

# FCC 47 CFR PART 15 SUBPART E

## TEST REPORT

For

**Wearable Camera**

**Model: Narrative Clip 2**

**Trade Name: Narrative**

*Issued to*

**Narrative AB**  
**Agatan 55A, 582 22 Linköping, Sweden**

*Issued by*

**Compliance Certification Services Inc.**  
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**Issued Date: March 28, 2016**



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**Revision History**

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		March 28, 2016		Initial Issue	ALL	Becca Chen
01		May 9, 2016		1. Modify Band Edges data.	P25 ~ P40	Becca Chen
02		May 27, 2016		1. Added note. 2. Modify test Configuration & test procedure.	P25 ~ P40 P21	Becca Chen

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## 1. TEST RESULT CERTIFICATION

**Applicant:** Narrative AB  
Agatan 55A, 582 22 Linkoping, Sweden

**Equipment Under Test:** Wearable Camera

**Model Number:** Narrative Clip 2

**Trade Name:** Narrative

**Date of Test:** February 26 ~ March 25, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart E	No non-compliance noted

### We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. 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 conducted and radiated emission limits of FCC Rules Part 15.407 and Industry Canada RSS-247 Issue 1.

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

*Approved by:*

*Reviewed by:*



\_\_\_\_\_  
Miller Lee  
Manager  
Compliance Certification Services Inc.



\_\_\_\_\_  
Angel Cheng  
Section Manager  
Compliance Certification Services Inc.

## 2. EUT DESCRIPTION

Product	Wearable Camera				
Model Number	Narrative Clip 2				
Trade Name	Narrative				
Model Discrepancy	N/A				
Received Date	February 26, 2016				
EUT Power Rating	1. Power from host device via USB Cable 2. Power from Li-ion BATTERY: Rating: 315mAh, 1.20Wh				
Operating Frequency Range & Number of Channels		Mode	Frequency Range (MHz)	Number of Channels	
	UNII Band I	IEEE 802.11a	5180 ~ 5240	4 Channels	
		IEEE 802.11n HT 20 MHz	5180 ~ 5240	4 Channels	
		IEEE 802.11n HT 40 MHz	5190 ~ 5230	2 Channels	
Transmit Power		Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (w)
	UNII Band I	IEEE 802.11a	5180 ~ 5240	13.07	0.0203
		IEEE 802.11n HT 20 MHz	5180 ~ 5240	11.94	0.0156
		IEEE 802.11n HT 40 MHz	5190 ~ 5230	12.14	0.0164
Modulation Technique	OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)				
Antenna Specification	PCB Antenna / 2.9 dBi				

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

### **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, 15.407, KDB 644545 D03 v01 and KDB 789033 D02 v01r01 General UNII Test Procedures New Rules v01.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

According to the requirements in ANSI C63.10: 2013, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

##### **Radiated Emissions**

The EUT is placed on the turntable, which is 1.5 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. 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
<sup>1</sup> 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	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	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> 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: Narrative Clip 2) had been tested under operating condition.

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

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

#### **UNII Band I:**

##### **IEEE 802.11a for 5180 ~ 5240MHz:**

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with 6Mbps data rate were chosen for full testing.

##### **IEEE 802.11n HT 20 MHz for 5180 ~ 5240MHz:**

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with 6.5Mbps data rate were chosen for full testing.

##### **IEEE 802.11n HT 40 MHz Channel for 5190 ~ 5230MHz:**

Channel Low (5190MHz) and Channel High (5230MHz) 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 stand-up 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	12/07/2016
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	10/07/2016
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	02/14/2017
EMI Test Receiver	R&S	ESCI	100064	06/03/2016
Bilog Antenna	Sunol Sciences	JB3	A030105	08/05/2016
Horn Antenna	EMCO	3117	00055165	02/23/2017
Horn Antenna	EMCO	3116	26370	01/14/2017
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	01/13/2017
Coaxial Cable	Huber+Suhner	102	29212/2	01/11/2017
Coaxial Cable	Huber+Suhner	102	29406/2	01/11/2017
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room #B				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101073	09/08/2016
LISN	R&S	ENV216	101054	06/06/2016
LISN	SCHWARZBECK	NSLK 8127	8127-541	11/22/2016
Capacitive Voltage Probe	FCC	F-CVP-1	100185	03/08/2017
Test S/W	CCS-3A1-CE			

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration Request.

### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2575
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., Luchu Hsiang, Taoyuan Hsien 338, Taiwan  
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.



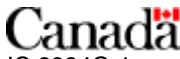
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

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	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, 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	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 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 I 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	IBM	7663 (T61)	L3E9812	N/A	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

**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 REQUIREMENTS

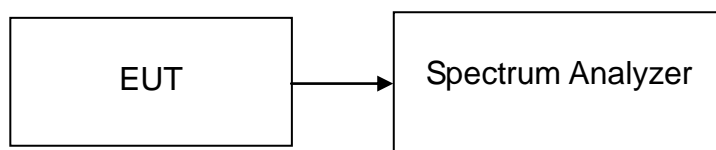
### 7.1 26 DB EMISSION BANDWIDTH

#### LIMIT

Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### Test Configuration

#### 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 > 1%EBW, VBW > RBW, Span >26dB bandwidth, and Sweep = auto.
4. Mark the peak frequency and -26dB (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

#### TEST RESULTS

*No non-compliance noted*

## **Test Data**

### **Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>26db Bandwidth (MHz)</b>
Low	5180	22.7210
Mid	5220	21.4910
High	5240	20.0430

### **Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>26db Bandwidth (MHz)</b>
Low	5180	19.6820
Mid	5220	21.5630
High	5240	21.3460

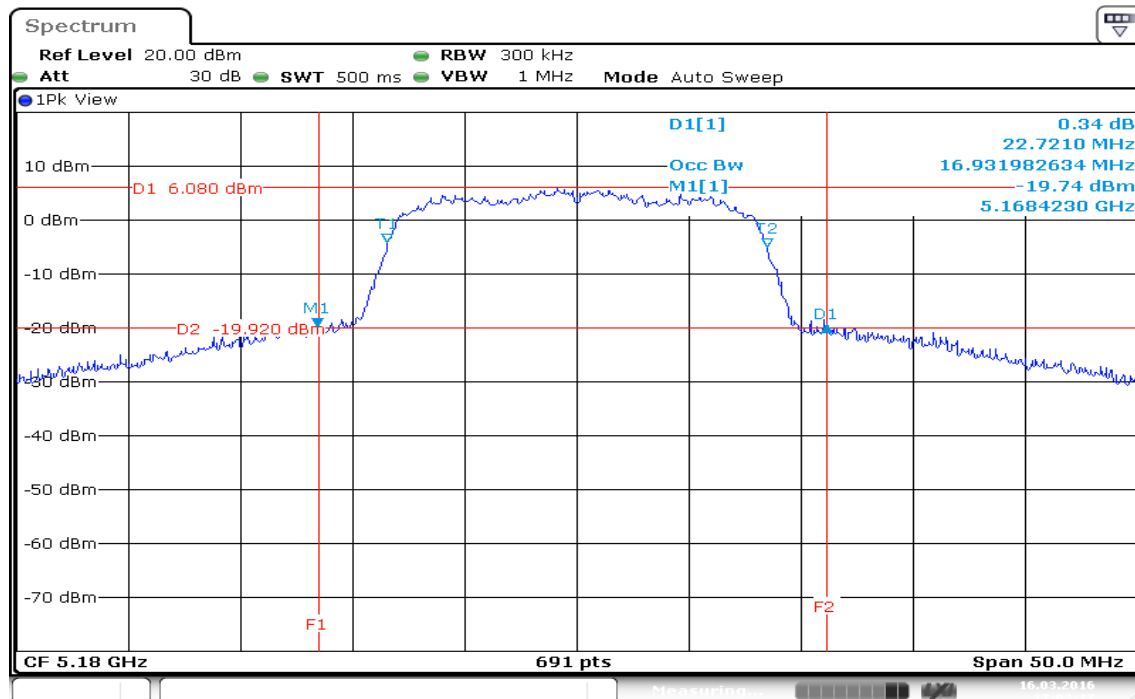
### **Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>26db Bandwidth (MHz)</b>
Low	5190	46.310
High	5230	48.510

## Test Plot

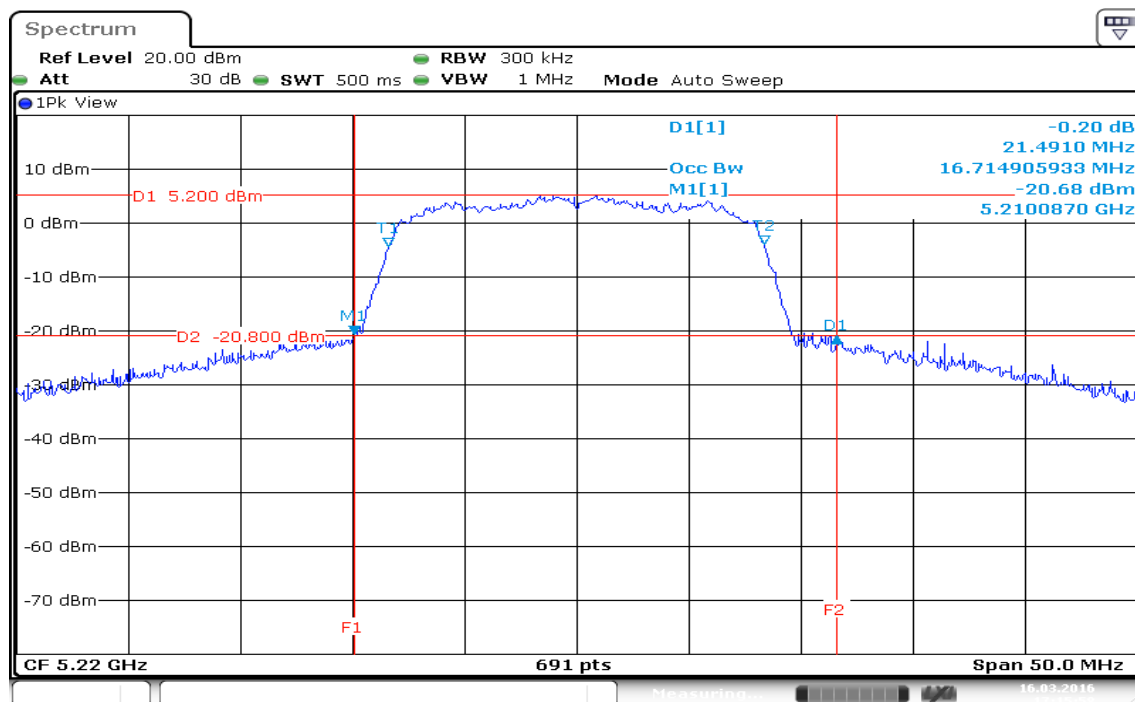
## IEEE 802.11a for 5180 ~ 5240MHz

## CH Low



Date: 16.MAR.2016 17:03:27

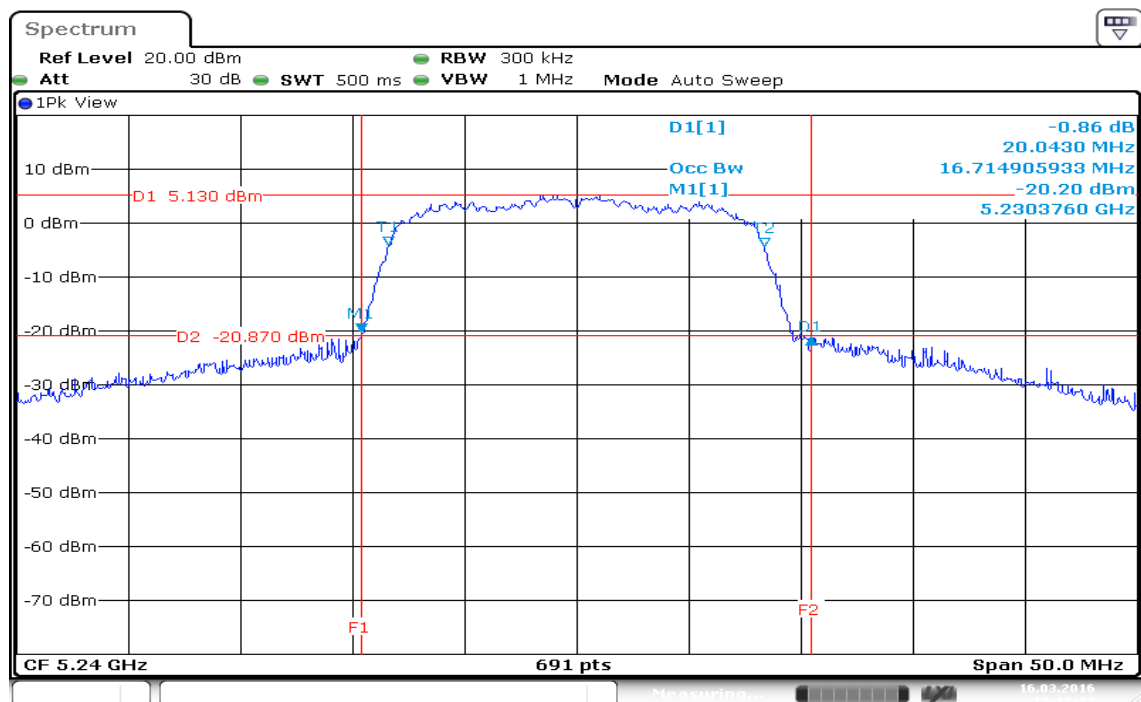
## CH Mid



Date: 16.MAR.2016 17:15:59



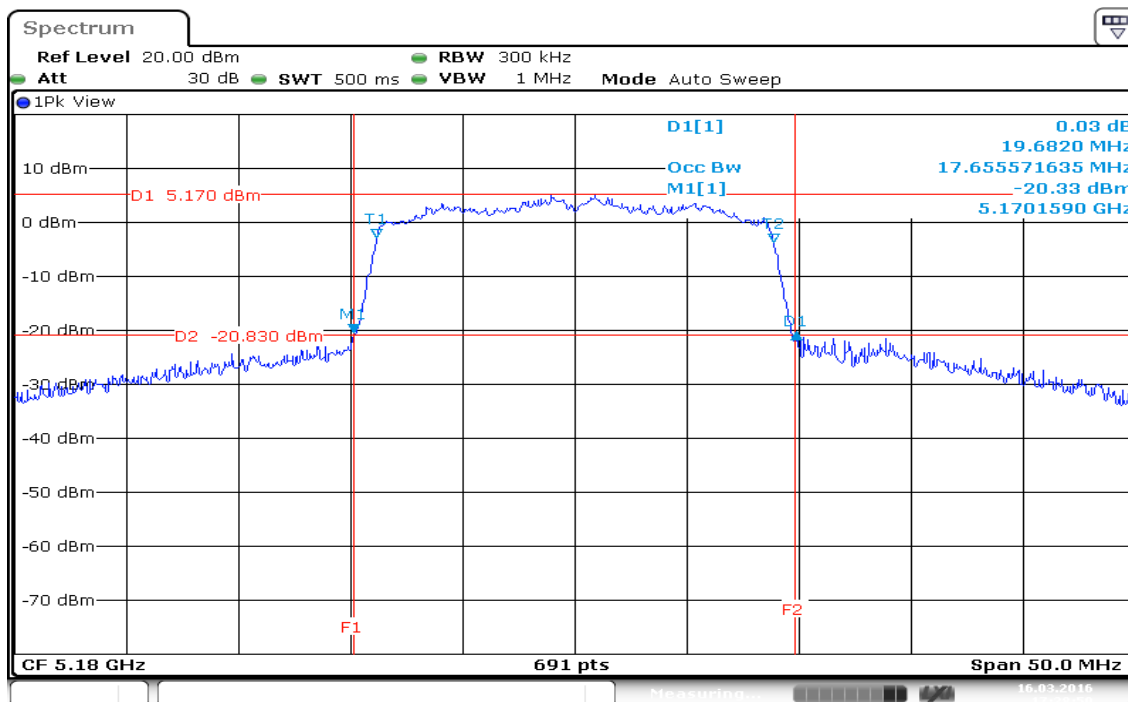
## CH High



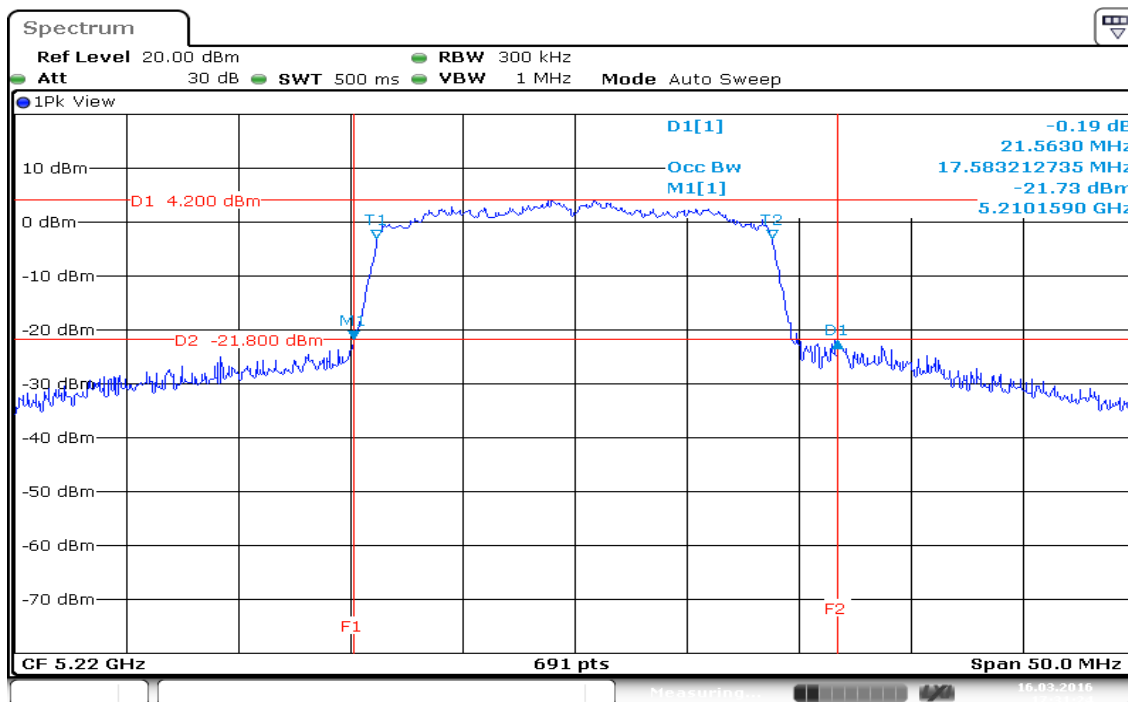
Date: 16.MAR.2016 17:18:34

## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

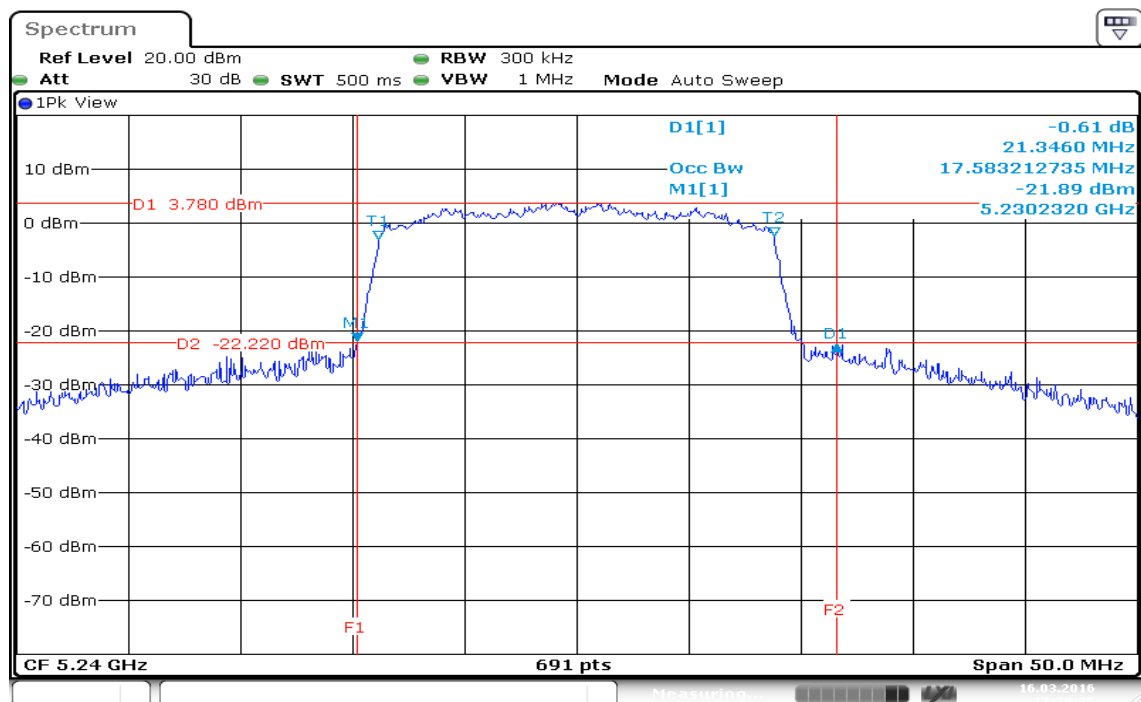
### CH Low



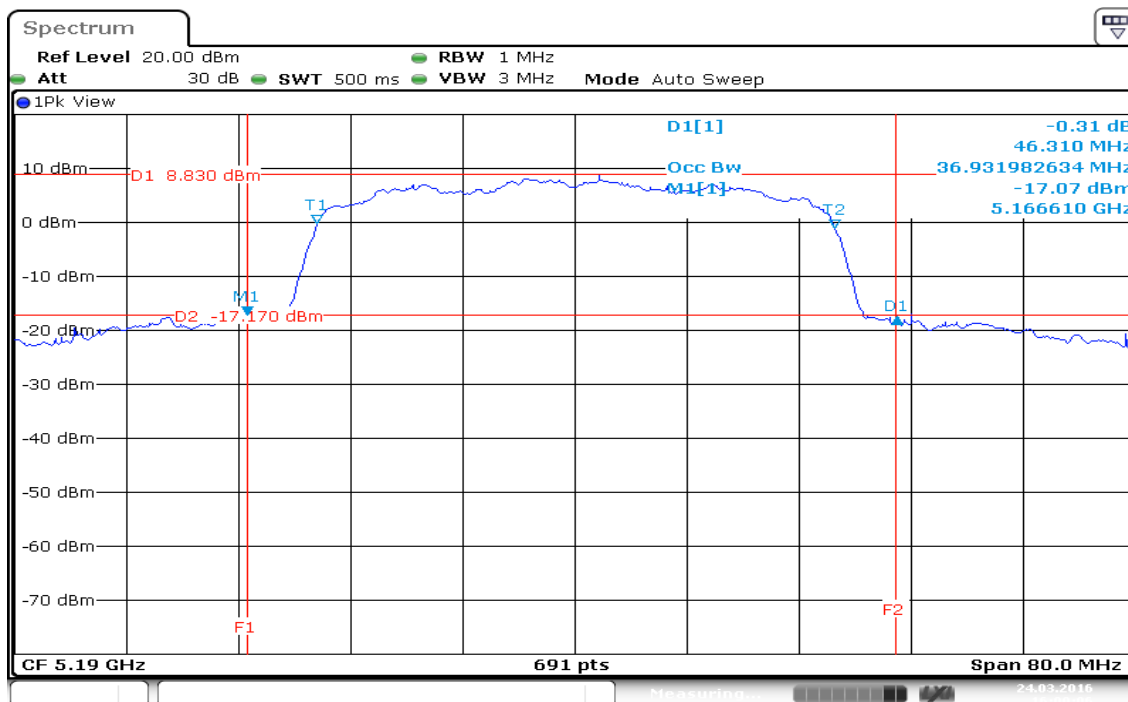
### CH Mid



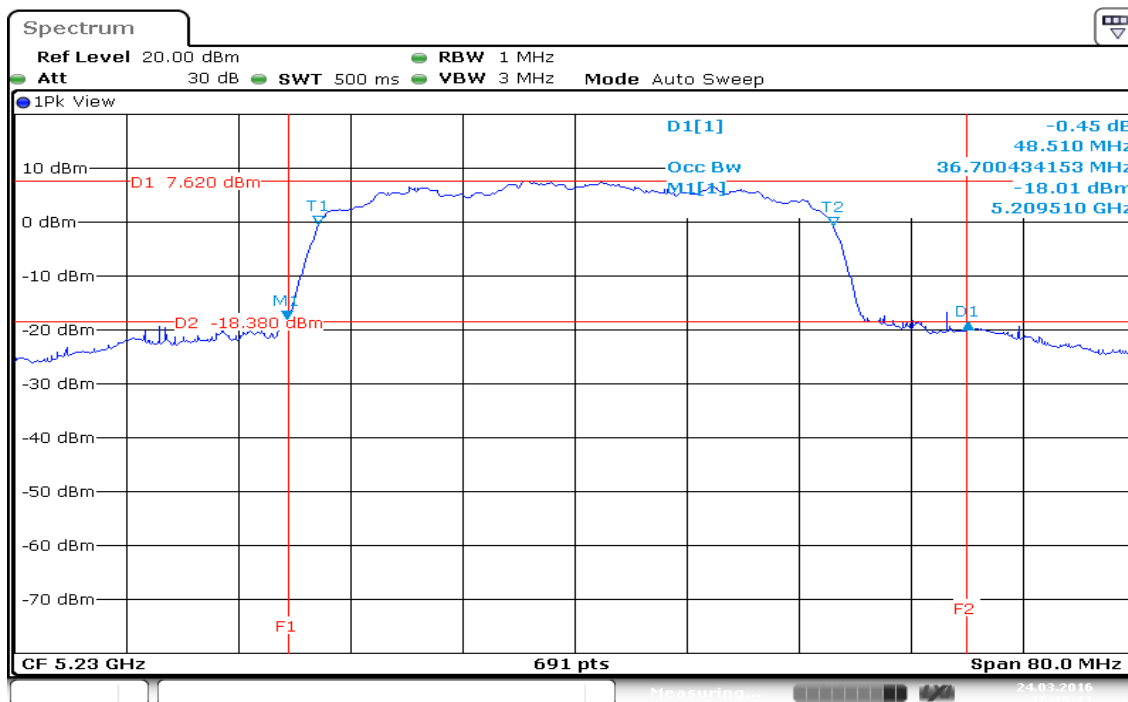
## CH High



Date: 16.MAR.2016 17:39:35

**IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz****CH Low**

Date: 24.MAR.2016 16:00:06

**CH High**

Date: 24.MAR.2016 16:15:11

## 7.2 MAXIMUM CONDUCTED OUTPUT POWER

### LIMIT

According to §15.407(a)

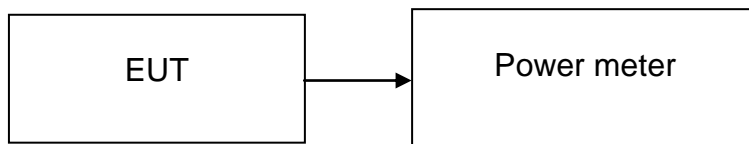
For the band 5.15-5.25 GHz, 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10\log B$ , where B is the 26 dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi

*In addition, devices with maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W. The peak power shall not exceed the limit as follow:*

### Test Configuration

*The EUT was connected to a Power meter through a 50Ω RF cable.*



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the avg power detection. The EUT is configured to transmit continuously.

## **TEST RESULTS**

*No non-compliance noted*

### **Test Data**

#### **ANT 1**

**Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz**

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)
Low	5180	<b>*13.07</b>	24.00
Mid	5220	13.04	24.00
High	5240	12.91	24.00

**Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz**

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)
Low	5180	<b>*11.94</b>	24.00
Mid	5220	10.54	24.00
High	5240	11.83	24.00

**Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz**

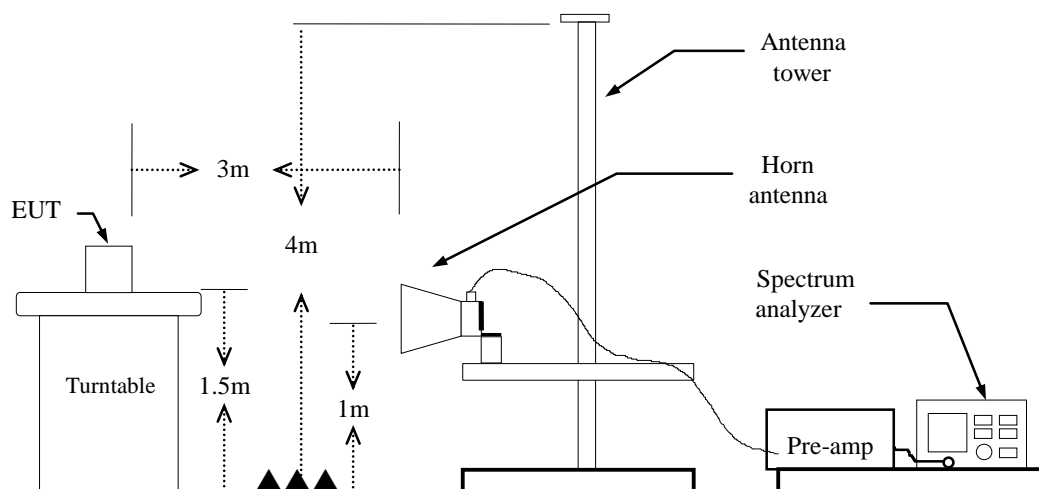
Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)
Low	5190	<b>*12.14</b>	24.00
High	5230	10.95	24.00

## 7.3 BAND EDGES MEASUREMENT

### LIMIT

According to §15.407, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, 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



## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m 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=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz,  
if duty cycle  $\geq 98\%$ , VBW=10Hz.  
if duty cycle  $< 98\%$  VBW=1/T.  
**IEEE 802.11a mode:**  $\geq 98\%$ , VBW=10Hz  
**IEEE 802.11n HT 20 MHz mode:**  $\approx 97\%$ , VBW=1.5kHz  
**IEEE 802.11n HT 40 MHz mode:**  $\geq 98\%$ , VBW=10Hz
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

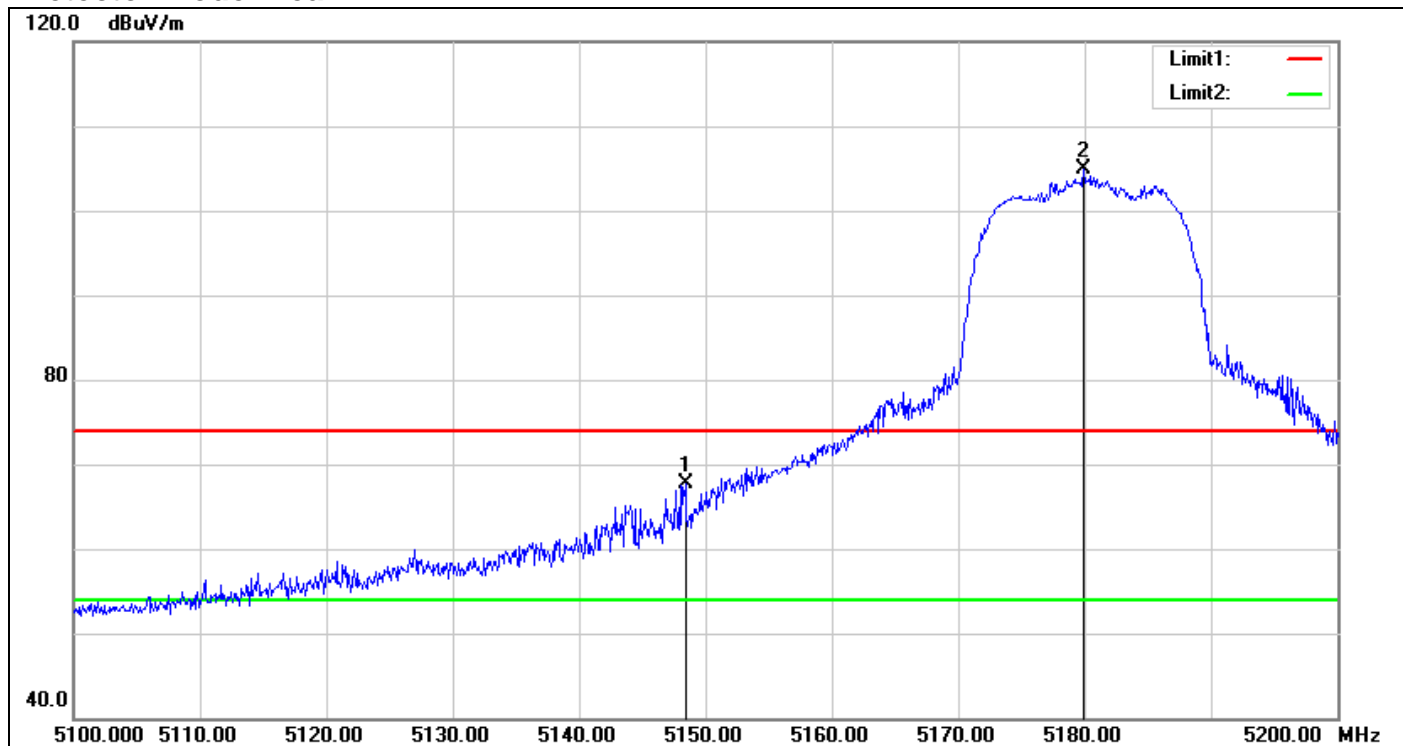
## **TEST RESULTS**

Refer to attach spectrum analyzer data chart.



## Band Edges (IEEE 802.11a mode / CH 5180 MHz)

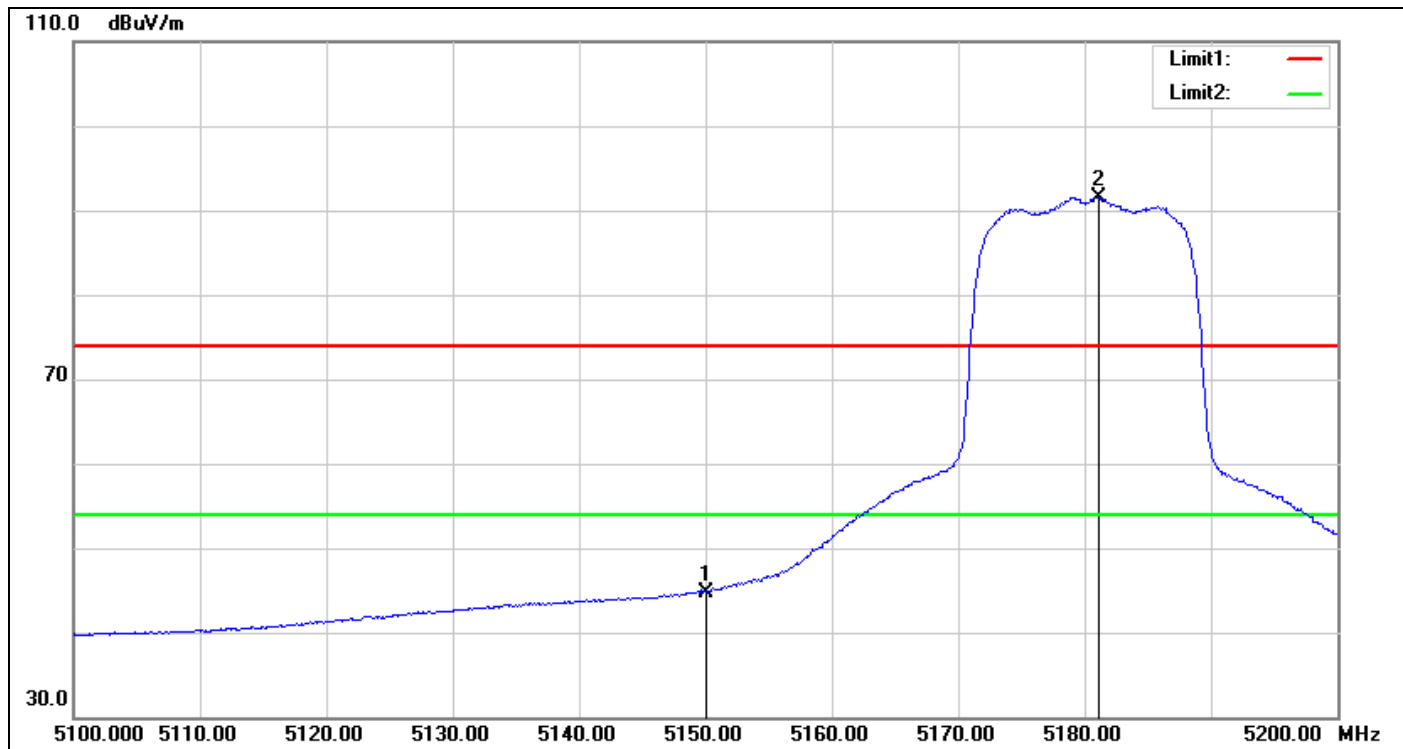
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5148.400	64.58	3.03	67.61	74.00	-6.39	peak
2	5179.900	101.04	3.91	104.95	--	--	peak

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

**Detector mode: Average**

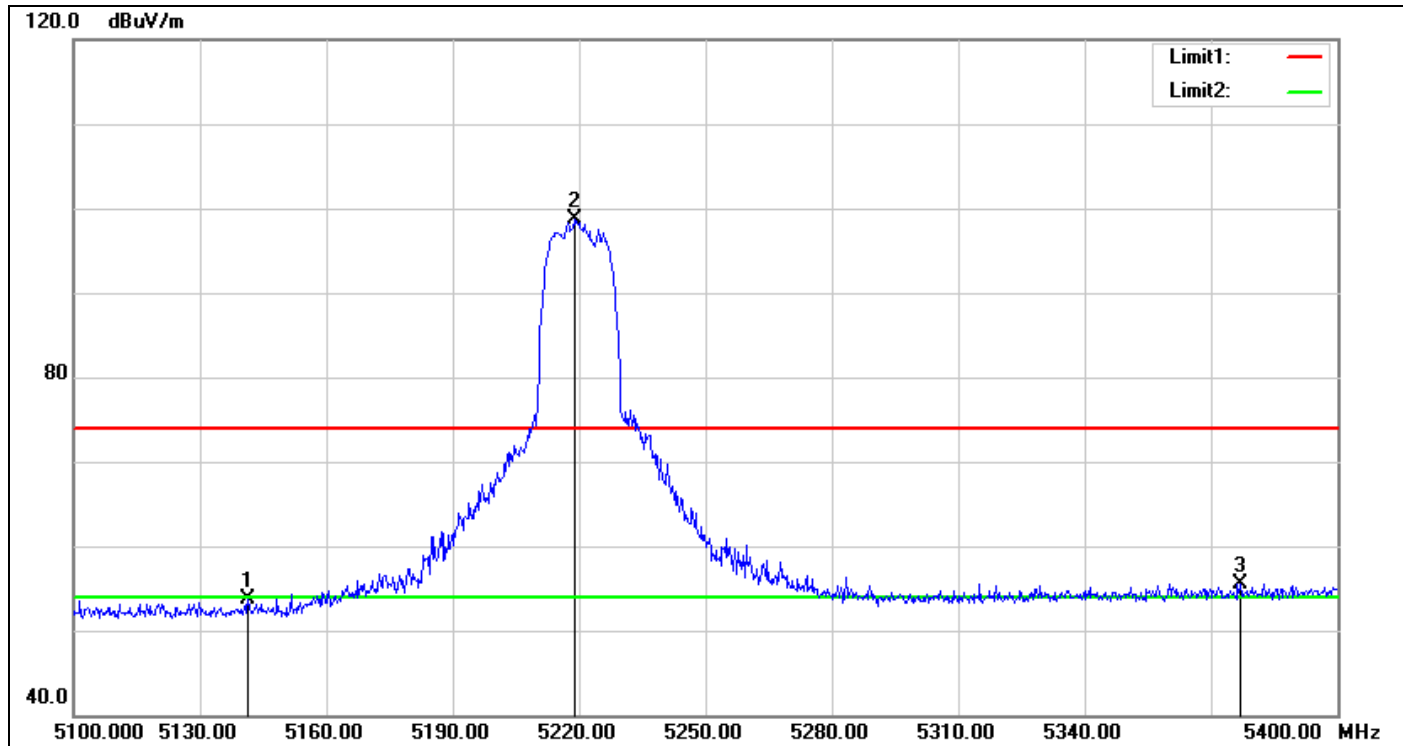


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5150.000	41.72	3.04	44.76	54.00	-9.24	AVG
2	5181.100	87.65	3.94	91.59	--	--	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11a mode / CH 5220 MHz)

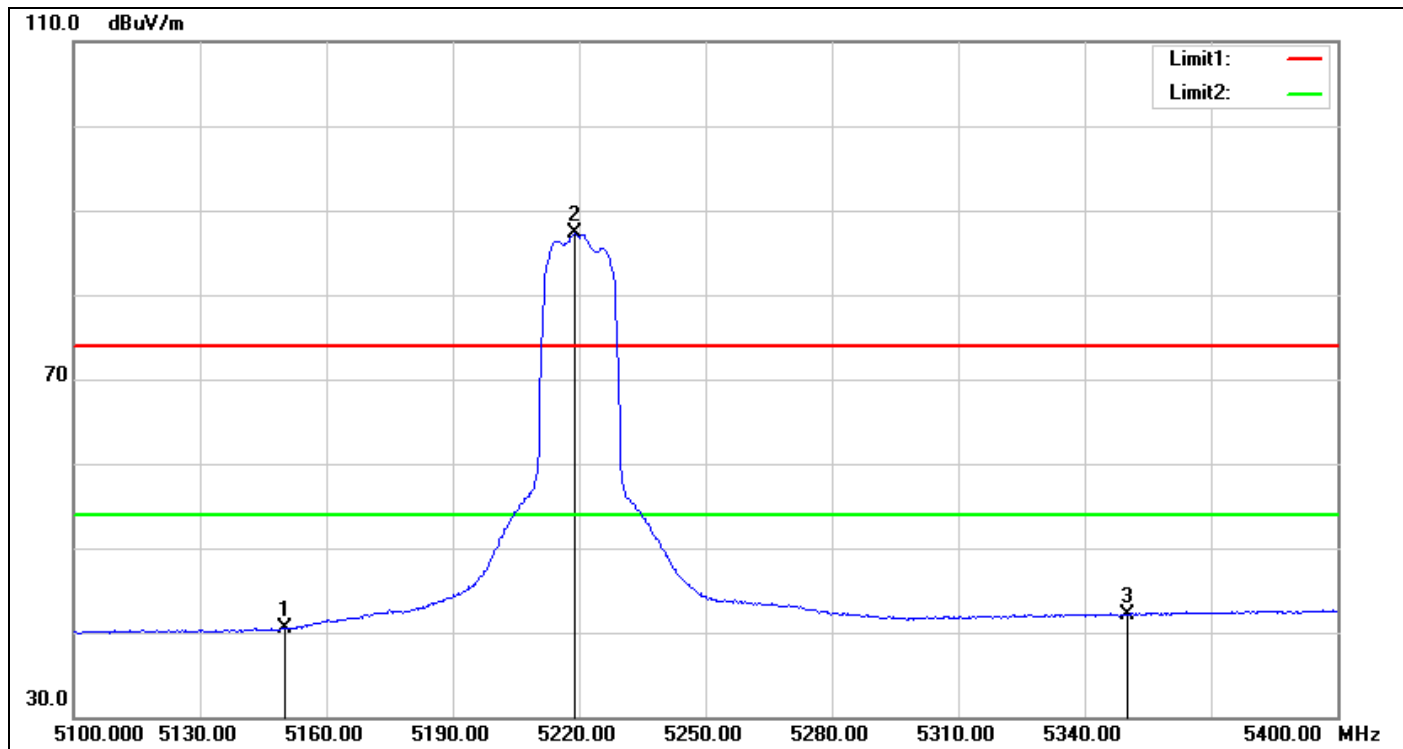
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5141.400	50.70	2.98	53.68	74.00	-20.32	peak
2	5218.800	94.17	4.55	98.72	--	--	peak
3	5376.900	50.07	5.53	55.60	74.00	-18.40	peak

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

**Detector mode: Average**

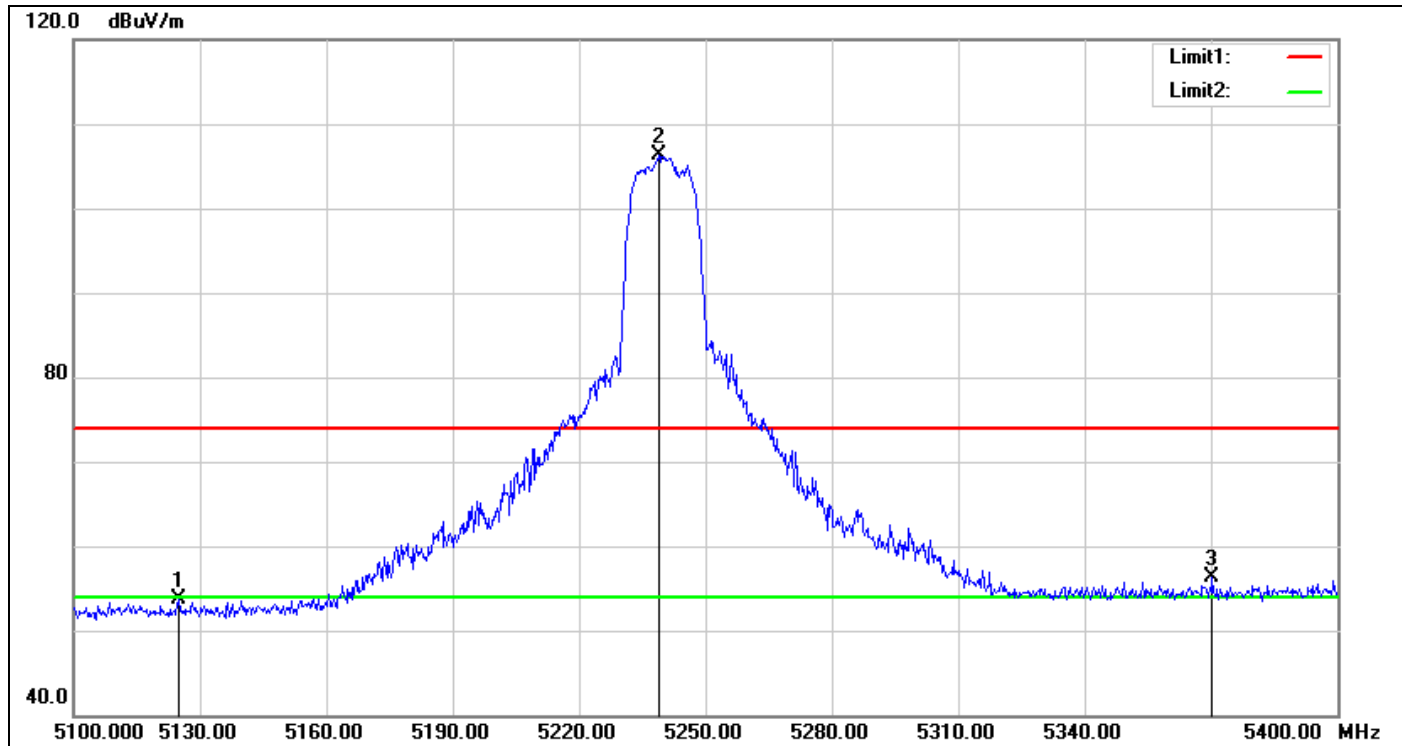


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5150.000	37.42	3.04	40.46	54.00	-13.54	AVG
2	5218.800	82.81	4.55	87.36	--	--	AVG
3	5350.000	36.83	5.31	42.14	54.00	-11.86	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11a mode / CH 5240 MHz)

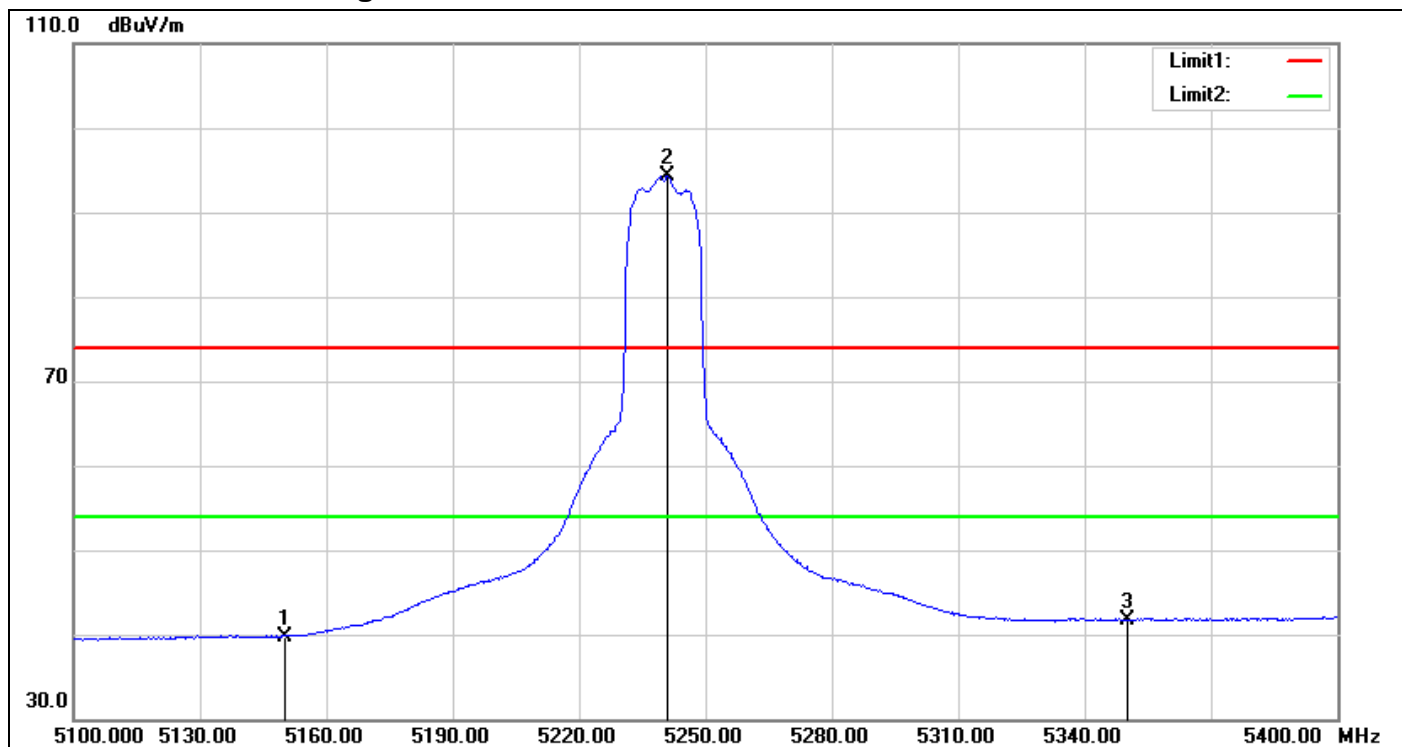
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5124.900	50.87	2.87	53.74	74.00	-20.26	peak
2	5238.900	101.62	4.62	106.24	--	--	peak
3	5370.300	50.75	5.48	56.23	74.00	-17.77	peak

**Note:** For in band it is not required to satisfy the -27 dBm emission limit.

## Detector mode: Average

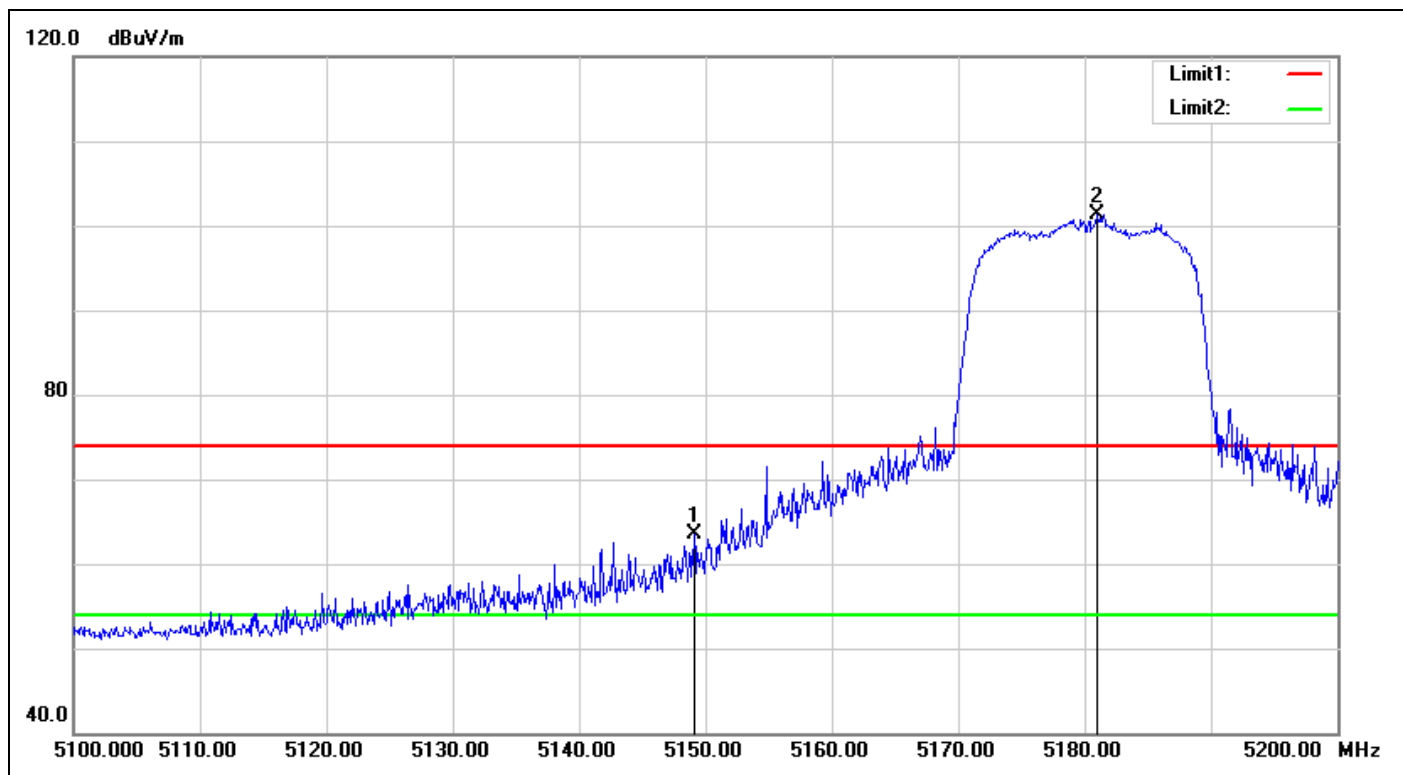


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5150.000	36.76	3.04	39.80	54.00	-14.20	AVG
2	5241.000	89.69	4.63	94.32	--	--	AVG
3	5350.000	36.47	5.31	41.78	54.00	-12.22	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11n HT 20 MHz mode / CH 5180 MHz)

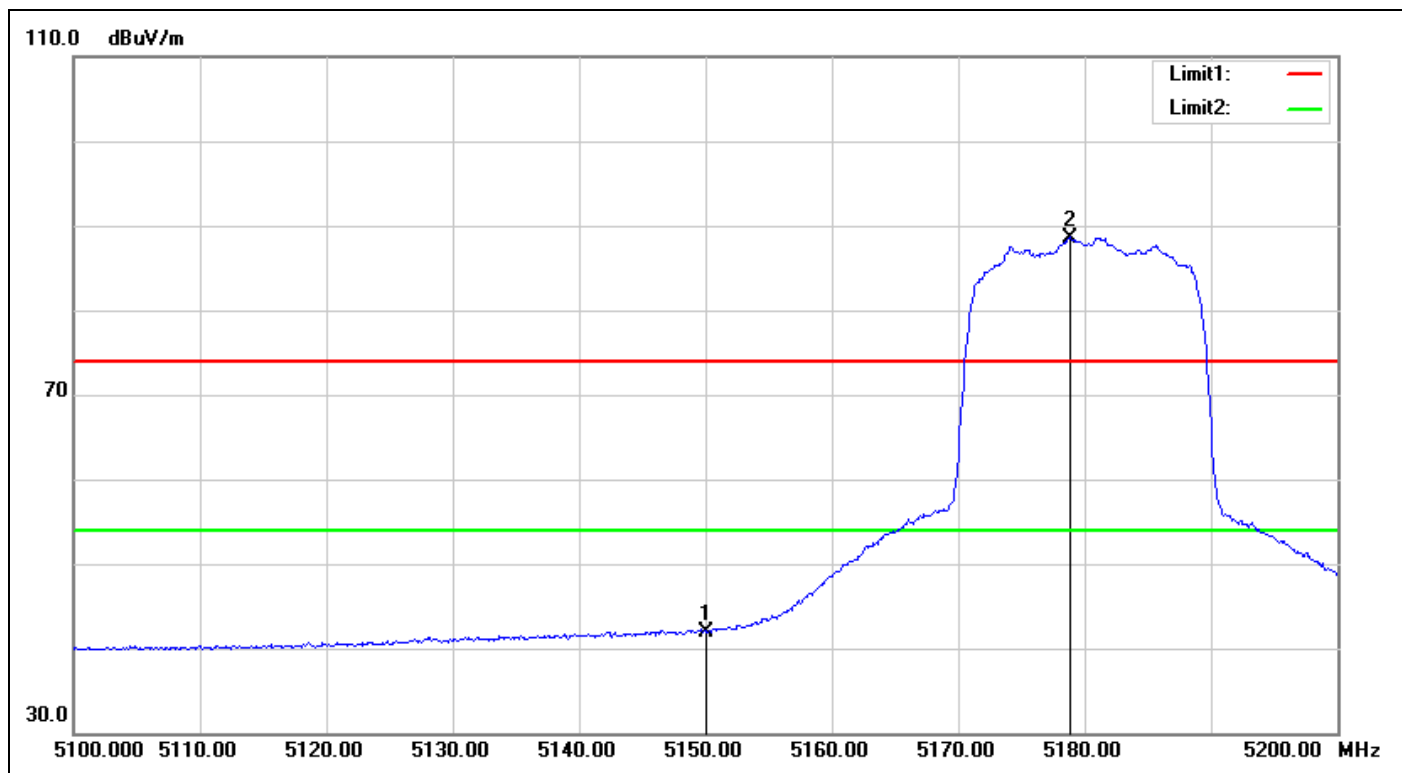
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5149.100	60.41	3.03	63.44	74.00	-10.56	peak
2	5181.000	97.34	3.94	101.28	--	--	peak

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

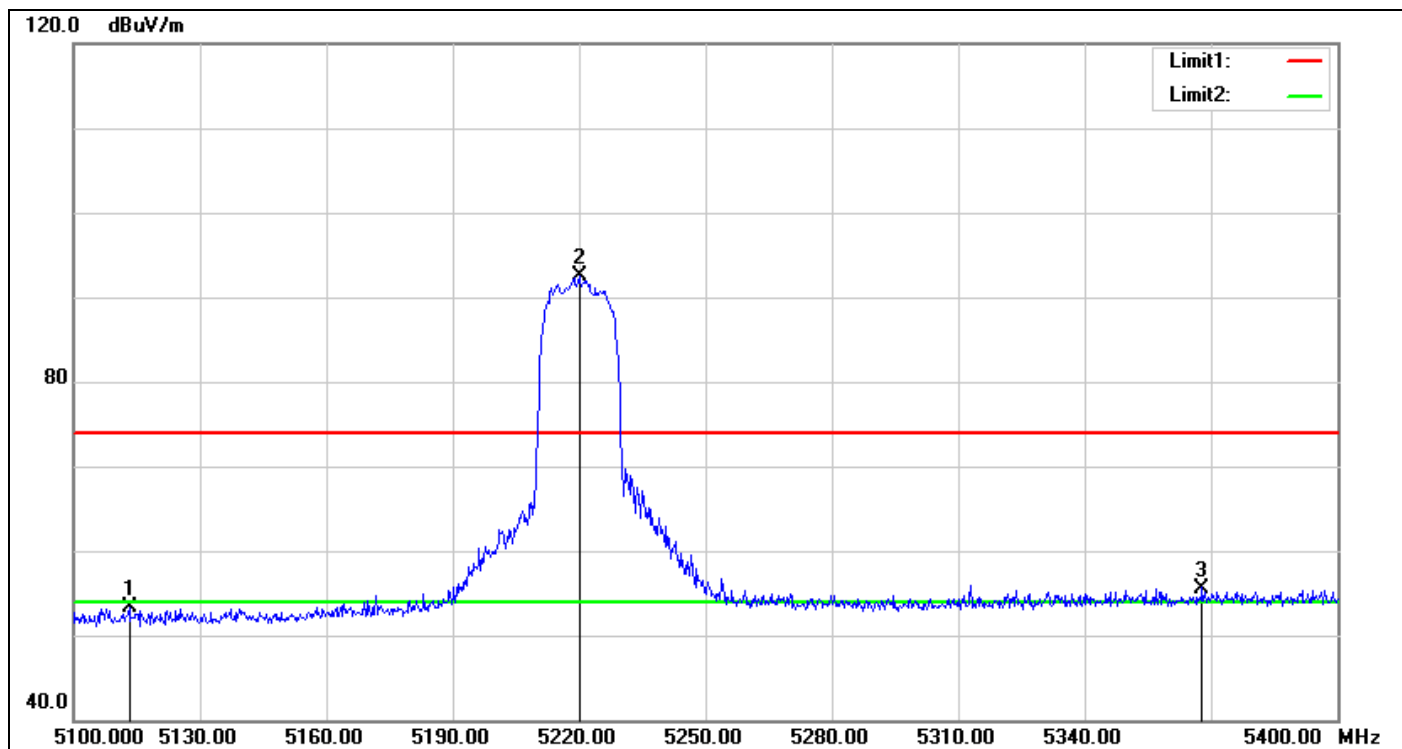
## Detector mode: Average



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5150.000	38.91	3.04	41.95	54.00	-12.05	AVG
2	5178.800	84.72	3.88	88.60	--	--	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

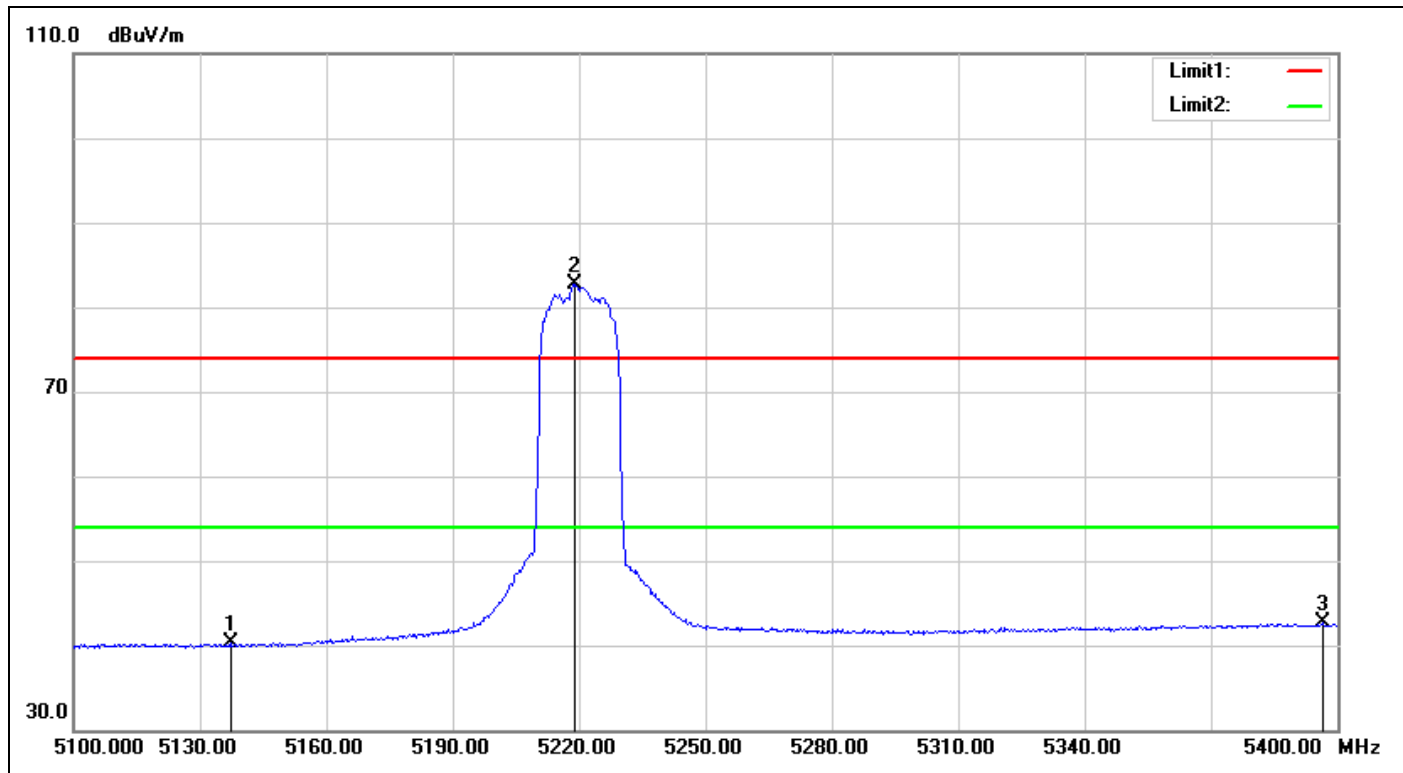


**Band Edges (IEEE 802.11n HT 20 MHz mode / CH 5220 MHz)****Detector mode: Peak**

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5113.200	50.43	2.79	53.22	74.00	-20.78	peak
2	5220.000	88.02	4.56	92.58	--	--	peak
3	5367.900	50.14	5.46	55.60	74.00	-18.40	peak

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

**Detector mode: Average**

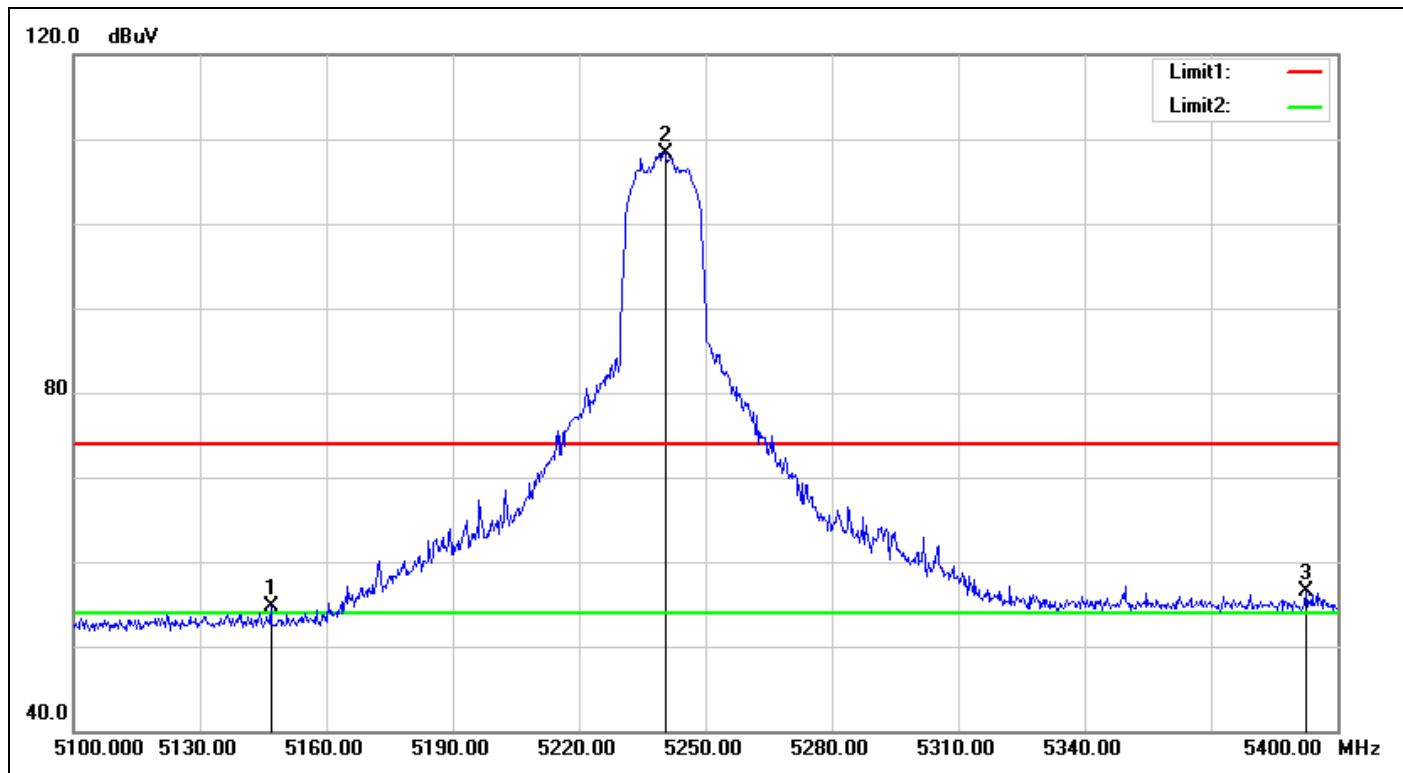


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5137.200	37.31	2.95	40.26	54.00	-13.74	AVG
2	5218.800	78.14	4.55	82.69	--	--	AVG
3	5396.400	36.98	5.69	42.67	54.00	-11.33	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11n HT 20 MHz mode / CH 5240 MHz)

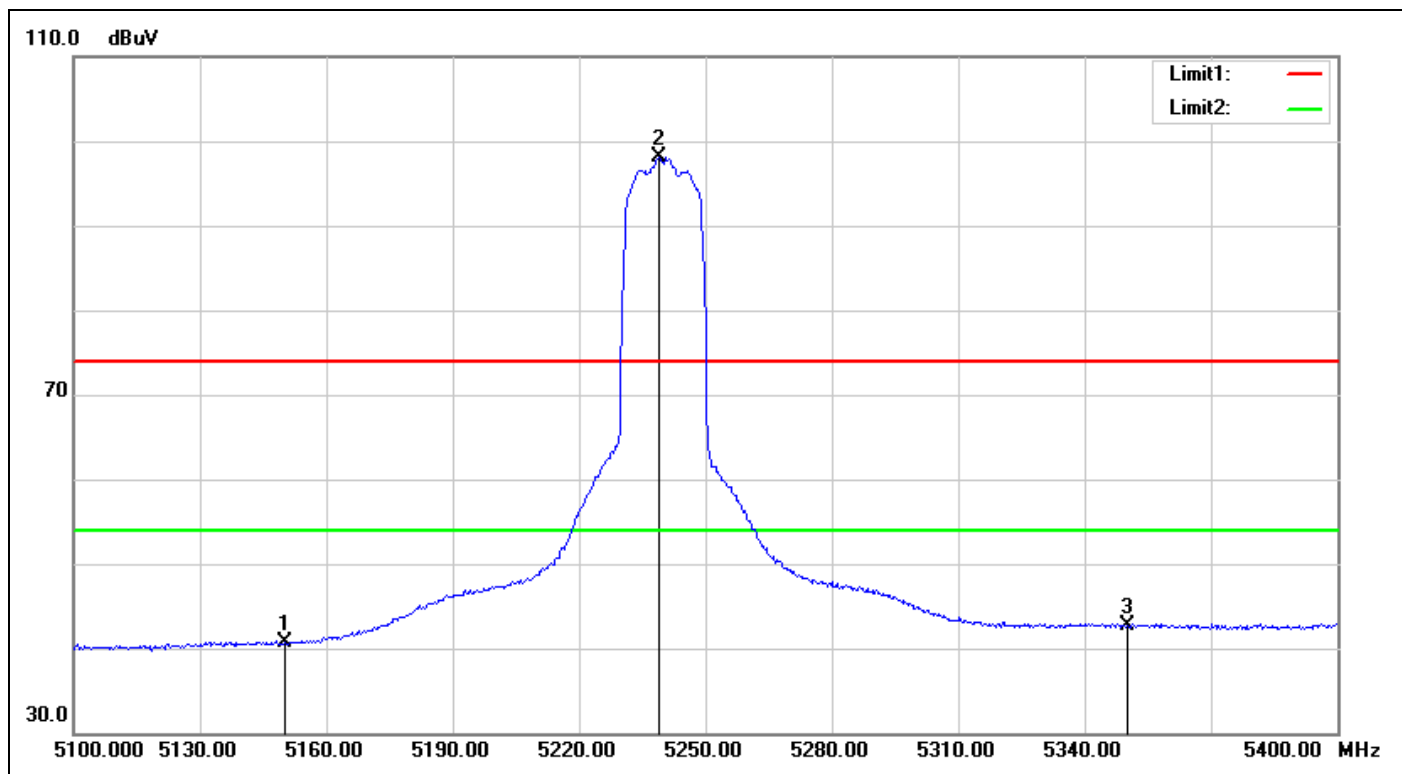
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	5146.800	51.60	3.02	54.62	74.00	-19.38	peak
2	5240.400	103.77	4.63	108.40	--	--	peak
3	5392.500	50.79	5.66	56.45	74.00	-17.55	peak

**Note:** For in band it is not required to satisfy the -27 dBm emission limit.

## Detector mode: Average

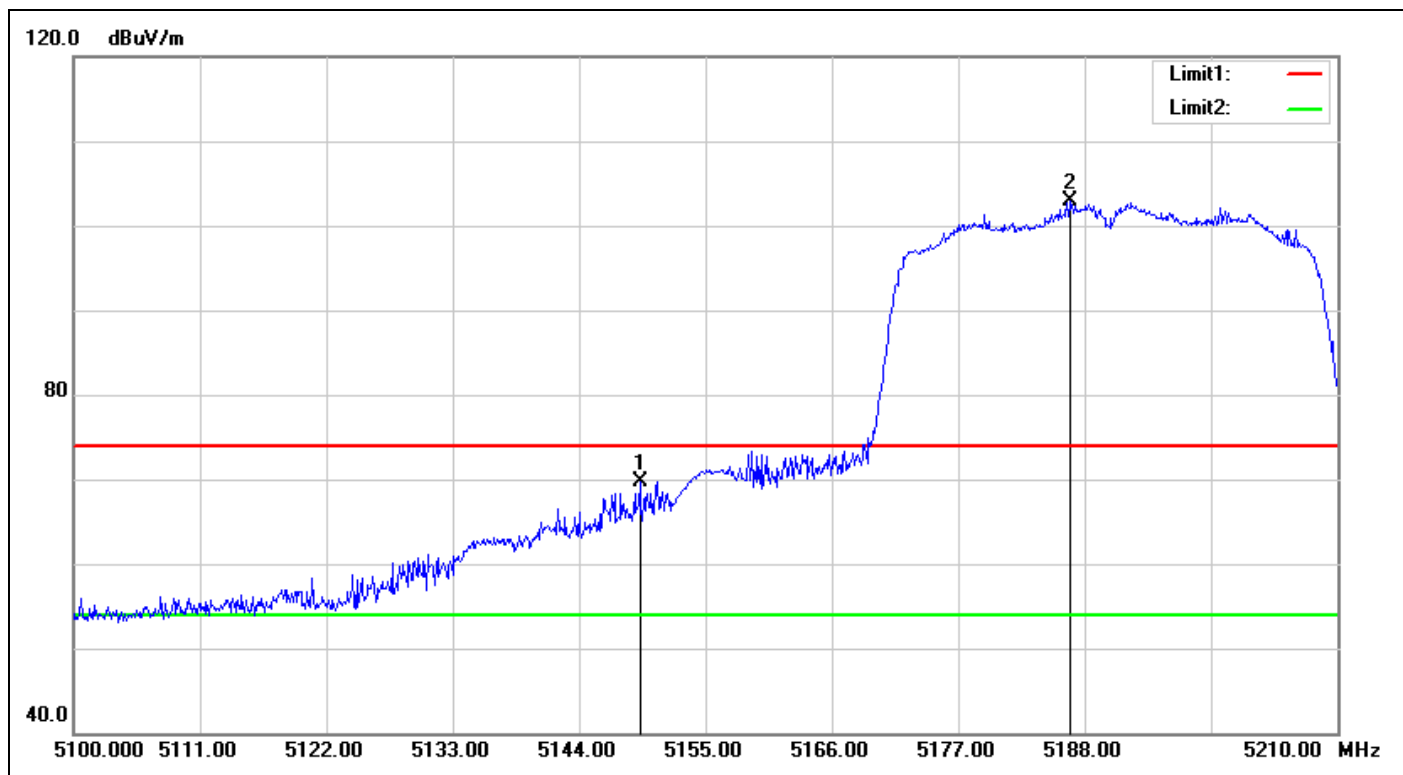


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	5150.000	37.57	3.04	40.61	54.00	-13.39	AVG
2	5238.900	93.56	4.62	98.18	--	--	AVG
3	5350.000	37.29	5.31	42.60	54.00	-11.40	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5190 MHz)

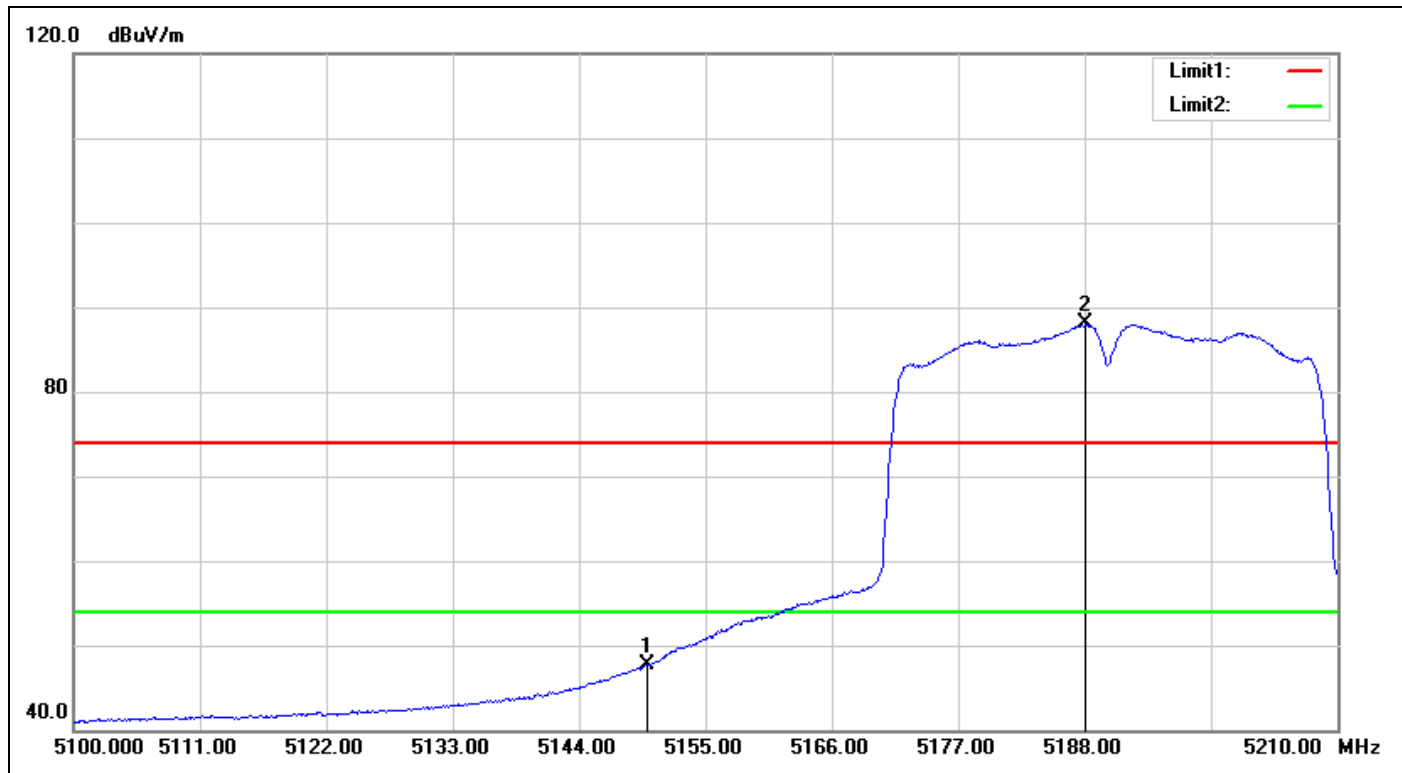
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5149.280	66.70	3.04	69.74	74.00	-4.26	peak
2	5186.680	98.83	4.10	102.93	--	--	peak

**Note:** For in band it is not required to satisfy the -27 dBm emission limit.

## Detector mode: Average

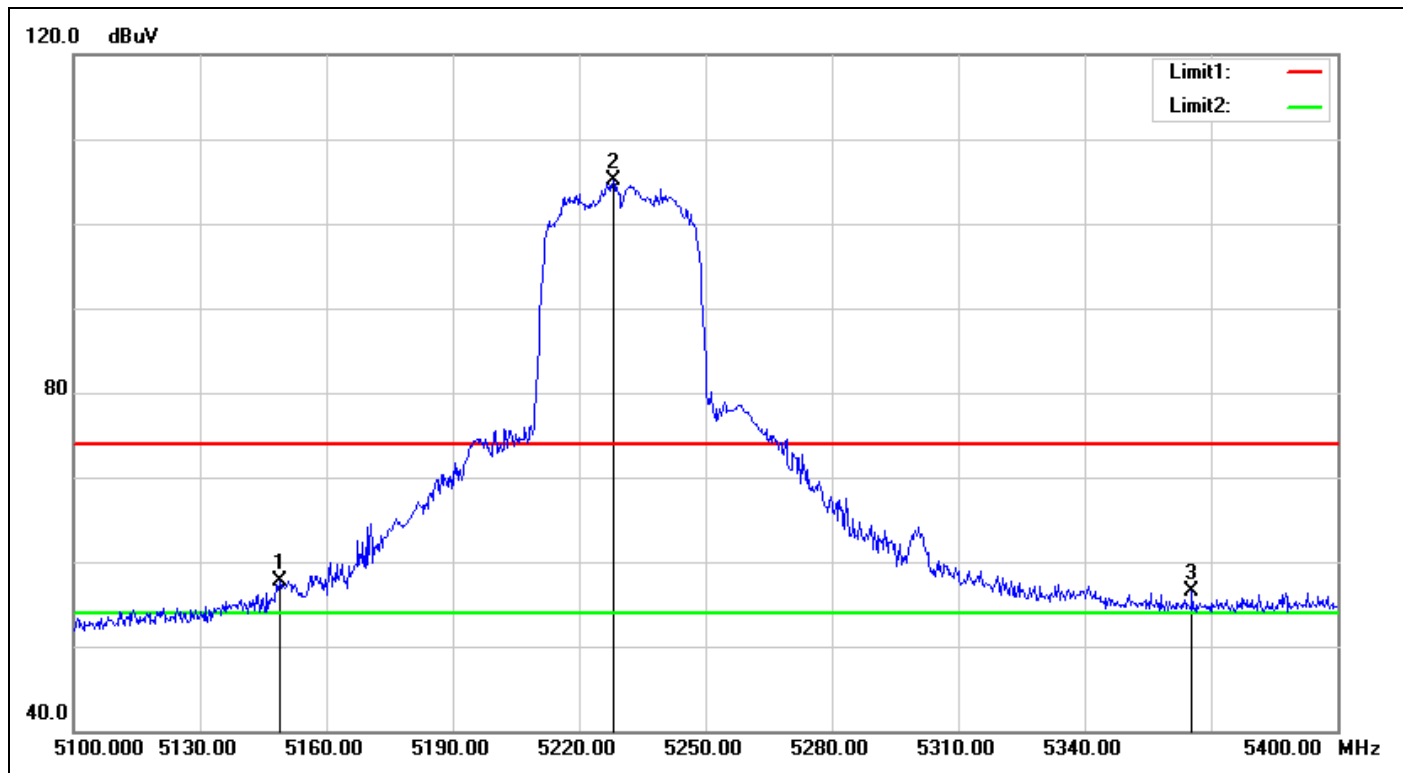


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5150.000	44.73	3.04	47.77	54.00	-6.23	AVG
2	5188.110	83.91	4.15	88.06	--	--	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

## Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5230 MHz)

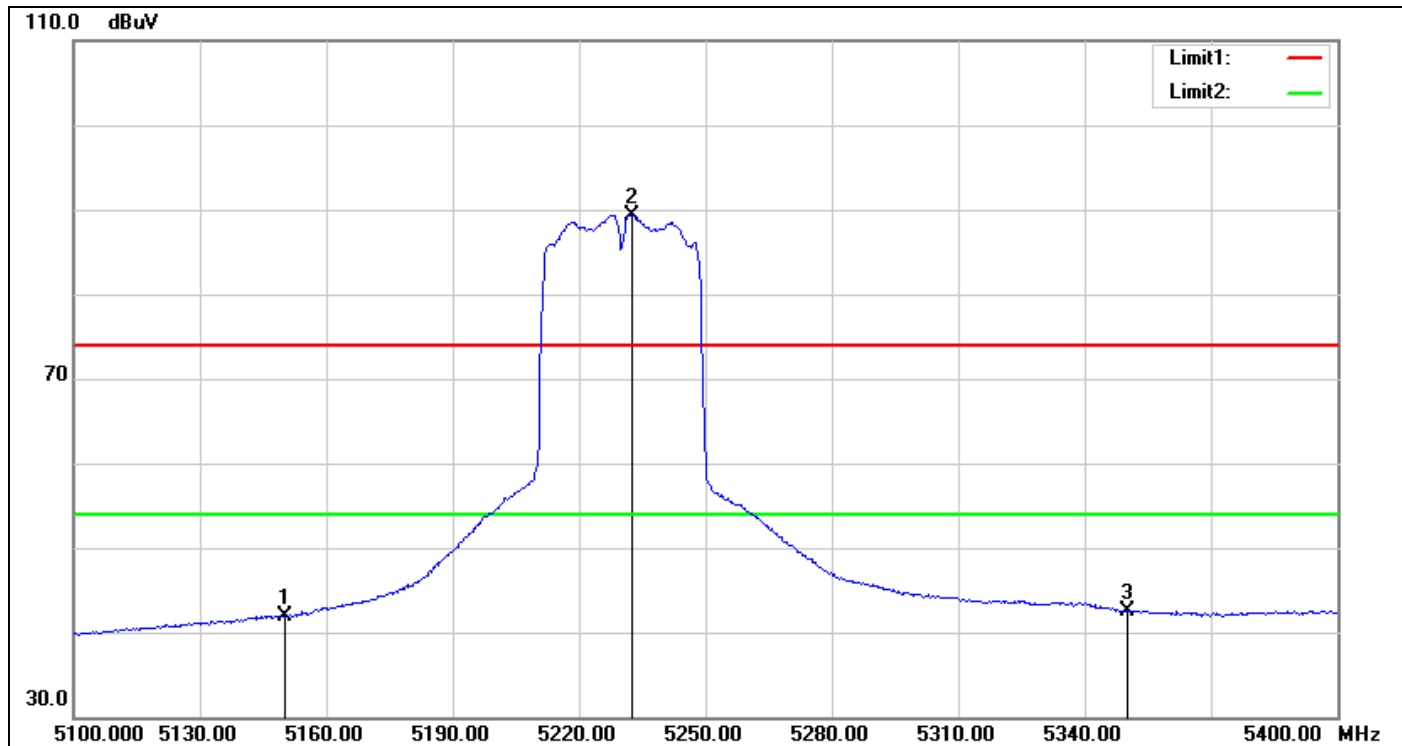
Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	5148.900	54.69	3.03	57.72	74.00	-16.28	peak
2	5228.100	100.51	4.59	105.10	--	--	peak
3	5365.500	51.04	5.44	56.48	74.00	-17.52	peak

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**

**Detector mode: Average**



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	5150.000	38.90	3.04	41.94	54.00	-12.06	AVG
2	5232.600	84.78	4.60	89.38	--	--	AVG
3	5350.000	37.22	5.31	42.53	54.00	-11.47	AVG

**Note: For in band it is not required to satisfy the -27 dBm emission limit.**



## 7.4 PEAK POWER SPECTRAL DENSITY

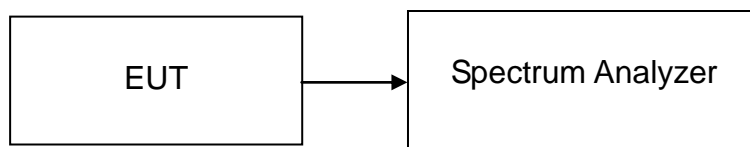
### LIMIT

According to §15.407(a)

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 11dBm in any 1MHz band.
- (2) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11dBm in any 1MHz band.

*If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.*

### Test Configuration



### 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 = 1MHz, VBW = 3MHz, Span = Sweep= AUTO
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 802.11a mode / 5180 ~ 5240MHz**

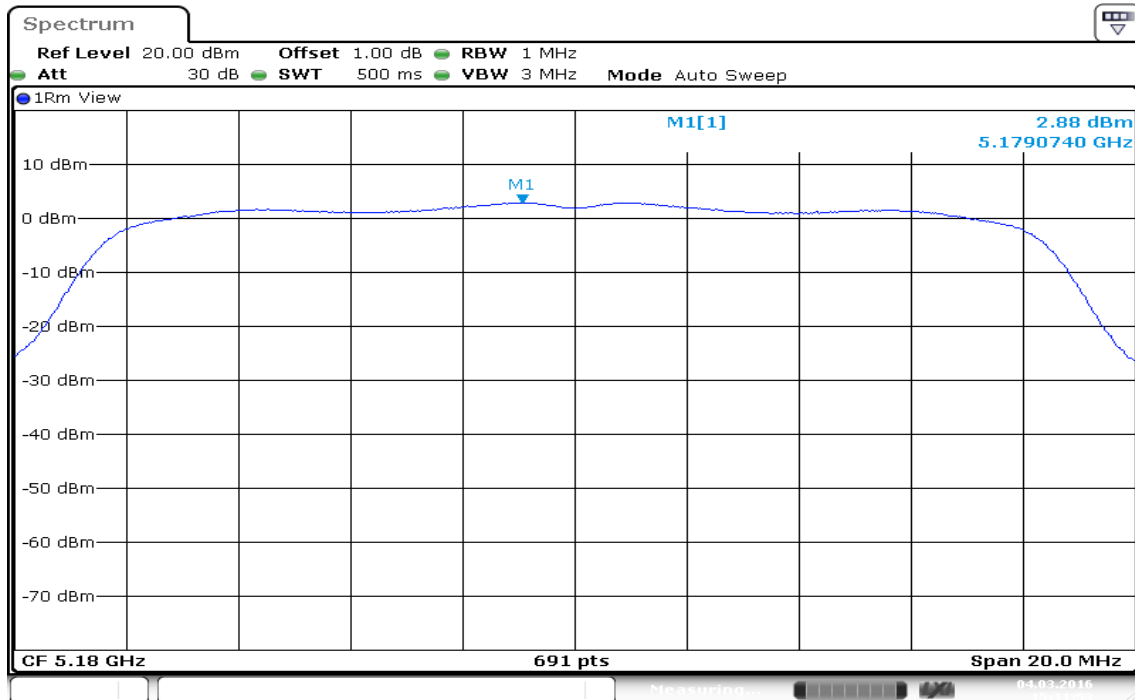
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	2.88	11.00	-8.12	PASS
Mid	5220	2.25	11.00	-8.75	PASS
High	5240	2.01	11.00	-8.99	PASS

**Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz**

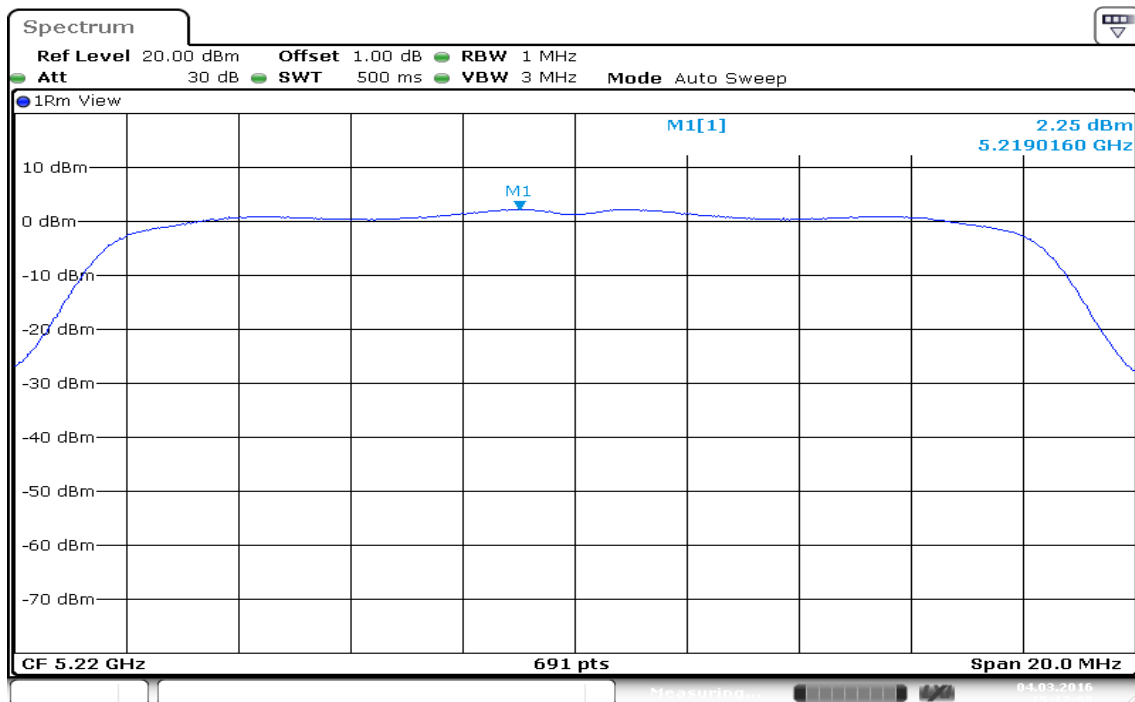
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	1.62	11.00	-9.38	PASS
Mid	5220	1.00	11.00	-10.00	PASS
High	5240	0.32	11.00	-10.68	PASS

**Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5190	-1.69	11.00	-12.69	PASS
High	5230	-2.05	11.00	-13.05	PASS

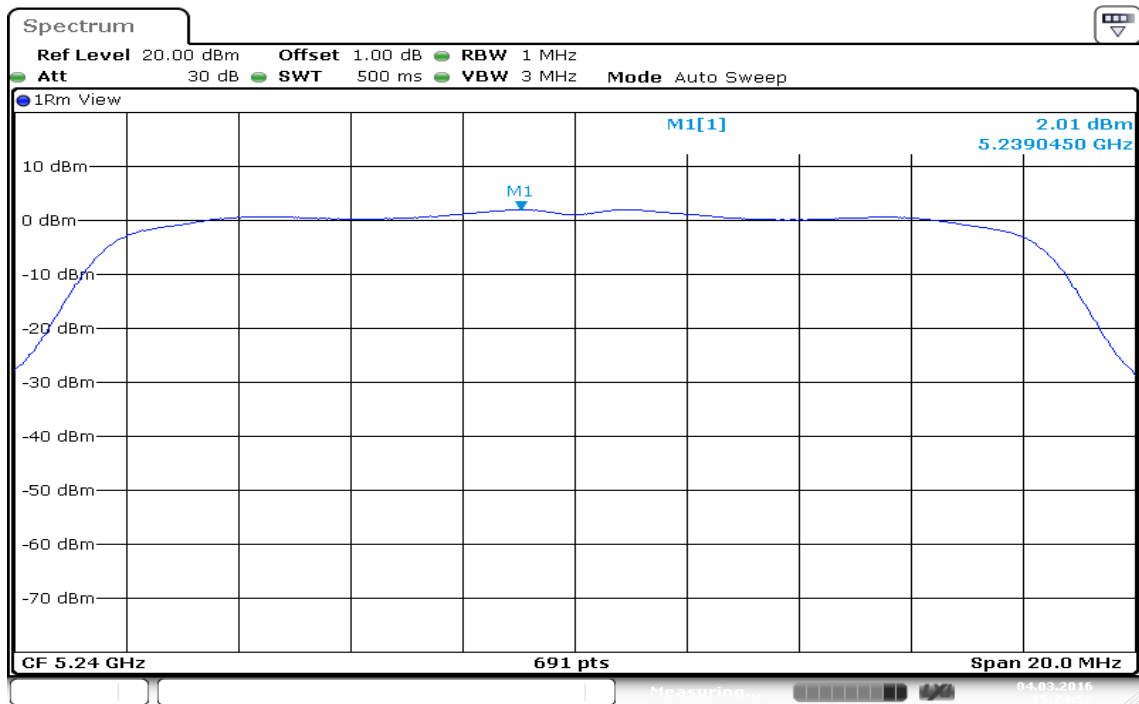
**Test Plot****IEEE 802.11a mode / 5180 ~ 5240MHz****CH Low**

Date: 4.MAR.2016 15:11:52

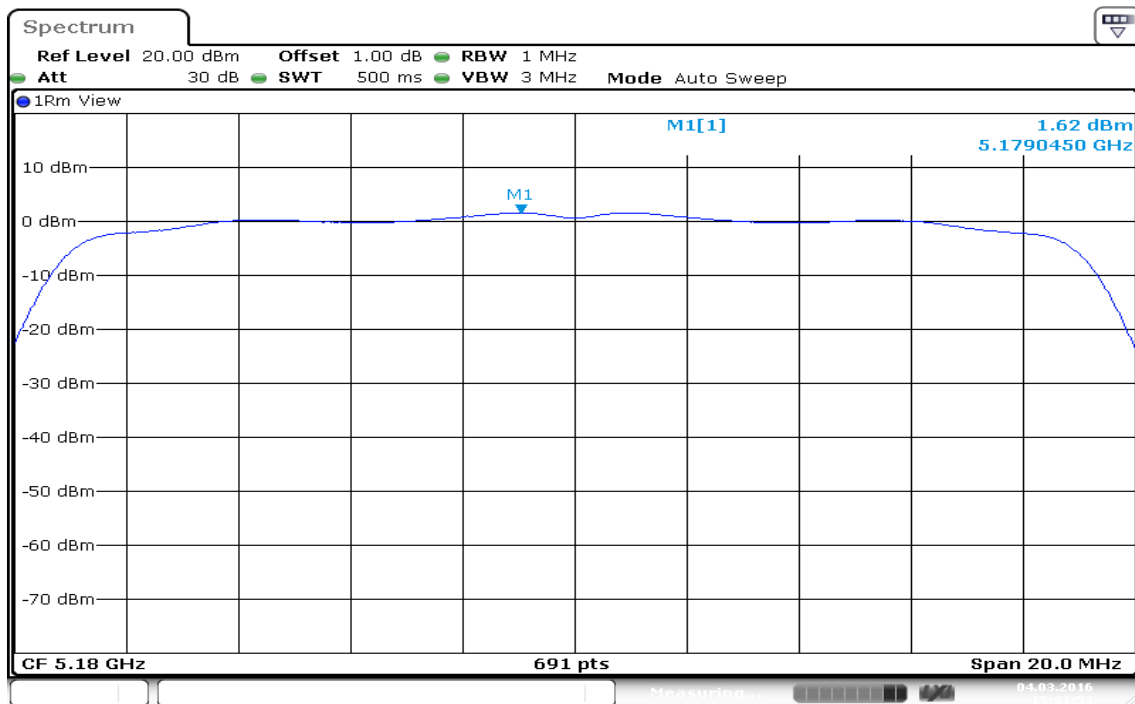
**CH Mid**

Date: 4.MAR.2016 15:17:08

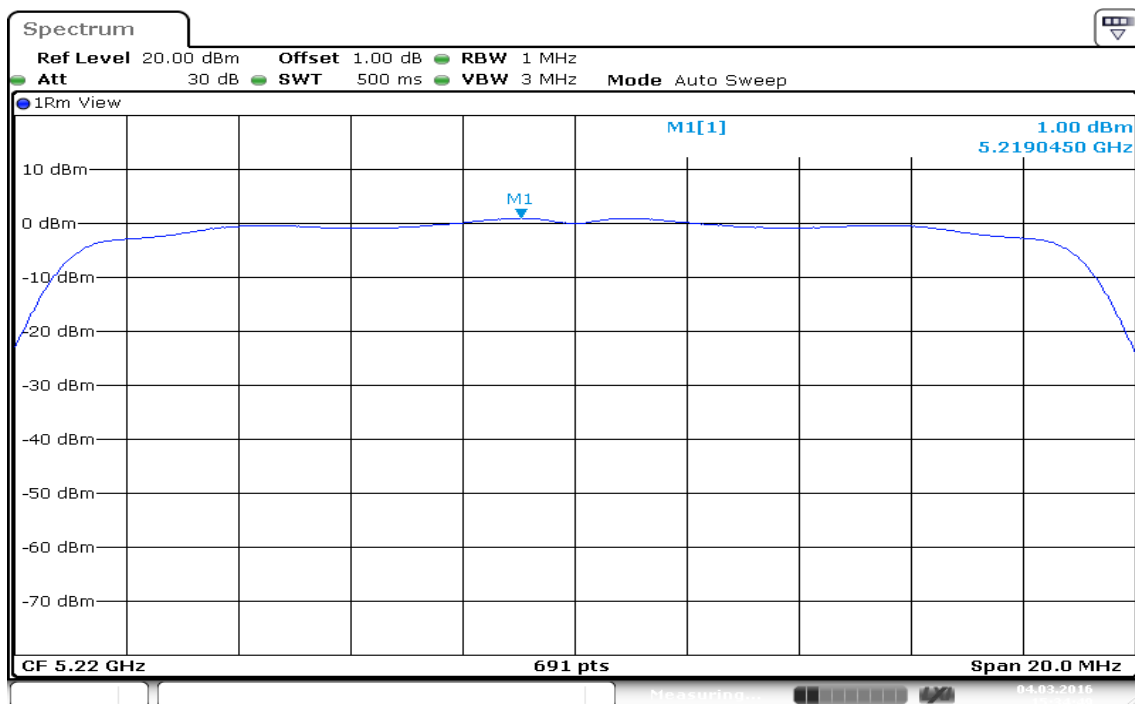
## CH High



Date: 4.MAR.2016 15:24:51

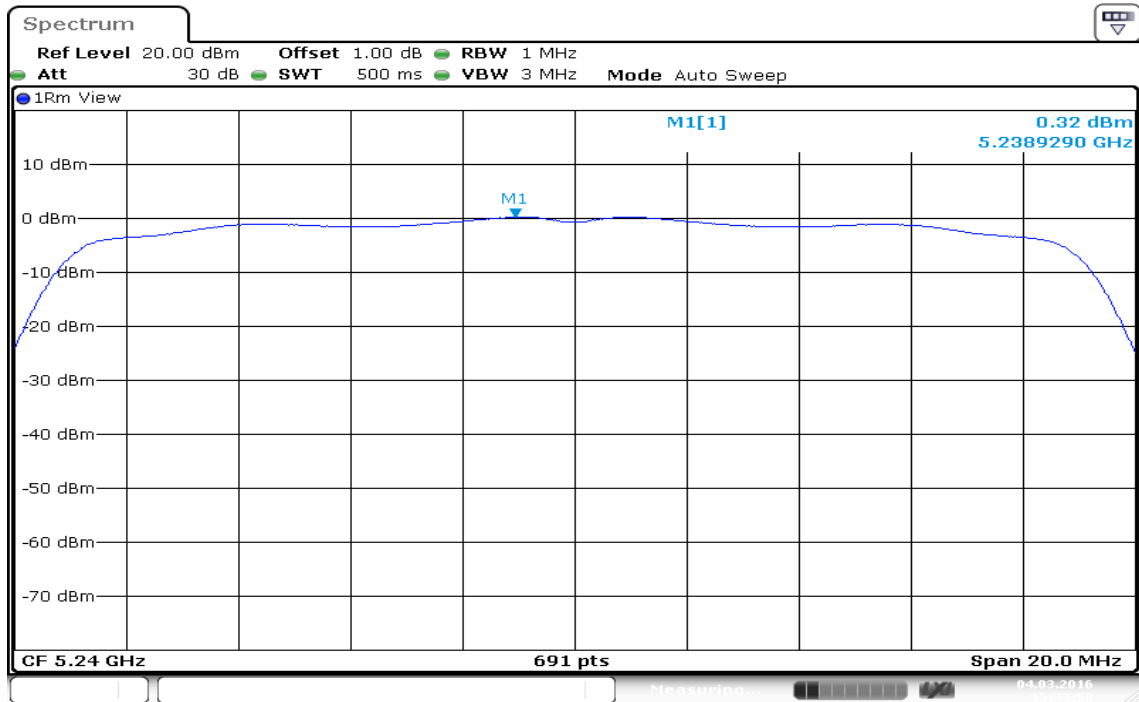
**IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz****CH Low**

Date: 4.MAR.2016 15:31:53

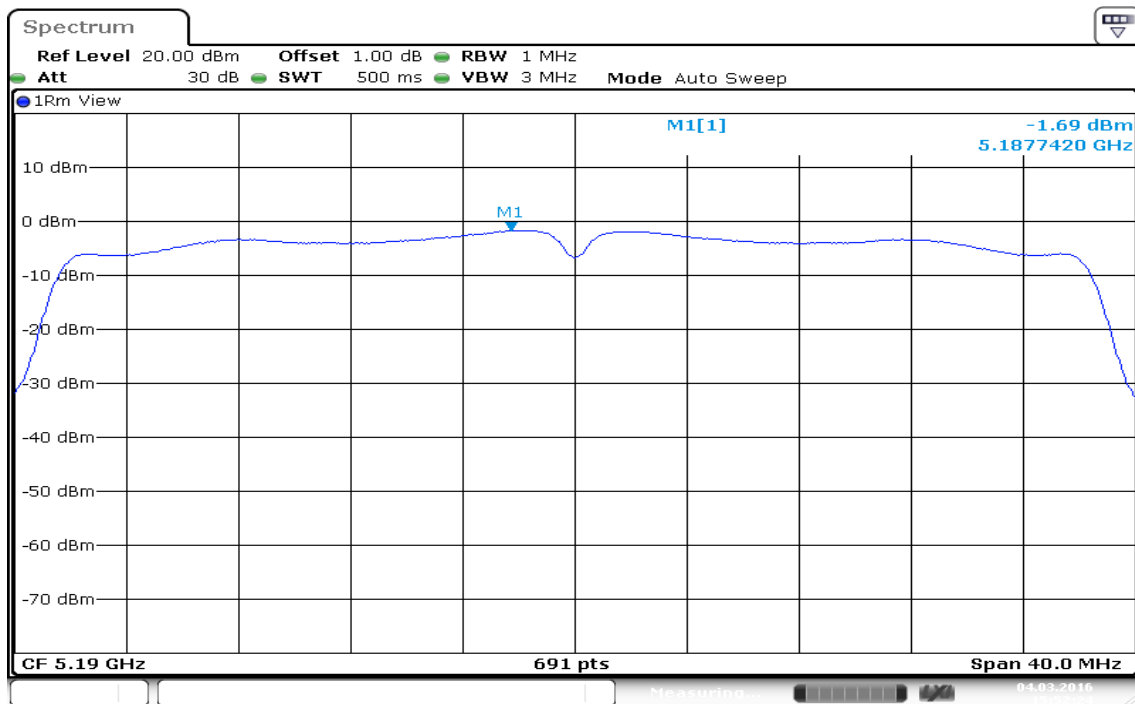
**CH Mid**

Date: 4.MAR.2016 15:34:49

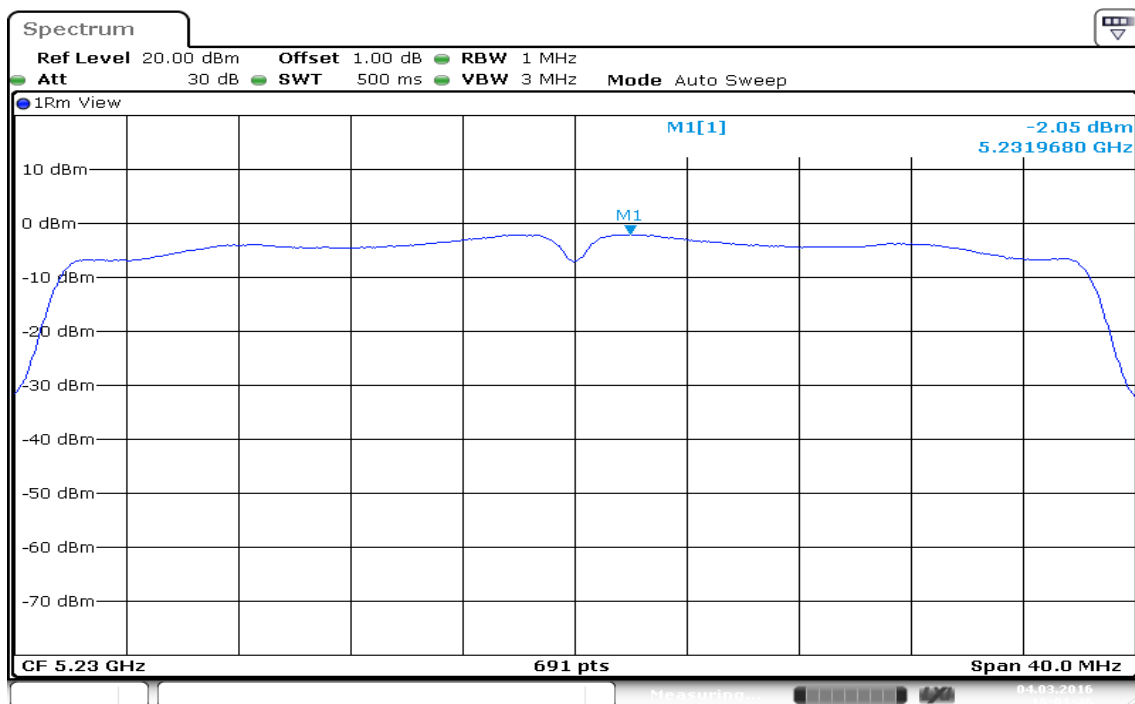
## CH High



Date: 4.MAR.2016 15:43:50

**IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz****CH Low**

Date: 4.MAR.2016 15:52:24

**CH High**

Date: 4.MAR.2016 16:01:46

## 7.5 RADIATED UNDESIRABLE EMISSION

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

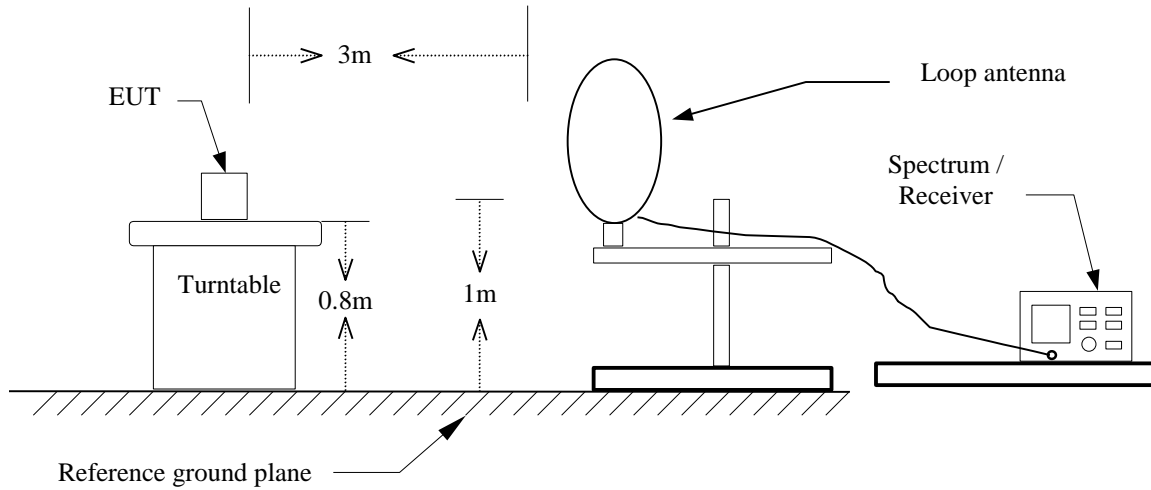
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

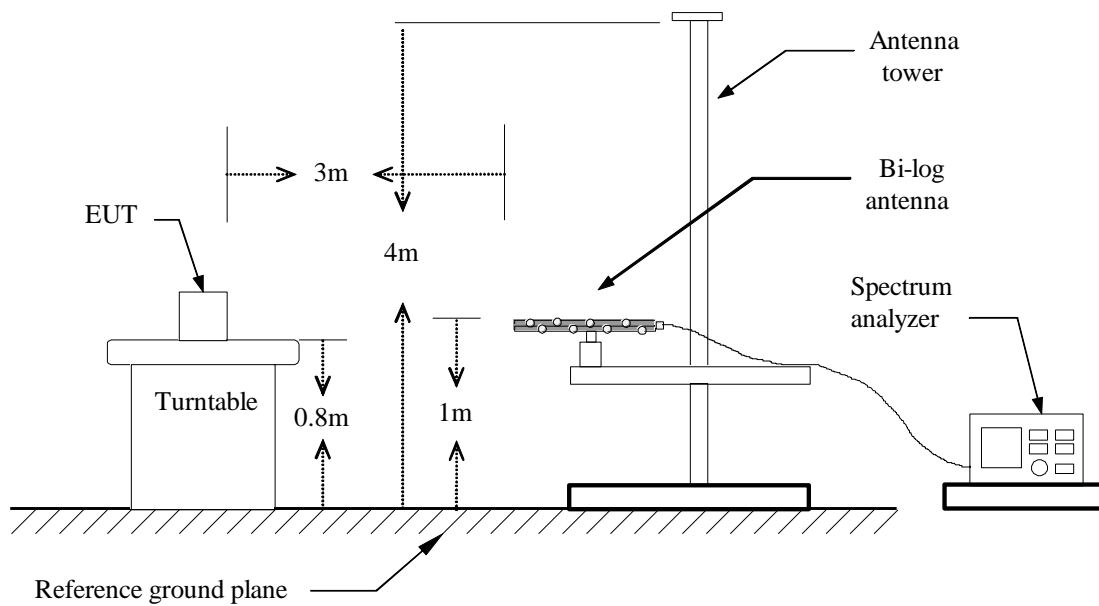


## Test Configuration

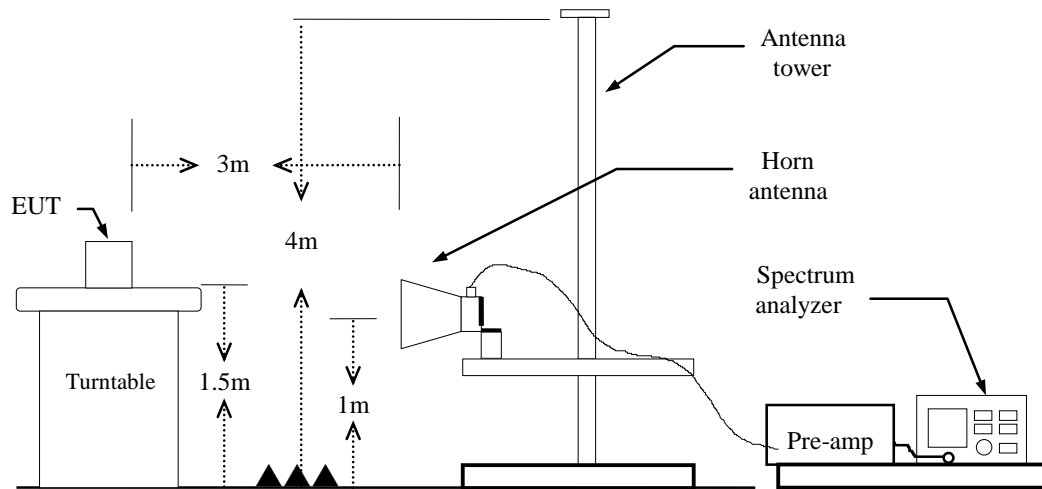
### 9kHz ~ 30MHz



### 30MHz ~ 1GHz



## Above 1 GHz



## **TEST PROCEDURE**

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m high and below 1 GHz is 0.8m high 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=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz,  
if duty cycle  $\geq$  98%, VBW=10Hz.

if duty cycle < 98% VBW=1/T.

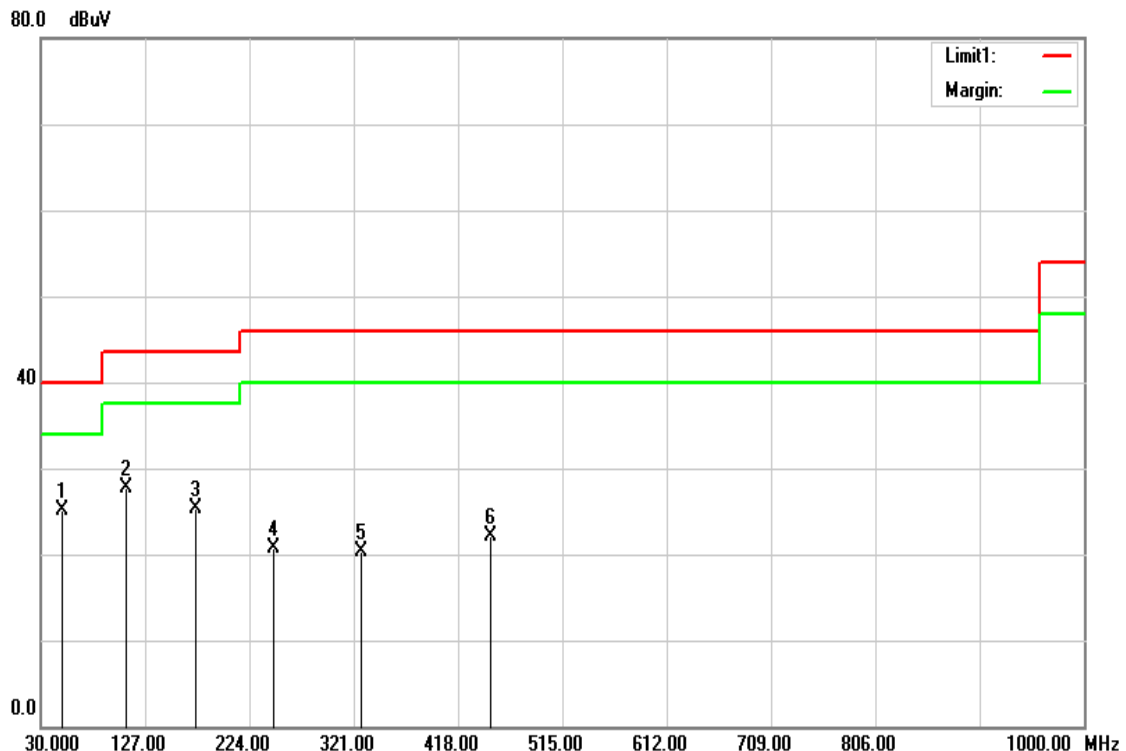
**IEEE 802.11a mode:**  $\geq$  98%, VBW=10Hz

**IEEE 802.11n HT 20 MHz mode:** =97%, VBW=1.5kHz

**IEEE 802.11n HT 40 MHz mode:**  $\geq$  98%, VBW=10Hz

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

**Note:** We checked every harmonics frequencies from Fundamental frequencies with reduced VBW, and we mark a point to prove pass or not if we find any emission. For this case, there are no emissions hidden in the noise floor.

**Below 1GHz****Operation Mode:** Normal Link**Temperature:** 27°C**Humidity:** 53% RH**Test Date:** March 16, 2016**Tested by:** Jason Lu**Polarity:** Ver.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
50.3700	46.27	-21.11	25.16	40.00	-14.84	peak	V
109.5400	45.15	-17.35	27.80	43.50	-15.70	peak	V
173.5600	42.24	-17.02	25.22	43.50	-18.28	peak	V
246.3100	36.97	-16.36	20.61	46.00	-25.39	peak	V
327.7900	33.71	-13.49	20.22	46.00	-25.78	peak	V
448.0700	32.38	-10.25	22.13	46.00	-23.87	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

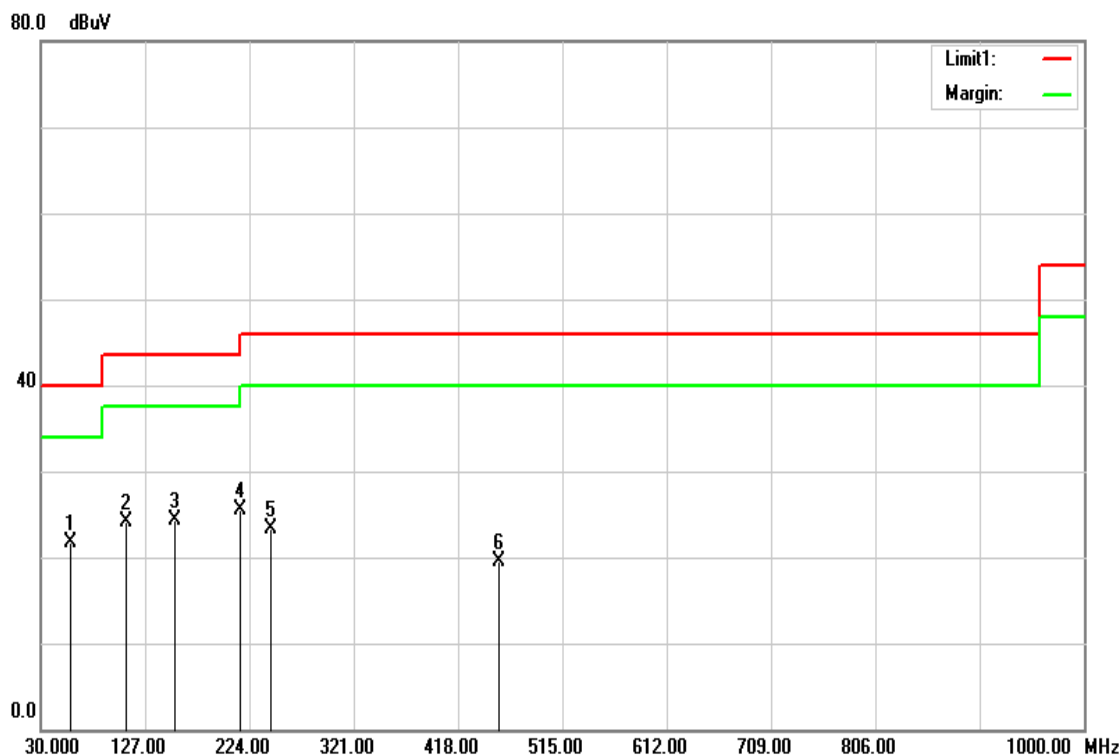
Temperature: 27°C

Humidity: 53% RH

Test Date: March 16, 2016

Tested by: Jason Lu

Polarity: Hor.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
57.1600	43.50	-21.81	21.69	40.00	-18.31	peak	H
109.5400	41.41	-17.35	24.06	43.50	-19.44	peak	H
155.1300	40.52	-16.22	24.30	43.50	-19.20	peak	H
215.2700	42.14	-16.63	25.51	43.50	-17.99	peak	H
243.4000	39.68	-16.43	23.25	46.00	-22.75	peak	H
455.8300	29.52	-10.08	19.44	46.00	-26.56	peak	H

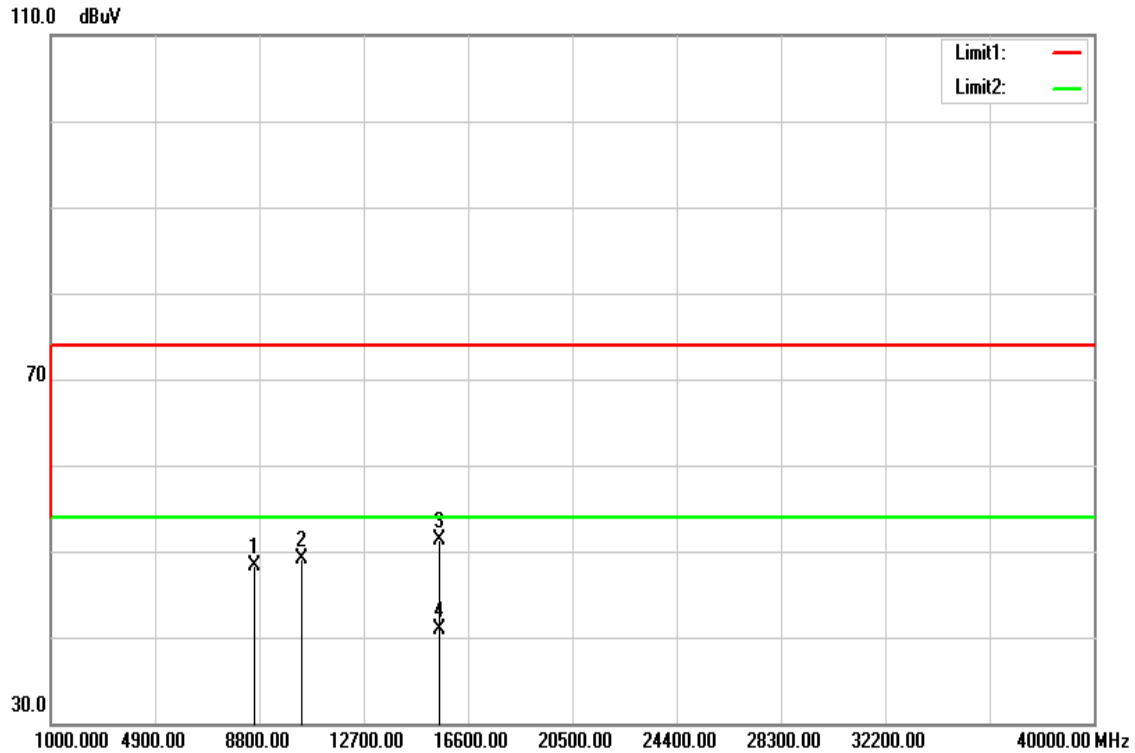
**Remark:**

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).

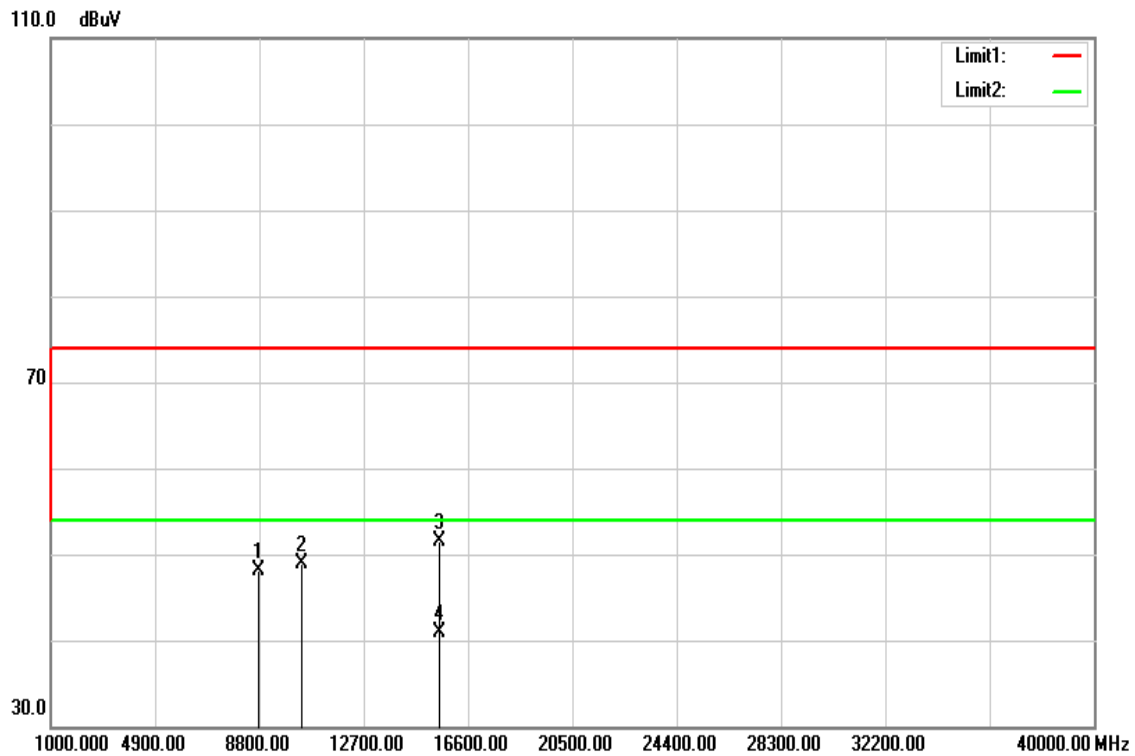
**Above 1 GHz**

**Tx / IEEE 802.11a mode / CH Low**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** Tx / IEEE 802.11a mode / CH Low**Test Date:** March 16, 2016**Temperature:** 27°C**Tested by:** Jason Lu**Humidity:** 53% RH**Polarity:** Ver. / Hor.

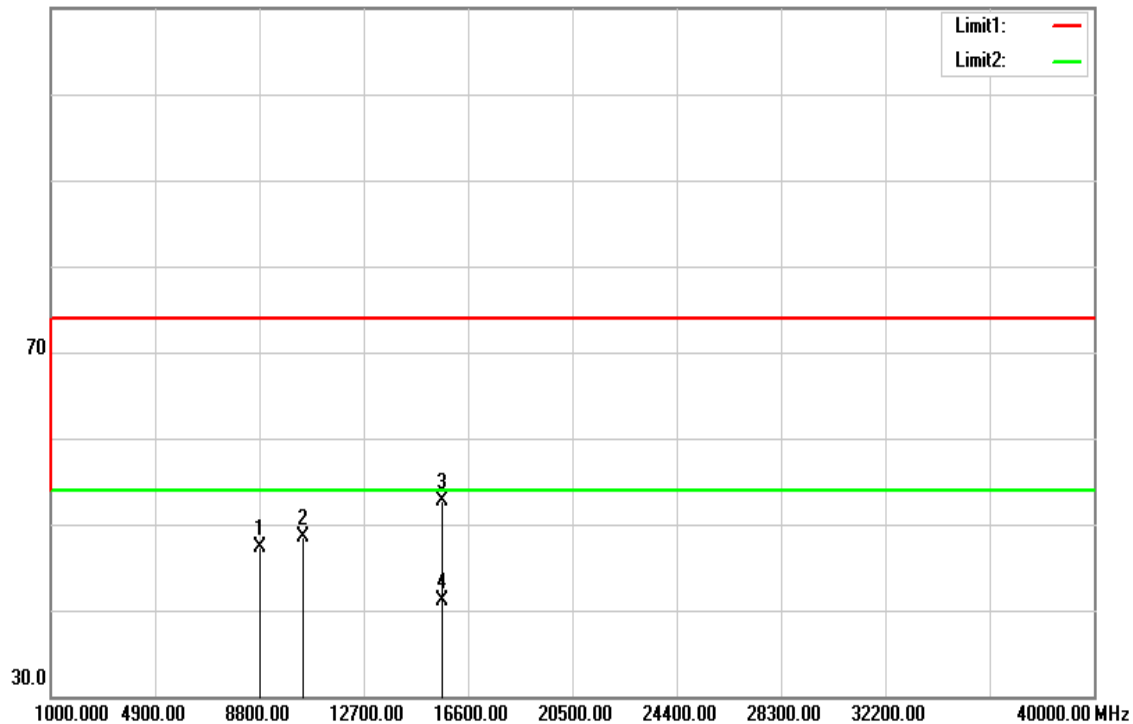
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8610.000	34.57	13.69	48.26	74.00	-25.74	peak	V
10360.000	32.53	16.52	49.05	74.00	-24.95	peak	V
15540.000	32.32	19.04	51.36	74.00	-22.64	peak	V
15540.000	21.81	19.04	40.85	54.00	-13.15	AVG	V
N/A							
8750.000	34.37	13.75	48.12	74.00	-25.88	peak	H
10360.000	32.42	16.52	48.94	74.00	-25.06	peak	H
15540.000	32.43	19.04	51.47	74.00	-22.53	peak	H
15540.000	21.82	19.04	40.86	54.00	-13.14	AVG	H
N/A							

**Remark:**

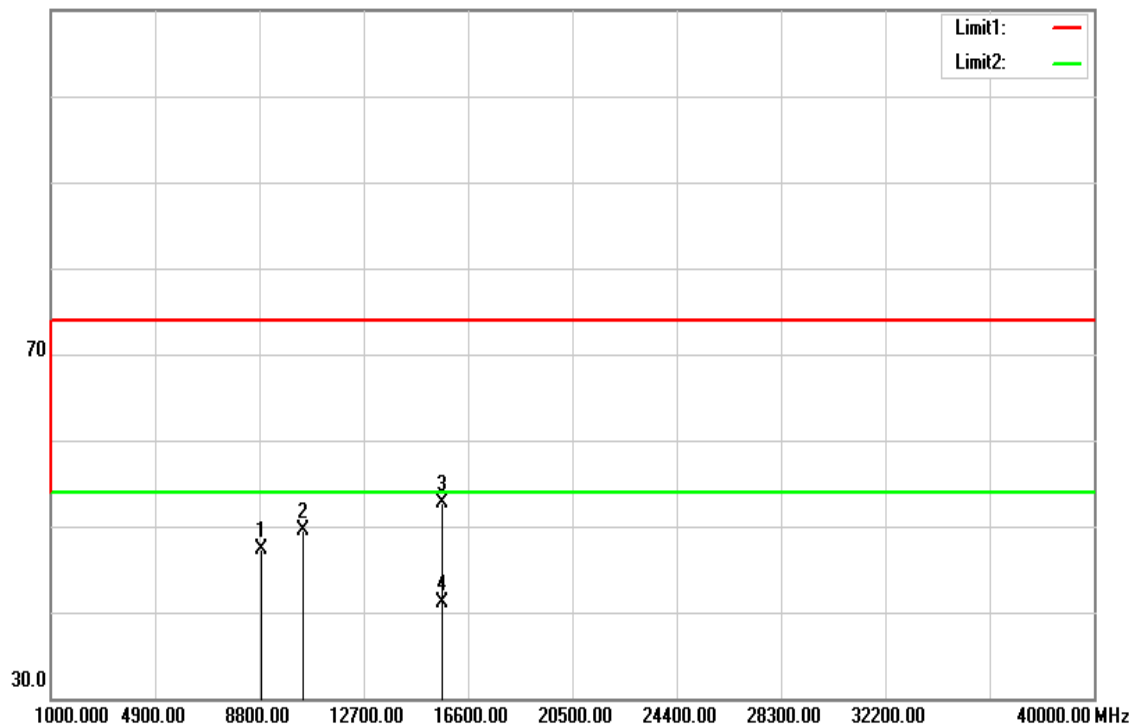
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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 802.11a mode / CH Mid****Polarity: Vertical**

110.0 dBuV

**Polarity: Horizontal**

110.0 dBuV





**Operation Mode:** Tx / IEEE 802.11a mode / CH Mid**Test Date:** March 16, 2016**Temperature:** 27°C**Tested by:** Jason Lu**Humidity:** 53% RH**Polarity:** Ver. / Hor.

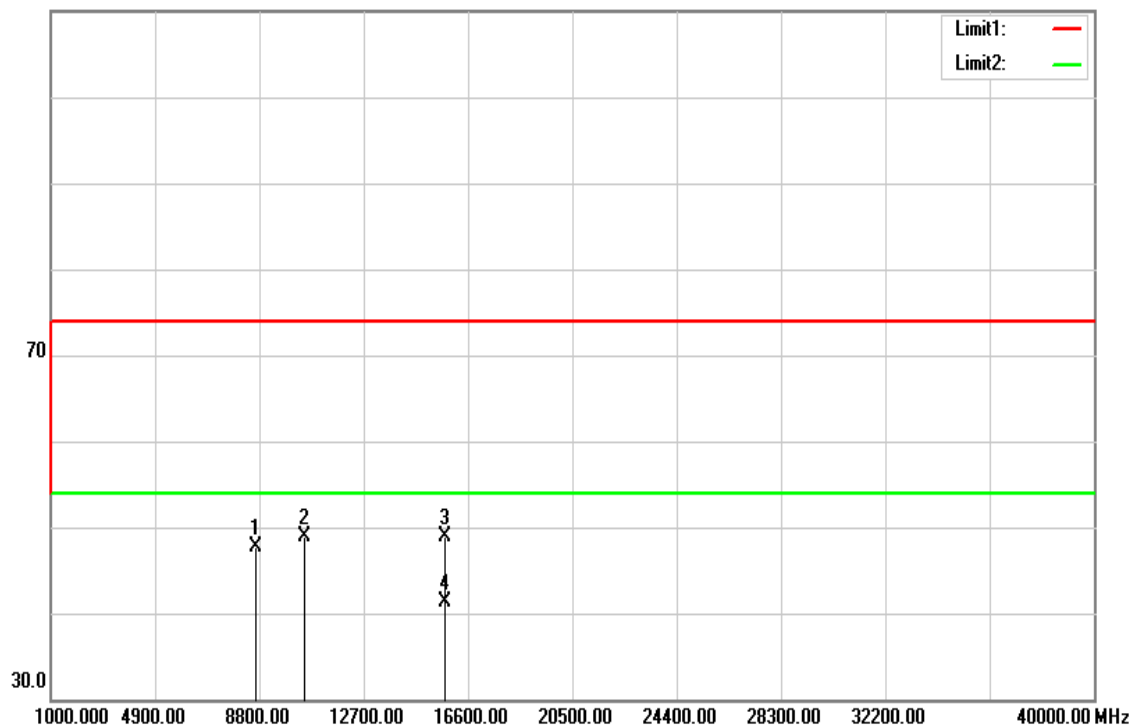
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8814.000	33.47	13.78	47.25	74.00	-26.75	peak	V
10440.000	31.70	16.89	48.59	74.00	-25.41	peak	V
15660.000	33.60	19.14	52.74	74.00	-21.26	peak	V
15660.000	21.97	19.14	41.11	54.00	-12.89	AVG	V
N/A							
8865.000	33.46	13.81	47.27	74.00	-26.73	peak	H
10440.000	32.55	16.89	49.44	74.00	-24.56	peak	H
15660.000	33.53	19.14	52.67	74.00	-21.33	peak	H
15660.000	21.97	19.14	41.11	54.00	-12.89	AVG	H
N/A							

**Remark:**

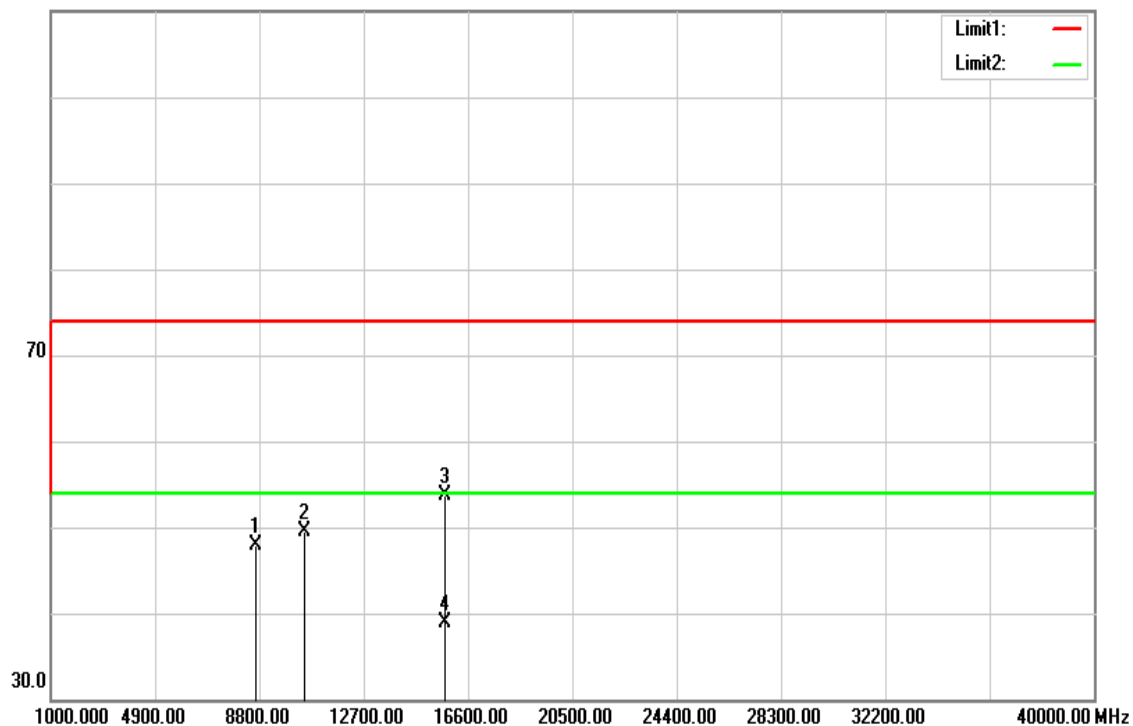
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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 802.11a mode / CH High****Polarity: Vertical**

110.0 dBuV

**Polarity: Horizontal**

110.0 dBuV



**Operation Mode:** Tx / IEEE 802.11a mode / CH High**Test Date:** March 16, 2016**Temperature:** 27°C**Tested by:** Jason Lu**Humidity:** 53% RH**Polarity:** Ver. / Hor.

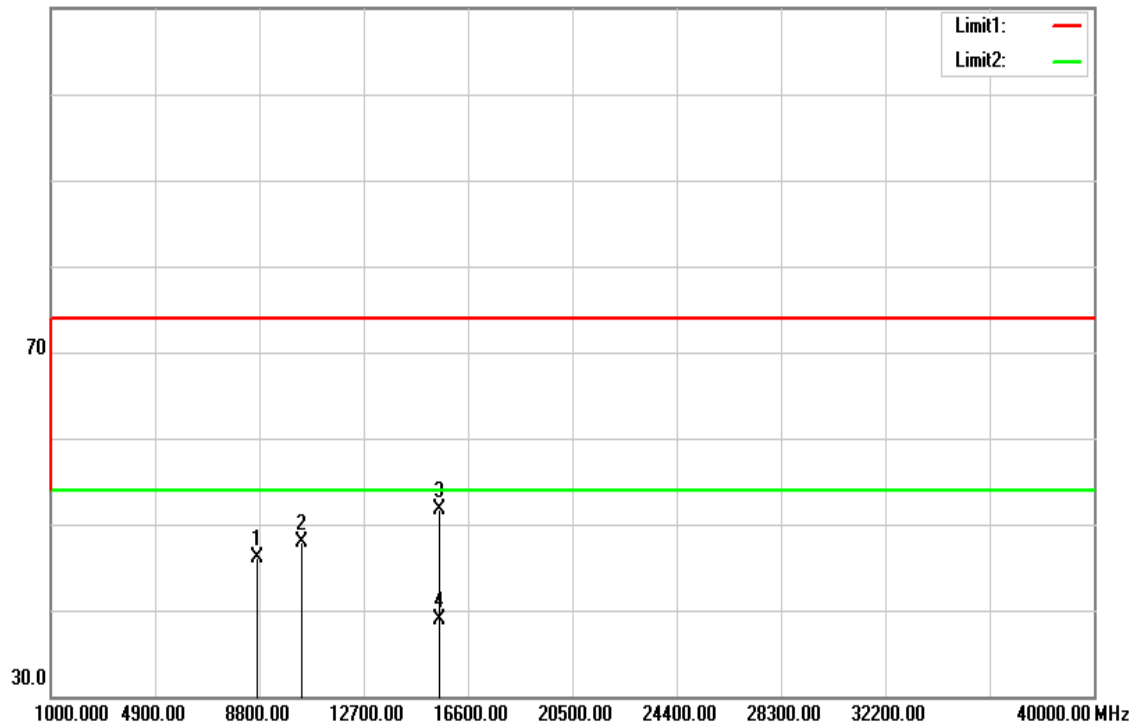
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8690.000	34.02	13.73	47.75	74.00	-26.25	peak	V
10480.000	31.84	17.07	48.91	74.00	-25.09	peak	V
15720.000	29.72	19.19	48.91	74.00	-25.09	peak	V
15720.000	22.04	19.19	41.23	54.00	-12.77	AVG	V
N/A							
8650.000	34.12	13.71	47.83	74.00	-26.17	peak	H
10480.000	32.34	17.07	49.41	74.00	-24.59	peak	H
15720.000	34.51	19.19	53.70	74.00	-20.30	peak	H
15720.000	19.65	19.19	38.84	54.00	-15.16	AVG	H
N/A							

**Remark:**

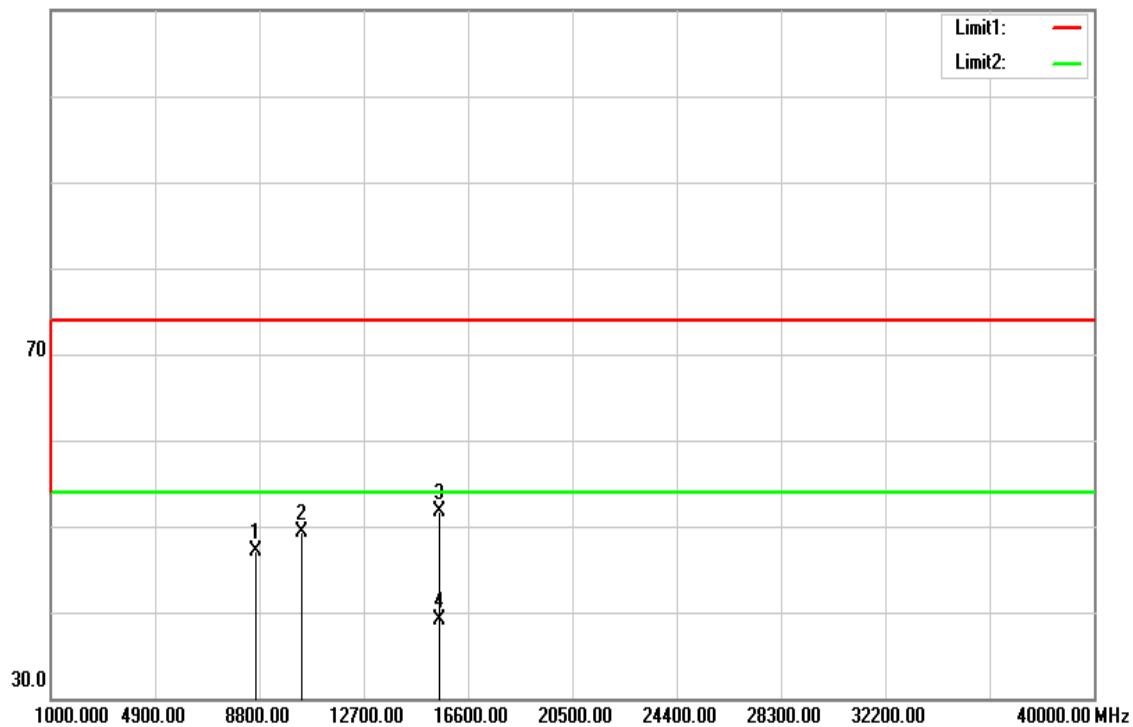
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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**

110.0 dBuV

**Polarity: Horizontal**

110.0 dBuV



**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / CH Low **Test Date:** March 16, 2016

**Temperature:** 27°C

**Tested by:** Jason Lu

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8740.000	32.44	13.75	46.19	74.00	-27.81	peak	V
10360.000	31.43	16.52	47.95	74.00	-26.05	peak	V
15540.000	32.75	19.04	51.79	74.00	-22.21	peak	V
15540.000	19.91	19.04	38.95	54.00	-15.05	AVG	V
N/A							
8690.000	33.36	13.73	47.09	74.00	-26.91	peak	H
10360.000	32.70	16.52	49.22	74.00	-24.78	peak	H
15540.000	32.64	19.04	51.68	74.00	-22.32	peak	H
15540.000	20.06	19.04	39.10	54.00	-14.90	AVG	H
N/A							

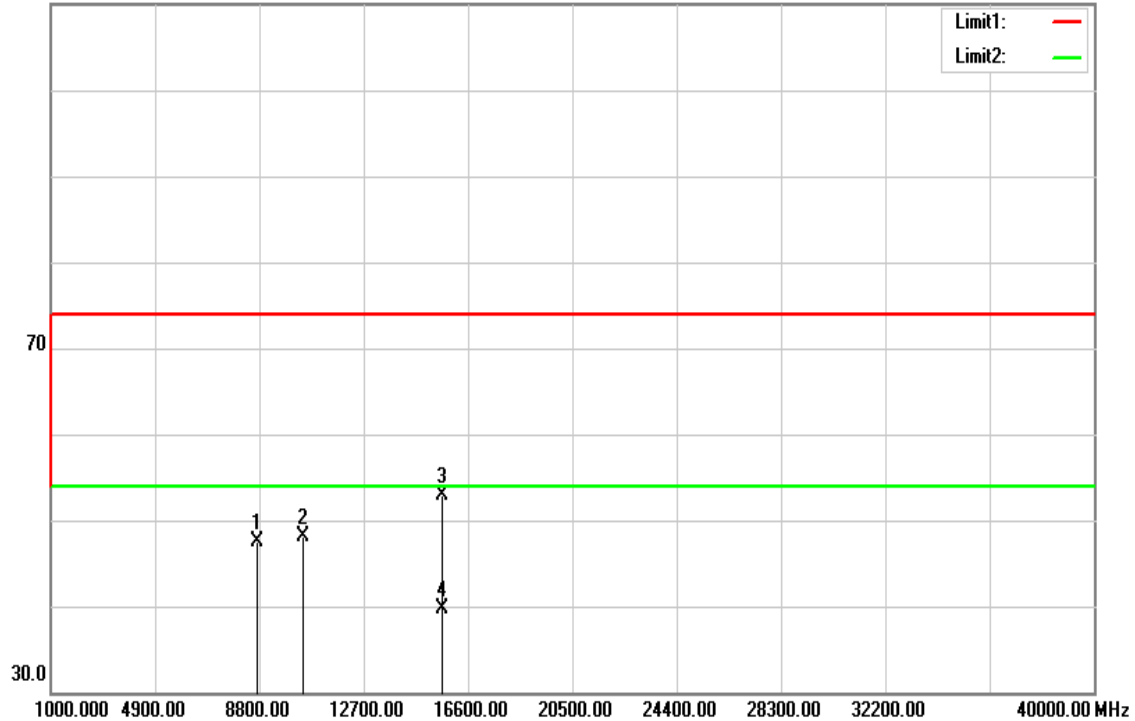
**Remark:**

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.
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 Channel mode / CH Mid**

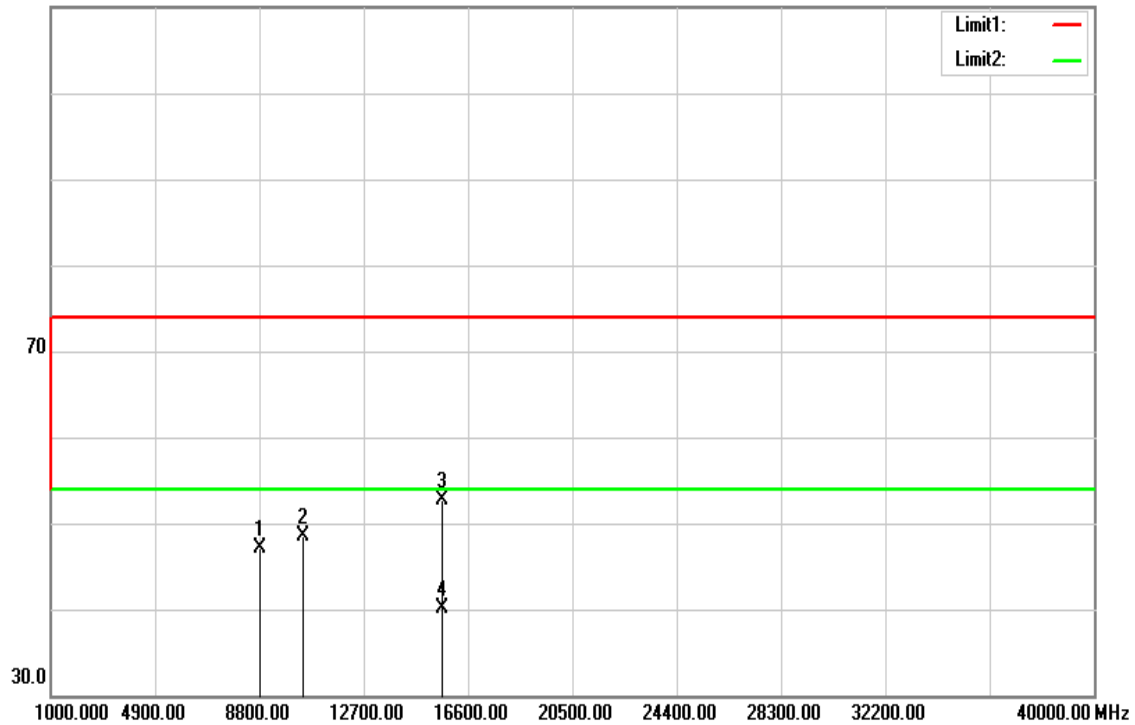
**Polarity: Vertical**

110.0 dBuV



**Polarity: Horizontal**

110.0 dBuV



**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / CH Mid **Test Date:** March 16, 2016

**Temperature:** 27°C

**Tested by:** Jason Lu

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

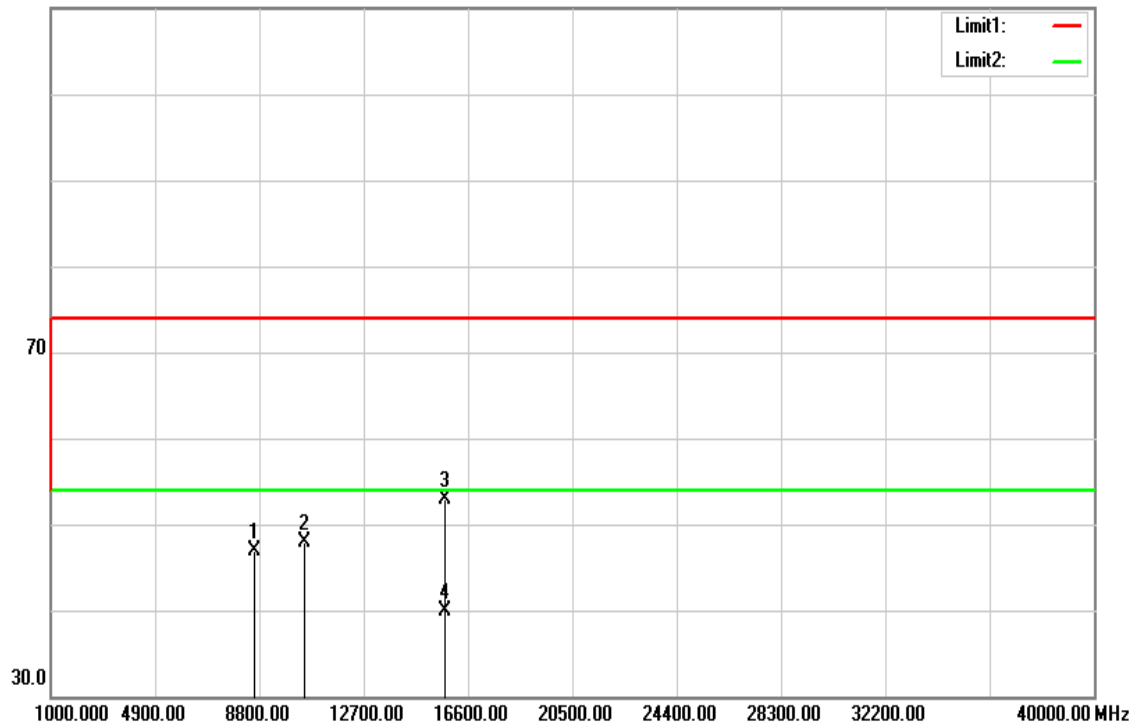
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8700.000	33.83	13.73	47.56	74.00	-26.44	peak	V
10440.000	31.13	16.89	48.02	74.00	-25.98	peak	V
15660.000	33.75	19.14	52.89	74.00	-21.11	peak	V
15660.000	20.66	19.14	39.80	54.00	-14.20	AVG	V
N/A							
8800.000	33.26	13.78	47.04	74.00	-26.96	peak	H
10440.000	31.52	16.89	48.41	74.00	-25.59	peak	H
15660.000	33.58	19.14	52.72	74.00	-21.28	peak	H
15660.000	21.03	19.14	40.17	54.00	-13.83	AVG	H
N/A							

**Remark:**

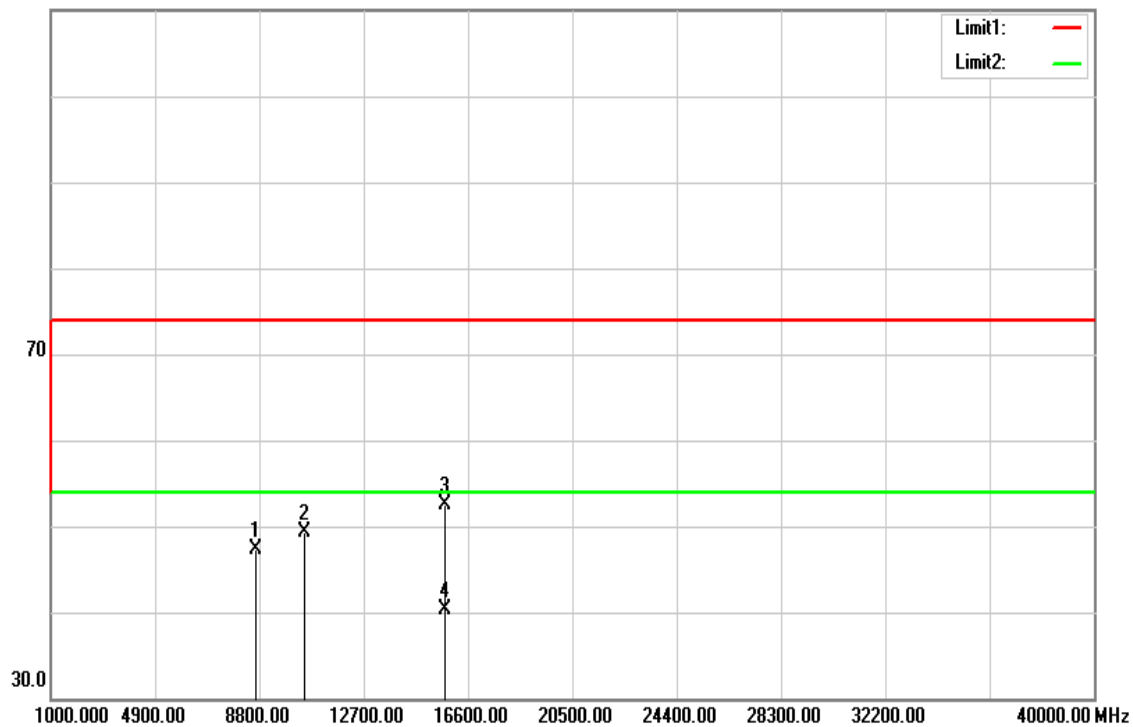
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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**

110.0 dBuV

**Polarity: Horizontal**

110.0 dBuV





**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / CH High **Test Date:** March 16, 2016

**Temperature:** 27°C

**Tested by:** Jason Lu

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

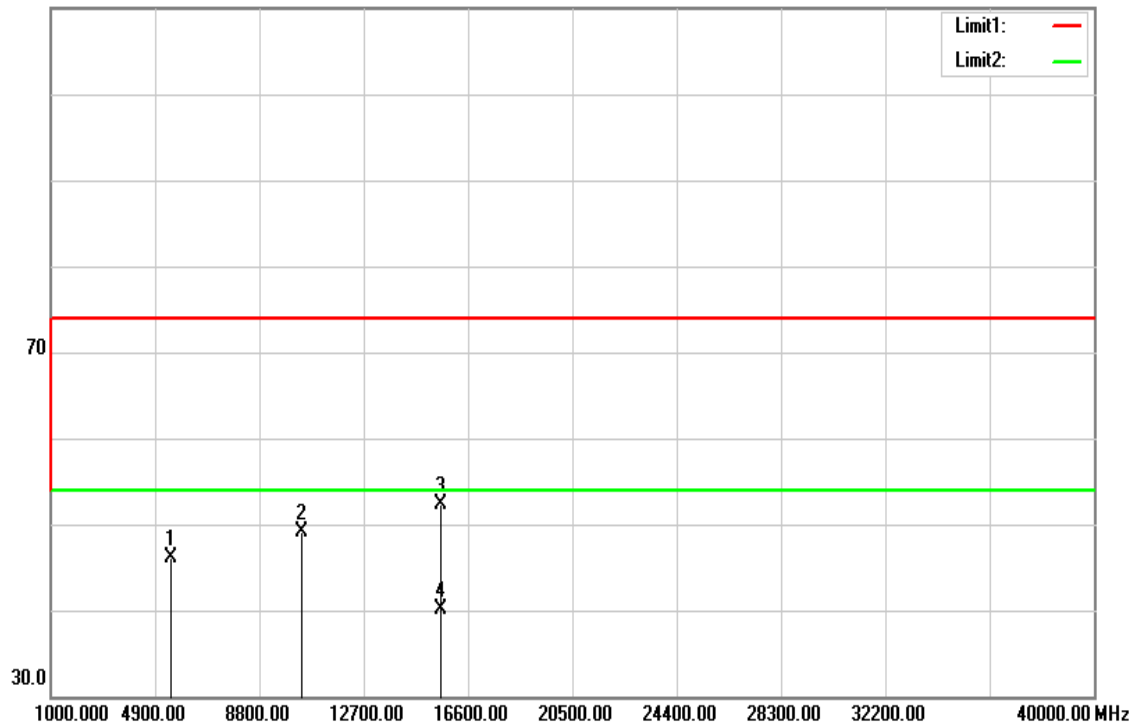
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8610.000	33.19	13.69	46.88	74.00	-27.12	peak	V
10480.000	30.79	17.07	47.86	74.00	-26.14	peak	V
15720.000	33.67	19.19	52.86	74.00	-21.14	peak	V
15720.000	20.65	19.19	39.84	54.00	-14.16	AVG	V
N/A							
8650.000	33.56	13.71	47.27	74.00	-26.73	peak	H
10480.000	32.24	17.07	49.31	74.00	-24.69	peak	H
15720.000	33.30	19.19	52.49	74.00	-21.51	peak	H
15720.000	21.01	19.19	40.20	54.00	-13.80	AVG	H
N/A							

**Remark:**

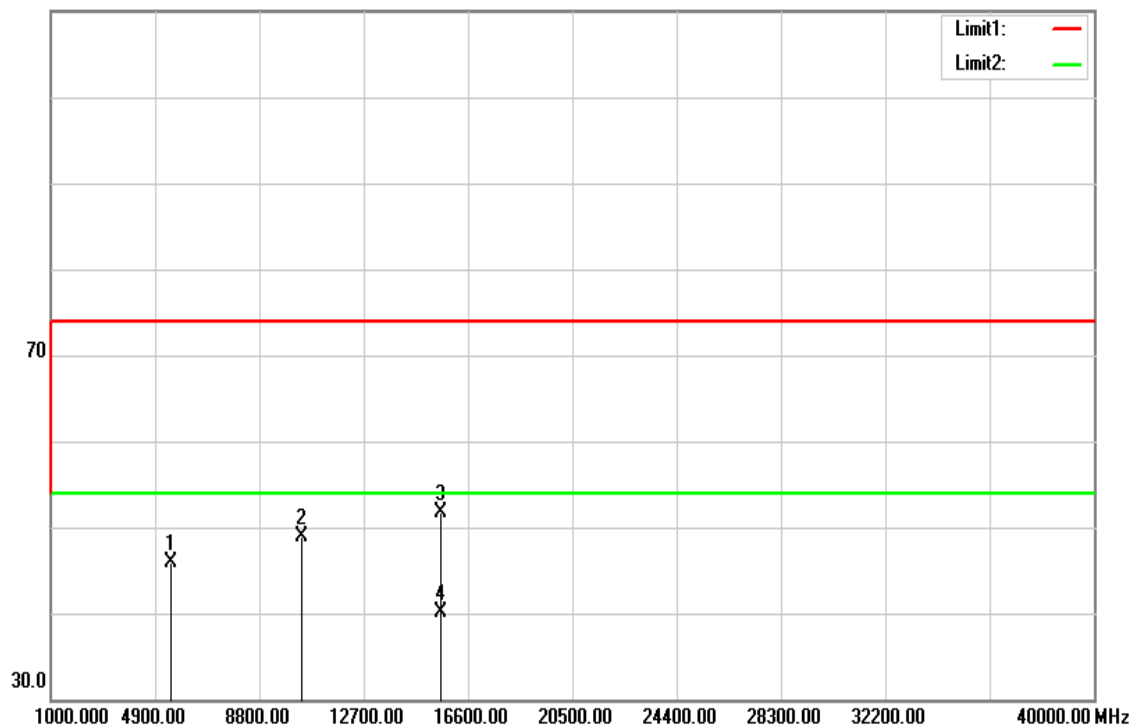
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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**

110.0 dBuV/m

**Polarity: Horizontal**

110.0 dBuV/m



**Operation Mode:** Tx / IEEE 802.11n HT 40 MHz mode / CH Low **Test Date:** February 26, 2016

**Temperature:** 27°C

**Tested by:** Jason Lu

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

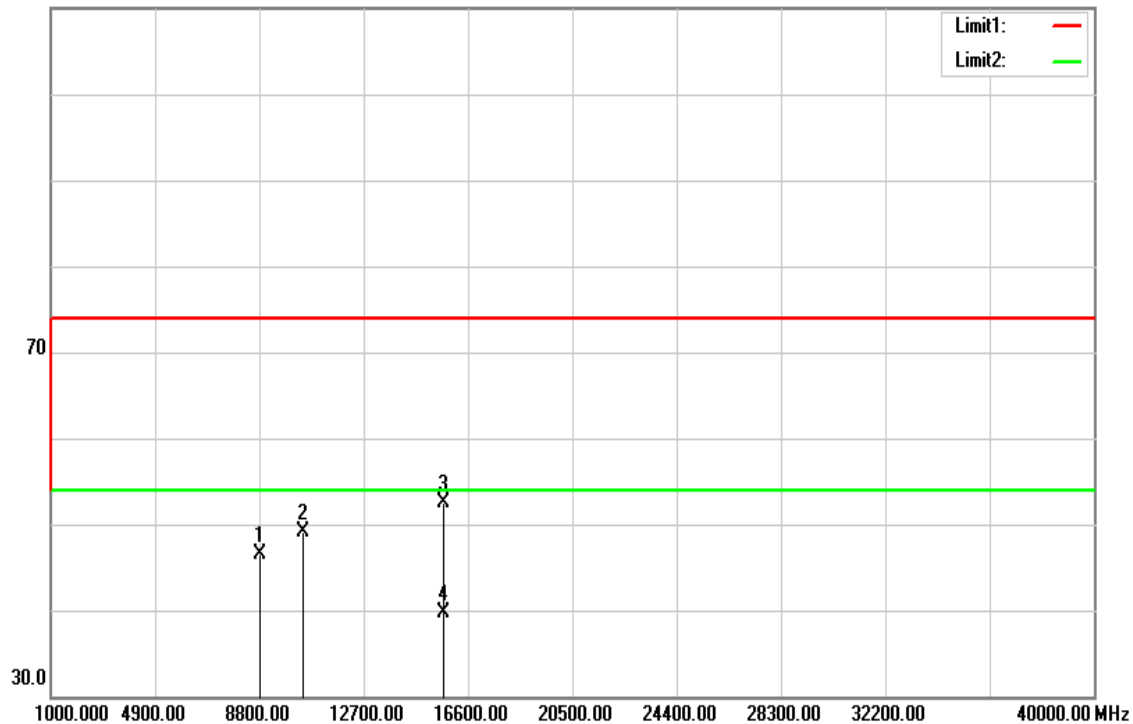
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
5490.000	40.82	5.30	46.12	74.00	-27.88	peak	V
10380.000	32.42	16.62	49.04	74.00	-24.96	peak	V
15570.000	33.23	19.07	52.30	74.00	-21.70	peak	V
15570.000	21.08	19.07	40.15	54.00	-13.85	AVG	V
N/A							
5480.000	40.52	5.34	45.86	74.00	-28.14	peak	H
10380.000	32.22	16.62	48.84	74.00	-25.16	peak	H
15570.000	32.64	19.07	51.71	74.00	-22.29	peak	H
15570.000	21.07	19.07	40.14	54.00	-13.86	AVG	H
N/A							

**Remark:**

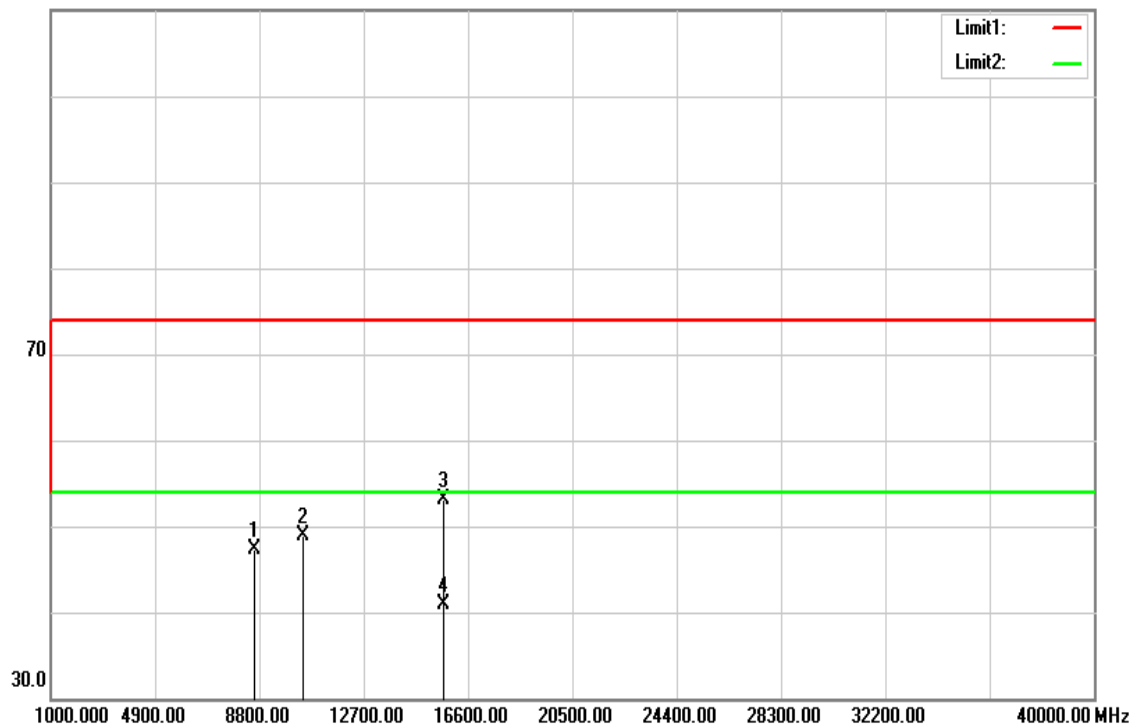
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
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**

110.0 dBuV

**Polarity: Horizontal**

110.0 dBuV



**Operation Mode:** Tx / IEEE 802.11n HT 40 MHz mode / CH High **Test Date:** March 16, 2016

**Temperature:** 27°C

**Tested by:** Jason Lu

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
8810.000	32.71	13.78	46.49	74.00	-27.51	peak	V
10460.000	32.12	16.98	49.10	74.00	-24.90	peak	V
15690.000	33.24	19.17	52.41	74.00	-21.59	peak	V
15690.000	20.62	19.17	39.79	54.00	-14.21	AVG	V
N/A							
8617.000	33.65	13.69	47.34	74.00	-26.66	peak	H
10460.000	32.02	16.98	49.00	74.00	-25.00	peak	H
15690.000	33.88	19.17	53.05	74.00	-20.95	peak	H
15690.000	21.64	19.17	40.81	54.00	-13.19	AVG	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.
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).

## 7.6 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**

**Operation Mode:** Normal Link      **Test Date:** March 25, 2016  
**Temperature:** 24°C      **Tested by:** Dennis Li  
**Humidity:** 56% RH

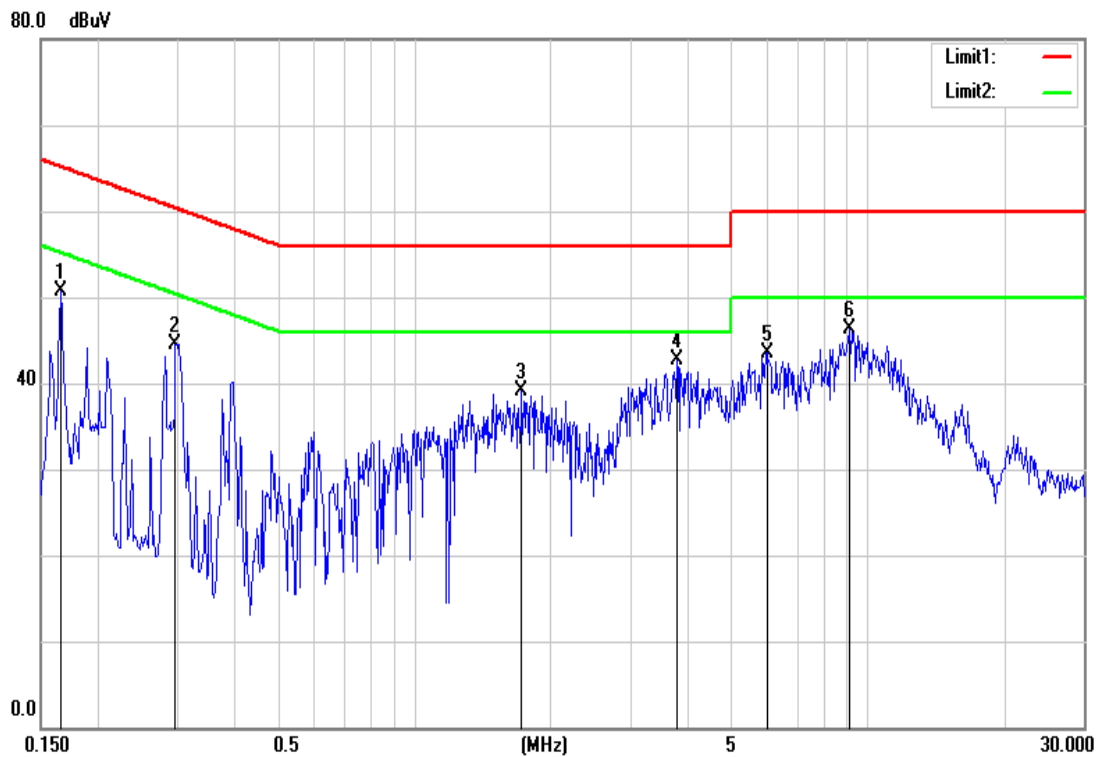
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1660	41.08	41.08	9.69	50.77	50.77	65.15	55.16	-14.38	-4.39	L1
0.2980	34.85	34.85	9.68	44.53	44.53	60.30	50.30	-15.77	-5.77	L1
1.7340	29.09	29.09	9.96	39.05	39.05	56.00	46.00	-16.95	-6.95	L1
3.8140	32.88	32.88	9.82	42.70	42.70	56.00	46.00	-13.30	-3.30	L1
6.0140	33.71	33.71	9.86	43.57	43.57	60.00	50.00	-16.43	-6.43	L1
9.1340	36.41	36.41	9.92	46.33	46.33	60.00	50.00	-13.67	-3.67	L1
0.1700	40.98	40.98	9.64	50.62	50.62	64.96	54.96	-14.34	-4.34	L2
0.1900	39.24	39.24	9.64	48.88	48.88	64.03	54.04	-15.15	-5.16	L2
0.2980	36.91	36.91	9.64	46.55	46.55	60.30	50.30	-13.75	-3.75	L2
1.7780	29.02	29.02	9.89	38.91	38.91	56.00	46.00	-17.09	-7.09	L2
8.9020	35.95	35.95	9.89	45.84	45.84	60.00	50.00	-14.16	-4.16	L2
9.6500	35.69	35.69	9.91	45.60	45.60	60.00	50.00	-14.40	-4.40	L2

**Remark:**

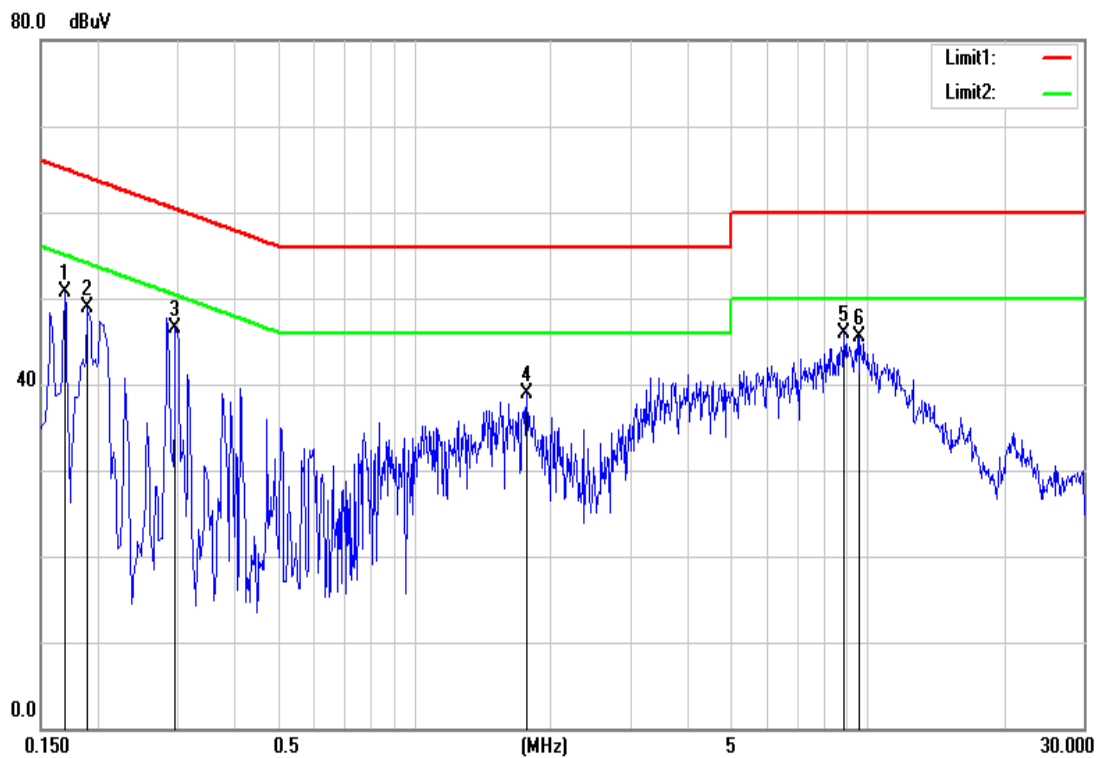
1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

## Test Plots

### Conducted emissions (Line 1)



### Conducted emissions (Line 2)



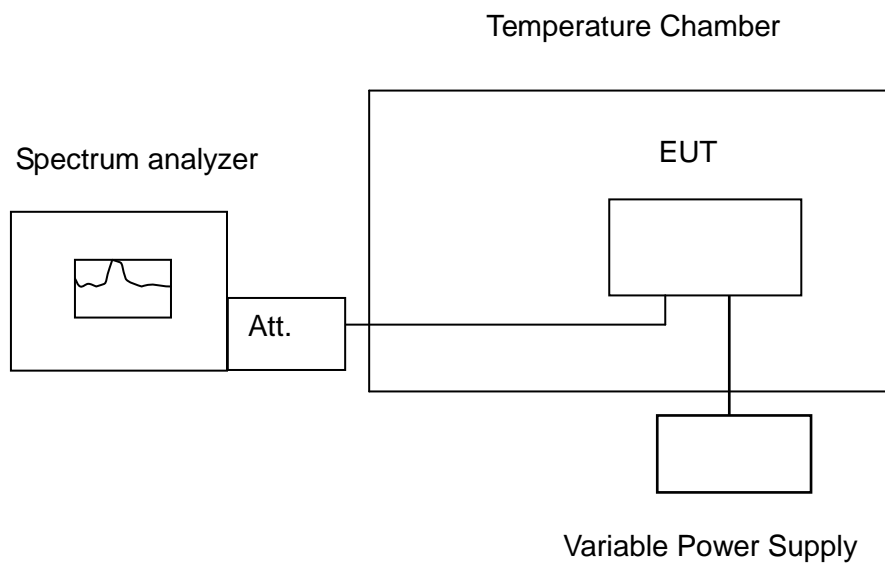


## 7.7 FREQUENCY STABILITY

### LIMIT

According to §15.407(g) & RSS-247, manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the operational description.

### Test Configuration



**Remark:** Measurement setup for testing on Antenna connector

## **TEST PROCEDURE**

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

## **TEST RESULTS**

*No non-compliance noted.*

### **5220 MHz:**

Operating Frequency: 5220 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit	Result
			±20ppm	(Pass/Fail)
50	5	5220.007810	1.496168582	Pass
40	5	5219.981330	-3.576628353	Pass
30	5	5219.968740	-5.988505747	Pass
20	5	5219.968310	-6.070881226	Pass
10	5	5219.976990	-4.408045977	Pass
0	5	5219.990880	-1.747126437	Pass
-10	5	5220.001300	0.249042146	Pass
-20	5	5220.014330	2.745210728	Pass

Operating Frequency: 5220 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit	Result
			±20ppm	(Pass/Fail)
20	4.25	5219.969180	-5.904214559	Pass
	5	5219.968310	-6.070881226	Pass
	5.75	5219.968740	-5.988505747	Pass