FCC 47 CFR PART 15 SUBPART C & INDUSTRY CANADA RSS-247

TEST REPORT

For

Product	Model
Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module	**WCBN4507R**
	WCBN4508R
Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.1LE) USB Combo Module	**WCBN4507R(32U)**
	WCBN4508R(32U)

Trade Name: LITE-ON

Issued to

Lite-On Technology Cop.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com
Issued Date: August 27, 2015

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		August 27, 2015		Initial Issue	ALL	Doris Chu

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1. TEST RESULT CERTIFICATION

Applicant: Lite-On Technology Cop.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

Manufacturer: LITE-ON TECHNOLOGY (Changzhou) CO., LTD
A9 Building,No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone ,Changzhou City,Jiangsu Province 213100 China

Equipment Under Test / Model Number:

Product	Model
Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module	WCBN4507R
	WCBN4508R
Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.1LE) USB Combo Module	WCBN4507R(32U)
	WCBN4508R(32U)

Trade Name: LITE-ON

Date of Test: August 25, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C & Industry Canada RSS-247 Issue 1	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 and Industry Canada RSS-247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by: *Reviewed by:*

Miller Lee   Angel Cheng
Manager   Section Manager
Compliance Certification Services Inc.   Compliance Certification Services Inc.

2. EUT DESCRIPTION

	Product			Model
Product / Model Number	Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module			WCBN4507R
				WCBN4508R
	Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.1LE) USB Combo Module			WCBN4507R(32U)
				WCBN4508R(32U)

Trade Name	LITE-ON
Model Discrepancy	MT7662U – 802.11abgn + ac + BT (WCBN4507R / WCBN4508R) MT7632U – 802.11abgn + BT (WCBN4507R(32U) / WCBN4508R(32U))
Received Date	July 27, 2015
Power Adapter	Power form host device
Frequency Range	2412 ~ 2462 MHz

Transmit Power	Mode	Frequency Range	Output Power (dBm)	Output Power (W)
	IEEE 802.11b	2412 - 2462	20.31	0.1074
	IEEE 802.11g	2412 - 2462	24.85	0.3055
	IEEE 802.11n HT 20 MHz	2412 - 2462	27.37	0.5458
	IEEE 802.11n HT 40 MHz	2422 - 2452	25.83	0.3828

Modulation Technique	IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mpbs) IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mpbs) IEEE 802.11n HT 20 MHz mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) IEEE 802.11n HT 40 MHz mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)
Number of Channels	IEEE 802.11b/g mode: 11 Channels IEEE 802.11n HT 20 MHz mode: 11 Channels IEEE 802.11n HT 40 MHz mode: 7 Channels
Antenna Specification	1. Tyco PCB Antenna 2195488-2: 4.06 dBi 2195488-3: 4.92 dBi 2. Walsin PCB Antenna RFPCA311131IMLB701: 4.94 dBi RFPCA311148IMLB701: 4.12 dBi MIMO:10*LOG((($10^{4.94 / 20}$+$10^{4.12 /20}$)^2)/2)= 7.55 dBi

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2. This submittal(s) (test report) is intended for FCC&IC ID: **PPQ-WCBN4507R**& **4491A-WCBN4507R** filing to comply with FCC Part 15C, Section 15.207, 15.209 and IC RSS-247 & RSS-GEN.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.247.

The tests documented in this report were performed in accordance with IC RSS-247, IC RSS-Gen and ANSI C63.10:2013.

This submittal(s) (test report) is intended for IC Certification with Industry Canada RSS-247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

The tests documented in this report were performed in accordance with IC RSS-247, IC RSS-Gen, IC RSS-102, and ANSI C63.10: 2013.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675		2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT (model: WCBN4507R) had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting and receiving mode was programmed.

After verification, all tests carried out are with the worst-case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid mode only.

IEEE 802.11b mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz mode:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz mode:
Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	11/23/2015
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	10/07/2015
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	07/07/2016
Power Sensor	Anritsu	MA2411A	0917072	07/07/2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/19/2016

Wugu 966 Chamber A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510268	01/25/2016
EMI Test Receiver	R&S	ESCI	100064	06/03/2016
Bilog Antenna	Sunol Sciences	JB3	A030105	08/05/2016
Horn Antenna	EMCO	3117	00055165	01/26/2016
Horn Antenna	EMCO	3116	26370	12/25/2015
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Pre-Amplifier	MITEQ	1652-3000	1490939	08/09/2016
Pre-Amplifier	EMC	EMC 012635	980151	06/04/2016
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	12/25/2015
Coaxial Cable	Huber+Suhner	102	29212/2	12/25/2015
Coaxial Cable	Huber+Suhner	102	29406/2	12/25/2015
Test S/W	EZ-EMC (CCS-3A1RE)			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	N/A
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

    Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

    Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

    Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, horn and/or Loop. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.
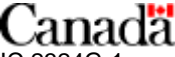
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, 2324G-2 for 3M Semi Anechoic Chamber B.

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	**FC** FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-247, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	**TAF** Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	**Canada** IC 2324G-1 IC 2324G-2

* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

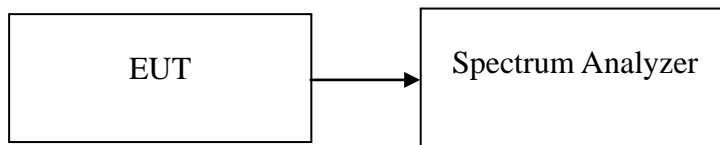| No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC	ASUS	M5200AE	5BN0AG019631	PD9WM3B2100	N/A	AC I/P: Unshielded, 1.8m with a core DC O/P: Unshielded, 1.8m

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*

2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7. FCC PART 15.247 REQUIREMENTS & RSS-247 REQUIREMENTS

7.1 99% BANDWIDTH

Test Configuration

```
┌─────────────┐        ┌─────────────────────┐
│             │        │                     │
│    EUT      │───────▶│  Spectrum Analyzer  │
│             │        │                     │
└─────────────┘        └─────────────────────┘
```

TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold.

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.1838
Mid	2437	12.1693
High	2462	12.1681

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5060
Mid	2437	16.9098
High	2462	16.9545

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.7958
Mid	2437	17.8257
High	2462	17.7606

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.7837
Mid	2437	17.7510
High	2462	17.6861

Test mode: 802.11n Standard-40 MHz / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	35.9741
Mid	2437	35.9452
High	2452	35.9547

Test mode: 802.11n Standard-40 MHz / Chain 1

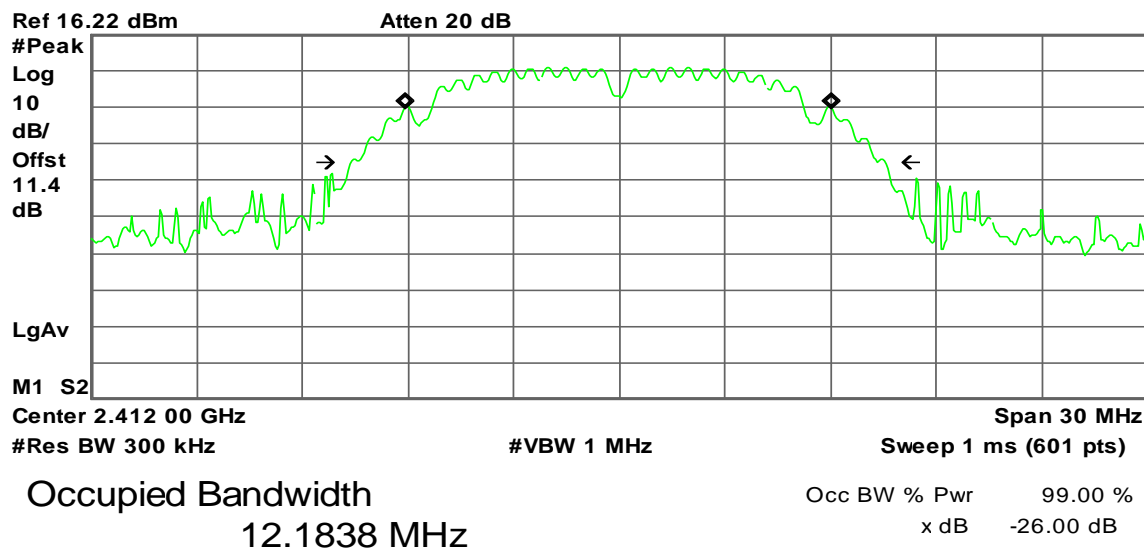| Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	35.9370
Mid	2437	35.9434
High	2452	35.9586

Test Plot

IEEE 802.11b mode
99% Bandwidth (CH Low)

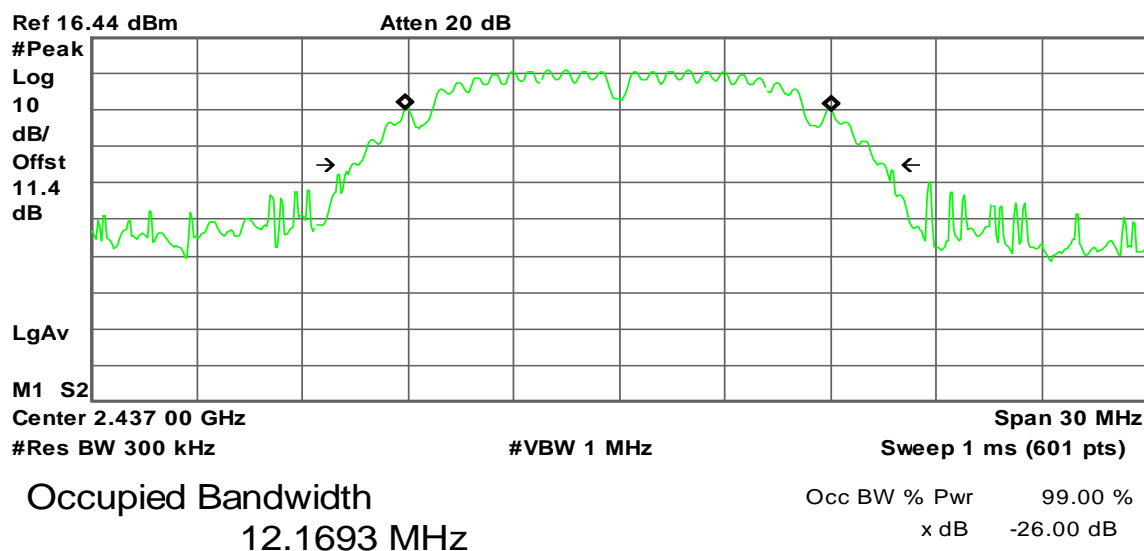Agilent   R L

Ref 16.22 dBm   Atten 20 dB

#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.412 00 GHz   Span 30 MHz
#Res BW 300 kHz   #VBW 1 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
        12.1838 MHz   x dB   -26.00 dB

Transmit Freq Error   -27.783 kHz
x dB Bandwidth   15.198 MHz

99% Bandwidth (CH Mid)

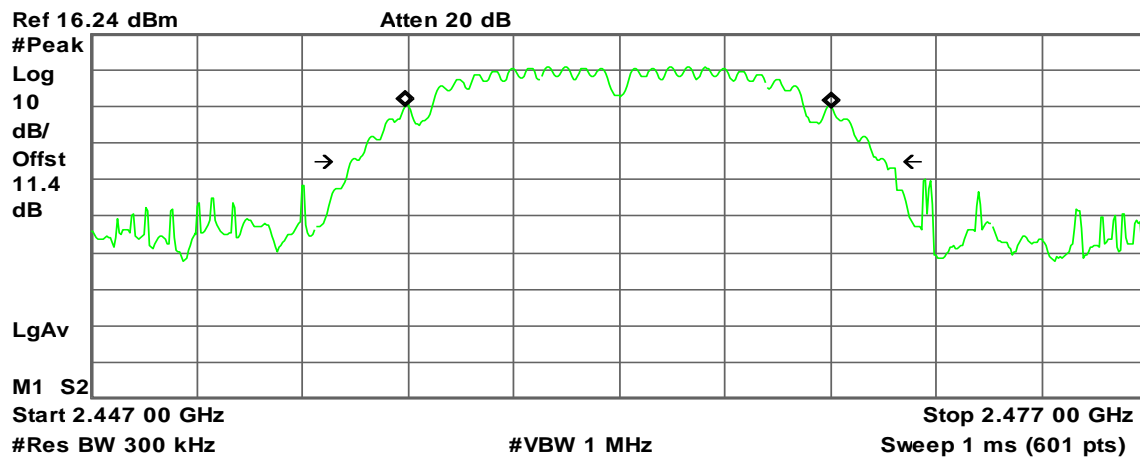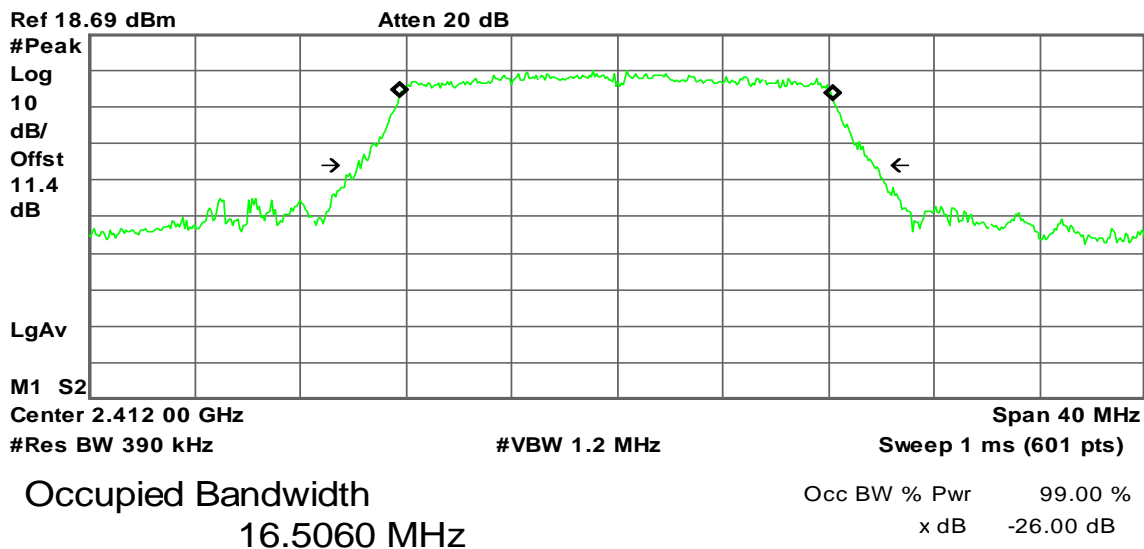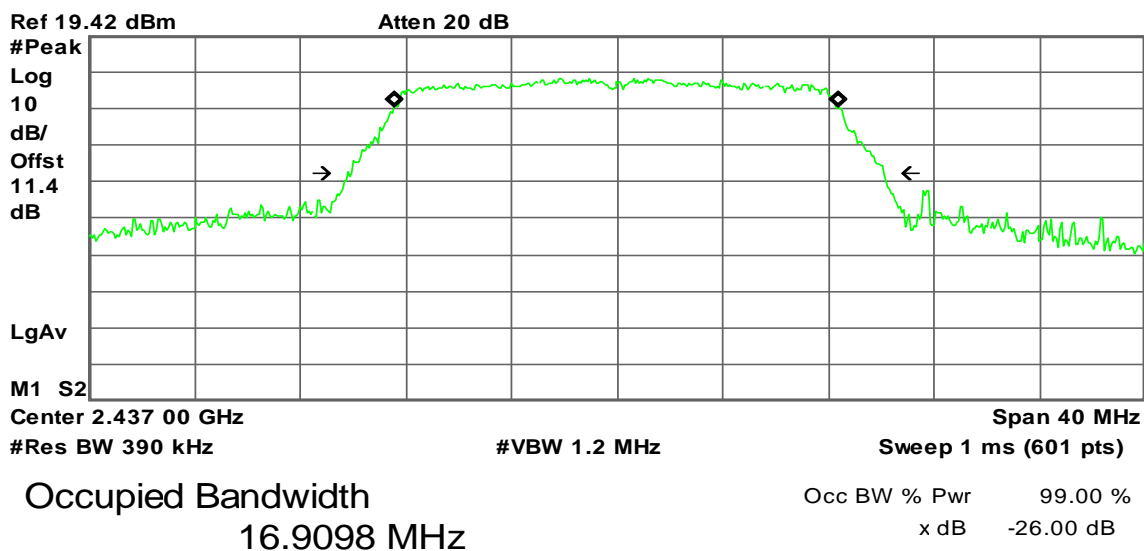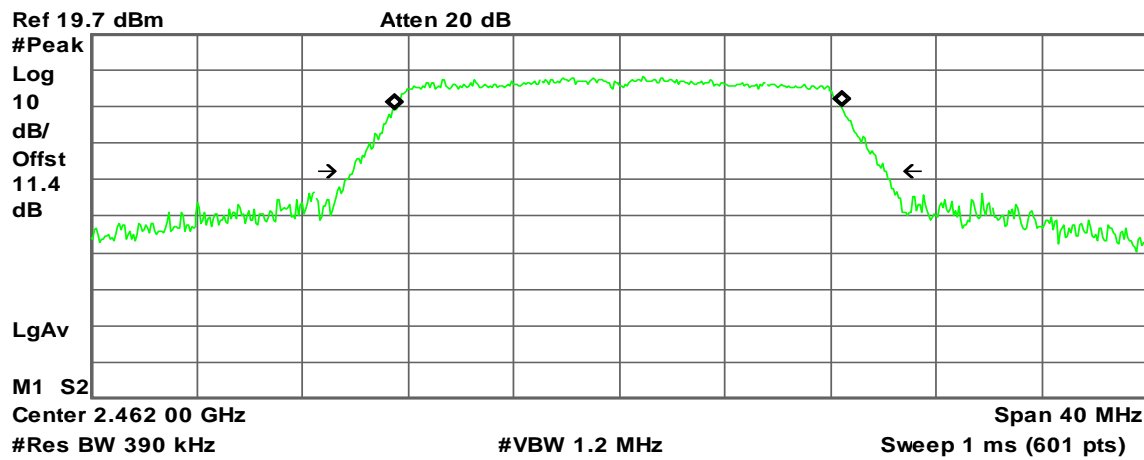Agilent   R L

Ref 16.44 dBm   Atten 20 dB

#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.437 00 GHz   Span 30 MHz
#Res BW 300 kHz   #VBW 1 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
        12.1693 MHz   x dB   -26.00 dB

Transmit Freq Error   -24.549 kHz
x dB Bandwidth   15.185 MHz

99% Bandwidth (CH High)

Agilent   R L
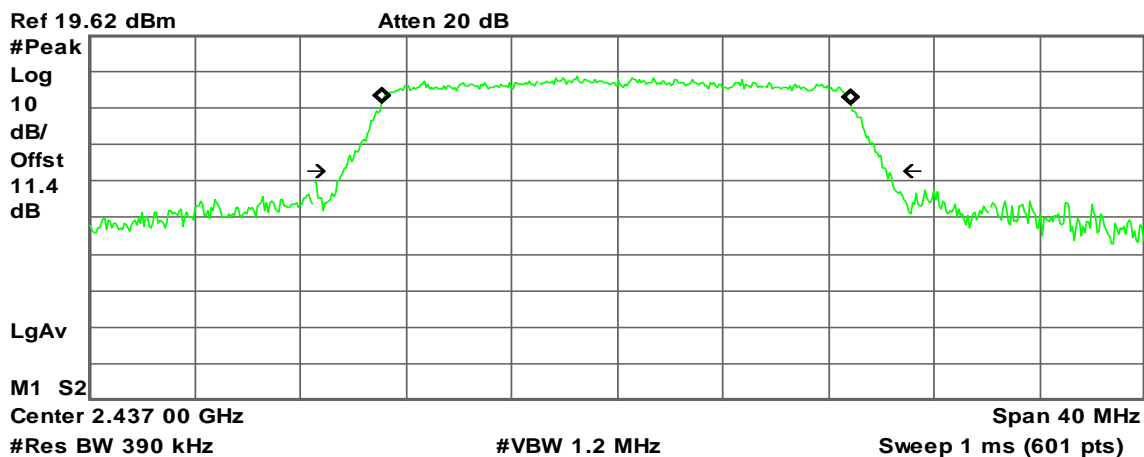
Ref 16.24 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Start 2.447 00 GHz   Stop 2.477 00 GHz
#Res BW 300 kHz   #VBW 1 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
    12.1681 MHz   x dB   -26.00 dB

Transmit Freq Error   -19.175 kHz
x dB Bandwidth   15.205 MHz

IEEE 802.11g mode
99% Bandwidth (CH Low)

Occupied Bandwidth
16.5060 MHz

| Occ BW % Pwr | 99.00 % |
| x dB | -26.00 dB |

| Transmit Freq Error | -37.522 kHz |
| x dB Bandwidth | 19.584 MHz |

99% Bandwidth (CH Mid)

Occupied Bandwidth
16.9098 MHz

| Occ BW % Pwr | 99.00 % |
| x dB | -26.00 dB |

| Transmit Freq Error | -23.075 kHz |
| x dB Bandwidth | 20.324 MHz |

99% Bandwidth (CH High)

Agilent   R L

Ref 19.7 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv
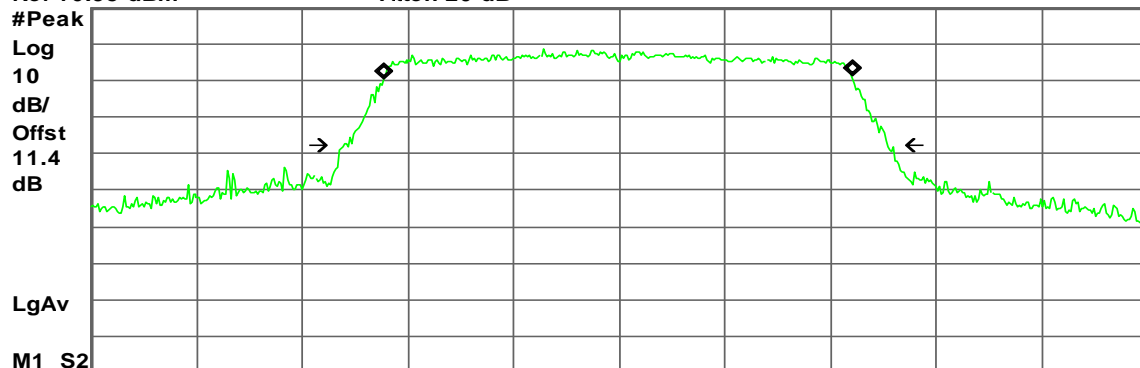
M1 S2

Center 2.462 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)
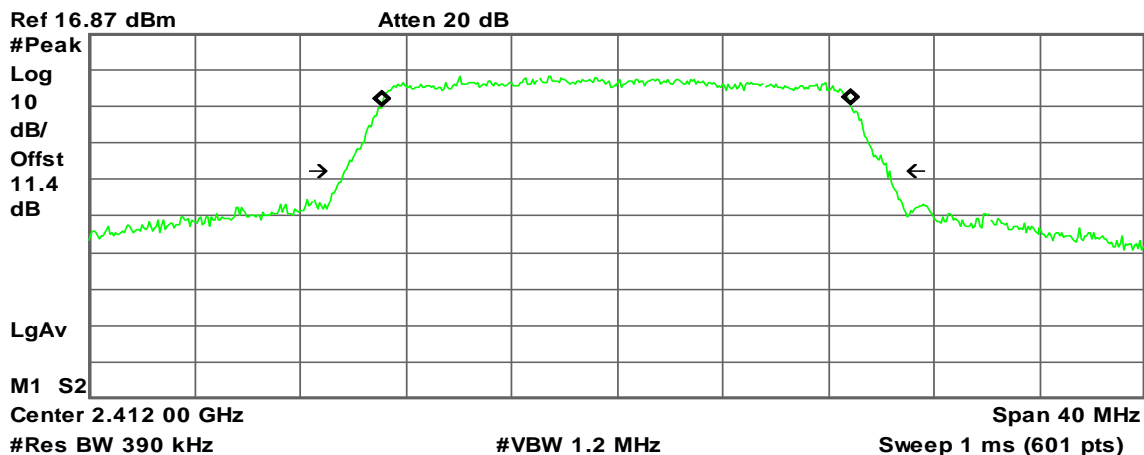
Occupied Bandwidth   Occ BW % Pwr   99.00 %
          16.9545 MHz   x dB   -26.00 dB

Transmit Freq Error   -35.070 kHz
x dB Bandwidth   20.221 MHz

IEEE 802.11n HT 20 MHz mode / Chain 0

99% Bandwidth (CH Low)

Agilent   R L

Ref 16.39 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.412 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)
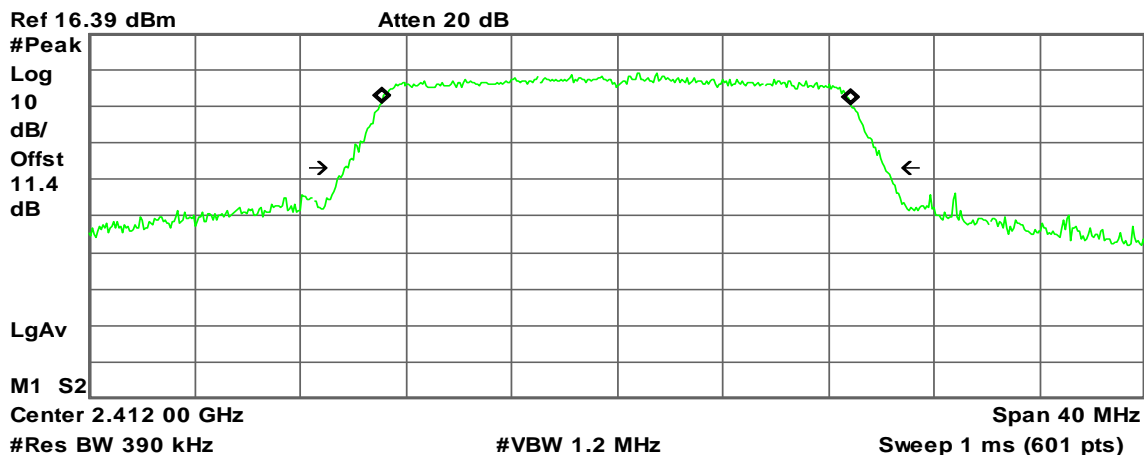
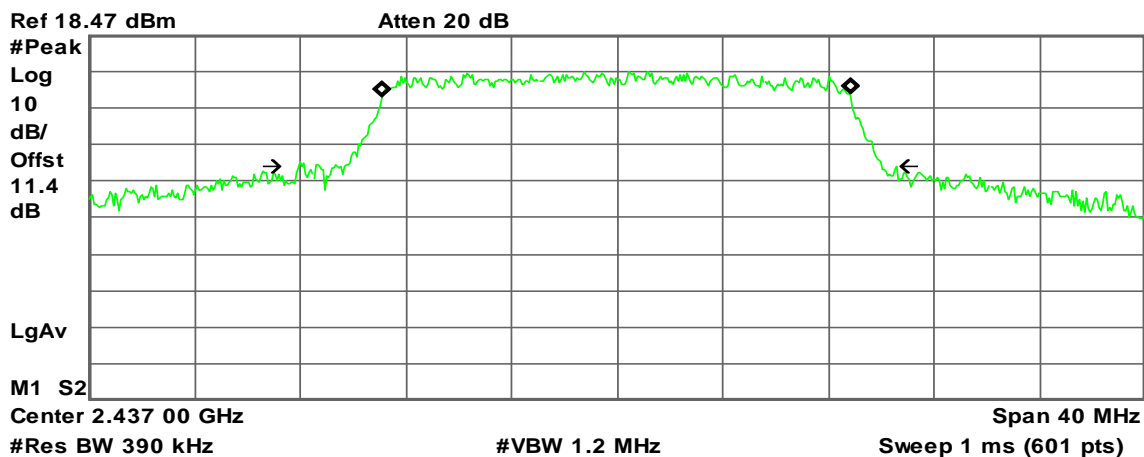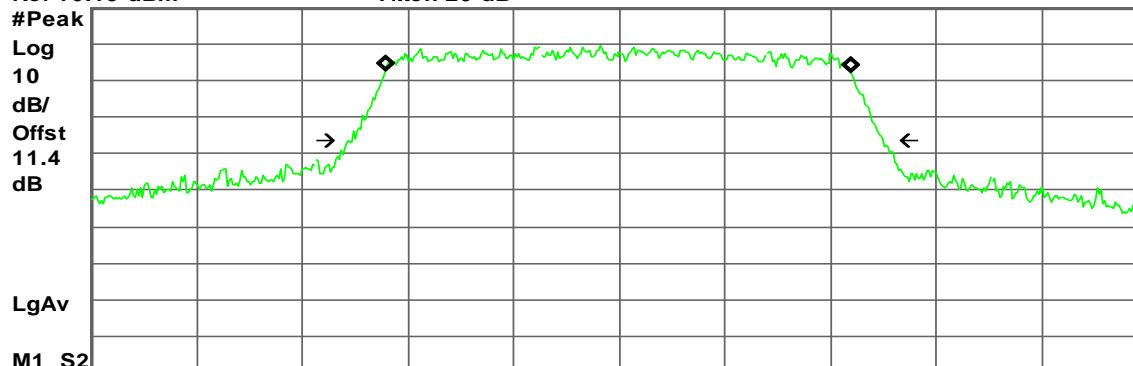Occupied Bandwidth   Occ BW % Pwr   99.00 %
        17.7958 MHz   x dB   -26.00 dB

Transmit Freq Error   -30.327 kHz
x dB Bandwidth   20.480 MHz

99% Bandwidth (CH Mid)

Agilent   R L

Ref 19.62 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.437 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
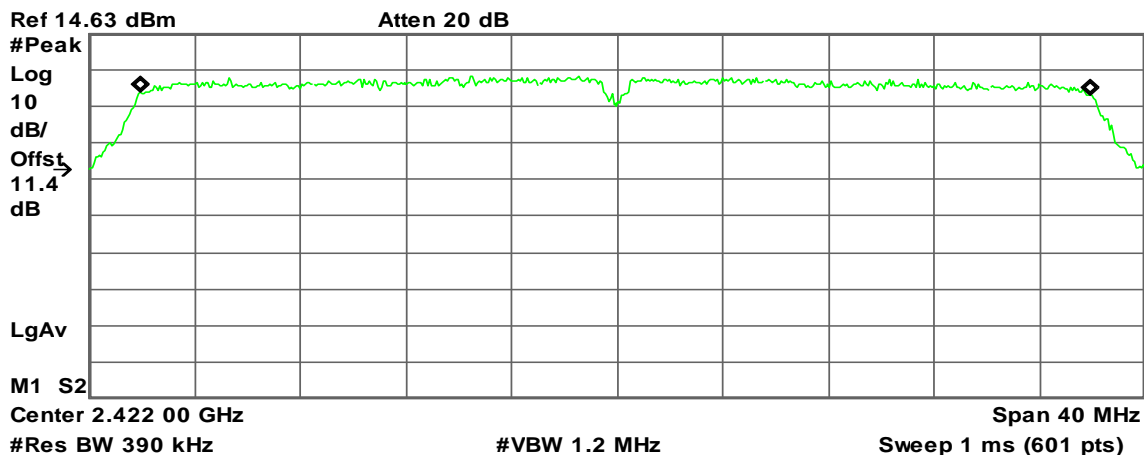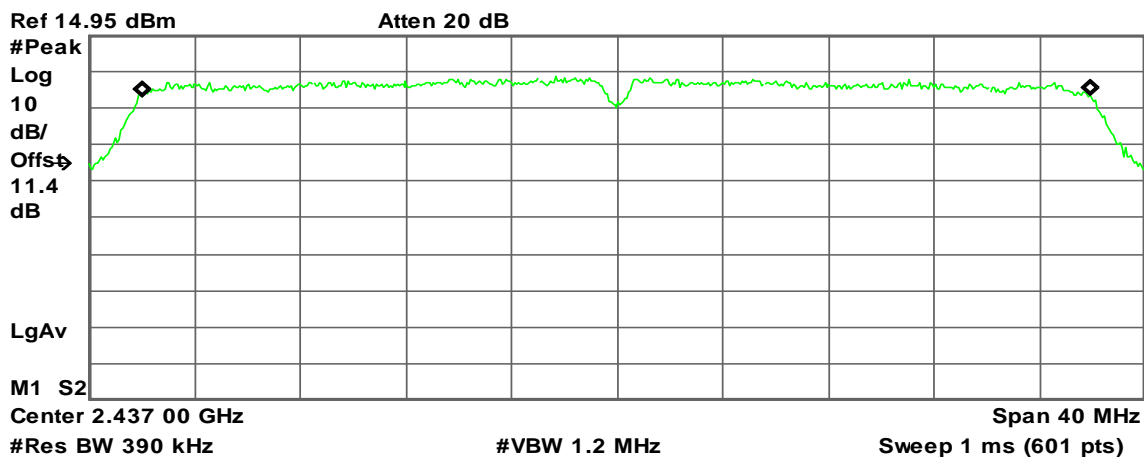   17.8257 MHz   x dB   -26.00 dB

Transmit Freq Error   -26.698 kHz
x dB Bandwidth   20.593 MHz

99% Bandwidth (CH High)

Occupied Bandwidth
       17.7606 MHz

Occ BW % Pwr   99.00 %

x dB   -26.00 dB

Transmit Freq Error	-44.824 kHz
x dB Bandwidth	20.582 MHz

IEEE 802.11n HT 20 MHz mode / Chain 1

99% Bandwidth (CH Low)

Agilent   R L

Ref 16.87 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.412 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
        17.7837 MHz   x dB   -26.00 dB

Transmit Freq Error   -35.814 kHz
x dB Bandwidth   20.680 MHz

99% Bandwidth (CH Mid)

Agilent   R L

Ref 18.47 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.437 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
        17.7510 MHz   x dB   -26.00 dB

Transmit Freq Error   -40.829 kHz
x dB Bandwidth   22.078 MHz

99% Bandwidth (CH High)

Agilent   R L

Ref 16.19 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
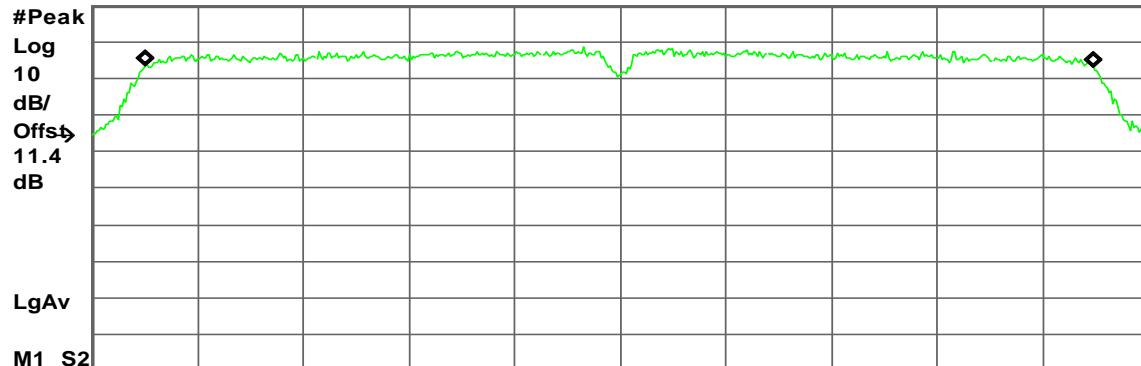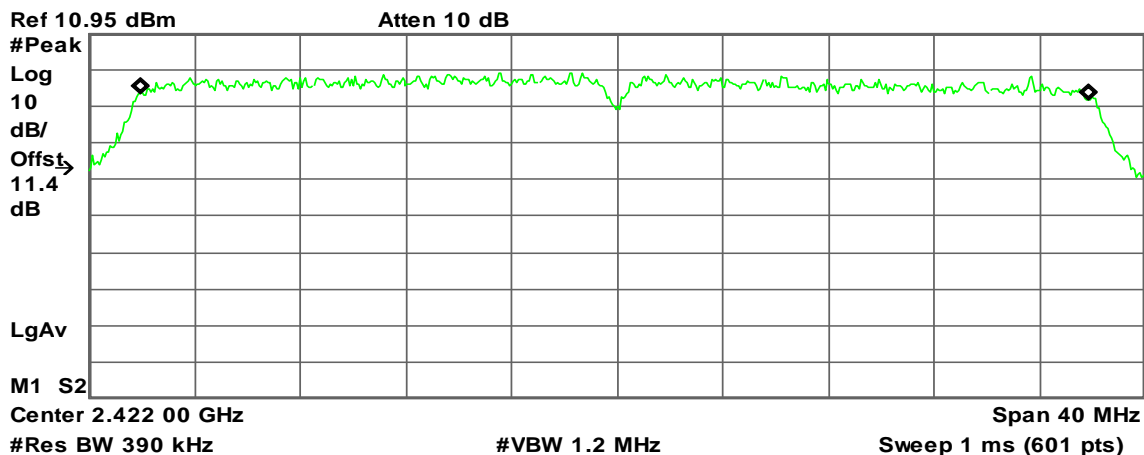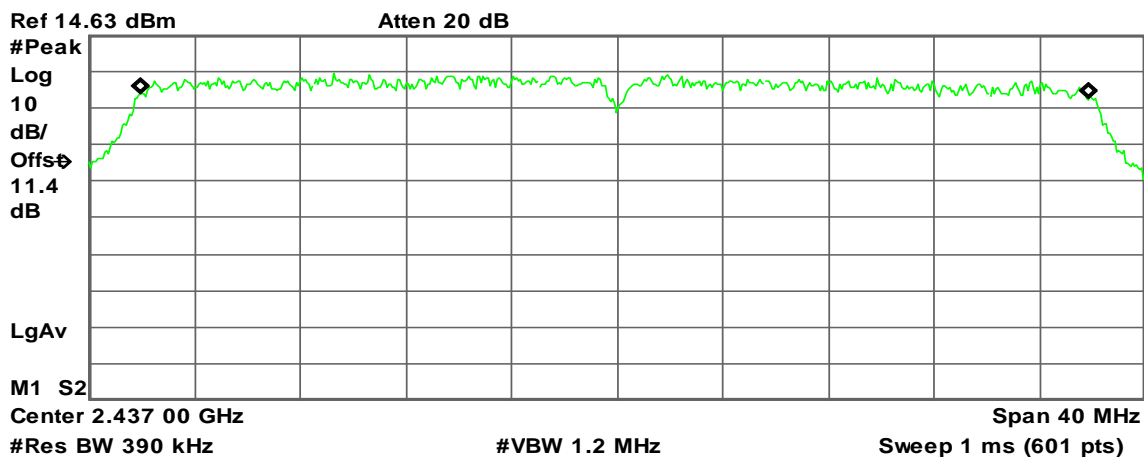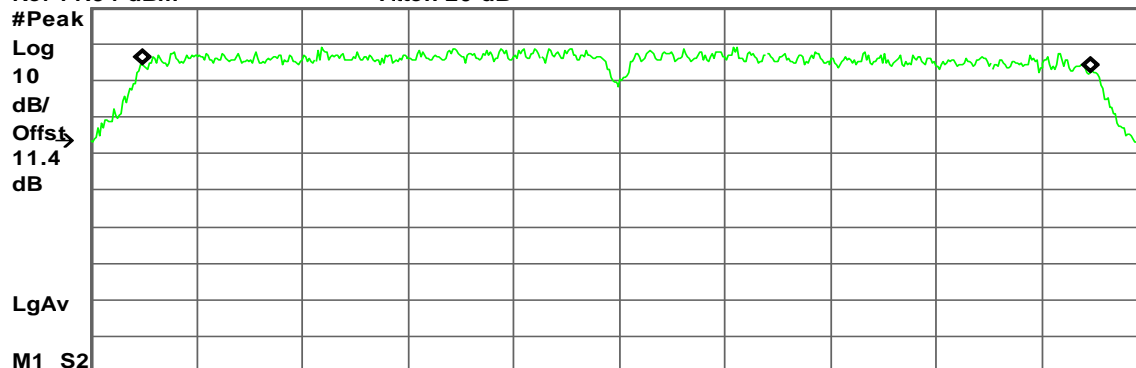Center 2.462 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
　　　　17.6861 MHz   x dB   -26.00 dB

Transmit Freq Error   -34.743 kHz
x dB Bandwidth   20.157 MHz

802.11n Standard-40 MHz / Chain 0

99% Bandwidth (CH Low)

Agilent   R L

Ref 14.63 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.422 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
35.9741 MHz   x dB   -26.00 dB

Transmit Freq Error   -58.294 kHz
x dB Bandwidth   40.000 MHz

99% Bandwidth (CH Mid)

Agilent   R L

Ref 14.95 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.437 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
35.9452 MHz   x dB   -26.00 dB

Transmit Freq Error   -52.134 kHz
x dB Bandwidth   40.000 MHz

99% Bandwidth (CH High)

❄ Agilent   R L

```
Ref 12.17 dBm                    Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB


        LgAv

M1 S2
Center 2.452 00 GHz                                    Span 40 MHz
#Res BW 390 kHz          #VBW 1.2 MHz          Sweep 1 ms (601 pts)
```

Occupied Bandwidth
35.9547 MHz

Occ BW % Pwr   99.00 %

x dB   -26.00 dB

Transmit Freq Error   -37.059 kHz
x dB Bandwidth   40.000 MHz

802.11n Standard-40 MHz / Chain1

99% Bandwidth (CH Low)

Occupied Bandwidth

35.9370 MHz

Occ BW % Pwr	99.00 %
x dB	-26.00 dB

Transmit Freq Error	-84.587 kHz
x dB Bandwidth	39.465 MHz

99% Bandwidth (CH Mid)

Occupied Bandwidth

35.9434 MHz

Occ BW % Pwr	99.00 %
x dB	-26.00 dB

Transmit Freq Error	-73.293 kHz
x dB Bandwidth	39.871 MHz

99% Bandwidth (CH High)

Agilent   R L

Ref 11.94 dBm   Atten 20 dB
#Peak
Log
10
dB/
Offst
11.4
dB

LgAv

M1 S2
Center 2.452 00 GHz   Span 40 MHz
#Res BW 390 kHz   #VBW 1.2 MHz   Sweep 1 ms (601 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
      35.9586 MHz   x dB   -26.00 dB

Transmit Freq Error   -100.264 kHz
x dB Bandwidth   39.829 MHz

7.2 6DB BANDWIDTH

LIMIT

According to §15.247(a)(2) & RSS-247, systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Configuration

| EUT | → | Spectrum Analyzer |
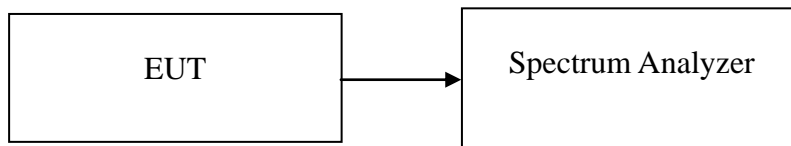
TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as RBW = 100 kHz, VBW = RBW, Span = 50 MHz, Sweep = auto.

4. Mark the peak frequency and –6dB (upper and lower) frequency.

5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.3334		PASS
Mid	2437	10.3334	>500	PASS
High	2462	10.3334		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.4167		PASS
Mid	2437	16.5	>500	PASS
High	2462	16.5		PASS

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.75		PASS
Mid	2437	17.75	>500	PASS
High	2462	17.6666		PASS

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.75		PASS
Mid	2437	17.75	>500	PASS
High	2462	17.75		PASS

Test mode: IEEE 802.11n HT 40 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	36.3333		PASS
Mid	2437	36.3333	>500	PASS
High	2452	36.4167		PASS

Test mode: IEEE 802.11n HT 40 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.9167		PASS
Mid	2437	36	>500	PASS
High	2452	36.0833		PASS

Test Plot

IEEE 802.11b mode

6dB Bandwidth (CH Low)
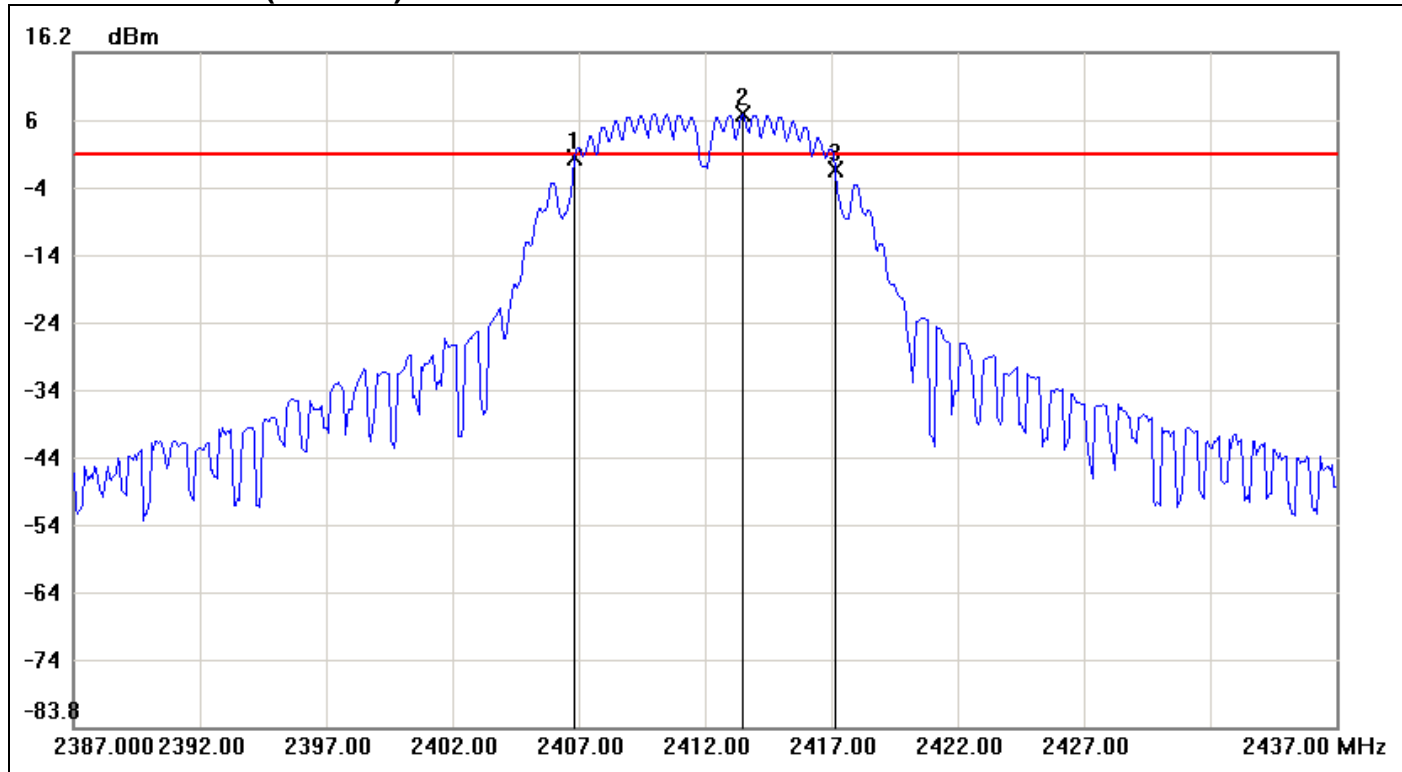
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2406.8333	0.70	1.02	-0.32
2	2413.5000	7.02	1.02	6.00
3	2417.1667	-1.15	1.02	-2.17

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	10.3334	-1.85

6dB Bandwidth (CH Mid)
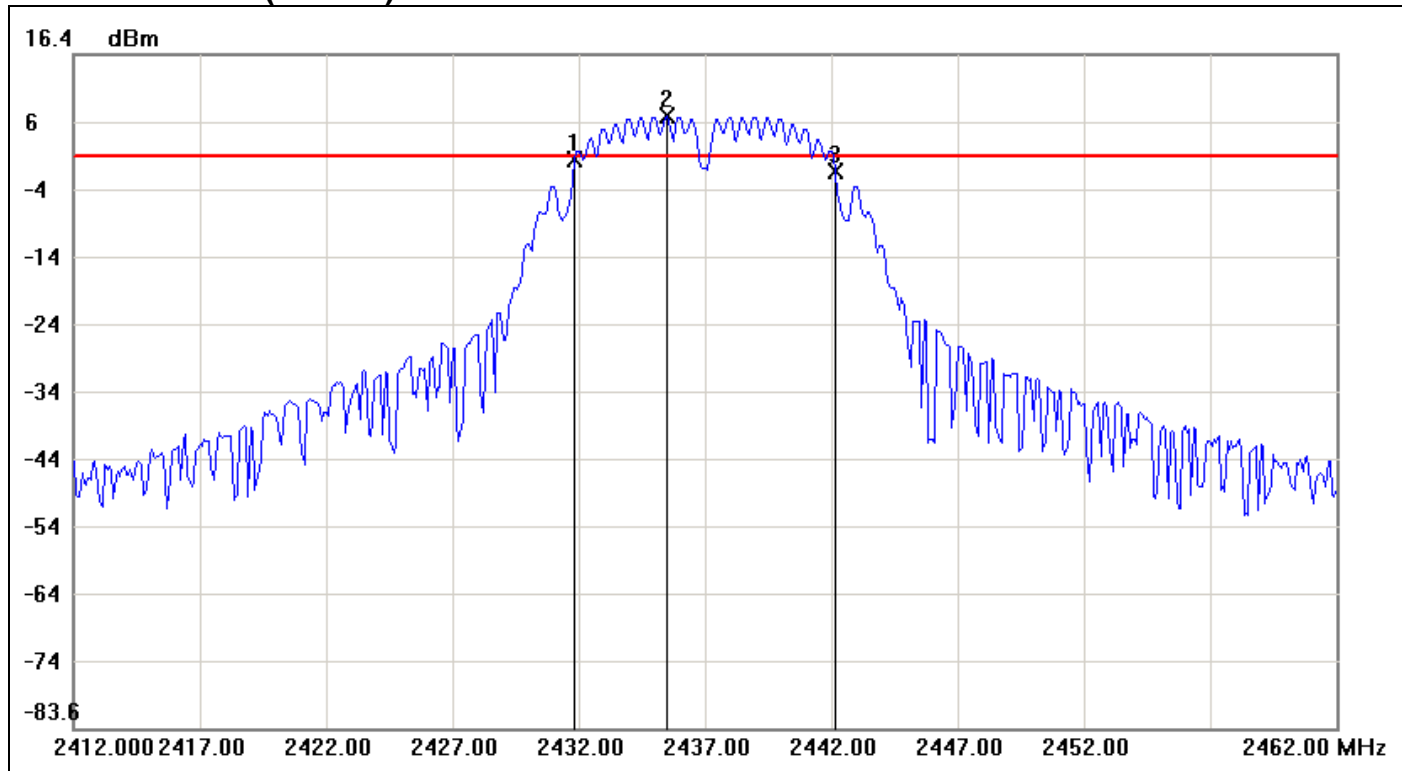
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2431.8333	0.88	1.26	-0.38
2	2435.5000	7.26	1.26	6.00
3	2442.1667	-1.00	1.26	-2.26

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	10.3334	-1.88

6dB Bandwidth (CH High)
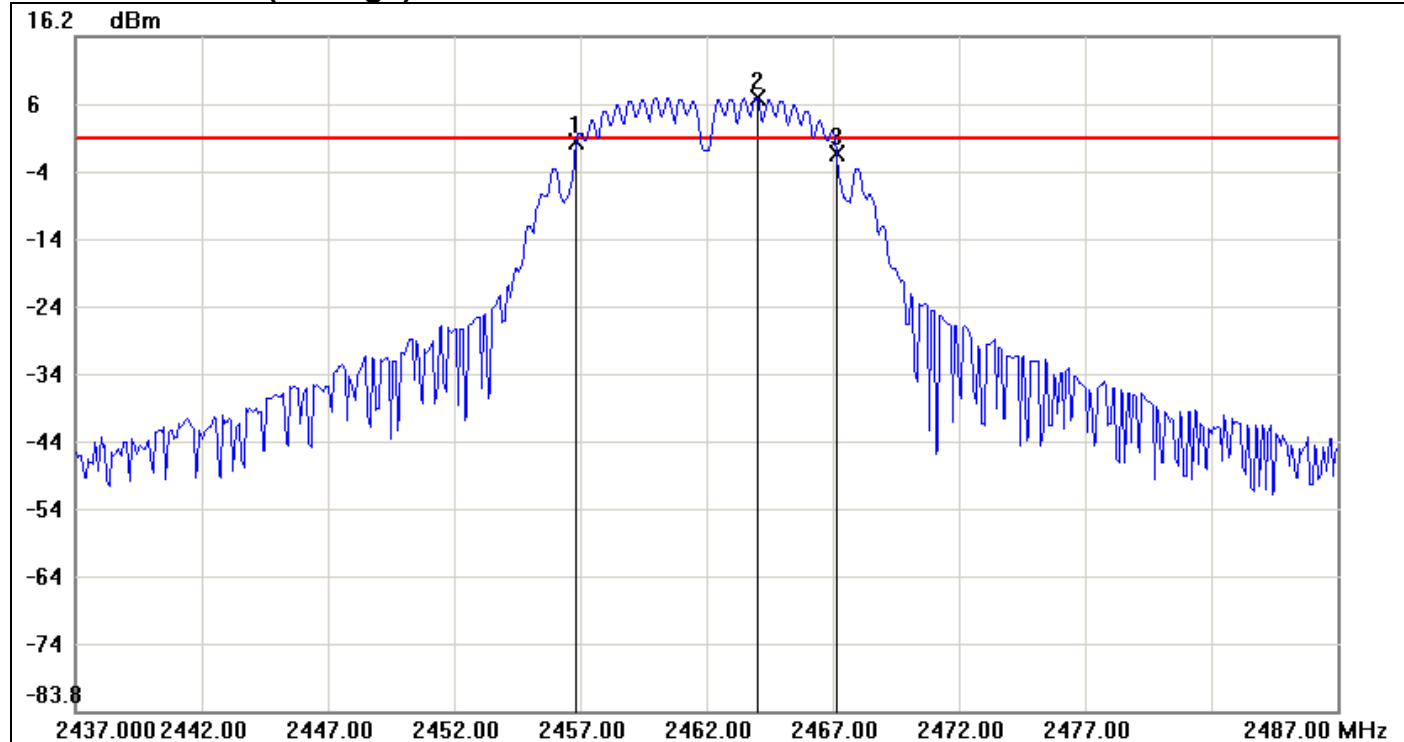
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2456.8333	0.74	1.05	-0.31
2	2464.0000	7.05	1.05	6.00
3	2467.1667	-1.09	1.05	-2.14

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	10.3334	-1.83

IEEE 802.11g mode

6dB Bandwidth (CH Low)
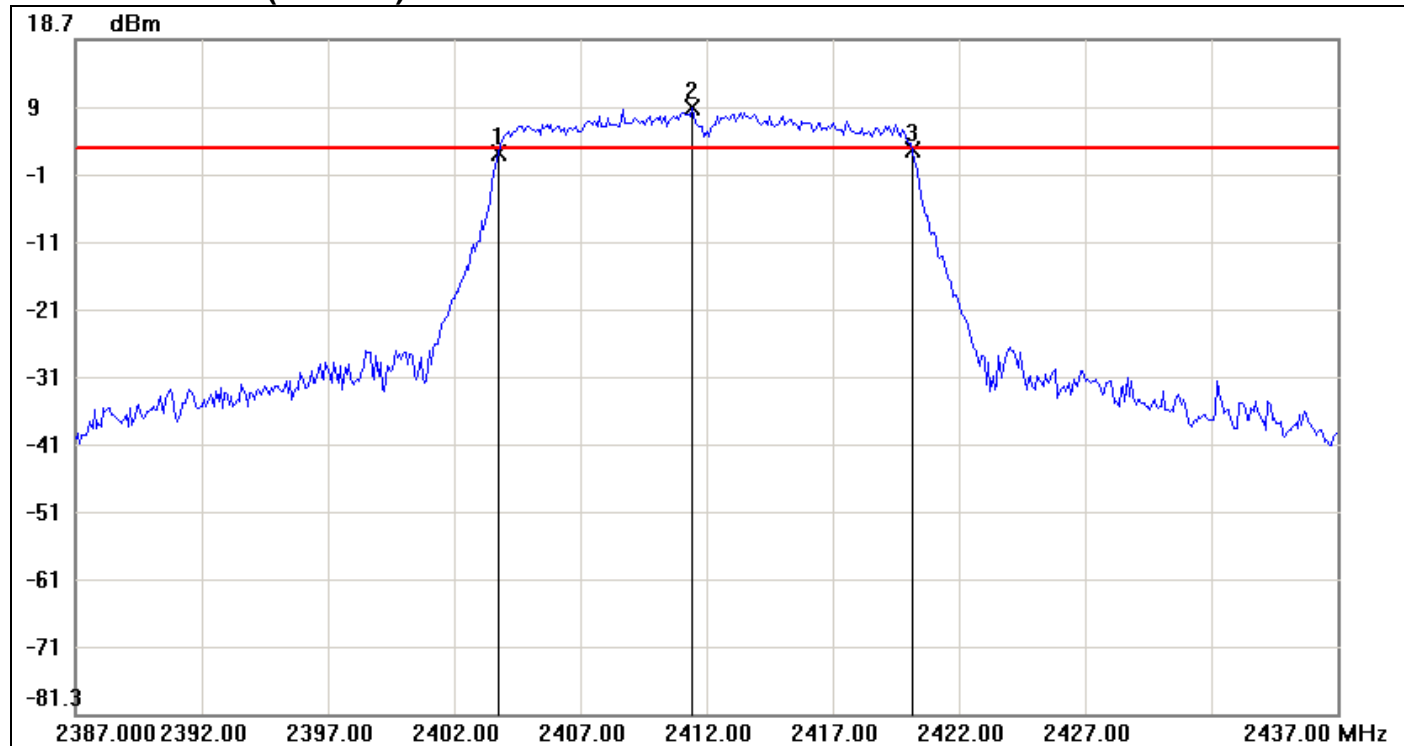
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2403.7500	1.70	2.48	-0.78
2	2411.4167	8.48	2.48	6.00
3	2420.1667	2.21	2.48	-0.27

No.		ΔFrequency(MHz)	ΔLevel(dB)
1	mk3-mk1	16.4167	0.51

6dB Bandwidth (CH Mid)
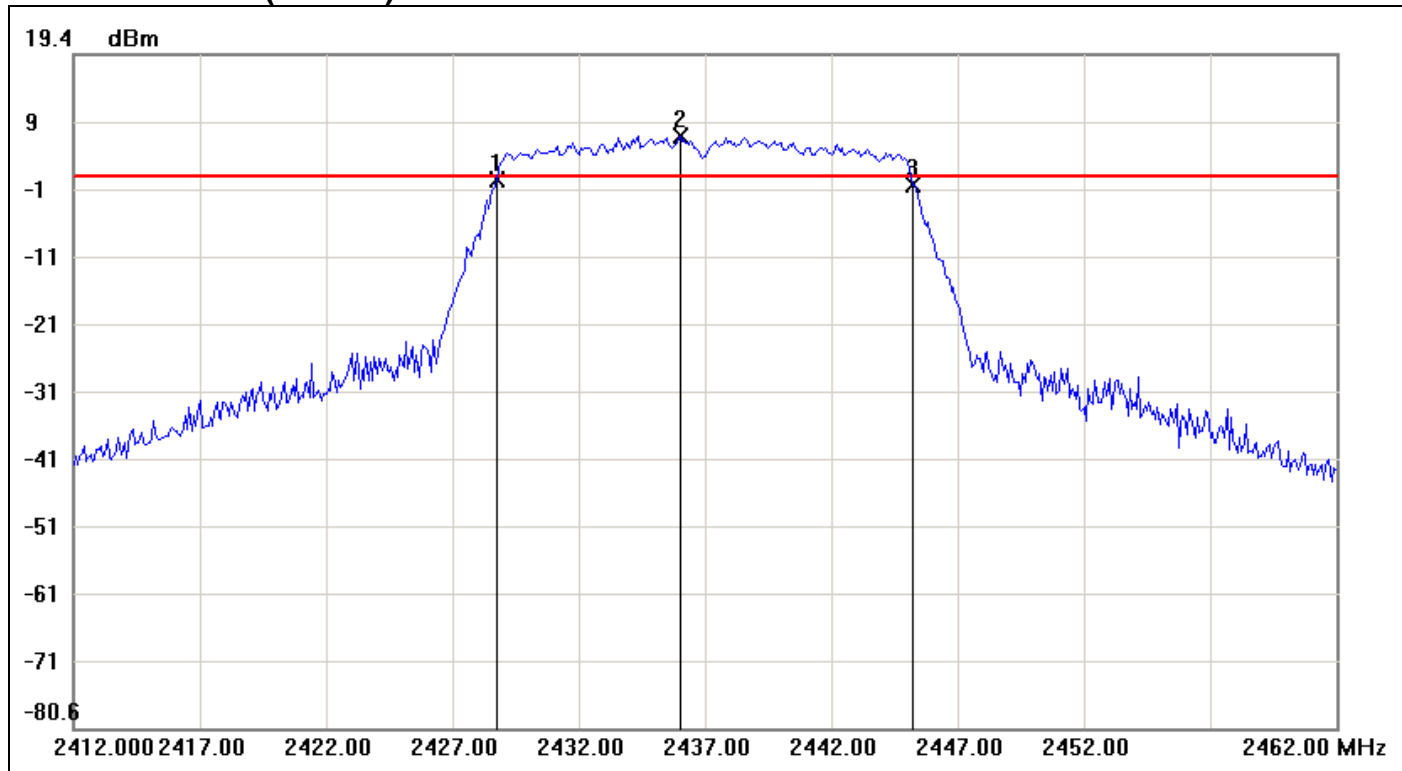
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2428.7500	0.79	1.32	-0.53
2	2436.0000	7.32	1.32	6.00
3	2445.2500	0.03	1.32	-1.29

No.		ΔFrequency(MHz)	ΔLevel(dB)
1	mk3-mk1	16.5	-0.76

6dB Bandwidth (CH High)
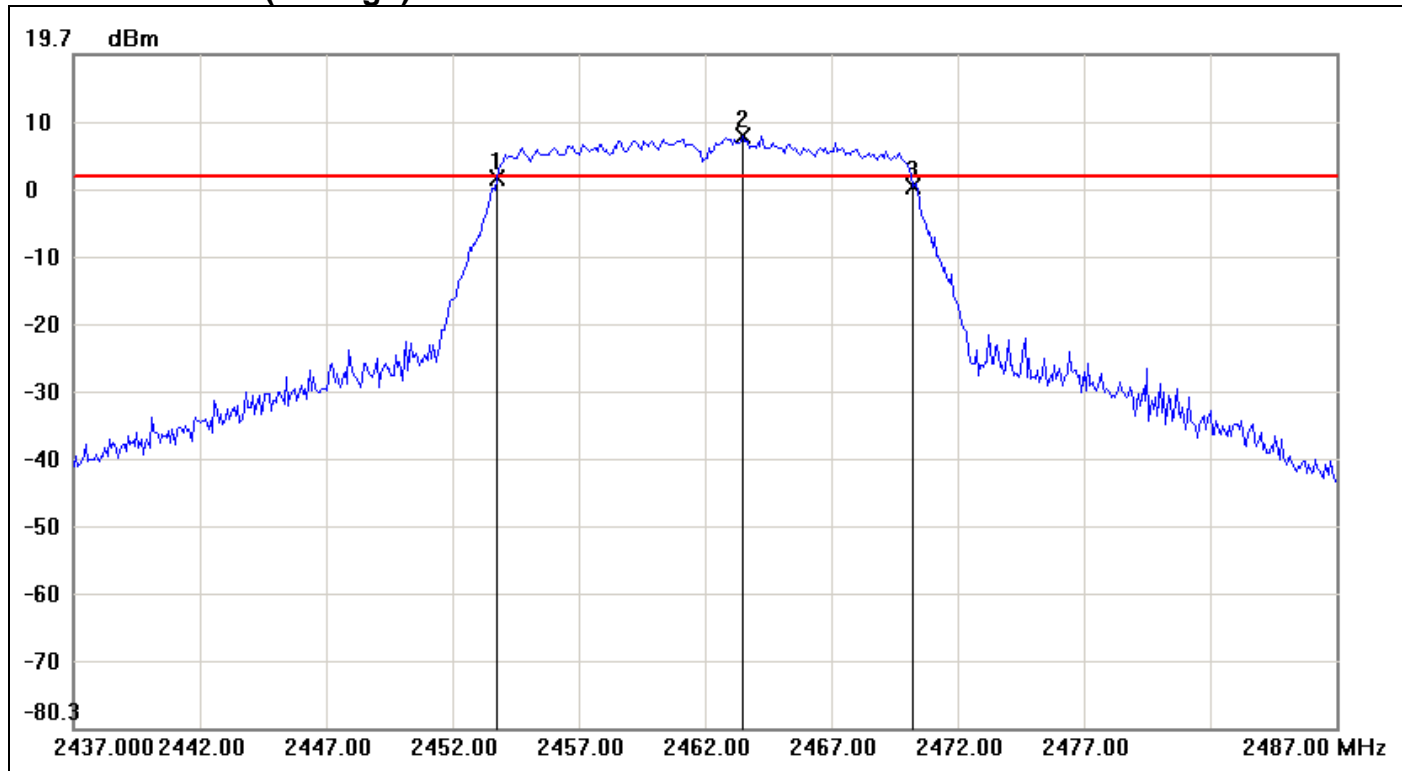
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2453.7500	1.42	1.56	-0.14
2	2463.5000	7.56	1.56	6.00
3	2470.2500	-0.03	1.56	-1.59

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	16.5	-1.45

IEEE 802.11n HT 20 MHz mode / Chain 0

6dB Bandwidth (CH Low)
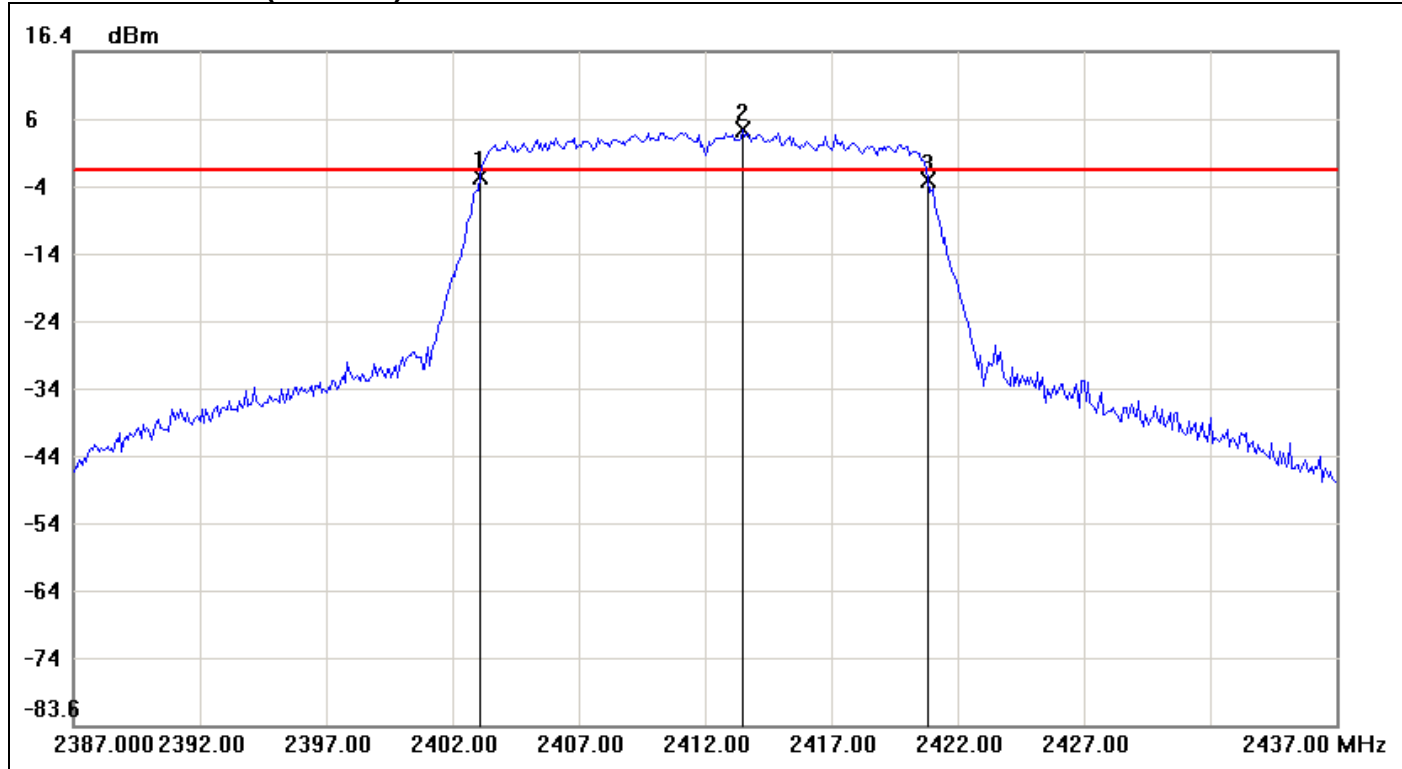
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2403.0833	-2.13	-1.34	-0.79
2	2413.5000	4.66	-1.34	6.00
3	2420.8333	-2.83	-1.34	-1.49

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	17.75	-0.7

6dB Bandwidth (CH Mid)
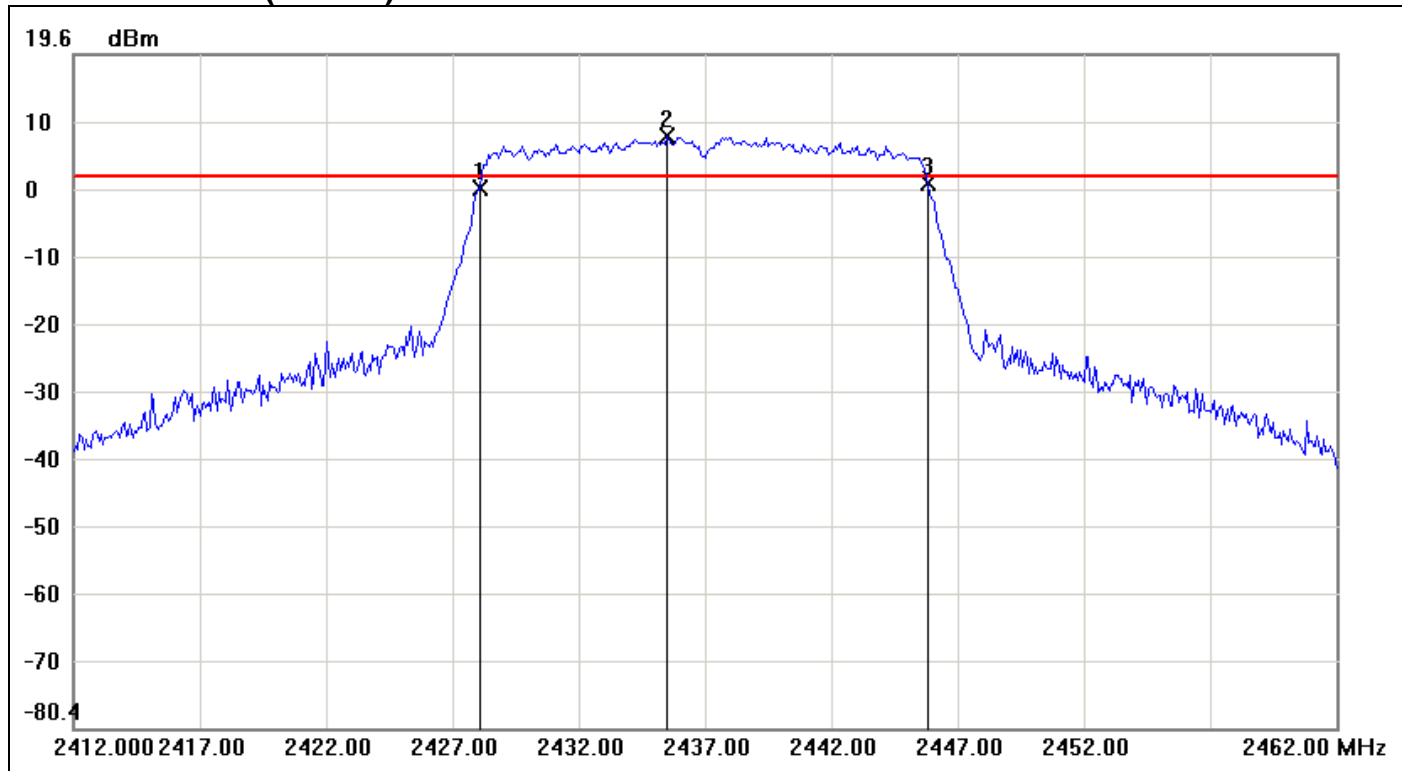
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2428.0833	-0.29	1.47	-1.76
2	2435.5000	7.47	1.47	6.00
3	2445.8333	0.45	1.47	-1.02

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	17.75	0.74

6dB Bandwidth (CH High)
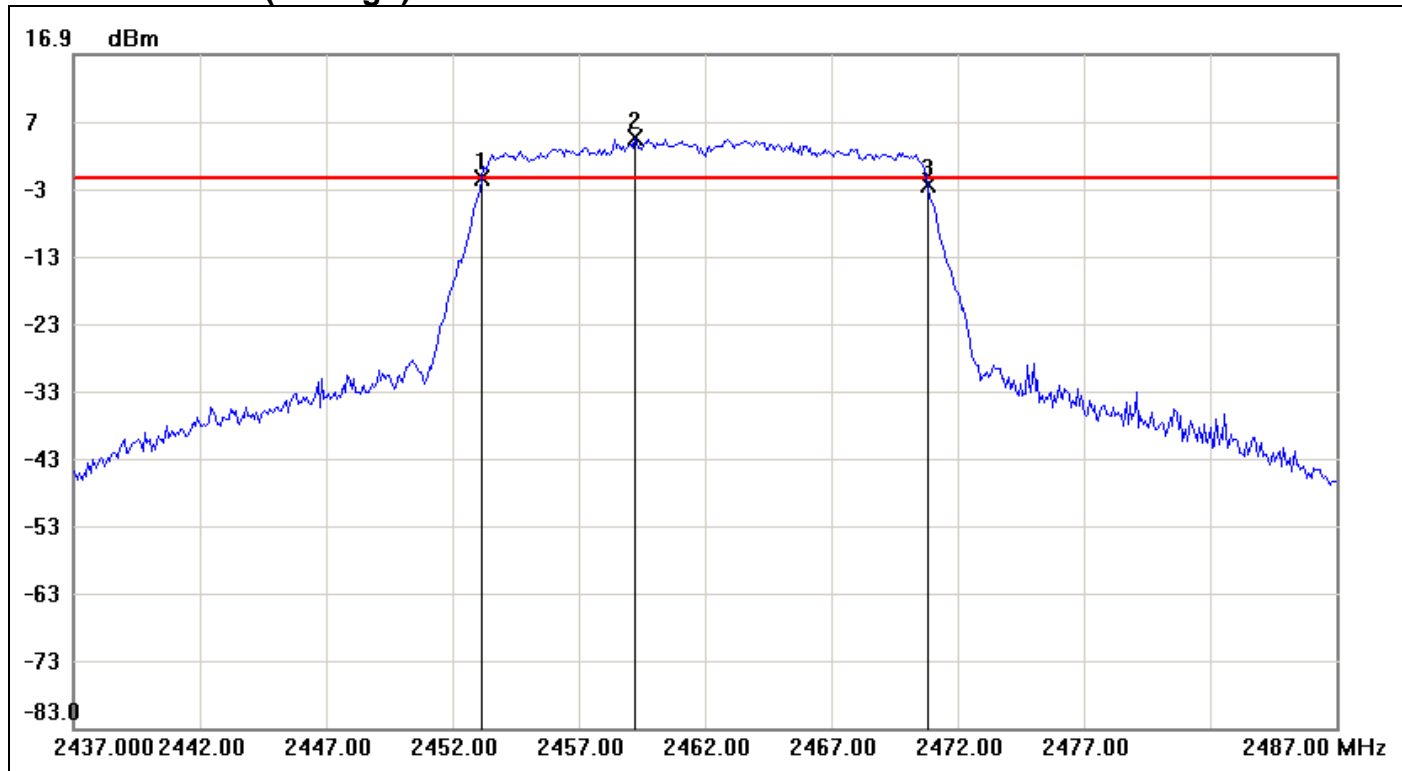
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2453.1667	-1.52	-1.52	0.00
2	2459.2500	4.48	-1.52	6.00
3	2470.8333	-2.51	-1.52	-0.99

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	17.6666	-0.99

IEEE 802.11n HT 20 MHz mode / Chain 1

6dB Bandwidth (CH Low)
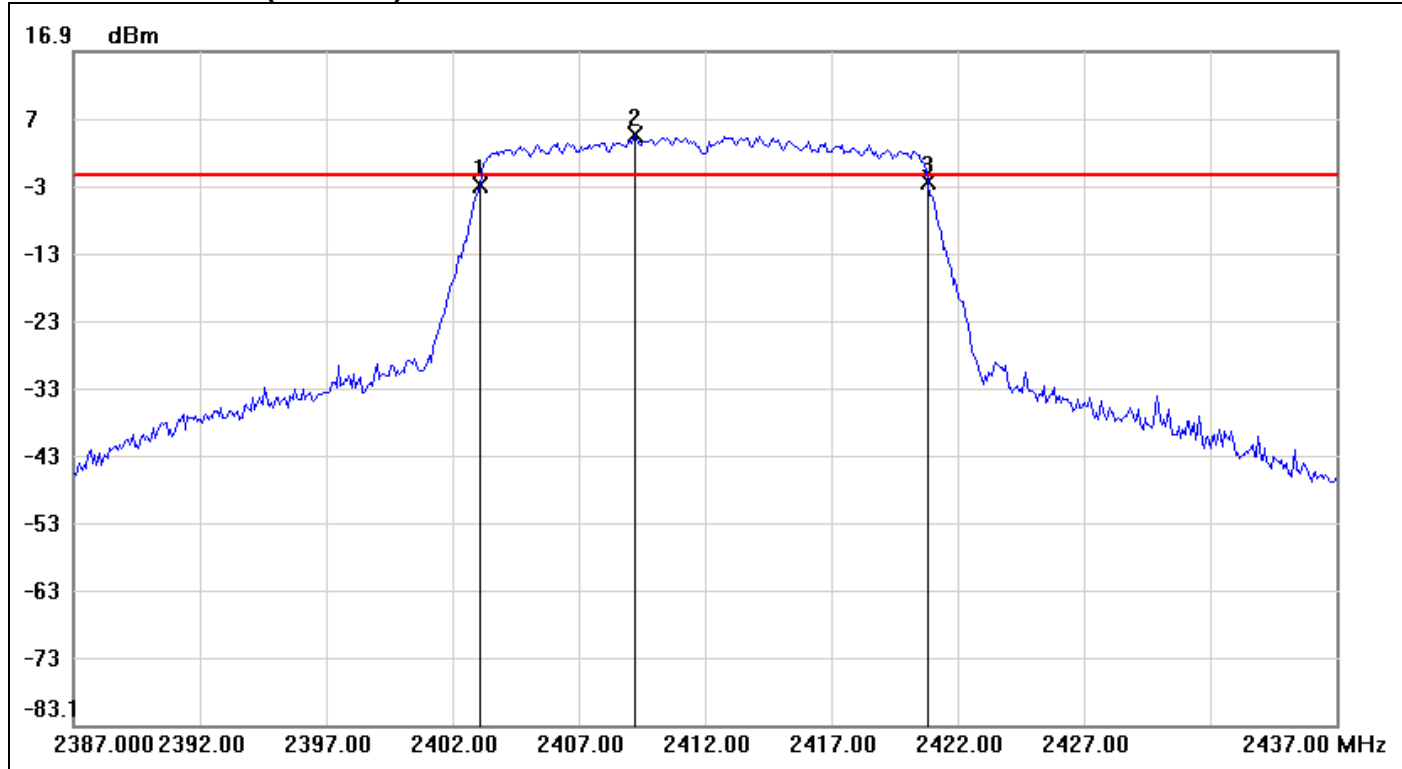
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2403.0833	-3.03	-1.58	-1.45
2	2409.2500	4.42	-1.58	6.00
3	2420.8333	-2.54	-1.58	-0.96

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	17.75	0.49

6dB Bandwidth (CH Mid)
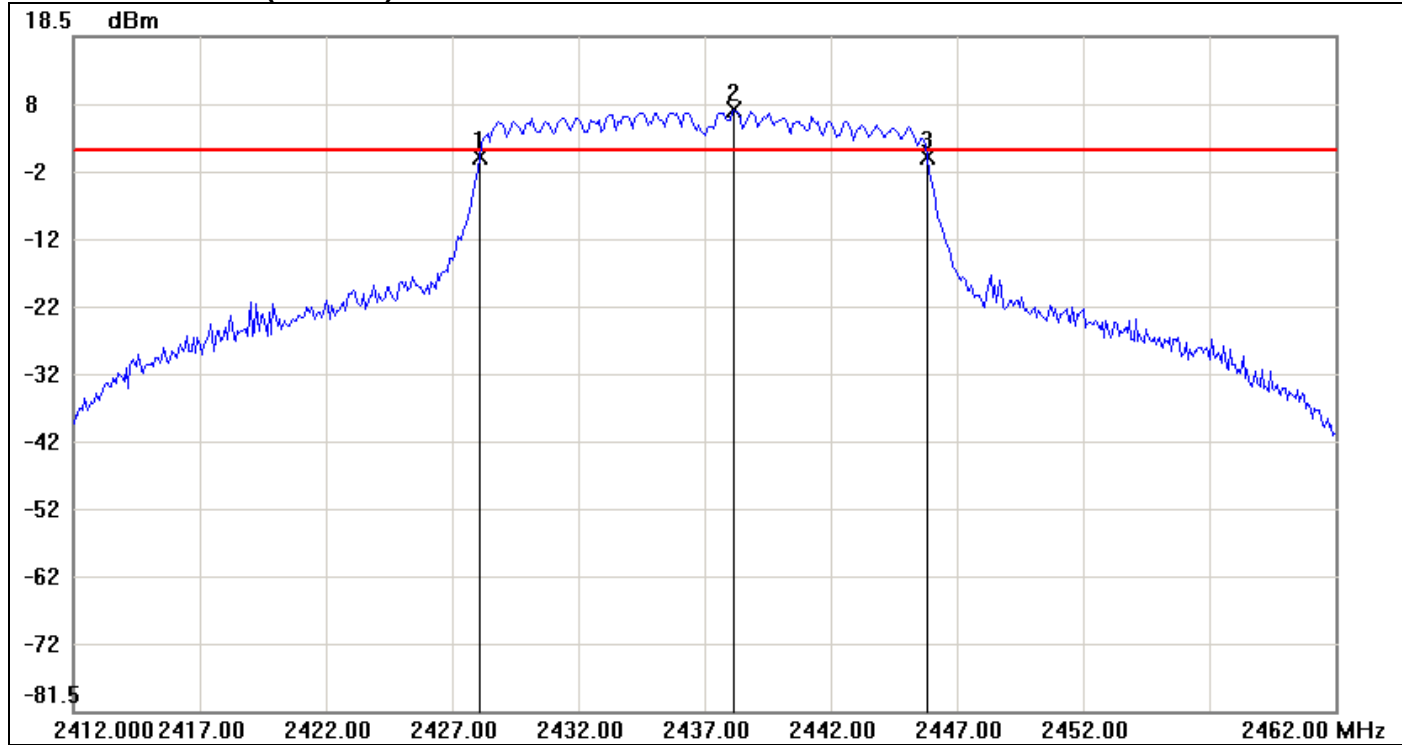
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2428.0833	0.72	1.53	-0.81
2	2438.1667	7.53	1.53	6.00
3	2445.8333	0.59	1.53	-0.94

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	17.75	-0.13

6dB Bandwidth (CH High)
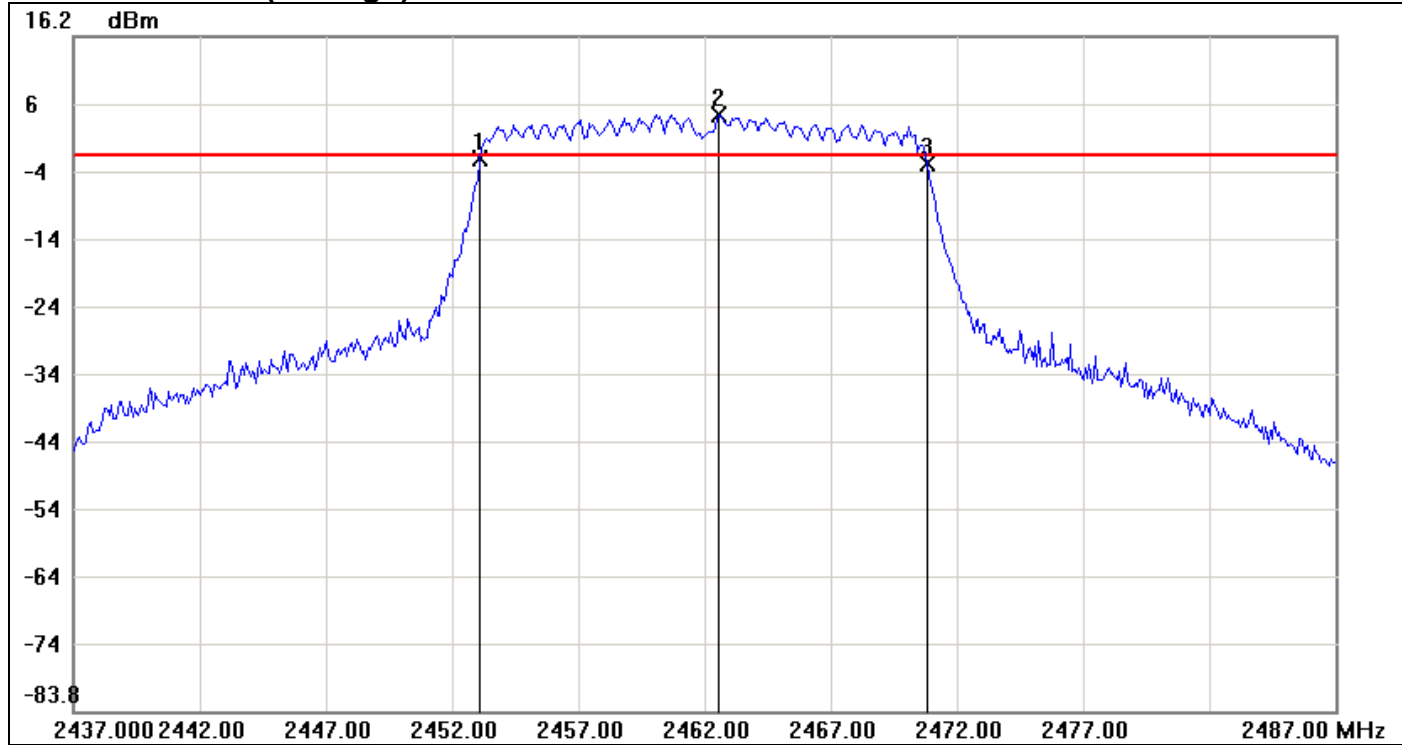
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2453.0833	-1.82	-1.32	-0.50
2	2462.5833	4.68	-1.32	6.00
3	2470.8333	-2.69	-1.32	-1.37

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	17.75	-0.87

IEEE 802.11n HT 40 MHz mode / Chain 0

6dB Bandwidth (CH Low)
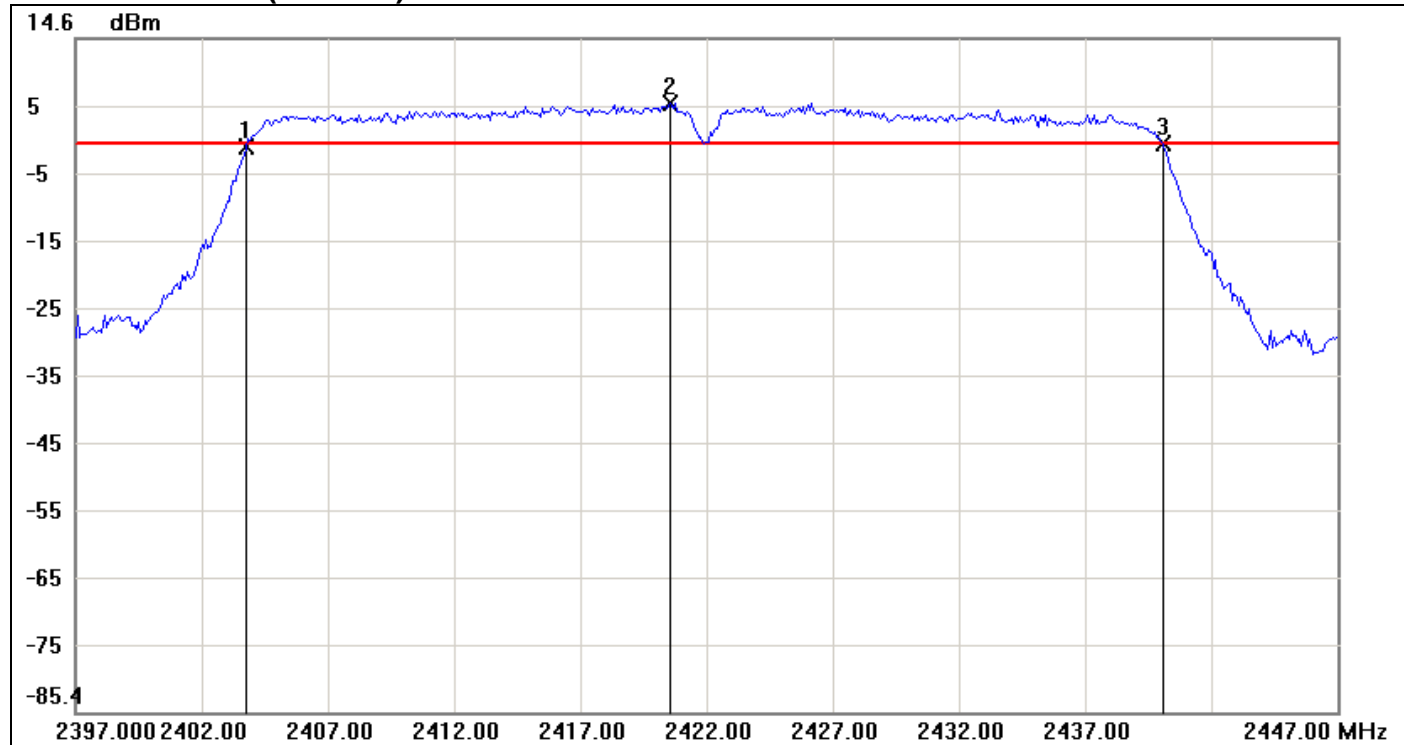
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2403.7500	-1.39	-0.92	-0.47
2	2420.5833	5.08	-0.92	6.00
3	2440.0833	-0.93	-0.92	-0.01

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	36.3333	0.46

6dB Bandwidth (CH Mid)
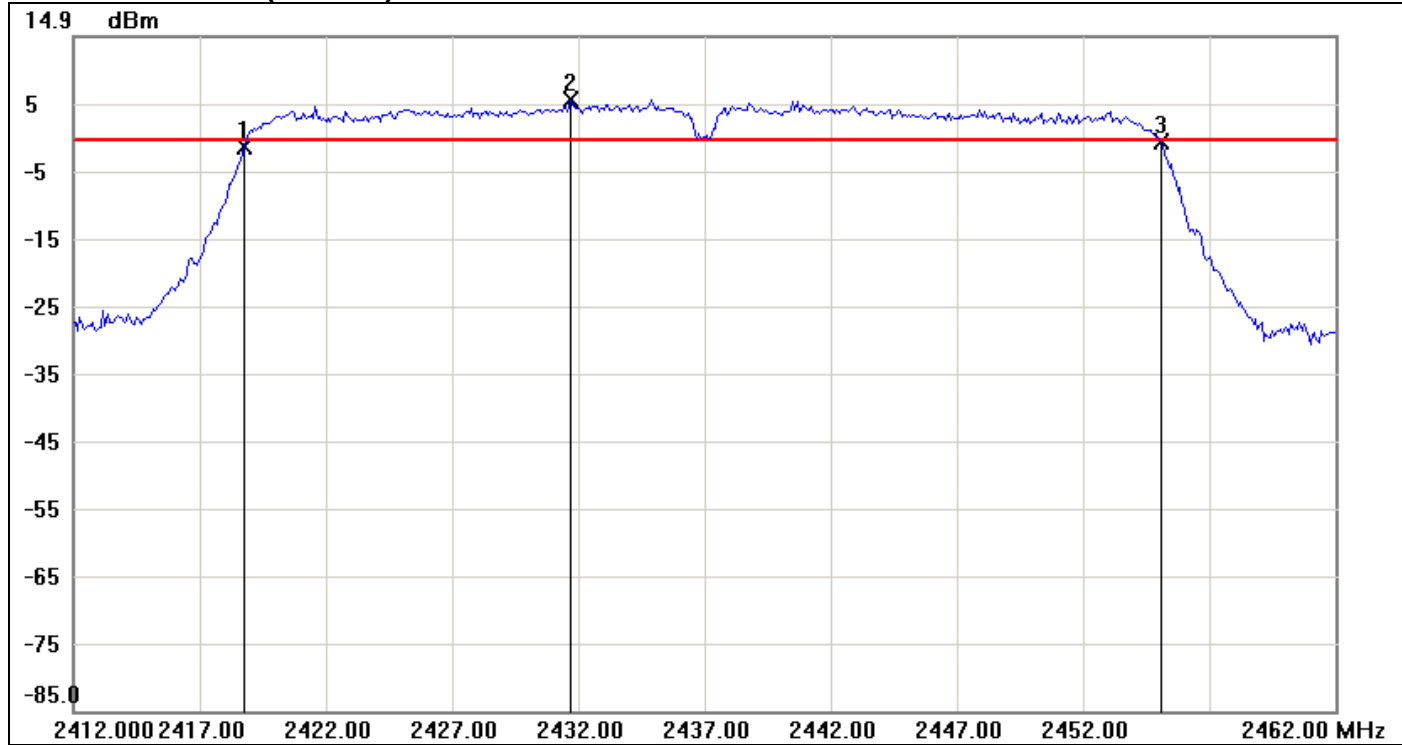
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2418.7500	-1.35	-0.30	-1.05
2	2431.6667	5.70	-0.30	6.00
3	2455.0833	-0.76	-0.30	-0.46

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	36.3333	0.59

6dB Bandwidth (CH High)
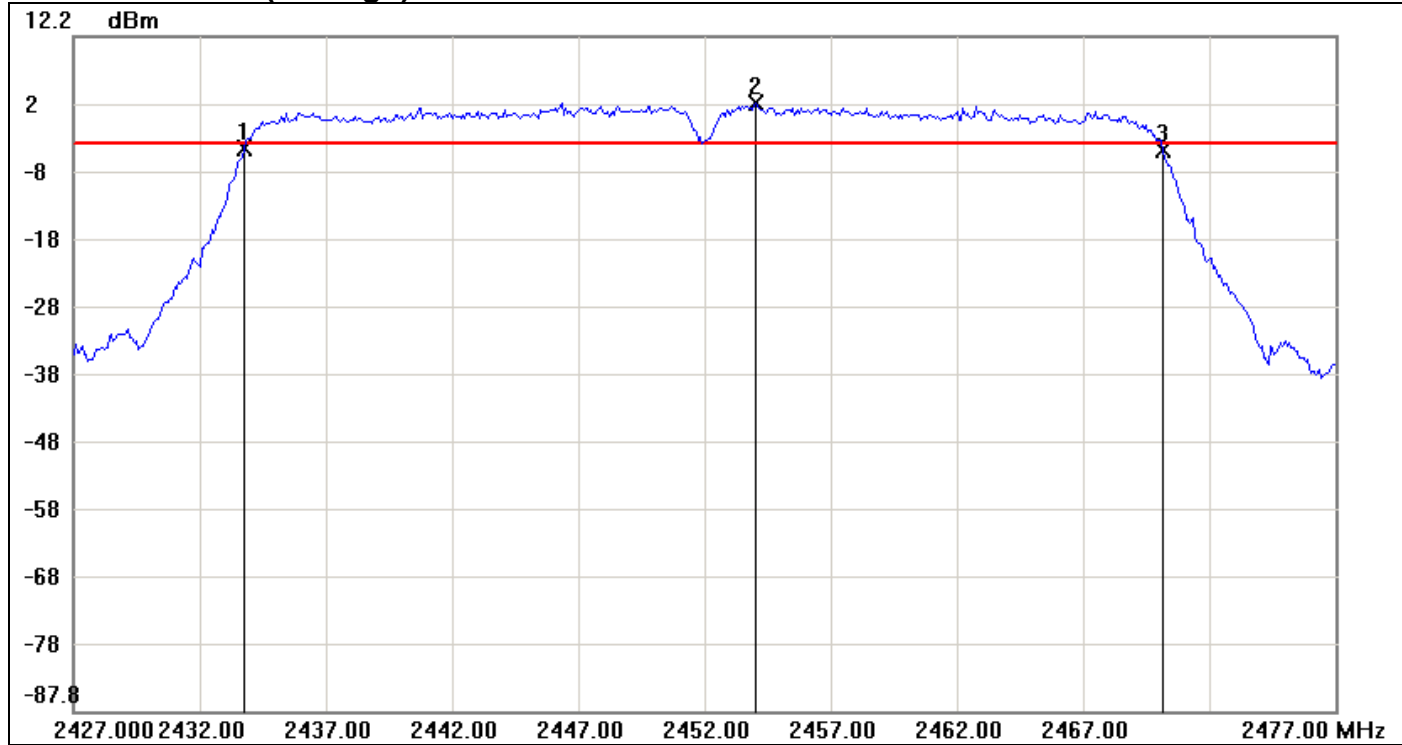
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2433.7500	-4.53	-3.70	-0.83
2	2454.0000	2.30	-3.70	6.00
3	2470.1667	-4.67	-3.70	-0.97

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	36.4167	-0.14

IEEE 802.11n HT 40 MHz mode / Chain 1

6dB Bandwidth (CH Low)
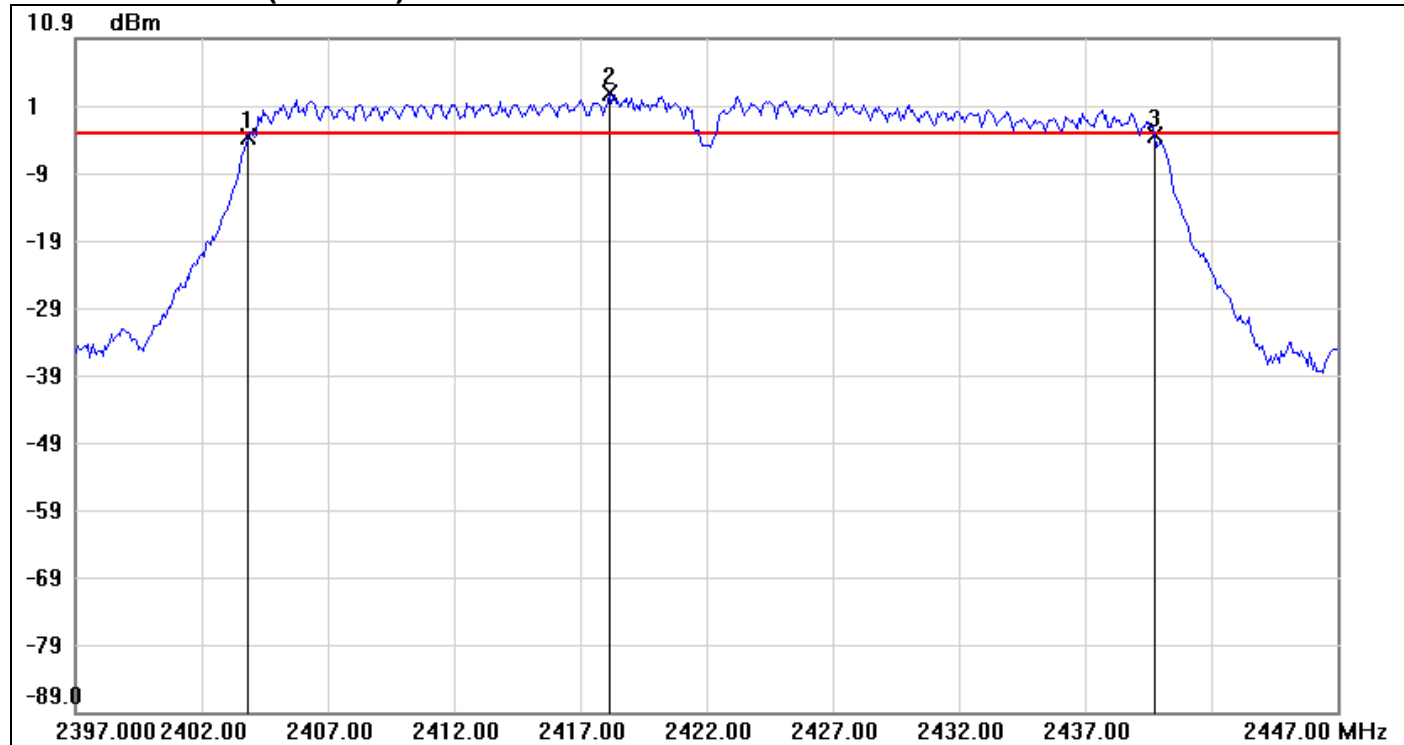
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2403.8333	-3.79	-3.13	-0.66
2	2418.1667	2.87	-3.13	6.00
3	2439.7500	-3.50	-3.13	-0.37

No.		△Frequency(MHz)	△Level(dB)
1	mk3-mk1	35.9167	0.29

6dB Bandwidth (CH Mid)
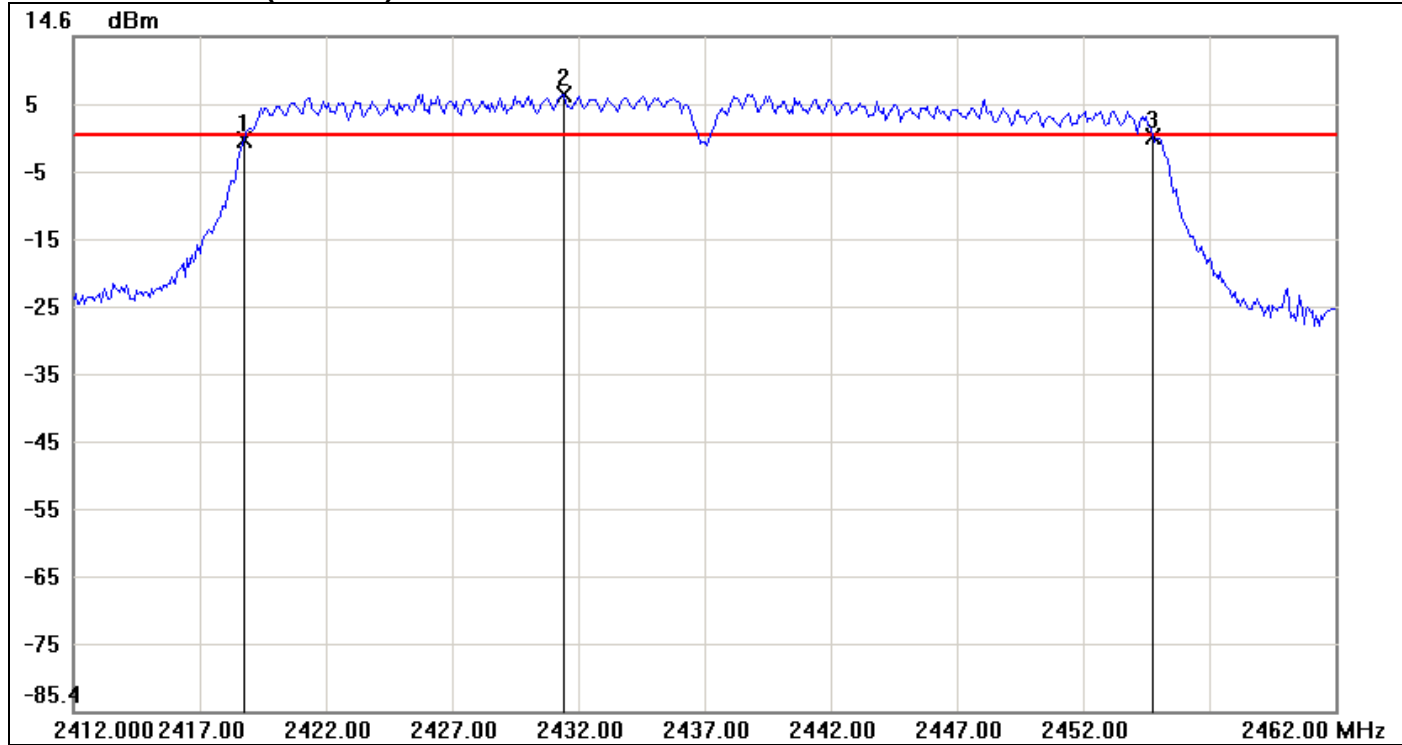
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2418.7500	-0.82	0.08	-0.90
2	2431.4167	6.08	0.08	6.00
3	2454.7500	-0.23	0.08	-0.31

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	36	0.59

6dB Bandwidth (CH High)
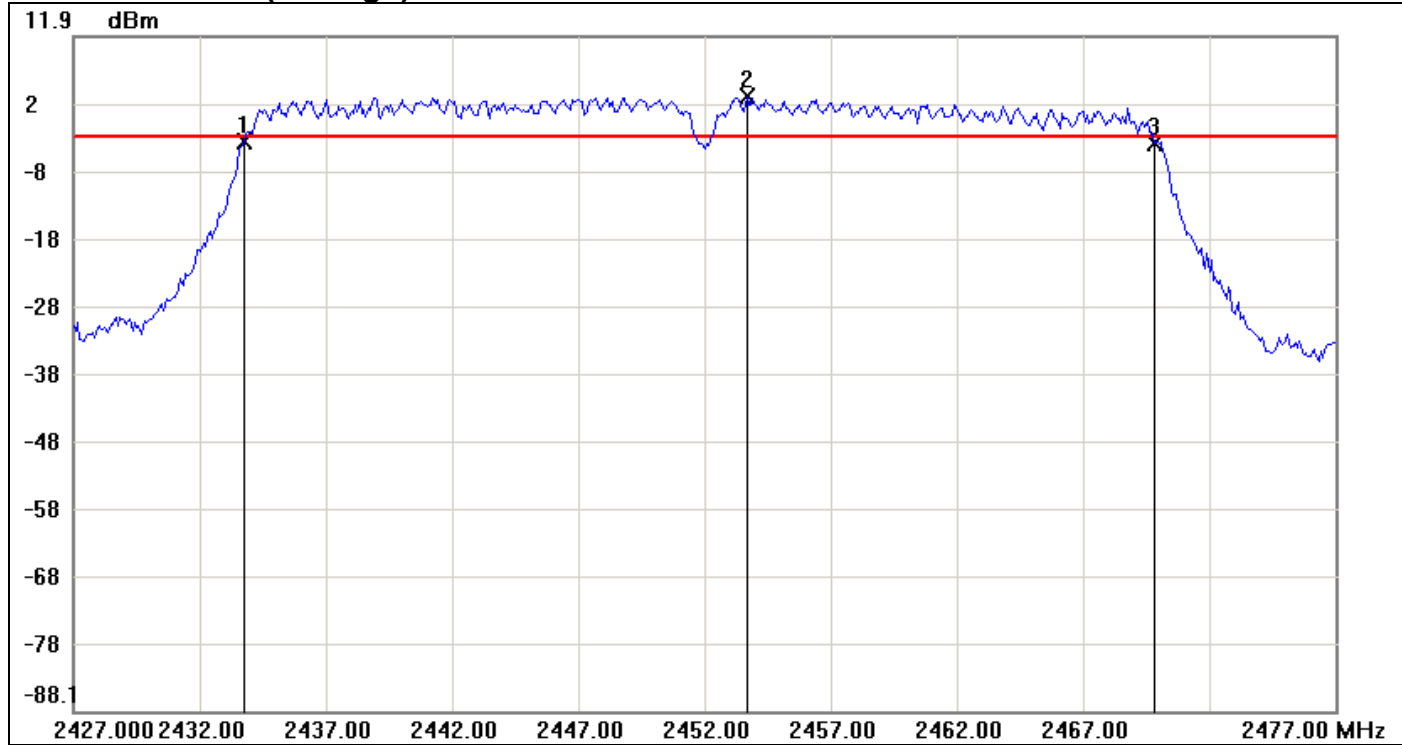
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2433.7500	-3.71	-3.04	-0.67
2	2453.6667	2.96	-3.04	6.00
3	2469.8333	-3.90	-3.04	-0.86

No.		∆Frequency(MHz)	∆Level(dB)
1	mk3-mk1	36.0833	-0.19

7.3 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3. According to RSS-247, for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

Test Configuration
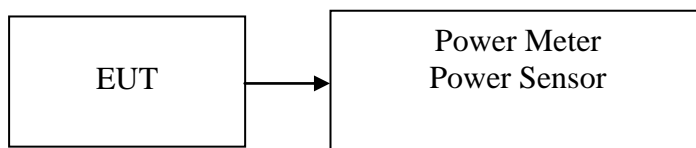
| EUT | → | Power Meter Power Sensor |

TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	20.01	0.1002		PASS
Mid	2437	20.15	0.1035	30	PASS
High	2462	*20.31	0.1074		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	24.67	0.2931		PASS
Mid	2437	24.23	0.2649	30	PASS
High	2462	*24.85	0.3055		PASS

Test mode: IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	22.12	21.37	24.77	0.2999		PASS
Mid	2437	24.76	23.92	*27.37	0.5458	28.45	PASS
High	2462	22.77	20.94	24.96	0.3133		PASS

Test mode: IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2422	21.83	20.89	24.40	0.2754		PASS
Mid	2437	23.06	22.57	*25.83	0.3828	28.45	PASS
High	2452	22.04	20.97	24.55	0.2851		PASS

Remark:
1. Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)
2. The maximum antenna gain is 7.55dBi; therefore the reduction due to antenna gain is 1.55dBi, so the limit is 28.45dBm.

7.4 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration
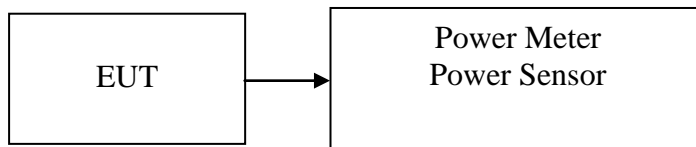
```
┌──────────────┐          ┌──────────────────┐
│              │          │   Power Meter    │
│     EUT      │─────────▶│  Power Sensor    │
│              │          │                  │
└──────────────┘          └──────────────────┘
```

TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	16.85	0.0484
Mid	2437	16.75	0.0473
High	2462	16.81	0.0480

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	15.84	0.0384
Mid	2437	15.95	0.0394
High	2462	15.78	0.0378

Test mode: IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2412	13.38	12.81	16.11	0.0408
Mid	2437	15.68	15.95	18.82	0.0762
High	2462	13.21	12.60	15.92	0.0391

Test mode: IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2422	12.37	11.47	14.95	0.0313
Mid	2437	13.75	13.96	16.87	0.0486
High	2452	12.26	11.55	14.93	0.0311

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000) + Chain 1 (10^(Output Power /10)/1000)*

7.5 BAND EDGES MEASUREMENT

LIMIT

According to §15.247(d) & RSS-247, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration
For Radiated
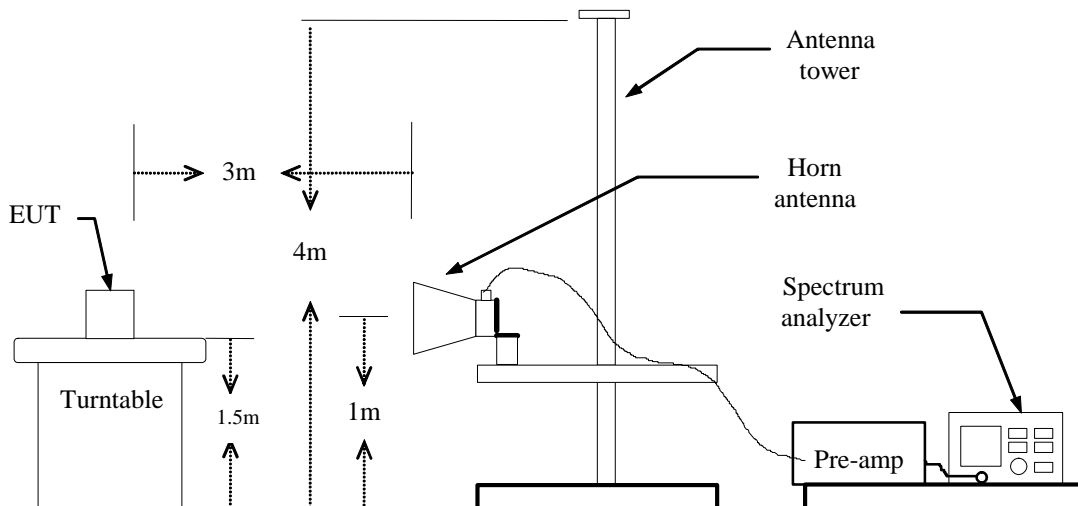
For Conducted
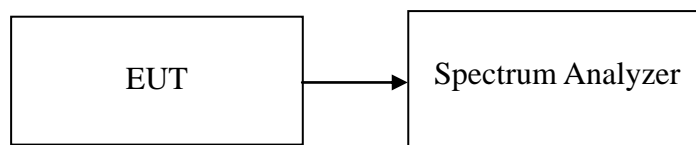
TEST PROCEDURE

For Radiated

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
       if duty cycle$\geq$98%, VBW=10Hz.
       if duty cycle<98% VBW=1/T.
       IEEE 802.11b mode: $\geq$98%, VBW=10Hz
       IEEE 802.11g mode: = 88%, VBW=750Hz
       IEEE 802.11n HT 20 MHz mode: = 77%, VBW=1.5KHz
       IEEE 802.11n HT 40 MHz mode: = 65%, VBW=3KHz

5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.
6. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

For Conducted

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

TEST RESULTS

Refer to attach spectrum analyzer data chart.

Band Edges (IEEE 802.11b mode / CH Low)

Polarity: Vertical
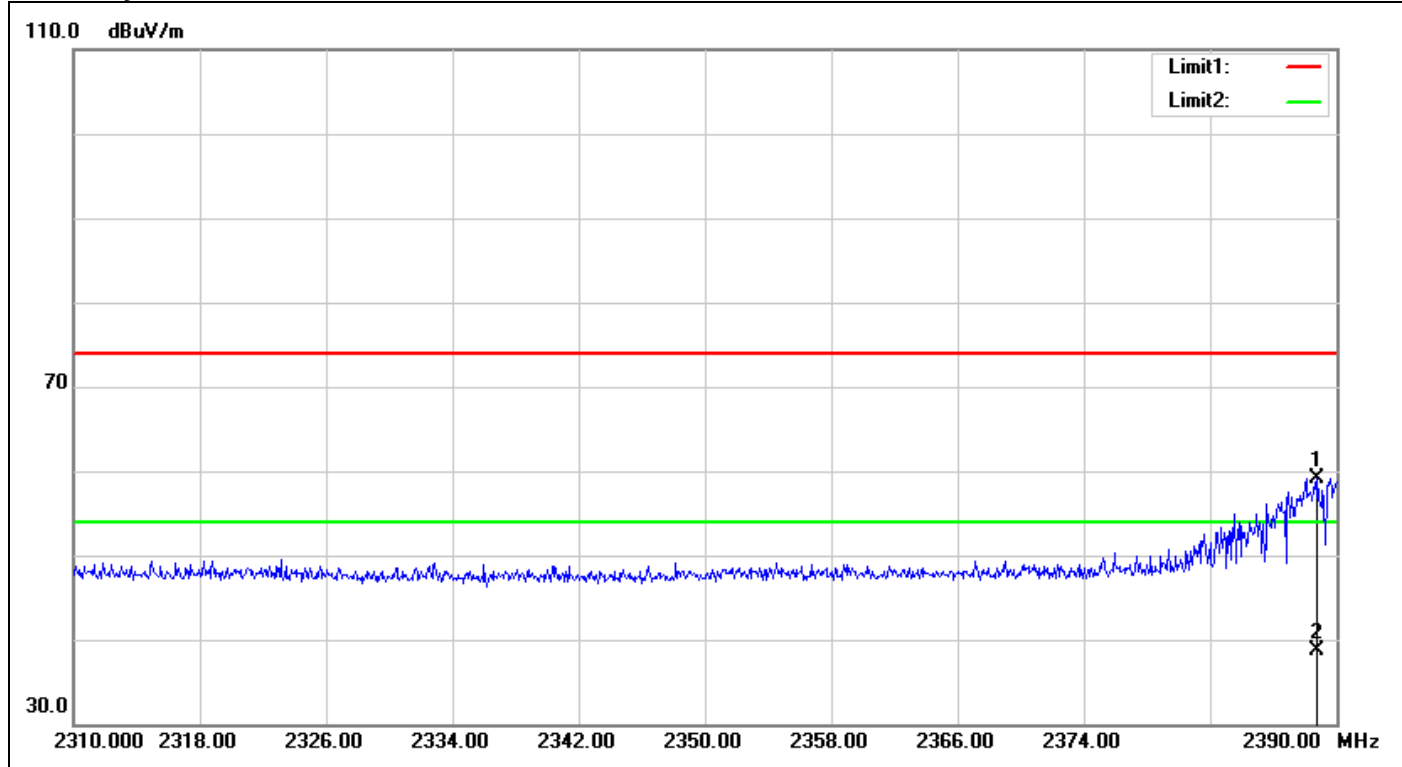
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2388.800	61.62	-2.50	59.12	74.00	-14.88	100	193	peak
2	2388.800	41.11	-2.50	38.61	54.00	-15.39	100	193	AVG

Polarity: Horizontal
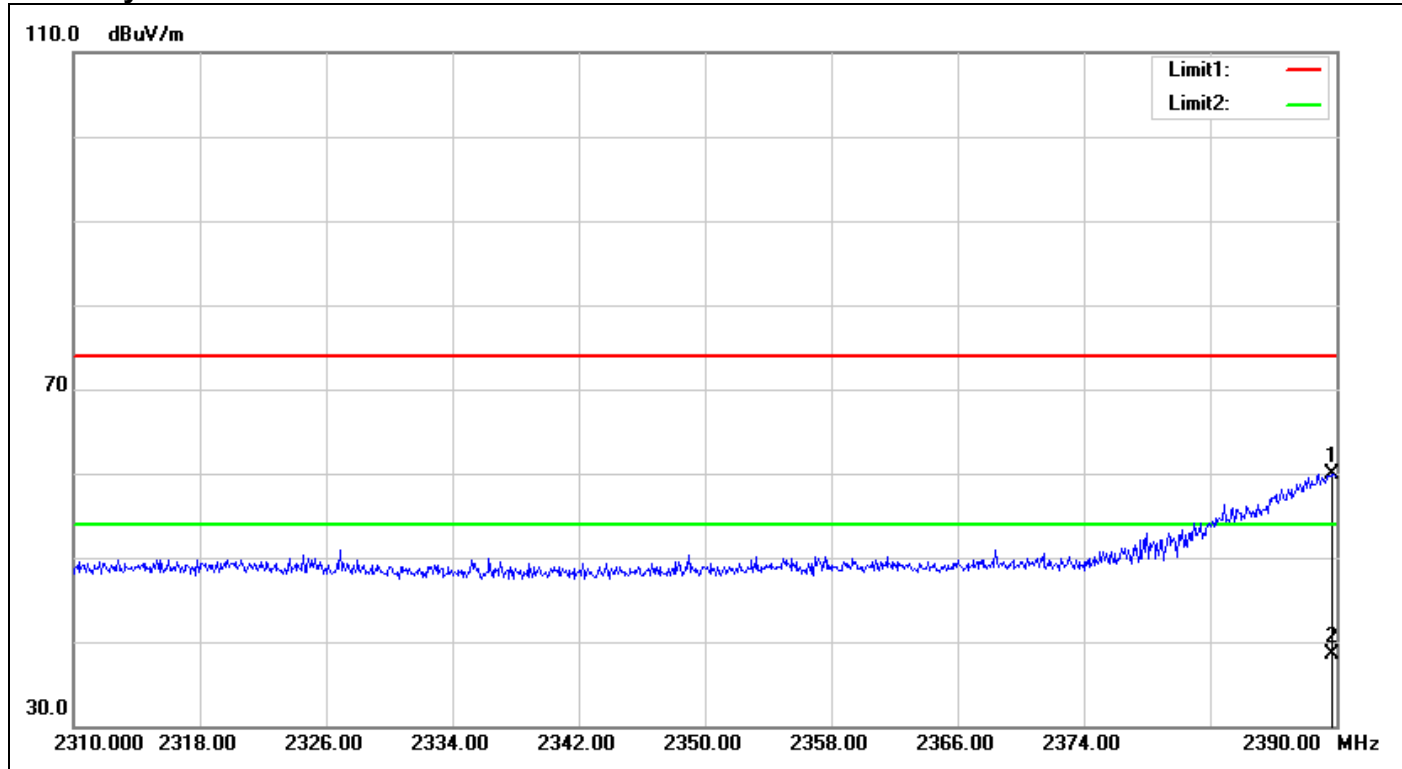
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2389.680	62.49	-2.49	60.00	74.00	-14.00	100	215	peak
2	2389.680	41.08	-2.49	38.59	54.00	-15.41	100	215	AVG

Band Edges (IEEE 802.11b mode / CH High)

Polarity: Vertical
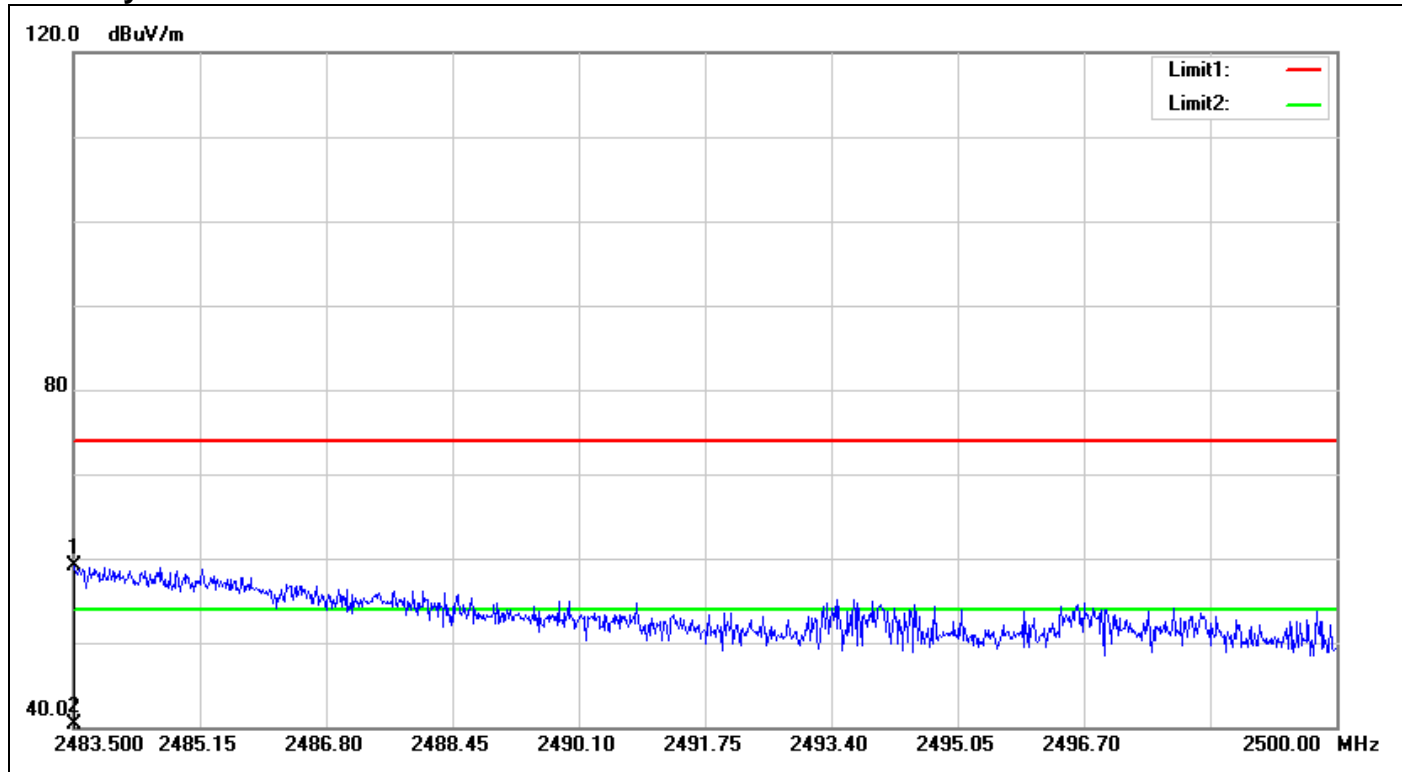
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.500	61.03	-1.99	59.04	74.00	-14.96	100	258	peak
2	2483.500	42.24	-1.99	40.25	54.00	-13.75	100	258	AVG

Polarity: Horizontal
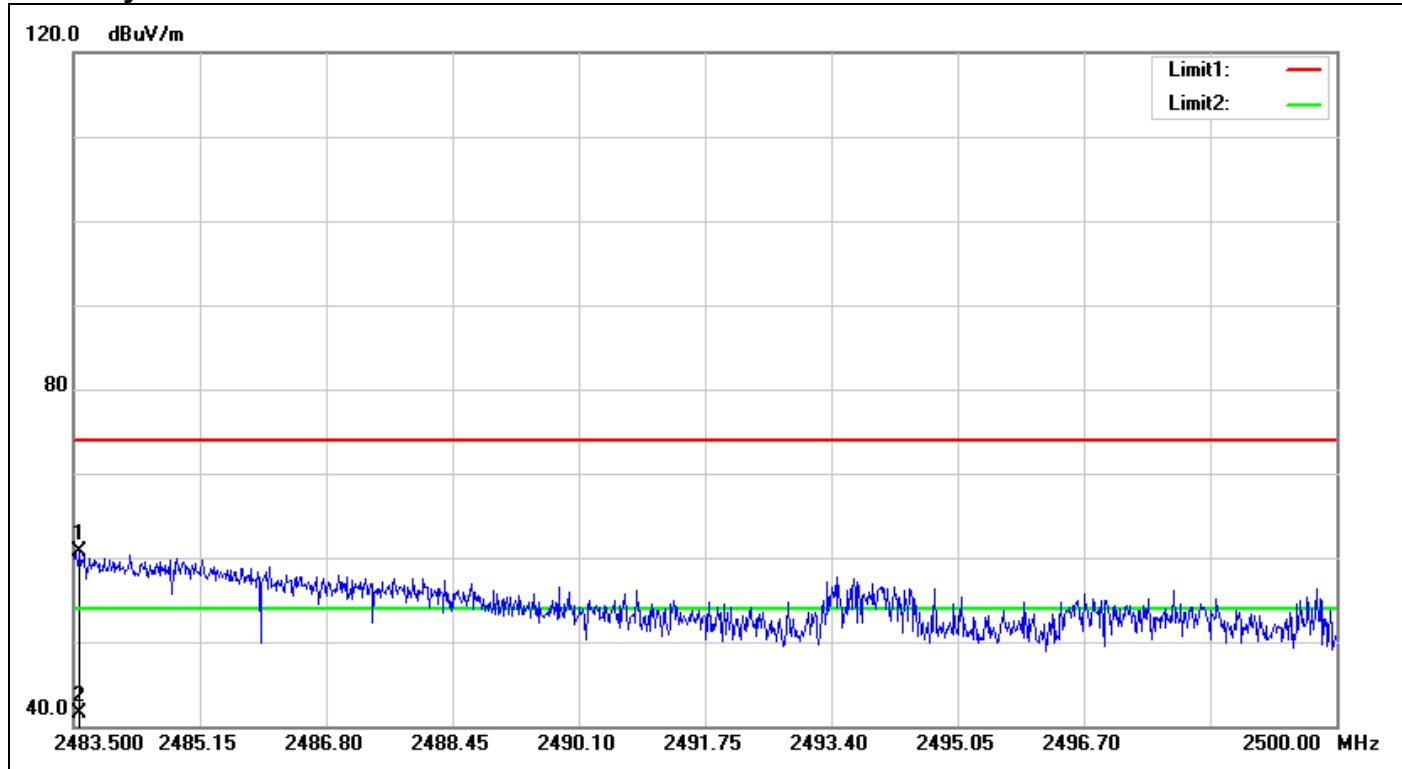
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.582	62.67	-1.99	60.68	74.00	-13.32	100	273	peak
2	2483.582	43.44	-1.99	41.45	54.00	-12.55	100	273	AVG

Band Edges (IEEE 802.11g mode / CH Low)

Polarity: Vertical
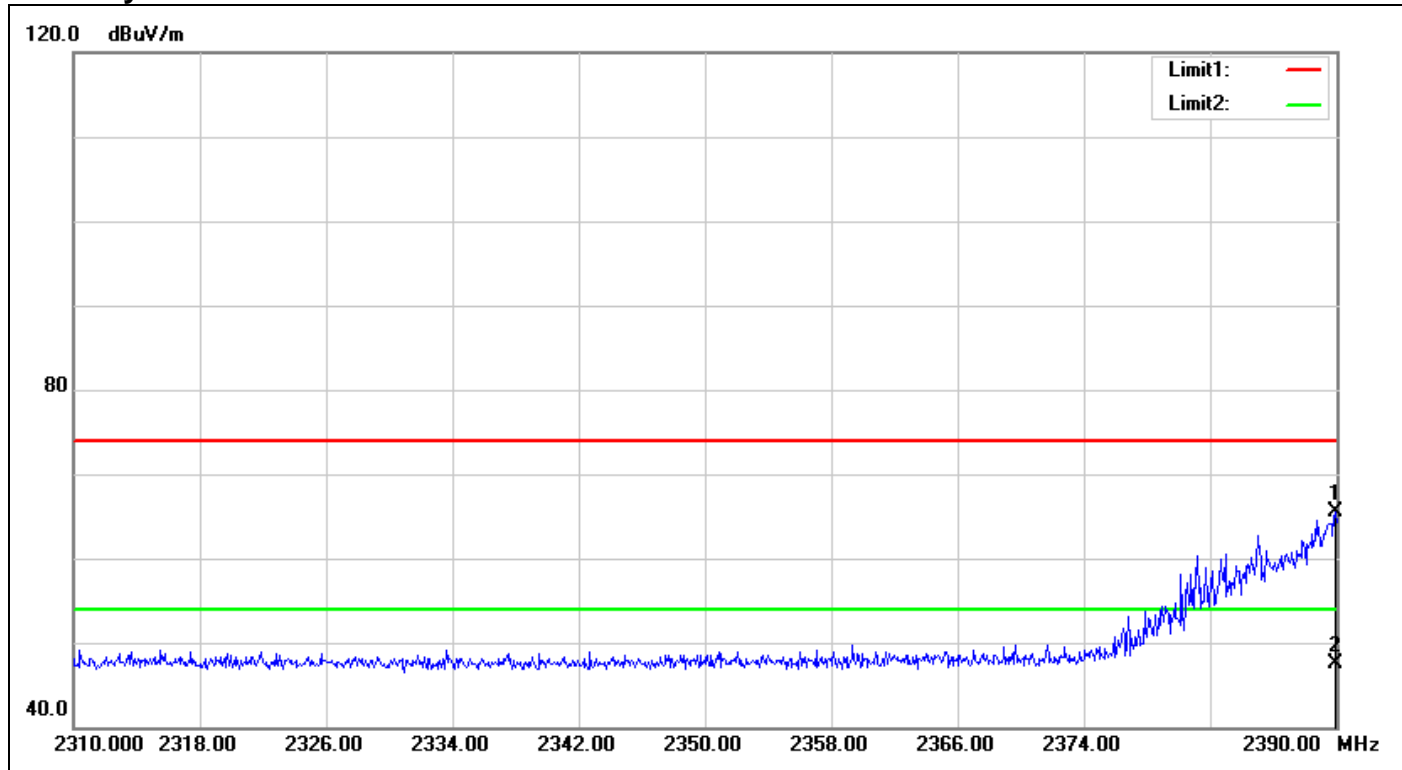
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2389.920	67.95	-2.49	65.46	74.00	-8.54	100	325	peak
2	2389.920	50.04	-2.49	47.55	54.00	-6.45	100	325	AVG

Polarity: Horizontal
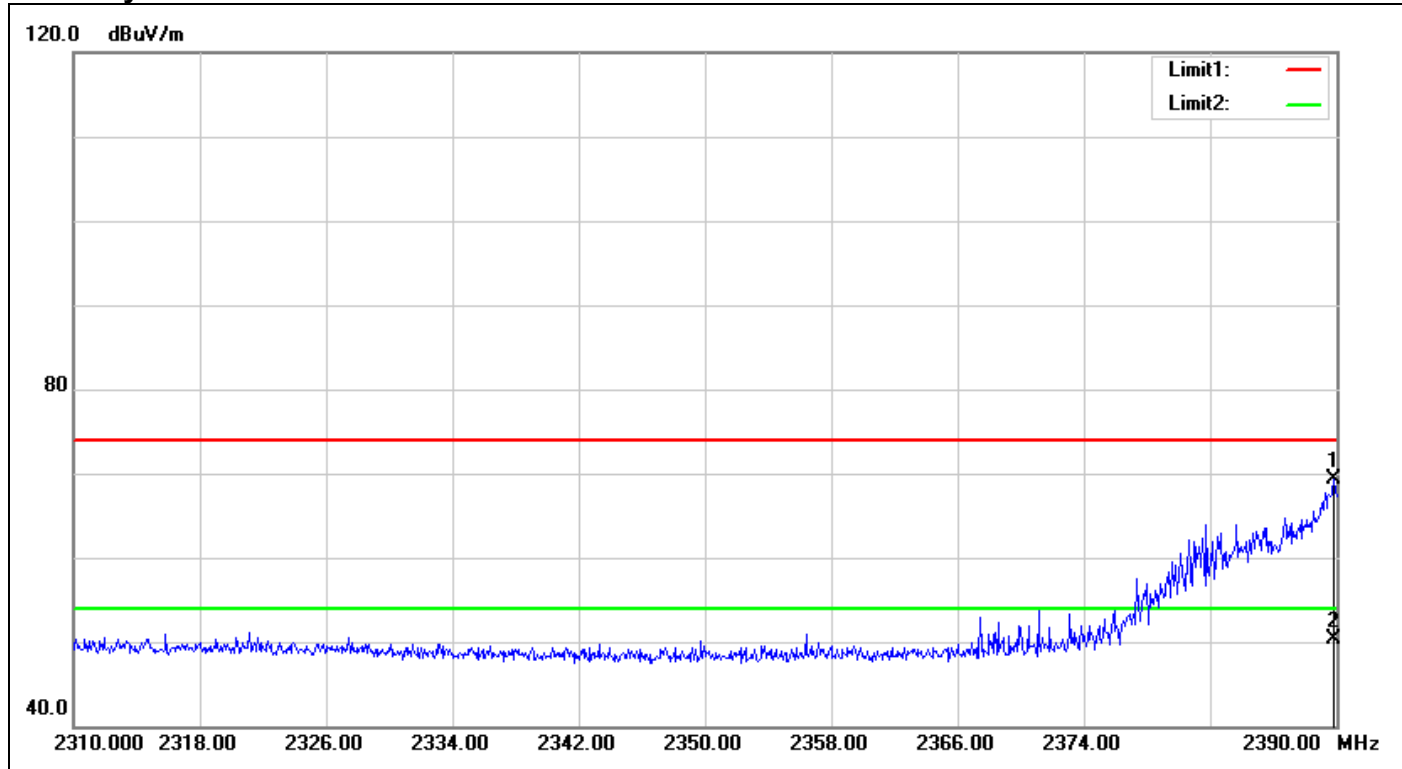
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2389.840	71.76	-2.49	69.27	74.00	-4.73	100	343	peak
2	2389.840	52.80	-2.49	50.31	54.00	-3.69	100	343	AVG

Band Edges (IEEE 802.11g mode / CH High)

Polarity: Vertical
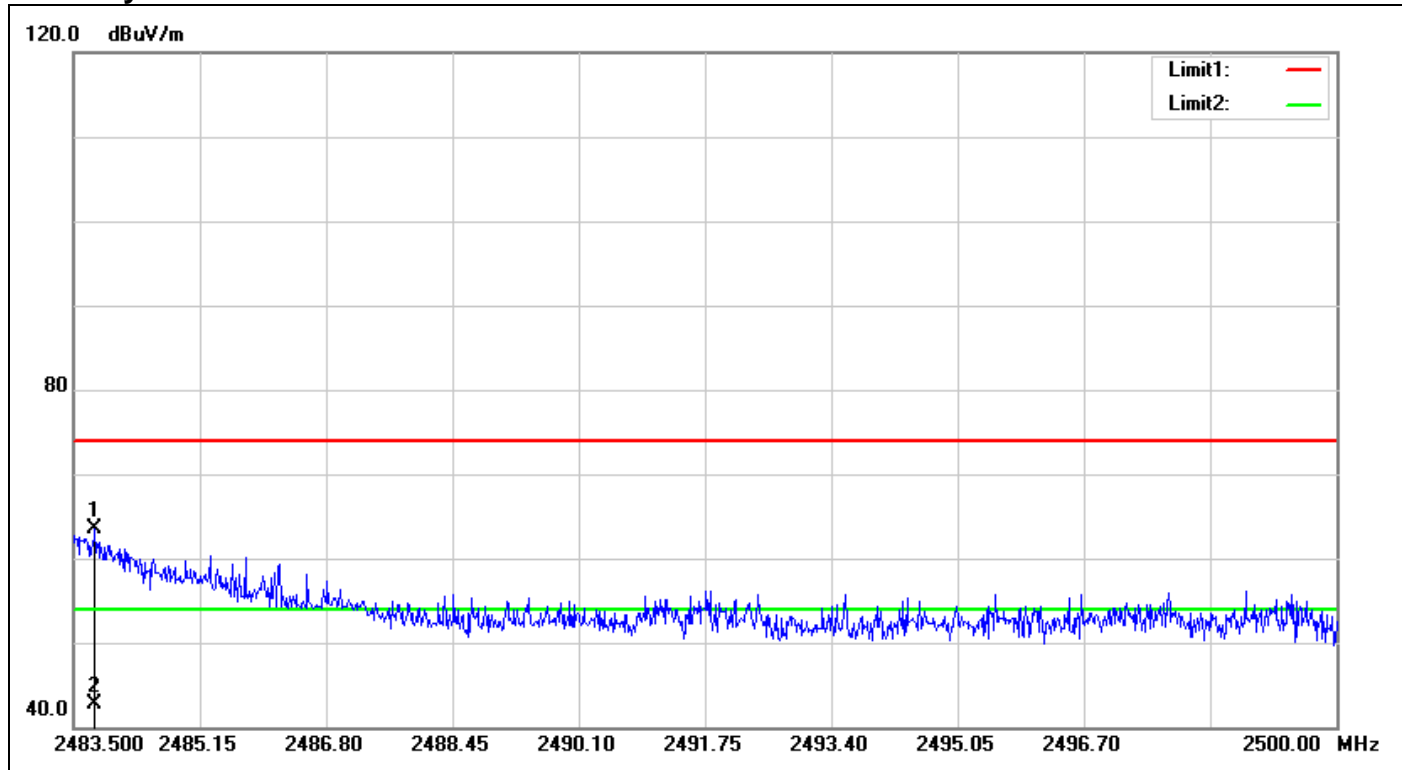
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.780	65.42	-1.99	63.43	74.00	-10.57	100	133	peak
2	2483.780	44.72	-1.99	42.73	54.00	-11.27	100	133	AVG

Polarity: Horizontal
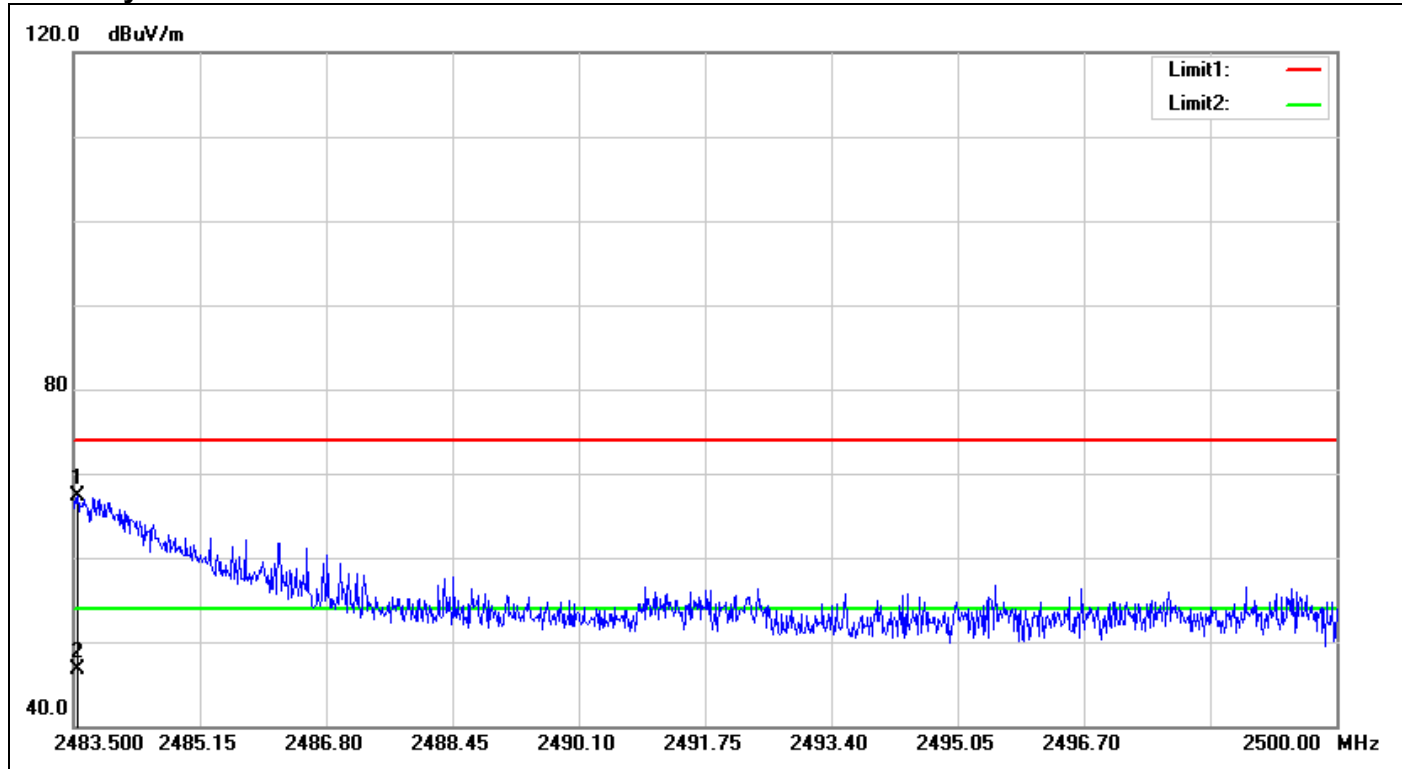
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.550	69.22	-1.99	67.23	74.00	-6.77	100	229	peak
2	2483.550	48.70	-1.99	46.71	54.00	-7.29	100	229	AVG

Band Edges (IEEE 802.11n HT 20 MHz mode / CH Low)
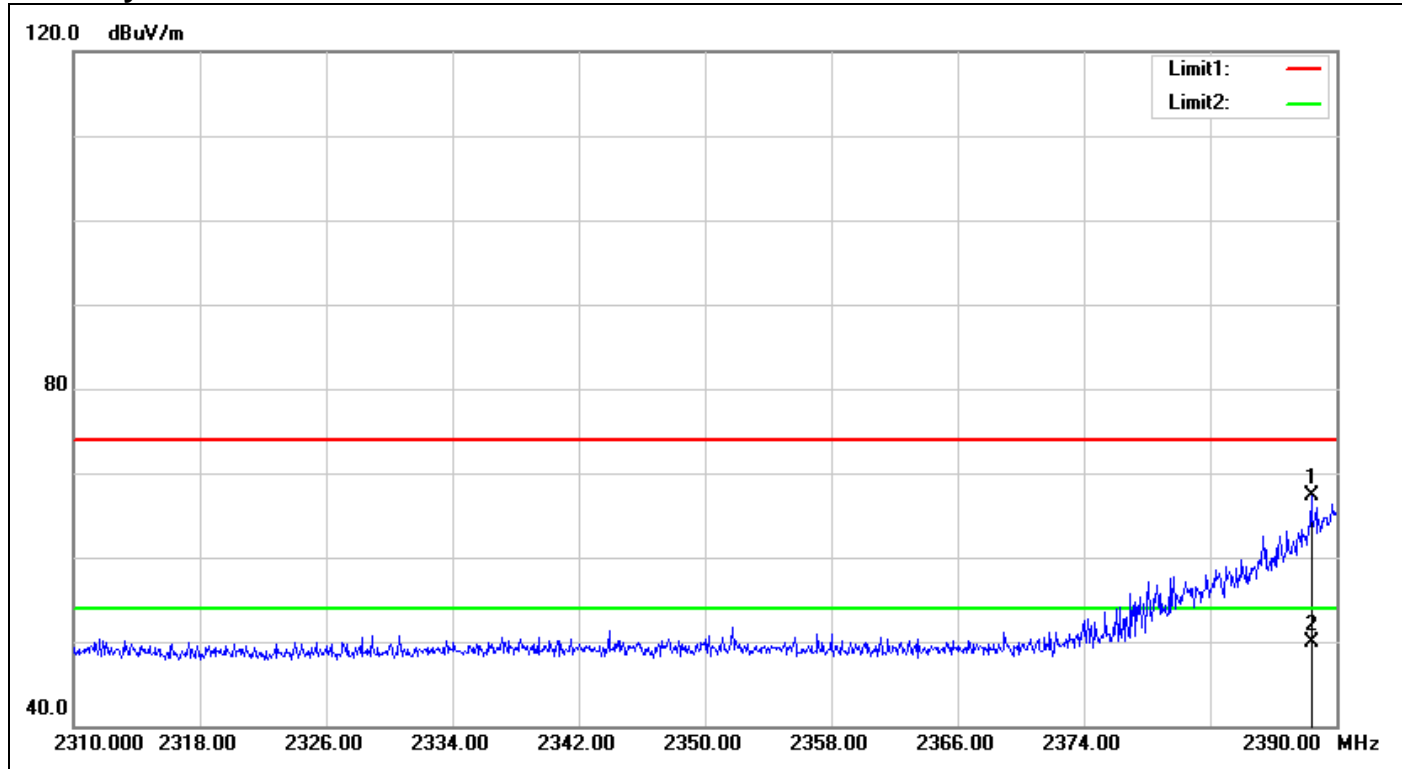
Polarity: Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2388.400	69.88	-2.50	67.38	74.00	-6.62	100	256	peak
2	2388.400	52.49	-2.50	49.99	54.00	-4.01	100	256	AVG

Polarity: Horizontal
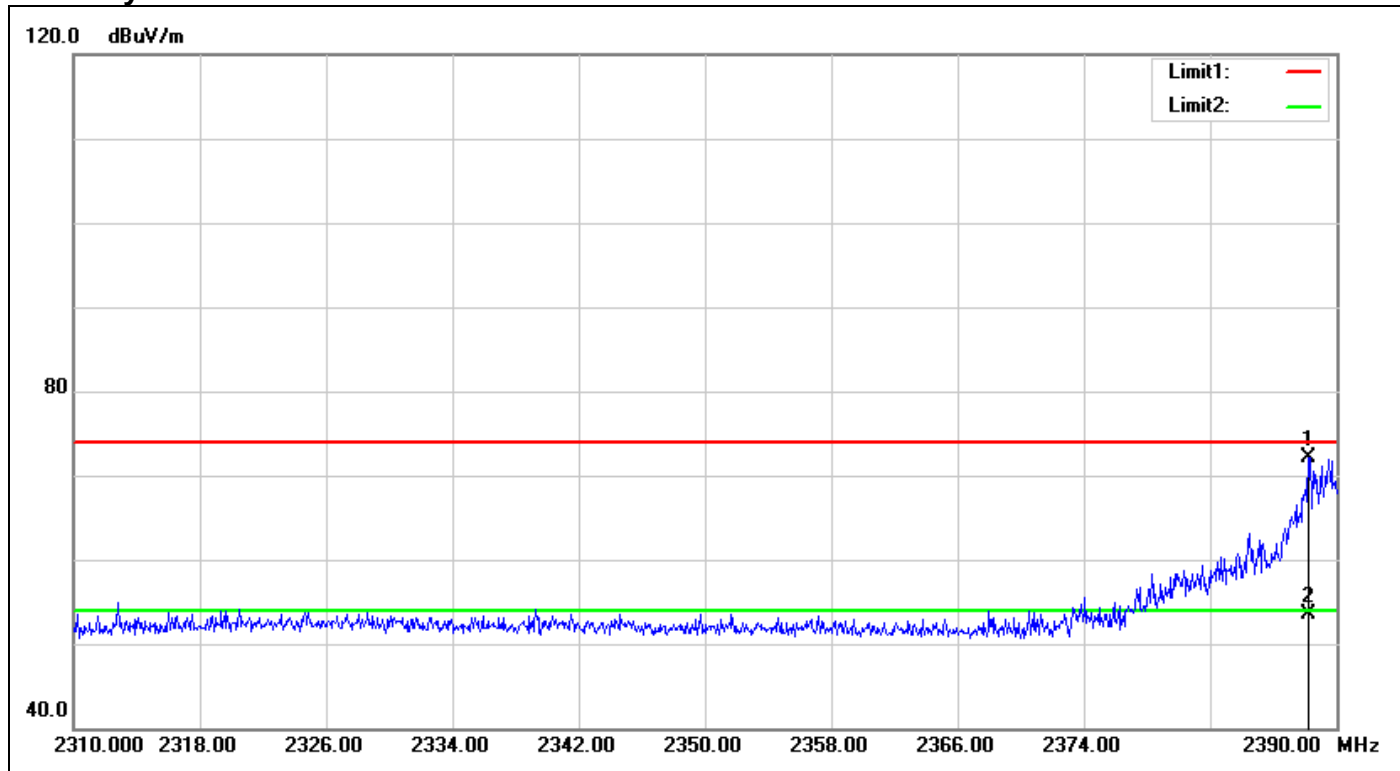
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2388.240	74.67	-2.51	72.16	74.00	-1.84	100	76	peak
2	2388.240	55.92	-2.51	53.41	54.00	-0.59	100	76	AVG

Band Edges (IEEE 802.11n HT 20 MHz mode / CH High)
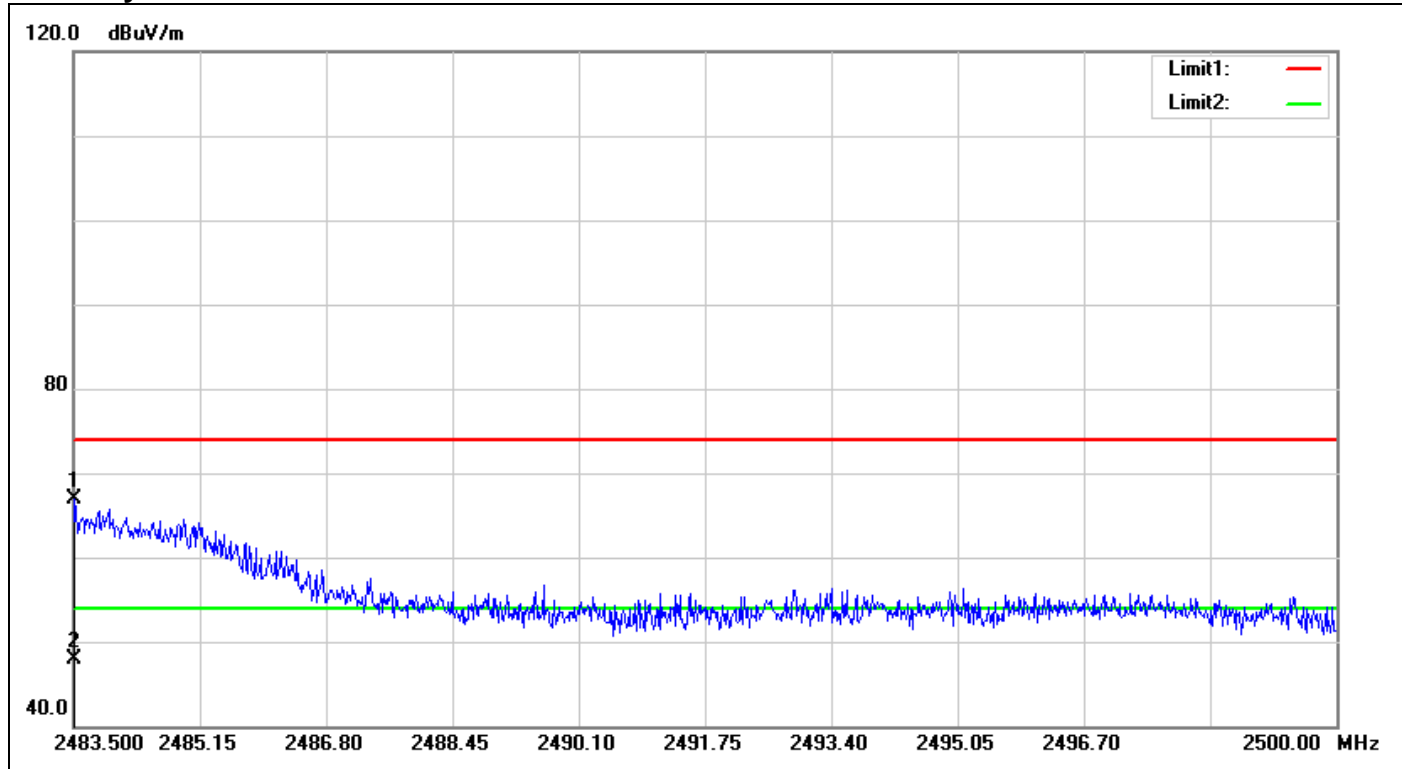
Polarity: Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.517	68.86	-1.99	66.87	74.00	-7.13	100	342	peak
2	2483.517	49.81	-1.99	47.82	54.00	-6.18	100	342	AVG

Polarity: Horizontal
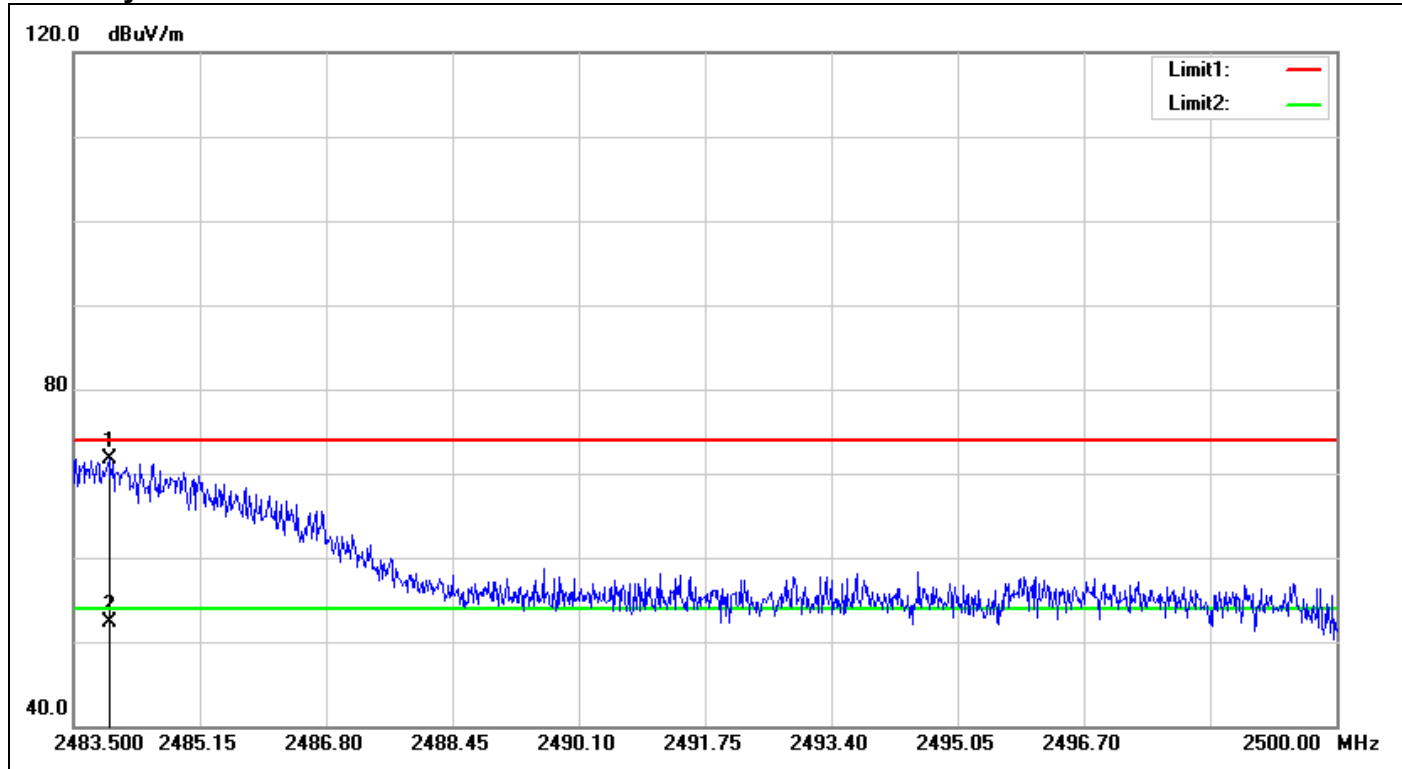
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2483.962	73.68	-1.99	71.69	74.00	-2.31	100	101	peak
2	2483.962	54.29	-1.99	52.30	54.00	-1.70	100	101	AVG

Band Edges (IEEE 802.11n HT 40 MHz mode / CH Low)
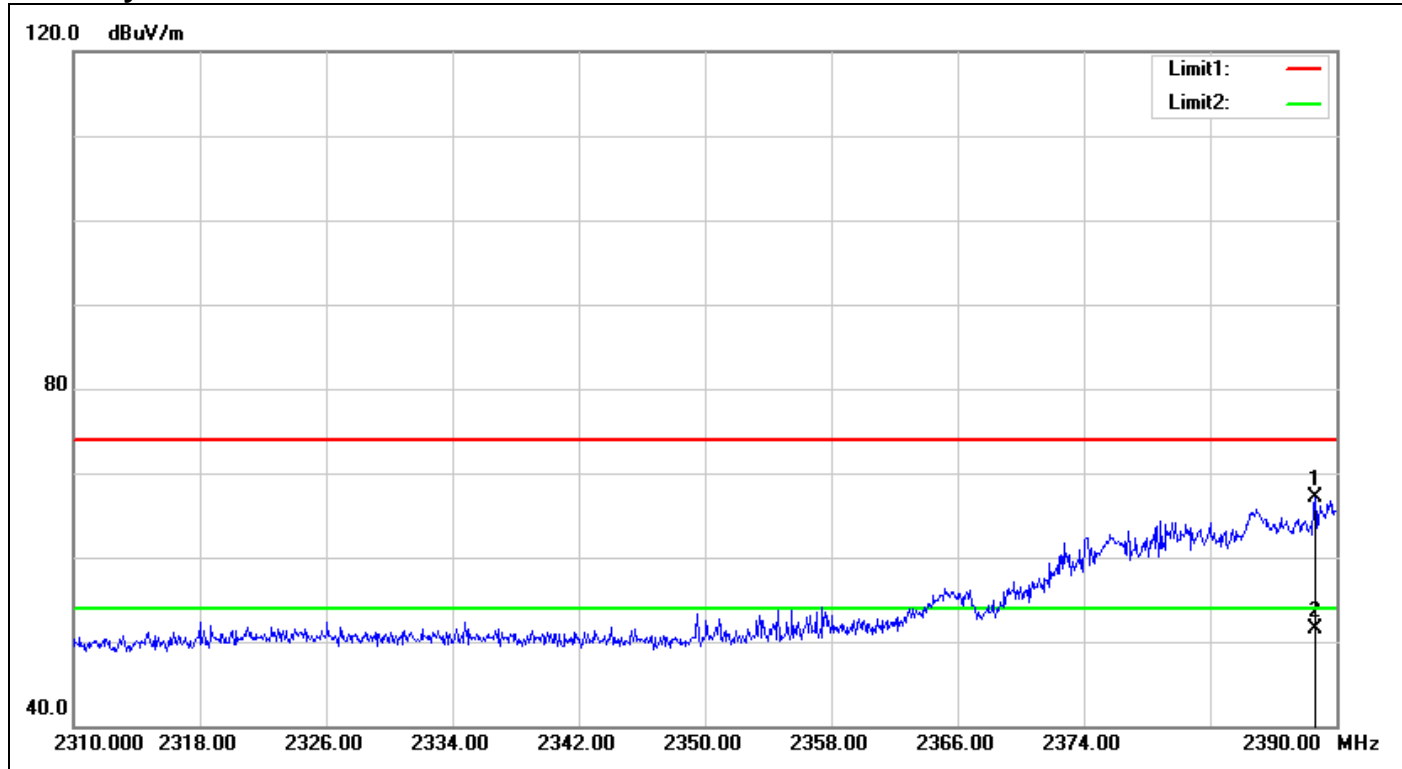
Polarity: Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2388.640	69.55	-2.50	67.05	74.00	-6.95	100	34	peak
2	2388.640	53.93	-2.50	51.43	54.00	-2.57	100	34	AVG

Polarity: Horizontal
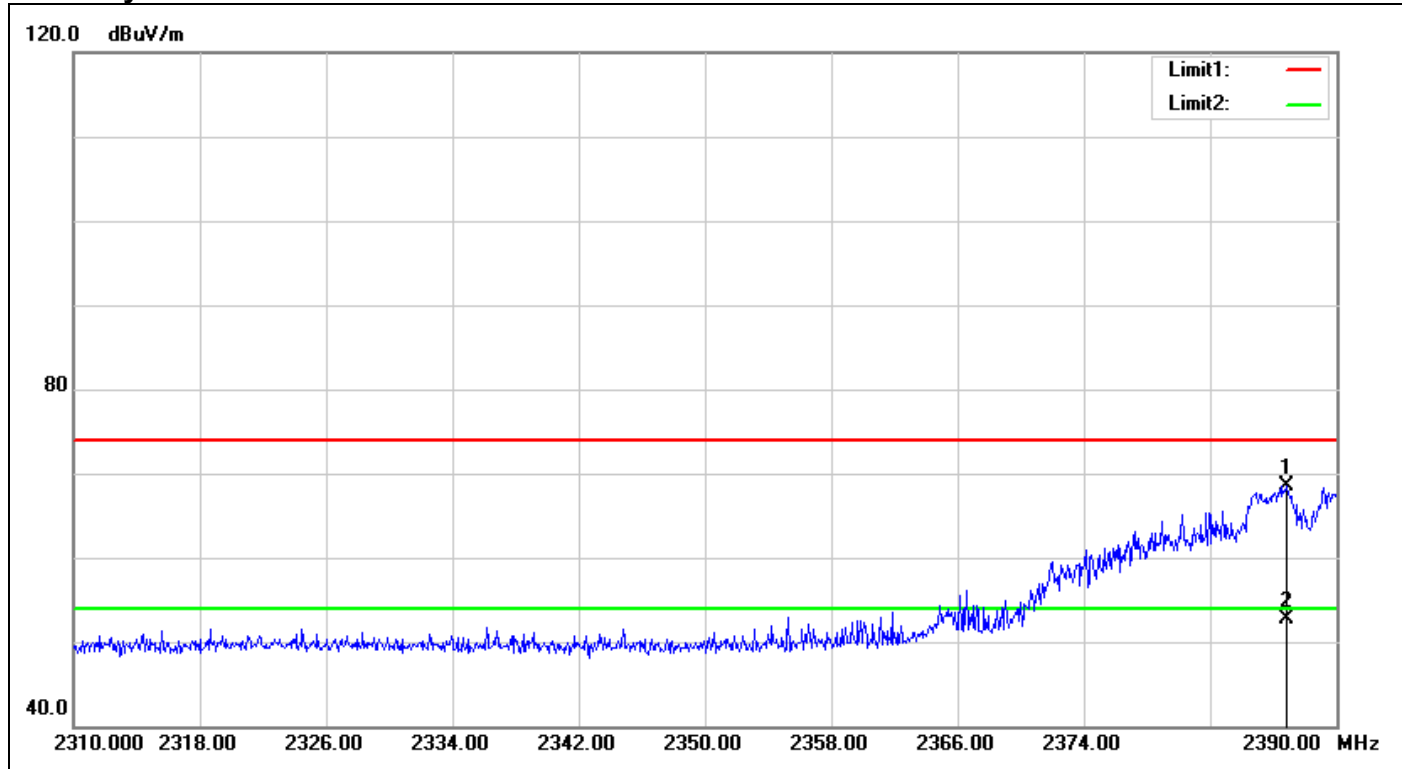
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2386.880	71.05	-2.52	68.53	74.00	-5.47	100	240	peak
2	2386.880	55.19	-2.52	52.67	54.00	-1.33	100	240	AVG

Band Edges (IEEE 802.11n HT 40 MHz mode / CH High)
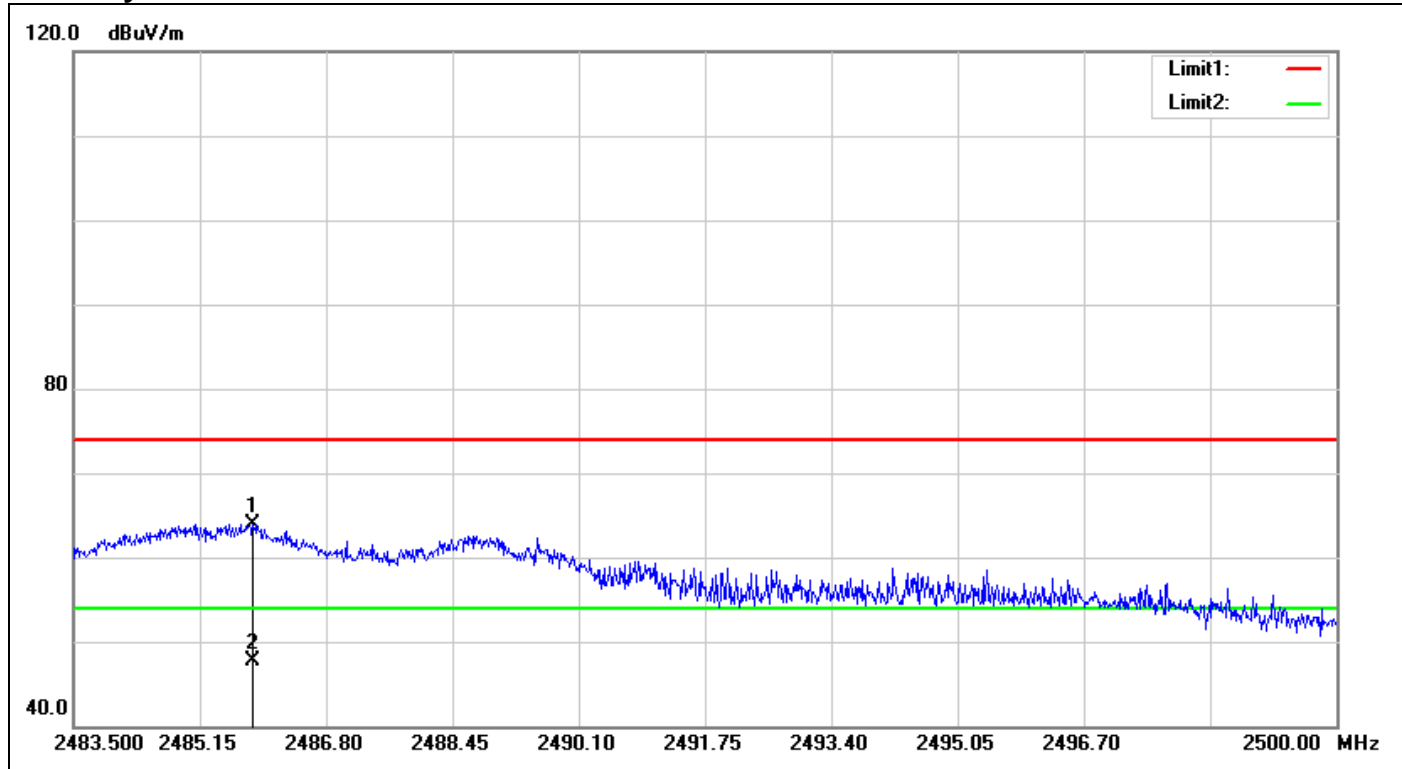
Polarity: Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2485.843	65.95	-1.97	63.98	74.00	-10.02	100	103	peak
2	2485.843	49.73	-1.97	47.76	54.00	-6.24	100	103	AVG

Polarity: Horizontal
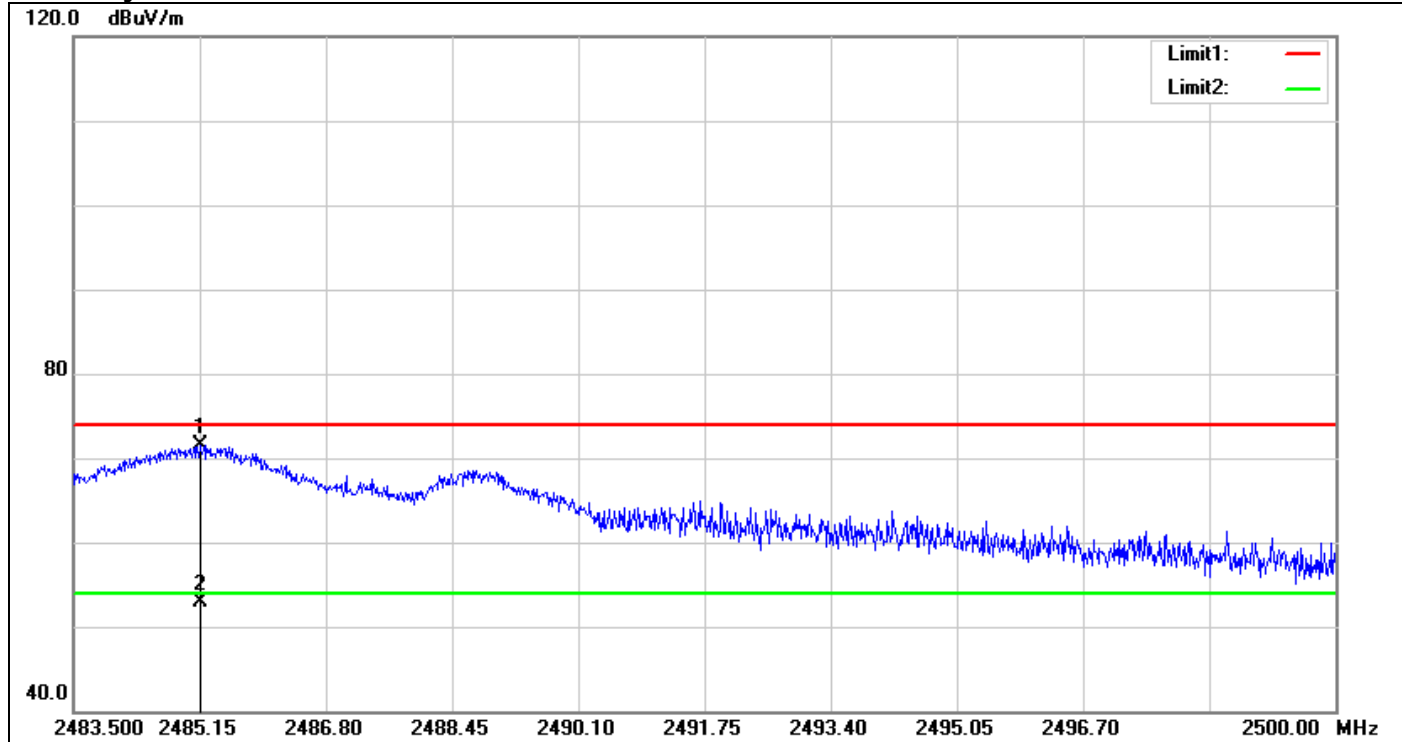
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	2485.150	73.47	-1.98	71.49	74.00	-2.51	100	240	peak
2	2485.150	54.79	-1.98	52.81	54.00	-1.19	100	240	AVG

Test Plot
Conducted Band Edges (IEEE 802.11b mode / CH Low)
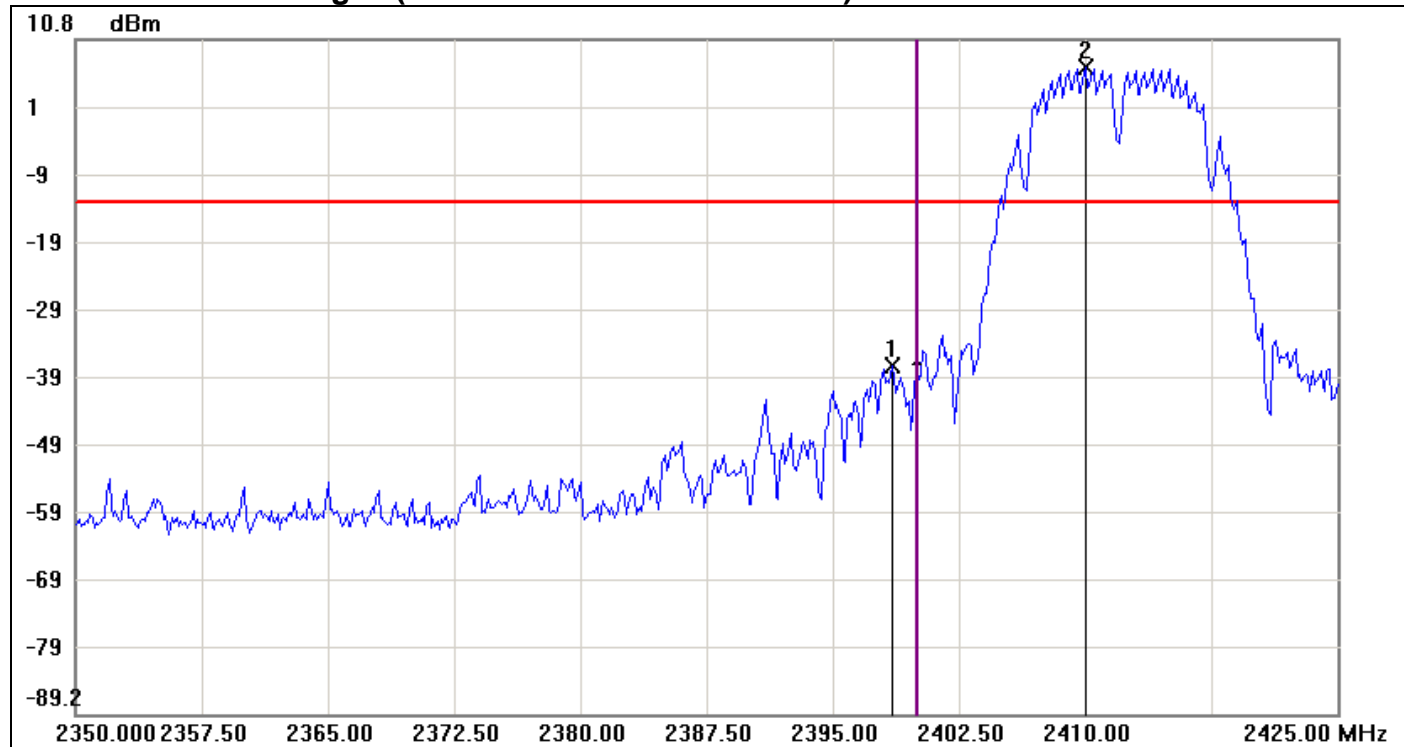
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2398.5000	-37.63	-13.39	-24.24
2	2410.0000	6.61	-13.39	20.00

Conducted Band Edges (IEEE 802.11b mode / CH High)
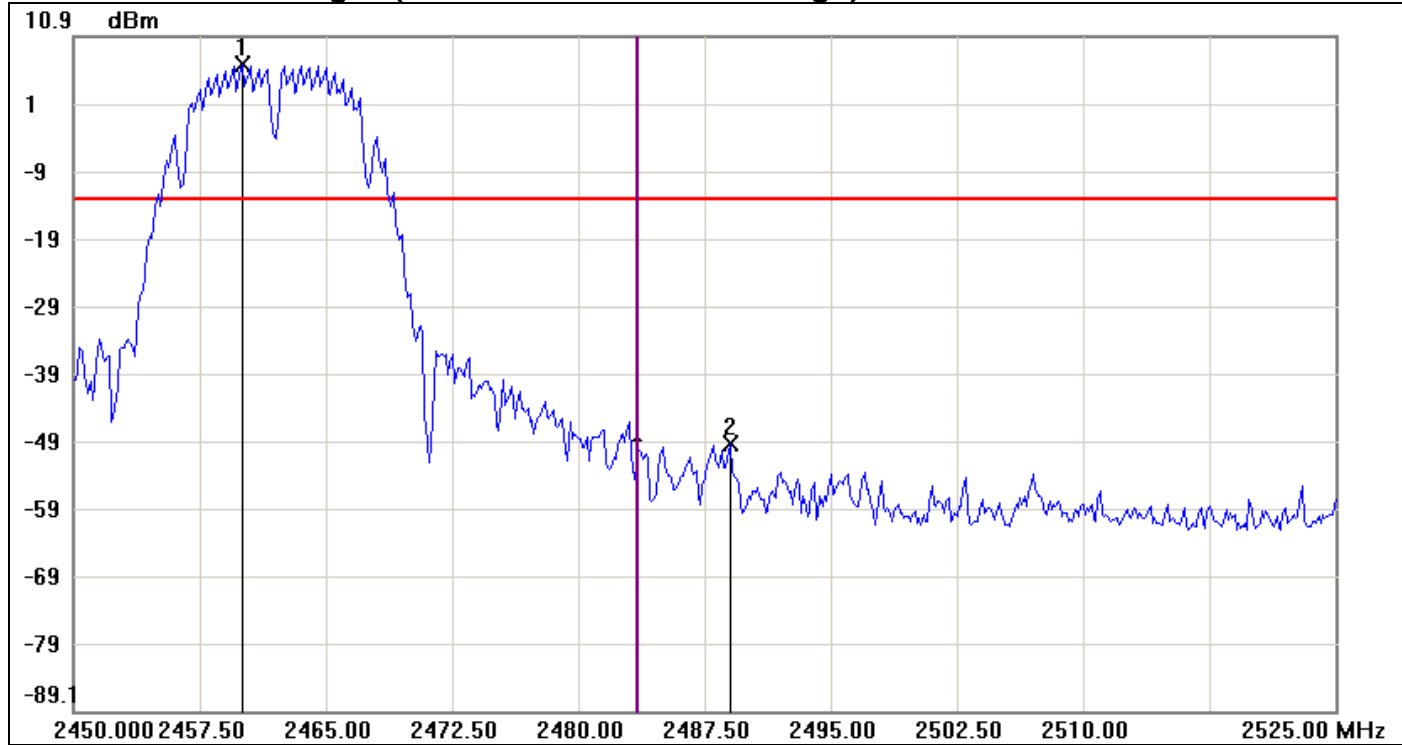
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2460.0000	6.69	-13.31	20.00
2	2489.0000	-49.54	-13.31	-36.23

Conducted Band Edges (IEEE 802.11g mode / CH Low)
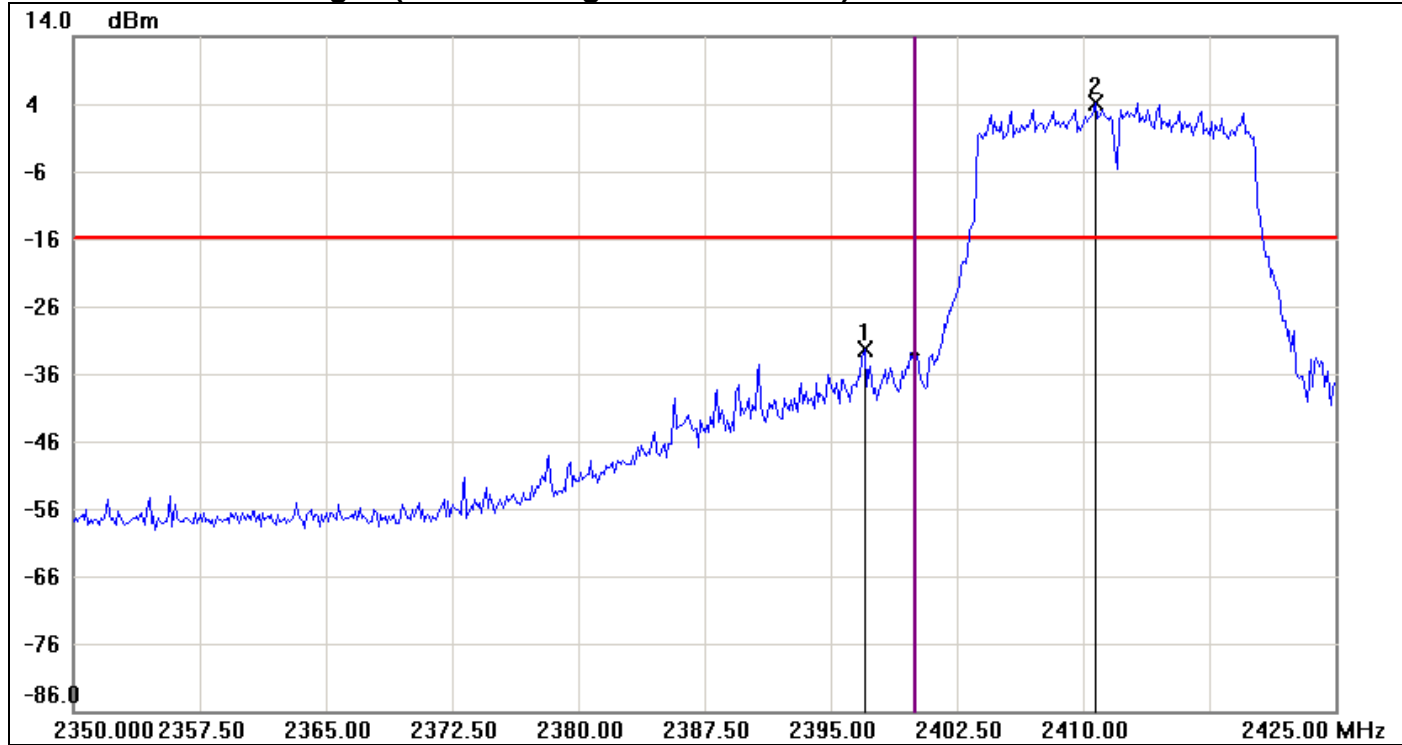
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2397.0000	-32.28	-15.75	-16.53
2	2410.7500	4.25	-15.75	20.00

Conducted Band Edges (IEEE 802.11g mode / CH High)
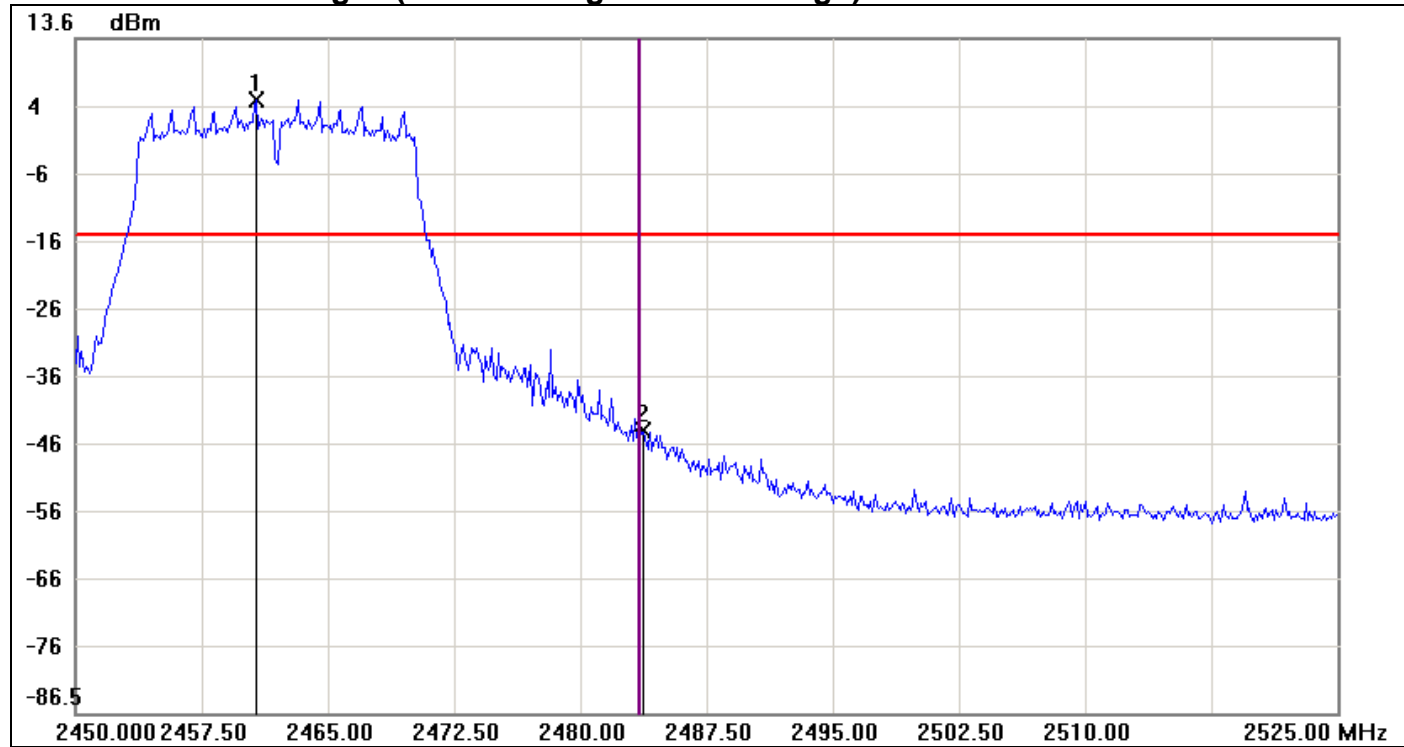
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2460.7500	4.40	-15.60	20.00
2	2483.7500	-44.65	-15.60	-29.05

Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH Low) / Chain 0
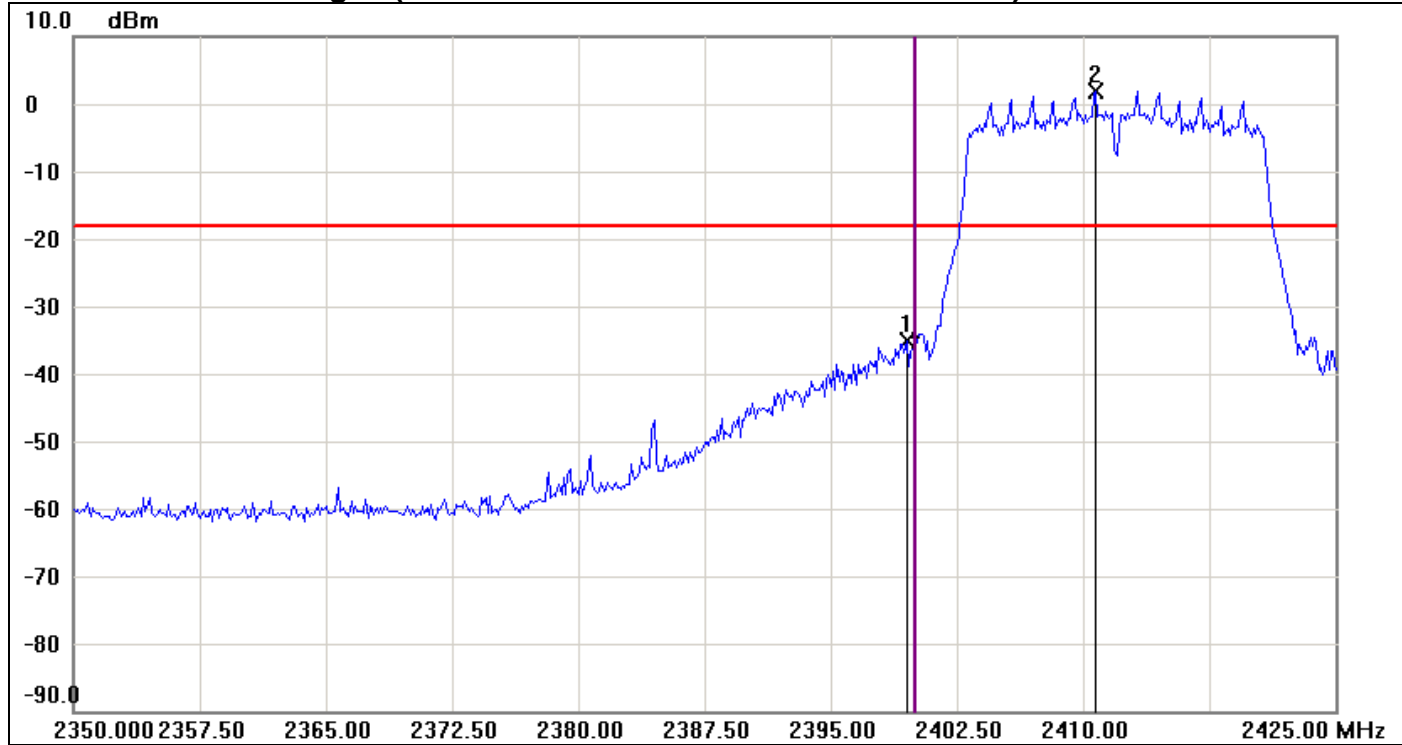
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.5000	-35.17	-18.14	-17.03
2	2410.7500	1.86	-18.14	20.00

Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH High) / Chain 0
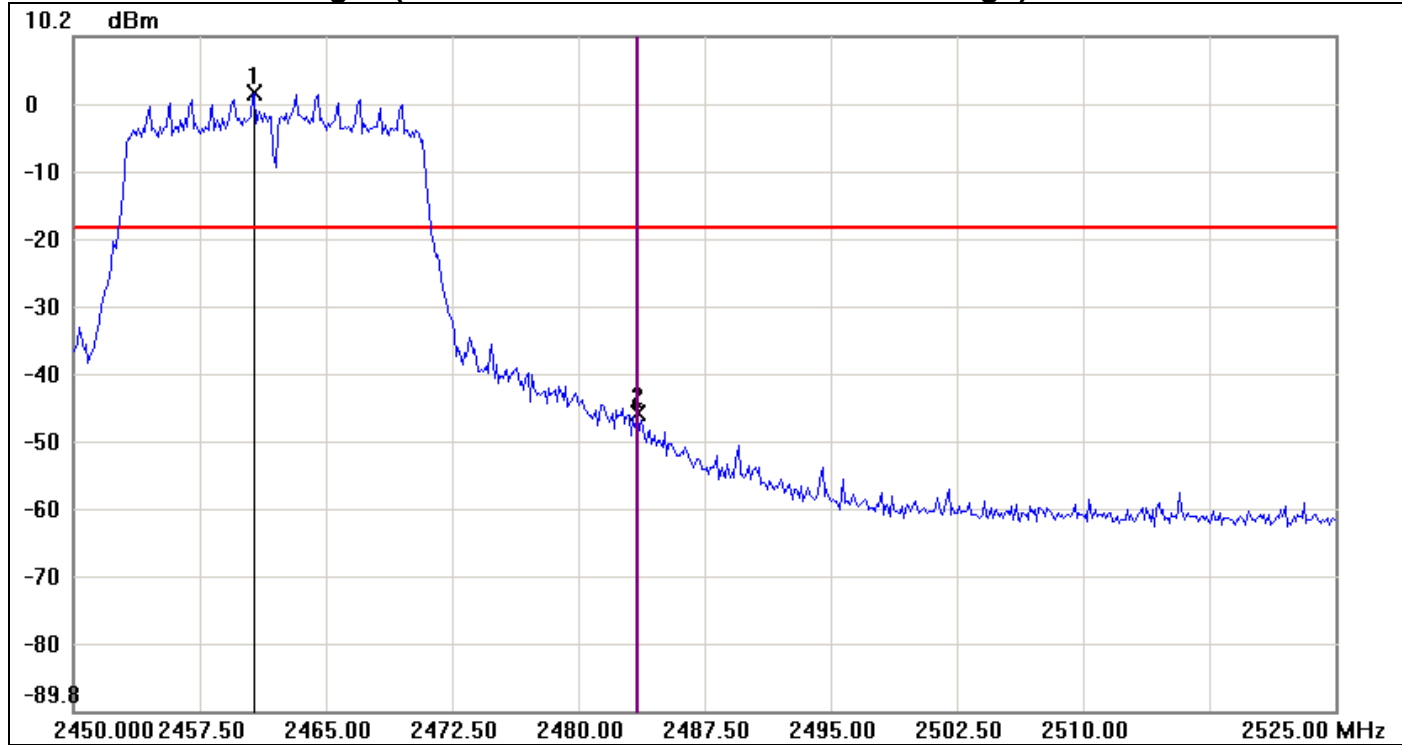
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2460.7500	1.73	-18.27	20.00
2	2483.5000	-45.70	-18.27	-27.43

Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH Low) / Chain 1
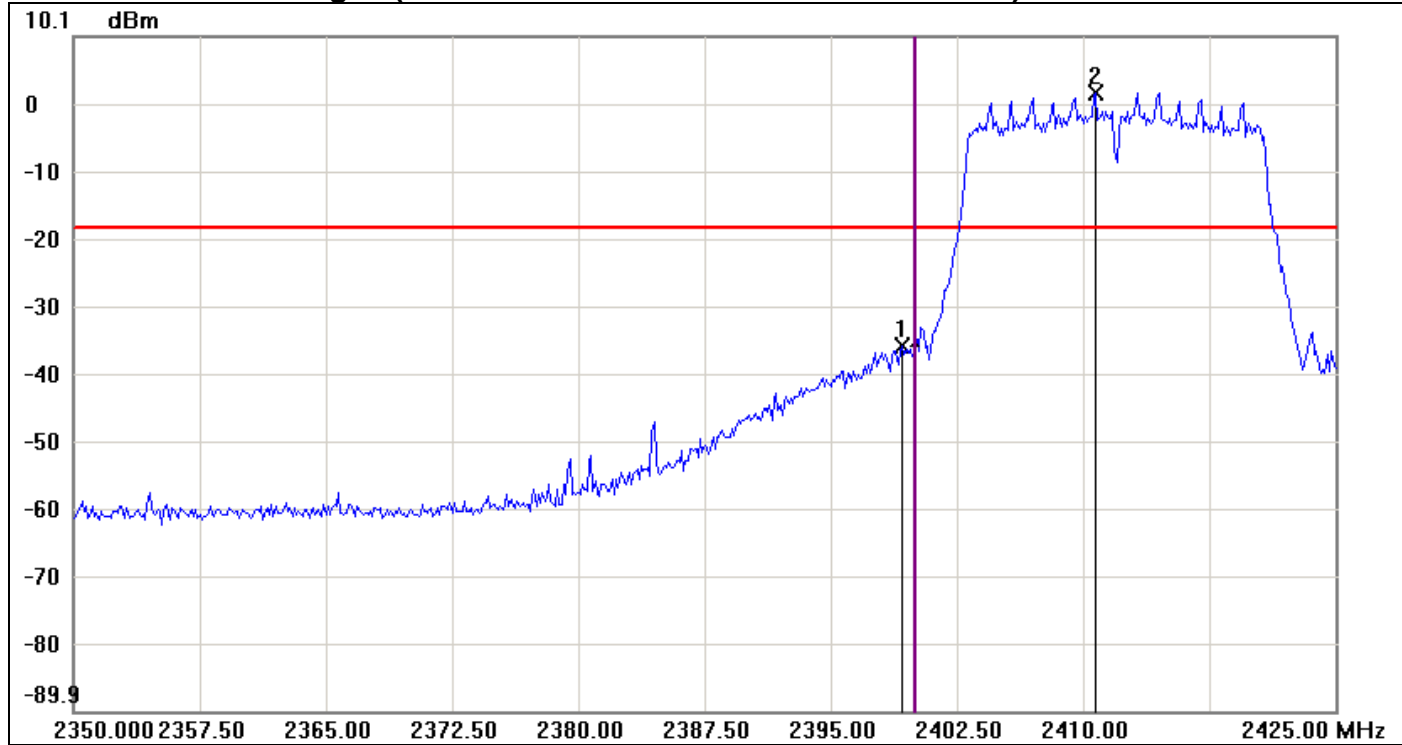
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.2500	-35.84	-18.21	-17.63
2	2410.7500	1.79	-18.21	20.00

Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH High) / Chain 1
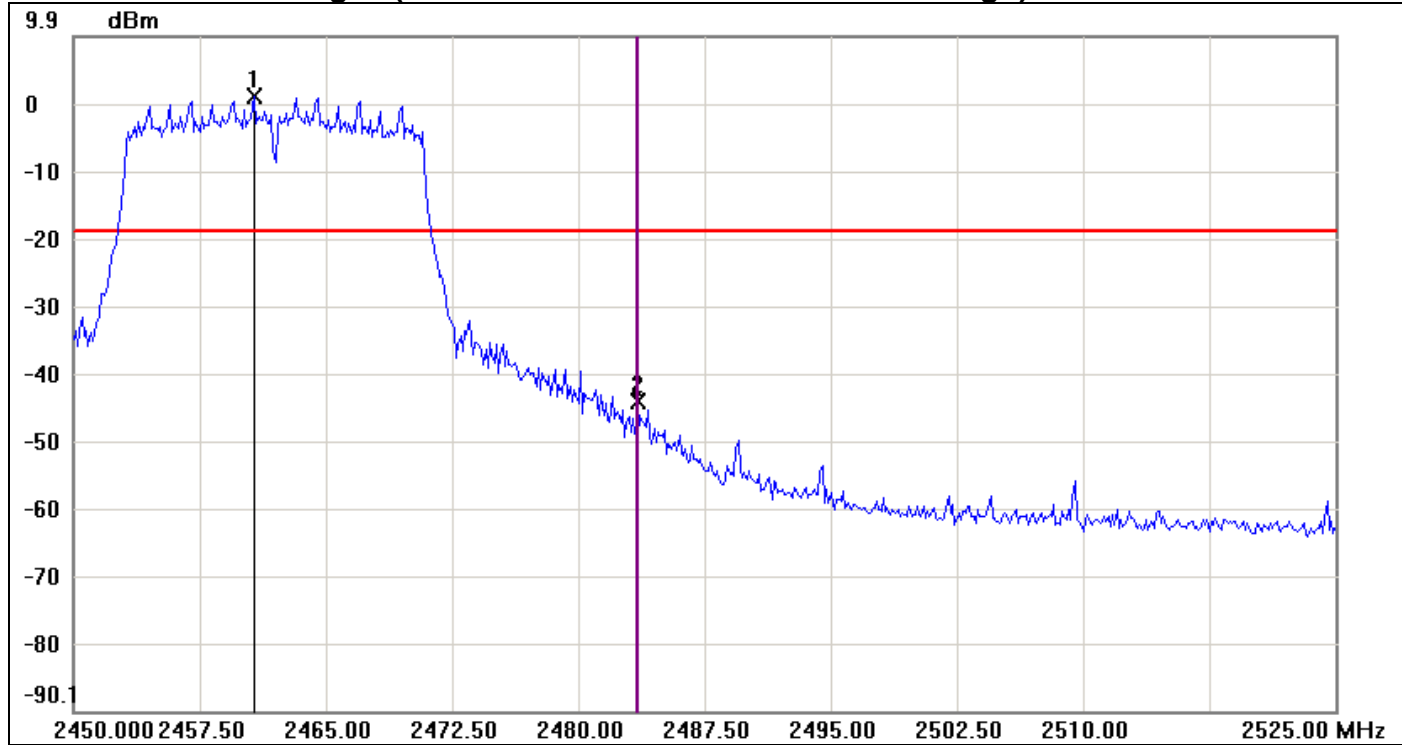
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2460.7500	1.04	-18.96	20.00
2	2483.5000	-44.26	-18.96	-25.30

Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH Low) / Chain 0
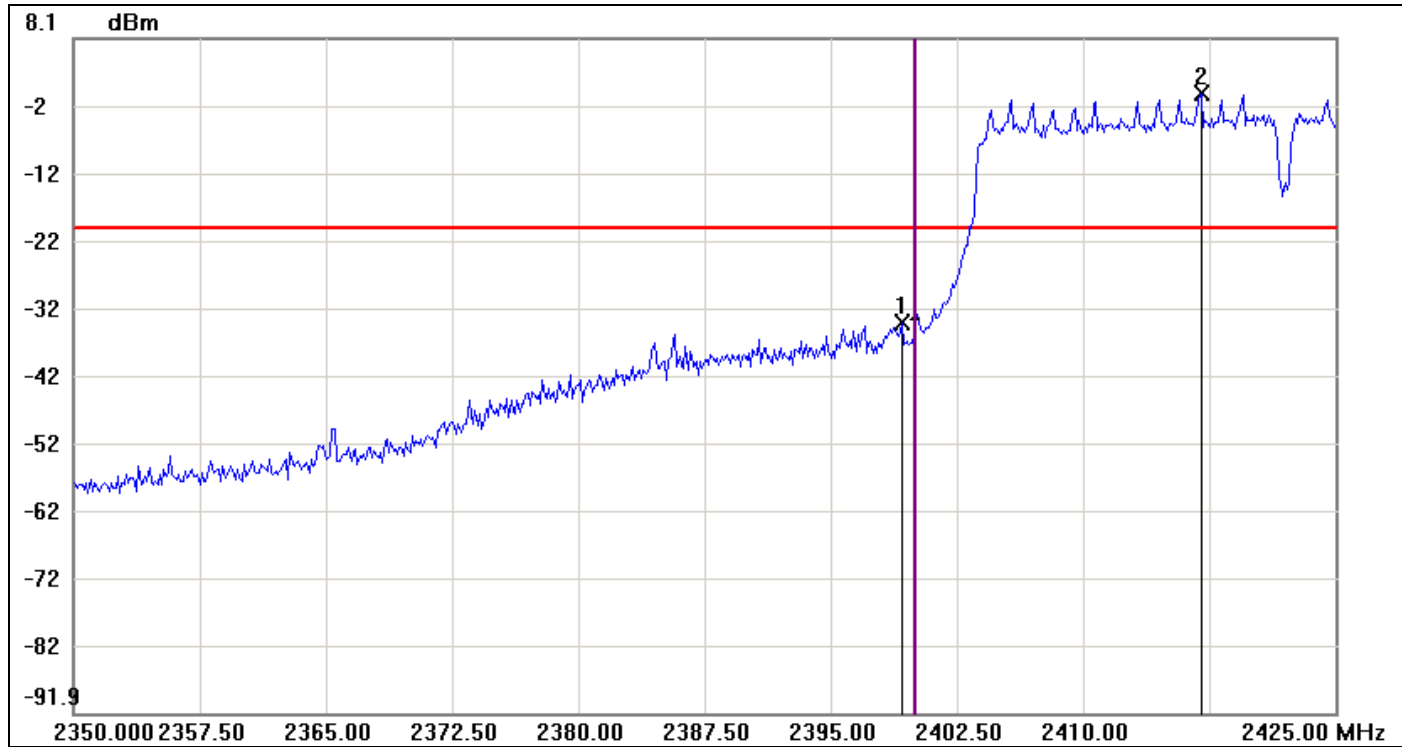
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.2500	-33.99	-20.08	-13.91
2	2417.0000	-0.08	-20.08	20.00

Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH High) / Chain 0
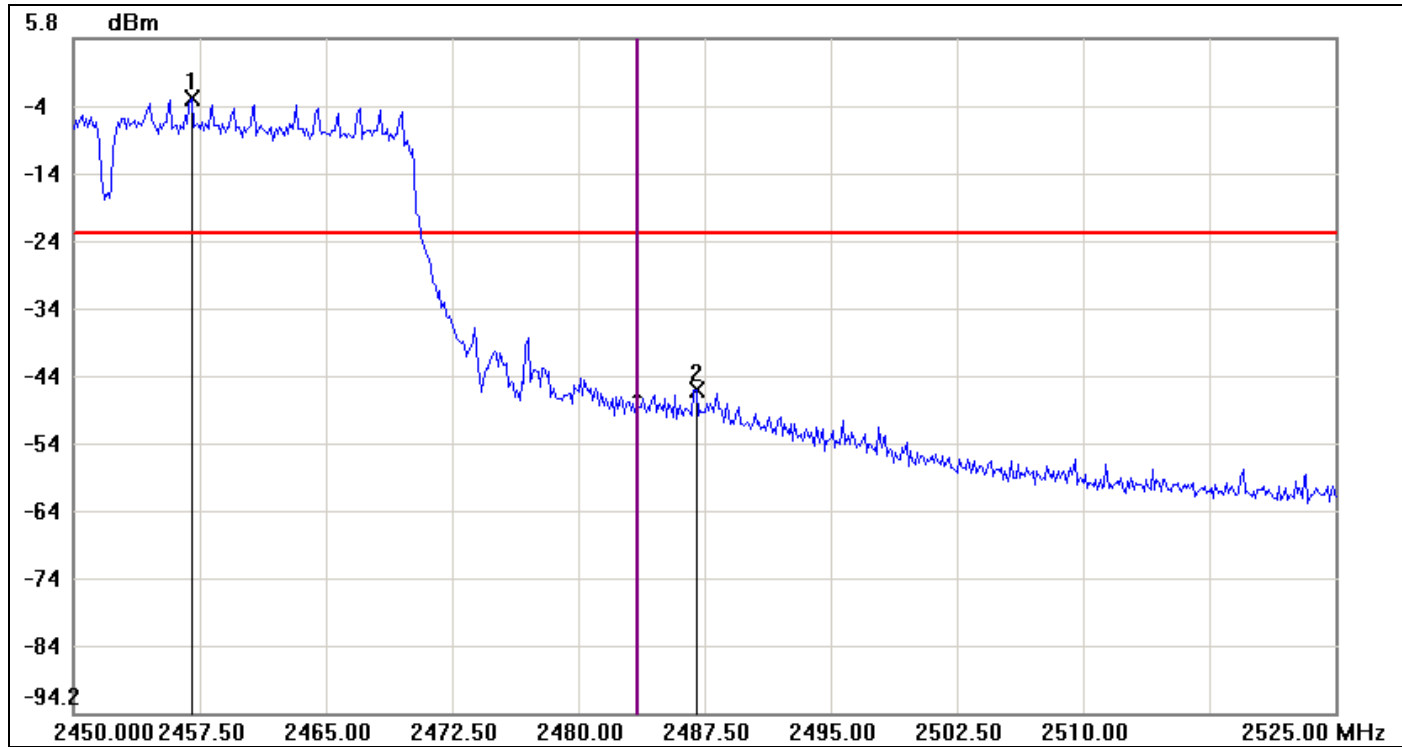
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2457.0000	-3.09	-23.09	20.00
2	2487.0000	-46.30	-23.09	-23.21

Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH Low) / Chain 1
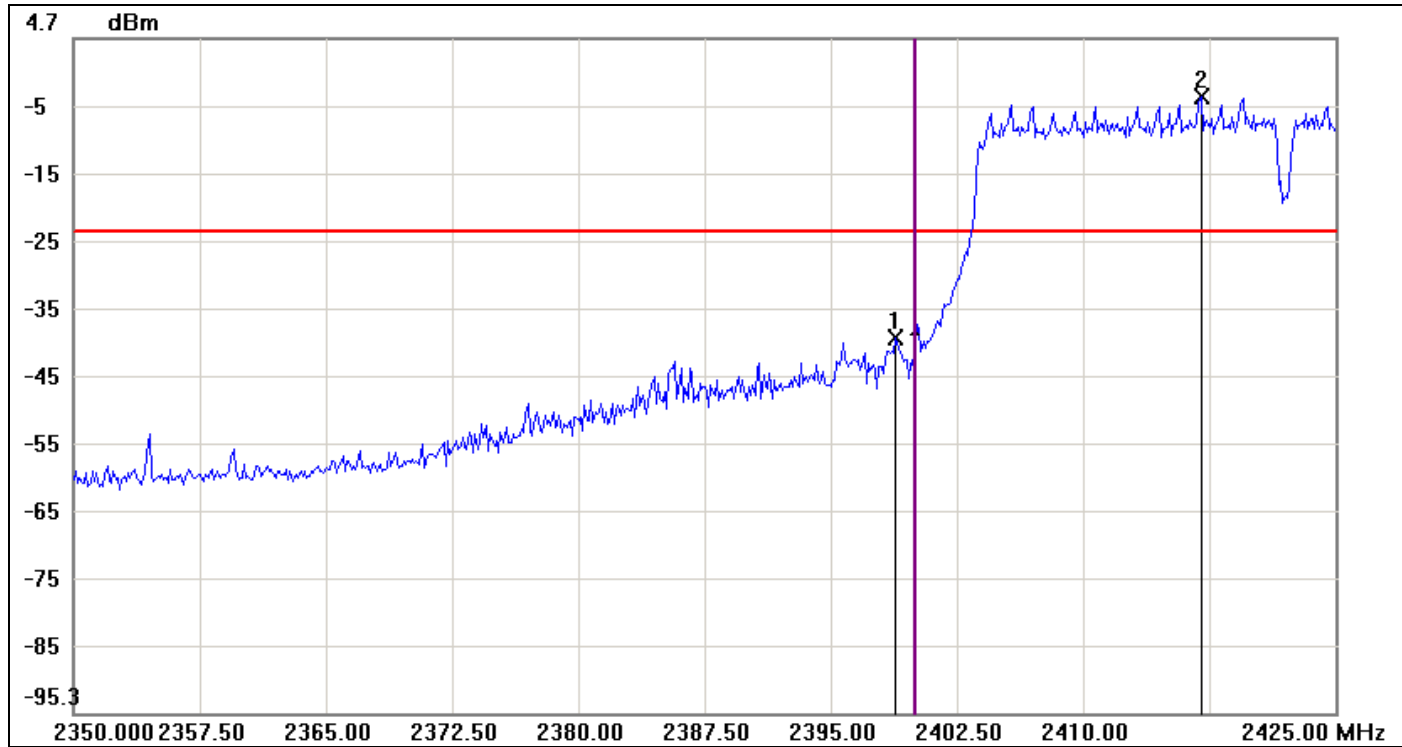
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2398.8750	-39.65	-24.00	-15.65
2	2417.0000	-4.00	-24.00	20.00

Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH High) / Chain 1
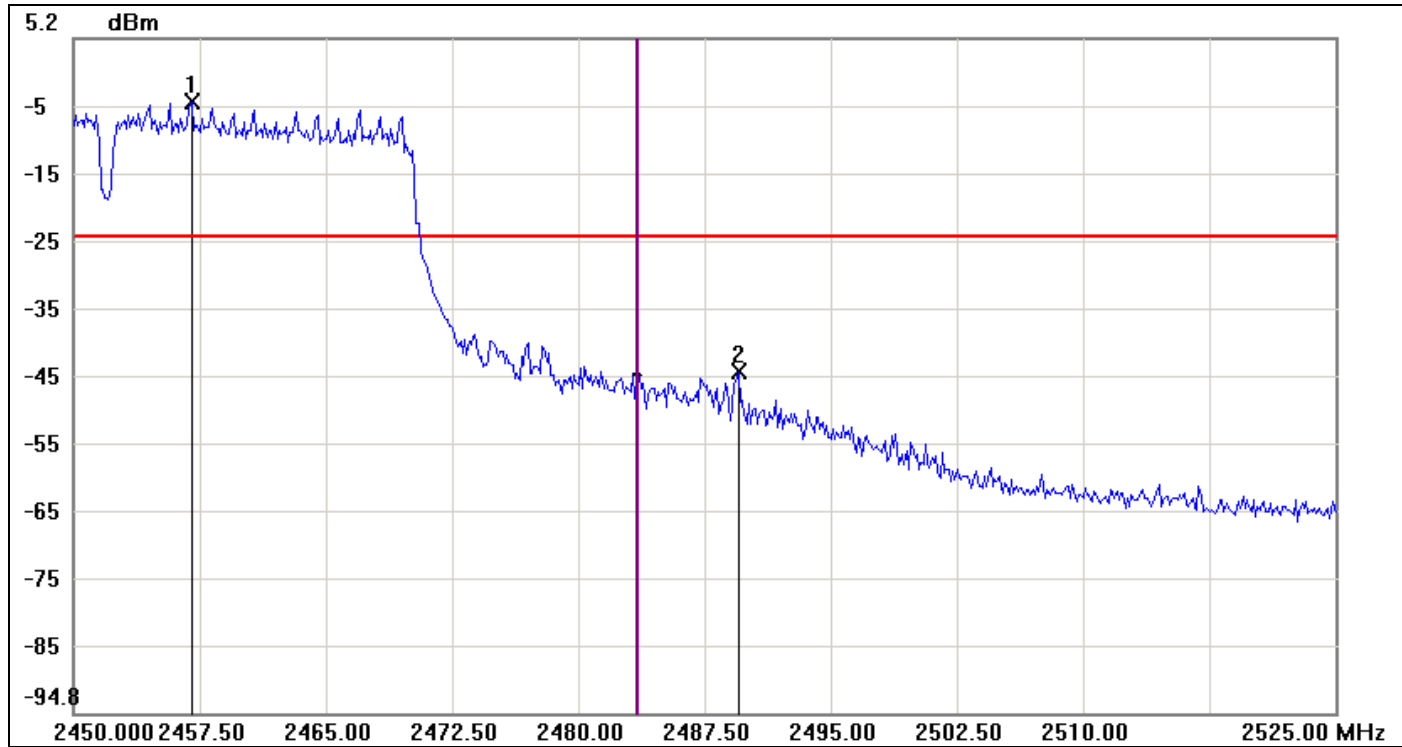
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2457.0000	-4.08	-24.08	20.00
2	2489.5000	-44.16	-24.08	-20.08

7.6 PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e) & RSS-247, for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2. According to §15.247(f) & RSS-247, the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

Test Configuration

| EUT | → | Spectrum Analyzer |
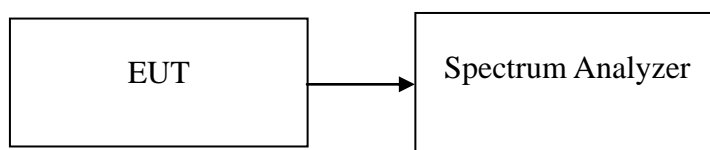
TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep time = 100 s

3. Record the max reading.

4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-1.91		PASS
Mid	2437	-1.43	8.00	PASS
High	2462	-0.79		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-4.85		PASS
Mid	2437	-3.34	8.00	PASS
High	2462	-3.03		PASS

Test mode: IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-6.35	-6.87	-3.59		PASS
Mid	2437	-1.98	-3.28	0.43	6.45	PASS
High	2462	-5.76	-7.24	-3.43		PASS

Test mode: IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2422	-9.26	-12.44	-7.55		PASS
Mid	2437	-8.16	-8.84	-5.48	6.45	PASS
High	2452	-11.61	-12.41	-8.98		PASS

Remark:
1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 PPSD / 10)+10^(Chain 1 PPSD /10))
2. The maximum antenna gain is 7.55dBi; therefore the reduction due to antenna gain is 1.55dBi, so the limit is 6.45dBm.

Test Plot

IEEE 802.11b mode

PPSD (CH Low)
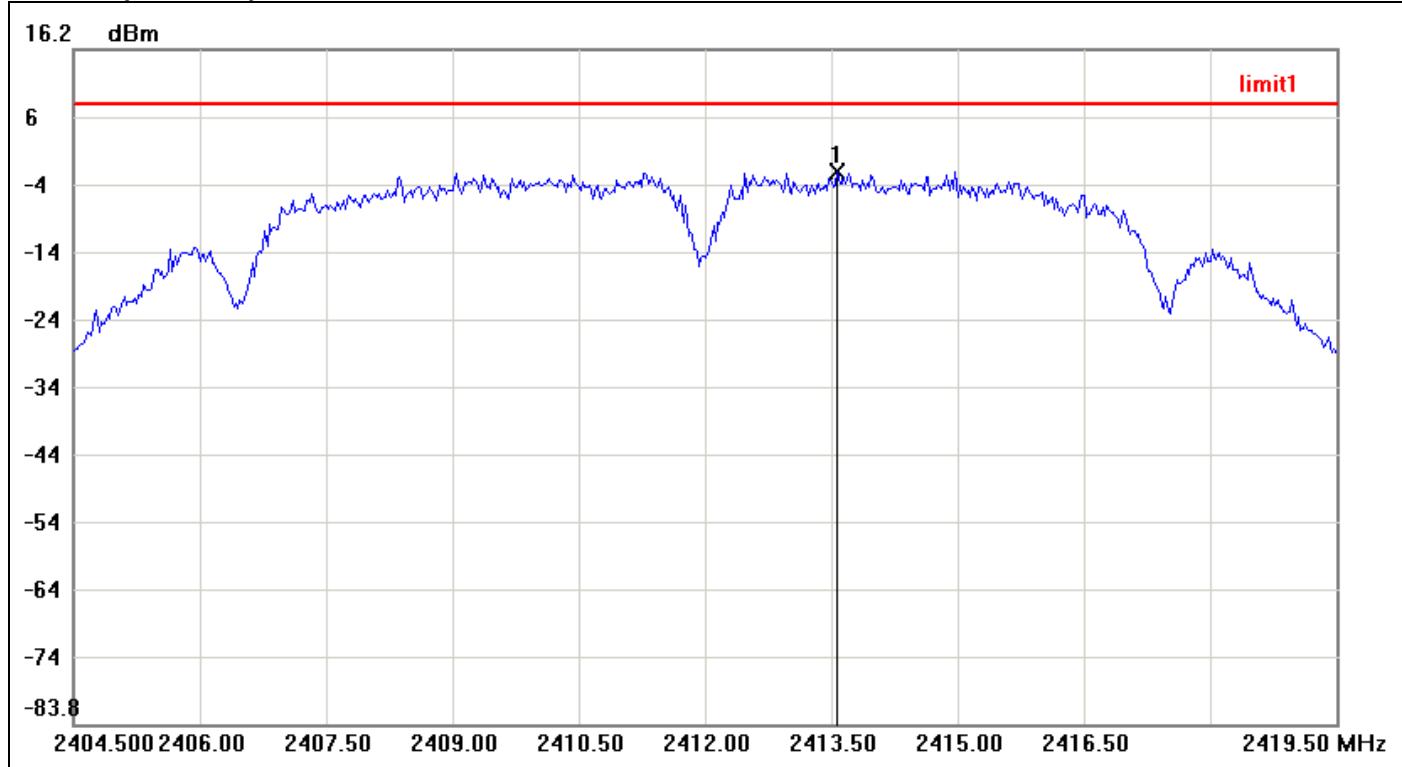
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2413.5750	-1.91	8.00	-9.91

PPSD (CH Mid)
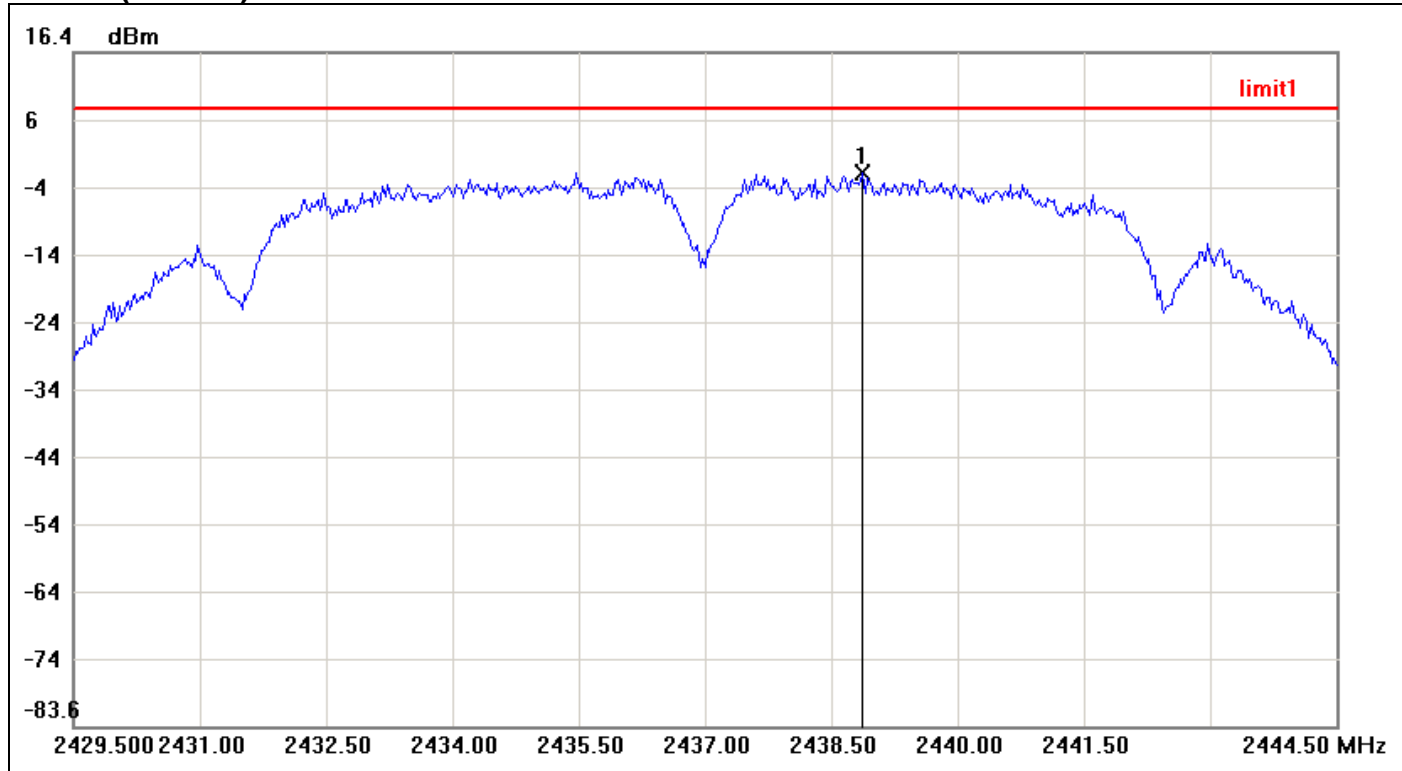
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2438.8750	-1.43	8.00	-9.43

PPSD (CH High)
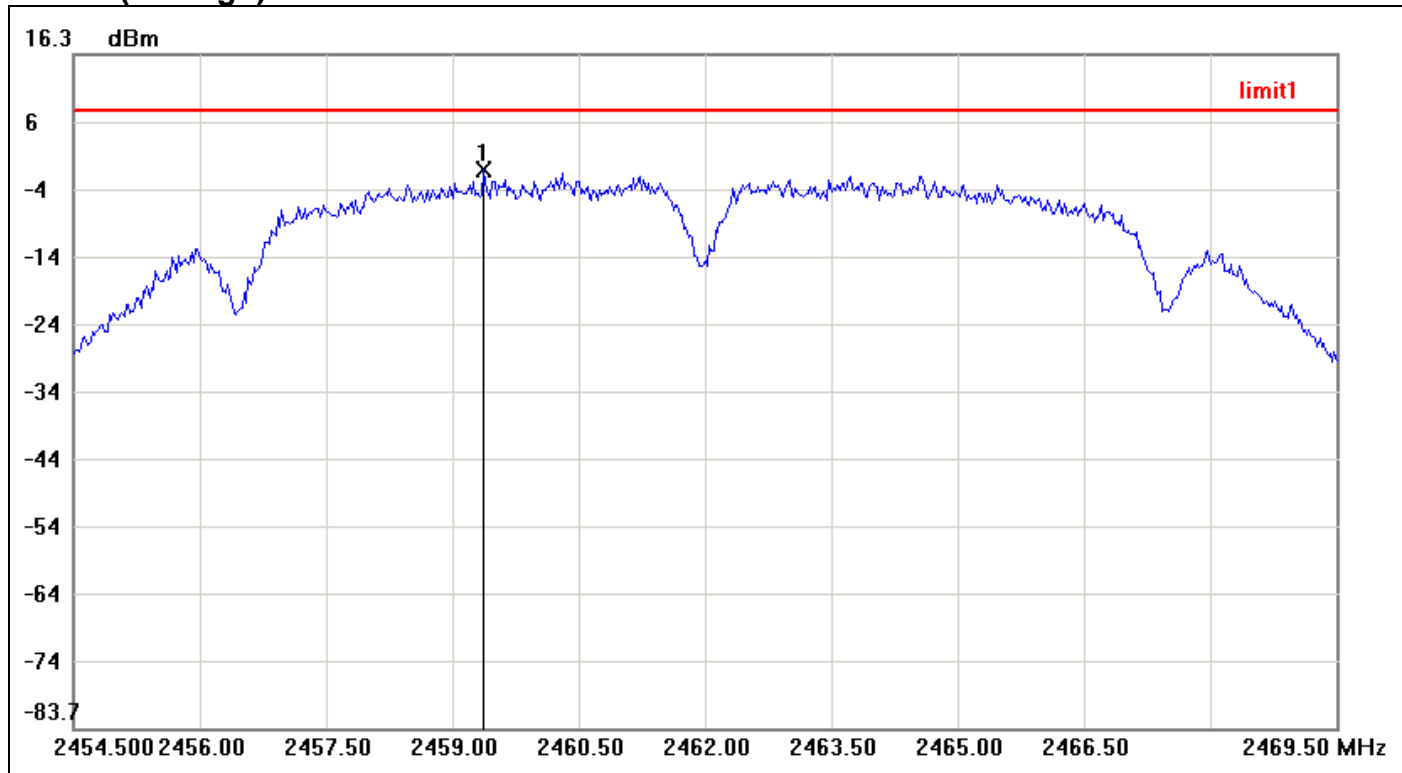
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2459.3750	-0.79	8.00	-8.79

IEEE 802.11g mode

PPSD (CH Low)
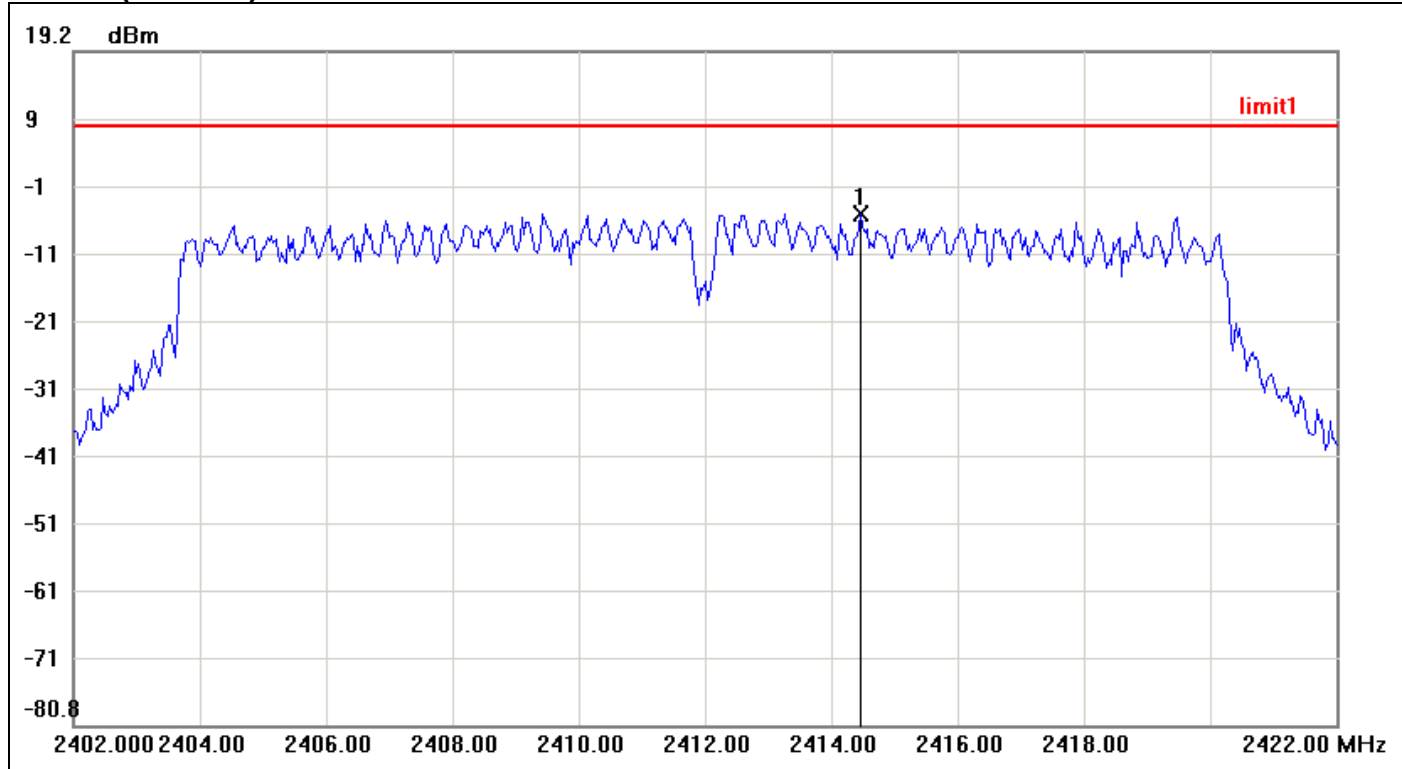
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2414.4667	-4.85	8.00	-12.85

PPSD (CH Mid)
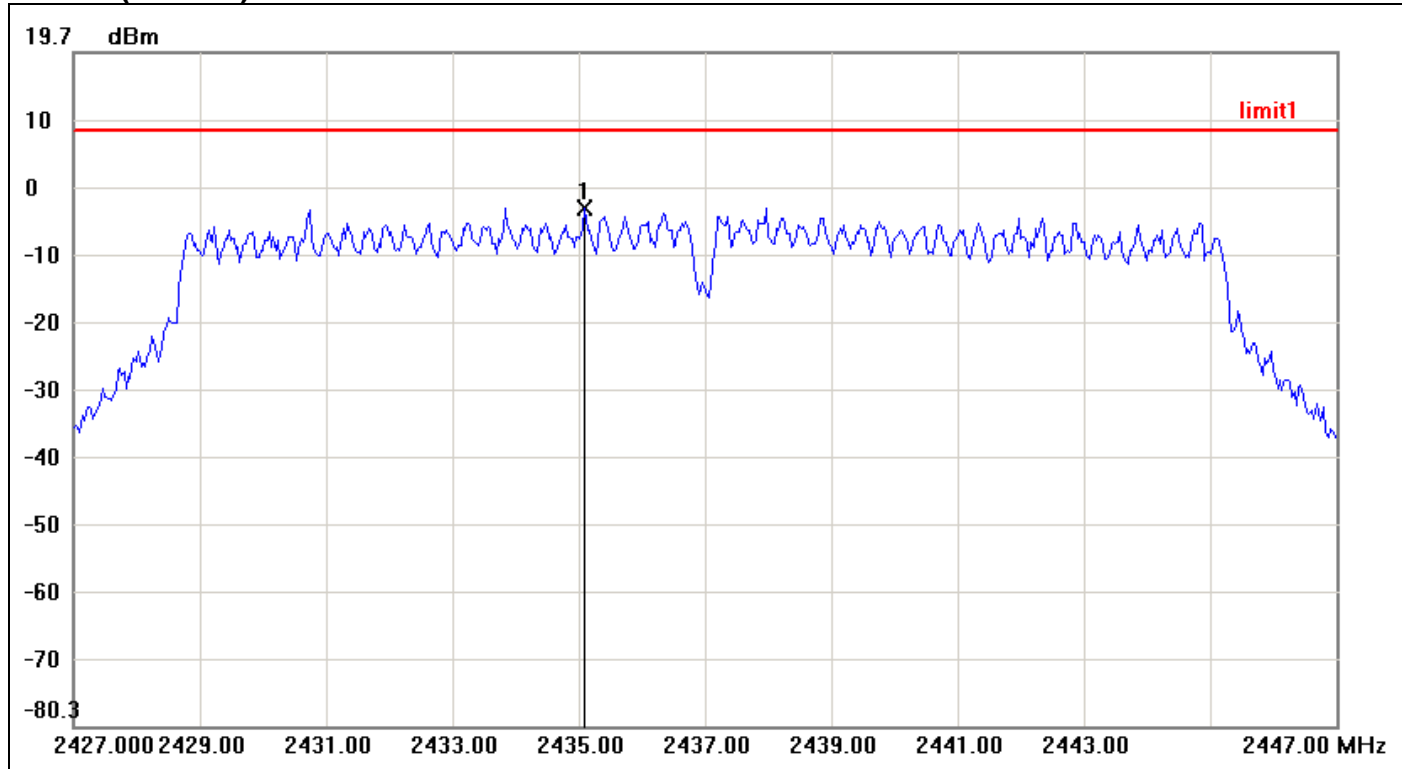
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2435.1000	-3.34	8.00	-11.34

PPSD (CH High)
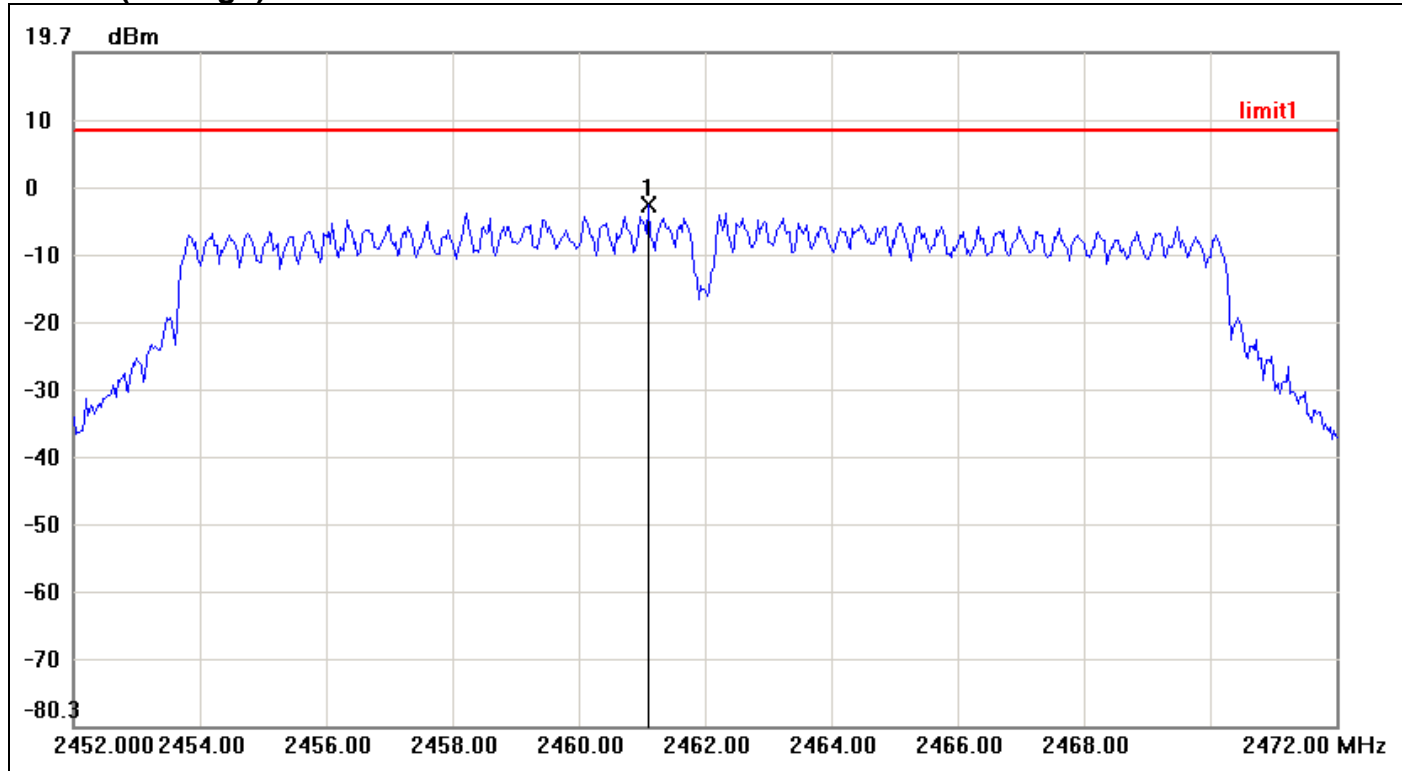
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2461.1000	-3.03	8.00	-11.03

IEEE 802.11n HT 20 MHz mode / Chain 0

PPSD (CH Low)
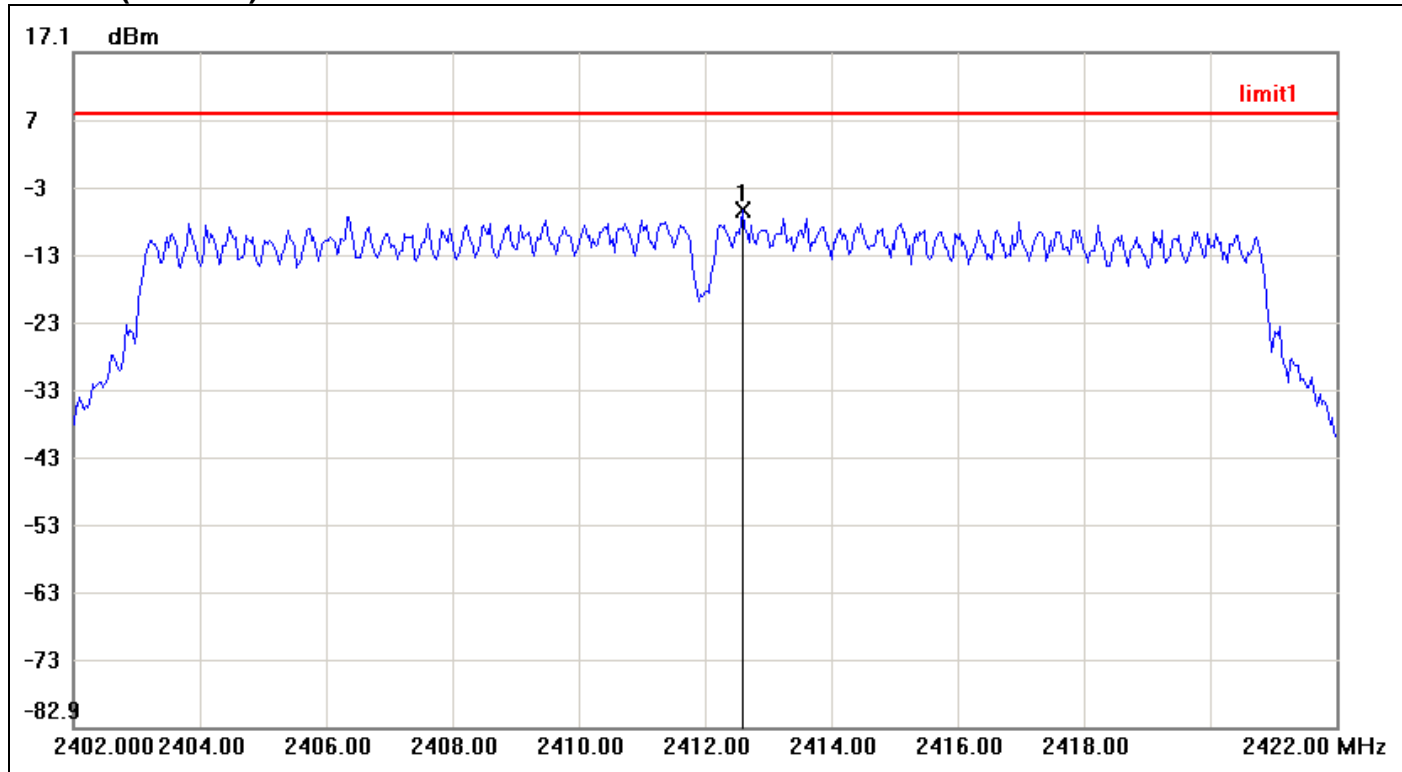
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2412.6000	-6.35	6.45	-12.8

PPSD (CH Mid)
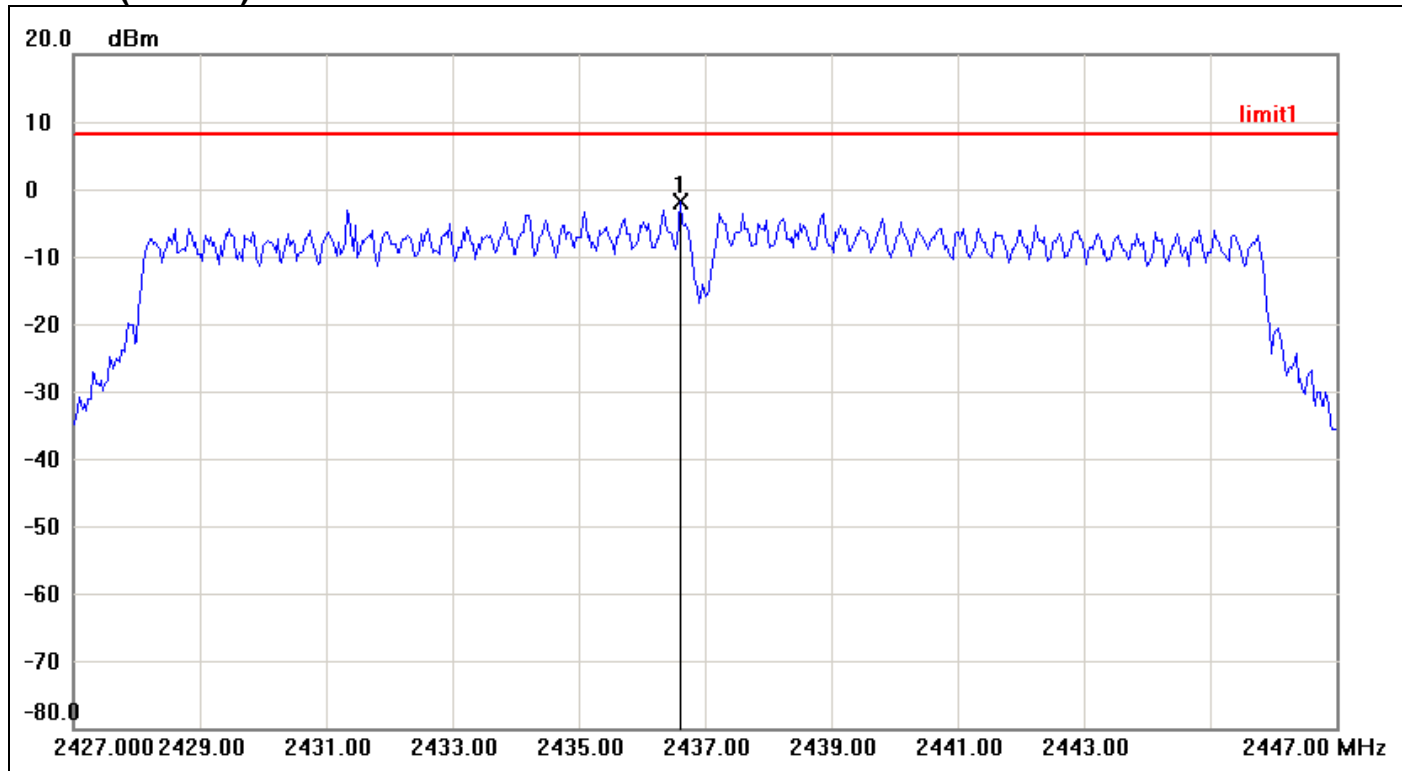
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2436.6000	-1.98	6.45	-8.43

PPSD (CH High)
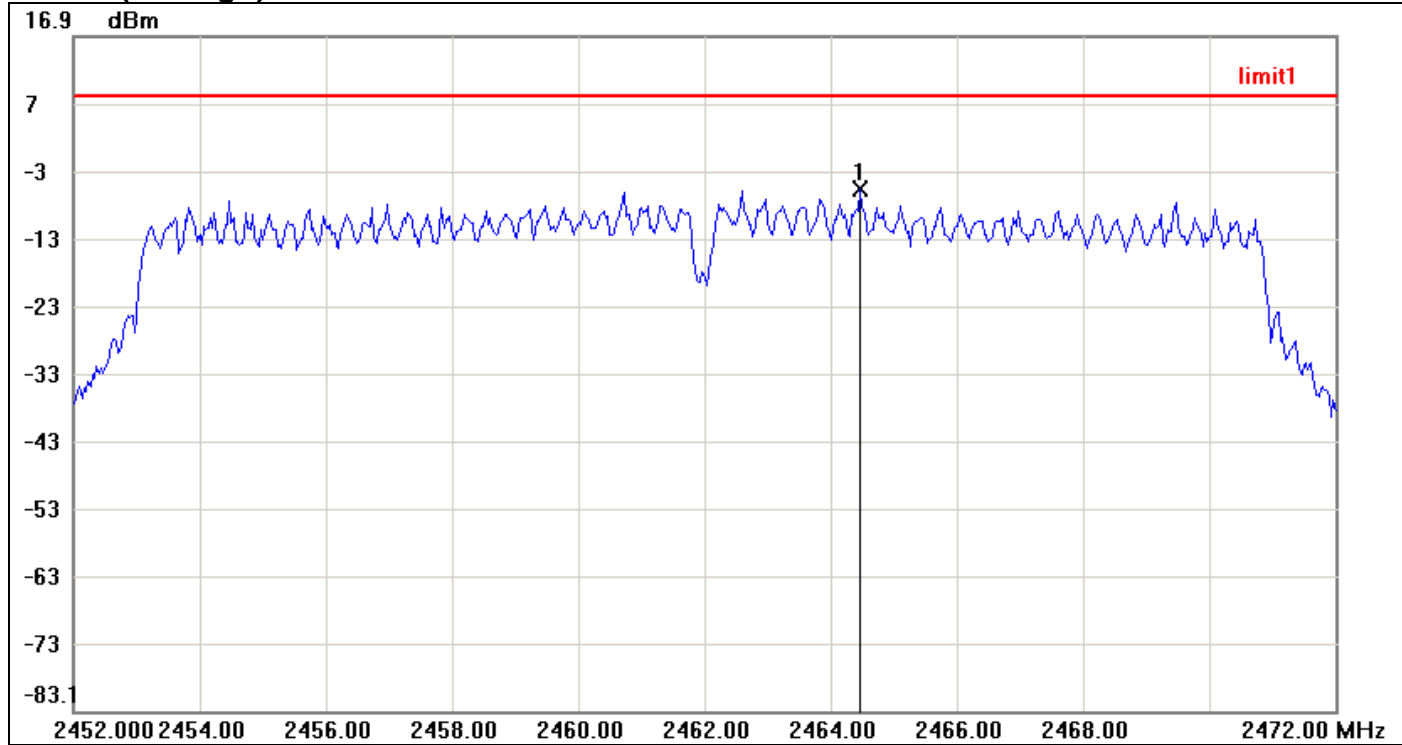
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2464.4667	-5.76	6.45	-12.21

IEEE 802.11n HT 20 MHz mode / Chain 1

PPSD (CH Low)
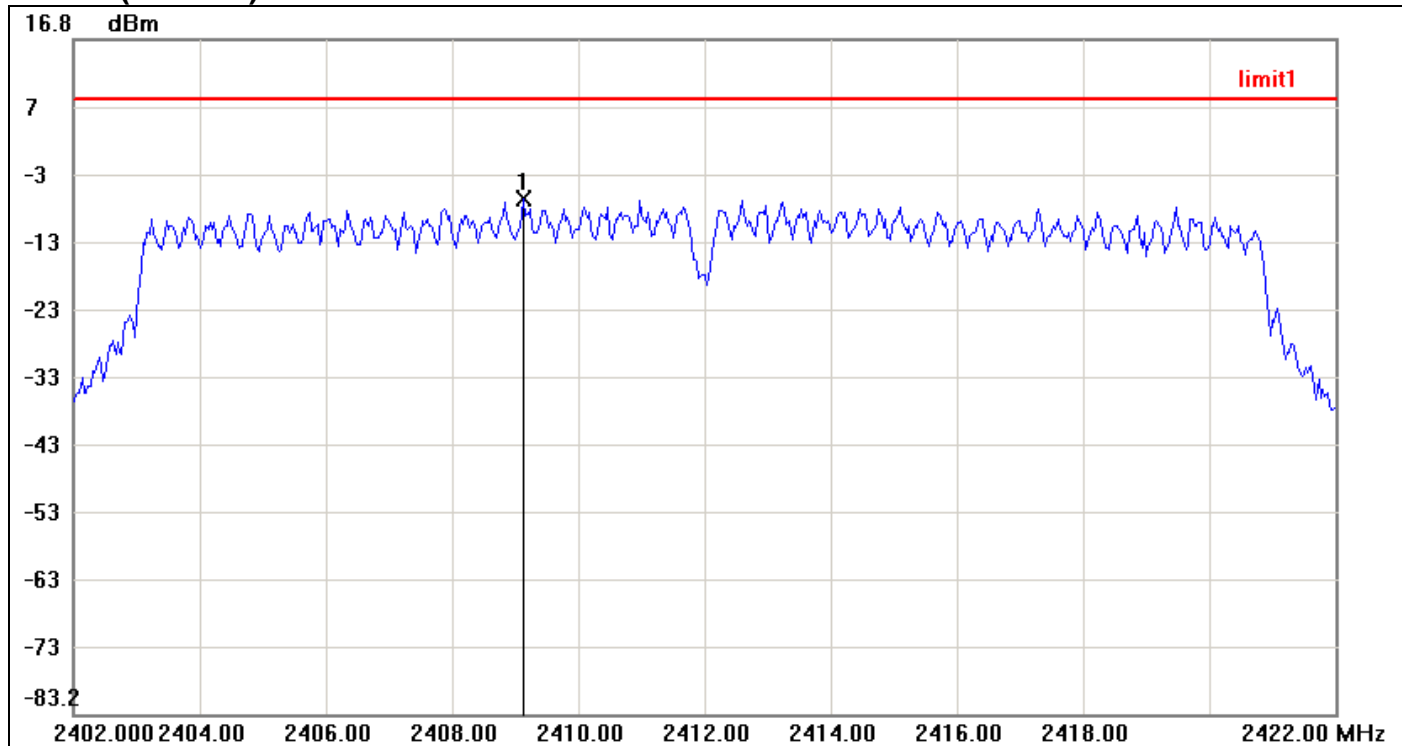
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2409.1333	-6.87	6.45	-13.32

PPSD (CH Mid)
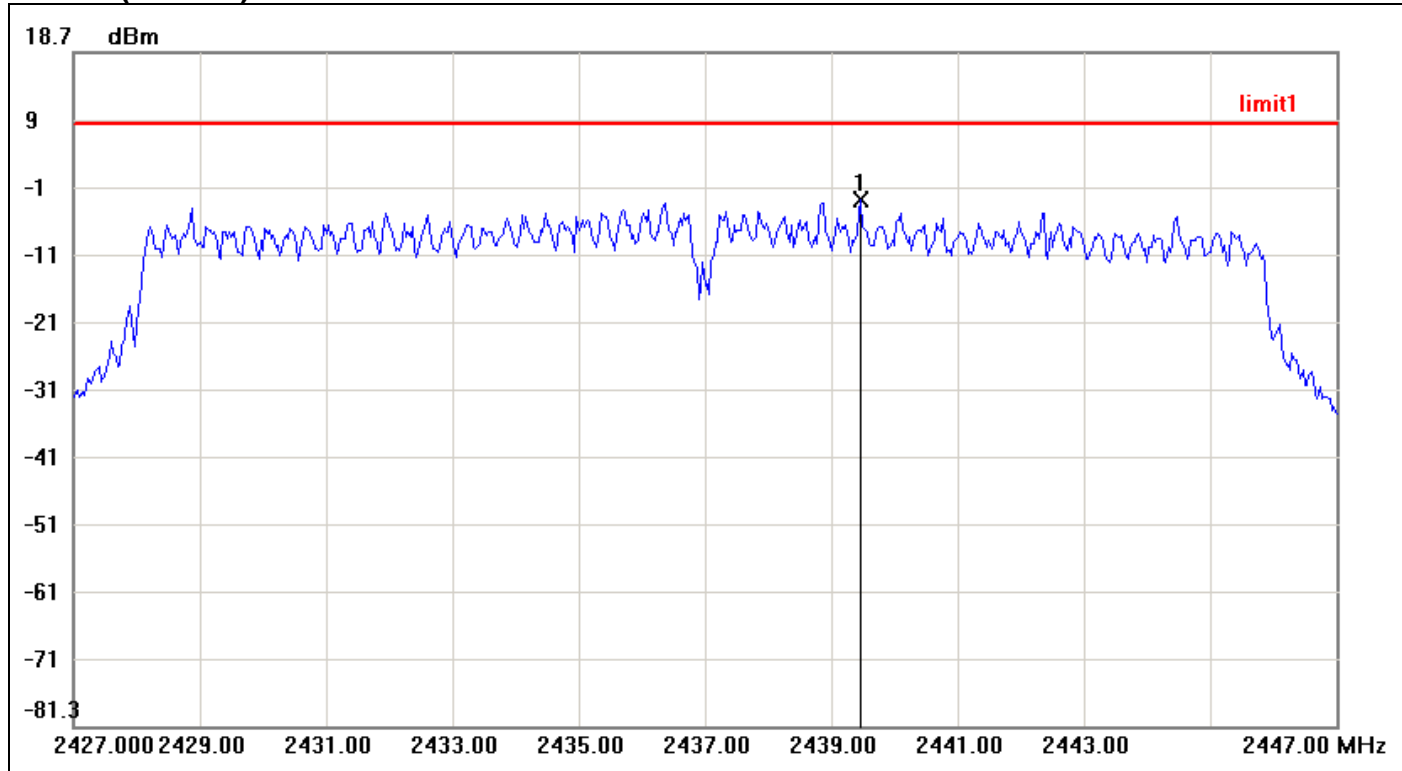
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2439.4667	-3.28	6.45	-9.73

PPSD (CH High)
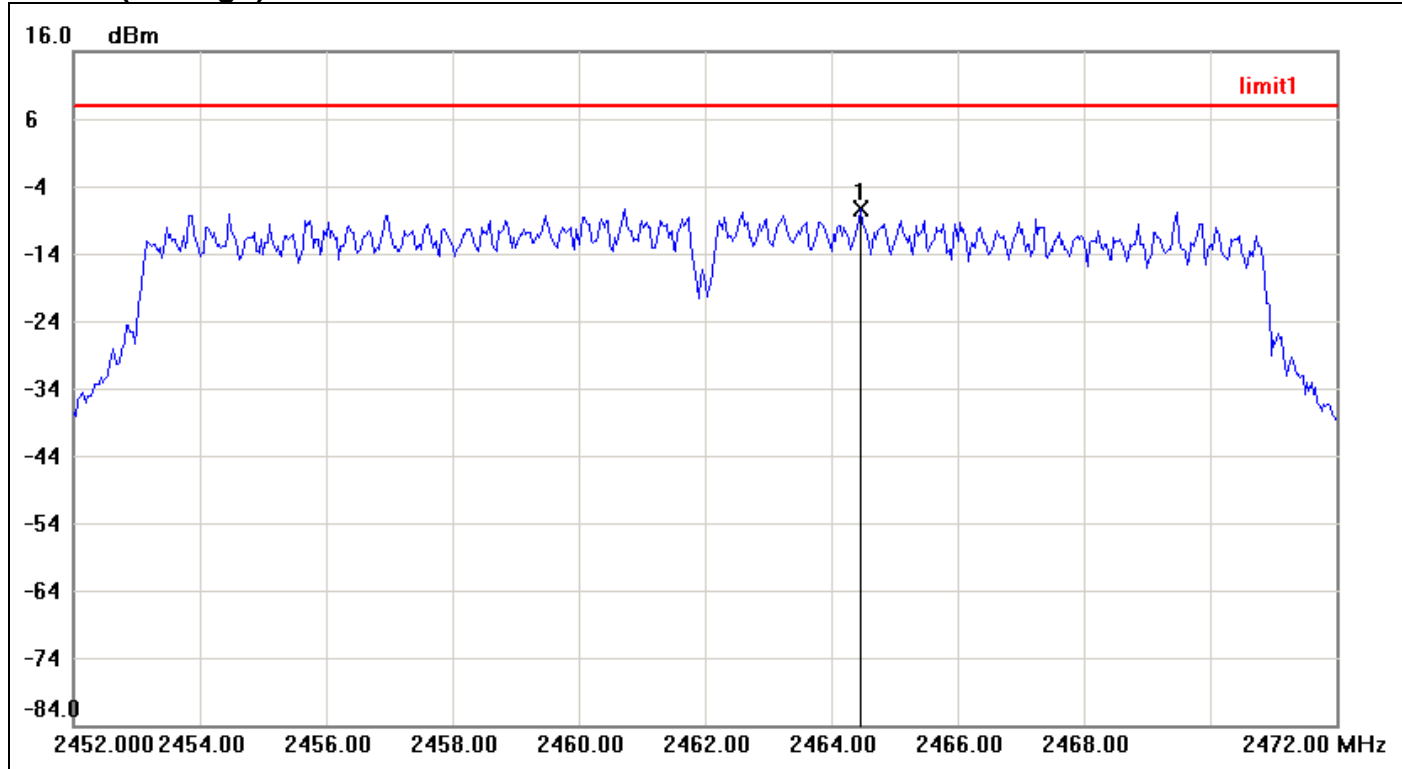
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2464.4667	-7.24	6.45	-13.69

IEEE 802.11n HT 40 MHz mode / Chain 0

PPSD (CH Low)
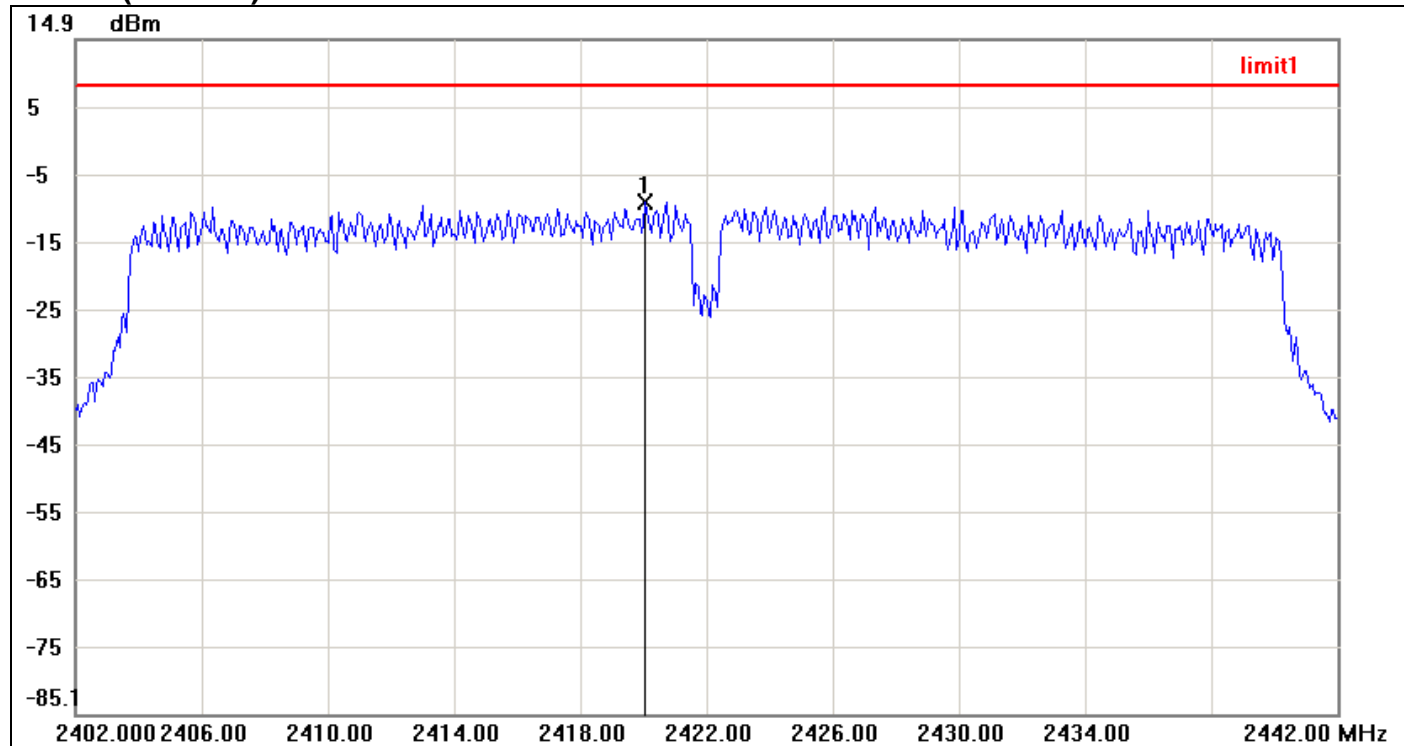
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2420.0667	-9.26	6.45	-15.71

PPSD (CH Mid)
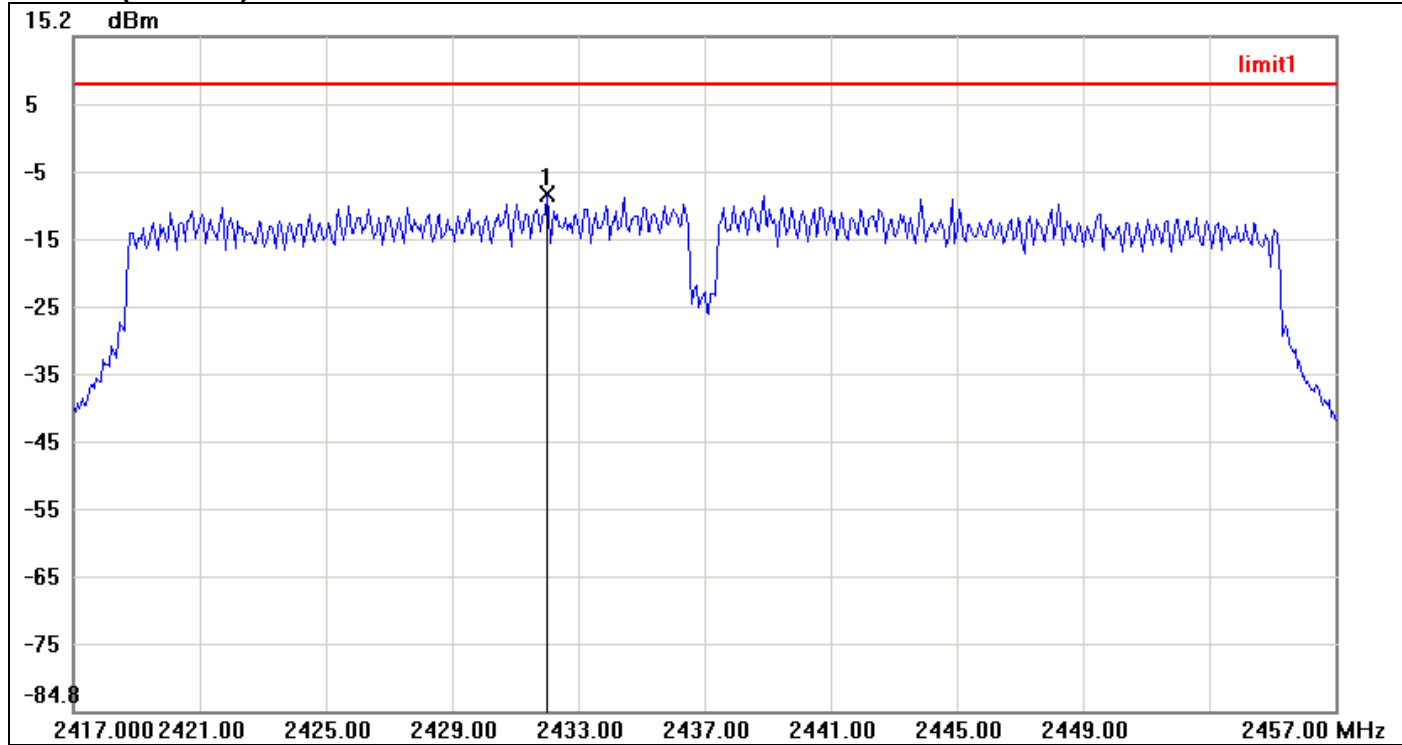
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2432.0000	-8.16	6.45	-14.61

PPSD (CH High)
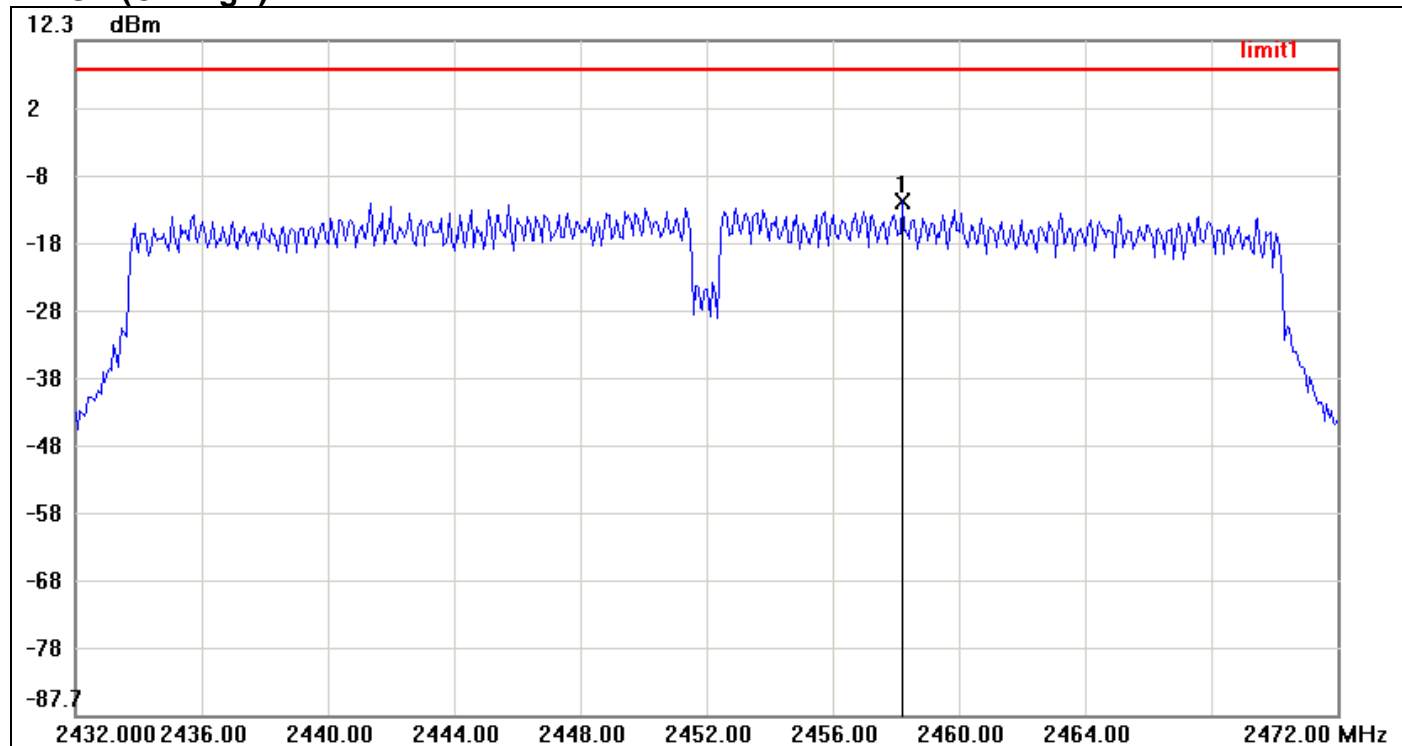
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2458.2000	-11.61	6.45	-18.06

IEEE 802.11n HT 40 MHz mode / Chain 1

PPSD (CH Low)
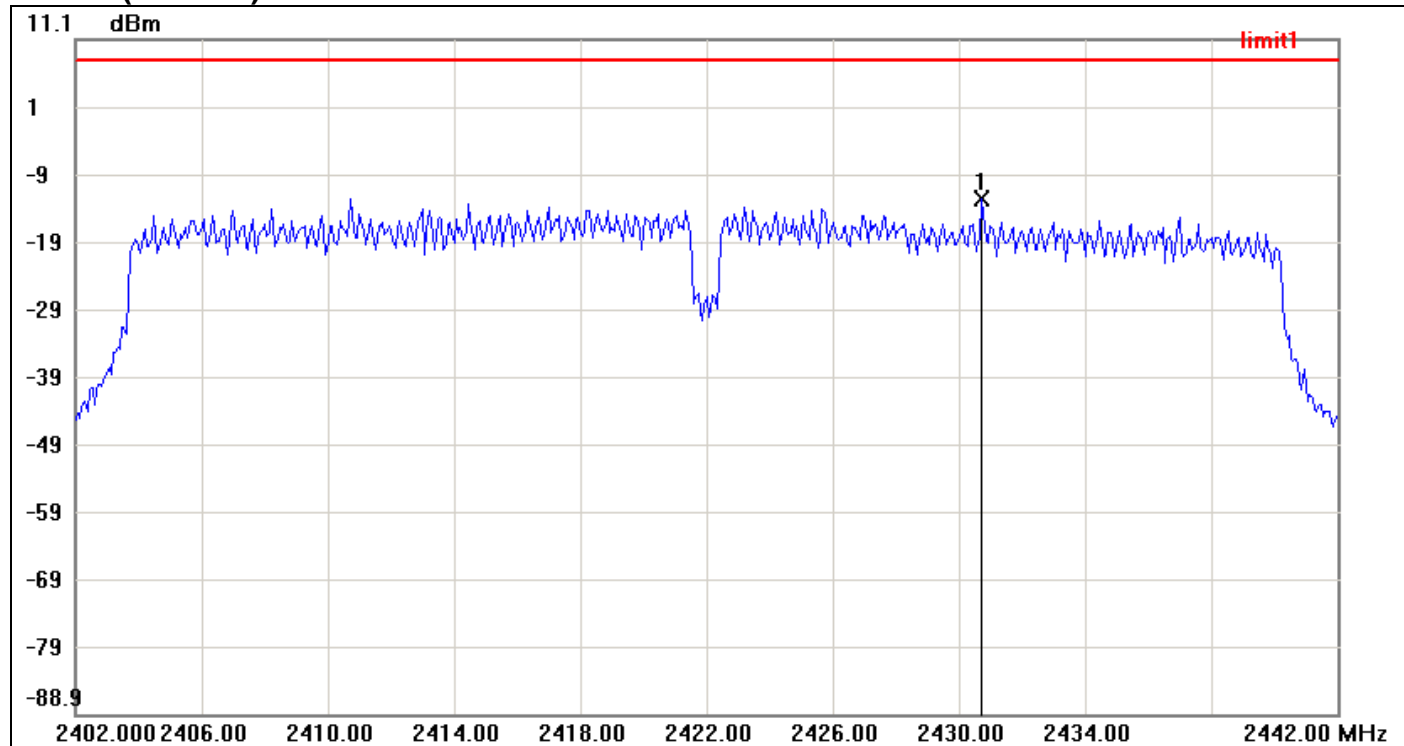
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2430.7333	-12.44	6.45	-18.89

PPSD (CH Mid)
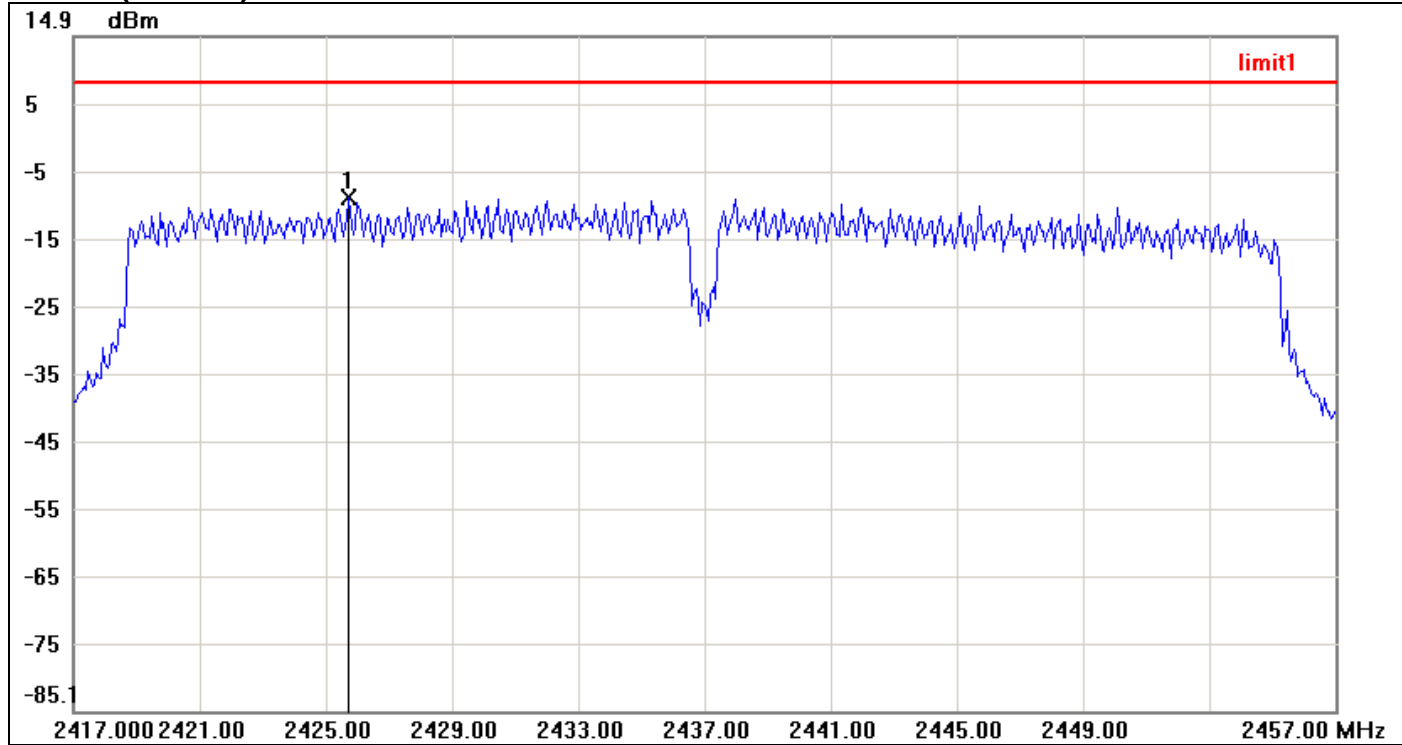
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2425.7333	-8.84	6.45	-15.29

PPSD (CH High)
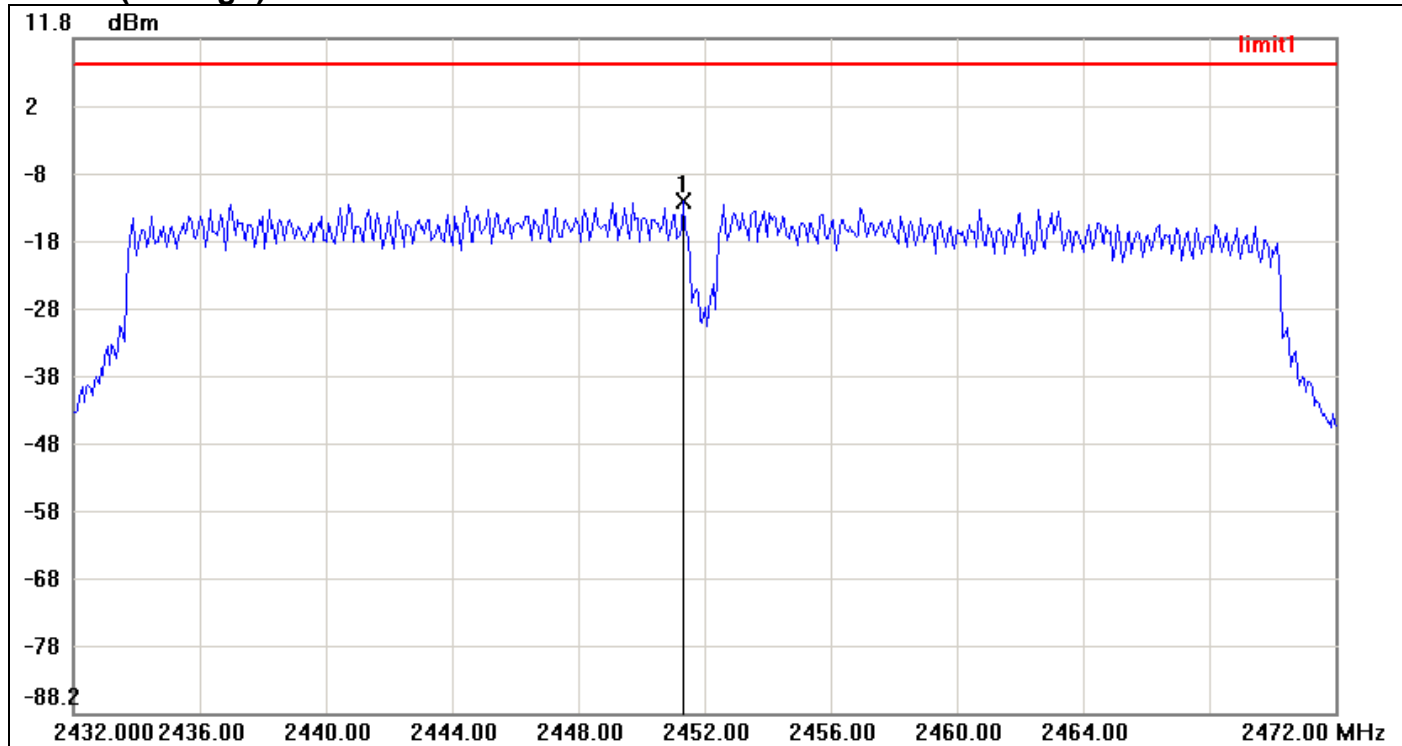
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2451.3333	-12.41	6.45	-18.86

7.7 SPURIOUS EMISSIONS

7.7.1 Conducted Measurement

LIMIT

According to §15.247(d) & RSS-247, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration

```
┌─────────────┐          ┌──────────────────────┐
│             │          │                      │
│     EUT     │ ───────► │  Spectrum Analyzer   │
│             │          │                      │
└─────────────┘          └──────────────────────┘
```

TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted

Test Plot

IEEE 802.11b mode

CH Low
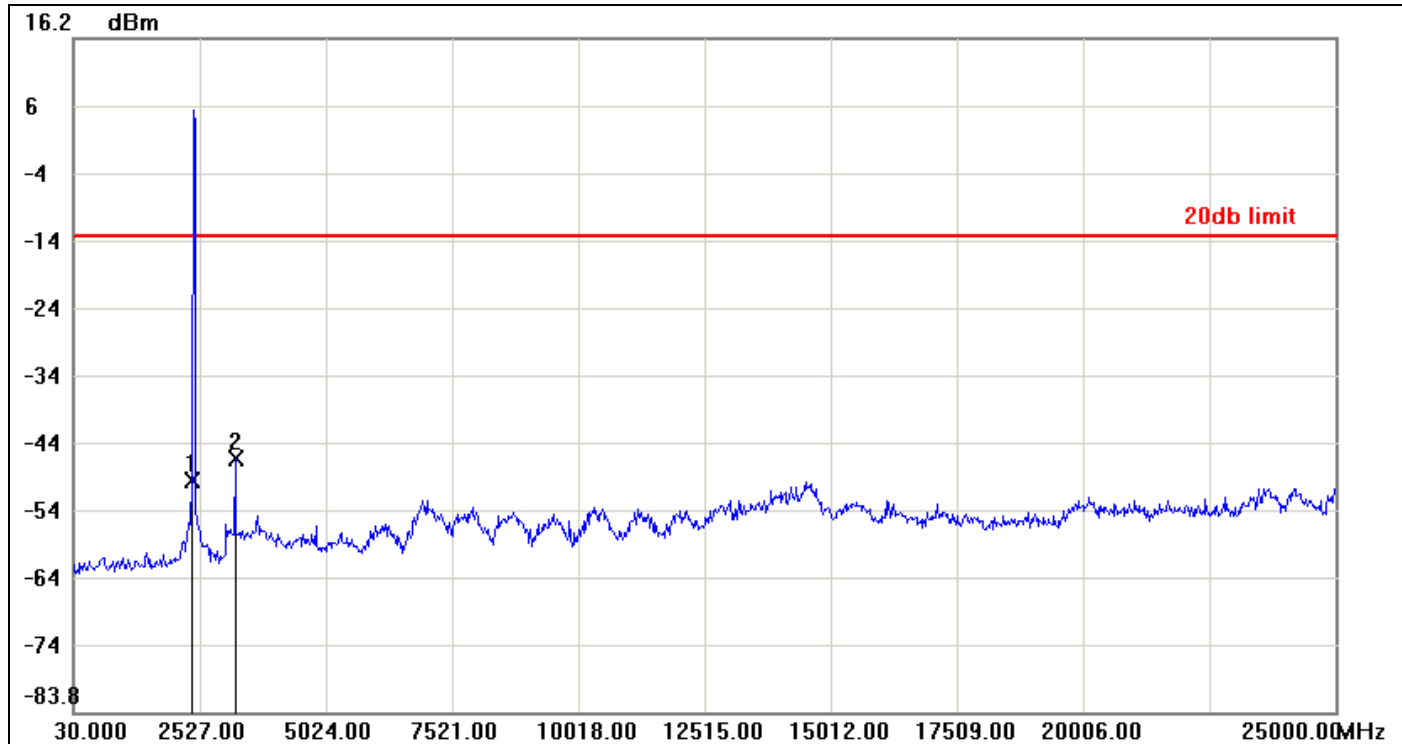
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-49.41	-13.29	-36.12
2	3226.1600	-46.19	-13.29	-32.90

CH Mid
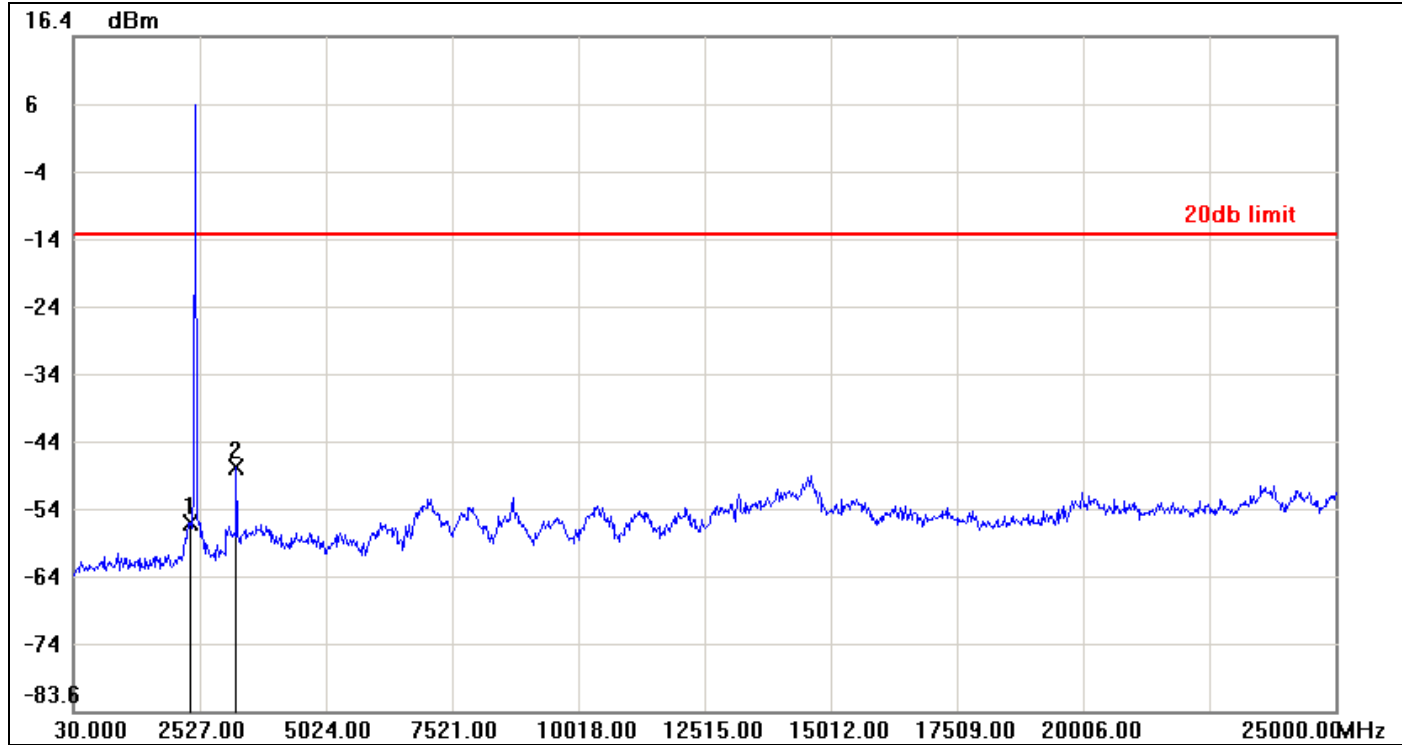
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2352.2100	-55.61	-12.97	-42.64
2	3251.1300	-47.44	-12.97	-34.47

CH High
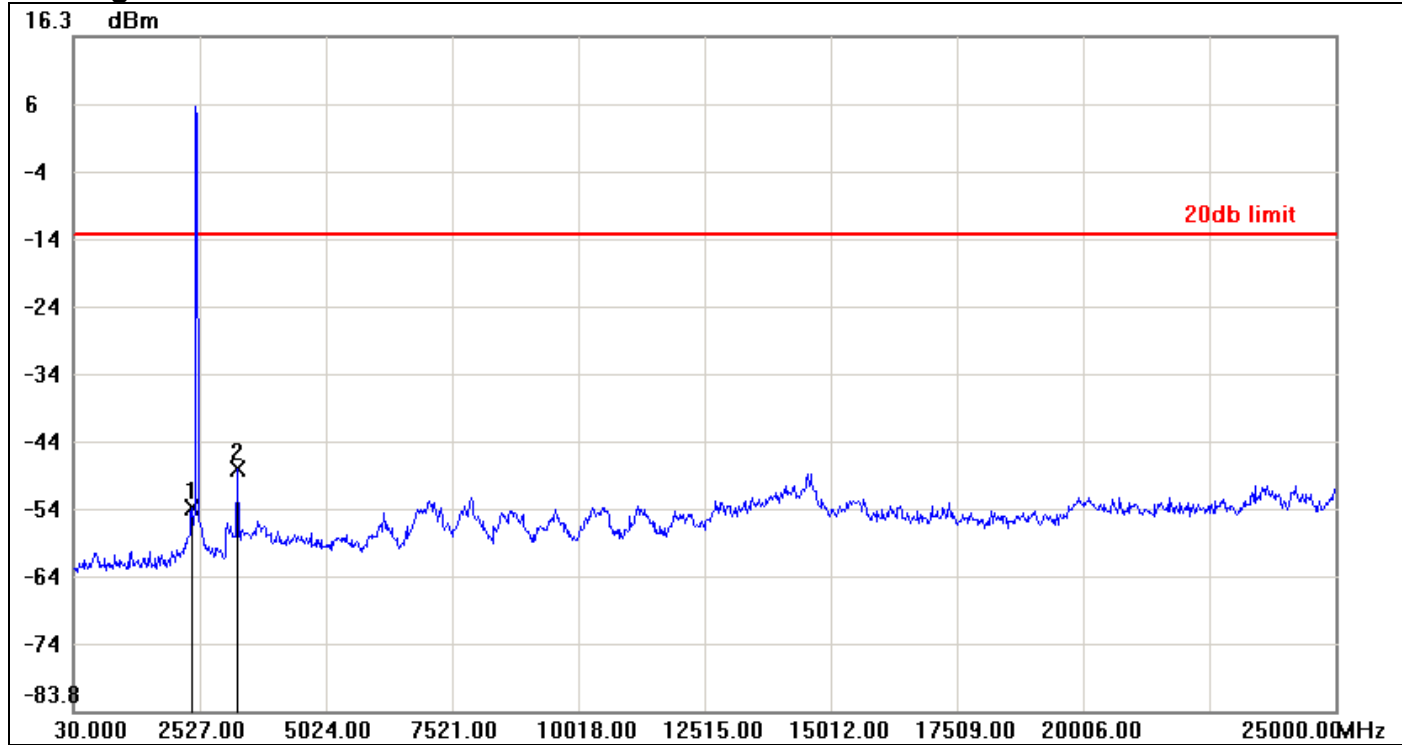
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-53.53	-13.17	-40.36
2	3276.1000	-47.98	-13.17	-34.81

IEEE 802.11g mode

CH Low
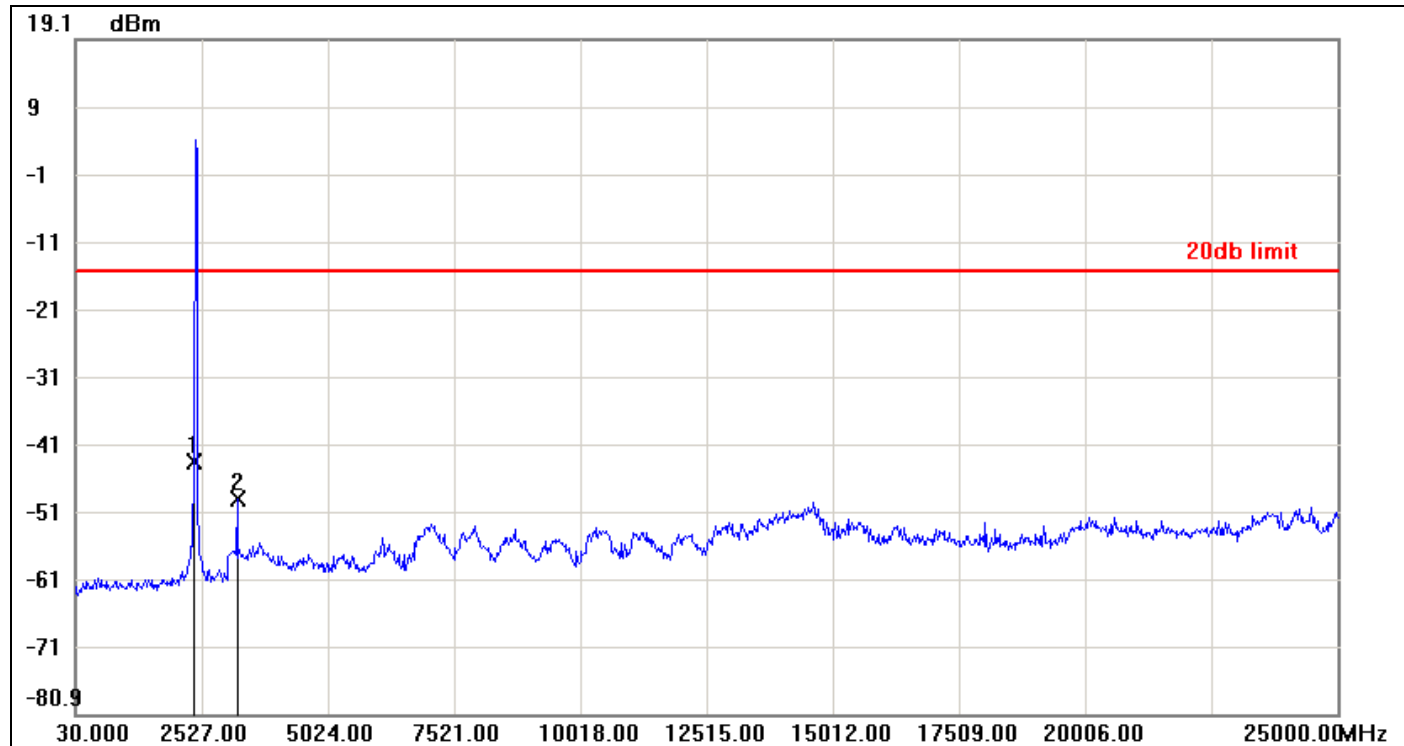
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-43.47	-15.15	-28.32
2	3226.1600	-49.07	-15.15	-33.92

CH Mid
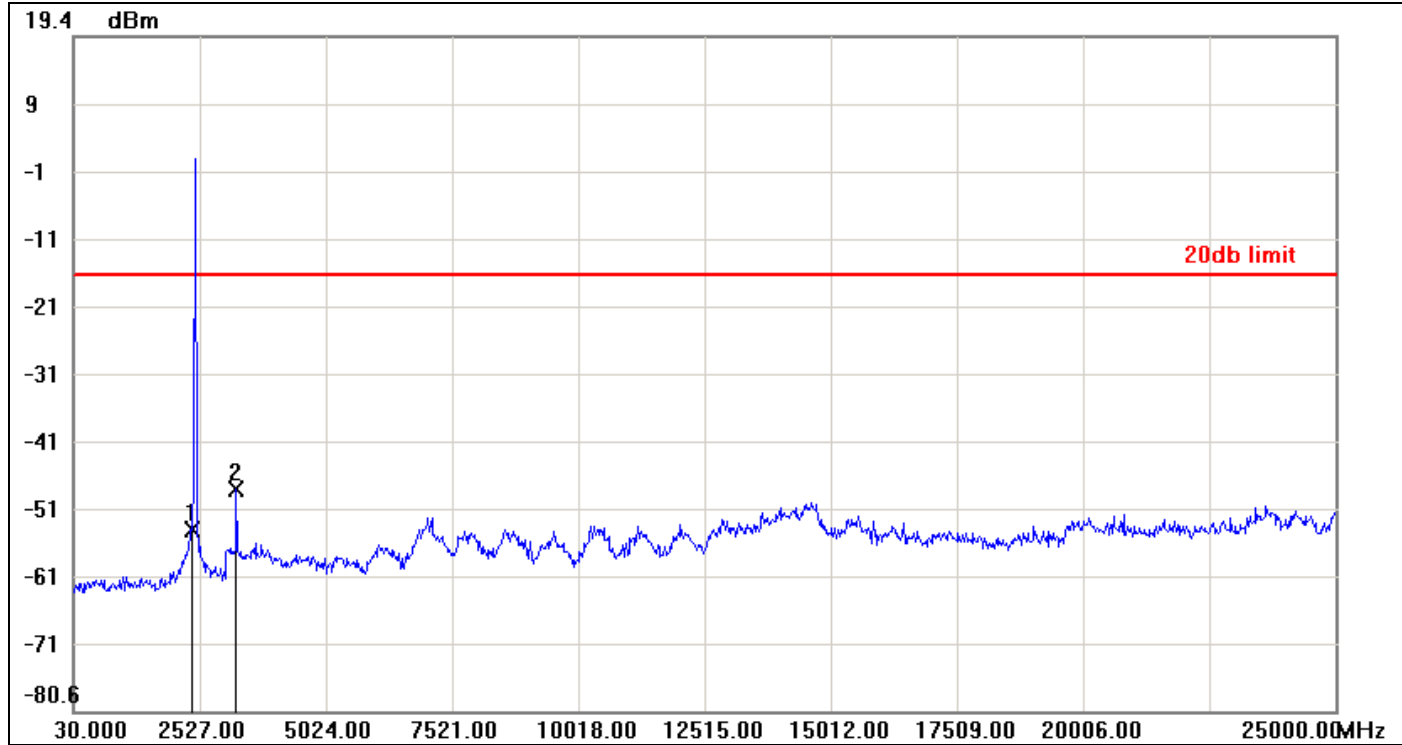
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-53.79	-15.98	-37.81
2	3251.1300	-47.74	-15.98	-31.76

CH High
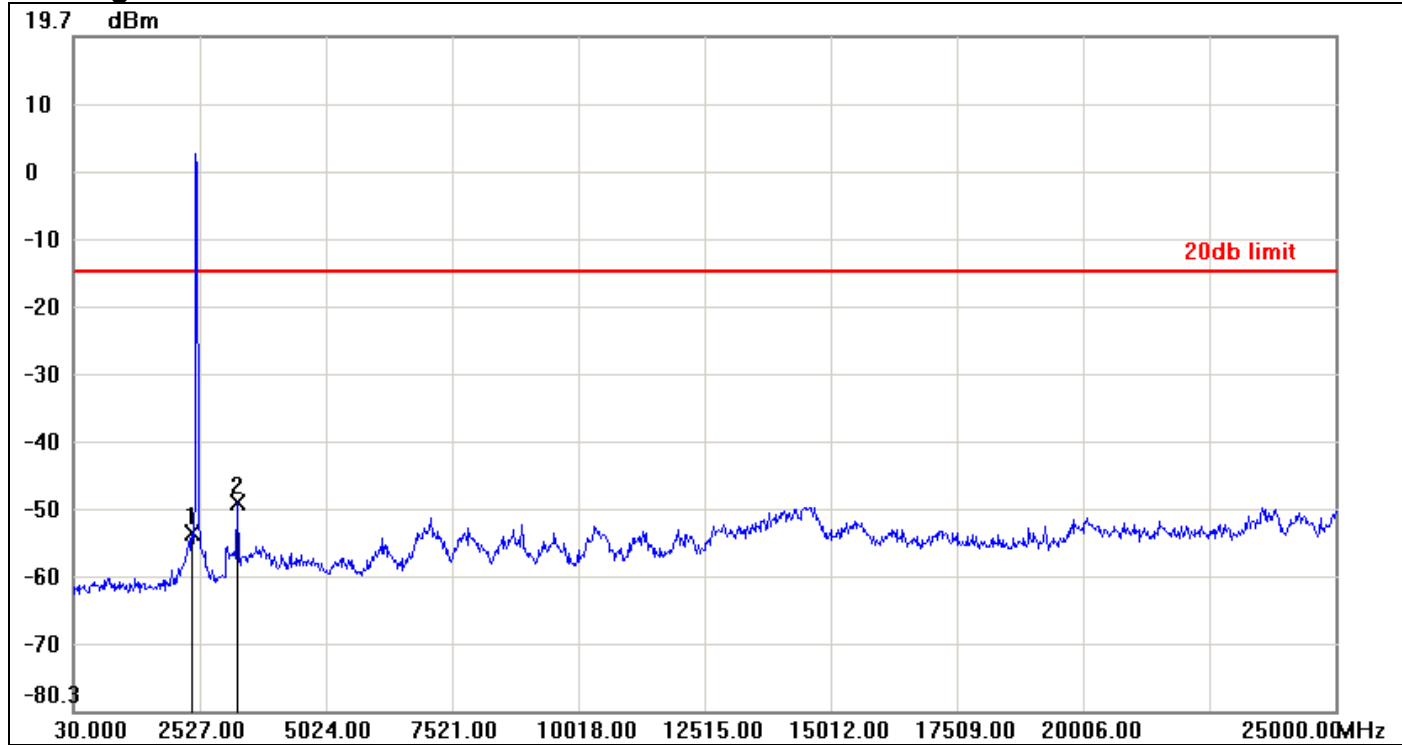
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-54.02	-15.08	-38.94
2	3276.1000	-49.44	-15.08	-34.36

IEEE 802.11n HT 20 MHz mode / Chain 0

CH Low
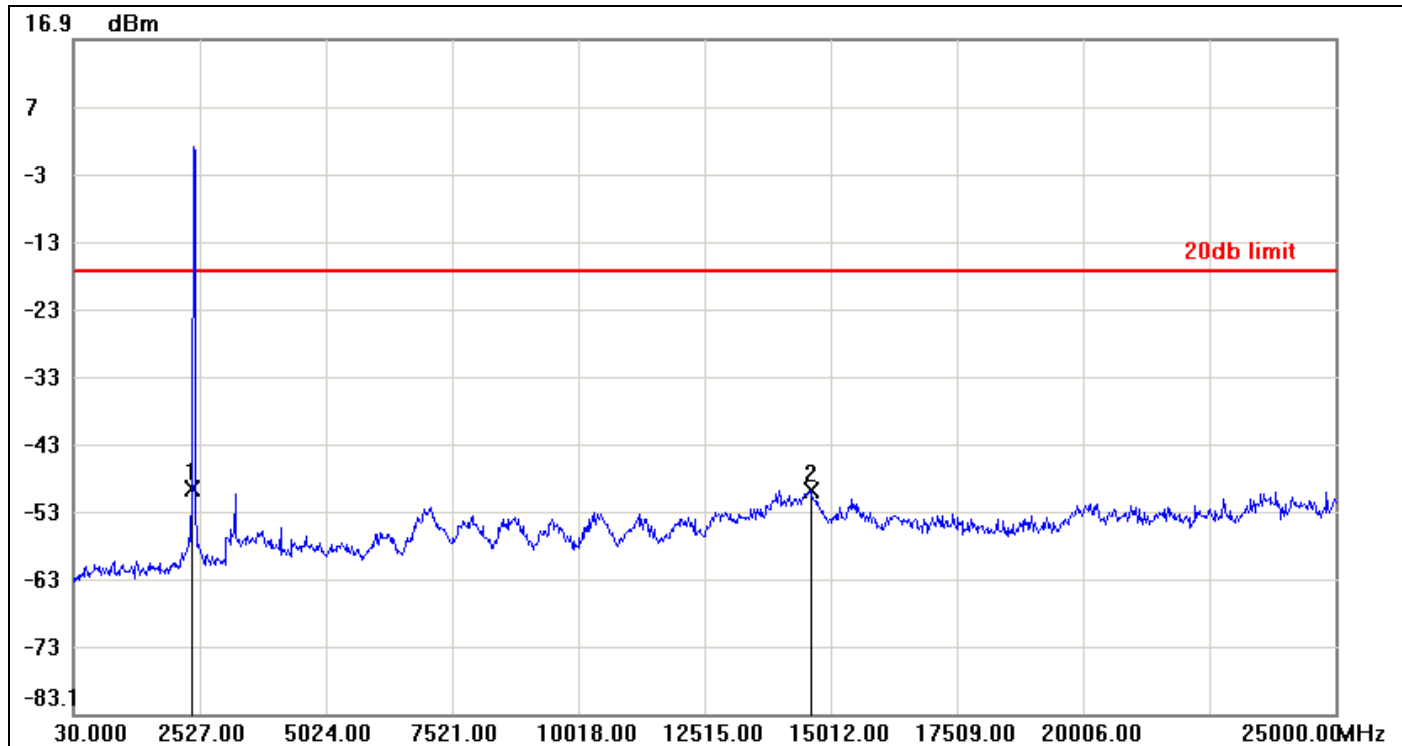
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-49.82	-17.50	-32.32
2	14612.4800	-49.85	-17.50	-32.35

CH Mid
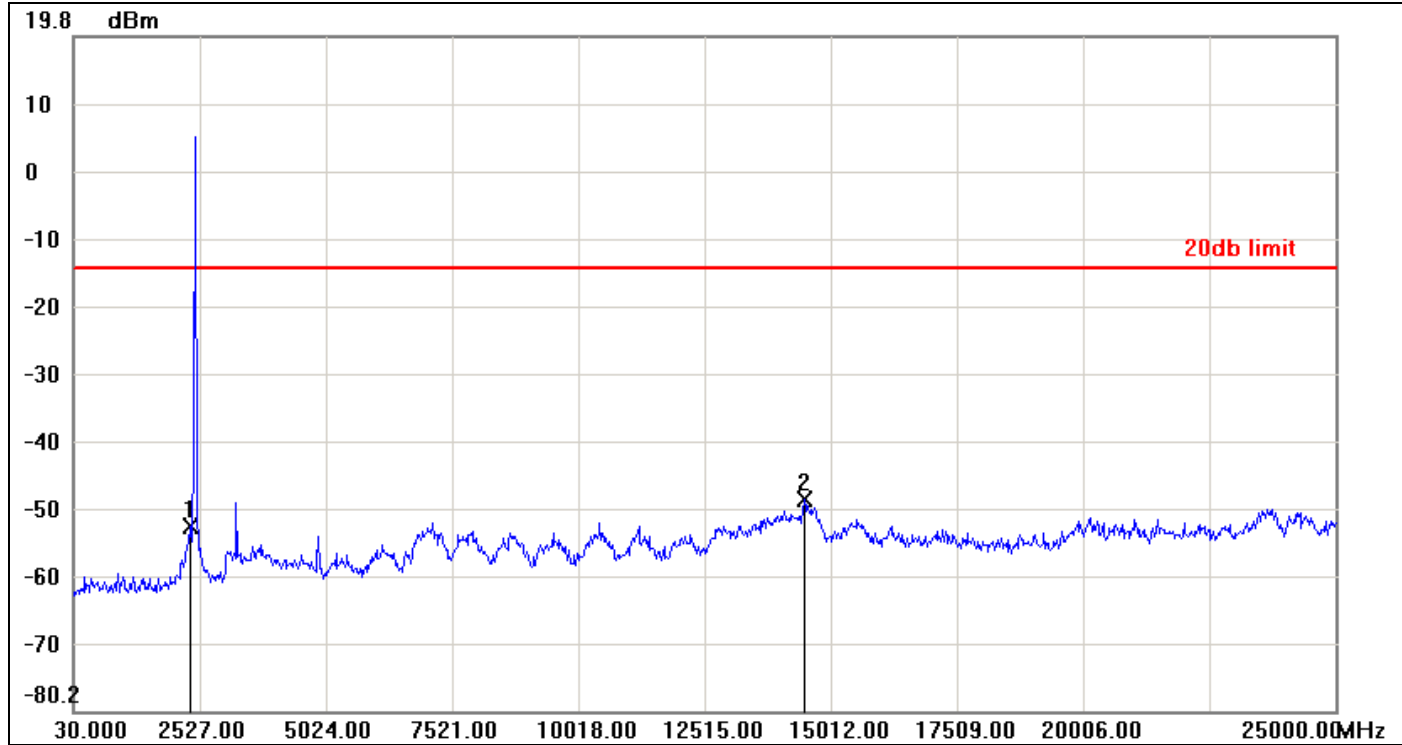
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2327.2400	-52.96	-14.62	-38.34
2	14487.6300	-48.75	-14.62	-34.13

CH High
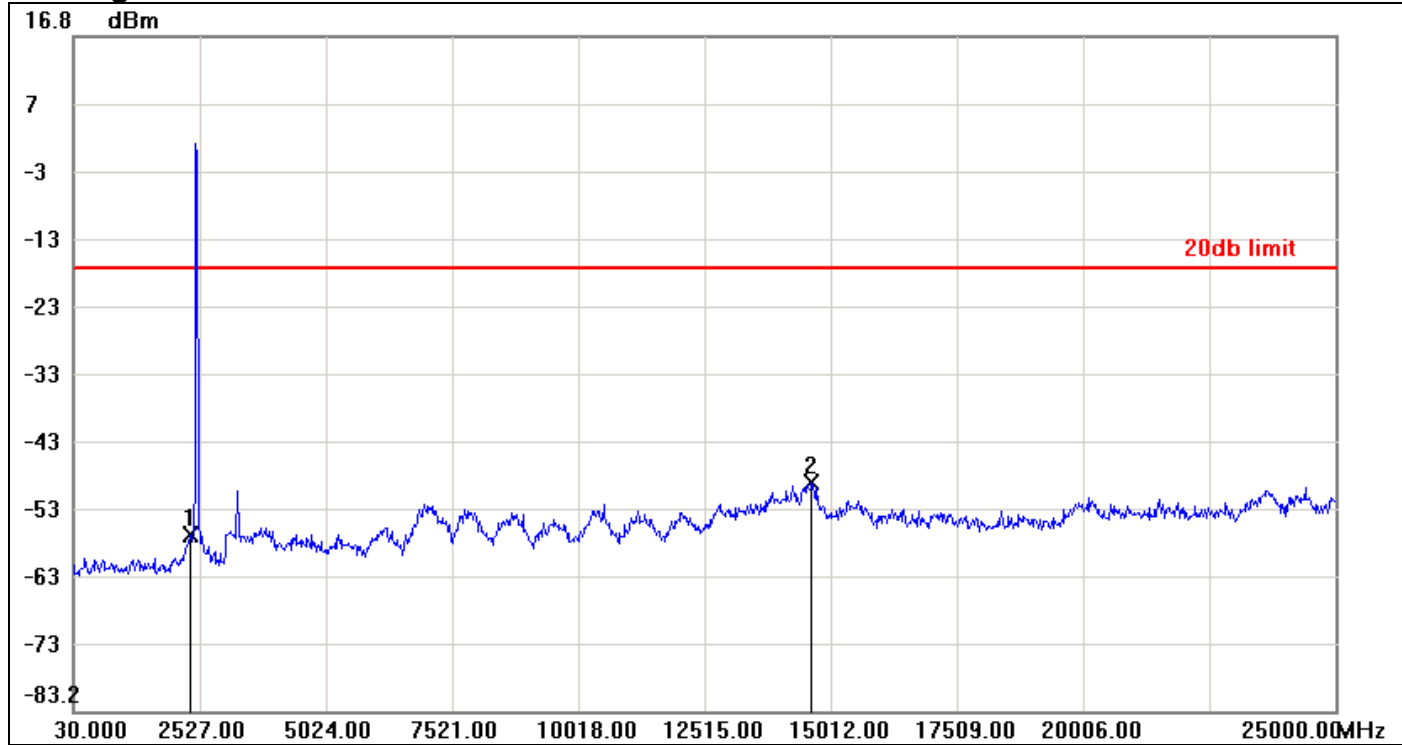
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2327.2400	-57.02	-17.58	-39.44
2	14637.4500	-49.23	-17.58	-31.65

IEEE 802.11n HT 20 MHz mode / Chain 1

CH Low
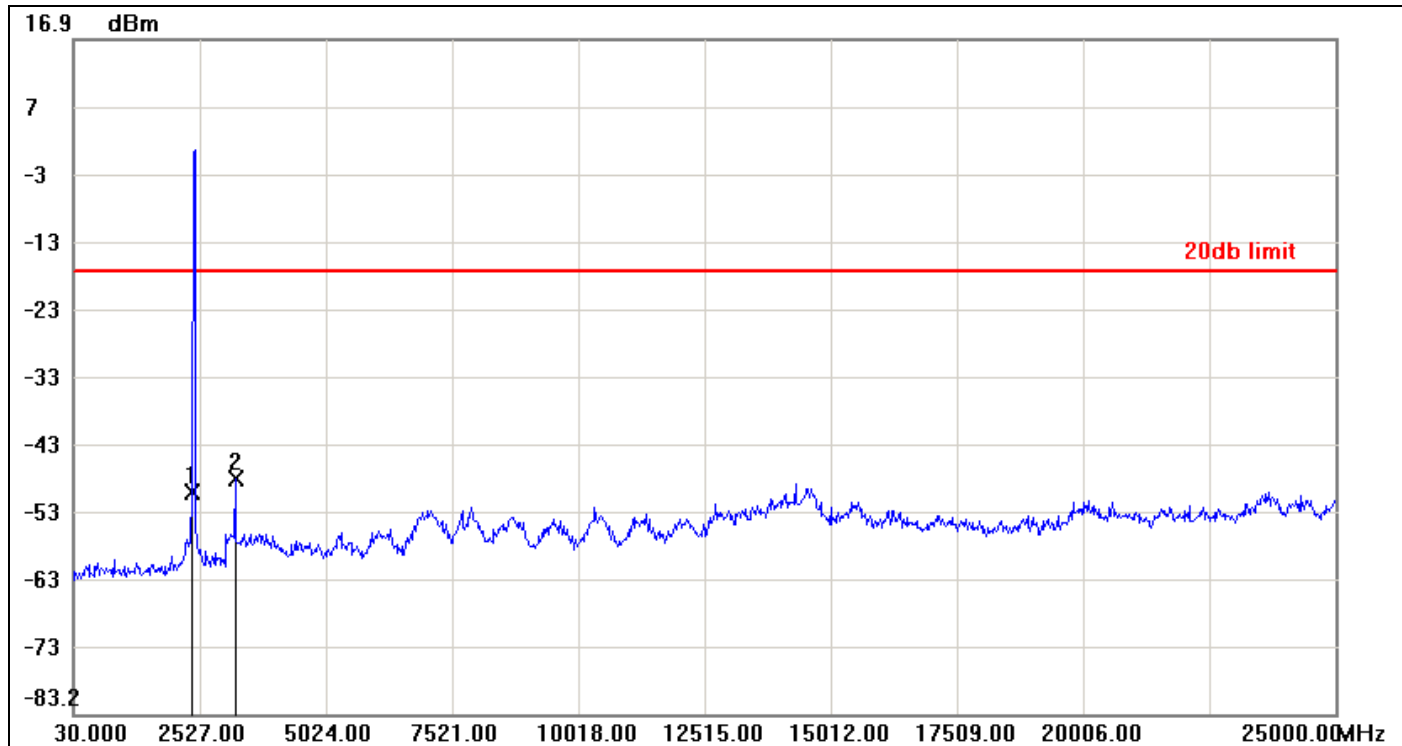
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-50.35	-17.55	-32.80
2	3226.1600	-48.21	-17.55	-30.66

CH Mid
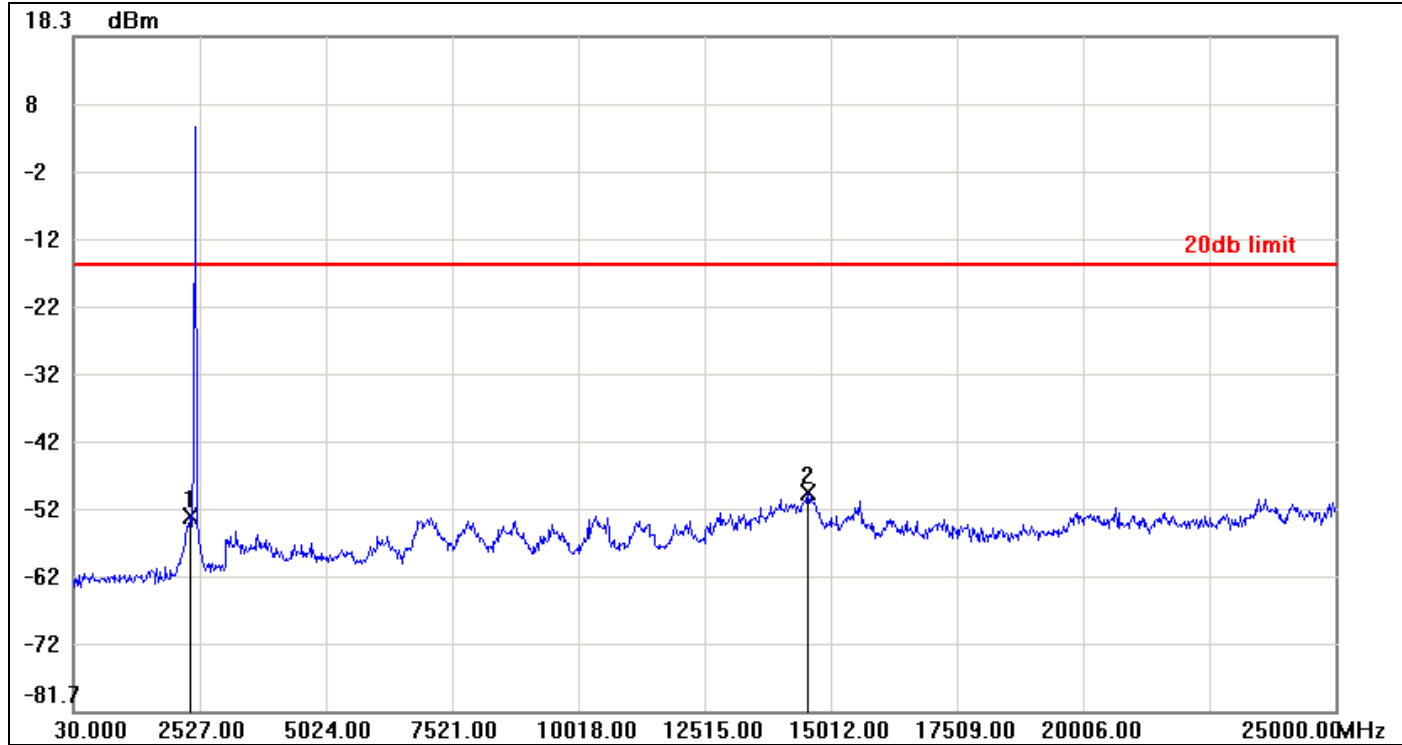
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2352.2100	-52.81	-15.49	-37.32
2	14562.5400	-49.20	-15.49	-33.71

CH High
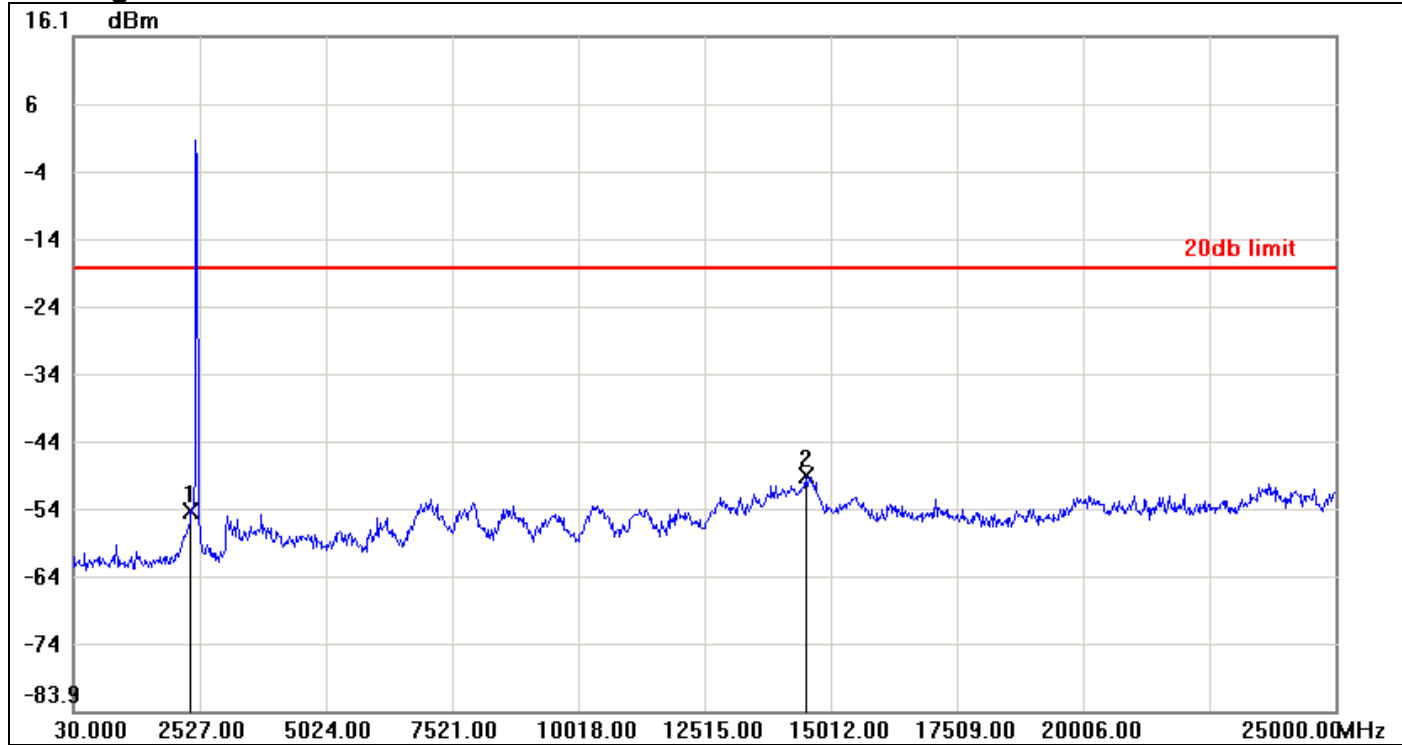
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2352.2100	-54.26	-18.35	-35.91
2	14512.6000	-49.01	-18.35	-30.66

IEEE 802.11n HT 40 MHz mode / Chain 0

CH Low
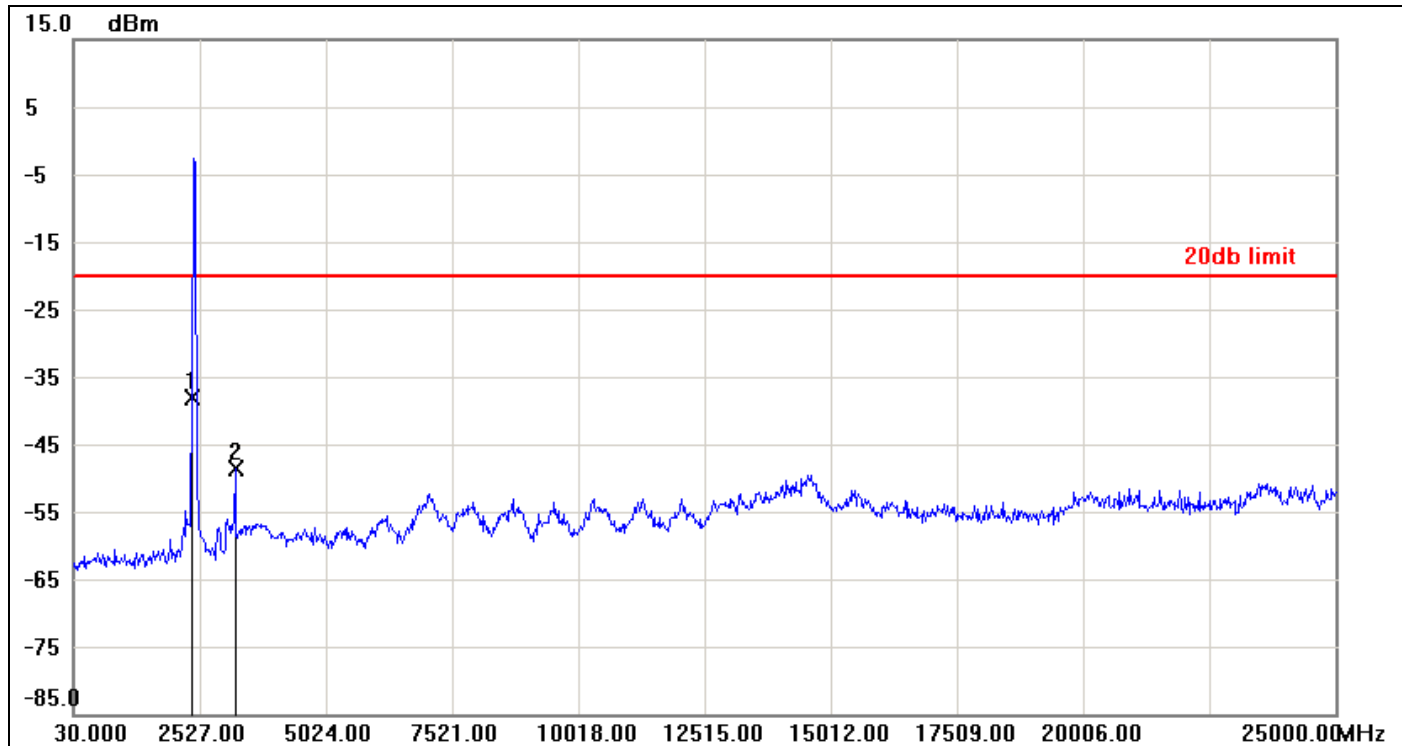
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-38.10	-19.99	-18.11
2	3226.1600	-48.51	-19.99	-28.52

CH Mid
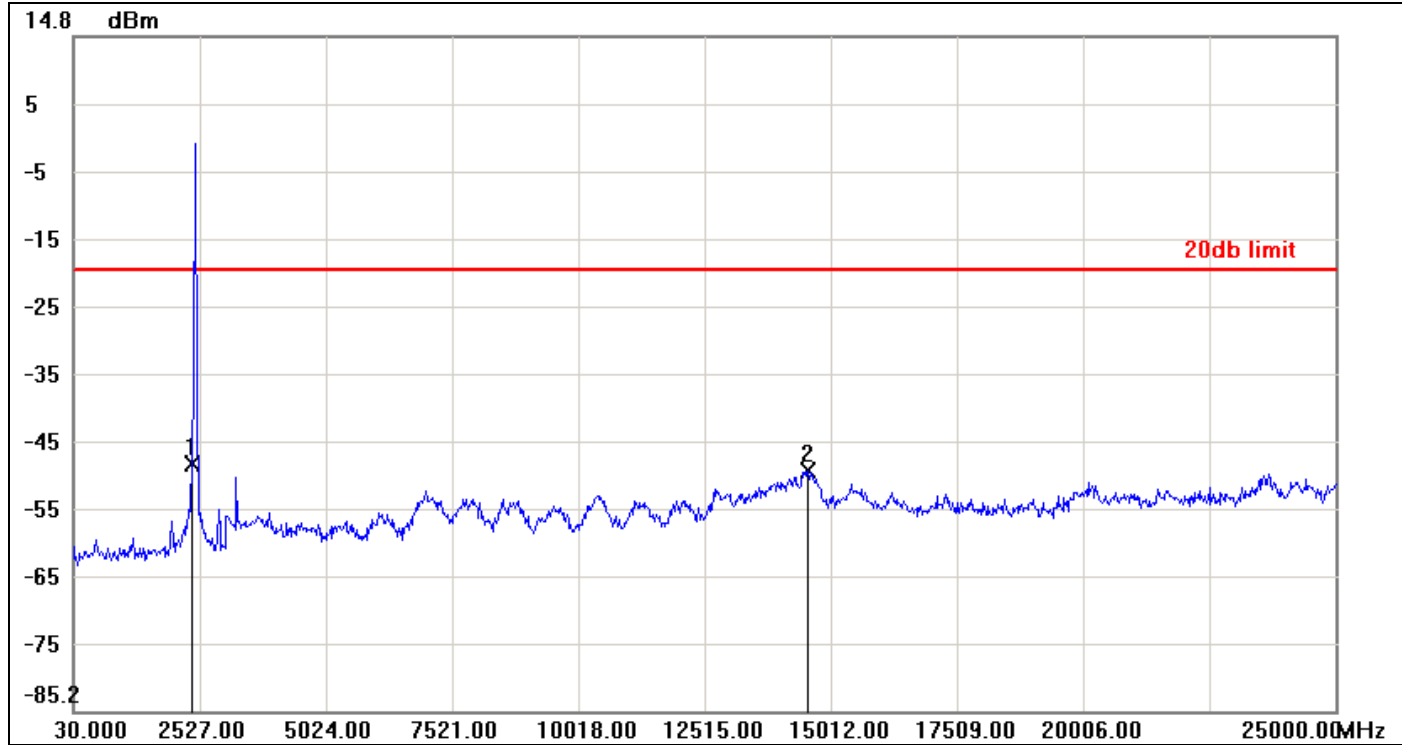
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-48.56	-19.78	-28.78
2	14562.5400	-49.59	-19.78	-29.81

CH High
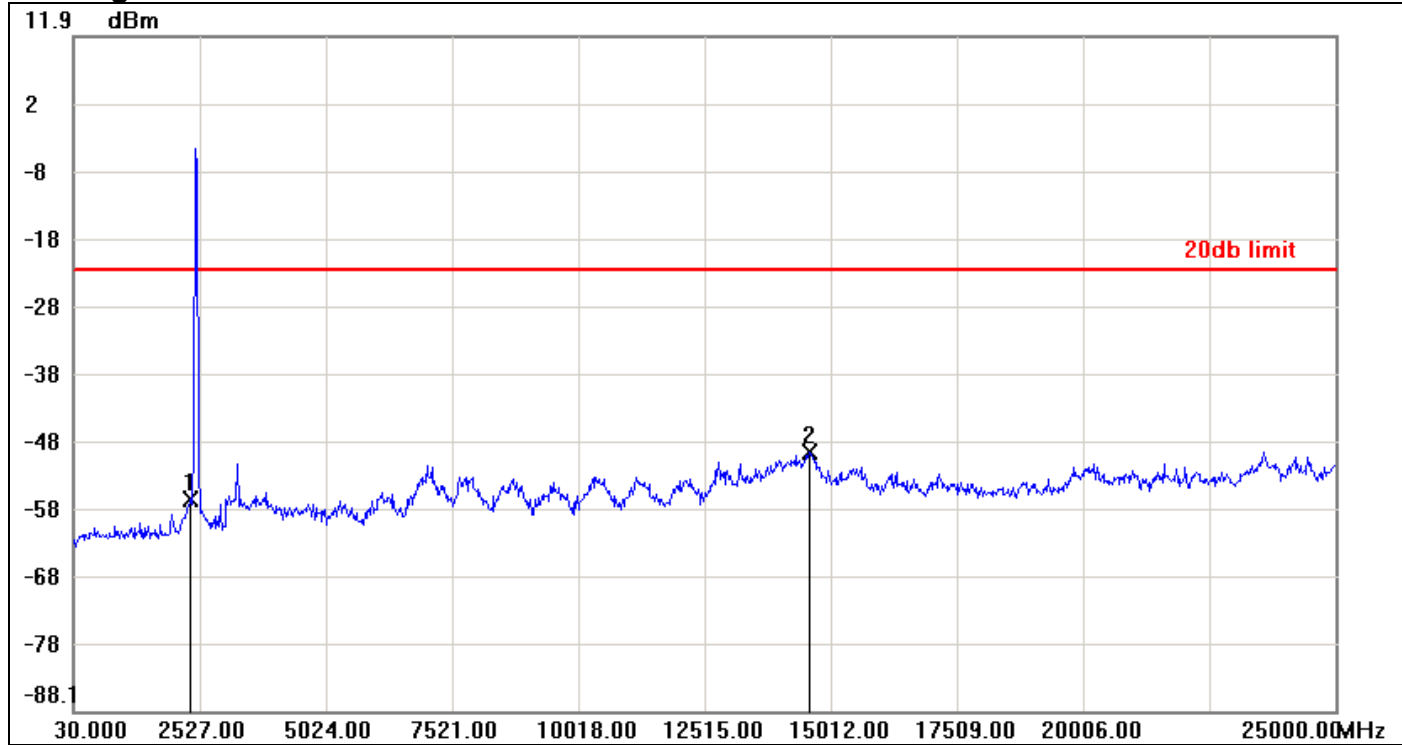
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2352.2100	-56.60	-22.75	-33.85
2	14587.5100	-49.72	-22.75	-26.97

IEEE 802.11n HT 40 MHz mode / Chain 1

CH Low
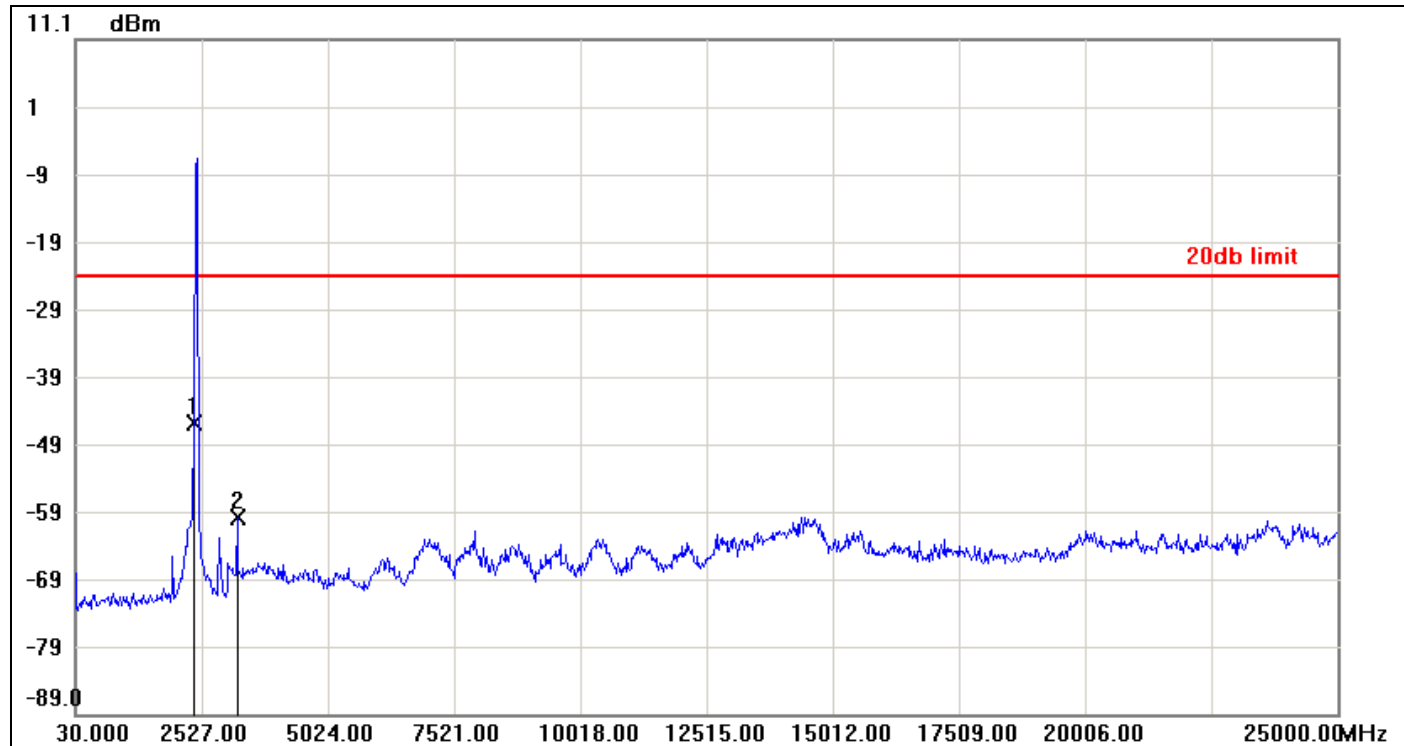
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-45.75	-24.00	-21.75
2	3226.1600	-59.77	-24.00	-35.77

CH Mid
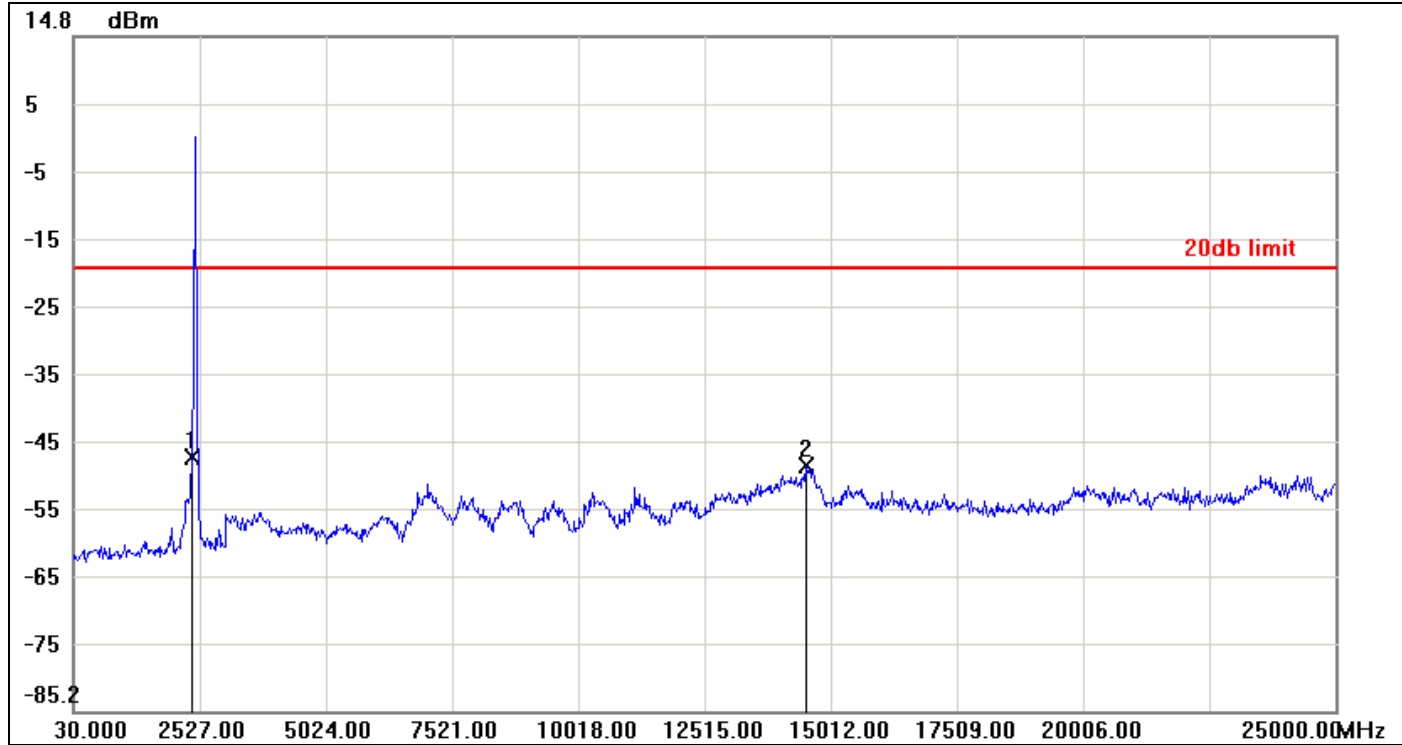
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2377.1800	-47.51	-19.51	-28.00
2	14512.6000	-48.75	-19.51	-29.24

CH High
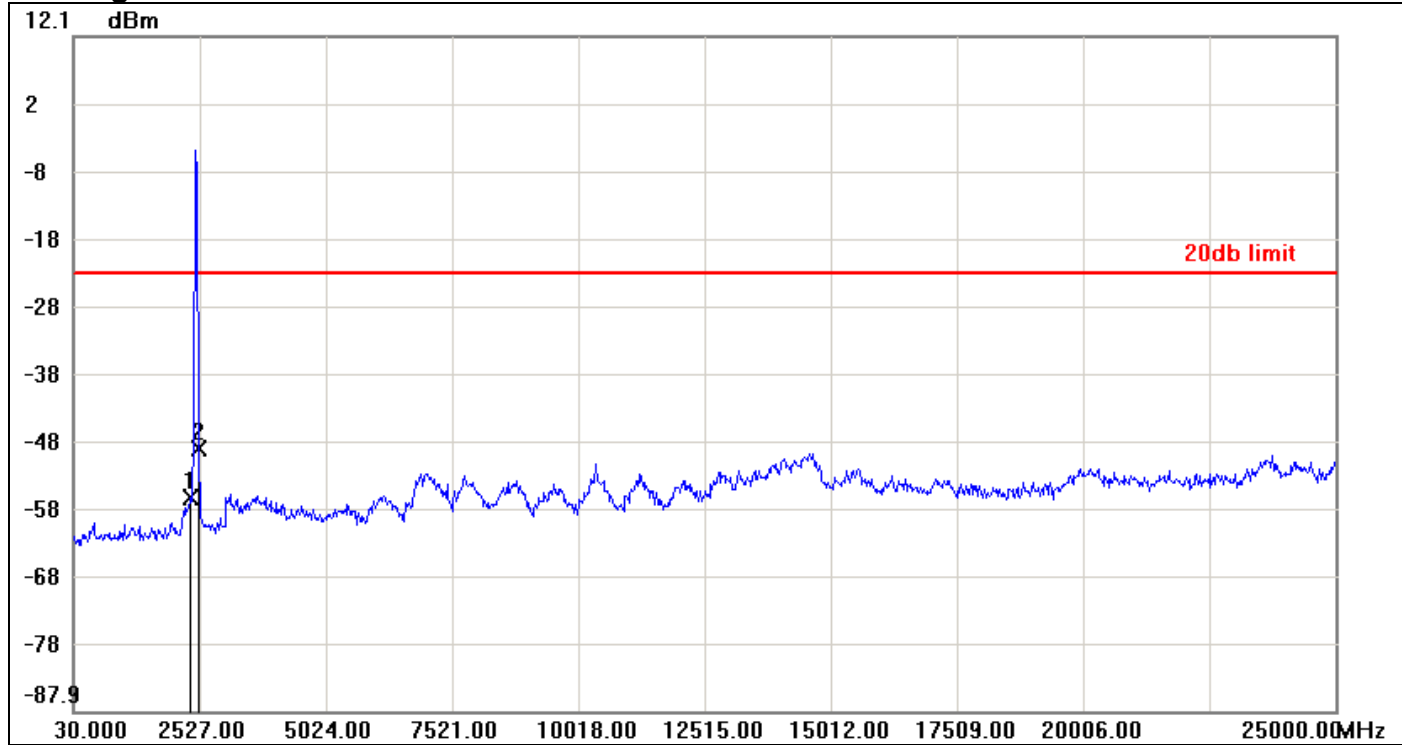
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2352.2100	-56.32	-23.13	-33.19
2	2502.0300	-49.04	-23.13	-25.91

7.8 RADIATED EMISSIONS

LIMIT

All spurious emissions shall comply with the limits of §15.209(a) and RSS-Gen Table 2 & Table 5.

RSS-Gen Table 2 & Table 5: General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	**Receivers**
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: *Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.
Transmitting devices are not permitted in Table 1 bands or, unless stated otherwise, in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz).

RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	3000
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements
employing an average detector.

Test Configuration

9kHz ~ 30MHz

30MHz ~ 1GHz

Above 1 GHz

Antenna tower

Horn antenna

Spectrum analyzer

Pre-amp

EUT

Turntable

3m

4m

1.5m

1m
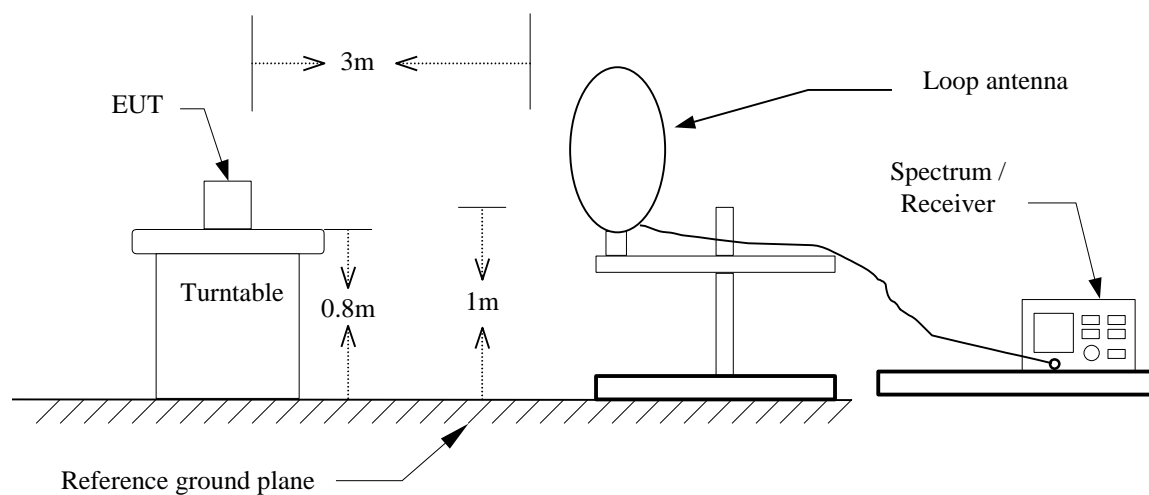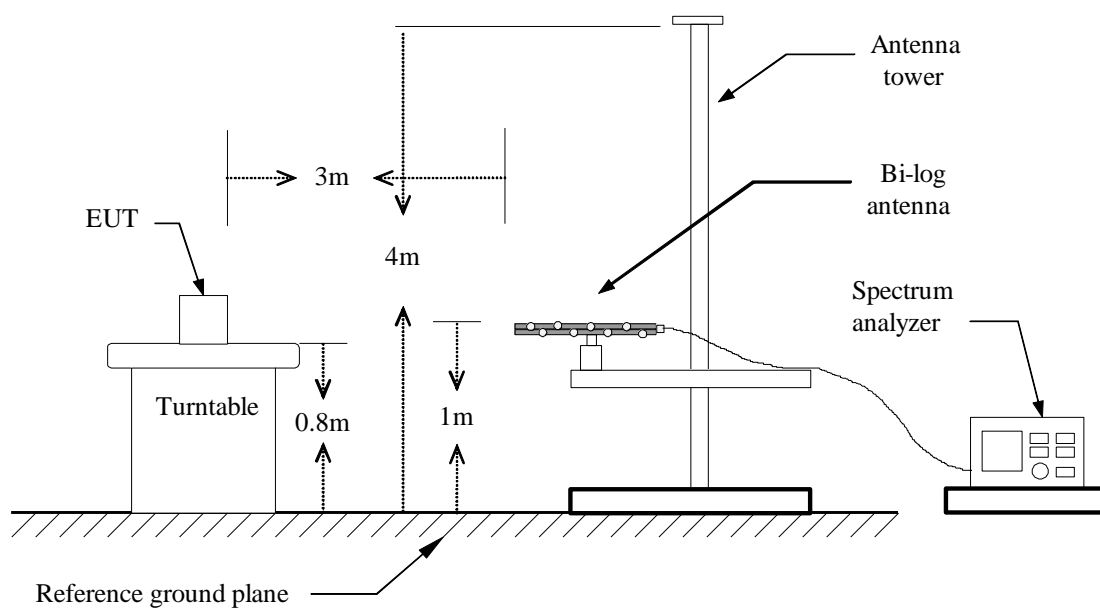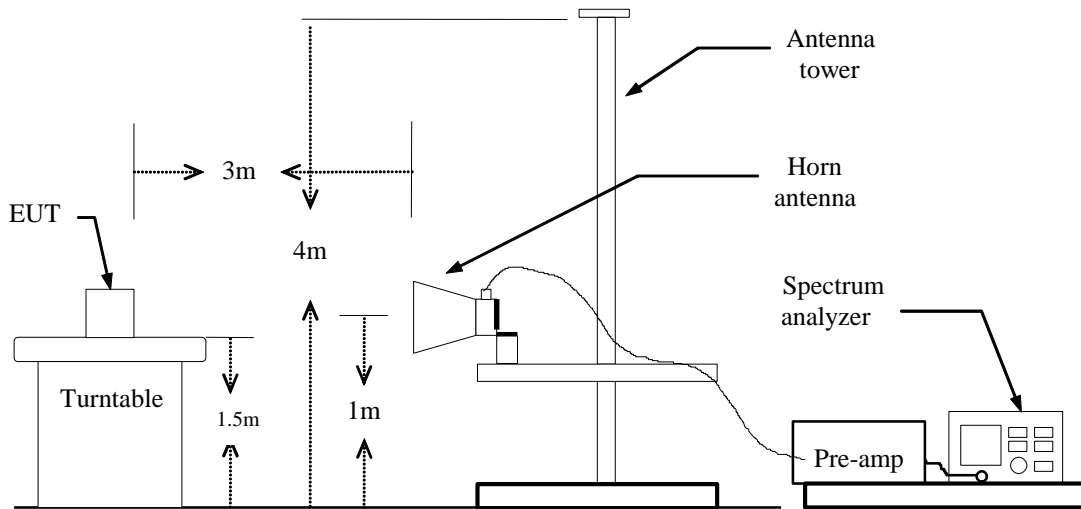
TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Set the spectrum analyzer in the following setting as:

    Below 1GHz:

    > RBW=100kHz / VBW=300kHz / Sweep=AUTO

    Above 1GHz:

    > (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
    > (b) AVERAGE: RBW=1MHz,
    > if duty cycle$\geqq$98%, VBW=10Hz.
    > if duty cycle<98% VBW=1/T.
    > **IEEE 802.11b mode:** $\geqq$98%, VBW=10Hz
    > **IEEE 802.11g mode:** = 88%, VBW=750Hz
    > **IEEE 802.11n HT 20 MHz mode:** = 77%, VBW=1.5KHz
    > **IEEE 802.11n HT 40 MHz mode:** = 65%, VBW=3KHz

7. Repeat above procedures until the measurements for all frequencies are complete.

8. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

Below 1GHz

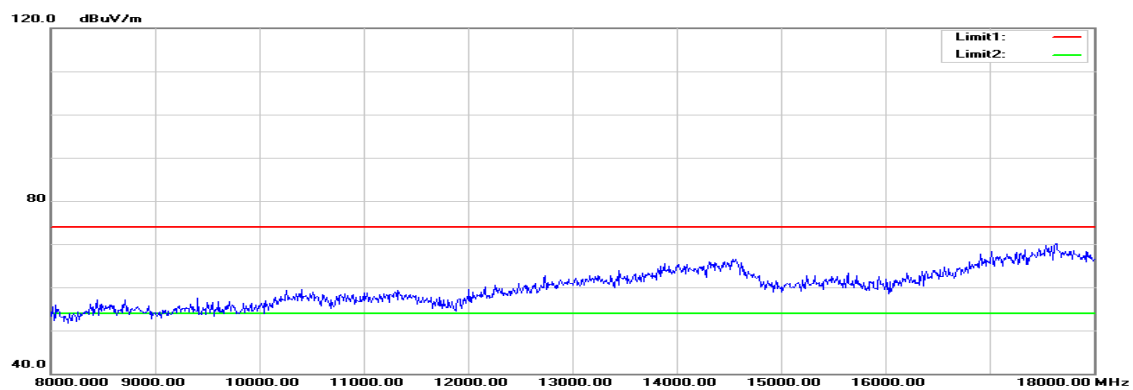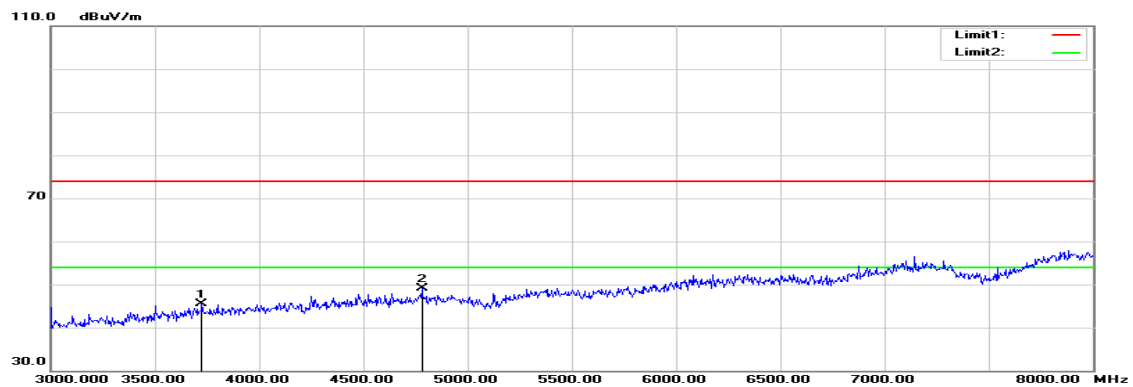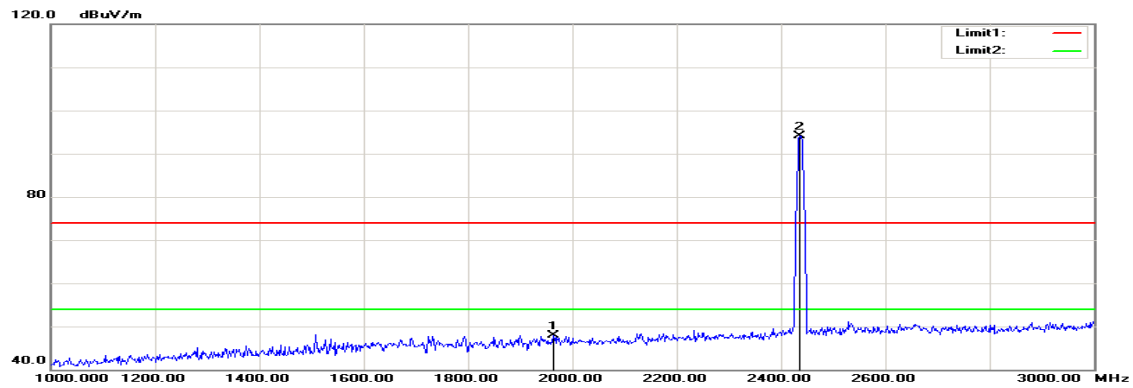**Operation Mode:** Normal Link   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

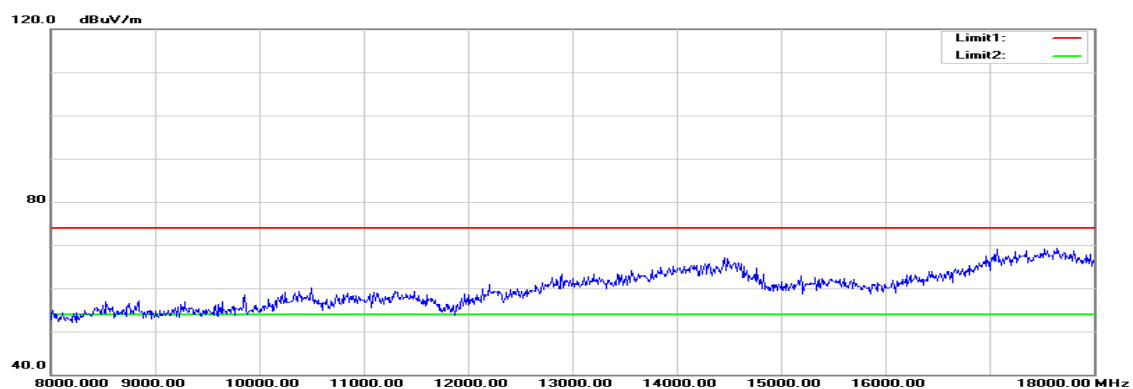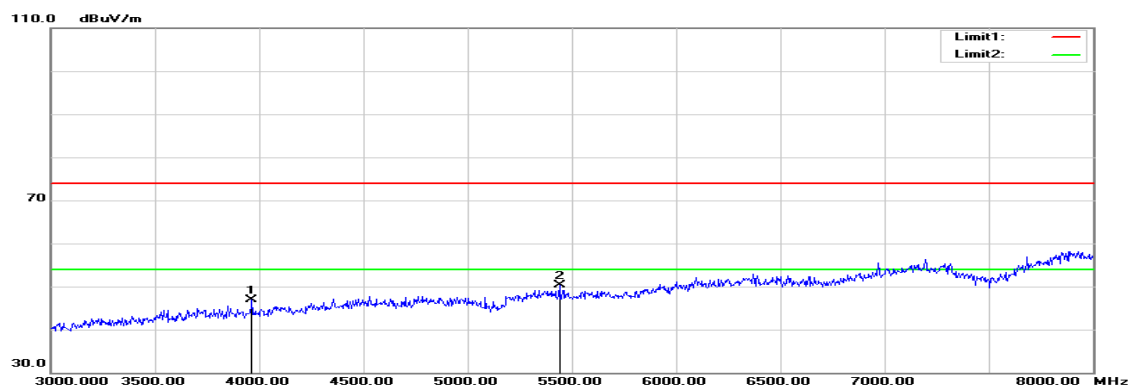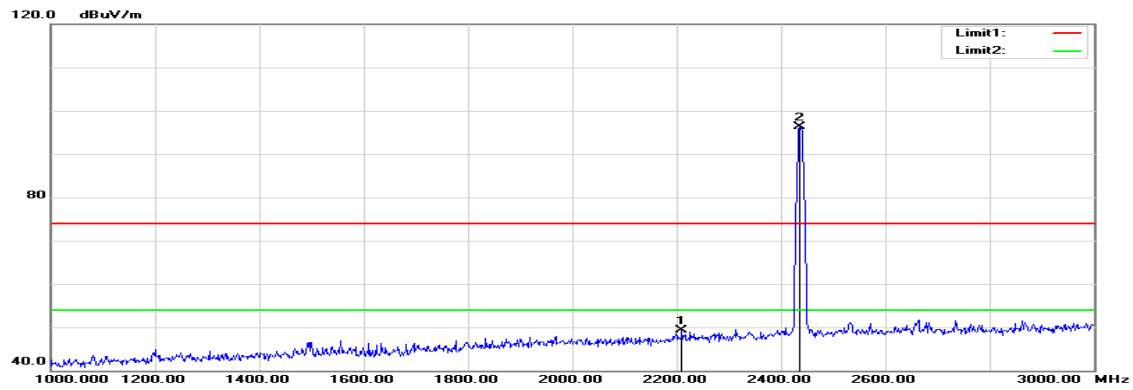**Humidity:** 53% RH   **Polarity:** Ver.
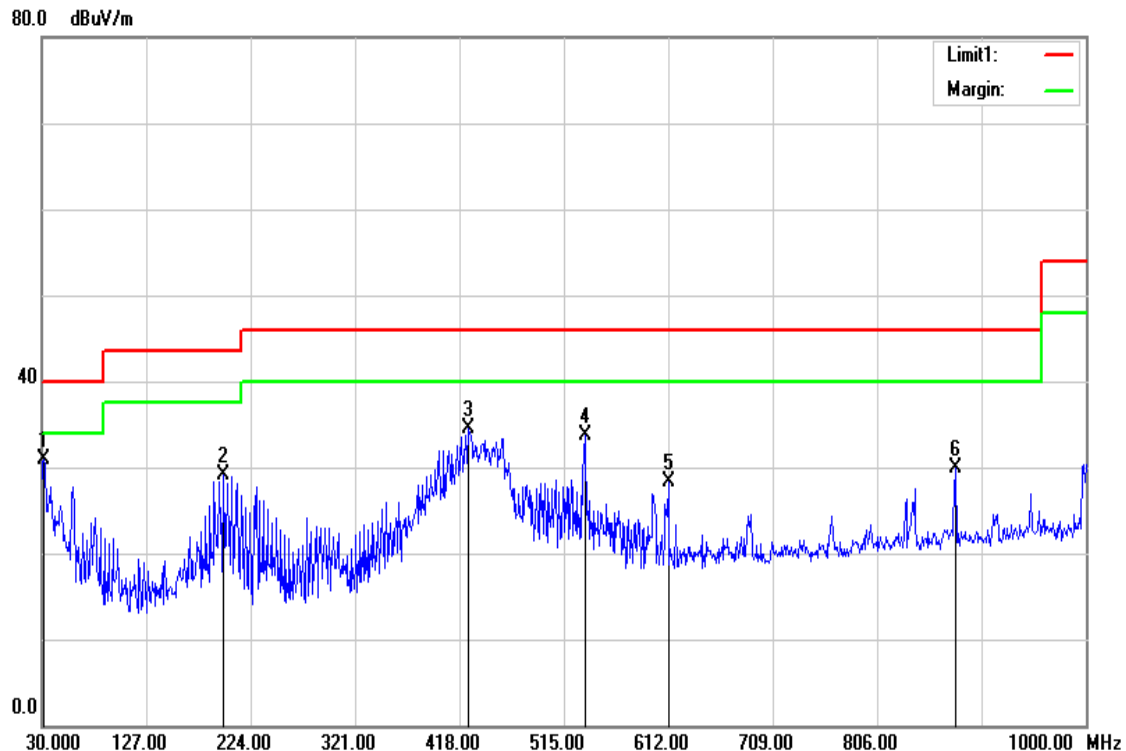
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
31.9400	42.16	-11.29	30.87	40.00	-9.13	Peak	V
198.7800	46.74	-17.64	29.10	43.50	-14.40	Peak	V
425.7600	47.82	-13.32	34.50	46.00	-11.50	Peak	V
534.4000	45.04	-11.26	33.78	46.00	-12.22	Peak	V
612.0000	38.48	-10.22	28.26	46.00	-17.74	Peak	V
878.7500	36.23	-6.42	29.81	46.00	-16.19	Peak	V

Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*

2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*

3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*

4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

5. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

Operation Mode:	Normal Link	**Test Date:**	August 25, 2015
Temperature:	27°C	**Tested by:**	Jason Lu
Humidity:	53% RH	**Polarity:**	Hor.
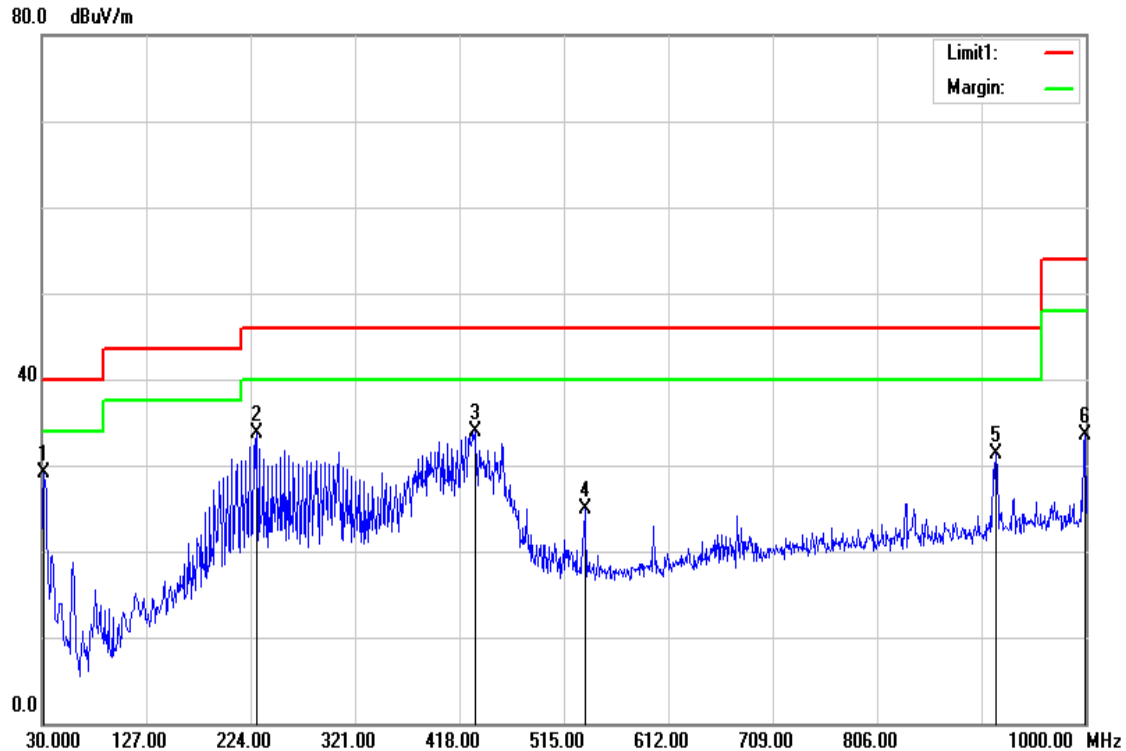
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
31.9400	40.41	-11.29	29.12	40.00	-10.88	peak	H
229.8200	52.55	-18.81	33.74	46.00	-12.26	peak	H
432.5500	46.94	-13.13	33.81	46.00	-12.19	peak	H
534.4000	36.17	-11.26	24.91	46.00	-21.09	peak	H
916.5800	37.17	-5.93	31.24	46.00	-14.76	peak	H
999.0300	38.27	-4.70	33.57	54.00	-20.43	peak	H

Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*

2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*

3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*

4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

5. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

Above 1 GHz

TX / IEEE 802.11b / CH Low

Polarity: Vertical
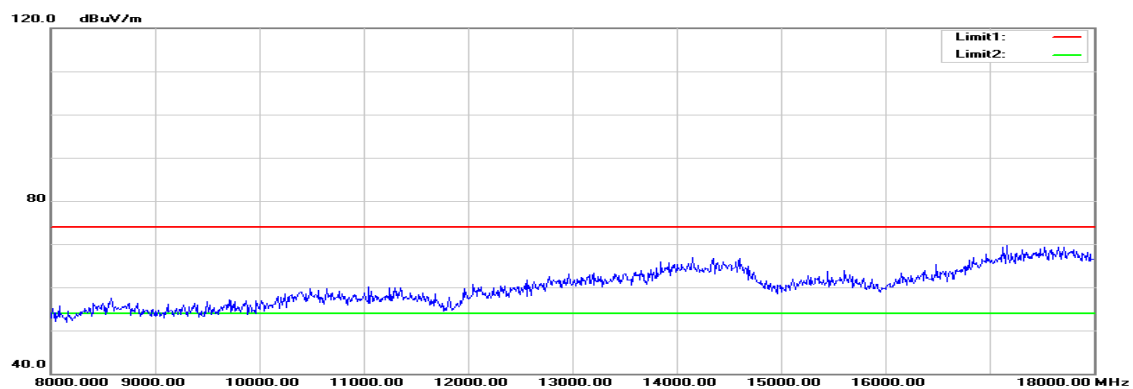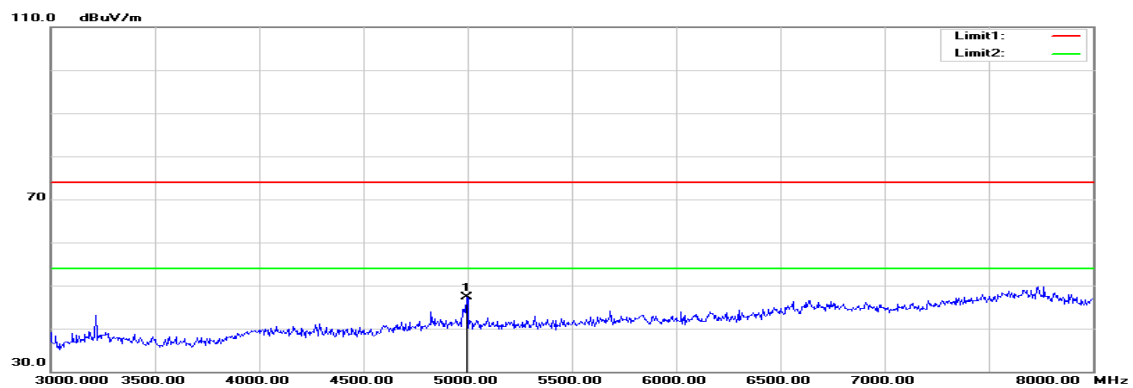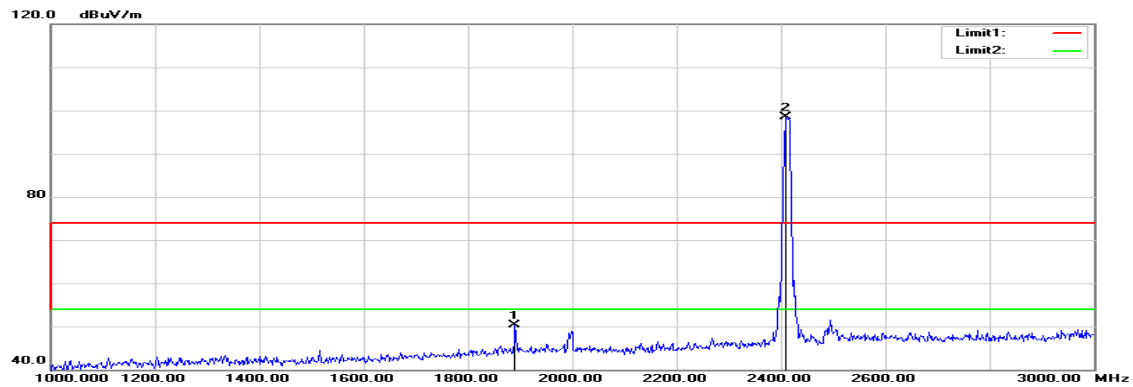
Polarity: Horizontal
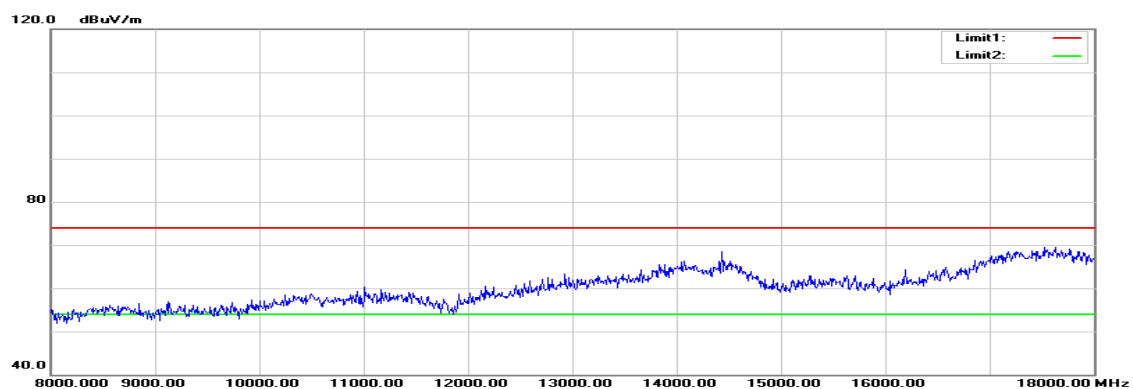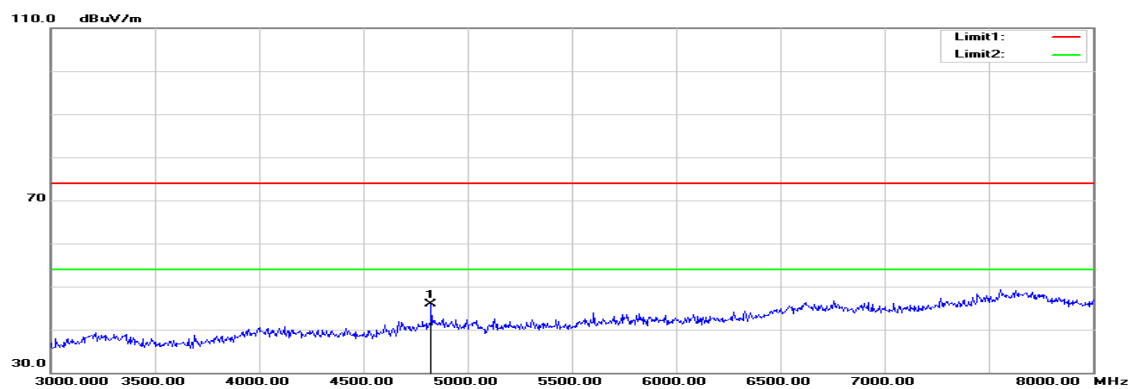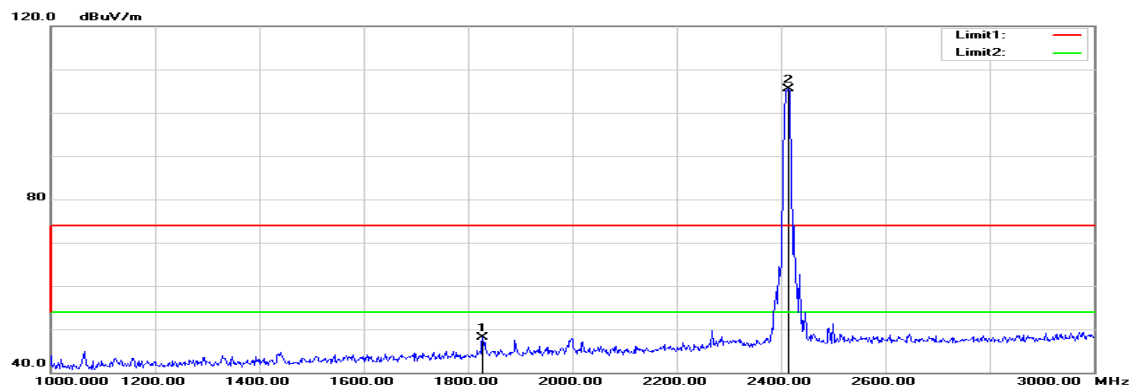
Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

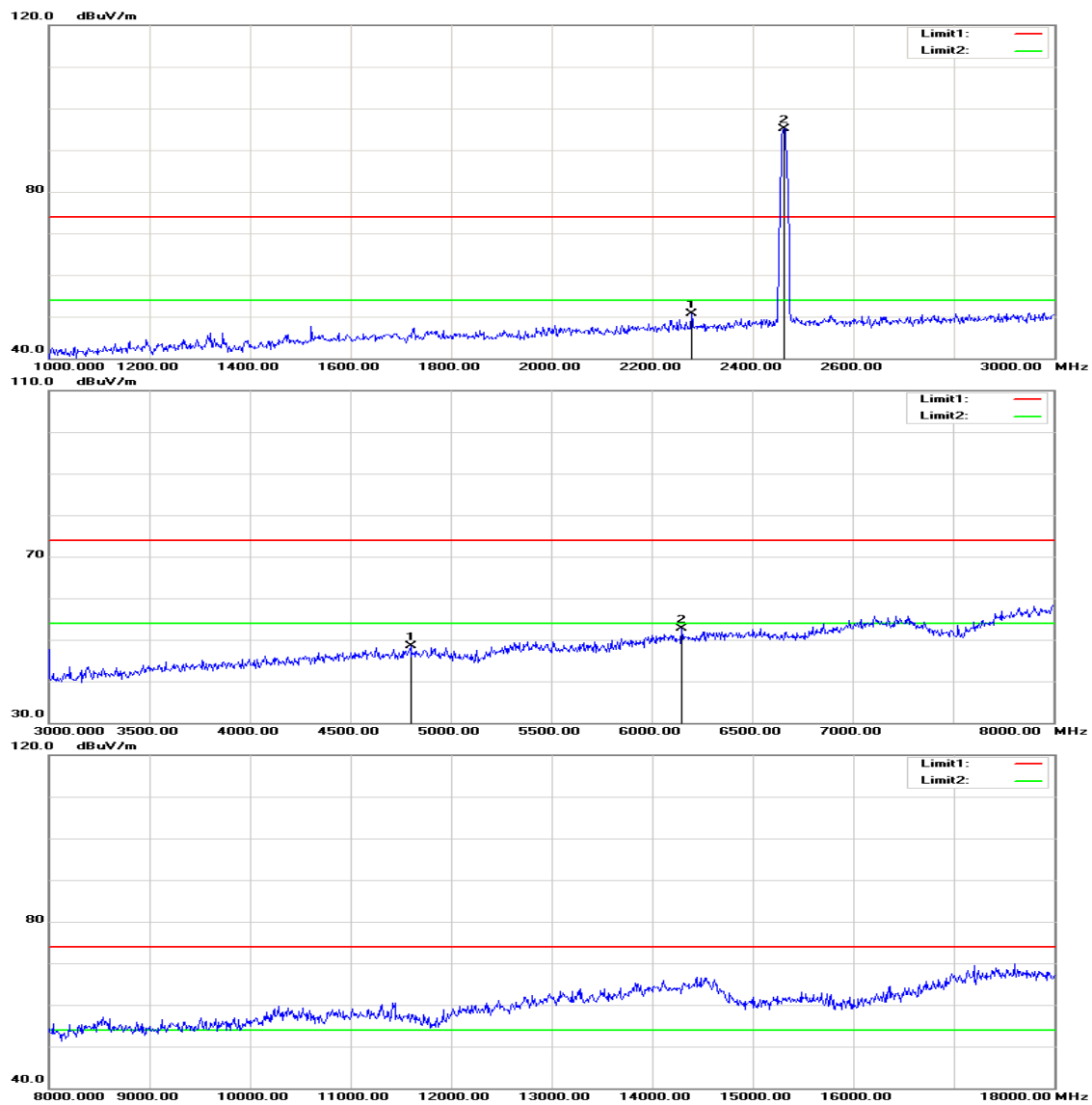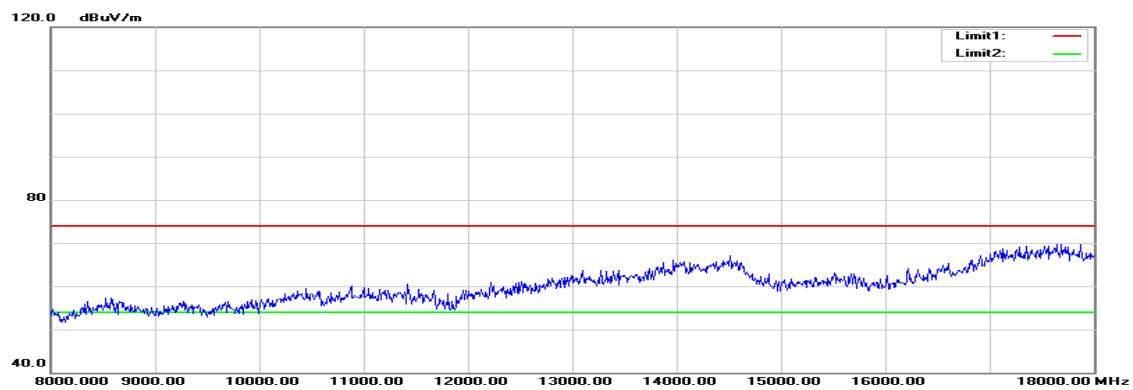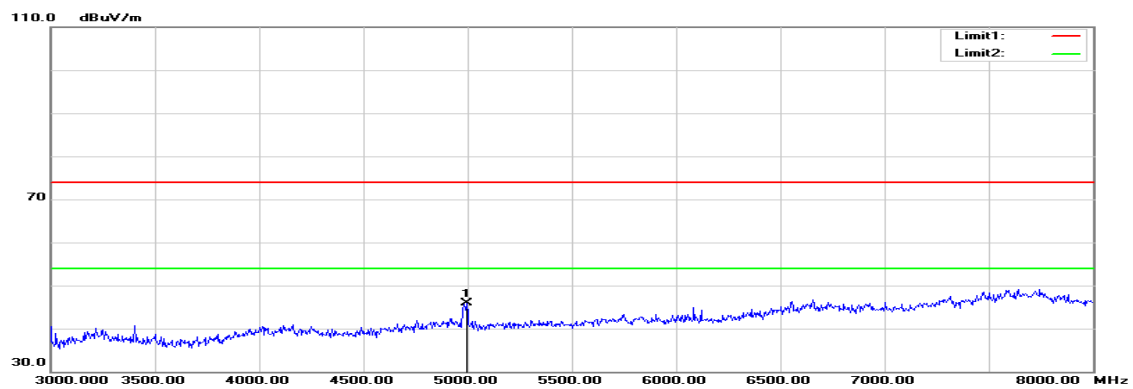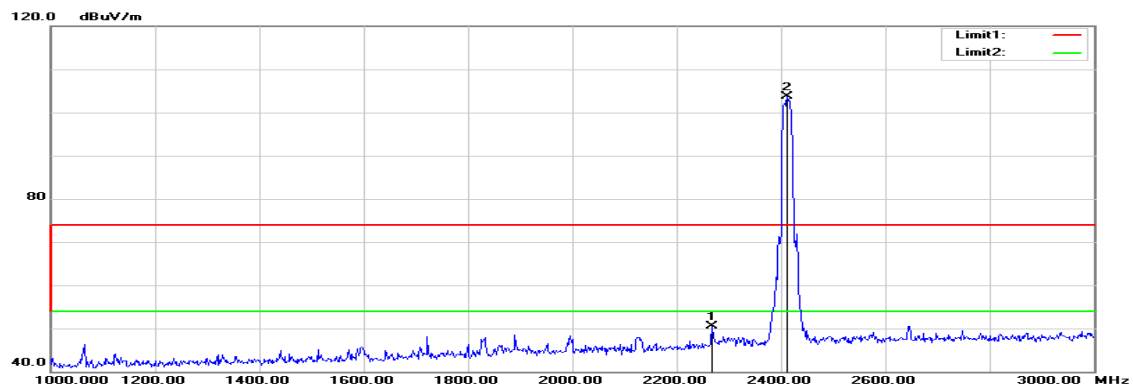**Humidity:**   53% RH   **Polarity:**   Ver. / Hor.

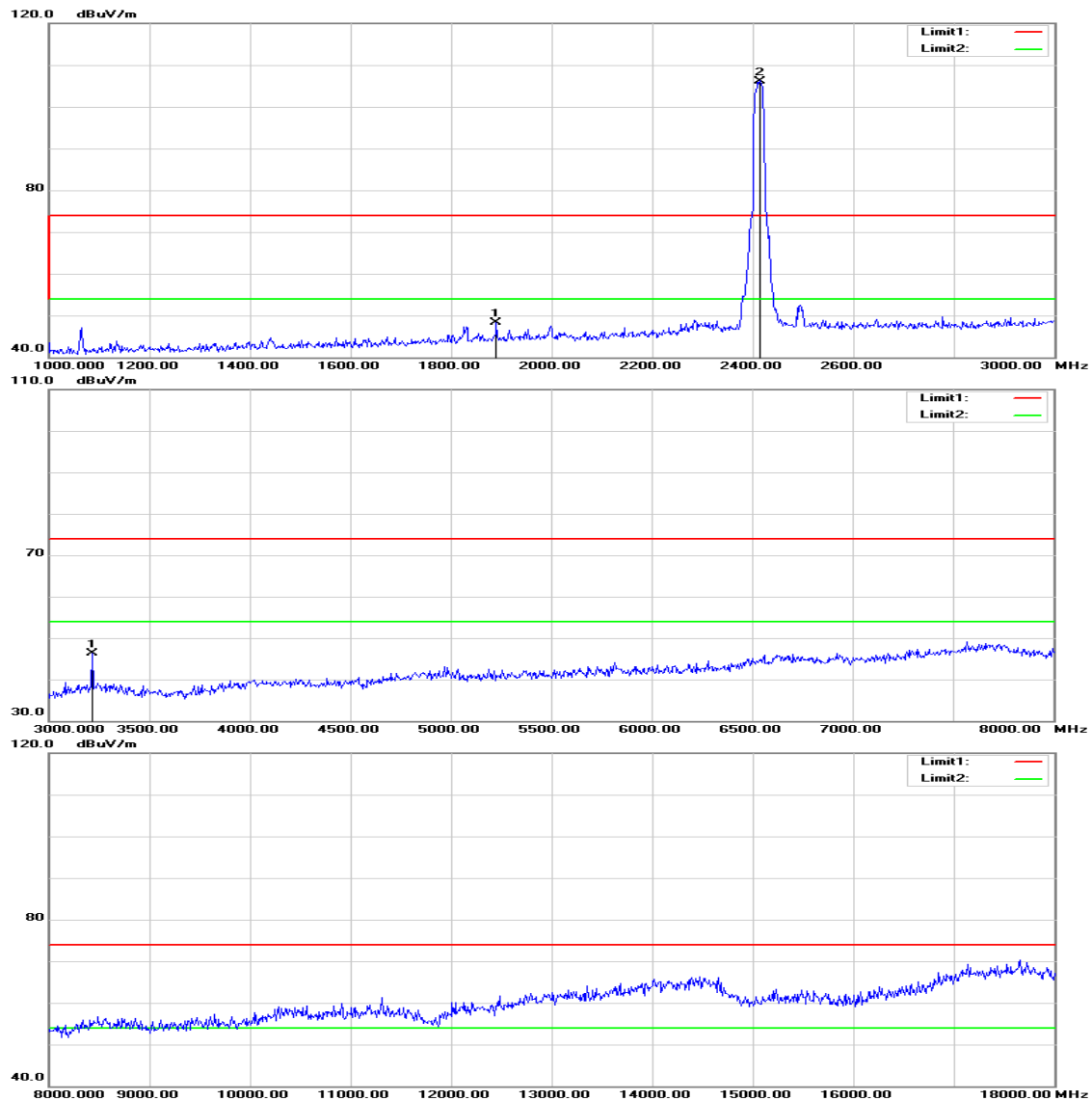| Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1890.000	54.44	-4.17	50.27	74.00	-23.73	peak	V
4995.000	41.82	5.56	47.38	74.00	-26.62	peak	V
N/A							
1828.000	52.60	-4.49	48.11	74.00	-25.89	peak	H
4825.000	40.80	5.10	45.90	74.00	-28.10	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11b / CH Mid

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11b / CH Mid   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

Humidity: 53% RH   **Polarity:** Ver. / Hor.

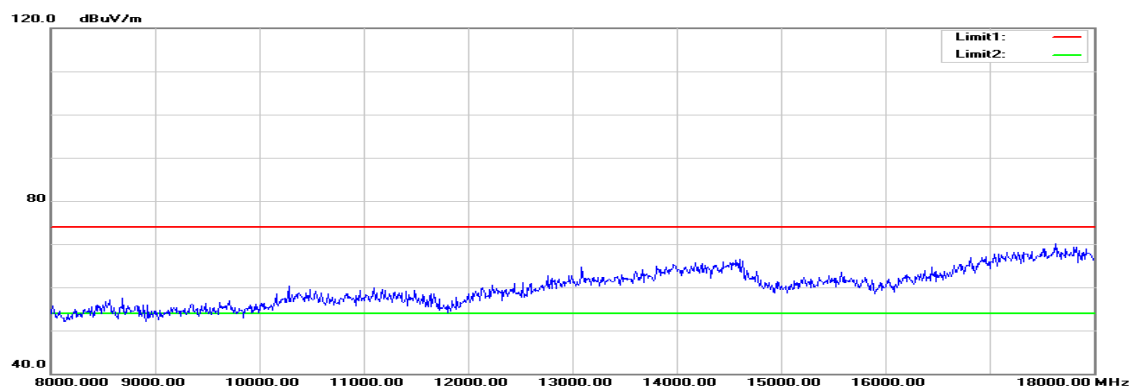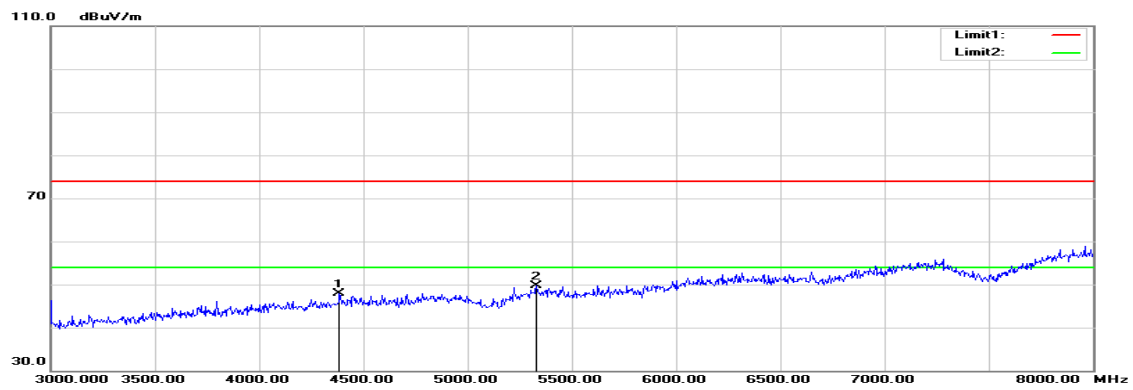| Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1964.000	50.63	-2.69	47.94	74.00	-26.06	peak	V
3725.000	41.62	3.94	45.56	74.00	-28.44	peak	V
4780.000	41.10	7.99	49.09	74.00	-24.91	peak	V
N/A							
2210.000	51.17	-1.82	49.35	74.00	-24.65	peak	H
3965.000	41.98	4.93	46.91	74.00	-27.09	peak	H
5440.000	40.34	10.01	50.35	74.00	-23.65	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11b / CH High

Polarity: Vertical

Polarity: Horizontal
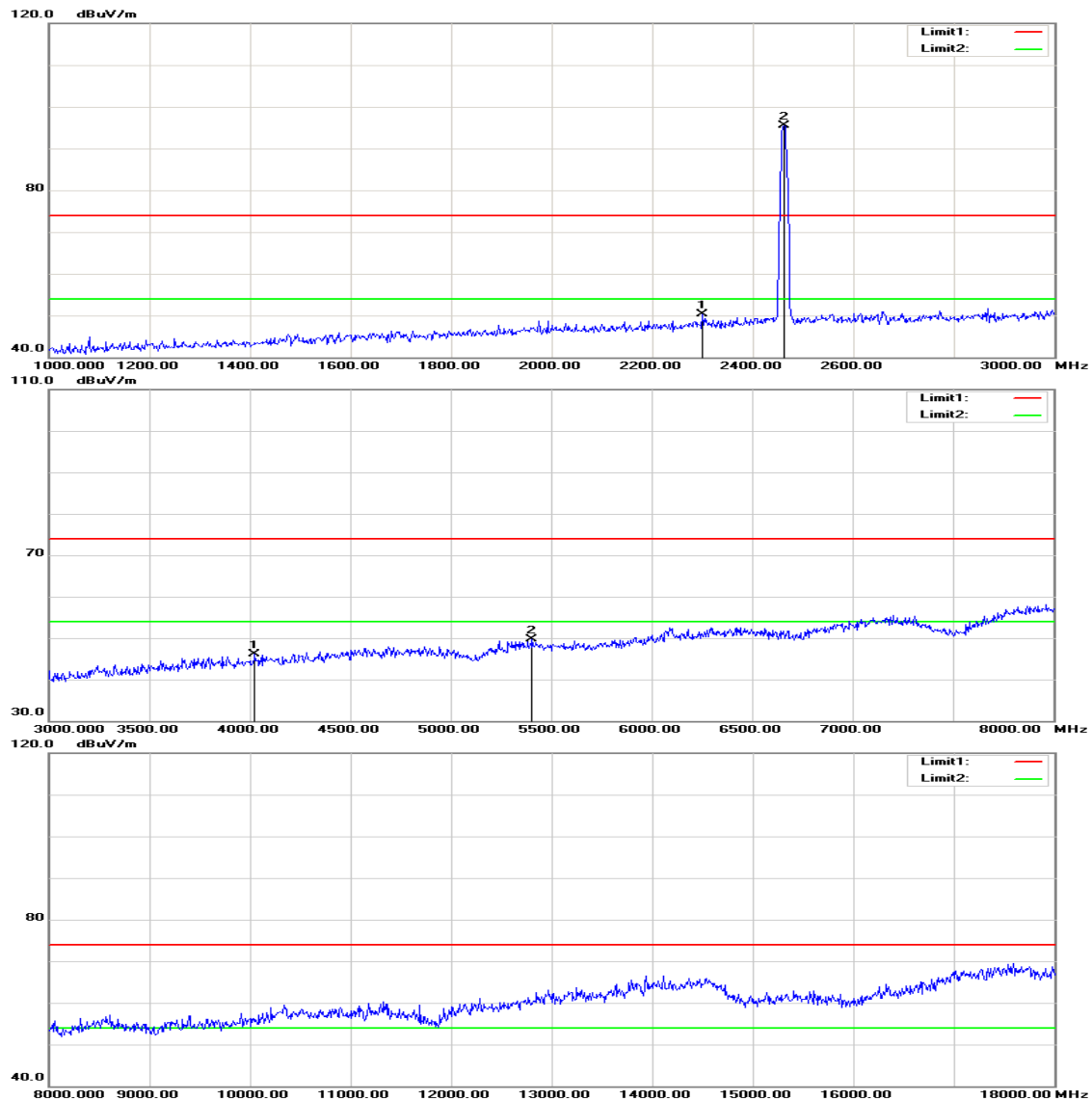
Operation Mode: TX / IEEE 802.11b / CH High   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

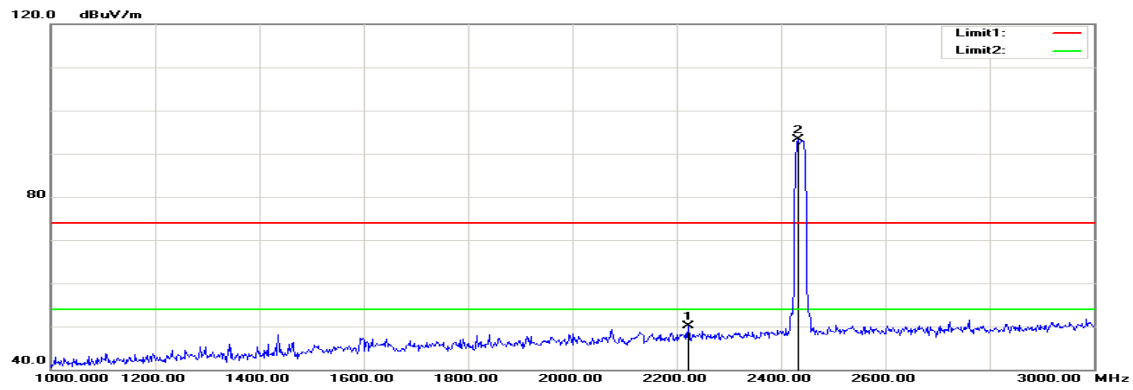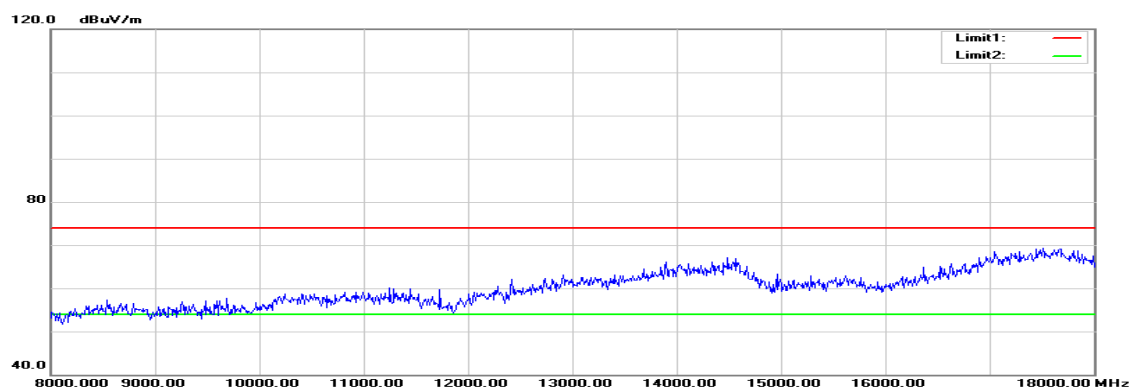**Humidity:**   53% RH   **Polarity:**   Ver. / Hor.

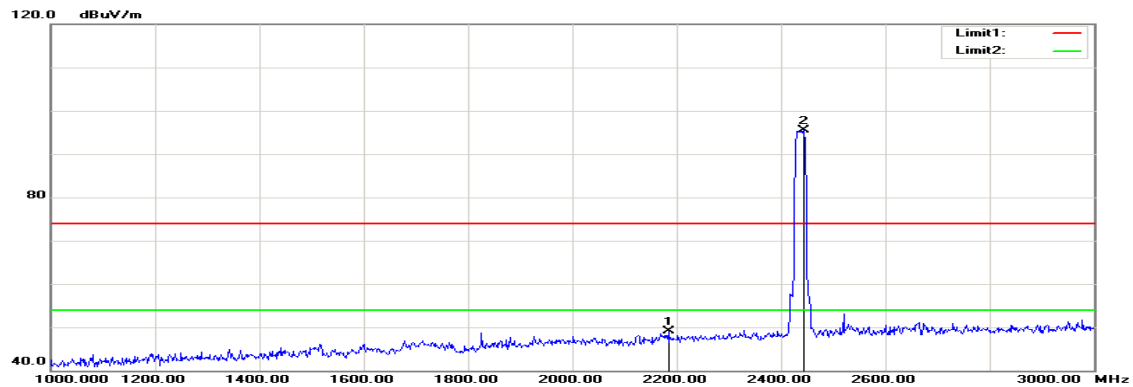| Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2278.000	52.41	-1.67	50.74	74.00	-23.26	peak	V
4800.000	40.46	8.05	48.51	74.00	-25.49	peak	V
6150.000	39.72	12.93	52.65	74.00	-21.35	peak	V
N/A							
2300.000	52.02	-1.62	50.40	74.00	-23.60	peak	H
4025.000	40.88	5.19	46.07	74.00	-27.93	peak	H
5405.000	39.48	10.18	49.66	74.00	-24.34	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11g / CH Low

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11g / CH Low   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu
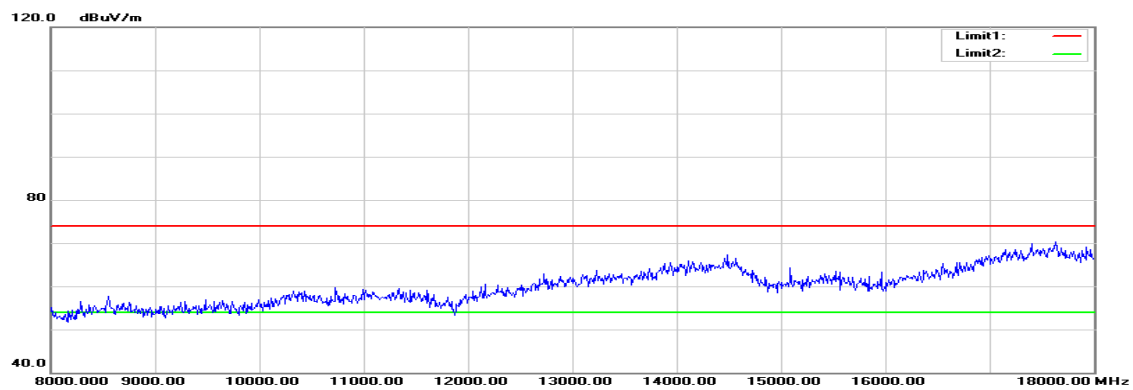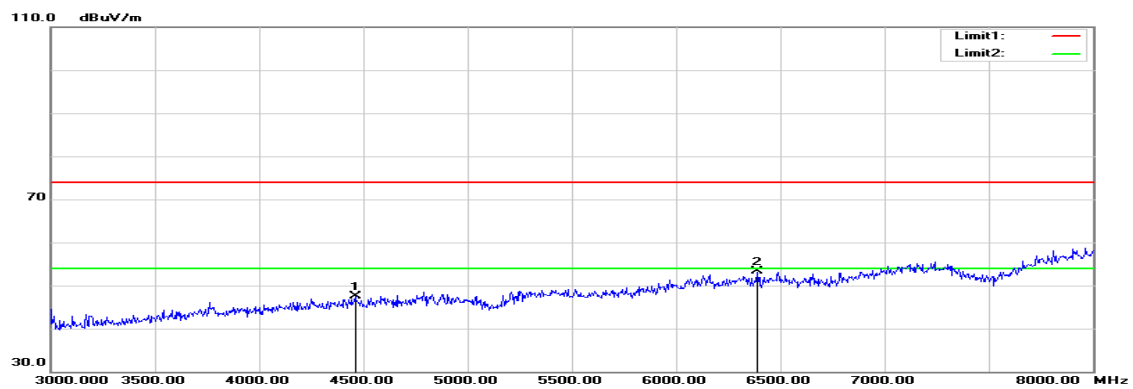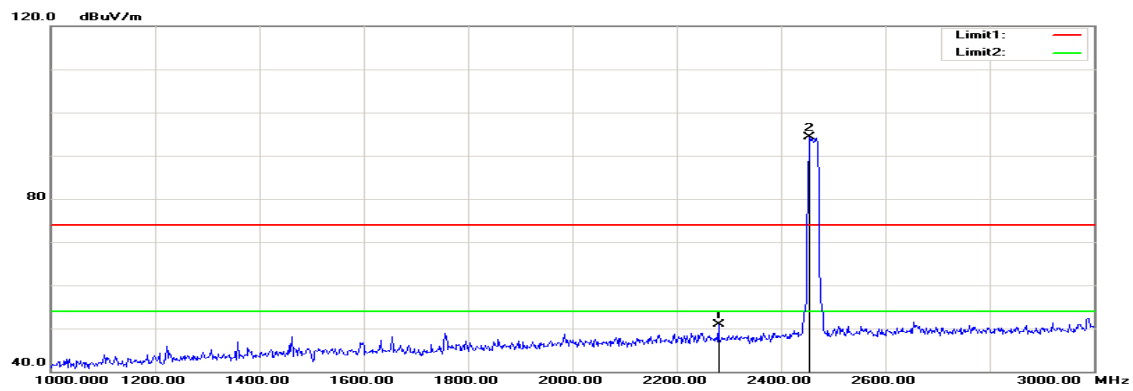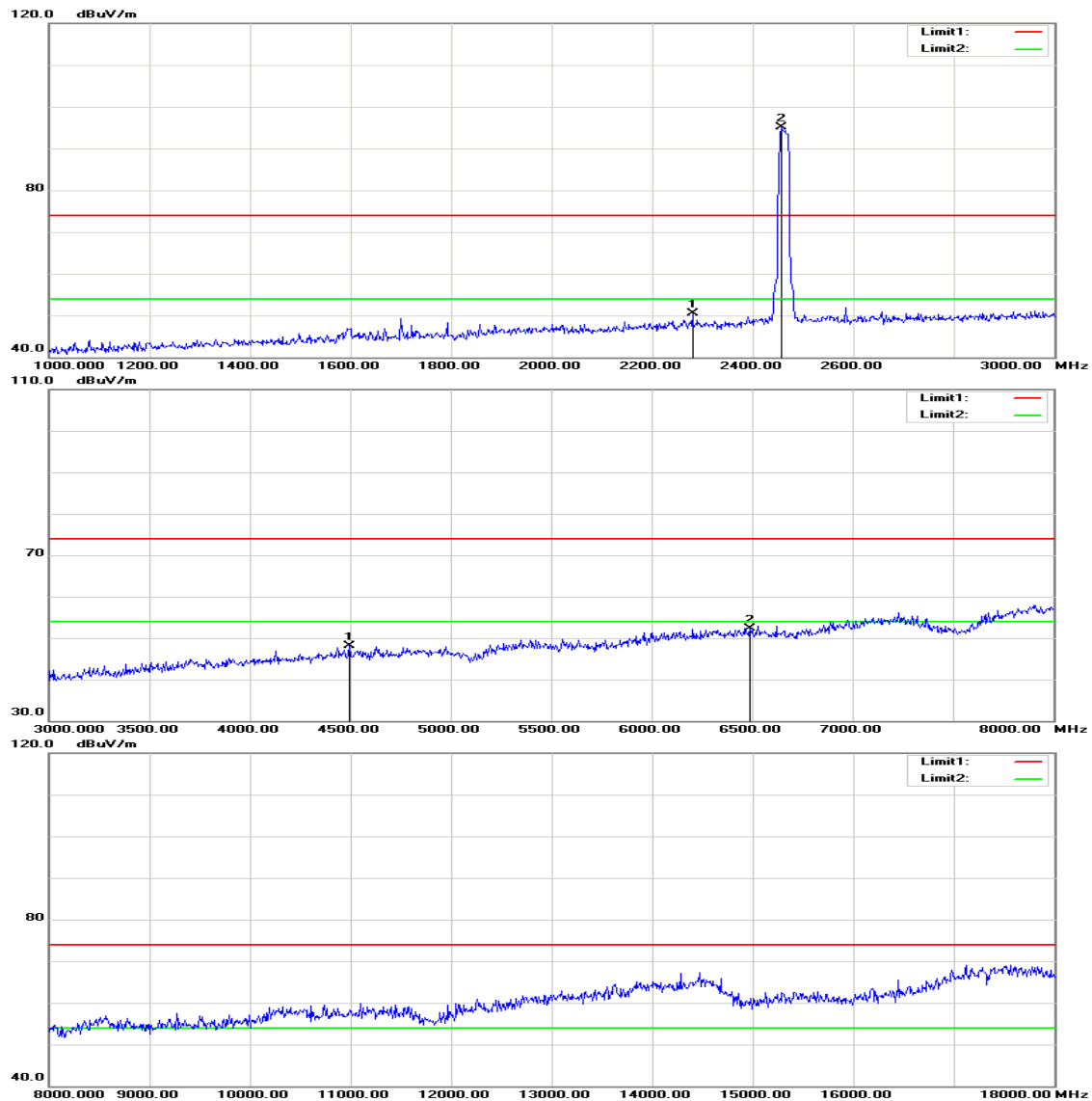
Humidity: 53% RH   **Polarity:**   Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2268.000	53.52	-3.05	50.47	74.00	-23.53	peak	V
4995.000	40.40	5.56	45.96	74.00	-28.04	peak	V
N/A							
1890.000	52.52	-4.17	48.35	74.00	-25.65	peak	H
3215.000	46.47	-0.09	46.38	74.00	-27.62	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11g / CH Mid

Polarity: Vertical

Polarity: Horizontal
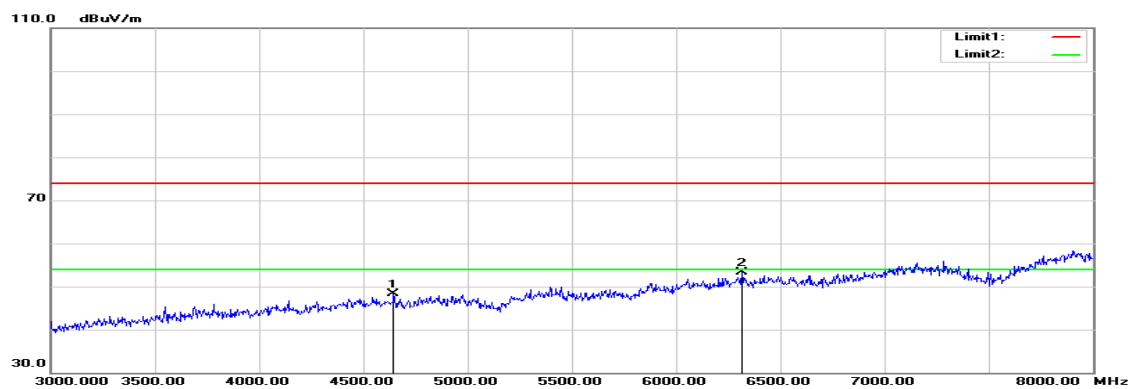
Operation Mode: TX / IEEE 802.11g / CH Mid   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

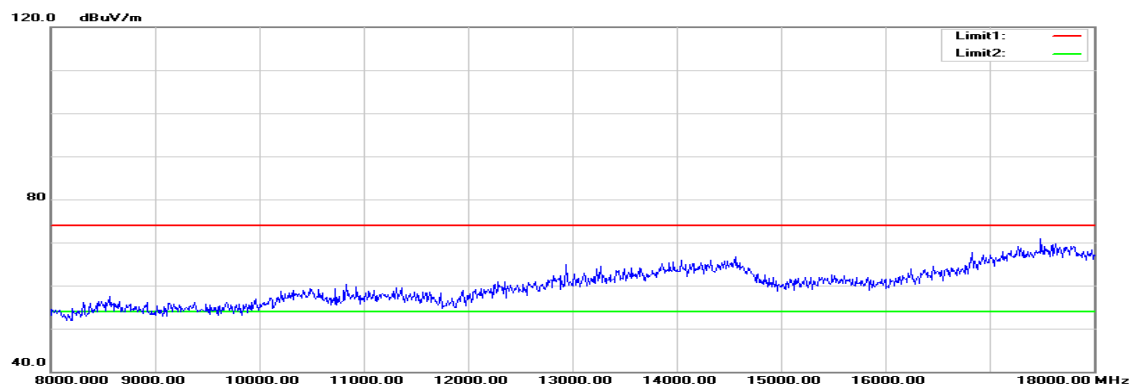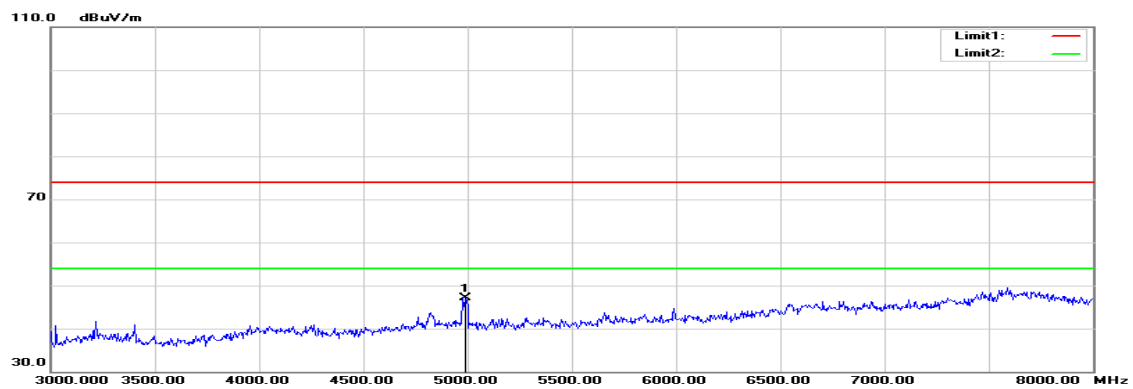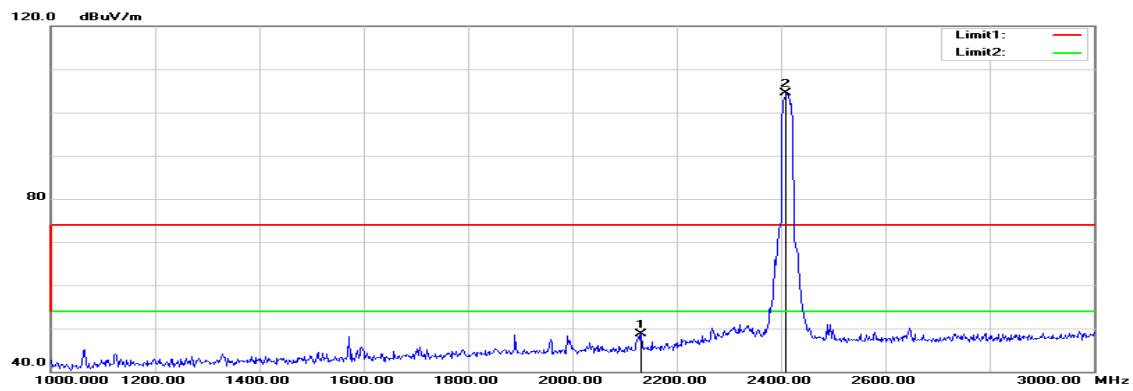**Humidity:**   53% RH   **Polarity:**   Ver. / Hor.

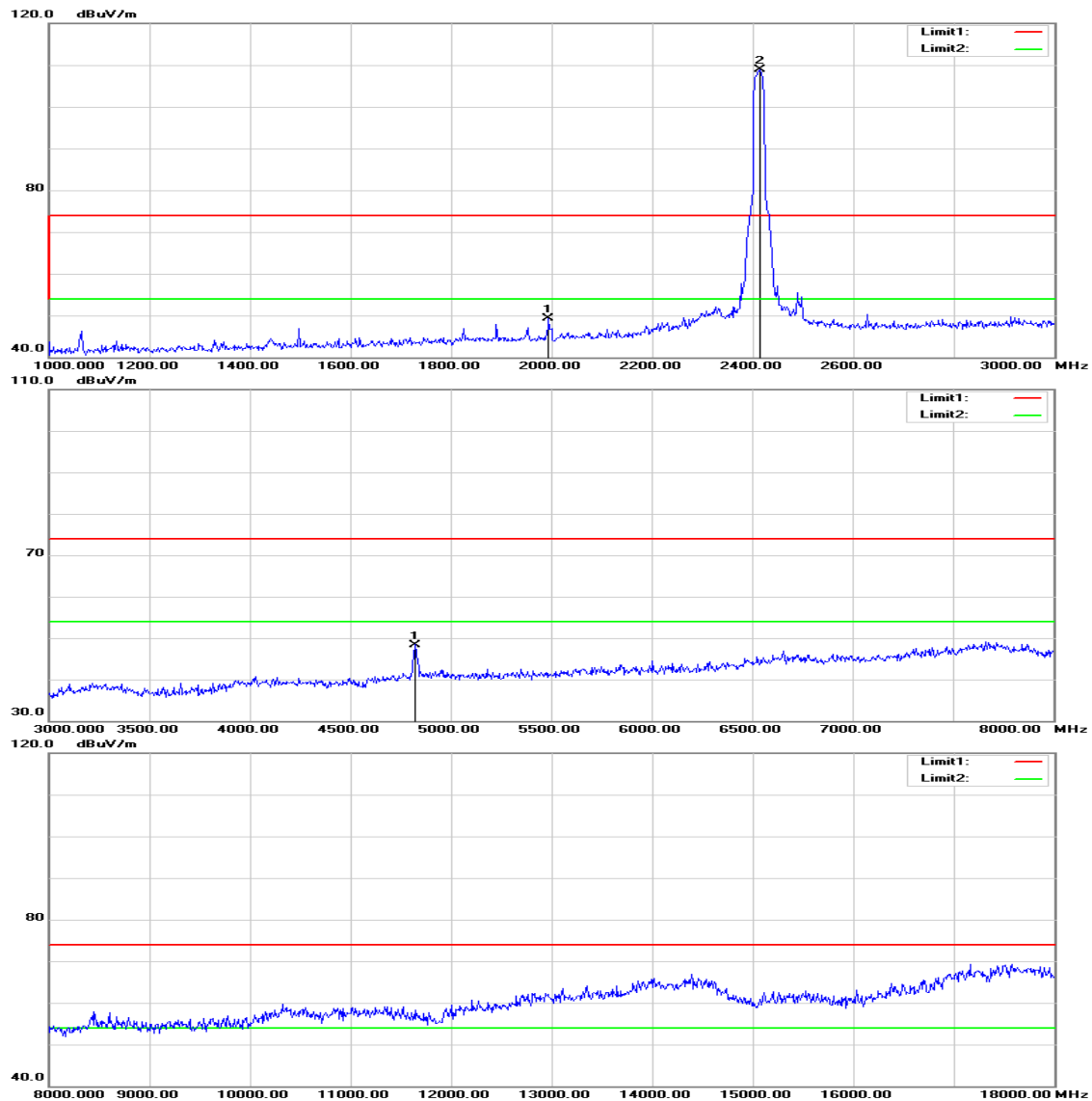| Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2222.000	51.97	-1.79	50.18	74.00	-23.82	peak	V
4385.000	41.12	6.75	47.87	74.00	-26.13	peak	V
5330.000	40.04	9.60	49.64	74.00	-24.36	peak	V
N/A							
2184.000	51.08	-1.95	49.13	74.00	-24.87	peak	H
4645.000	40.65	7.64	48.29	74.00	-25.71	peak	H
6315.000	39.71	13.51	53.22	74.00	-20.78	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11g / CH High

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11g / CH High   **Test Date:** August 25, 2015

Temperature: 27°C   **Tested by:** Jason Lu

Humidity: 53% RH   **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2280.000	52.56	-1.66	50.90	74.00	-23.10	peak	V
4460.000	40.40	7.08	47.48	74.00	-26.52	peak	V
6390.000	39.43	13.77	53.20	74.00	-20.80	peak	V
N/A							
2280.000	52.18	-1.66	50.52	74.00	-23.48	peak	H
4495.000	40.80	7.23	48.03	74.00	-25.97	peak	H
6490.000	38.15	14.12	52.27	74.00	-21.73	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 20 MHz mode / CH Low

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH Low **Test Date:** August 25, 2015

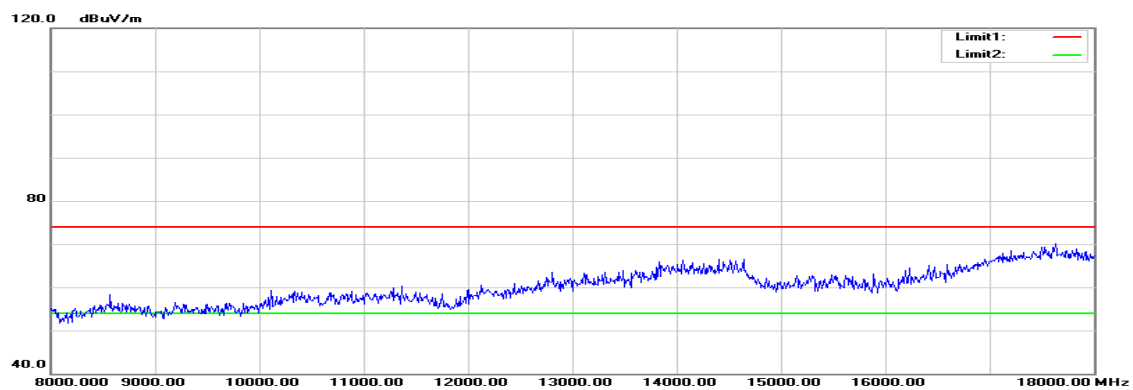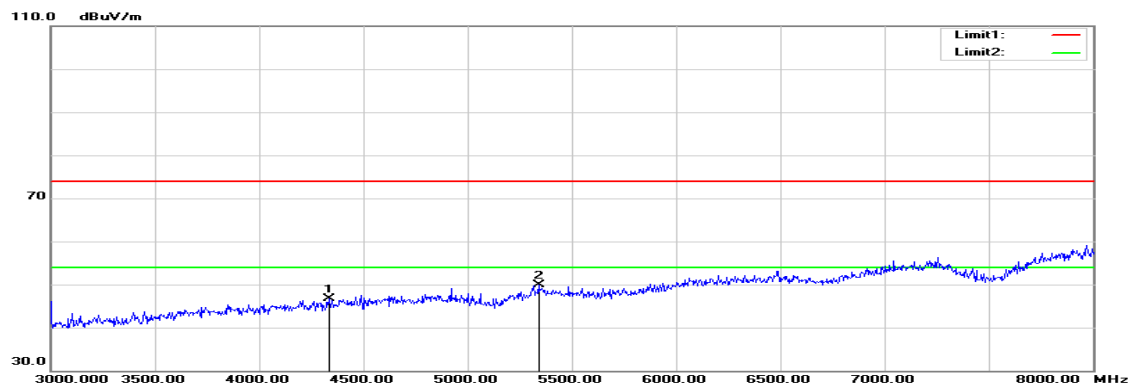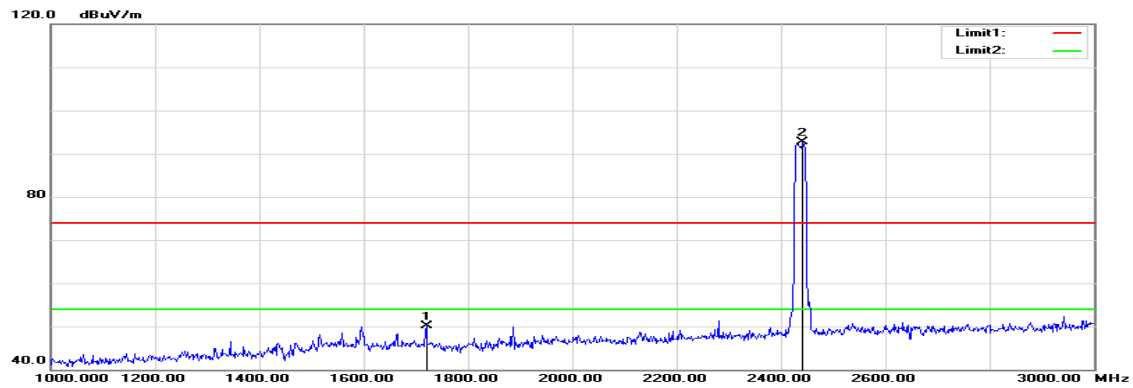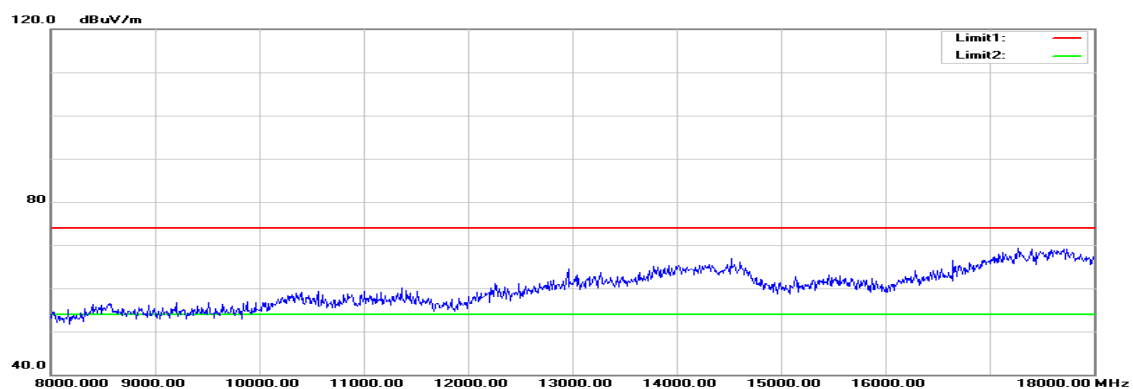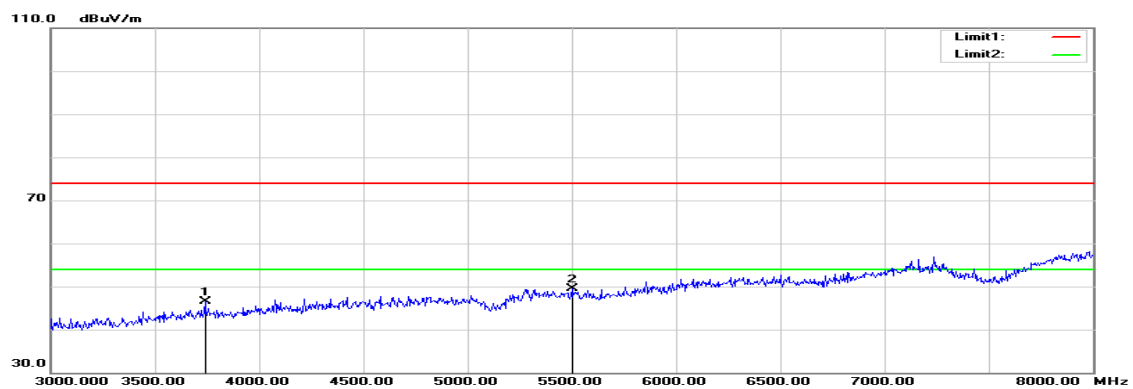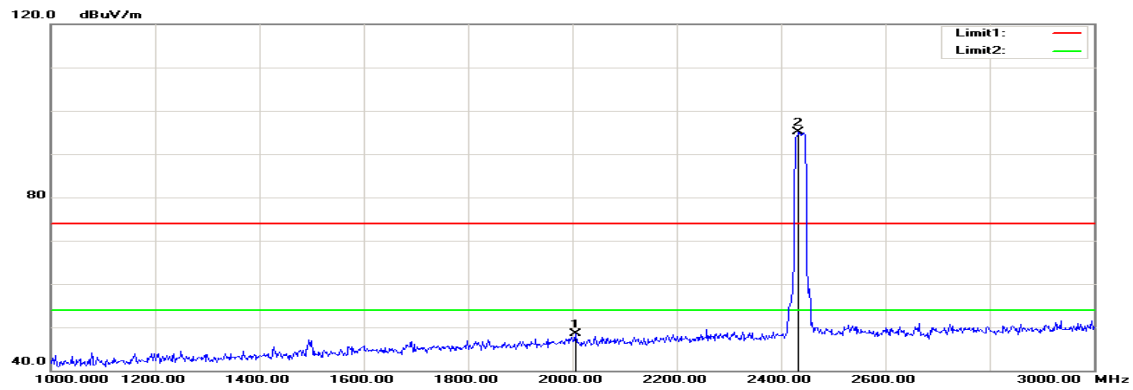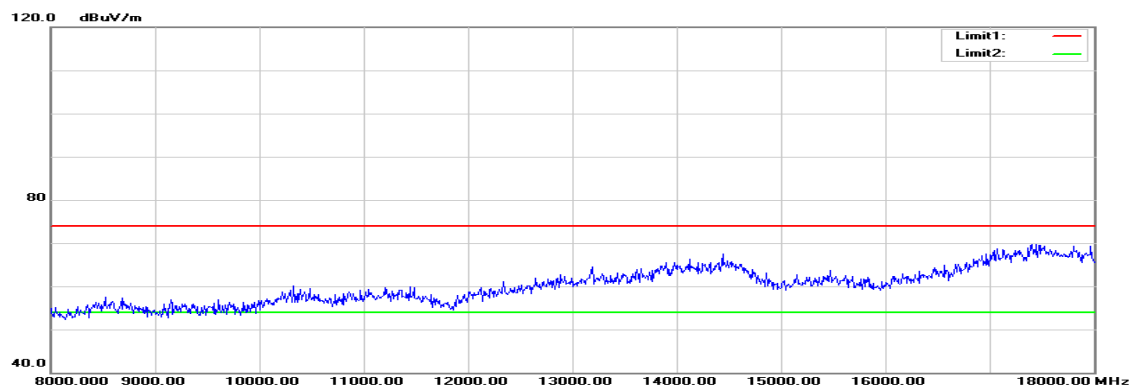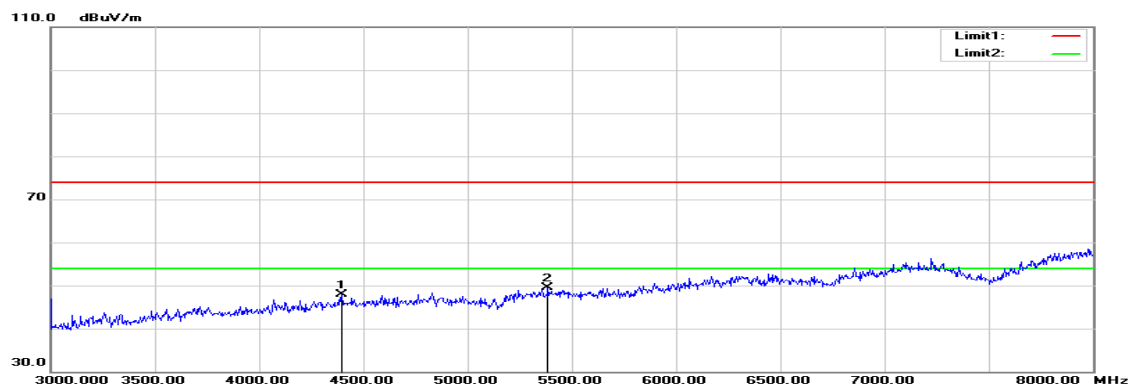**Temperature:**   27°C   **Tested by:** Jason Lu

Humidity: 53% RH   **Polarity:**   Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2132.000	52.29	-3.52	48.77	74.00	-25.23	peak	V
4990.000	41.55	5.54	47.09	74.00	-26.91	peak	V
N/A							
1994.000	52.94	-3.63	49.31	74.00	-24.69	peak	H
4825.000	43.30	5.10	48.40	74.00	-25.60	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 20 MHz mode / CH Mid

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH Mid **Test Date:** August 25, 2015

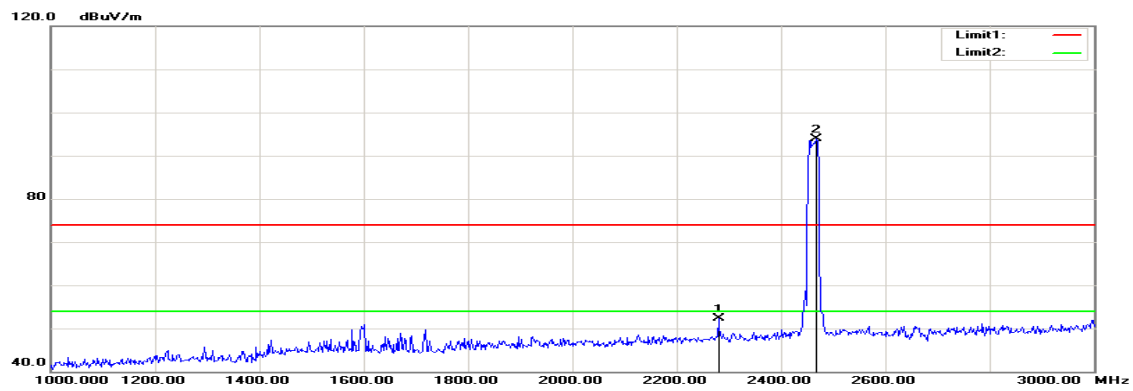**Temperature:** 27°C   **Tested by:** Jason Lu
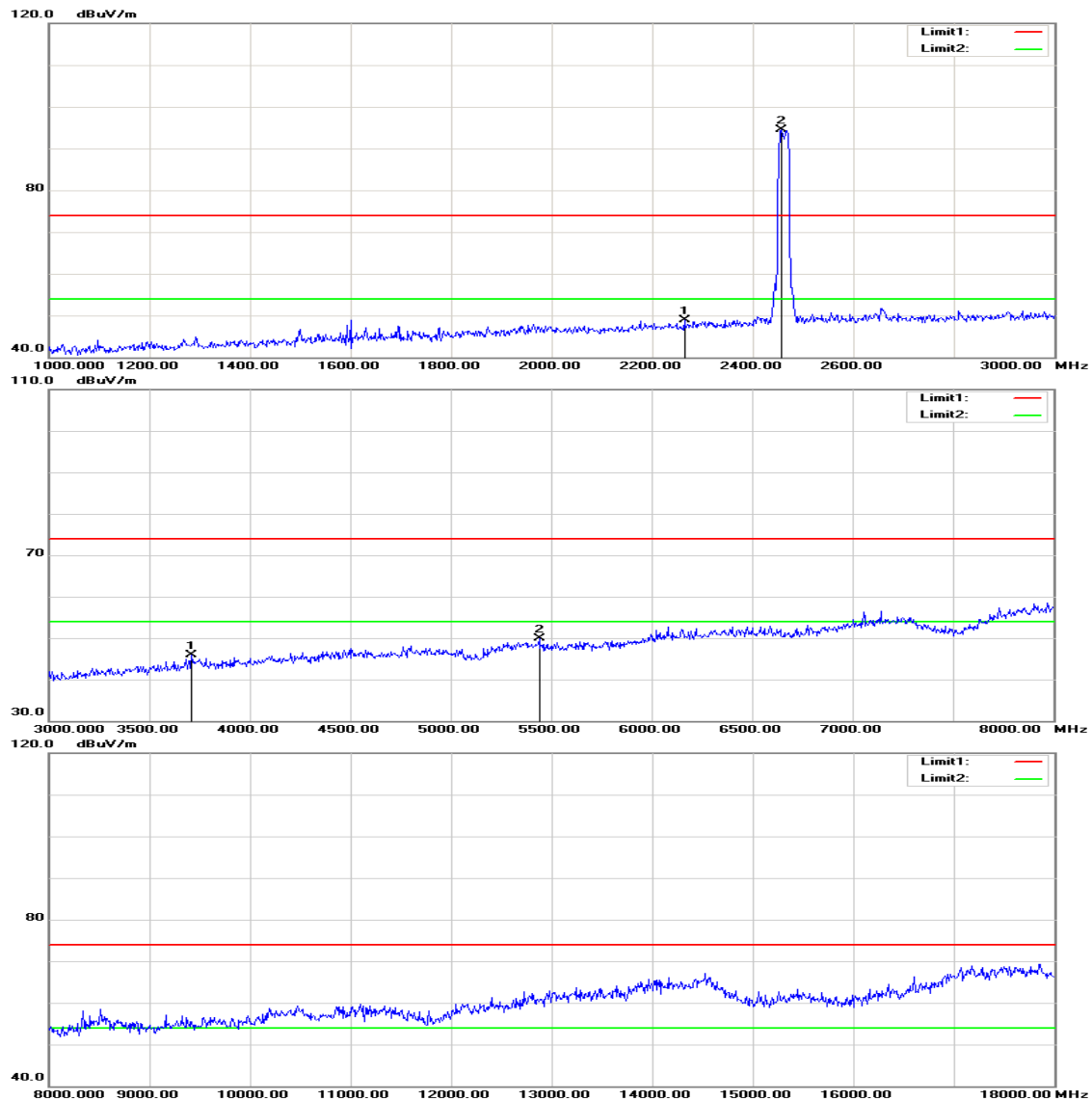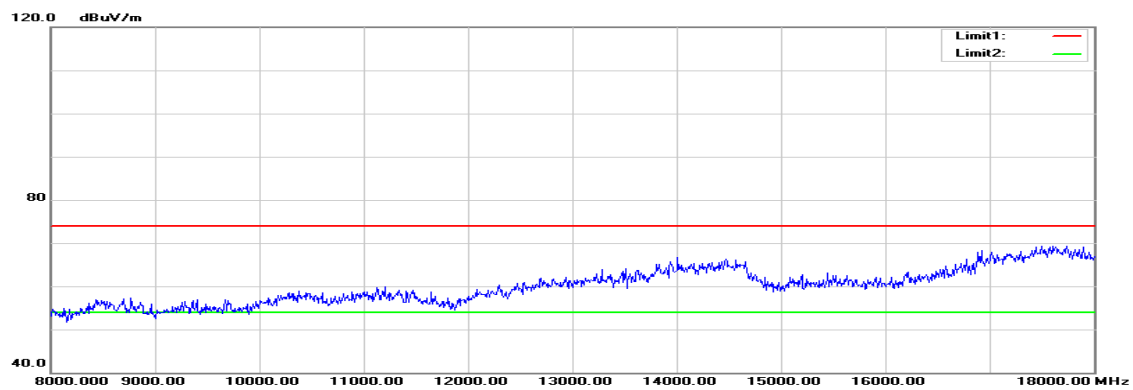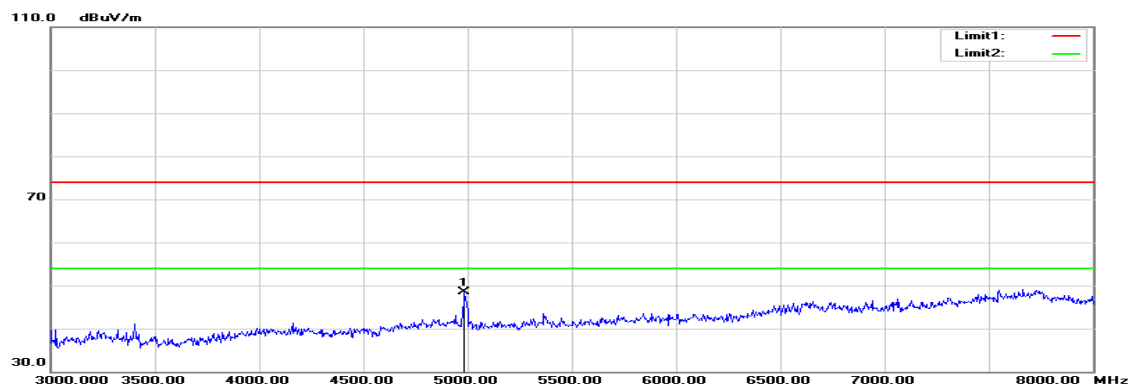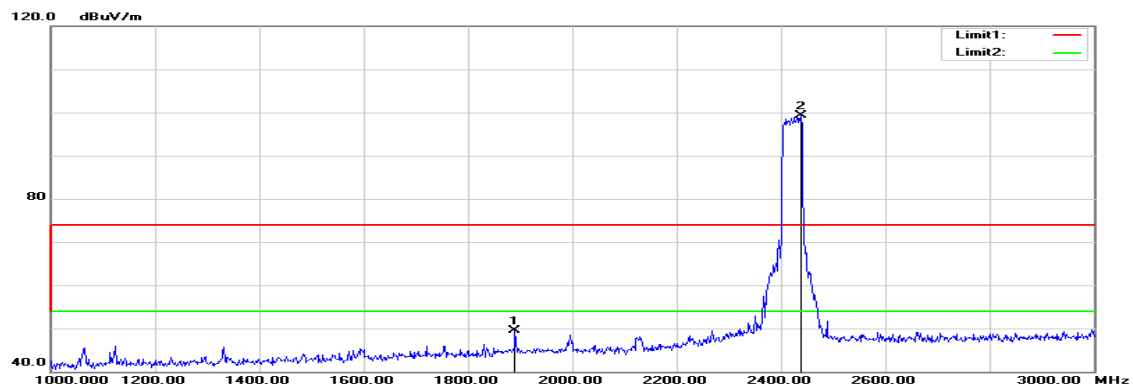
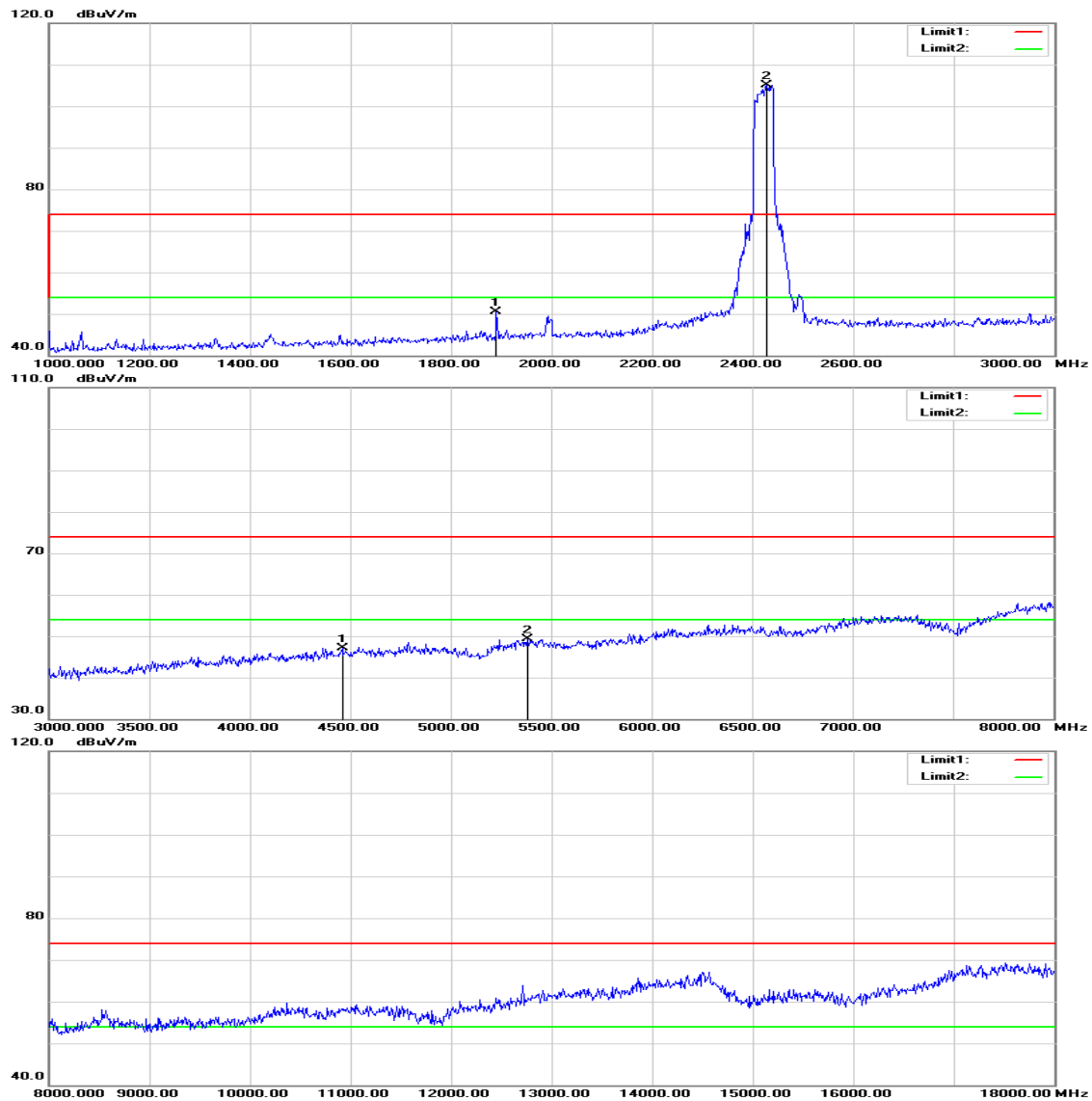**Humidity:** 53% RH   **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1720.000	54.21	-4.17	50.04	74.00	-23.96	peak	V
4335.000	40.08	6.53	46.61	74.00	-27.39	peak	V
5340.000	40.29	9.68	49.97	74.00	-24.03	peak	V
N/A							
2006.000	50.91	-2.47	48.44	74.00	-25.56	peak	H
3740.000	42.50	4.00	46.50	74.00	-27.50	peak	H
5500.000	39.74	9.73	49.47	74.00	-24.53	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.

3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.

4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11n HT 20 MHz mode / CH High

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH High

Temperature: 27°C

Humidity: 53% RH

Test Date: August 25, 2015

Tested by: Jason Lu

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
2280.000	53.99	-1.66	52.33	74.00	-21.67	peak	V
4395.000	41.04	6.79	47.83	74.00	-26.17	peak	V
5385.000	39.42	10.07	49.49	74.00	-24.51	peak	V
N/A							
2264.000	50.52	-1.70	48.82	74.00	-25.18	peak	H
3710.000	41.97	3.87	45.84	74.00	-28.16	peak	H
5440.000	39.89	10.01	49.90	74.00	-24.10	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 40 MHz mode / CH Low

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH Low

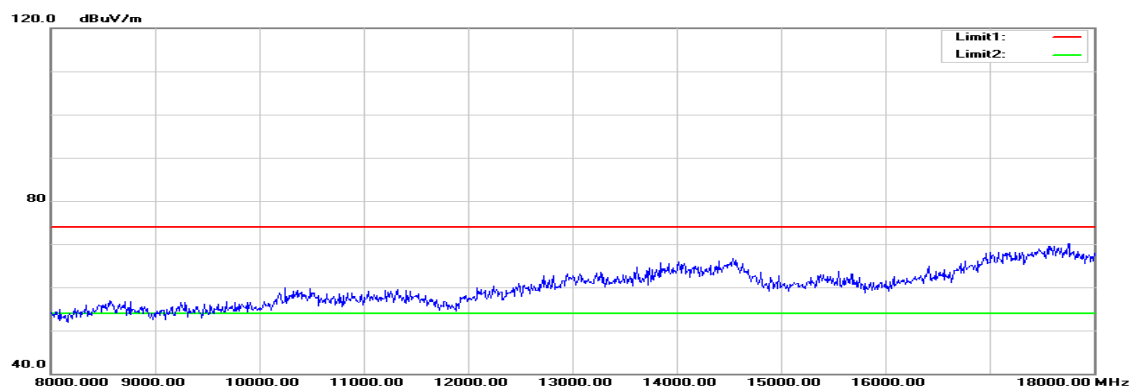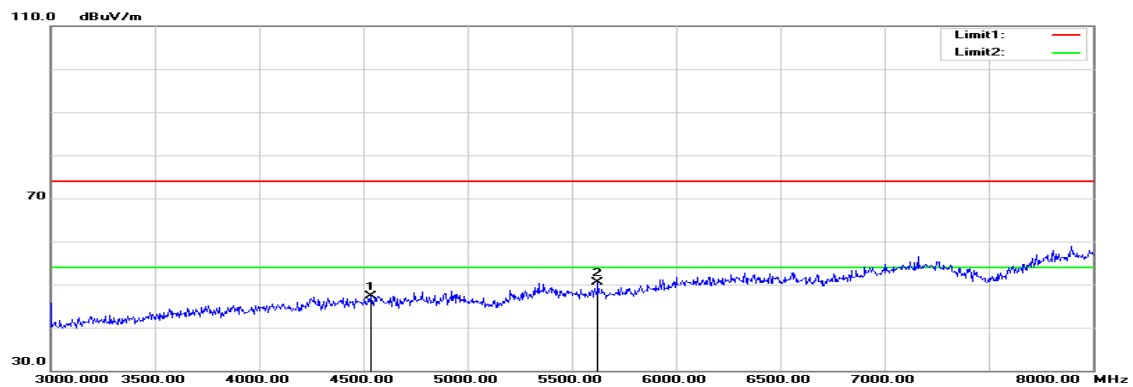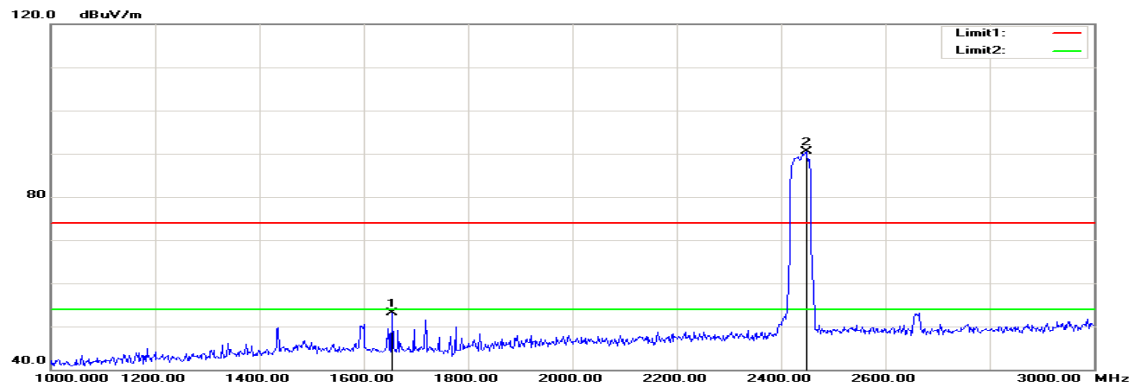**Test Date:** August 25, 2015

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

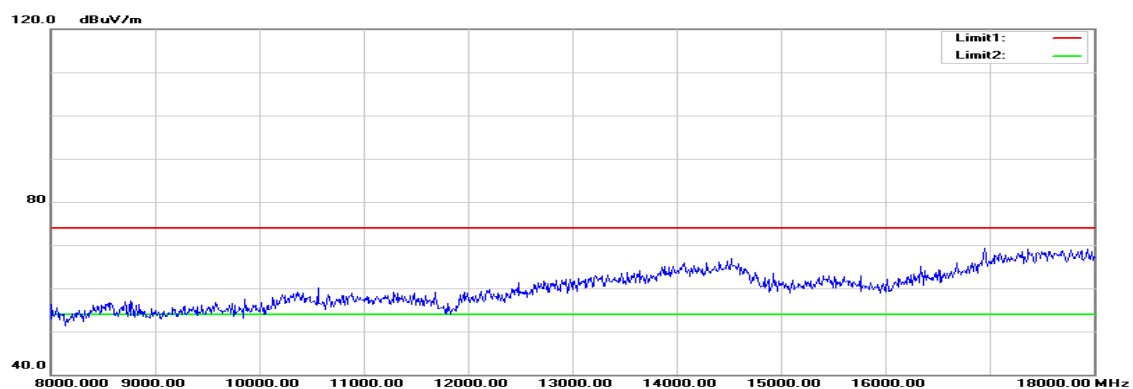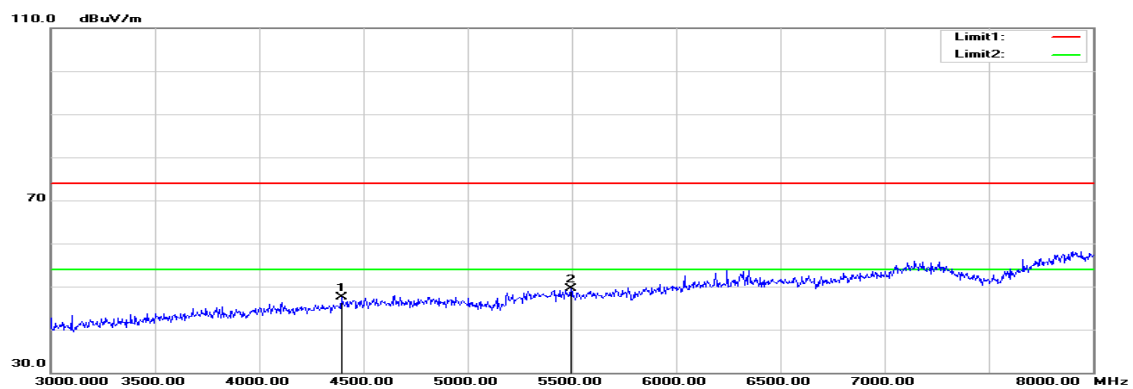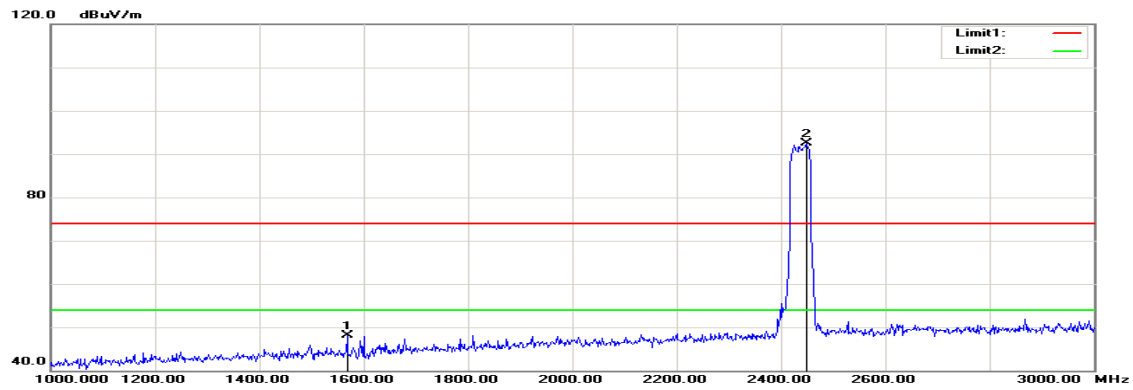| Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1890.000	53.72	-4.17	49.55	74.00	-24.45	peak	V
4985.000	43.00	5.53	48.53	74.00	-25.47	peak	V
N/A							
1890.000	54.74	-4.17	50.57	74.00	-23.43	peak	H
4460.000	40.06	7.08	47.14	74.00	-26.86	peak	H
5380.000	39.35	10.02	49.37	74.00	-24.63	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.

3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.

4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11n HT 40 MHz mode / CH Mid

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH Mid

Temperature: 27°C

Humidity: 53% RH

Test Date: August 25, 2015

Tested by: Jason Lu

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1654.000	57.60	-4.57	53.03	74.00	-20.97	peak	V
4535.000	39.95	7.34	47.29	74.00	-26.71	peak	V
5625.000	40.19	10.40	50.59	74.00	-23.41	peak	V
N/A							
1568.000	53.18	-5.10	48.08	74.00	-25.92	peak	H
4395.000	40.62	6.79	47.41	74.00	-26.59	peak	H
5495.000	39.76	9.75	49.51	74.00	-24.49	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 40 MHz mode / CH High

Polarity: Vertical

Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH High

Test Date: August 25, 2015

Temperature: 27°C
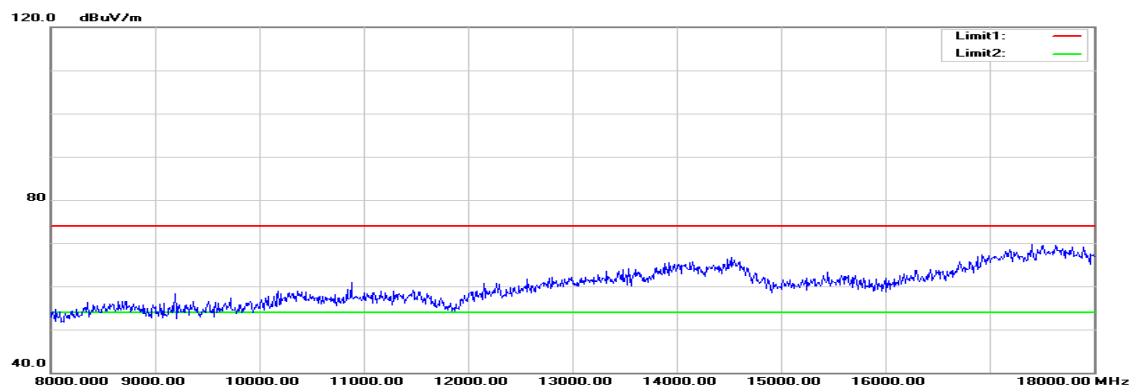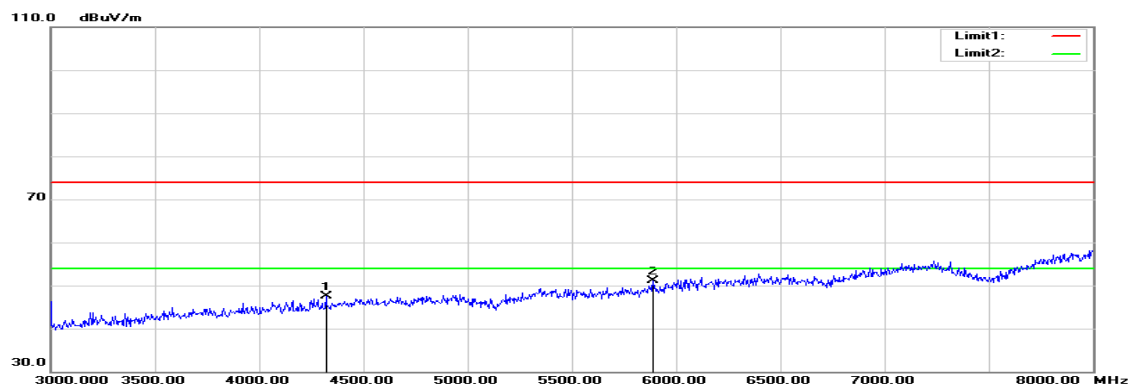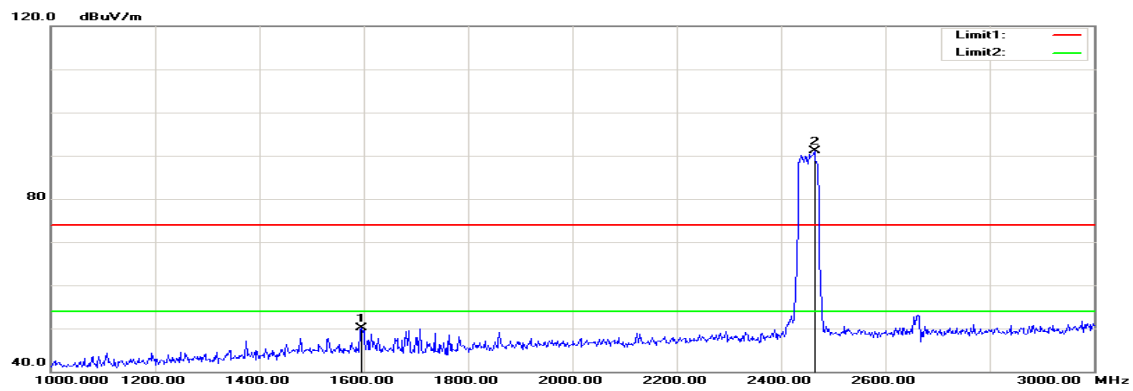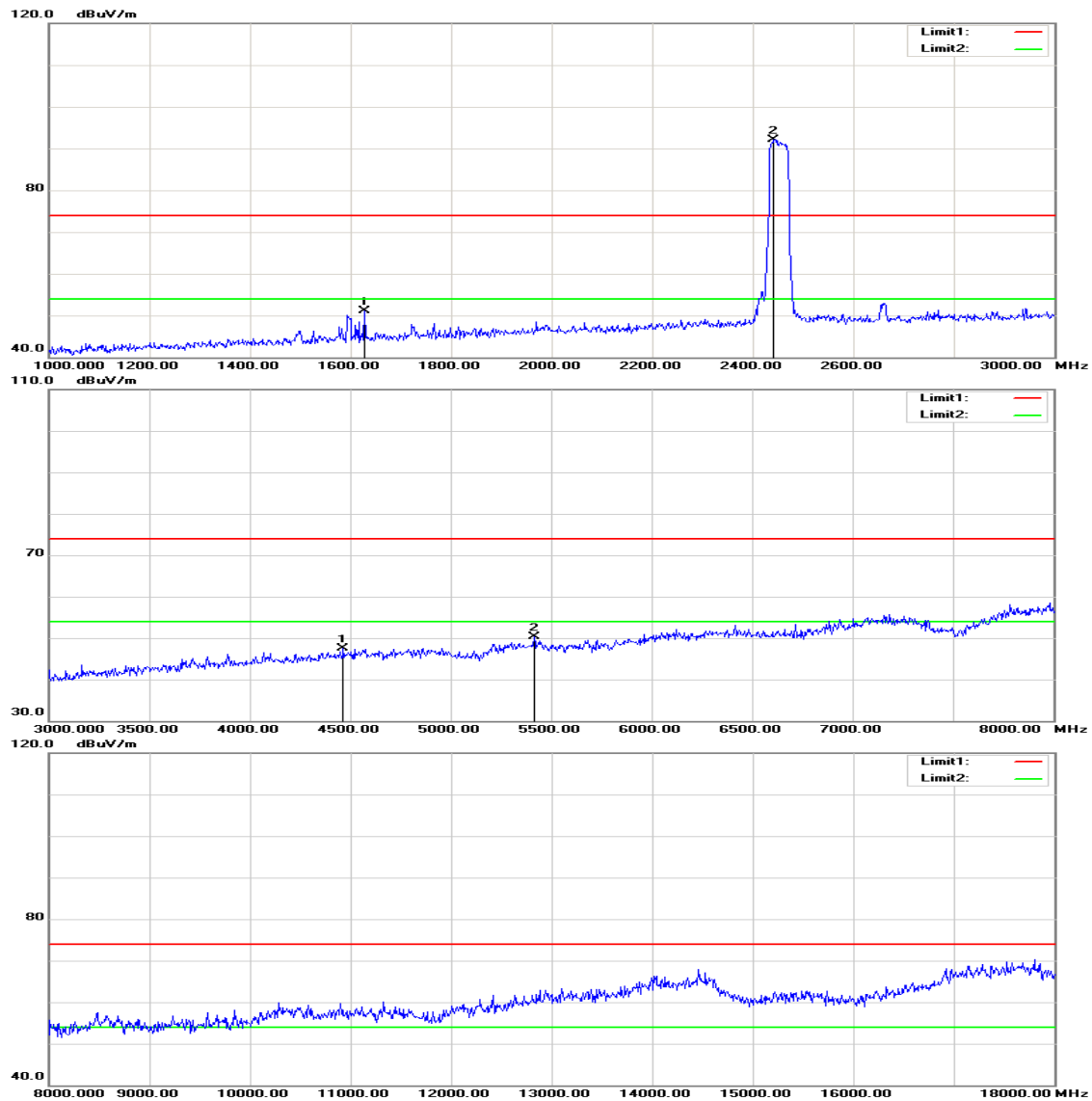
Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1596.000	54.94	-4.93	50.01	74.00	-23.99	peak	V
4320.000	40.96	6.47	47.43	74.00	-26.57	peak	V
5890.000	39.23	11.81	51.04	74.00	-22.96	peak	V
N/A							
1628.000	55.74	-4.73	51.01	74.00	-22.99	peak	H
4465.000	40.49	7.10	47.59	74.00	-26.41	peak	H
5415.000	40.21	10.13	50.34	74.00	-23.66	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*

3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*

4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

7.9 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a) & RSS-Gen §7.2.4, except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

Decreases with the logarithm of the frequency.

Test Configuration

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.

2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Not applicable, because EUT not connect to AC Main Source direct.