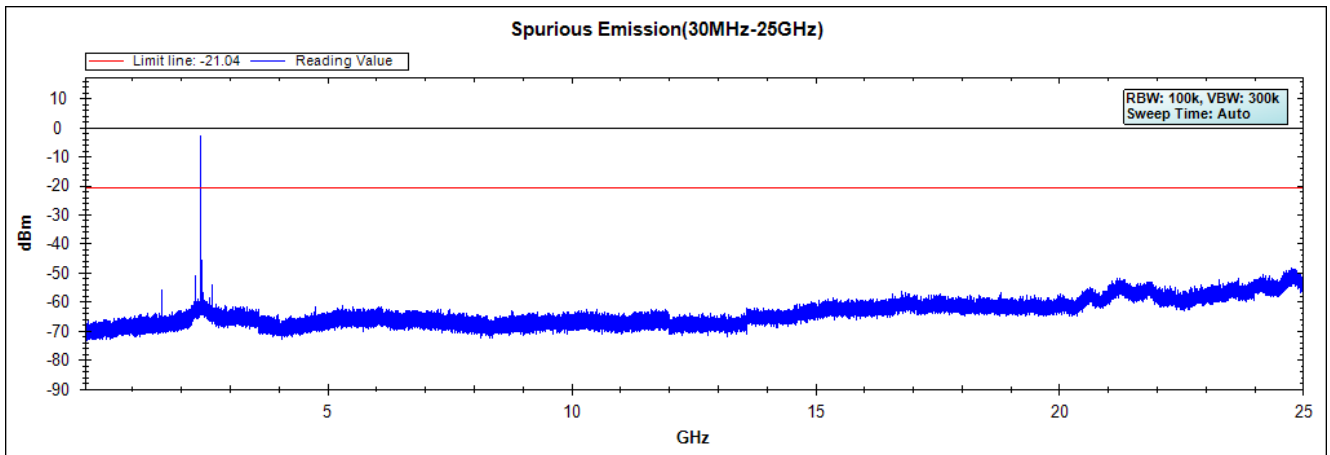
The measurement uncertainty

Conducted is defined as $\pm 1.27\text{dB}$

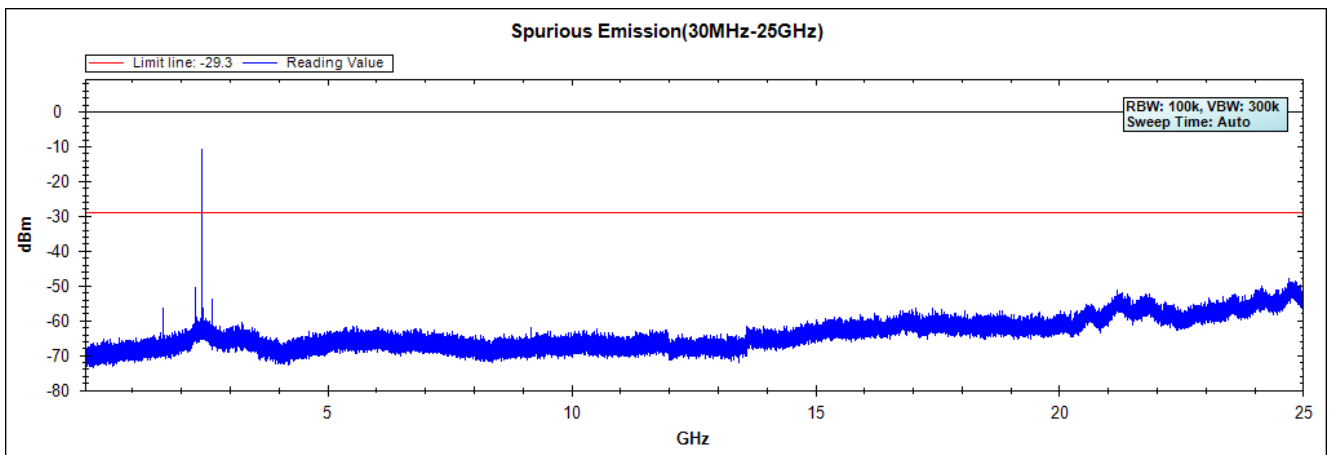
4.6. Test Result of RF antenna conducted test

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : RF antenna conducted test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW

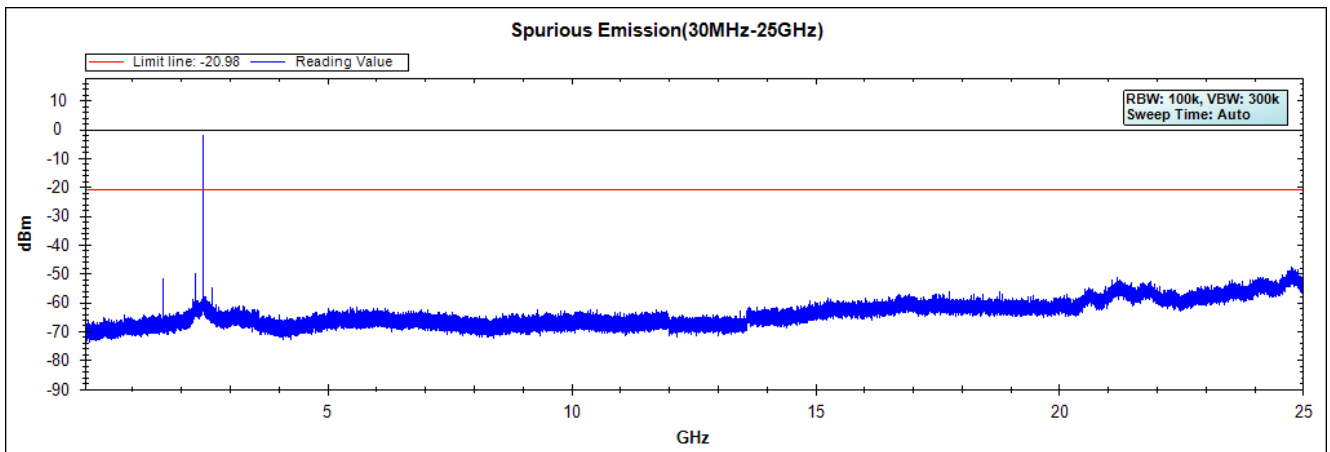
Channel 01 (2412MHz) 30MHz-25GHz



Channel 06 (2437MHz) 30MHz -25GHz



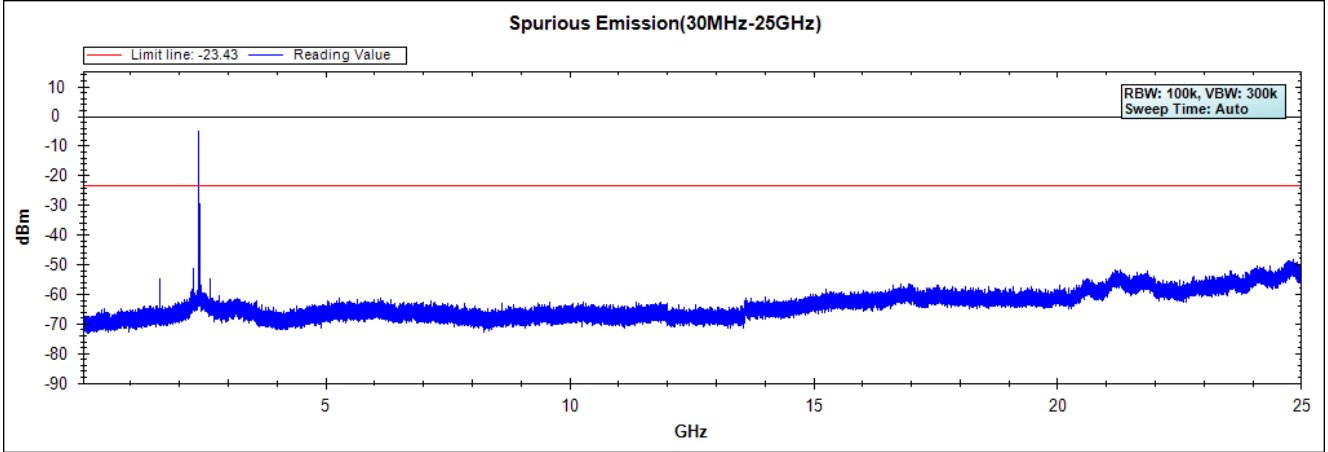
Channel 11 (2462MHz) 30MHz -25GHz



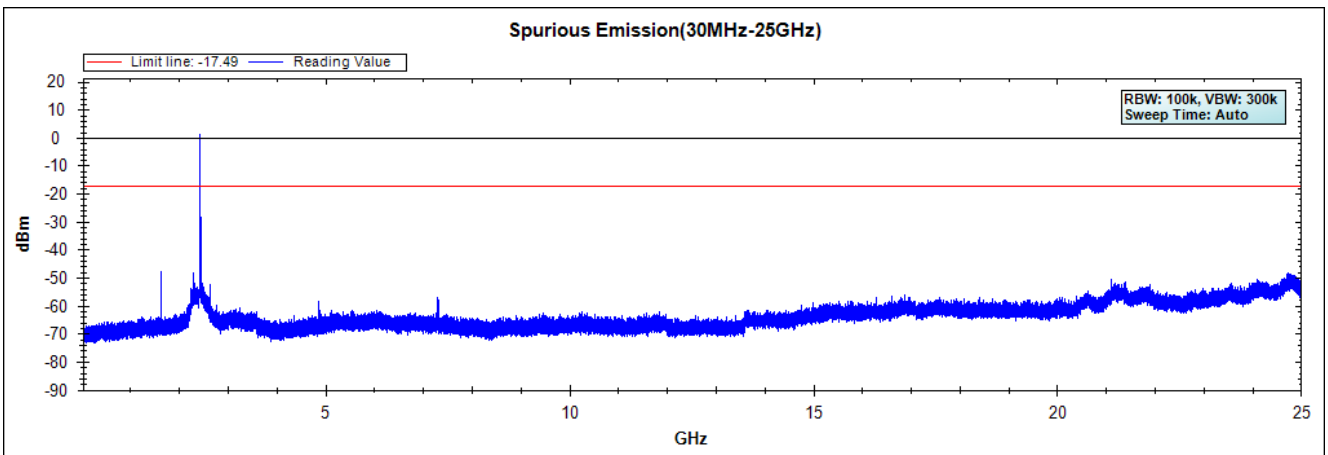
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : IEEE 802.11a/b/g miniPCI module
Test Item : RF Antenna Conducted Spurious
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit-10MHz BW

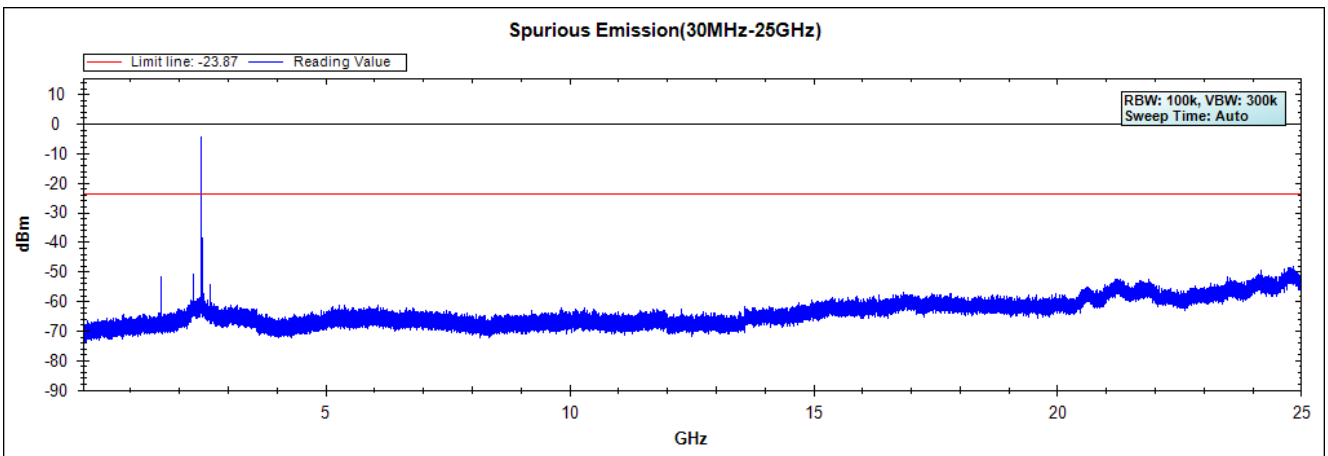
Channel 01 (2412MHz) 30MHz -25GHz



Channel 06 (2437MHz) 30MHz -25GHz



Channel 11 (2462MHz) 30MHz -25GHz



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

5. Band Edge

5.1. Test Equipment

RF Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

RF Radiated Measurement:

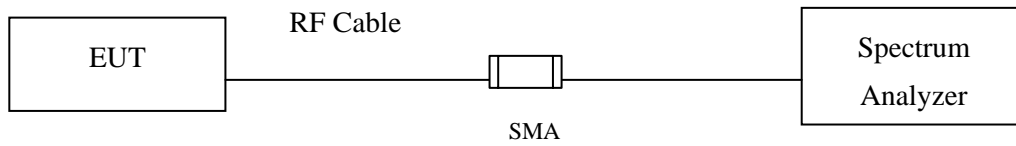
The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct, 2015
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar, 2016
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2016
	X	Horn Antenna	TRC	AH-0801/95051	Aug, 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan, 2016
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul, 2015
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul, 2015

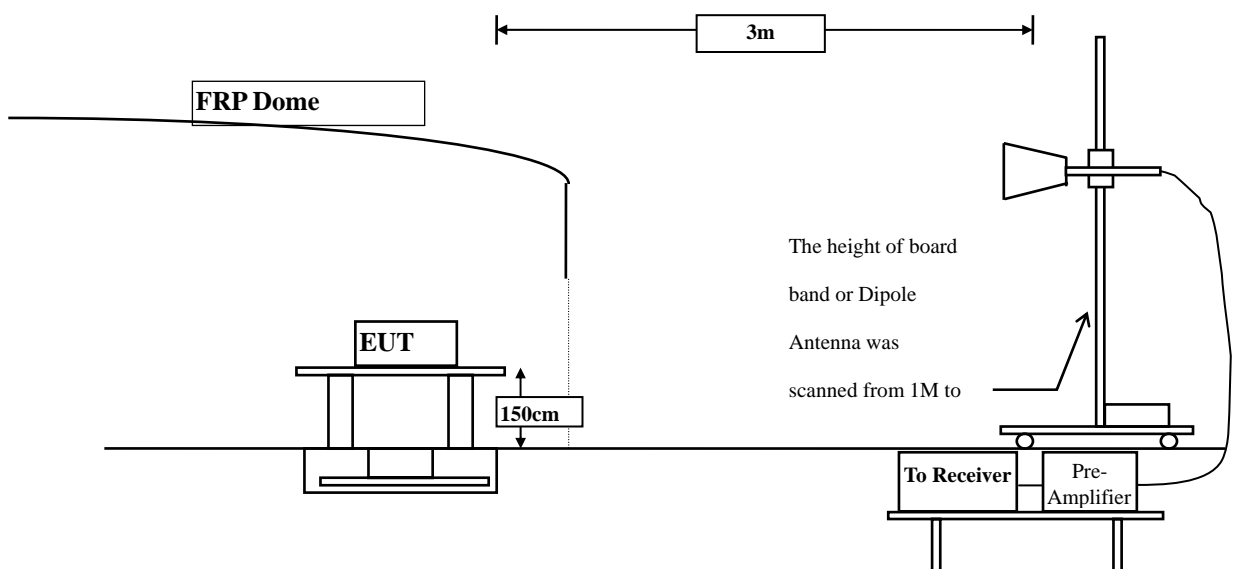
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

5.2. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



5.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 30dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

5.4. 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.

5.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

5.6. Test Result of Band Edge

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2412MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2383.768	31.485	27.412	58.897	74.00	54.00	Pass
01 (Peak)	2390.000	31.509	25.178	56.687	74.00	54.00	Pass
01 (Peak)	2395.942	31.537	27.581	59.118	--	--	--
01 (Peak)	2400.000	31.561	26.053	57.614	--	--	--
01 (Peak)	2411.739	31.636	75.093	106.729	--	--	--
01 (Average)	2347.246	31.342	14.319	45.661	74.00	54.00	Pass
01 (Average)	2390.000	31.509	13.593	45.102	74.00	54.00	Pass
01 (Average)	2391.884	31.517	13.786	45.303	--	--	--
01 (Average)	2400.000	31.561	13.628	45.189	--	--	--
01 (Average)	2412.609	31.643	61.192	92.835	--	--	--

Figure Channel 01: Horizontal (Peak)

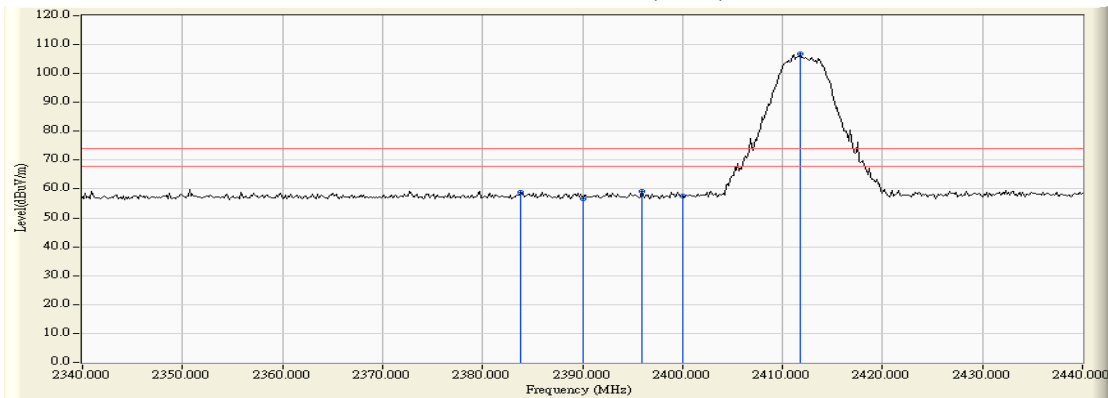
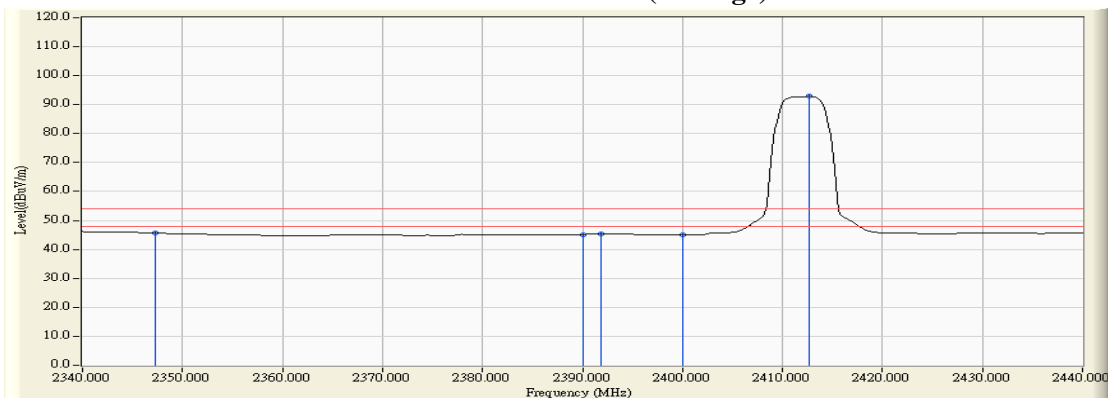


Figure Channel 01: Horizontal (Average)



- 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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2412MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2380.000	30.962	27.726	58.688	74.00	54.00	Pass
01 (Peak)	2390.000	30.915	26.183	57.098	74.00	54.00	Pass
01 (Peak)	2395.217	30.899	27.211	58.111	--	--	--
01 (Peak)	2400.000	30.912	25.368	56.280	--	--	--
01 (Peak)	2412.029	30.950	63.134	94.083	--	--	--
01 (Average)	2350.580	31.098	14.010	45.108	74.00	54.00	Pass
01 (Average)	2390.000	30.915	13.505	44.420	--	--	--
01 (Average)	2400.000	30.912	13.363	44.275	--	--	--
01 (Average)	2412.609	30.953	49.020	79.973	--	--	--

Figure Channel 01: Vertical (Peak)

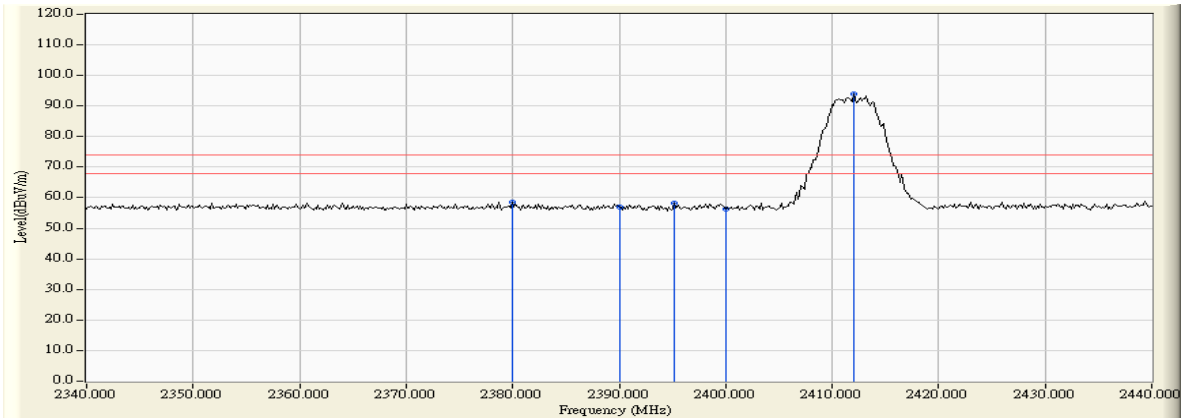
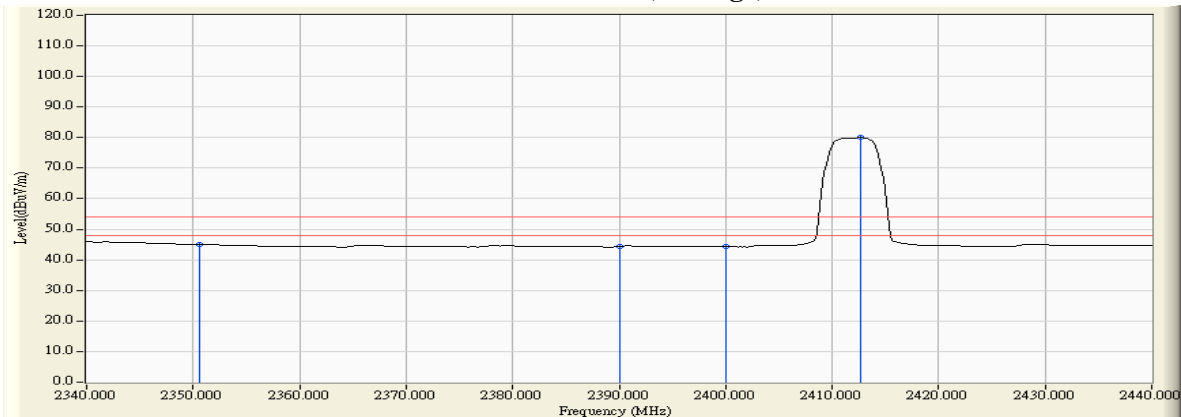


Figure Channel 01: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2417MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
02 (Peak)	2384.203	31.486	28.372	59.858	74.00	54.00	Pass
02 (Peak)	2390.000	31.509	26.147	57.656	74.00	54.00	Pass
02 (Peak)	2396.812	31.542	27.759	59.301	--	--	--
02 (Peak)	2400.000	31.561	26.715	58.276	--	--	--
02 (Peak)	2418.261	31.686	80.095	111.781	--	--	--
02 (Average)	2344.348	31.330	15.036	46.366	74.00	54.00	Pass
02 (Average)	2390.000	31.509	14.065	45.574	--	--	--
02 (Average)	2400.000	31.561	14.423	45.984	--	--	--
02 (Average)	2418.116	31.685	67.730	99.415	--	--	--

Figure Channel 01: Horizontal (Peak)

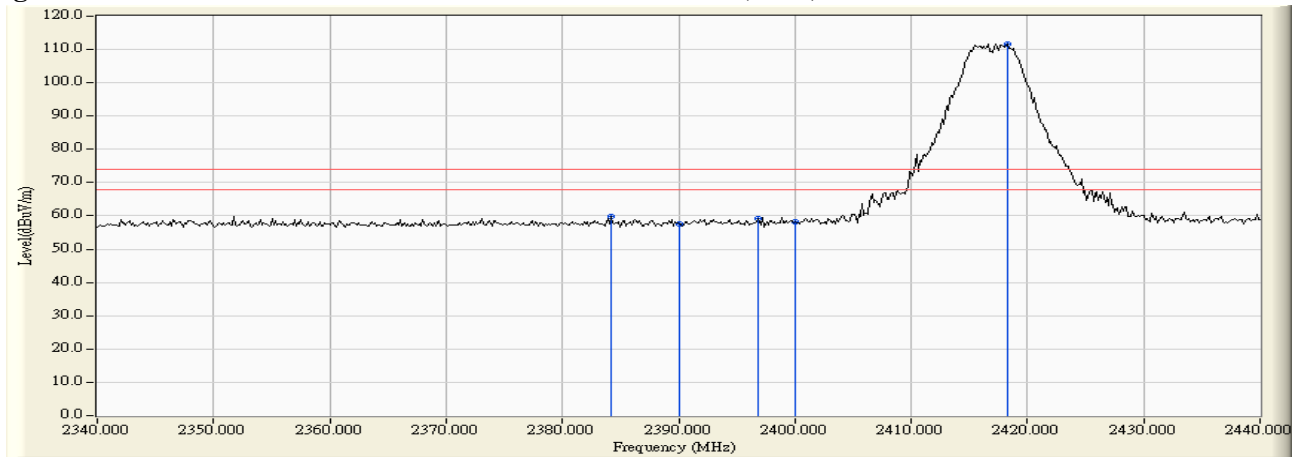
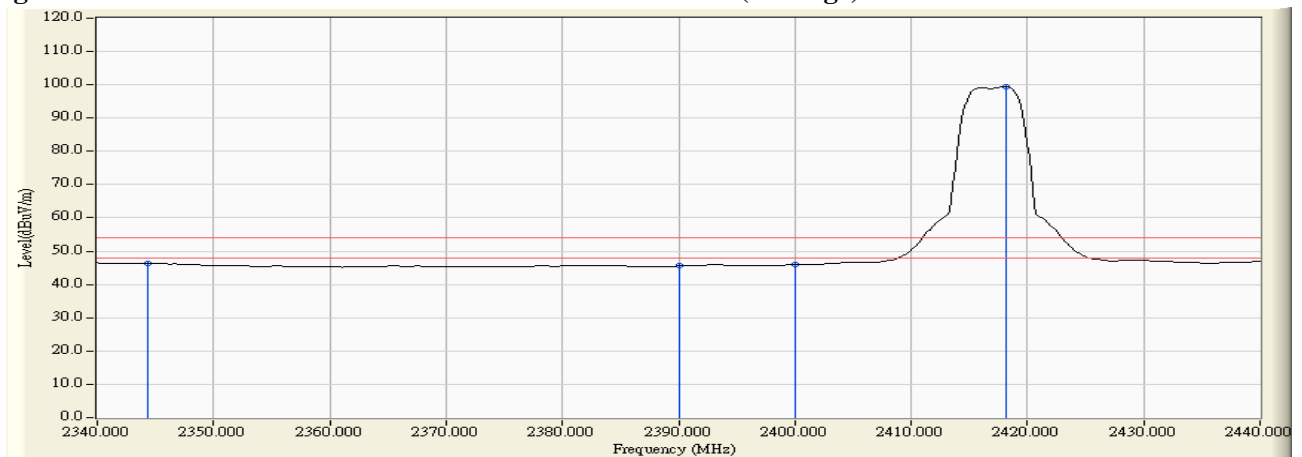


Figure Channel 01: Horizontal (Average)



- 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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2417MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
02 (Peak)	2387.101	30.929	27.830	58.759	74.00	54.00	Pass
02 (Peak)	2390.000	30.915	26.622	57.537	74.00	54.00	Pass
02 (Peak)	2394.638	30.898	27.388	58.287	--	--	--
02 (Peak)	2400.000	30.912	25.827	56.739	--	--	--
02 (Peak)	2418.696	30.994	69.356	100.351	--	--	--
02 (Average)	2351.159	31.096	13.972	45.067	74.00	54.00	Pass
02 (Average)	2390.000	30.915	13.532	44.447	--	--	--
02 (Average)	2400.000	30.912	13.419	44.331	--	--	--
02 (Average)	2417.971	30.990	56.156	87.146	--	--	--

Figure Channel 01: Vertical (Peak)

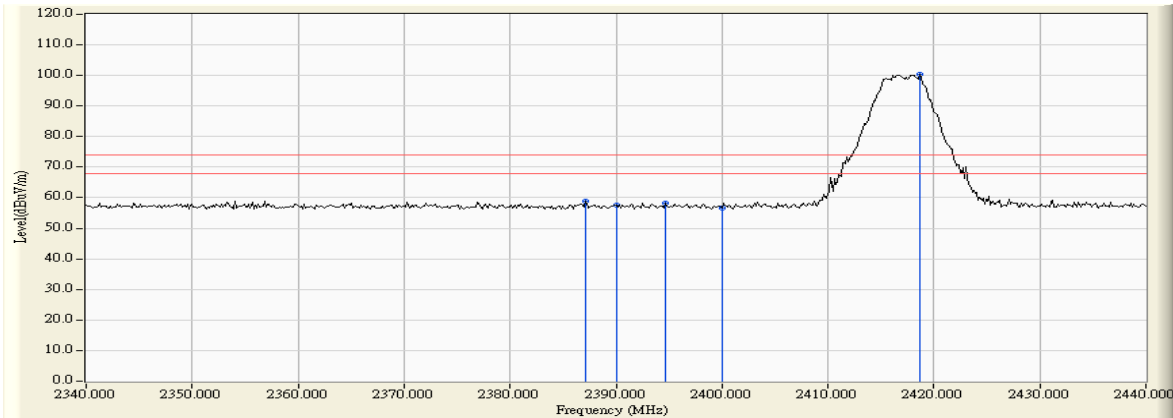
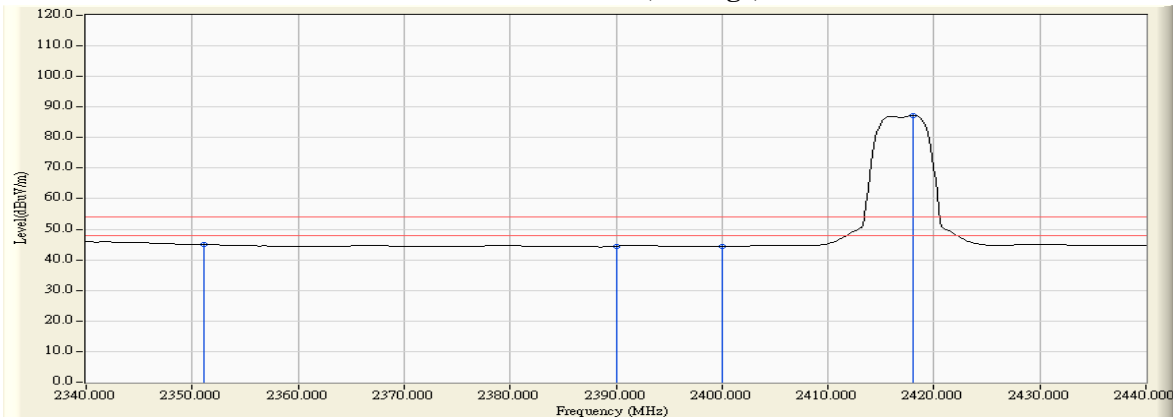


Figure Channel 01: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2457MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
10 (Peak)	2457.703	31.987	82.076	114.063	--	--	--
10 (Peak)	2483.500	32.182	26.754	58.936	74.00	54.00	Pass
10 (Peak)	2498.862	32.271	29.309	61.581	74.00	54.00	Pass
10 (Average)	2457.993	31.989	68.934	100.923	--	--	--
10 (Average)	2483.500	32.182	14.796	46.978	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

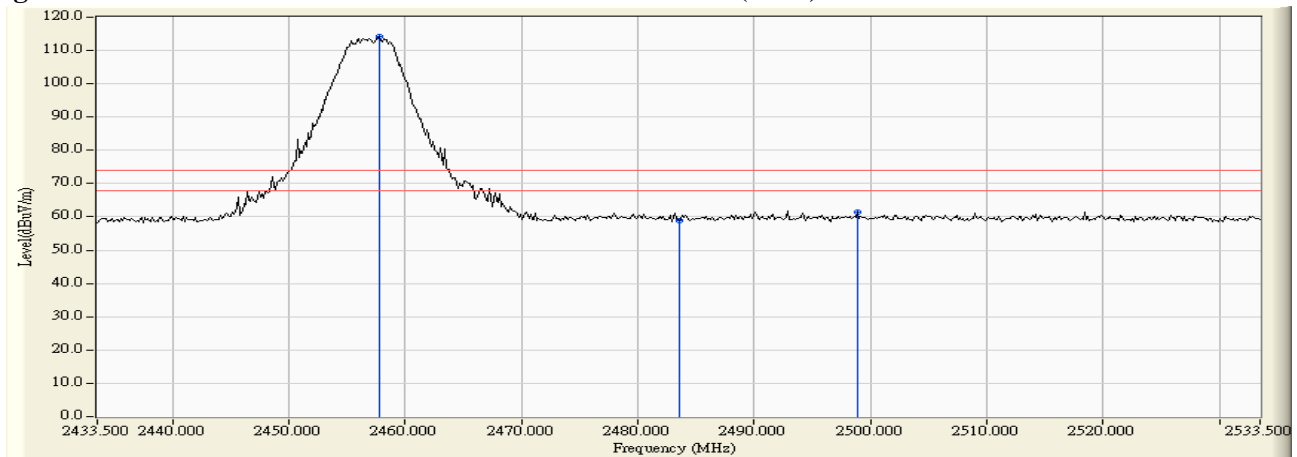
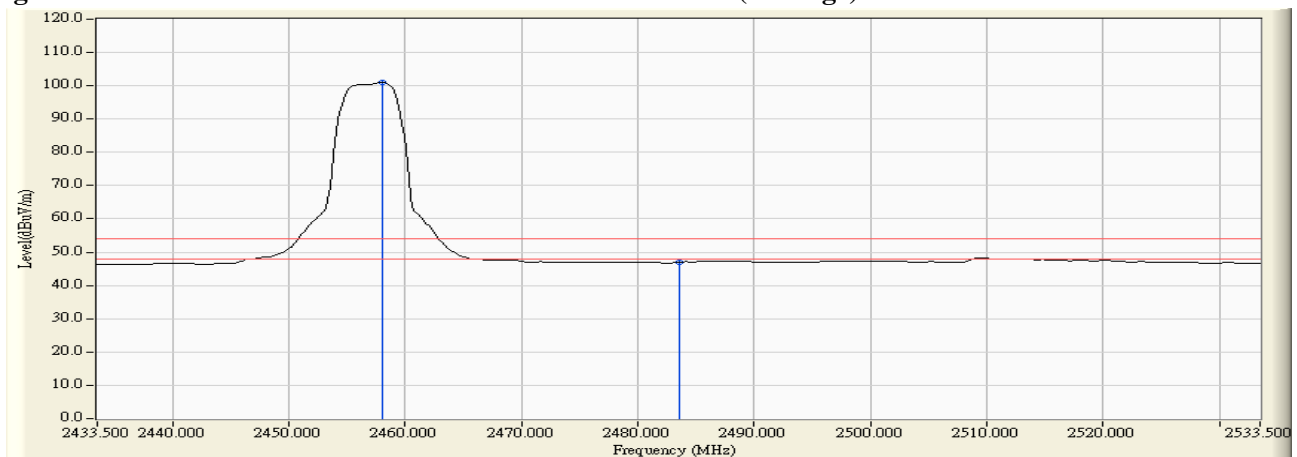


Figure Channel 11: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2457MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
10 (Peak)	2457.993	31.263	69.954	101.217	--	--	--
10 (Peak)	2483.500	31.435	27.058	58.493	74.00	54.00	Pass
10 (Peak)	2510.891	31.549	27.236	58.785	74.00	54.00	Pass
10 (Average)	2457.993	31.263	57.308	88.571	--	--	--
10 (Average)	2483.500	31.435	13.983	45.418	74.00	54.00	Pass
10 (Average)	2511.906	31.550	15.201	46.752	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

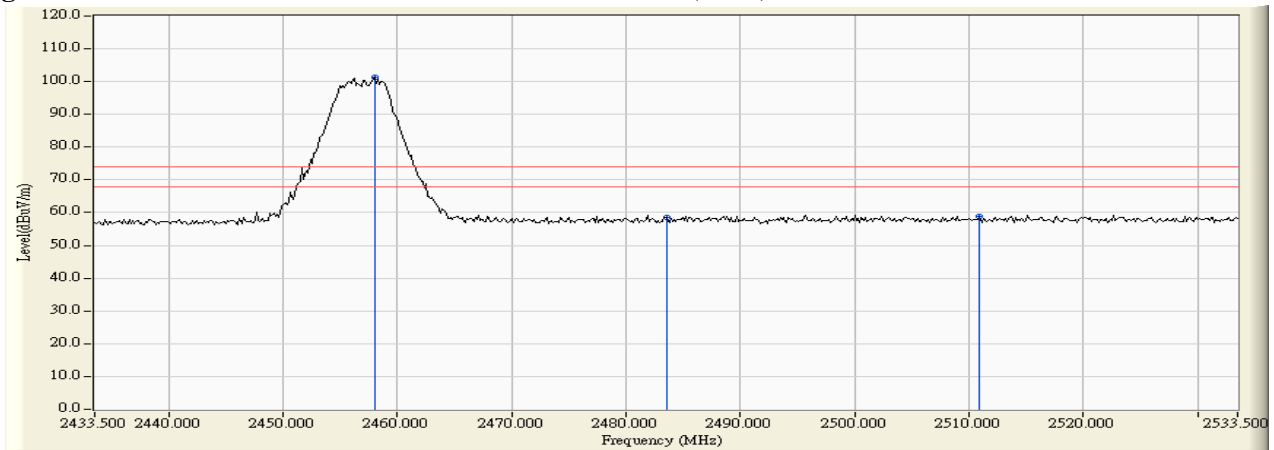
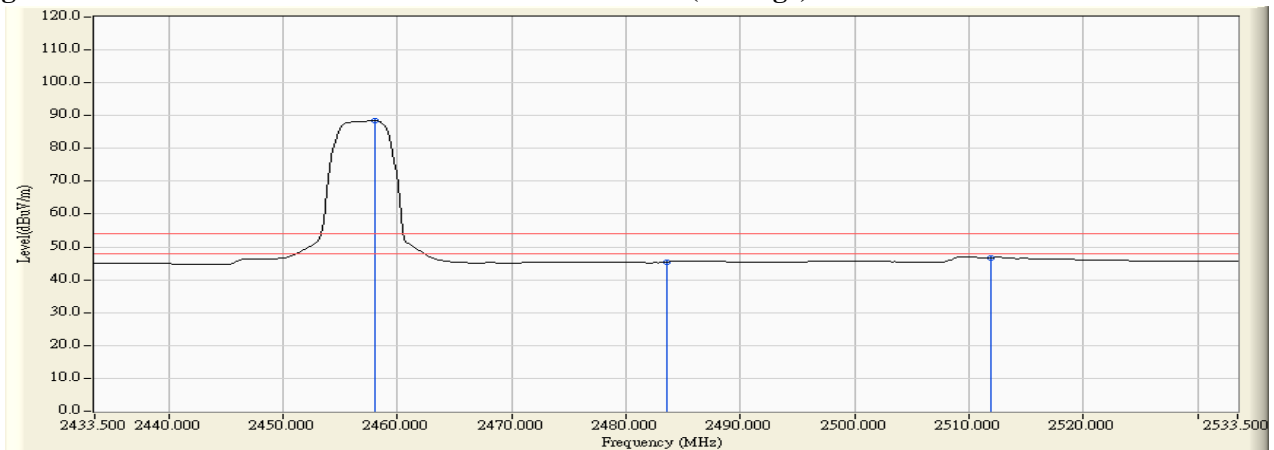


Figure Channel 11: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2462MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
11 (Peak)	2461.181	32.014	76.597	108.610	--	--	--
11 (Peak)	2483.500	32.182	27.220	59.402	74.00	54.00	Pass
11 (Peak)	2497.993	32.273	28.551	60.824	74.00	54.00	Pass
11 (Average)	2460.891	32.011	63.614	95.625	--	--	--
11 (Average)	2483.500	32.182	14.147	46.329	74.00	54.00	Pass
11 (Average)	2512.341	32.249	15.345	47.593	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

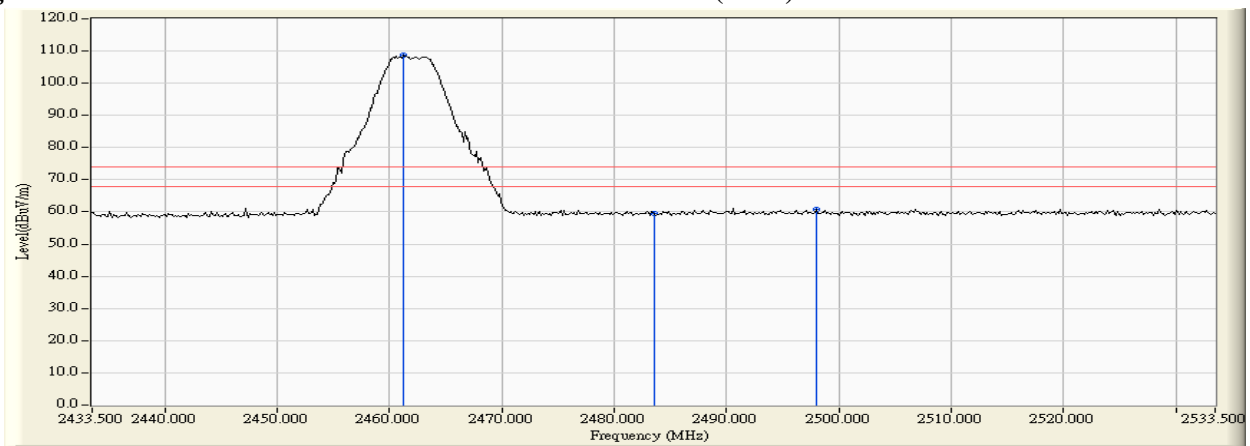
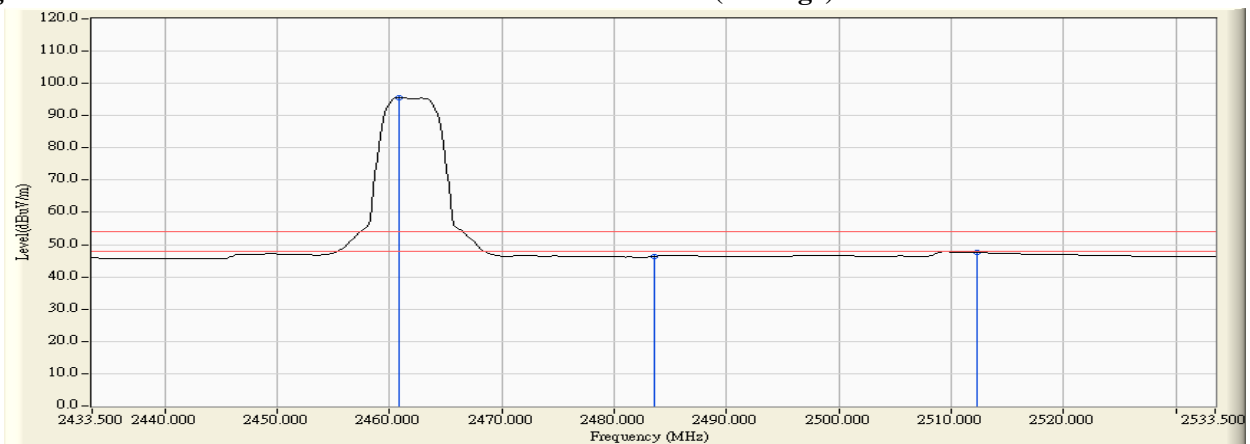


Figure Channel 11: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2462MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
11 (Peak)	2462.630	31.295	64.570	95.865	--	--	--
11 (Peak)	2483.500	31.435	26.630	58.065	74.00	54.00	Pass
11 (Peak)	2505.529	31.537	27.736	59.274	74.00	54.00	Pass
11 (Average)	2461.036	31.284	52.240	83.524	--	--	--
11 (Average)	2483.500	31.435	13.944	45.379	74.00	54.00	Pass
11 (Average)	2510.457	31.548	15.303	46.851	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

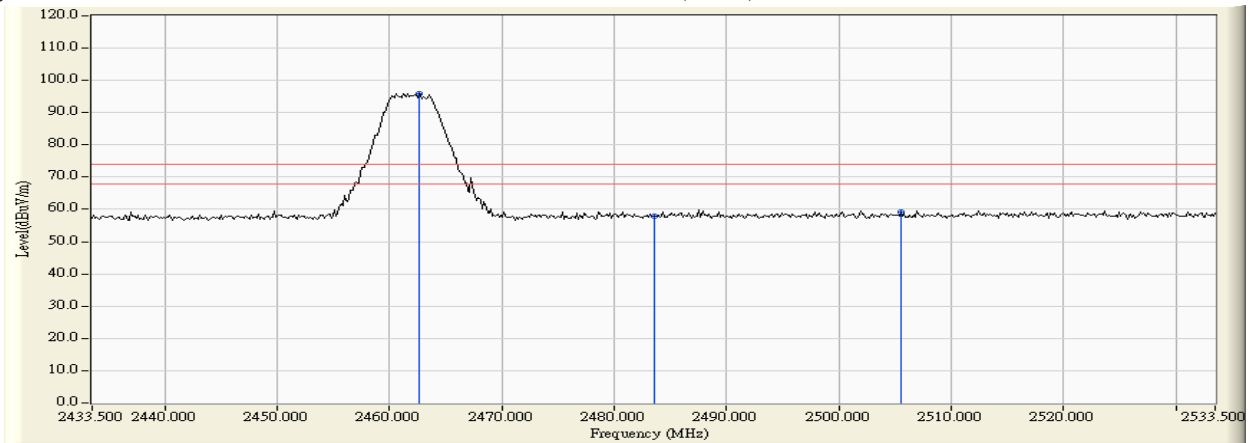
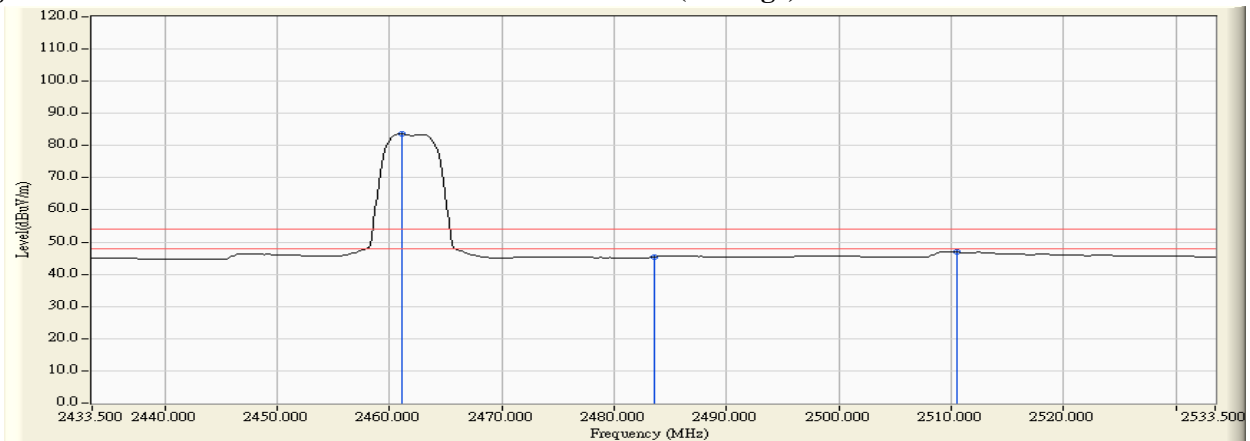


Figure Channel 11: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2412MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2386.667	31.496	27.269	58.765	74.00	54.00	Pass
01 (Peak)	2390.000	31.509	26.441	57.950	74.00	54.00	Pass
01 (Peak)	2400.000	31.561	34.002	65.563	--	--	--
01 (Peak)	2413.043	31.646	70.604	102.250	--	--	--
01(Average)	2345.797	31.336	14.415	45.751	74.00	54.00	Pass
01(Average)	2390.000	31.509	13.590	45.099	74.00	54.00	Pass
01(Average)	2400.000	31.561	14.099	45.660	--	--	--
01(Average)	2413.043	31.646	56.666	88.312	--	--	--

Figure Channel 01: Horizontal (Peak)

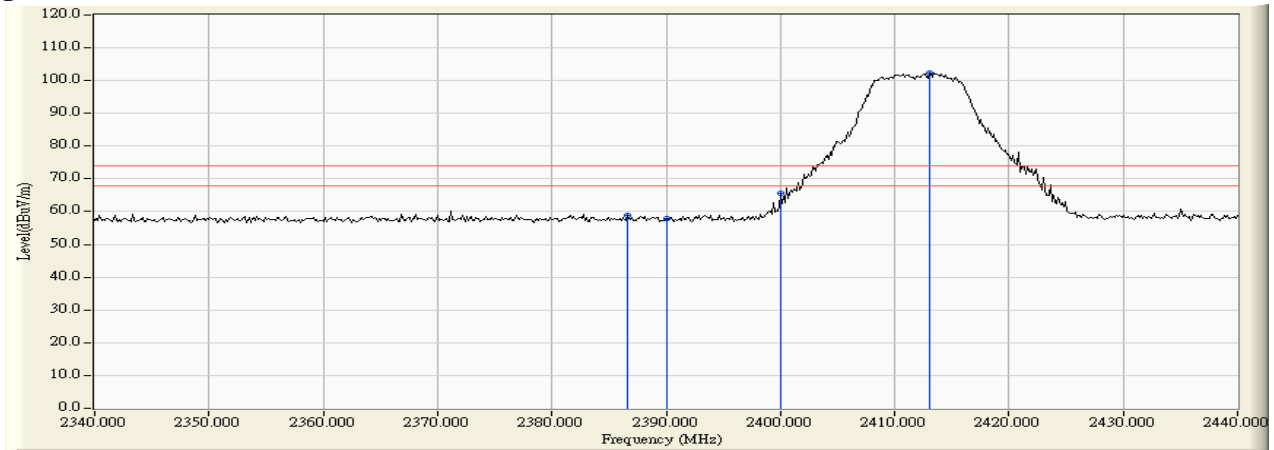
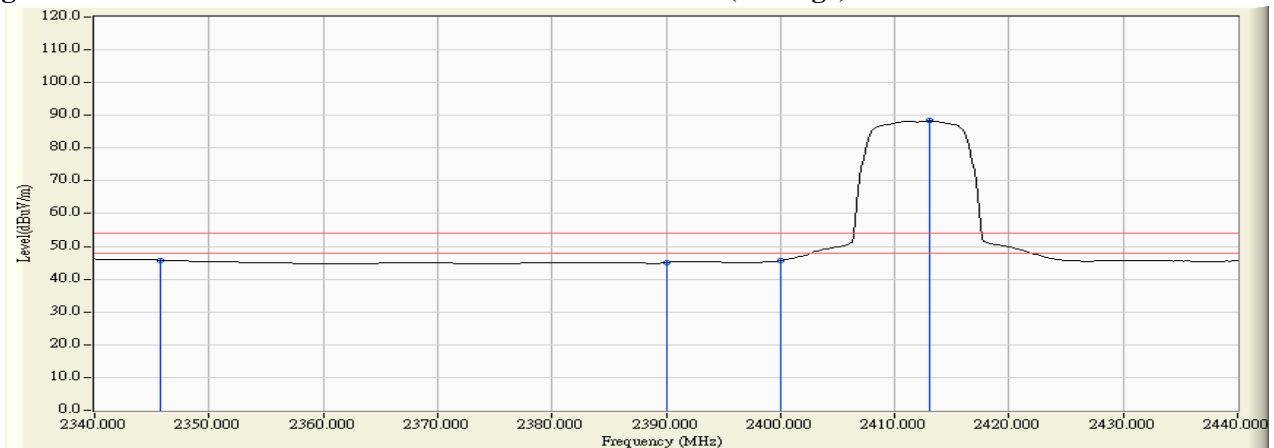


Figure Channel 01: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2412MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2385.797	30.935	27.230	58.165	74.00	54.00	Pass
01 (Peak)	2390.000	30.915	25.285	56.200	74.00	54.00	Pass
01 (Peak)	2393.188	30.901	26.995	57.896	--	--	--
01 (Peak)	2400.000	30.912	25.663	56.575	--	--	--
01 (Peak)	2411.304	30.945	60.093	91.038	--	--	--
01 (Average)	2347.246	31.114	14.173	45.286	74.00	54.00	Pass
01 (Average)	2390.000	30.915	13.491	44.406	74.00	54.00	Pass
01 (Average)	2400.000	30.912	13.394	44.306	--	--	--
01 (Average)	2413.043	30.957	45.780	76.736	--	--	--

Figure Channel 01:

Vertical (Peak)

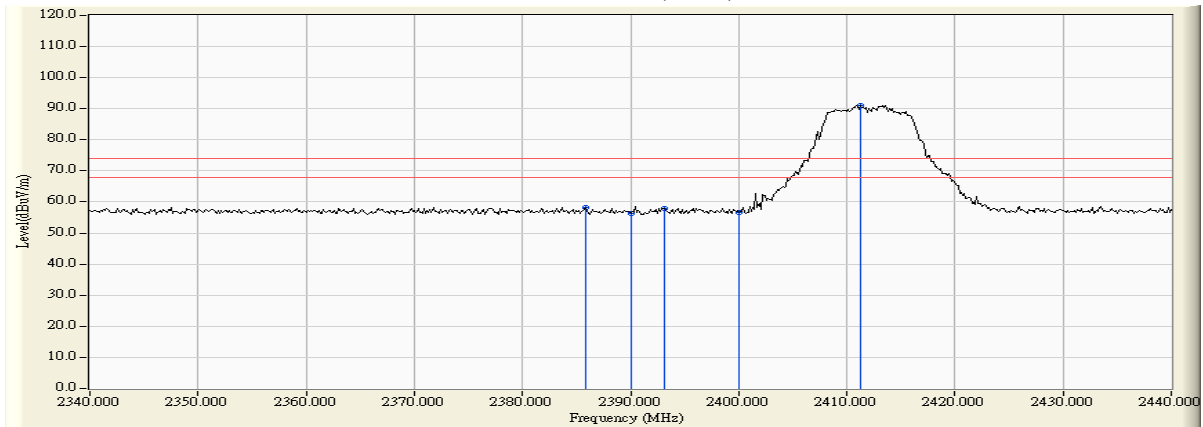
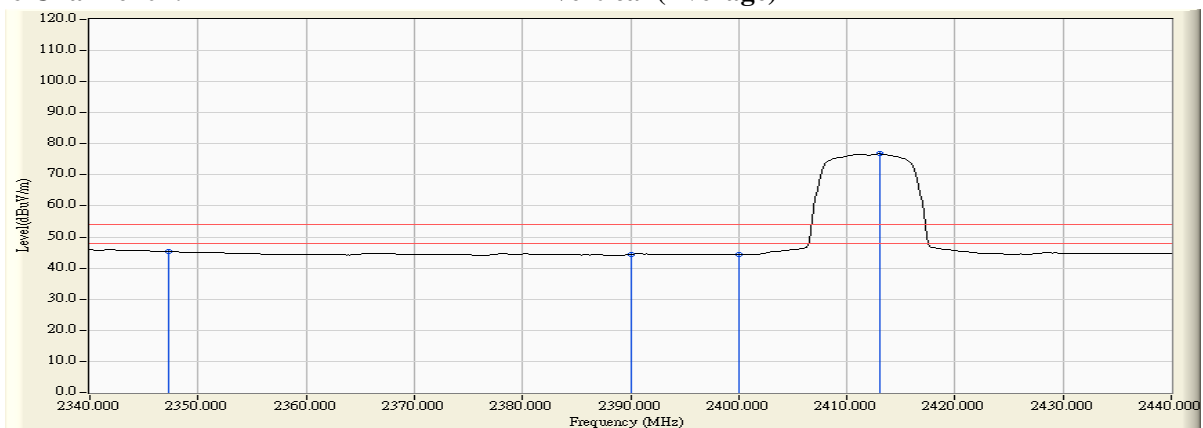


Figure Channel 01:

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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2417MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
02 (Peak)	2385.362	31.492	27.393	58.884	74.00	54.00	Pass
02 (Peak)	2390.000	31.509	25.584	57.093	74.00	54.00	Pass
02 (Peak)	2400.000	31.561	31.530	63.091	--	--	--
02 (Peak)	2419.855	31.699	76.522	108.220	--	--	--
02 (Average)	2346.812	31.340	14.654	45.994	74.00	54.00	Pass
02 (Average)	2390.000	31.509	13.975	45.484	74.00	54.00	Pass
02 (Average)	2400.000	31.561	14.787	46.348	--	--	--
02 (Average)	2420.290	31.702	64.650	96.352	--	--	--

Figure Channel 01: Horizontal (Peak)

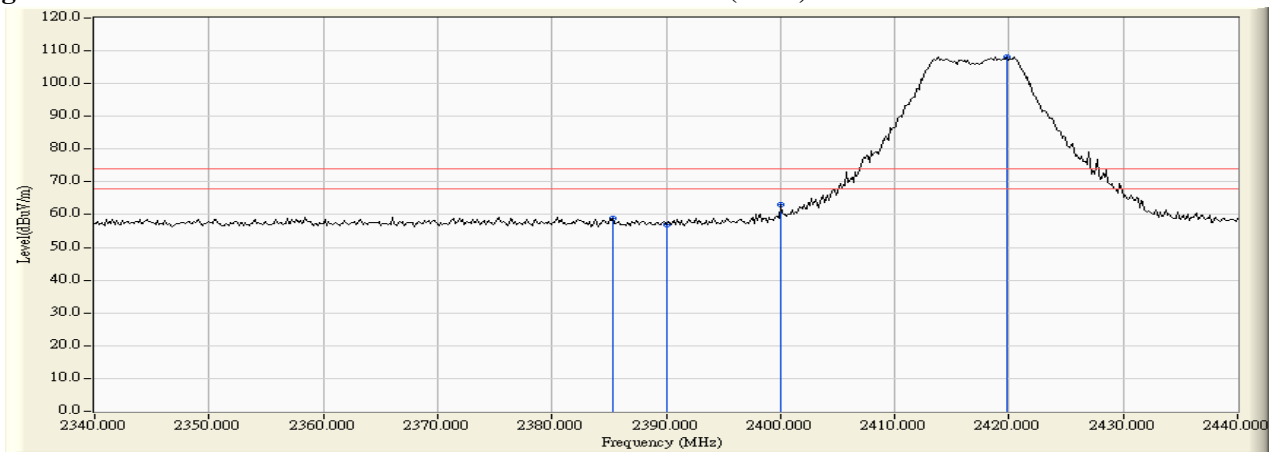
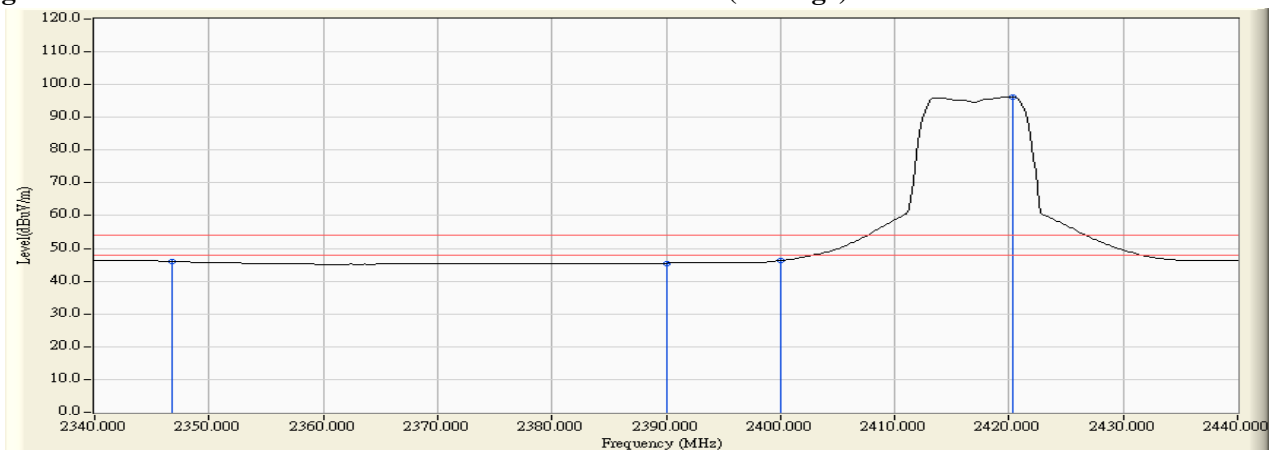


Figure Channel 01: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2417MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
02 (Peak)	2388.261	30.923	26.851	57.774	74.00	54.00	Pass
02 (Peak)	2390.000	30.915	25.233	56.148	74.00	54.00	Pass
02 (Peak)	2397.681	30.906	27.237	58.143	--	--	--
02 (Peak)	2400.000	30.912	25.092	56.004	--	--	--
02 (Peak)	2419.855	31.003	65.587	96.590	--	--	--
02 (Average)	2350.145	31.100	14.031	45.131	74.00	54.00	Pass
02 (Average)	2390.000	30.915	13.506	44.421	74.00	54.00	Pass
02 (Average)	2400.000	30.912	13.427	44.339	--	--	--
02 (Average)	2420.145	31.005	53.816	84.821	--	--	--

Figure Channel 01: Vertical (Peak)

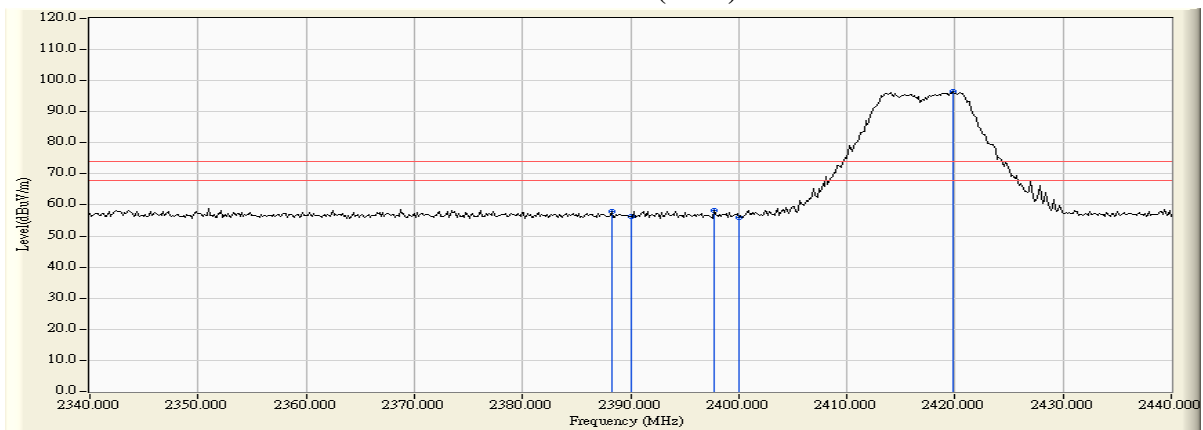
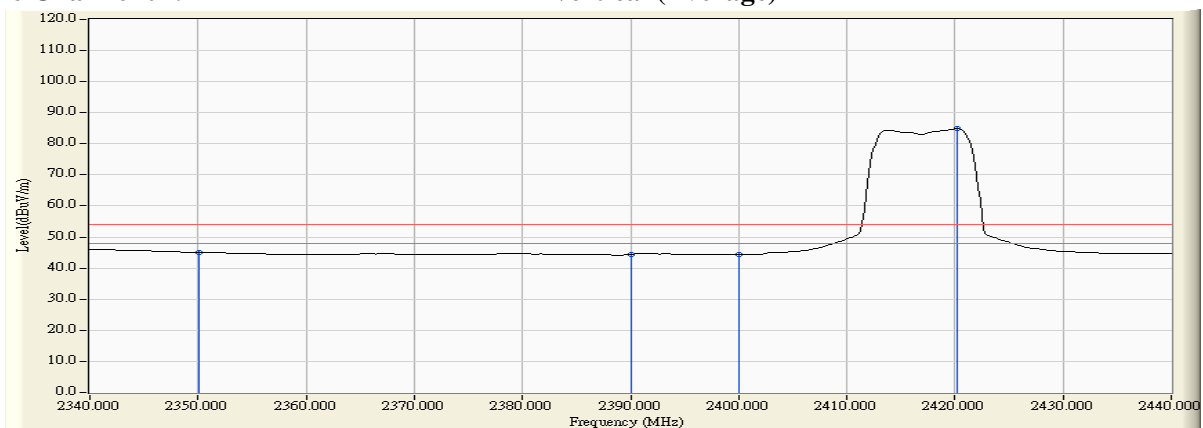


Figure Channel 01: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2457MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
10 (Peak)	2458.283	31.991	78.296	110.287	--	--	--
10 (Peak)	2483.500	32.182	26.954	59.136	74.00	54.00	Pass
10 (Peak)	2493.645	32.259	28.704	60.963	74.00	54.00	Pass
10 (Average)	2458.572	31.993	65.908	97.901	--	--	--
10 (Average)	2483.500	32.182	14.813	46.995	74.00	54.00	Pass
10 (Average)	2510.746	32.251	15.754	48.005	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

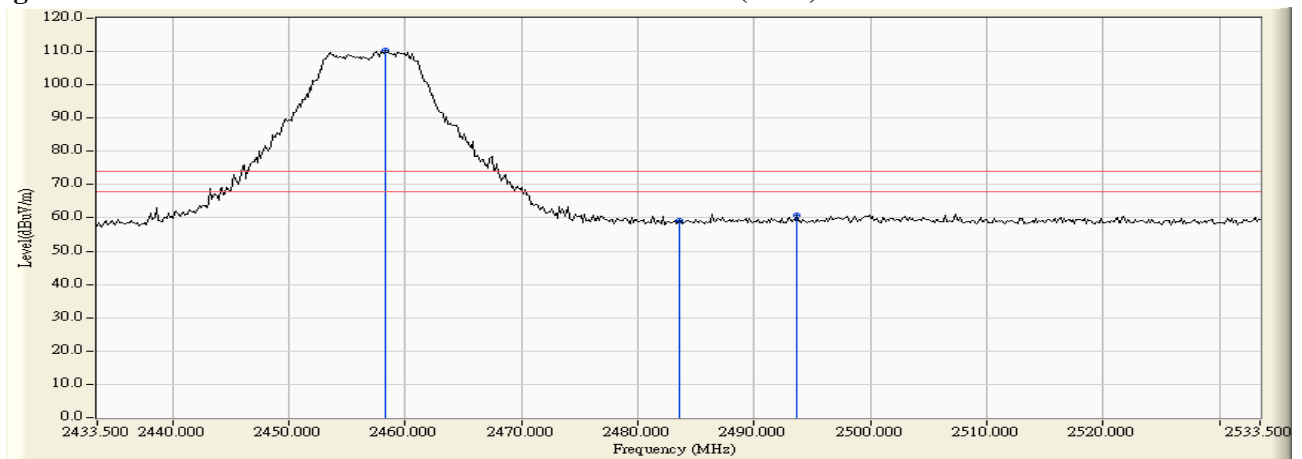
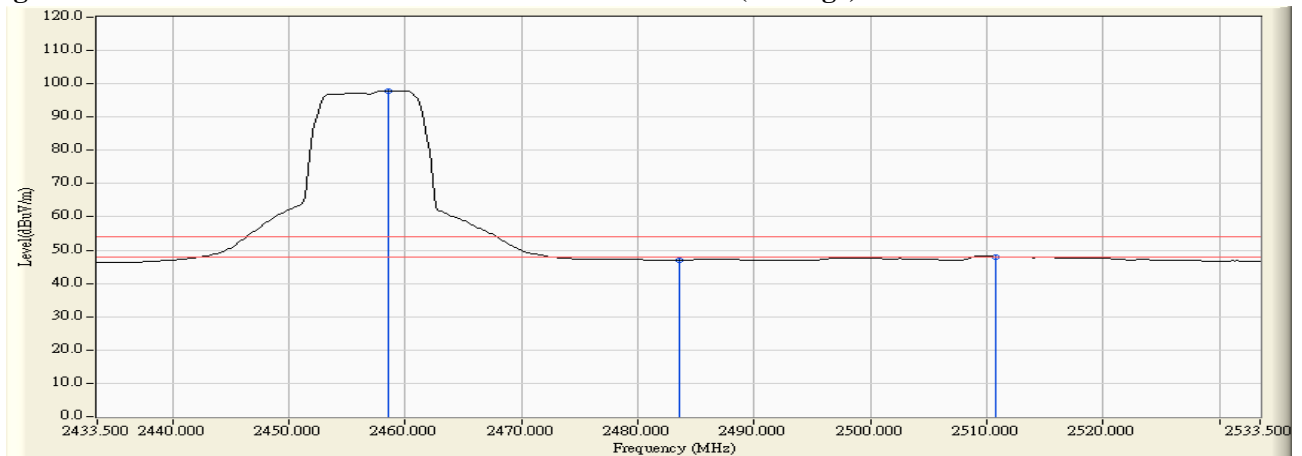


Figure Channel 11: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2457MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
10 (Peak)	2459.297	31.272	67.149	98.421	--	--	--
10 (Peak)	2483.500	31.435	25.346	56.781	74.00	54.00	Pass
10 (Peak)	2504.080	31.535	28.485	60.020	74.00	54.00	Pass
10 (Average)	2459.442	31.273	54.505	85.778	--	--	--
10 (Average)	2483.500	31.435	13.990	45.425	74.00	54.00	Pass
10 (Average)	2510.601	31.548	15.261	46.809	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

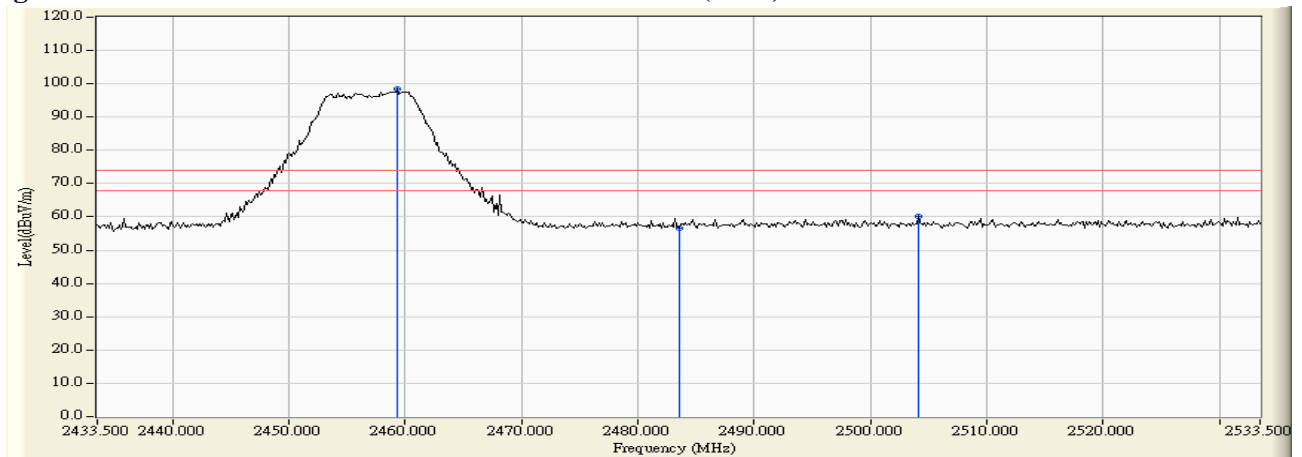


Figure Channel 11: Vertical (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2462MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
11 (Peak)	2460.457	32.008	72.560	104.568	--	--	--
11 (Peak)	2483.500	32.182	26.259	58.441	74.00	54.00	Pass
11 (Peak)	2498.572	32.272	28.874	61.146	74.00	54.00	Pass
11 (Average)	2460.746	32.010	60.386	92.396	--	--	--
11 (Average)	2483.500	32.182	14.107	46.289	74.00	54.00	Pass
11 (Average)	2509.442	32.253	15.609	47.862	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

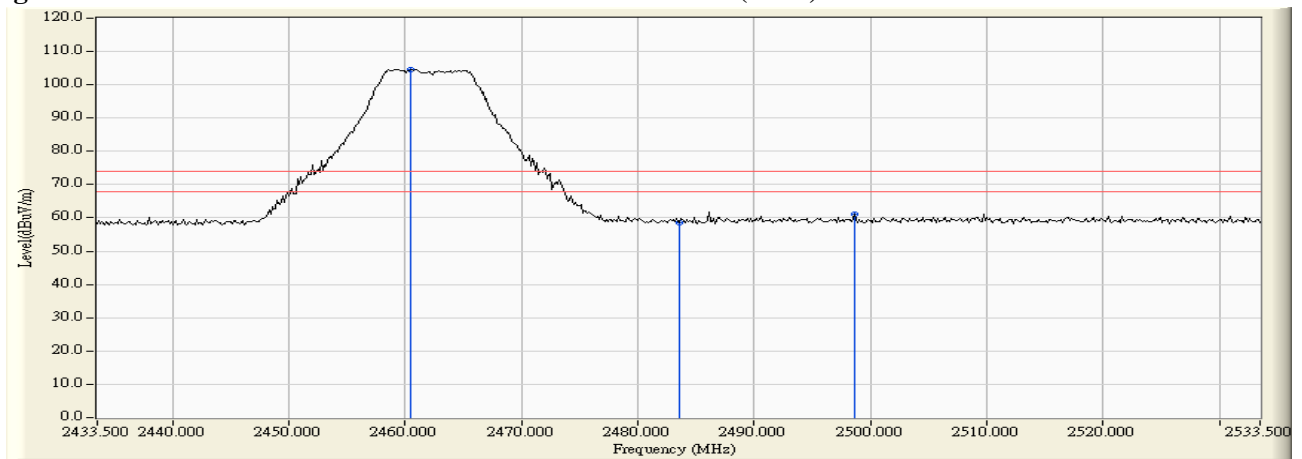
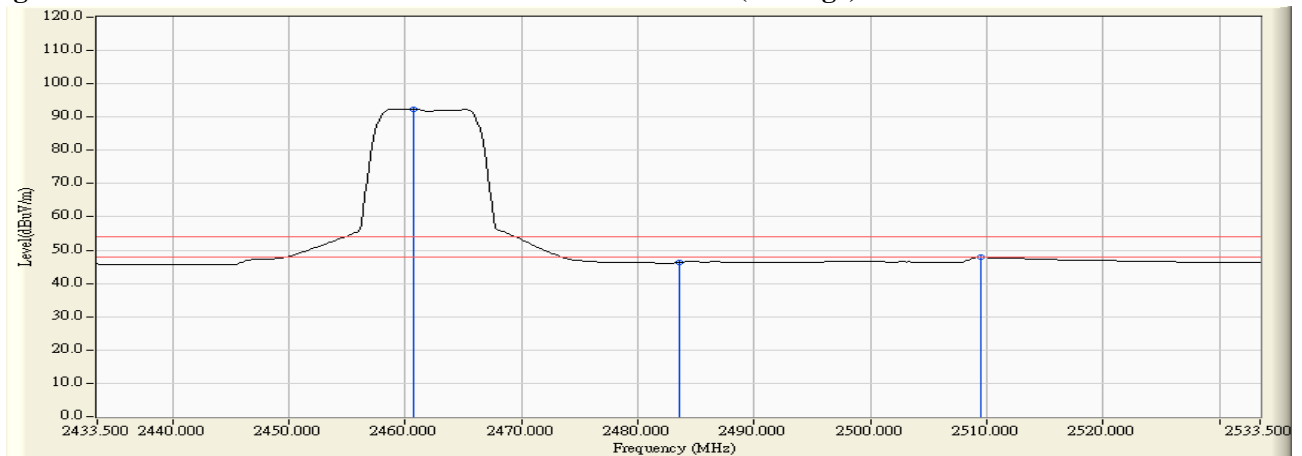


Figure Channel 11: Horizontal (Average)



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 : IEEE 802.11a/b/g miniPCI module
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2462MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
11 (Peak)	2458.862	31.270	61.299	92.568	--	--	--
11 (Peak)	2483.500	31.435	26.627	58.062	74.00	54.00	Pass
11 (Peak)	2497.268	31.522	28.438	59.960	74.00	54.00	Pass
11 (Average)	2459.442	31.273	49.247	80.520	--	--	--
11 (Average)	2483.500	31.435	13.933	45.368	74.00	54.00	Pass
11 (Average)	2508.862	31.544	15.208	46.753	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

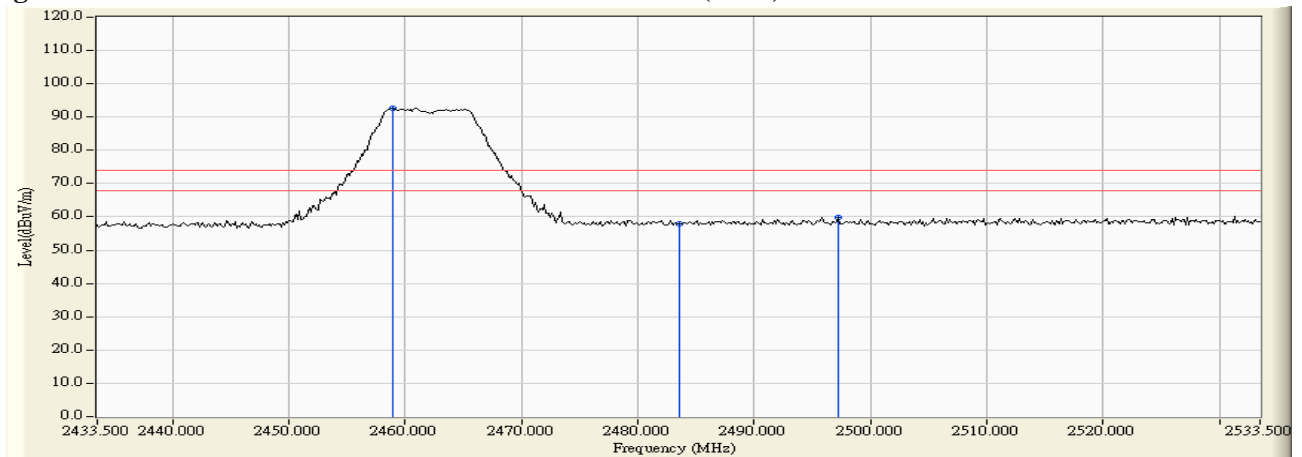
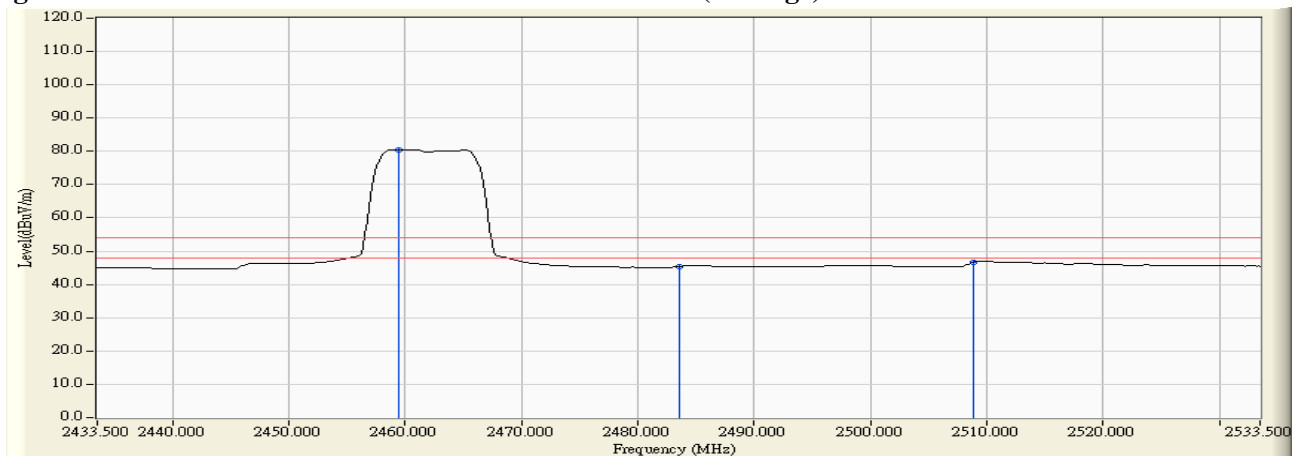


Figure Channel 11: Vertical (Average)



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.

6. Occupied Bandwidth

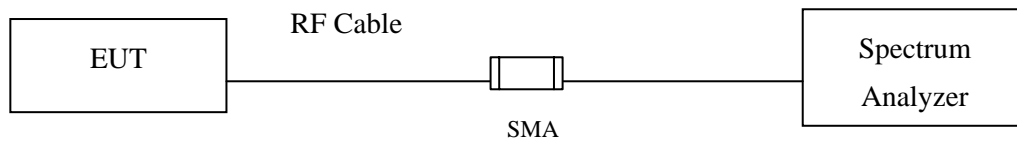
6.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

6.2. Test Setup



6.3. Limits

The minimum bandwidth shall be at least 500 kHz.

6.4. Test Procedure

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

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 * RBW$

6.5. Uncertainty

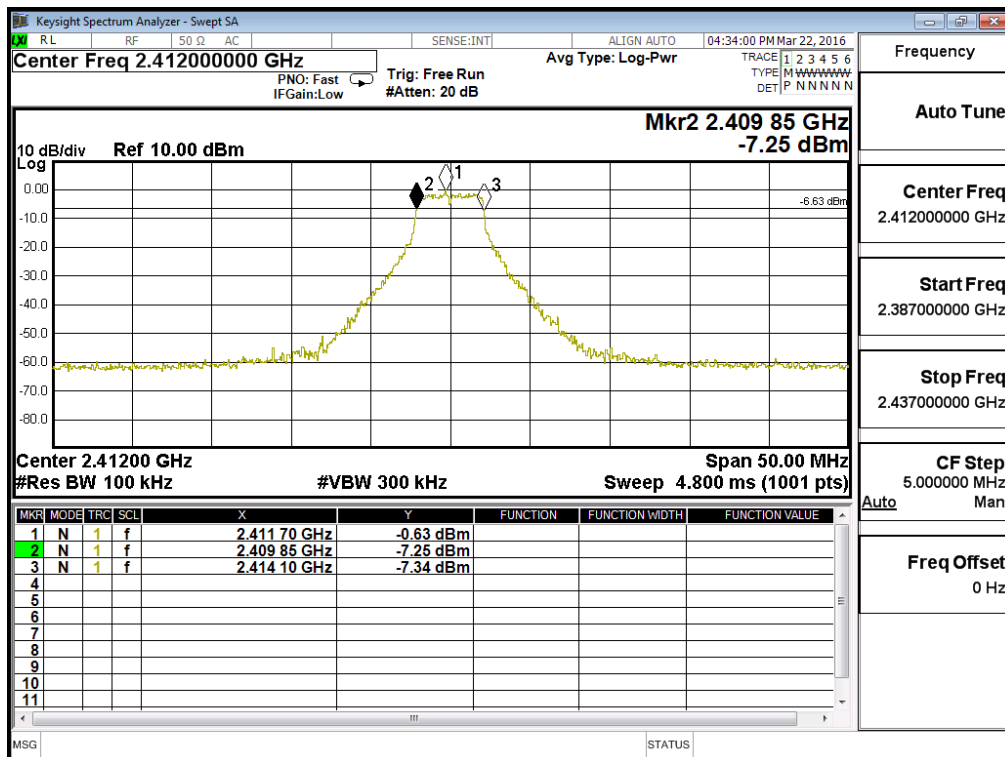
$\pm 150\text{Hz}$

6.6. Test Result of Occupied Bandwidth

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.00	4250	>500	Pass

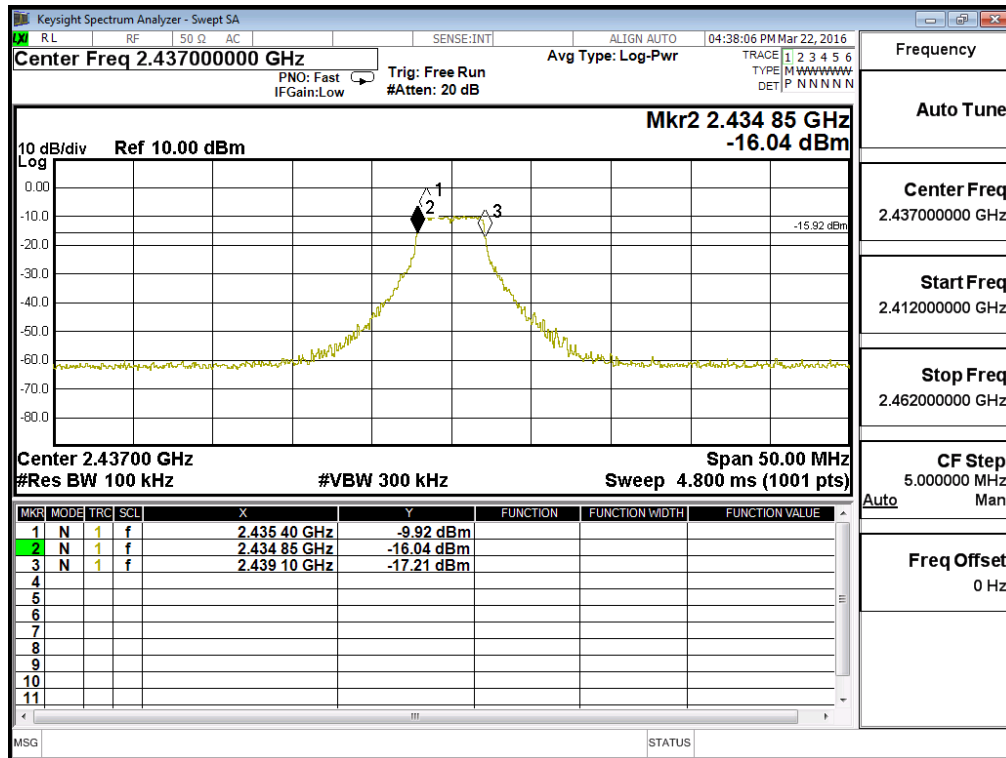
Figure Channel 1:



Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437.00	4300	>500	Pass

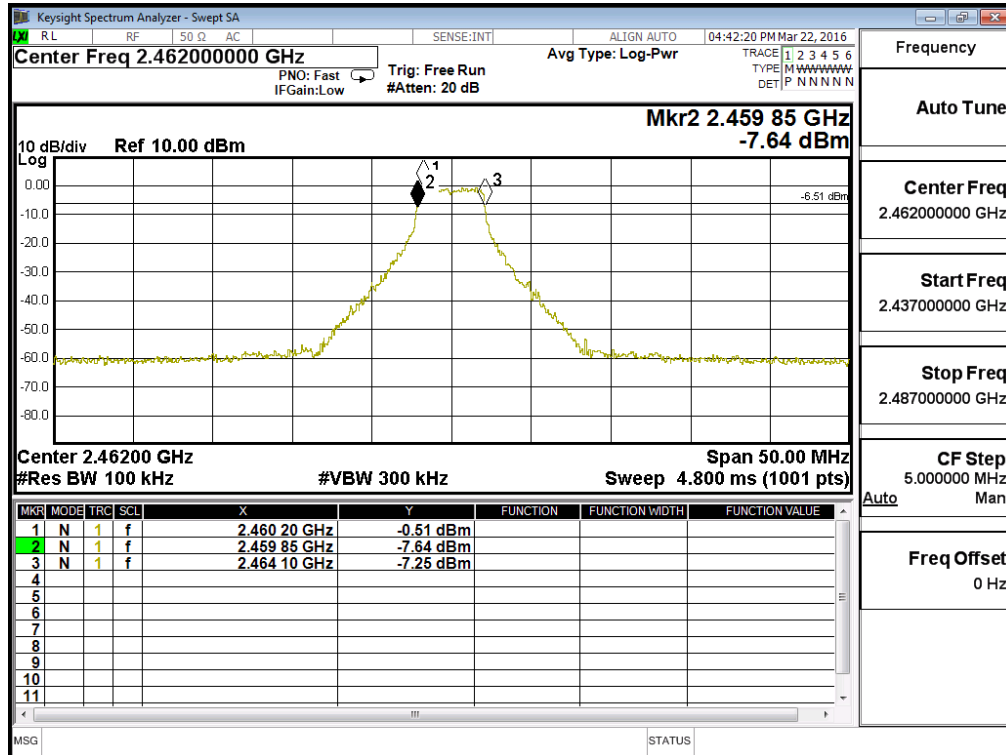
Figure Channel 6:



Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462.00	4250	>500	Pass

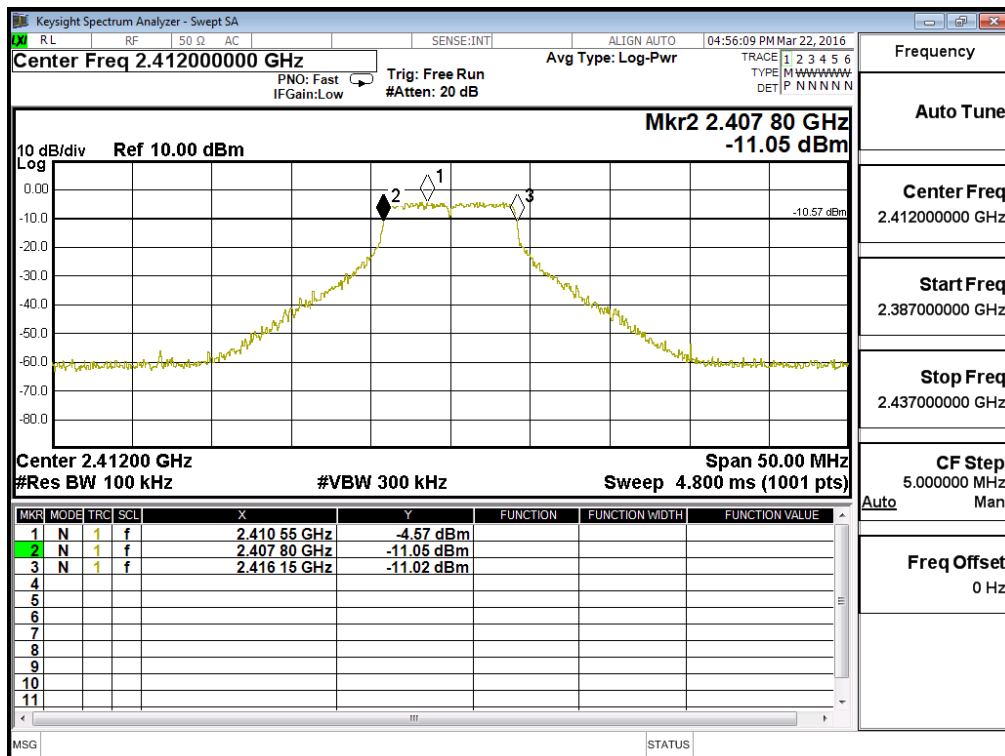
Figure Channel 11:



Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.00	8350	>500	Pass

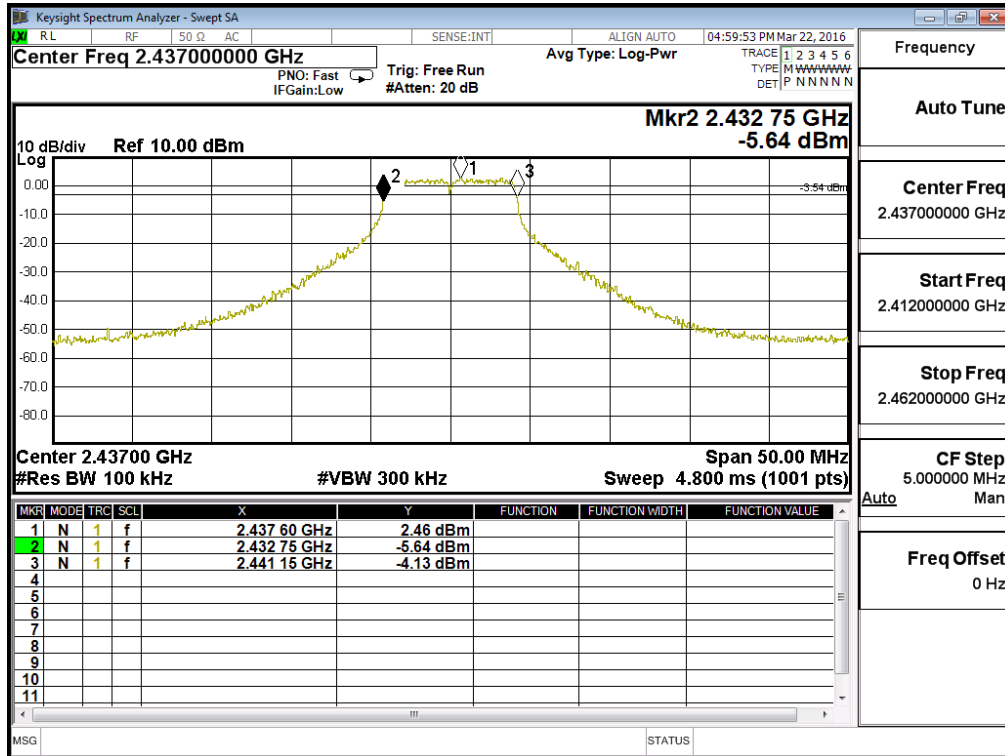
Figure Channel 1:



Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437.00	8400	>500	Pass

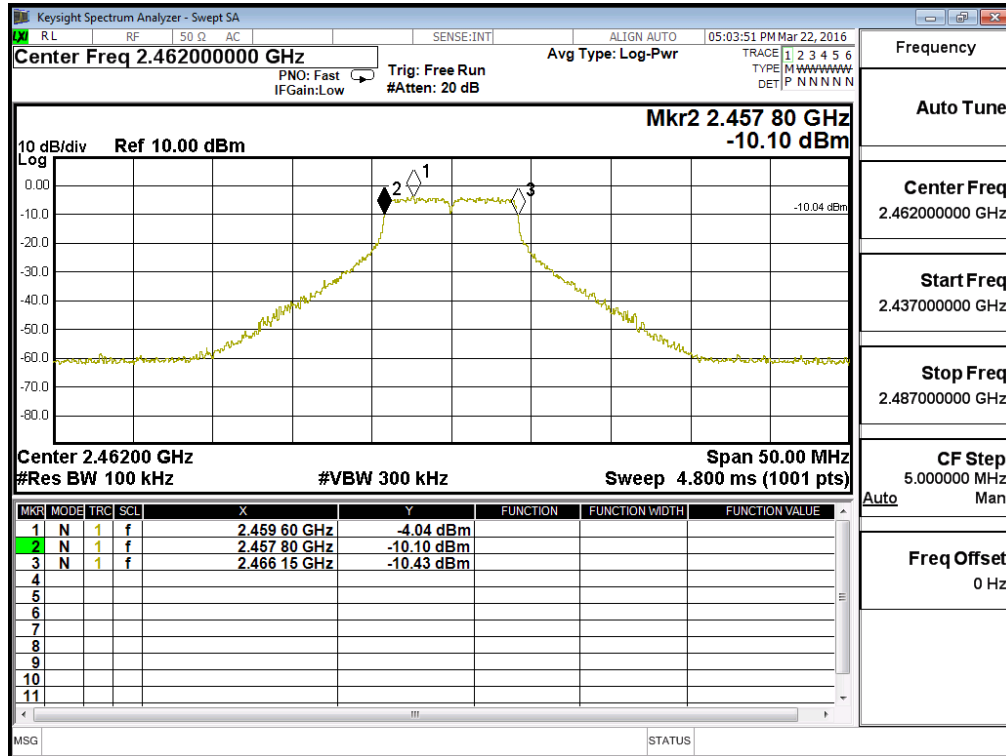
Figure Channel 6:



Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462.00	8350	>500	Pass

Figure Channel 11:



7. Power Density

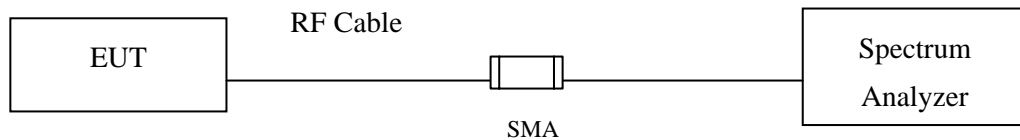
7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

7.2. Test Setup



7.3. Limits

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

7.4. 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.

7.5. Uncertainty

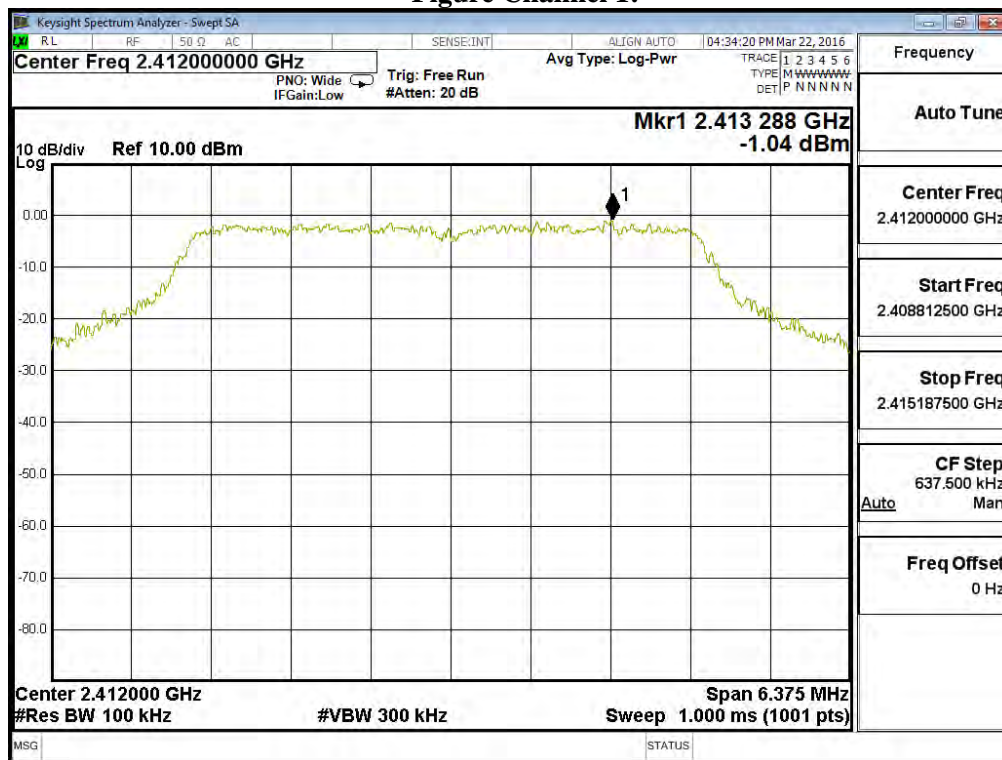
± 1.27 dB

7.6. Test Result of Power Density

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-1.040	< 6dBm	Pass

Figure Channel 1:



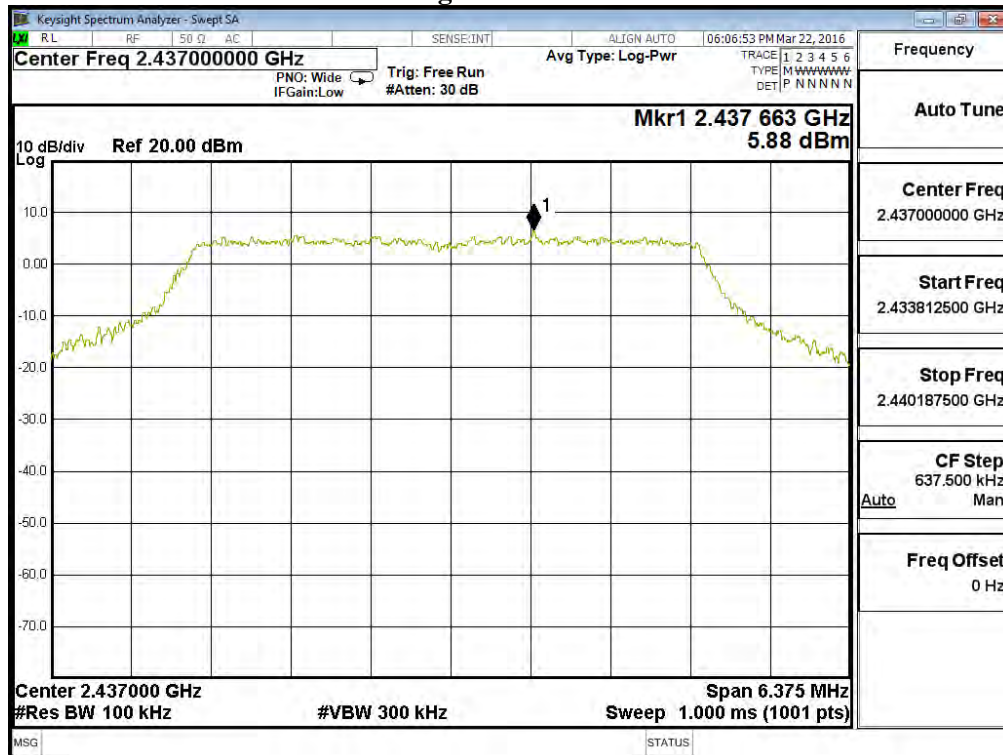
Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2437MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
6	2437	5.880	< 6dBm	Pass

Figure Channel 6:



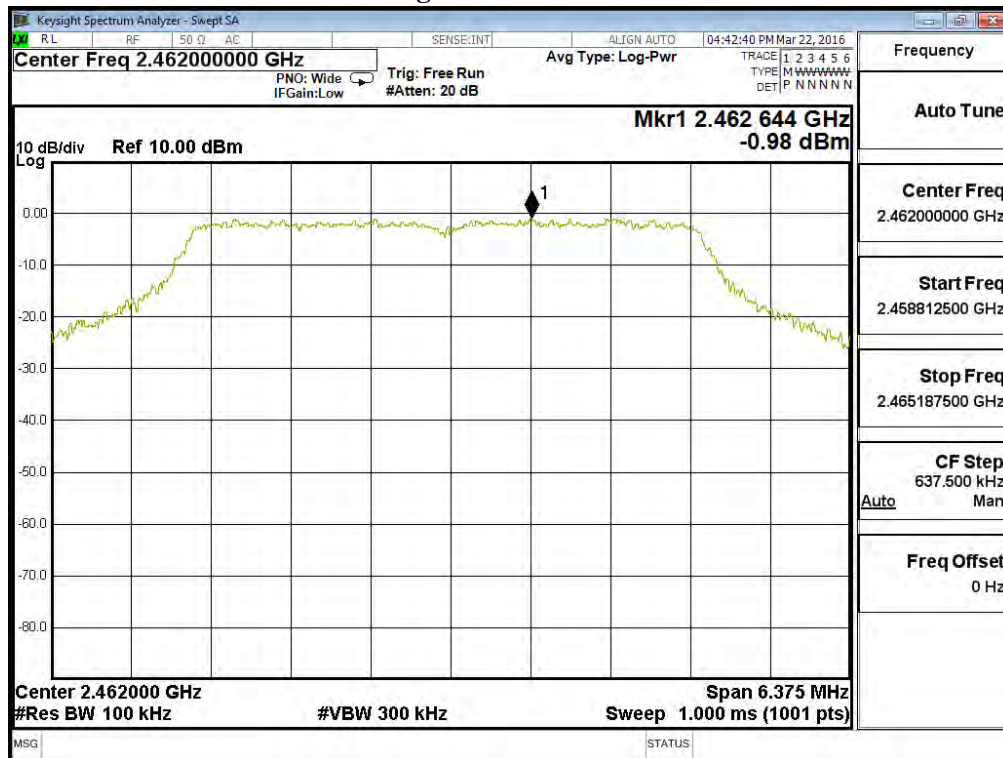
Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit-5MHz BW (2462MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
11	2462	-0.980	< 6dBm	Pass

Figure Channel 11:



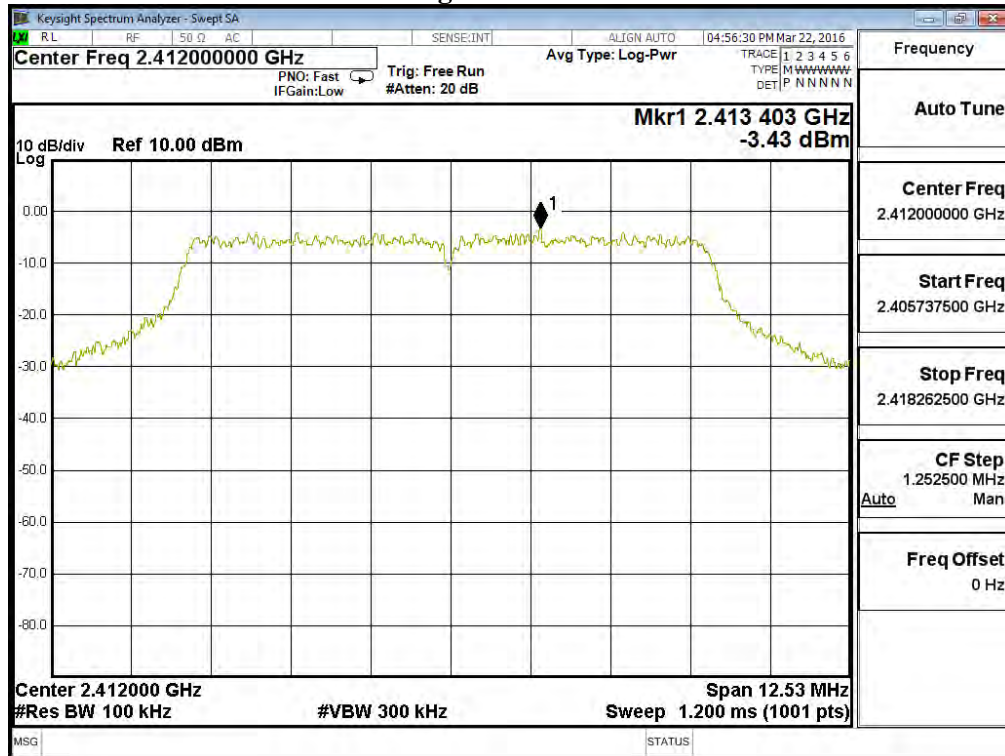
Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-3.430	< 6dBm	Pass

Figure Channel 1:



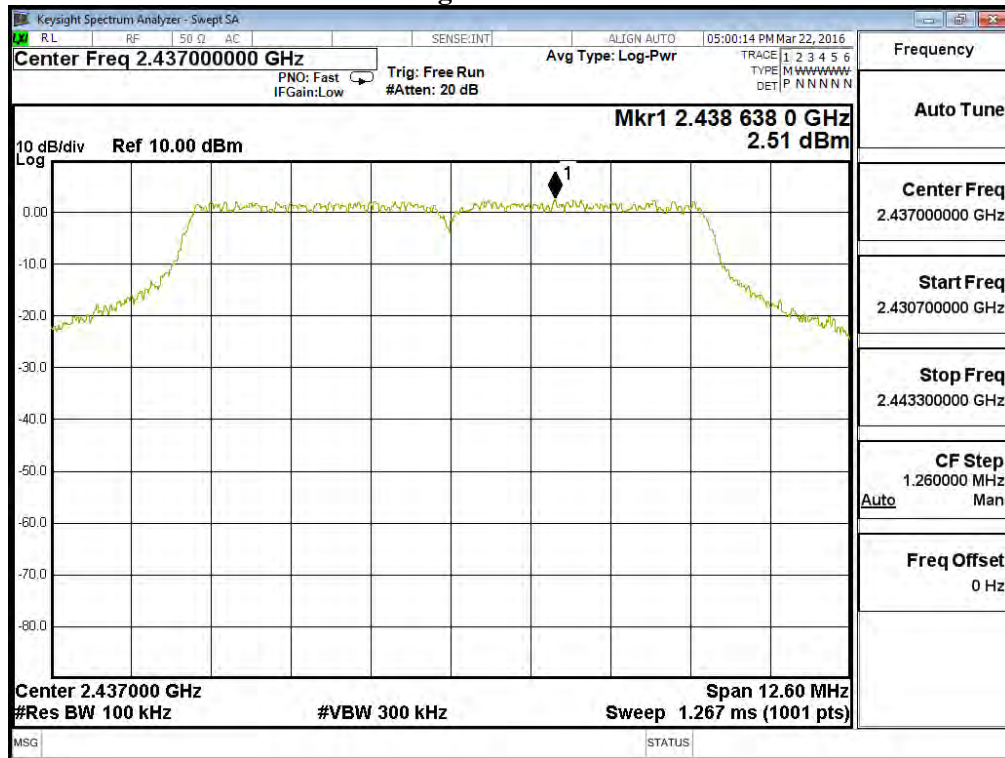
Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2437MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
6	2437	2.510	< 6dBm	Pass

Figure Channel 6:



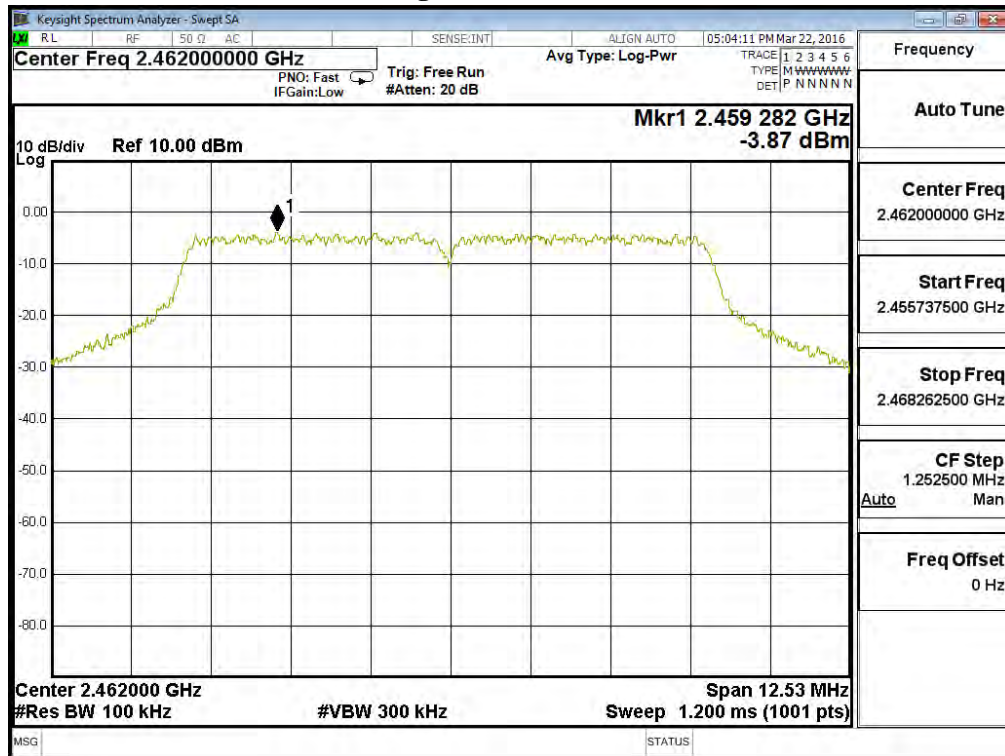
Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

Product : IEEE 802.11a/b/g miniPCI module
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit-10MHz BW (2462MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
11	2462	-3.870	< 6dBm	Pass

Figure Channel 11:



Note:

Required Limit= $8\text{dBm} - [(14\text{dBi} - 6\text{dBi}) / 3] = 6\text{ dBm}$ for compliance to FCC 47CFR 15.247(c) requirements.(fixed point to point operation)

8. EMI Reduction Method During Compliance Testing

No modification was made during testing.