

# FCC Part 15E Measurement and Test Report

For

**Shenzhen Modern Cowboy Technology Co., Ltd.**

**RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen,**

**China**

**FCC ID: 2AS4G-M16**

<b>FCC Rule(s):</b>	<u>FCC Part 15.407</u>
<b>Product Description:</b>	<u>Mobile handset 4G/LTE</u>
<b>Tested Model:</b>	<u>M16</u>
<b>Report No.:</b>	<u>WTX19X04020466W-3</u>
<b>Sample Receipt Date:</b>	<u>2019-04-04</u>
<b>Tested Date:</b>	<u>2019-04-04 to 2019-04-16</u>
<b>Issued Date:</b>	<u>2019-04-16</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Shenzhen Modern Cowboy Technology Co., Ltd.  
Address of applicant: RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen, China

Manufacturer: Shenzhen Modern Cowboy Technology Co., Ltd.  
Address of manufacturer: RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen, China

General Description of EUT	
Product Name:	Mobile handset 4G/LTE
Brand Name:	VEAH
Model No.:	M16
Adding Model(s):	/
Rated Voltage:	DC3.7V
Battery Capacity:	/
Power Adapter:	APS-M005050100W-G Input:AC100-240V 50/60Hz 0.3A Max Output: DC5V 1.0A
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n(HT20) , 802.11n-HT40
Frequency Range:	5150-5250MHz, 5725-5850MHz
RF Output Power:	12.35dBm (Conducted)
Type of Modulation:	BPSK, QPSK, 16QAM, 64QAM,
Data Rate:	6-54Mbps, up to 200Mbps
Type of Antenna:	Integral Antenna
Antenna Gain:	0.5dBi

### 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.407:** General technical requirements.

**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.

**KDB789033 D02 v02r01:** GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

### 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB789033 D02 v02r01. The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

### 1.4 Table for parameters of Test Software setting

Enter “\*#\*#3646633#\*#\*” into the calculator to enter the engineer mode, you can start to test. During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Mode	Test Frequency (MHz)												
	NCB: 20MHz												
	5180	5200	5240	5260	5300	5320	5500	5580	5700	5720	5745	5785	5825
802.11a 6Mbps	17	17	17	/	/	/	/	/	/	/	17	17	17
802.11n-HT20 MCS0	17	17	17	/	/	/	/	/	/	/	17	17	17
Mode	NCB: 40MHz												
	5190	5230	5270	5310	5510	5550	5670	5710	5755	5795			
802.11n-HT40 MCS0	17	17	/	/	/	/	/	/	17	17			
Mode	NCB: 80MHz												
	5210		5290		5530		5610		5690		5775		
802.11ac-VH80 MCS0/Nss2	/		/		/		/		/		/		

### **1.5 EUT Operating during test**

EUT was programmed to be in continuously transmitting mode. During the test, EUT operation to normal function and programs under Android were executed.

### **1.6 Test Facility**

#### **FCC – Registration No.: 125990**

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

#### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

### 1.7 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11a	5180MHz,5200MHz,5240MHz, ,5745MHz, 5785MHz,5825MHz
TM2	802.11n-HT20	5180MHz,5200MHz,5240MHz, 5745MHz, 5785MHz,5825MHz
TM3	802.11n-HT40	5190MHz,5230MHz, 5755MHz,5795MHz

Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.

Test Conditions	
Temperature:	22~25 °C
Relative humidity	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
USB Cable	1.0	Unshielded	Without Ferrite
Headphone cable	1.2	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

## 1.8 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

## 1.9 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-05-22	2019-05-21
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2019-03-18	2020-03-17
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2019-03-18	2020-03-17
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2019-03-18	2020-03-17
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2019-03-18	2020-03-17
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17



## 2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203; § 15.405	Antenna Requirement	Compliant
§ 15.207; § 15.407(b)(6)	Conducted Emission	Compliant
§ 15.407(a)(1),(2)	Power Spectral Density	Compliant
§ 15.407(e)	Emission Bandwidth and Occupied Bandwidth	Compliant
§ 15.407(a)(1),(2)	Maximum Conducted Output Power	Compliant
§ 15.407(b)(1),(2),(3),(4)	Undesirable emission	Compliant
§ 15.205; § 15.407(b)(1),(2),(3)	Radiated Emission	Compliant
§ 15.407(g)	Frequency Stability	Compliant
§ 15.407(h)	Dynamic Frequency Selection (DFS)	N/A

N/A: not applicable

### **3. RF Exposure**

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#### **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the SAR exposure, please see the SAR Report.

## **4. Antenna Requirement**

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### **4.1 Standard Applicable**

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

### **4.2 Evaluation Information**

This product has an integral antenna, fulfill the requirement of this section.

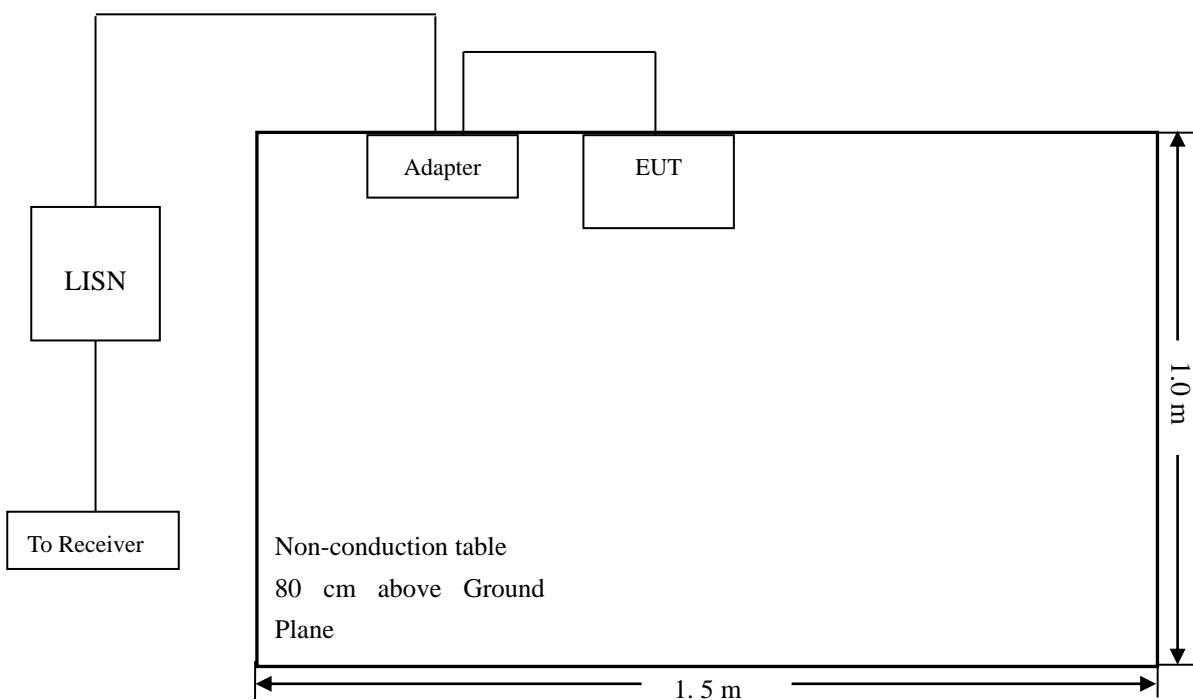
## 5. Conducted Emissions

### 5.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

### 5.2 Basic Test Setup Block Diagram



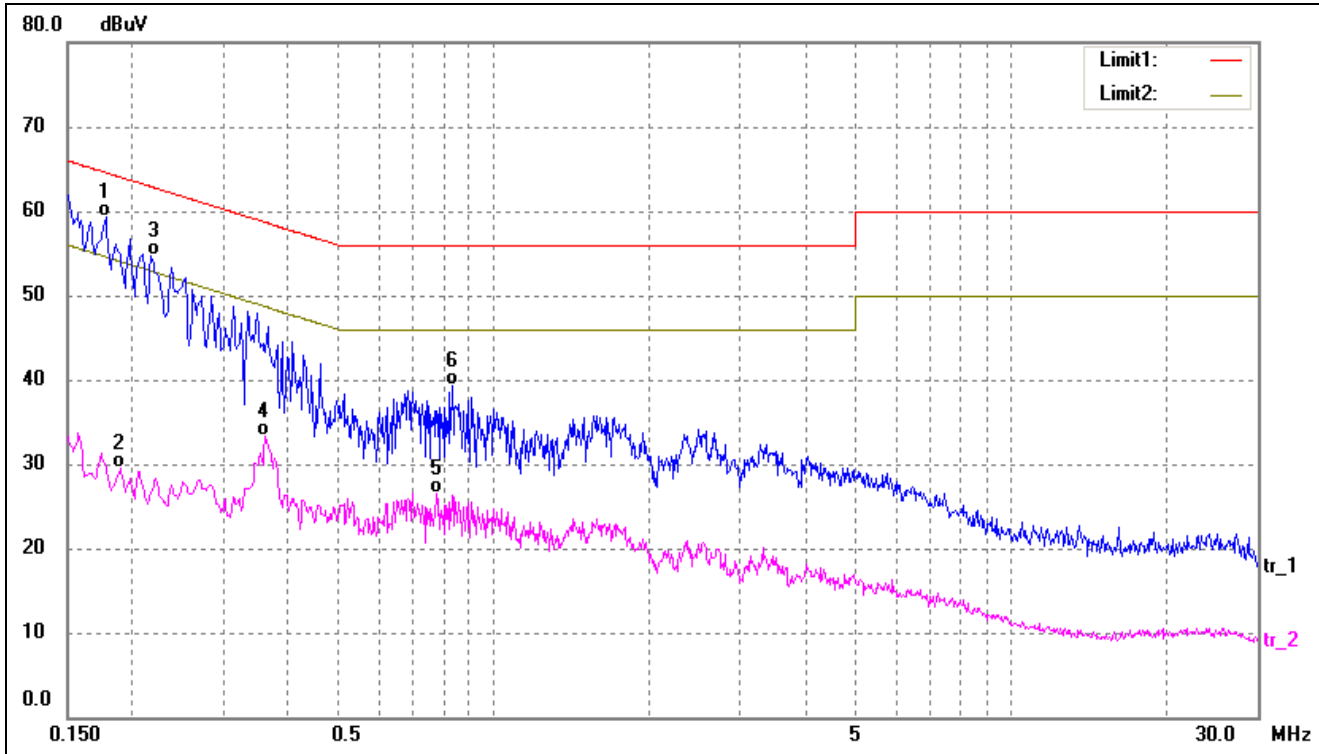
### 5.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency .....	150 kHz
Stop Frequency .....	30 MHz
Sweep Speed .....	Auto
IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth .....	9 kHz
Quasi-Peak Adapter Mode .....	Normal

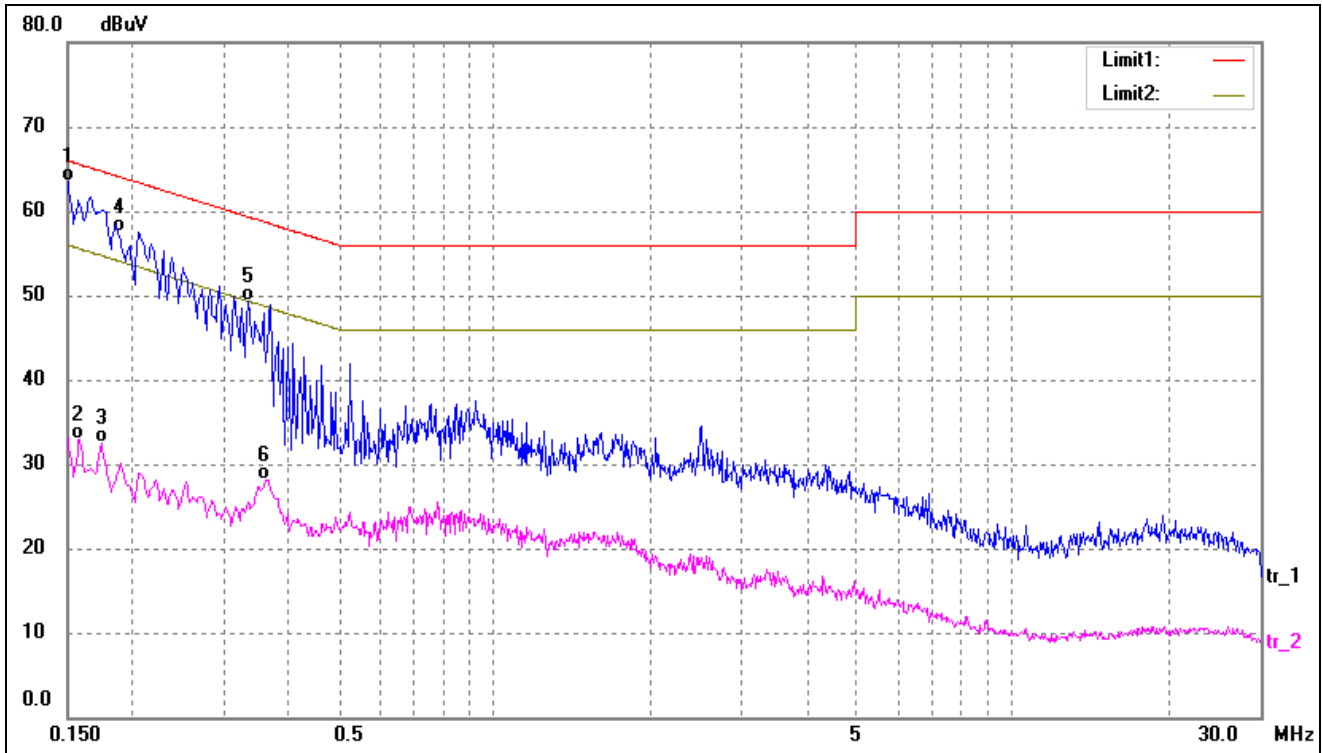
### 5.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1780	49.19	10.11	59.30	64.58	-5.28	QP
2	0.1900	19.45	10.12	29.57	54.04	-24.47	AVG
3	0.2180	44.59	10.13	54.72	62.89	-8.17	QP
4	0.3620	23.17	10.23	33.40	48.68	-15.28	AVG
5	0.7780	16.04	10.42	26.46	46.00	-19.54	AVG
6	0.8340	28.87	10.44	39.31	56.00	-16.69	QP

Test Mode	Communication	AC120V 60Hz	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1500	53.37	10.10	63.47	66.00	-2.53	QP
2	0.1580	22.90	10.10	33.00	55.57	-22.57	AVG
3	0.1740	22.33	10.11	32.44	54.77	-22.33	AVG
4	0.1874	47.43	10.11	57.54	64.15	-6.61	QP
5	0.3340	39.05	10.21	49.26	59.35	-10.09	QP
6	0.3620	17.84	10.23	28.07	48.68	-20.61	AVG

## 6. Power Spectral Density

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### 6.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands 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 megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### 6.2 Test Procedure

According to 789033 D02 v02r01 General UNII Test Procedures New Rules v02, the following is the measurement procedure.

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500kHz bandwidth, the following adjustments to the procedures apply:

- a) Set RBW  $\geq 1/T$ , where T is defined in section II.B.1.a).
- b) Set VBW  $\geq 3$  RBW.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500\text{kHz}/\text{RBW})$  to the measured result, whereas RBW ( $< 500$  kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1\text{MHz}/\text{RBW})$  to the measured result, whereas RBW ( $< 1$  MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHz is available on nearly all spectrum analyzers.

### 6.3 Summary of Test Results/Plots

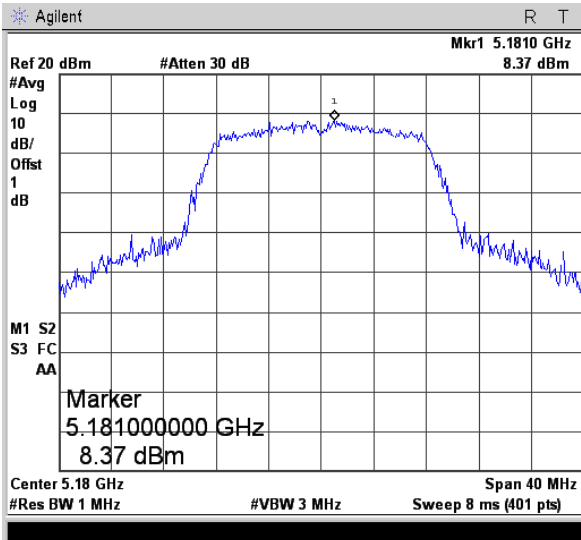
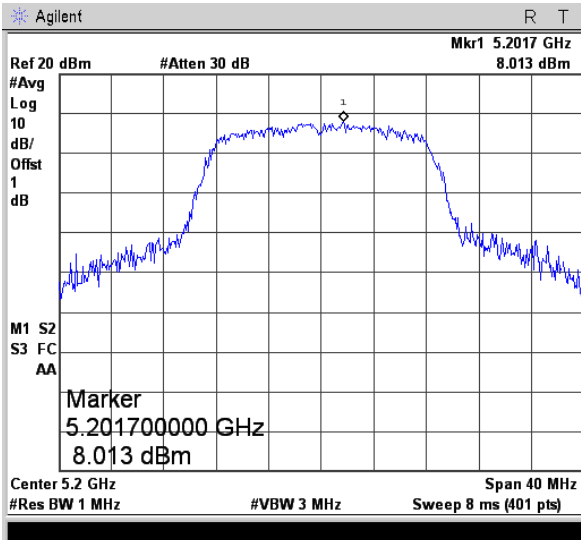
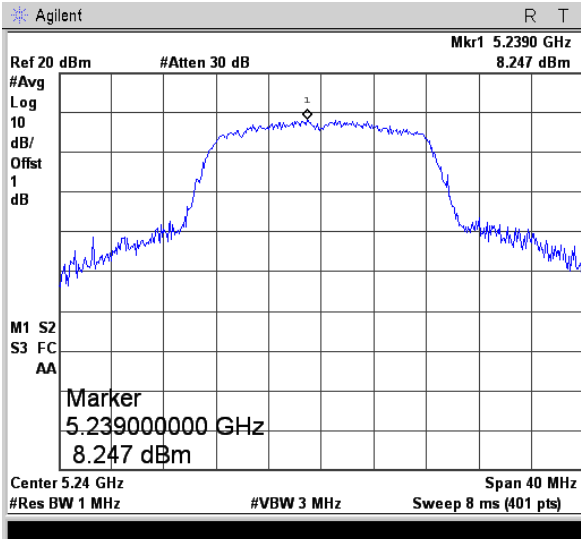
U-NII-1:5150-5250MHz			
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	8.370	11
	5200	8.013	11
	5240	8.247	11
802.11n-HT20	5180	7.929	11
	5200	7.731	11
	5240	8.037	11
802.11n-HT40	5190	4.688	11
	5230	4.511	11

U-NII-3: 5725-5850MHz					
Operating mode	Test Channel	Power Spectral Density dBm/300kHz	Factor	Power Spectral Density* dBm/500kHz	Limit dBm/500kHz
802.11a	5745	3.357	2.22	5.577	30
	5785	3.587	2.22	5.807	30
	5825	4.417	2.22	6.637	30
802.11n-HT20	5745	3.960	2.22	6.180	30
	5785	4.474	2.22	6.694	30
	5825	3.967	2.22	6.187	30
802.11n HT40	5755	0.155	2.22	2.375	30
	5795	0.050	2.22	2.270	30

\*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22

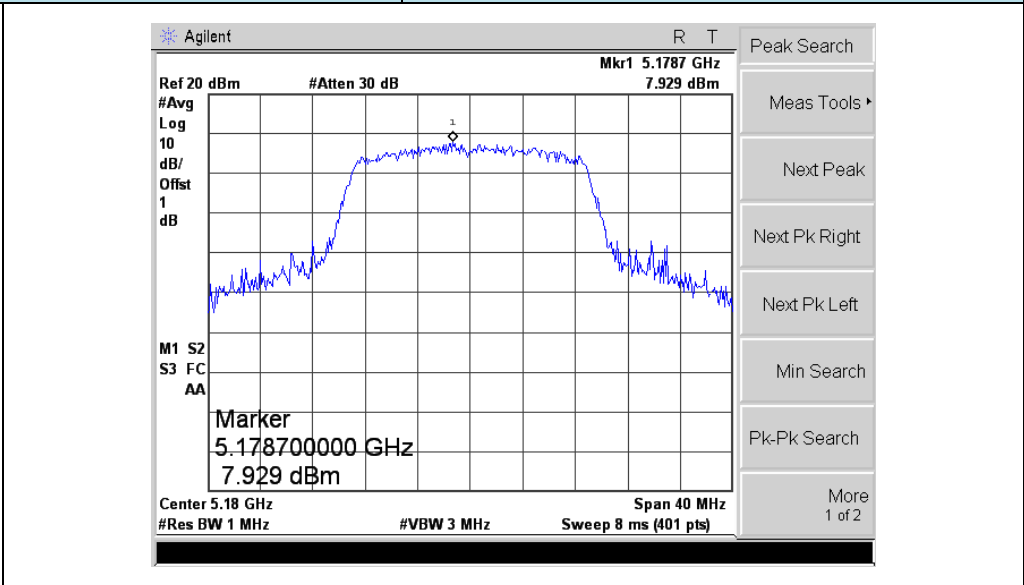


➤ 5150-5250MHz

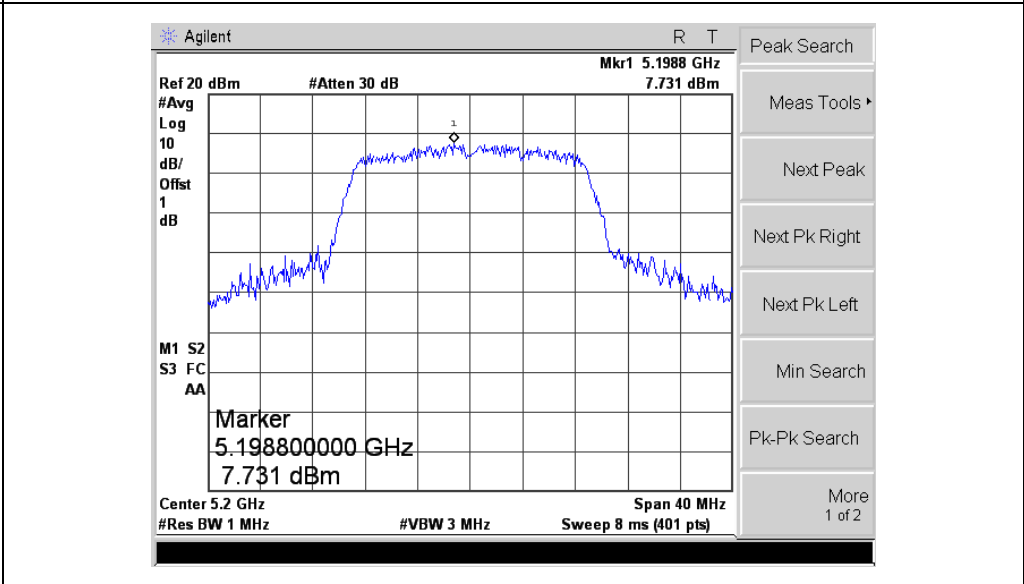
Mode:		802.11a
5180MHz		
5200MHz		
5240MHz		

**Mode:** 802.11n-HT20

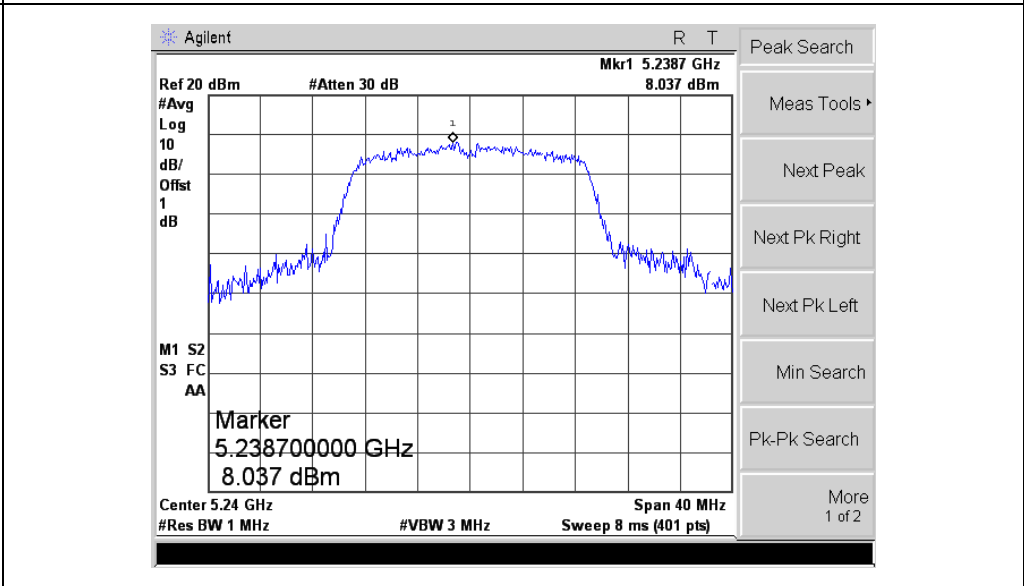
5180MHz

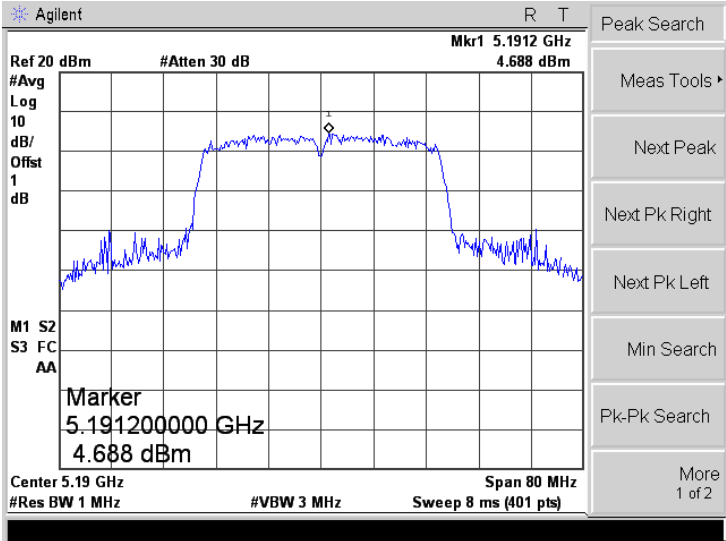
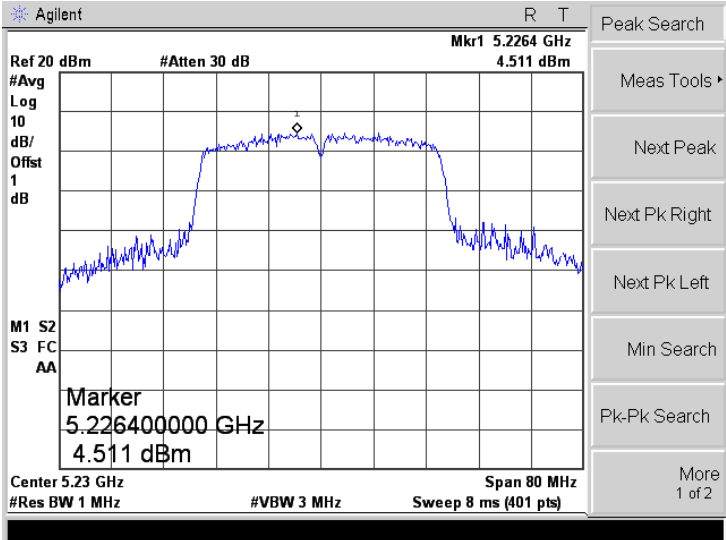


5200MHz

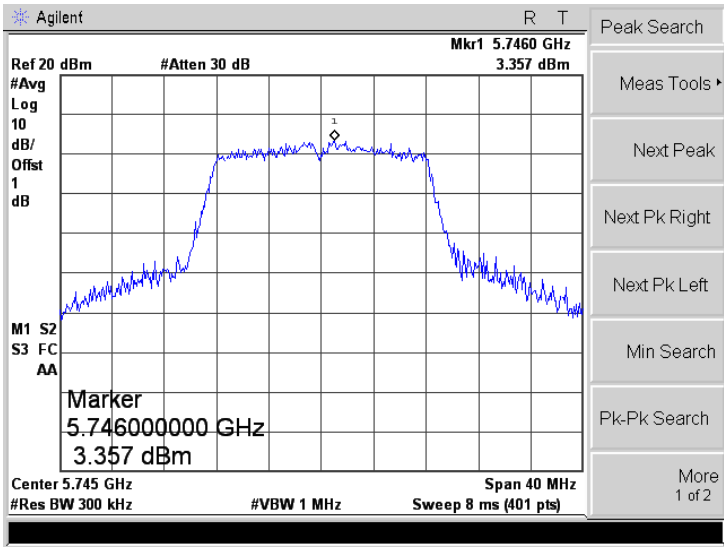
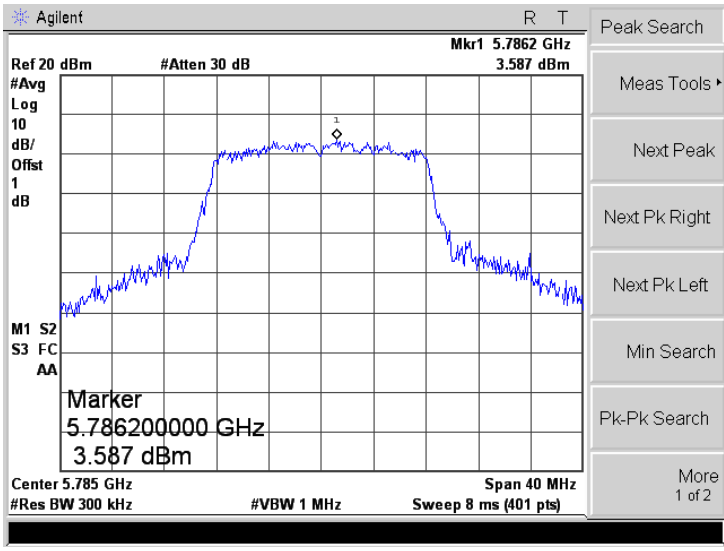
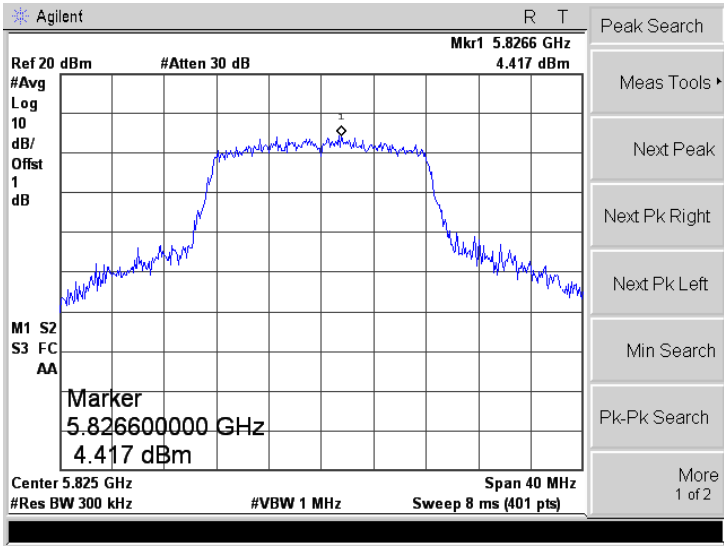


5240MHz



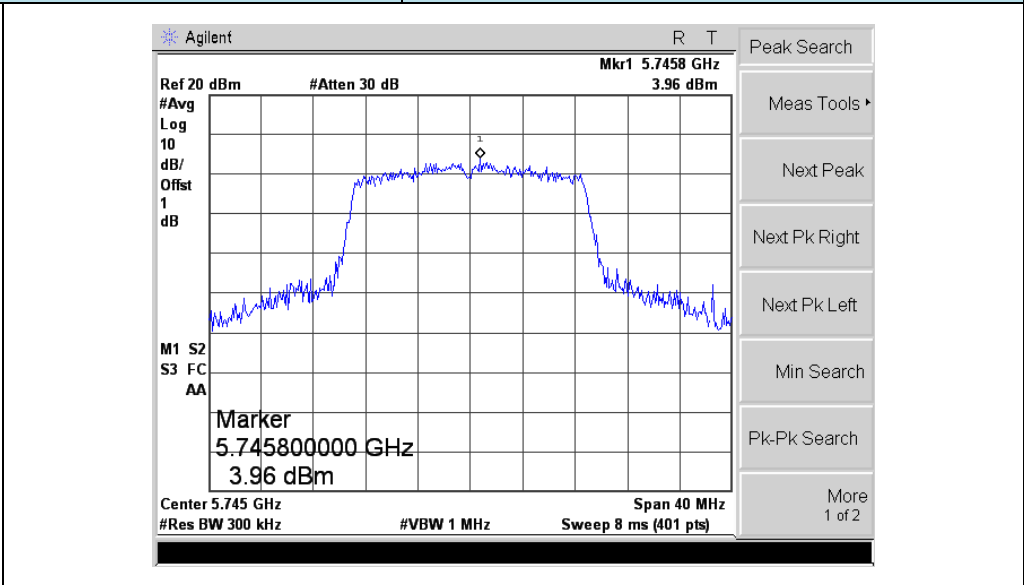
Mode:	802.11n-HT40
5190 MHz	 <p>Agilent R T          Ref 20 dBm #Atten 30 dB Mkr1 5.1912 GHz          4.688 dBm          #Avg Log 10 dB/ Offst 1 dB          M1 S2 S3 FC AA          Marker 5.191200000 GHz 4.688 dBm          Center 5.19 GHz Span 80 MHz          #Res BW 1 MHz #VBW 3 MHz Sweep 8 ms (401 pts)</p>
5230 MHz	 <p>Agilent R T          Ref 20 dBm #Atten 30 dB Mkr1 5.2264 GHz          4.511 dBm          #Avg Log 10 dB/ Offst 1 dB          M1 S2 S3 FC AA          Marker 5.226400000 GHz 4.511 dBm          Center 5.23 GHz Span 80 MHz          #Res BW 1 MHz #VBW 3 MHz Sweep 8 ms (401 pts)</p>

➤ 5725-5850MHz

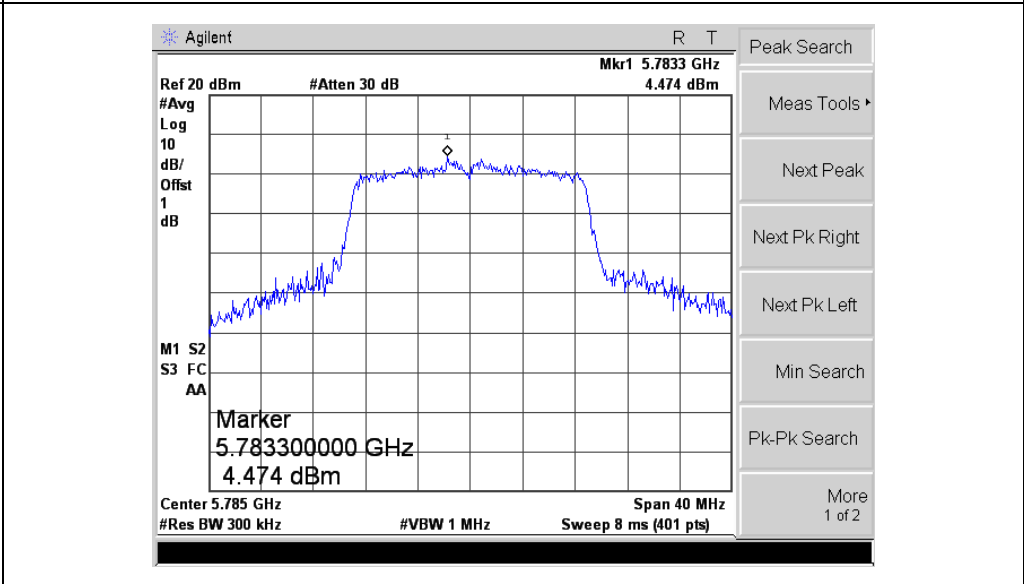
Mode:		802.11a
5745MHz		
5785MHz		
5825MHz		

**Mode:** 802.11n-HT20

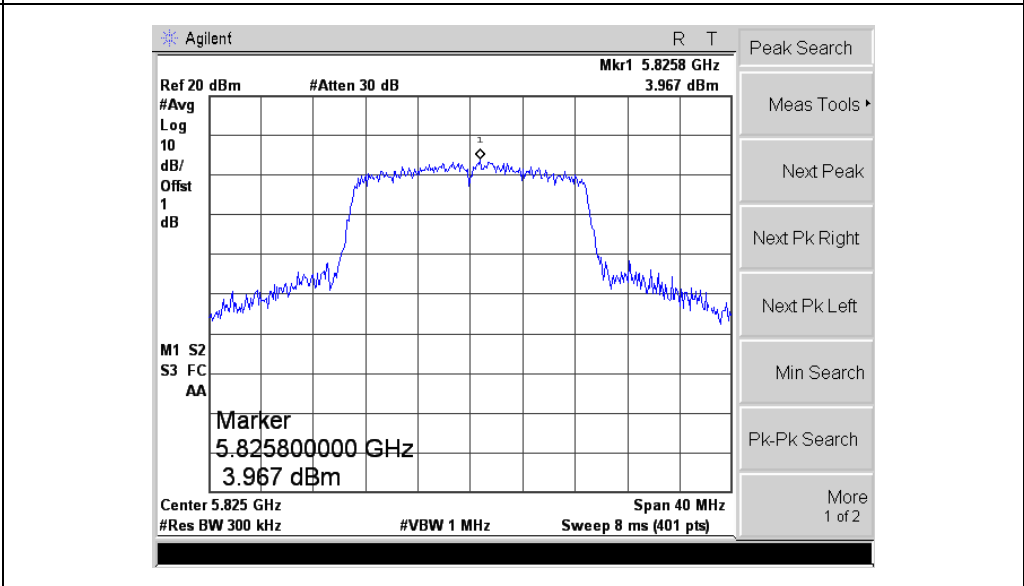
5745MHz

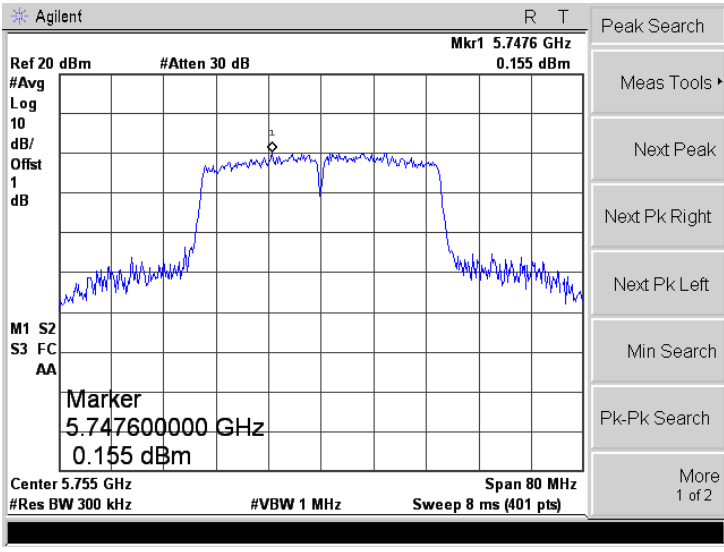
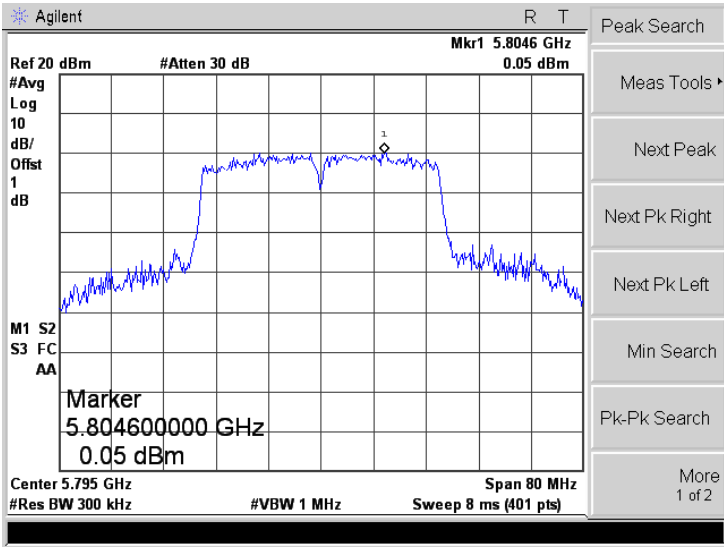


5785MHz



5825MHz



Mode:		802.11n-HT40
5755 MHz		
5795 MHz		

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## 7. Emission Bandwidth and Occupied Bandwidth

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### 7.1 Standard Applicable

According to 15.407 (a) and (e)

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands 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 megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 7.2 Test Procedure

According to 789033 D02 v02r0r section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)

a) Set RBW = approximately 1% of the emission bandwidth.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) 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%.

## 2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

## D. 99 Percent Occupied Bandwidth

The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v02r01 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW  $\geq 3 * RBW$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

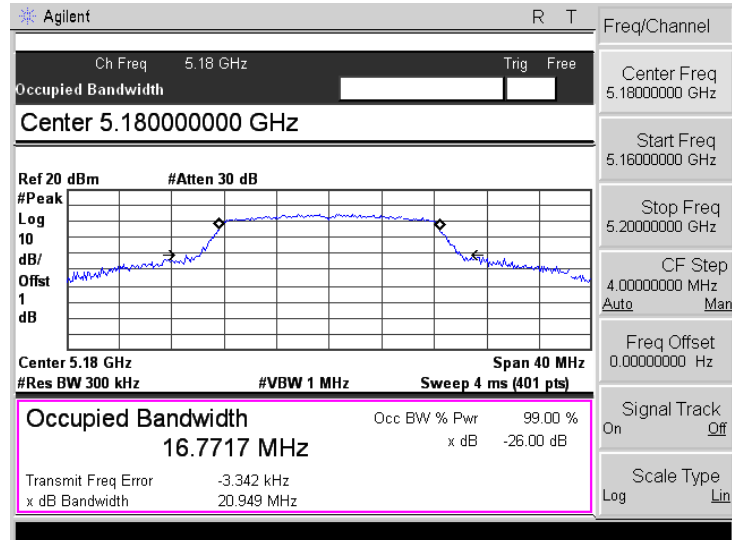
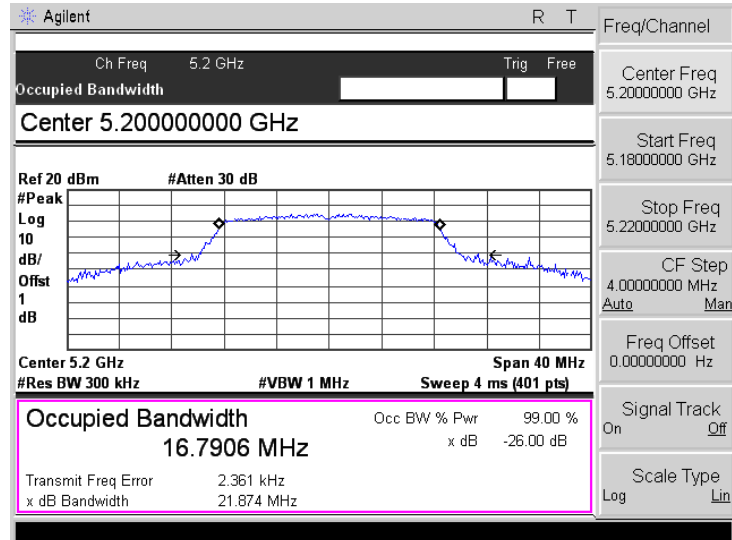
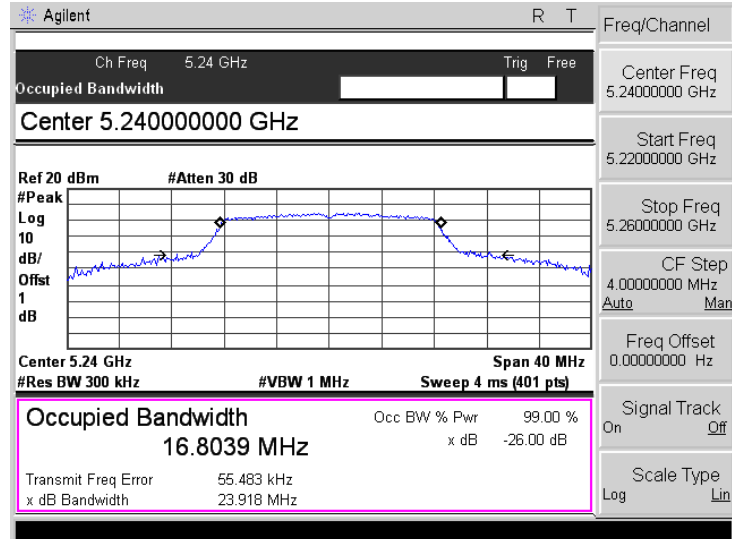


### 7.3 Summary of Test Results/Plots

<b>U-NII-1:5150-5250MHz</b>				
<b>Test Mode</b>	<b>Test Channel MHz</b>	<b>26 dB Bandwidth MHz</b>	<b>99% Bandwidth MHz</b>	<b>Limit MHz</b>
802.11a	5180	20.949	16.7717	Pass
	5200	21.874	16.7906	Pass
	5240	23.918	16.8039	Pass
802.11n-HT20	5180	21.007	17.7990	Pass
	5200	20.126	17.7350	Pass
	5240	23.420	17.7983	Pass
802.11n-HT40	5190	42.969	36.3855	Pass
	5230	43.479	36.4551	Pass

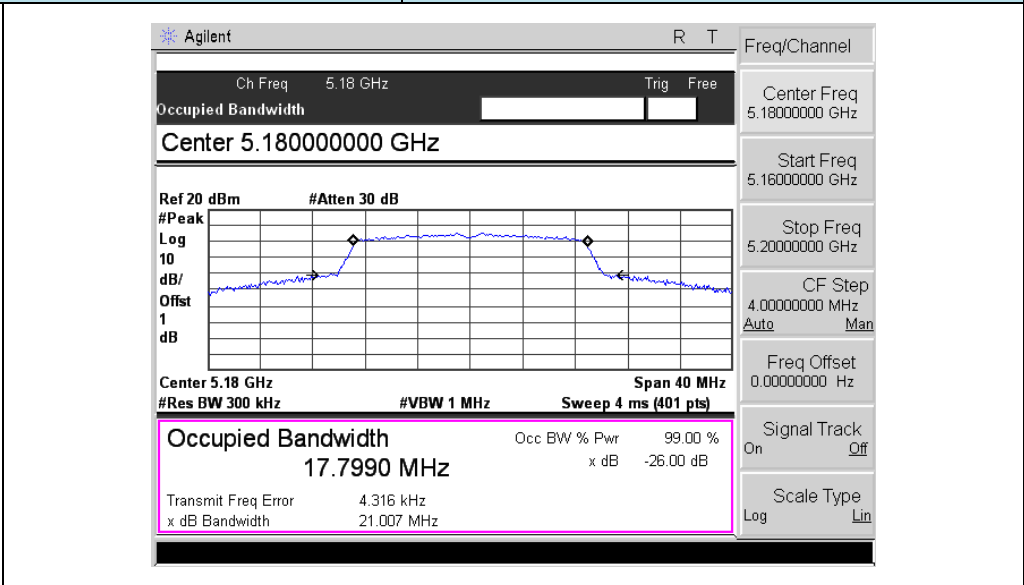
<b>U-NII-3: 5725-5850MHz</b>				
<b>Test Mode</b>	<b>Test Channel MHz</b>	<b>6 dB Bandwidth MHz</b>	<b>99% Bandwidth MHz</b>	<b>Limit MHz</b>
802.11a	5745	16.384	16.7432	≥500
	5785	16.358	16.8544	≥500
	5825	16.215	16.8299	≥500
802.11n-HT20	5745	17.374	17.7580	≥500
	5785	17.332	17.7106	≥500
	5825	17.451	17.8128	≥500
802.11n-HT40	5755	35.873	36.4593	≥500
	5795	35.996	36.8988	≥500

➤ 5150-5250MHz

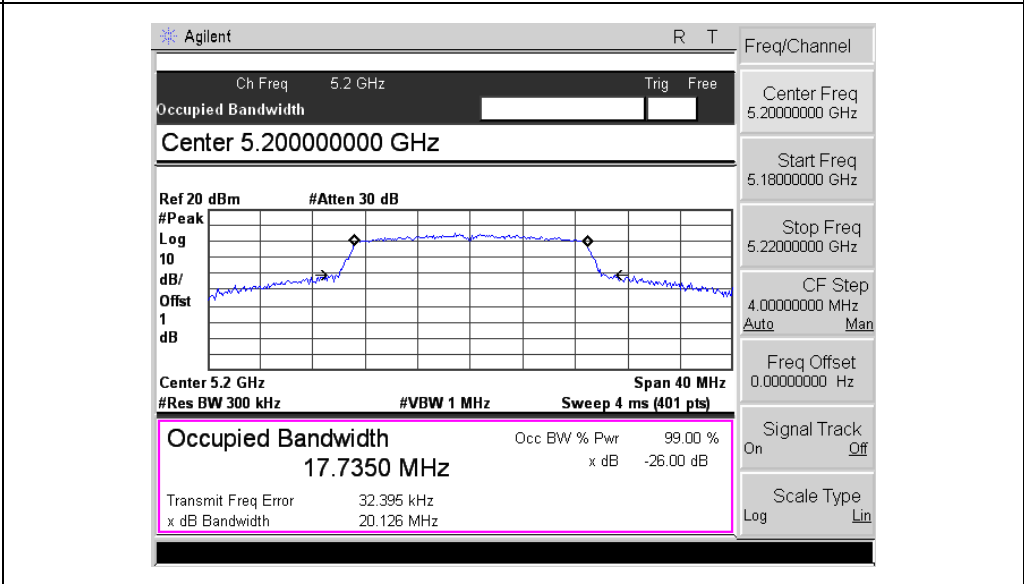
Mode:	802.11a
5180MHz	 <p>Agilent R T</p> <p>Ch Freq 5.18 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 5.18000000 GHz</p> <p>Ref 20 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 5.18 GHz Span 40 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.7717 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB</p> <p>Transmit Freq Error -3.342 kHz x dB Bandwidth 20.949 MHz</p> <p>Freq/Channel</p> <p>Center Freq 5.18000000 GHz</p> <p>Start Freq 5.16000000 GHz</p> <p>Stop Freq 5.20000000 GHz</p> <p>CF Step 4.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
5200MHz	 <p>Agilent R T</p> <p>Ch Freq 5.2 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 5.20000000 GHz</p> <p>Ref 20 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 5.2 GHz Span 40 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.7906 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB</p> <p>Transmit Freq Error 2.361 kHz x dB Bandwidth 21.874 MHz</p> <p>Freq/Channel</p> <p>Center Freq 5.20000000 GHz</p> <p>Start Freq 5.18000000 GHz</p> <p>Stop Freq 5.22000000 GHz</p> <p>CF Step 4.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
5240MHz	 <p>Agilent R T</p> <p>Ch Freq 5.24 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 5.24000000 GHz</p> <p>Ref 20 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 5.24 GHz Span 40 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.8039 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB</p> <p>Transmit Freq Error 55.483 kHz x dB Bandwidth 23.918 MHz</p> <p>Freq/Channel</p> <p>Center Freq 5.24000000 GHz</p> <p>Start Freq 5.22000000 GHz</p> <p>Stop Freq 5.26000000 GHz</p> <p>CF Step 4.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>

**Mode:** 802.11n-HT20

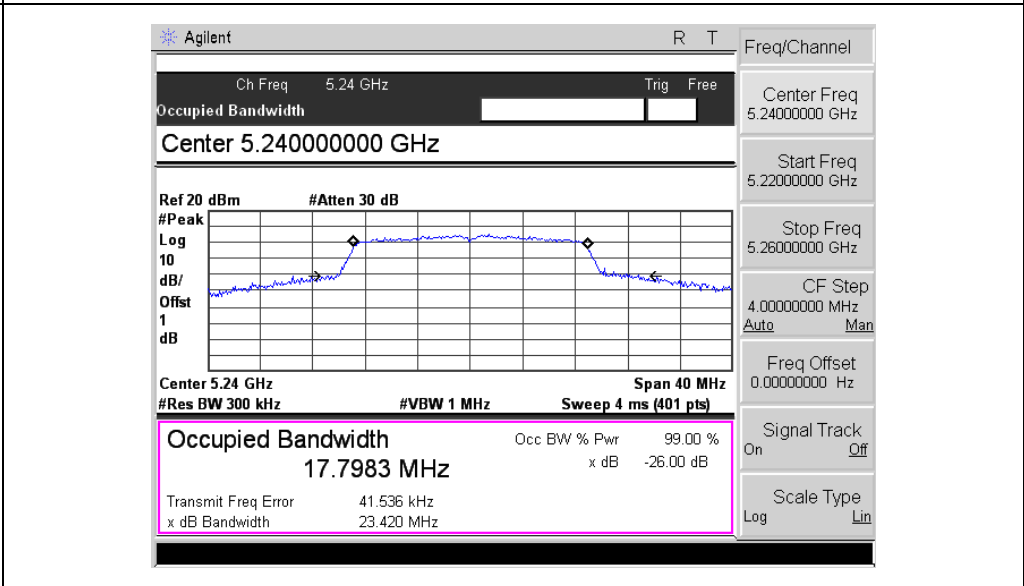
5180MHz

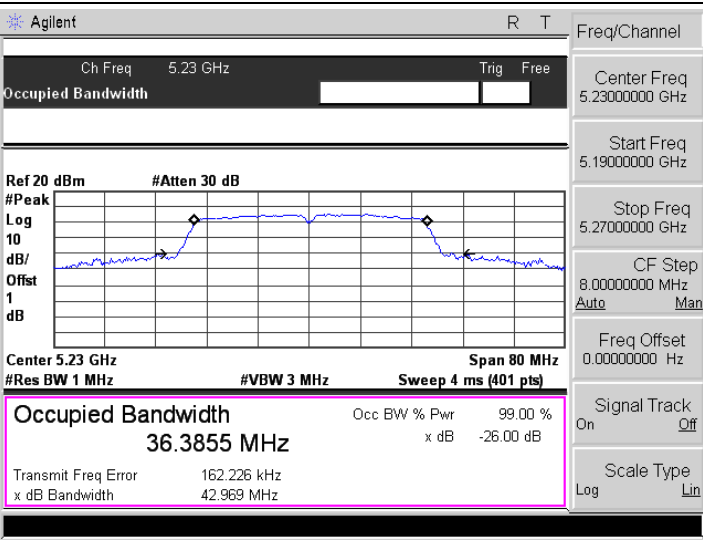
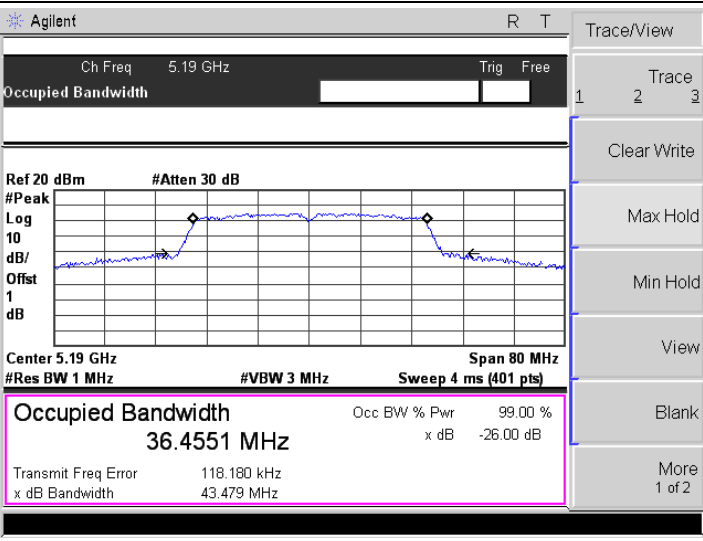


5200MHz

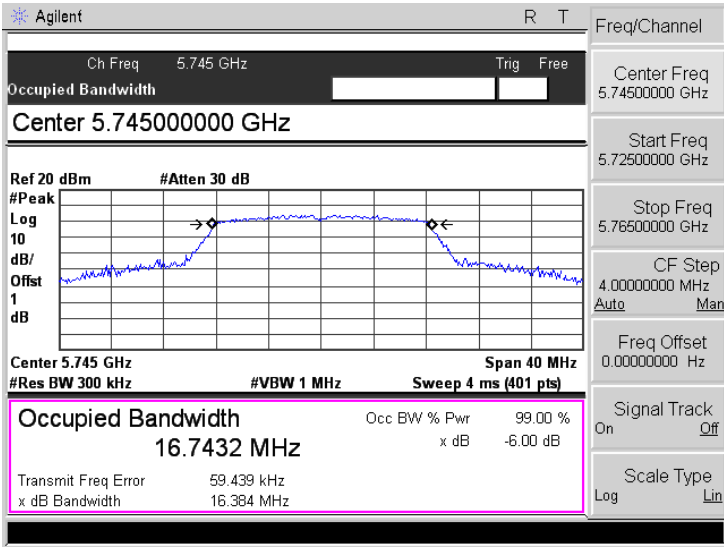
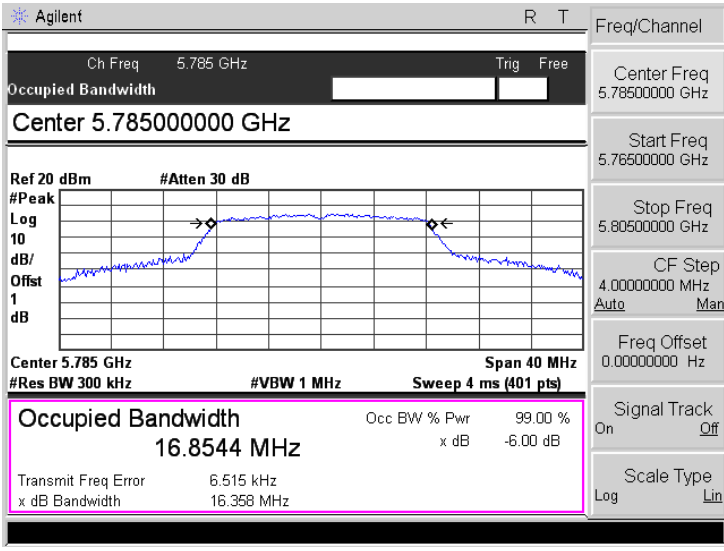
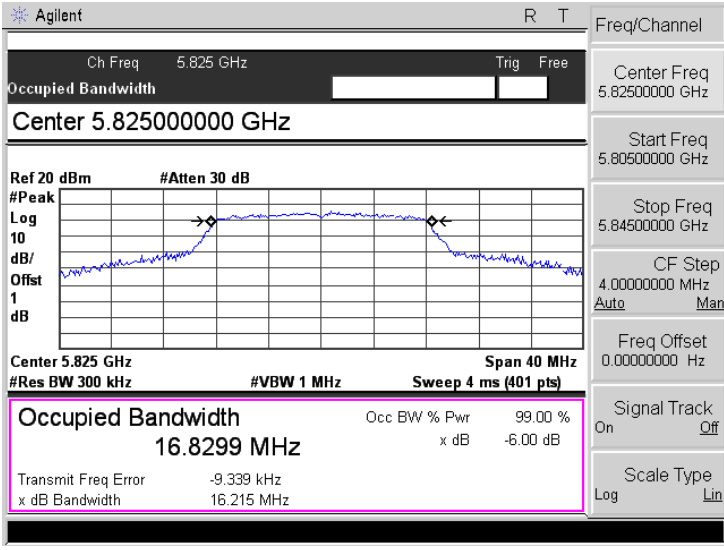


5240MHz



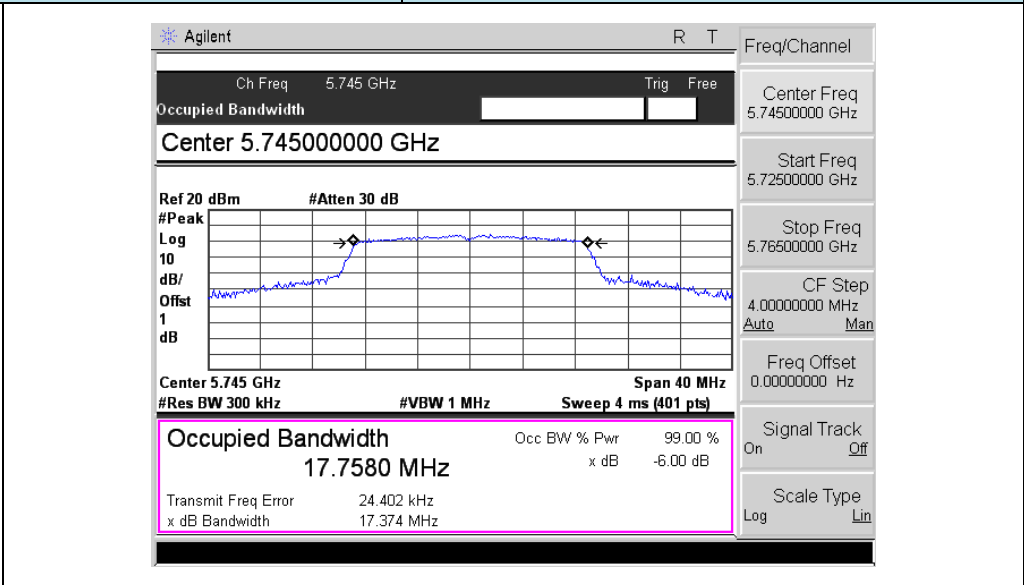
Mode:	802.11n-HT40
5190 MHz	 <p>Agilent R T</p> <p>Ch Freq 5.23 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm #Atten 30 dB</p> <p>#Peak</p> <p>Log 10 dB/ Offst 1 dB</p> <p>Center 5.23 GHz Span 80 MHz</p> <p>#Res BW 1 MHz #VBW 3 MHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth</b> Occ BW % Pwr 99.00 %</p> <p><b>36.3855 MHz</b> x dB -26.00 dB</p> <p>Transmit Freq Error 162.226 kHz</p> <p>x dB Bandwidth 42.969 MHz</p> <p>Freq/Channel</p> <p>Center Freq 5.2300000 GHz</p> <p>Start Freq 5.1900000 GHz</p> <p>Stop Freq 5.2700000 GHz</p> <p>CF Step 8.0000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
5230 MHz	 <p>Agilent R T</p> <p>Ch Freq 5.19 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm #Atten 30 dB</p> <p>#Peak</p> <p>Log 10 dB/ Offst 1 dB</p> <p>Center 5.19 GHz Span 80 MHz</p> <p>#Res BW 1 MHz #VBW 3 MHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth</b> Occ BW % Pwr 99.00 %</p> <p><b>36.4551 MHz</b> x dB -26.00 dB</p> <p>Transmit Freq Error 118.180 kHz</p> <p>x dB Bandwidth 43.479 MHz</p> <p>Trace/View</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>

➤ 5725-5850MHz

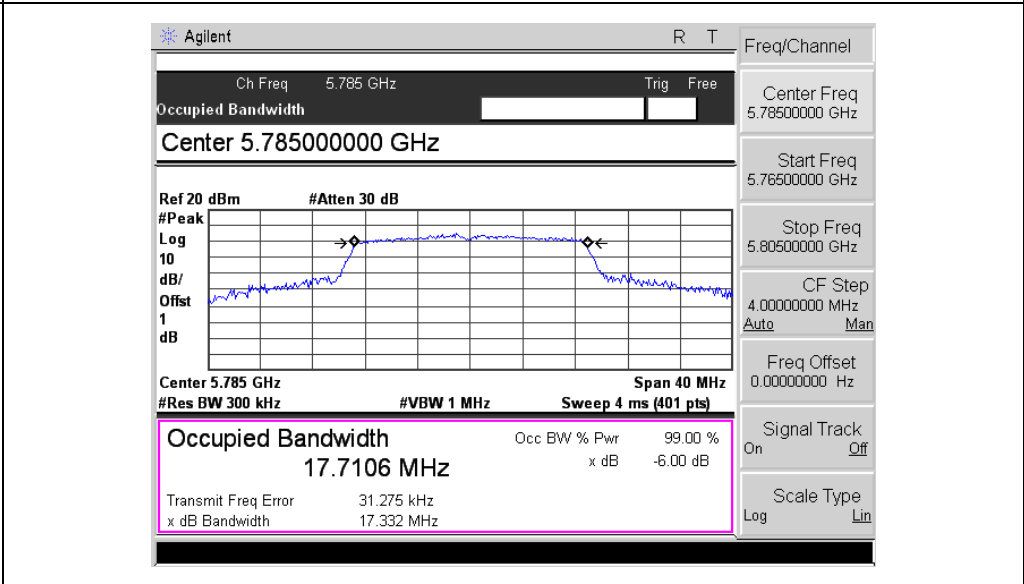
Mode:		802.11a
5745MHz		
5785MHz		
5825MHz		

**Mode:** **802.11n-HT20**

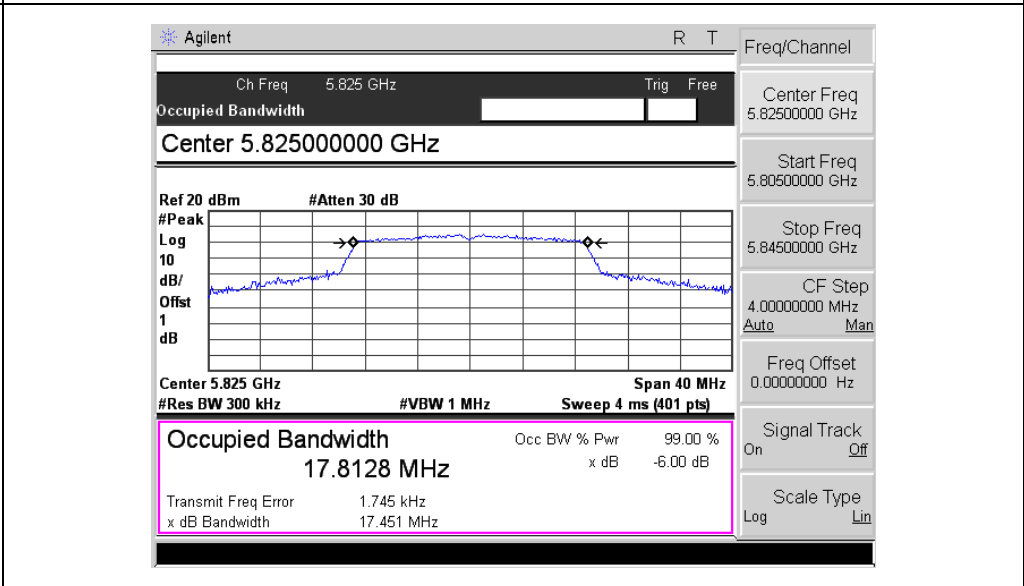
5745MHz

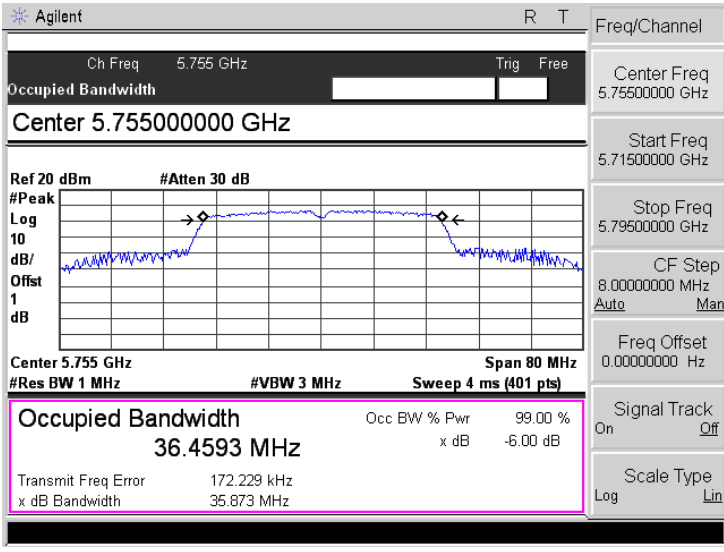
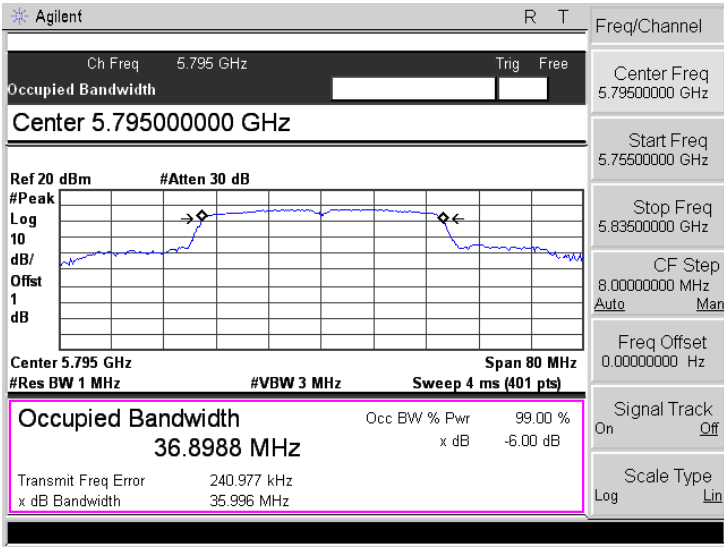


5785MHz



5825MHz



Mode:		802.11n-HT40
5755 MHz		
5795 MHz		

## 8. Maximum Conducted Output Power

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### 8.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands 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 megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### 8.2 Test Procedure

According to KDB789033 D02 v02r01 section E, the following is the measurement procedure.

- (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (ii) Set RBW = 1 MHz.
- (iii) Set VBW  $\geq$  3 MHz.
- (iv) Number of points in sweep  $\geq$  2 Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.



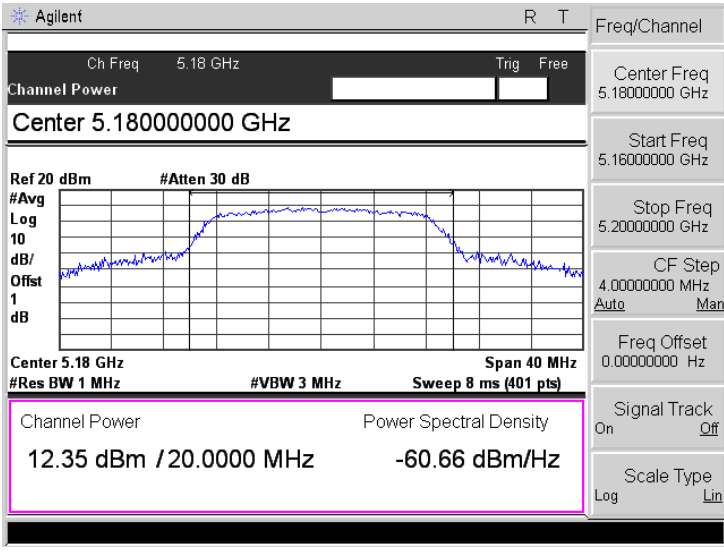
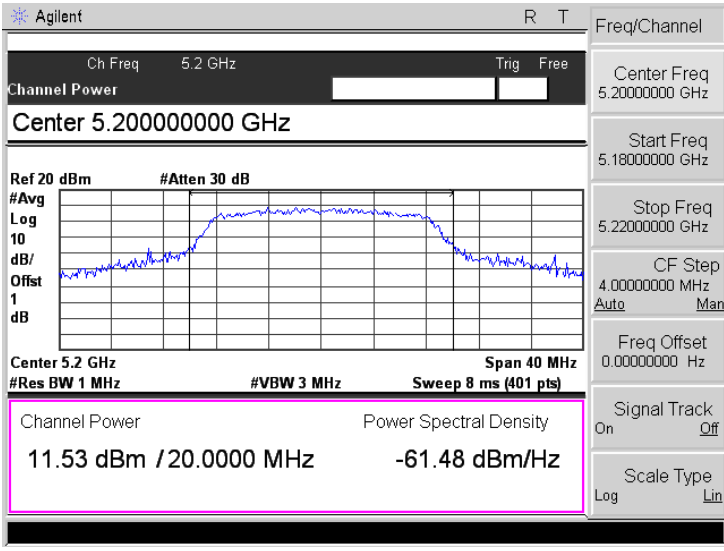
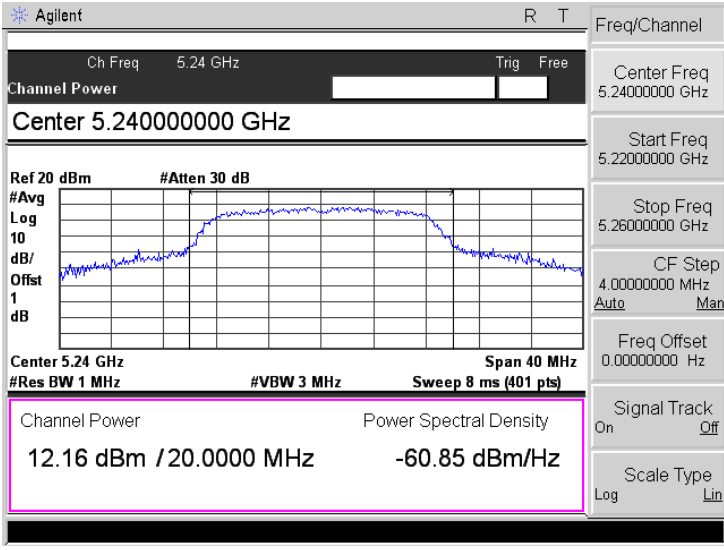
- (vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- (vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq$  98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
- (viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- (ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

### 8.3 Summary of Test Results/Plots

<b>U-NII-1:5150-5250MHz</b>				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5180	12.35	17.179	250
	5200	11.53	14.223	250
	5240	12.16	16.444	250
802.11n-HT20	5180	12.09	16.181	250
	5200	12.19	16.558	250
	5240	11.75	14.962	250
802.11n-HT40	5190	12.10	16.218	250
	5230	12.15	16.406	250

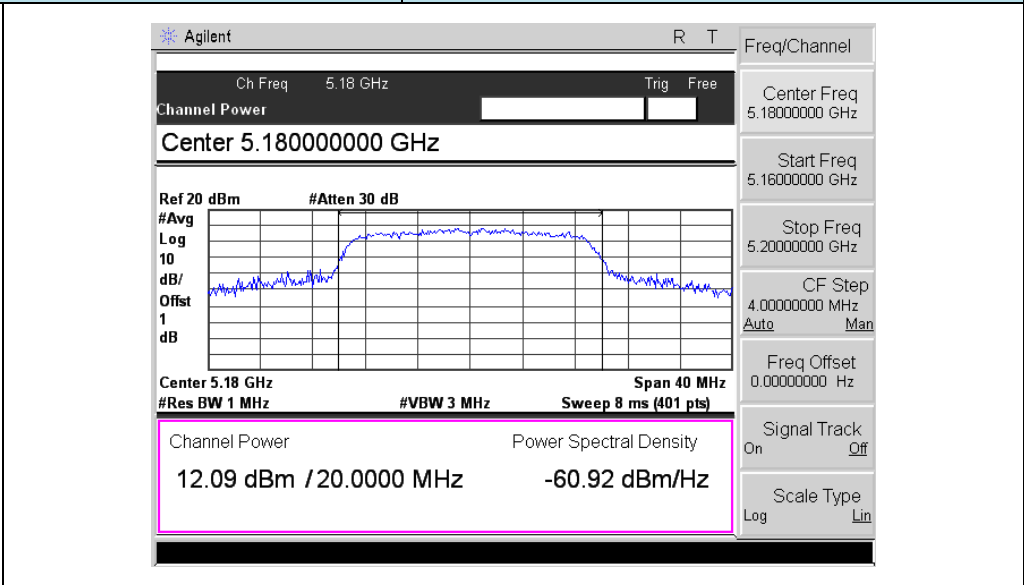
<b>U-NII-3: 5725-5850MHz</b>				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5745	11.21	13.213	1000
	5785	11.81	15.171	1000
	5825	12.04	15.996	1000
802.11n-HT20	5745	10.95	12.445	1000
	5785	11.49	14.093	1000
	5825	11.65	14.622	1000
802.11n-HT40	5755	11.44	13.932	1000
	5795	11.36	13.677	1000

➤ 5150-5250MHz

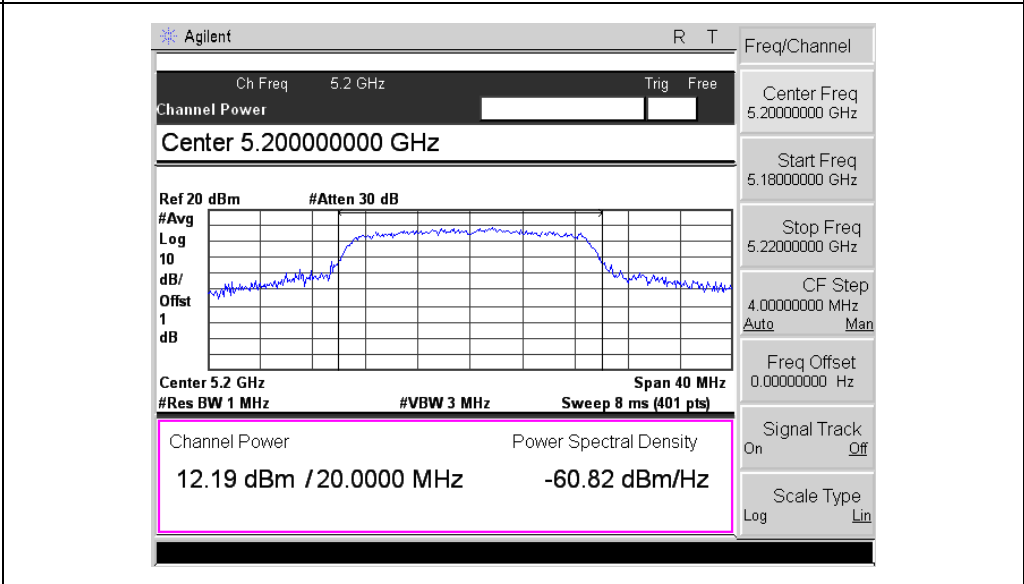
Mode:		802.11a
5180MHz		
5200MHz		
5240MHz		

**Mode:** 802.11n-HT20

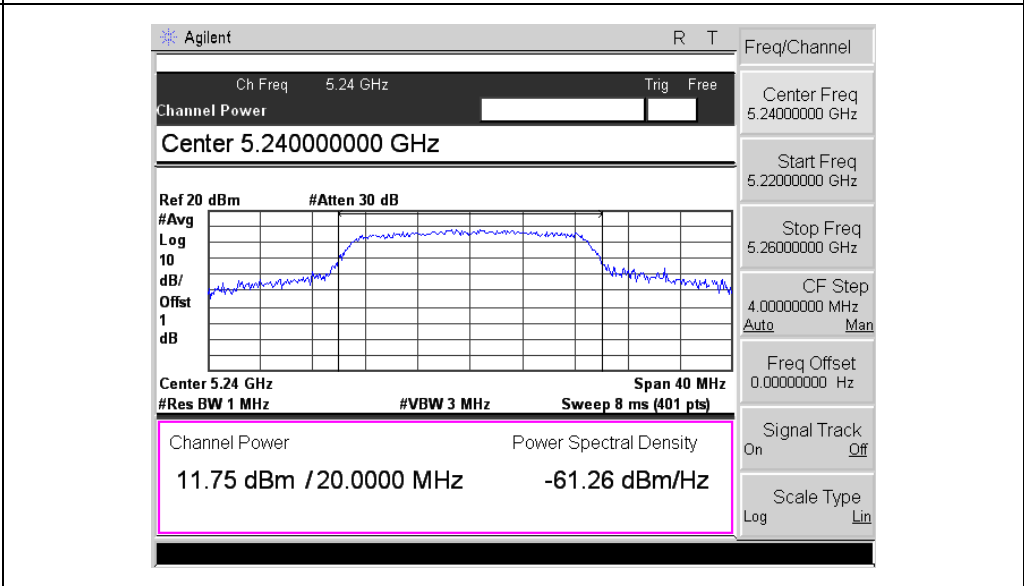
5180MHz

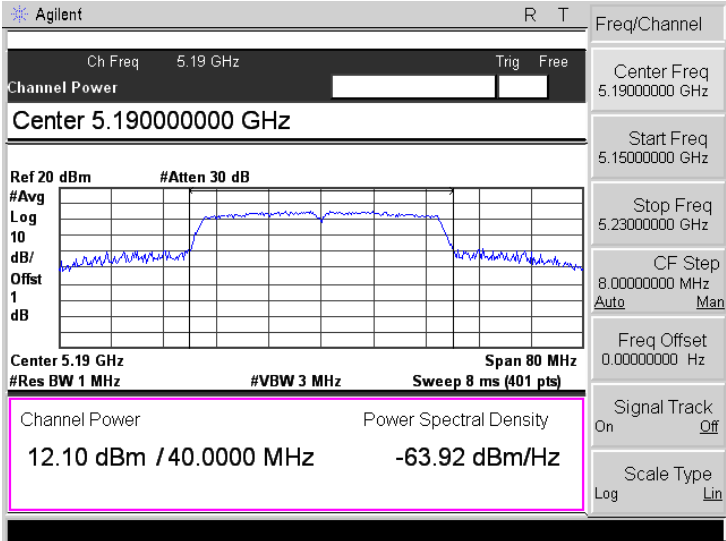
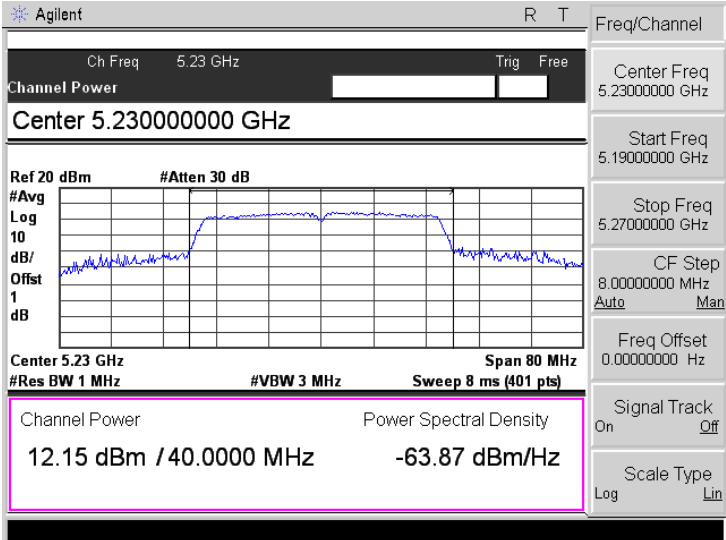


5200MHz

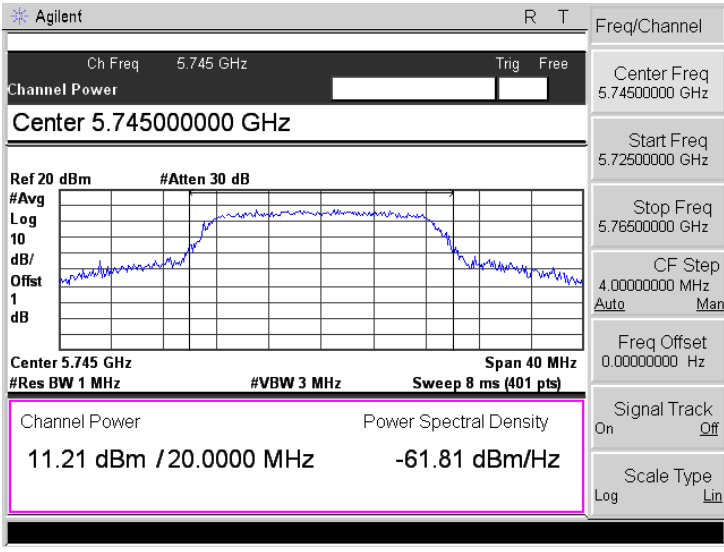
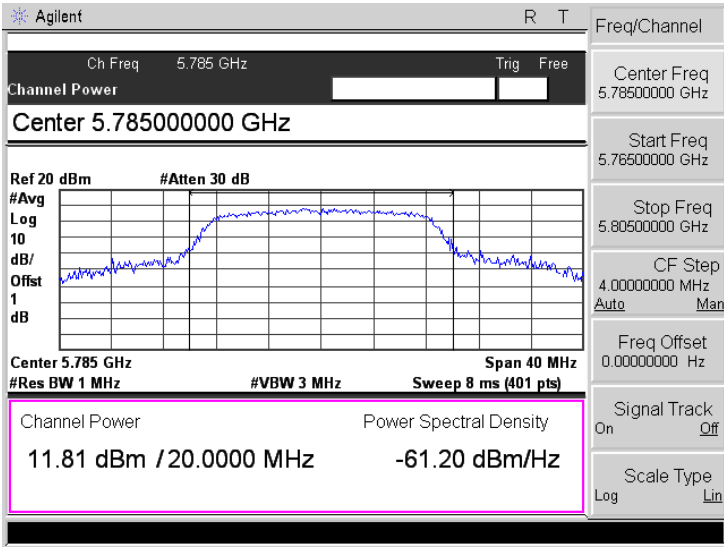
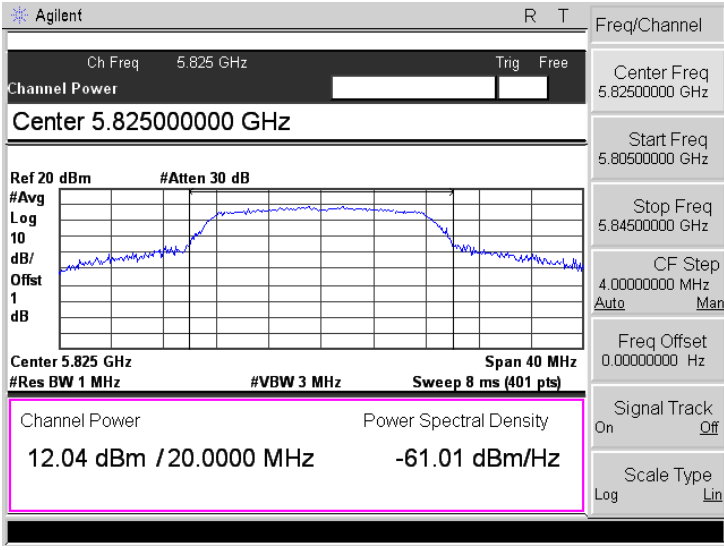


5240MHz



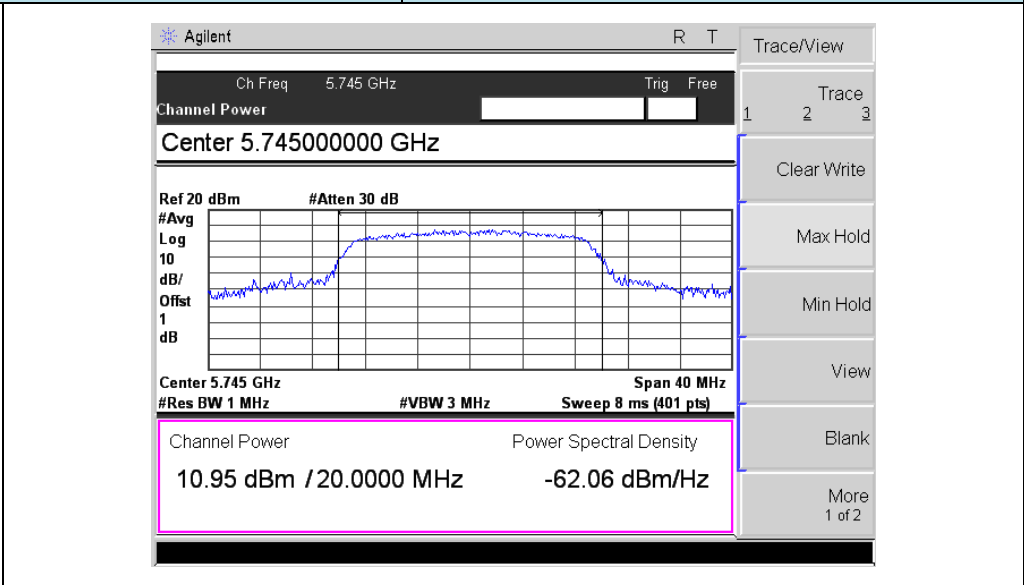
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<p>5190 MHz</p>	
<p>5230 MHz</p>	

➤ 5725-5850MHz

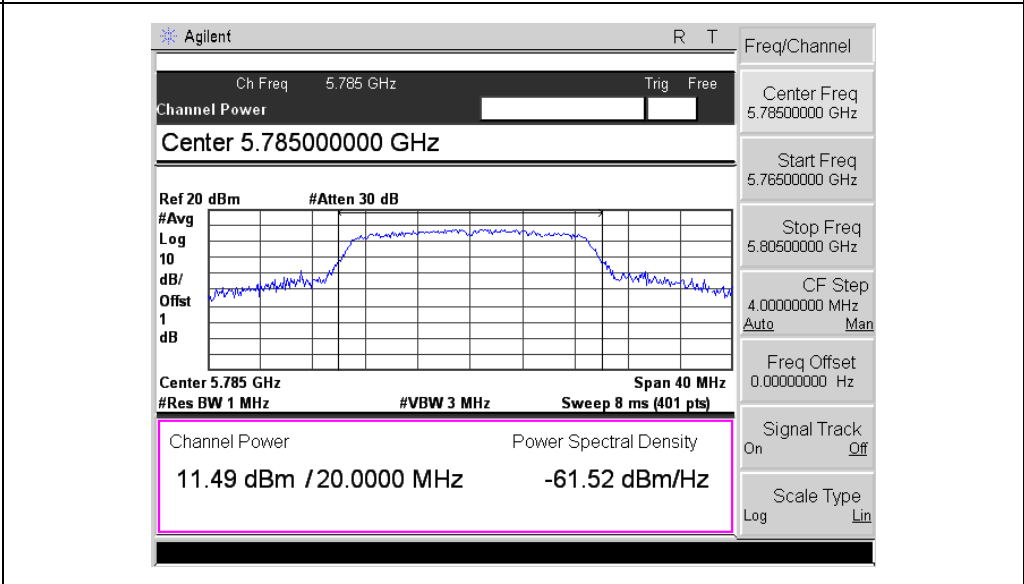
Mode:		802.11a
5745MHz		
5785MHz		
5825MHz		

**Mode:** 802.11n-HT20

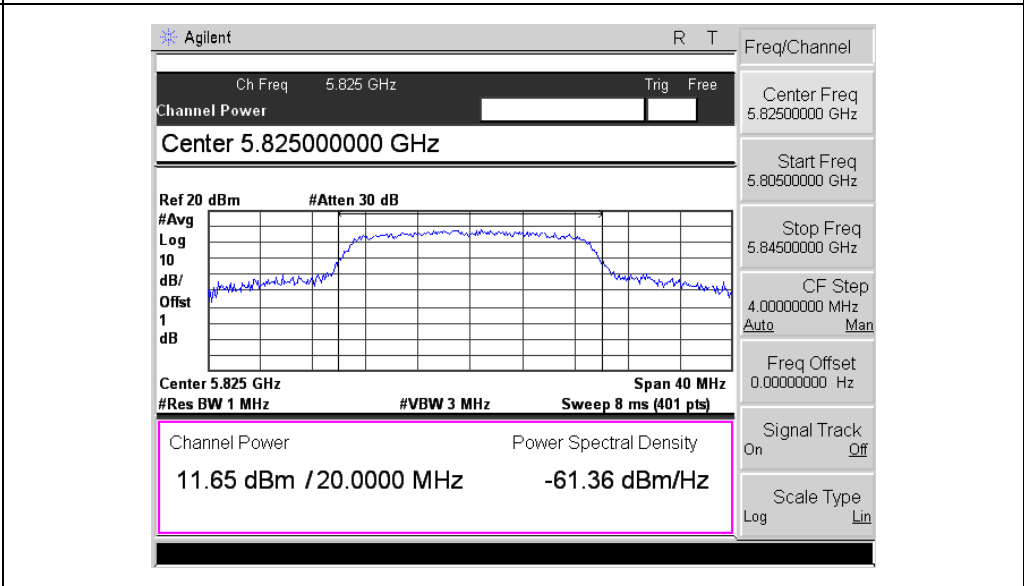
5745MHz



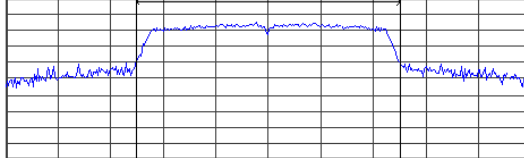
5785MHz

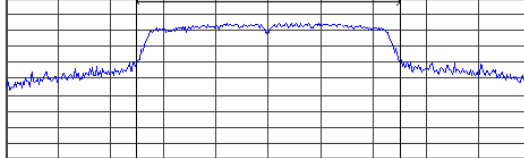


5825MHz



**Mode:** **802.11n-HT40**

5755 MHz	<div style="border: 1px solid gray; padding: 5px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <span>Agilent</span> <span>R T</span> </div> <div style="border-bottom: 1px solid gray; padding: 2px;"> <p style="text-align: center;">Ch Freq 5.755 GHz <span style="float: right;">Trig Free</span></p> <p style="text-align: center;">Channel Power <span style="border: 1px solid gray; display: inline-block; width: 50px; height: 15px;"></span></p> <p style="text-align: center; font-weight: bold;">Center 5.75500000 GHz</p> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>Ref 20 dBm</p> <p>#Atten 30 dB</p> </div> <div style="border-bottom: 1px solid gray;"> <p>#Avg Log dB/ Offst dB</p>  </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>Center 5.755 GHz</p> <p>Span 80 MHz</p> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>#Res BW 1 MHz</p> <p>#VBW 3 MHz</p> <p>Sweep 8 ms (401 pts)</p> </div> <div style="border: 2px solid magenta; padding: 5px;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Channel Power</td> <td style="width: 50%;">Power Spectral Density</td> </tr> <tr> <td style="text-align: center;">11.44 dBm / 40.0000 MHz</td> <td style="text-align: center;">-64.58 dBm/Hz</td> </tr> </table> </div> </div>	Channel Power	Power Spectral Density	11.44 dBm / 40.0000 MHz	-64.58 dBm/Hz
Channel Power	Power Spectral Density				
11.44 dBm / 40.0000 MHz	-64.58 dBm/Hz				

5795 MHz	<div style="border: 1px solid gray; padding: 5px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <span>Agilent</span> <span>R T</span> </div> <div style="border-bottom: 1px solid gray; padding: 2px;"> <p style="text-align: center;">Ch Freq 5.795 GHz <span style="float: right;">Trig Free</span></p> <p style="text-align: center;">Channel Power <span style="border: 1px solid gray; display: inline-block; width: 50px; height: 15px;"></span></p> <p style="text-align: center; font-weight: bold;">Center 5.79500000 GHz</p> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>Ref 20 dBm</p> <p>#Atten 30 dB</p> </div> <div style="border-bottom: 1px solid gray;"> <p>#Avg Log dB/ Offst dB</p>  </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>Center 5.795 GHz</p> <p>Span 80 MHz</p> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray;"> <p>#Res BW 1 MHz</p> <p>#VBW 3 MHz</p> <p>Sweep 8 ms (401 pts)</p> </div> <div style="border: 2px solid magenta; padding: 5px;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Channel Power</td> <td style="width: 50%;">Power Spectral Density</td> </tr> <tr> <td style="text-align: center;">11.36 dBm / 40.0000 MHz</td> <td style="text-align: center;">-64.66 dBm/Hz</td> </tr> </table> </div> </div>	Channel Power	Power Spectral Density	11.36 dBm / 40.0000 MHz	-64.66 dBm/Hz
Channel Power	Power Spectral Density				
11.36 dBm / 40.0000 MHz	-64.66 dBm/Hz				

## 9. Radiated Spurious Emissions

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### 9.1 Standard Applicable

According to §15.407(b), Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
  - (i) All emissions shall be limited to a level of  $-27$  dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

According to §15.407(b)(6), Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

According to §15.407(b)(7), The provisions of §15.205 apply to intentional radiators operating under this section.  
789033 D02 v02r01 General UNII Test Procedures New Rules v01

If radiated measurements are performed, field strength is then converted to EIRP as follows:

$$\text{EIRP} = ((E*d)^2) / 30$$

where:

- E is the field strength in V/m;
- d is the measurement distance in meters;
- EIRP is the equivalent isotropically radiated power in watts.

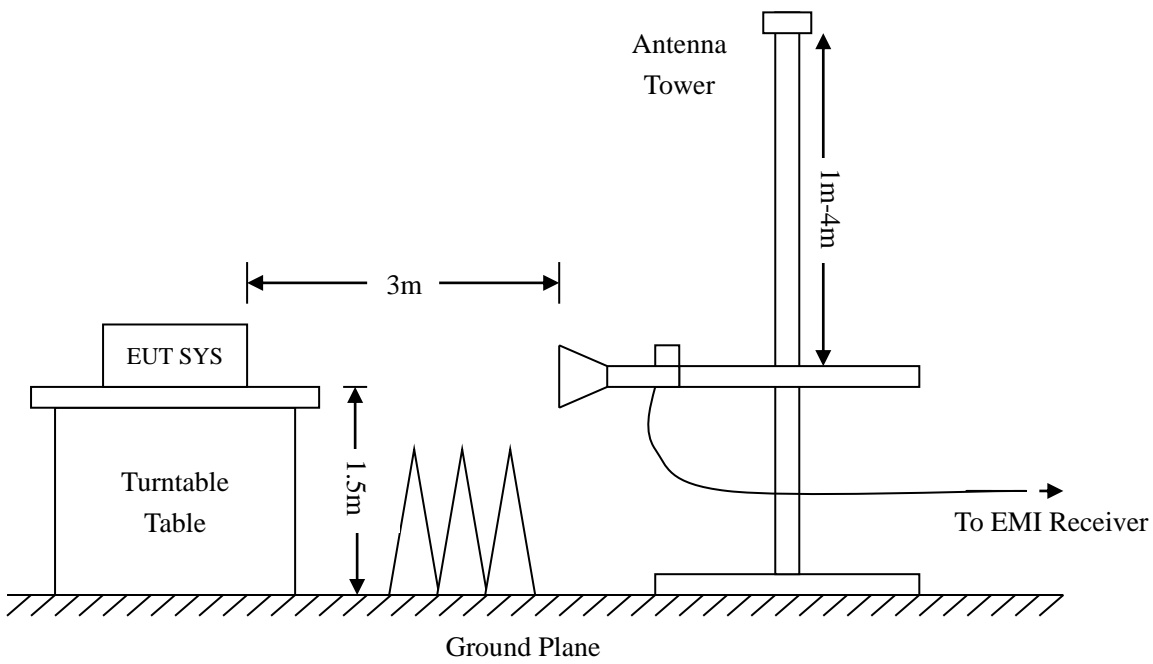
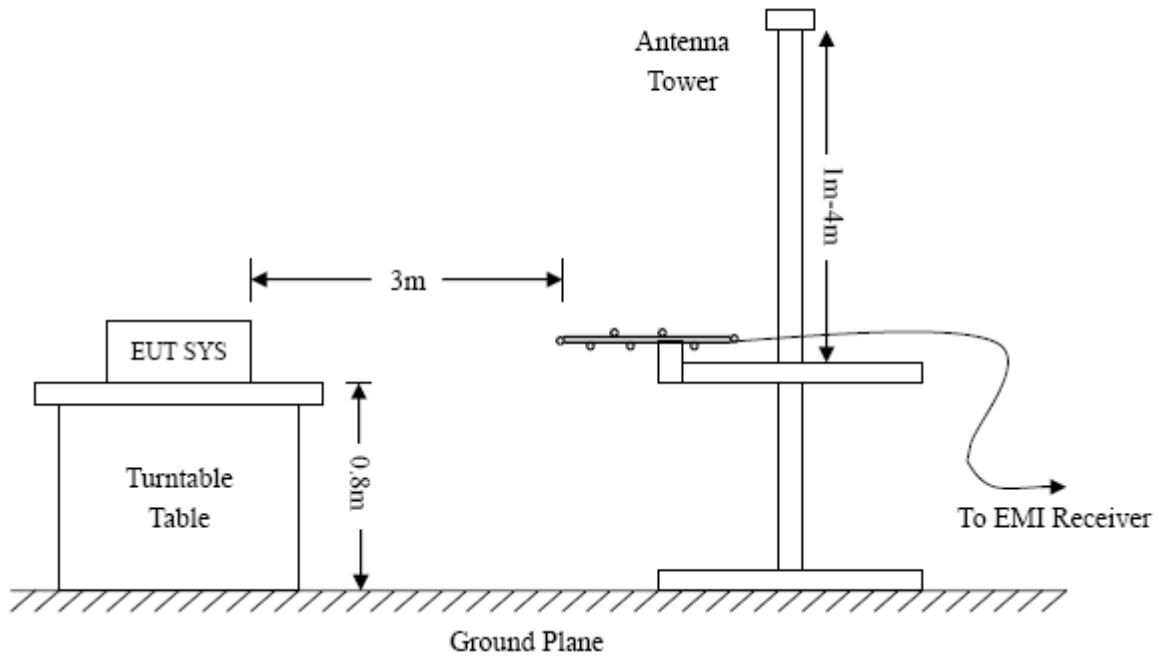
### 9.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.407(b)(6) and FCC Part 15.209 Limit..

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.





### 9.3 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:

RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:

RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

### 9.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB $\mu$ V means the emission is 6dB $\mu$ V below the maximum limit for Class B. The equation for margin calculation is as follows:

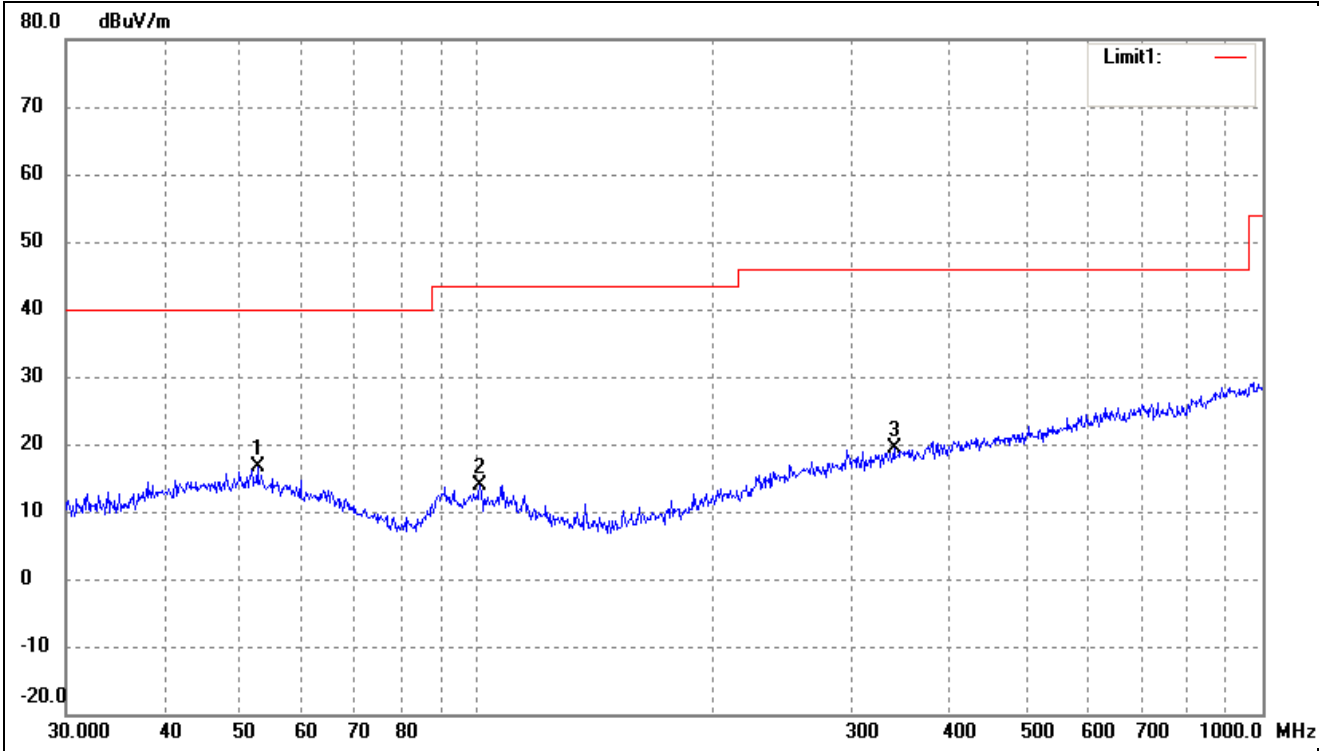
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

### 9.5 Summary of Test Results/Plots

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

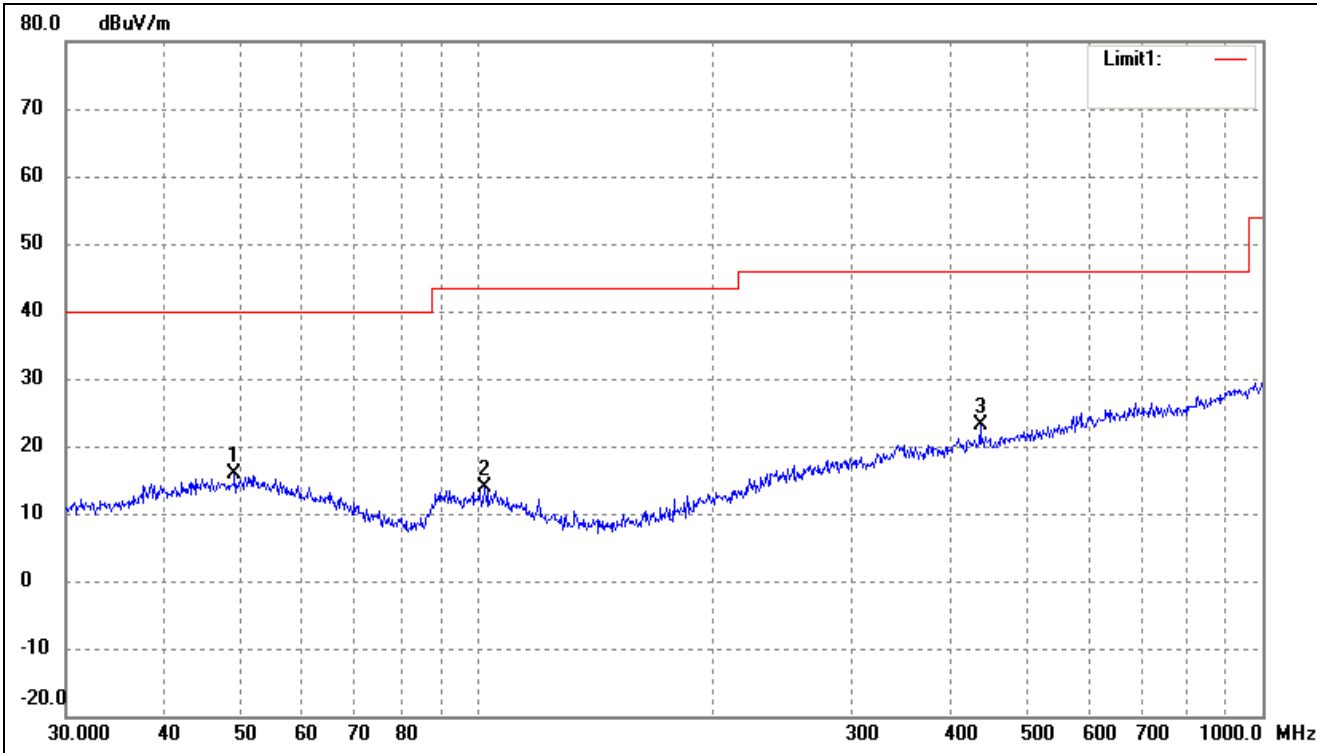
- Spurious Emission From 30 MHz to 1 GHz
- 5150-5250MHz

802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Horizontal



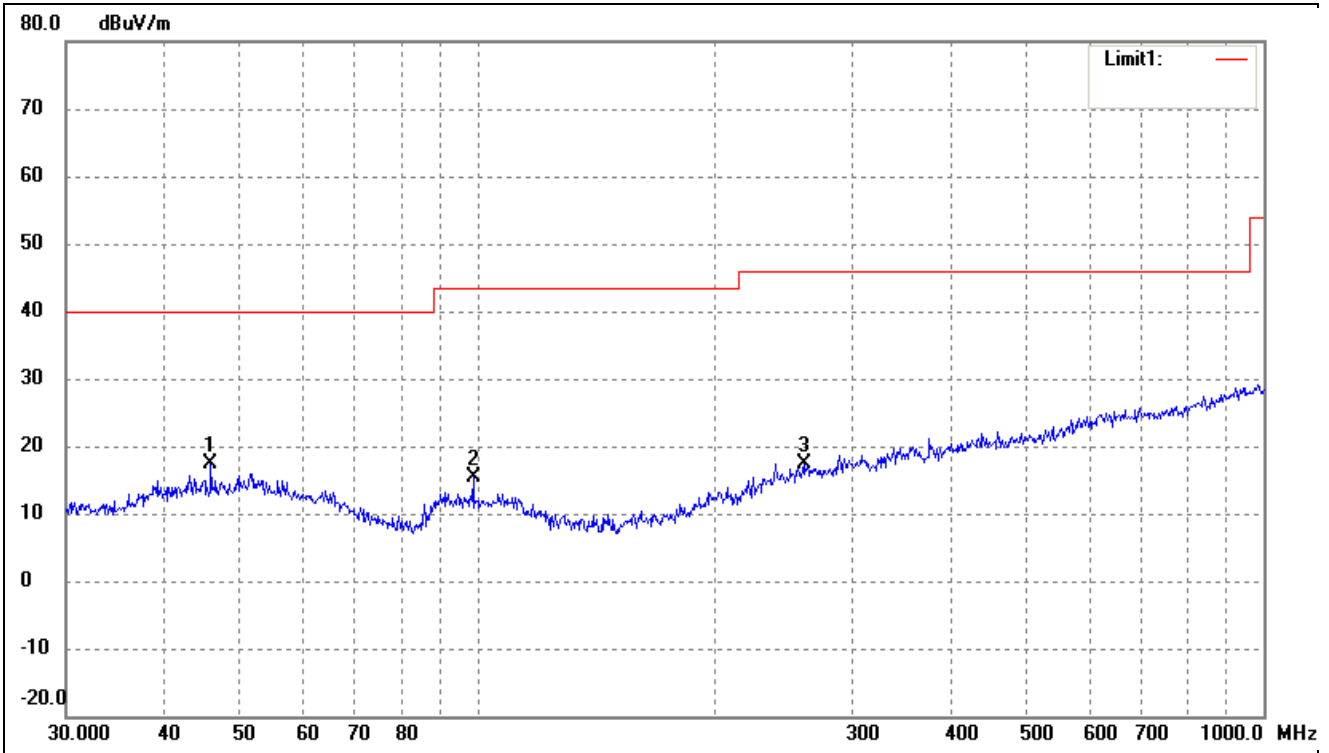
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	52.5753	28.24	-11.67	16.57	40.00	-23.43	353	100	peak
2	100.9340	27.63	-13.73	13.90	43.50	-29.60	98	100	peak
3	339.5888	26.60	-7.33	19.27	46.00	-26.73	57	100	peak

802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Vertical



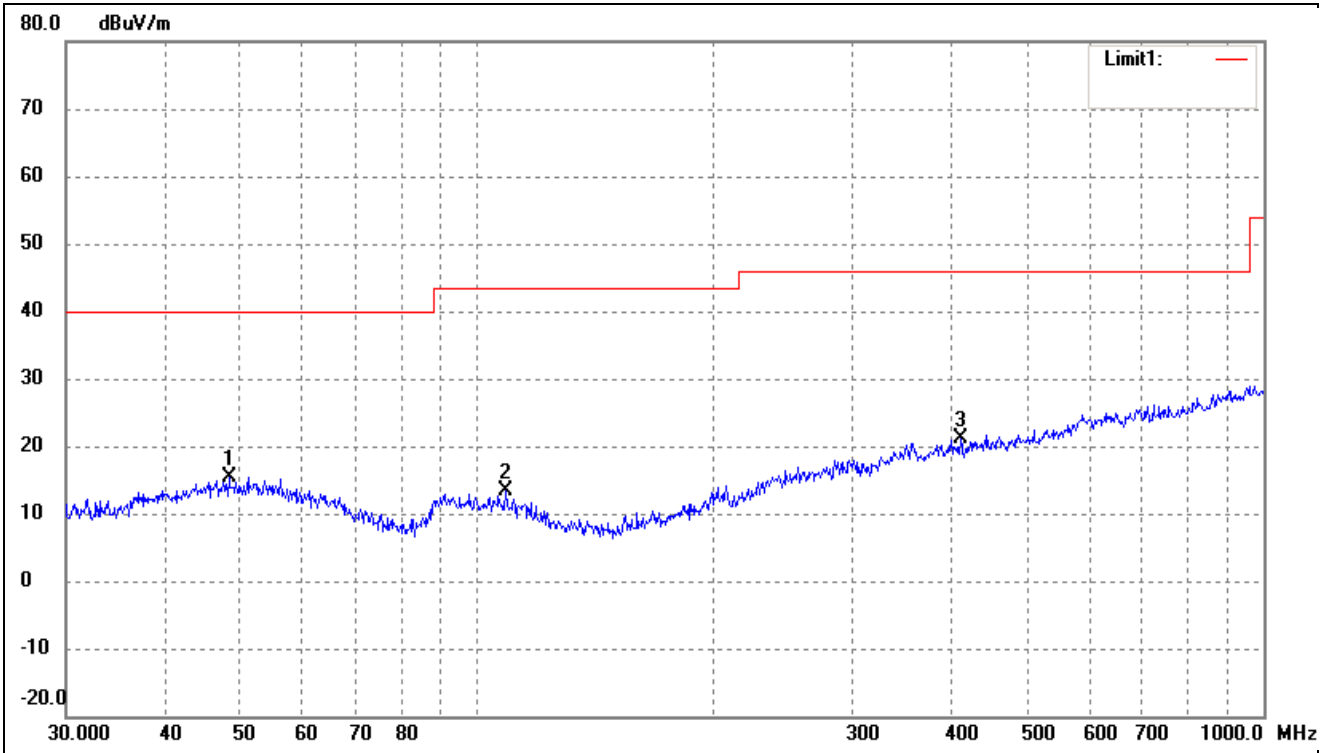
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	49.1866	27.51	-11.63	15.88	40.00	-24.12	306	100	peak
2	102.3597	27.48	-13.60	13.88	43.50	-29.62	99	100	peak
3	437.1199	29.09	-6.08	23.01	46.00	-22.99	221	100	peak

802.11n-HT20			
Test Channel	5180MHz(worst case)	Polarity:	Horizontal



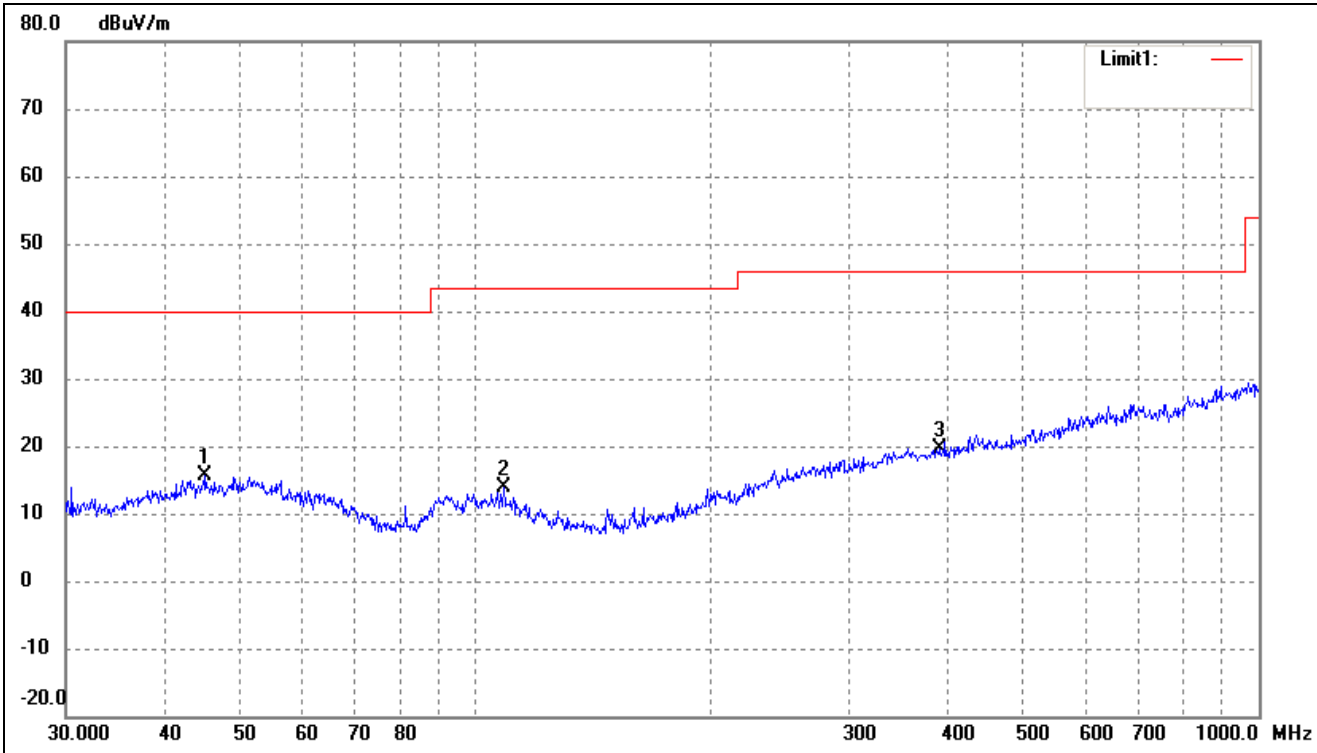
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	45.8553	29.21	-11.82	17.39	40.00	-22.61	349	100	peak
2	98.8326	29.27	-13.94	15.33	43.50	-28.17	188	100	peak
3	260.1444	26.83	-9.34	17.49	46.00	-28.51	51	100	peak

802.11n-HT20			
Test Channel	5180MHz(worst case)	Polarity:	Vertical



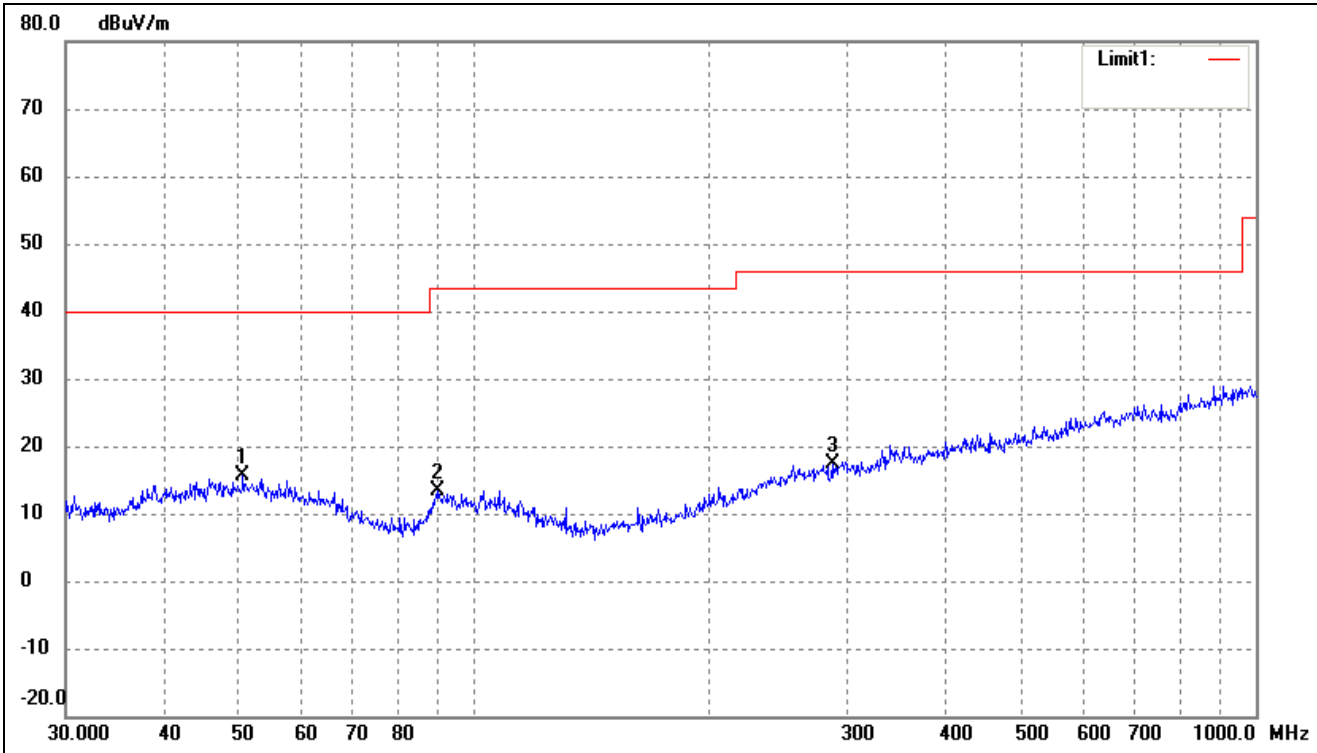
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	48.3318	27.08	-11.64	15.44	40.00	-24.56	113	100	peak
2	108.6470	27.19	-13.73	13.46	43.50	-30.04	143	100	peak
3	411.8240	27.46	-6.45	21.01	46.00	-24.99	73	100	peak

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	45.2166	27.53	-11.92	15.61	40.00	-24.39	190	100	peak
2	108.6470	27.69	-13.73	13.96	43.50	-29.54	101	100	peak
3	390.7226	26.74	-7.14	19.60	46.00	-26.40	81	100	peak

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Vertical

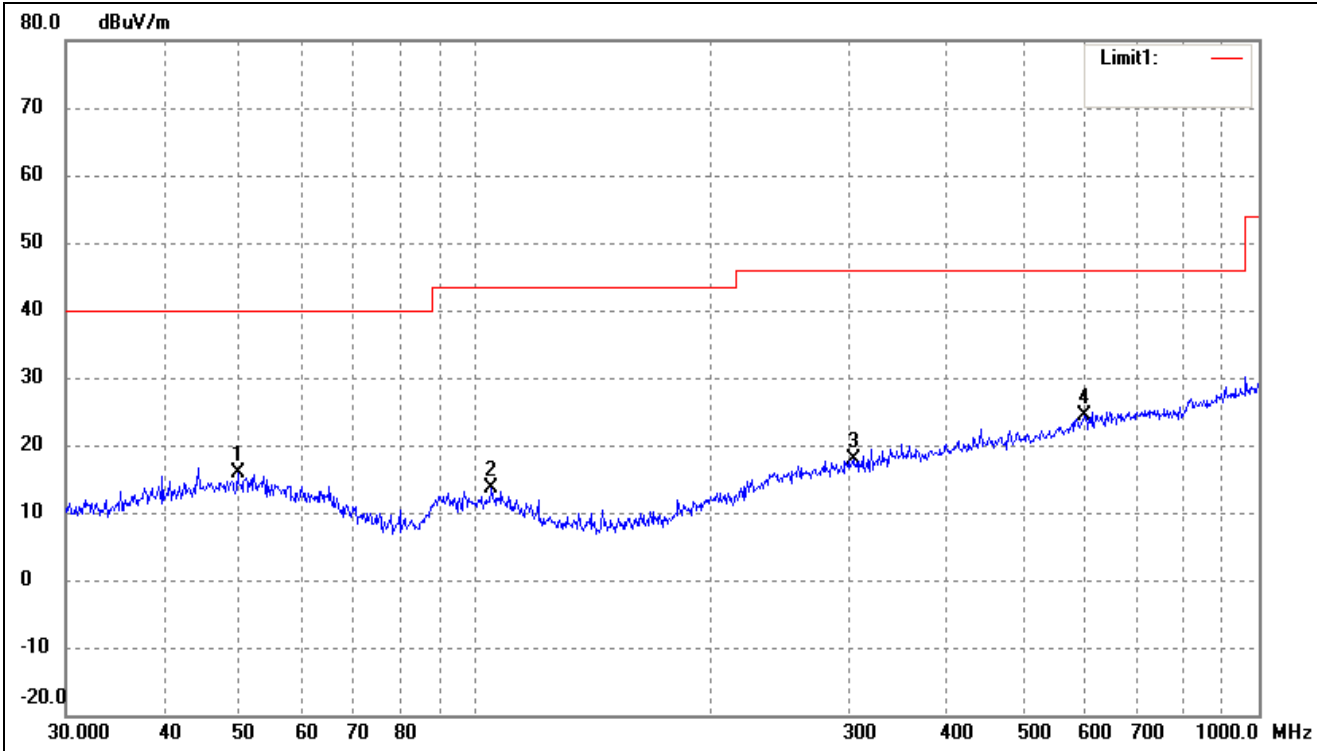


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	50.5860	27.29	-11.60	15.69	40.00	-24.31	57	100	peak
2	89.9047	26.91	-13.47	13.44	43.50	-30.06	170	100	peak
3	286.9823	26.19	-8.69	17.50	46.00	-28.50	85	100	peak



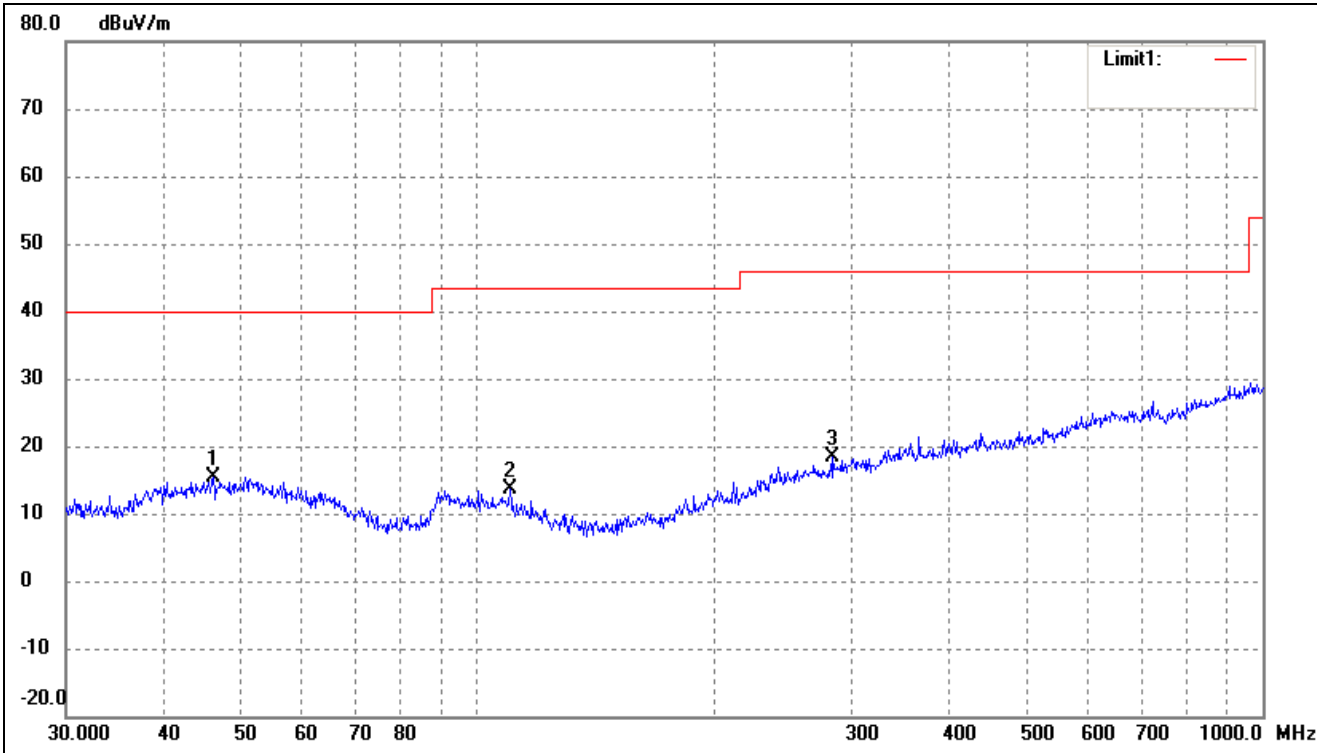
➤ 5725-5850MHz

802.11a			
Test Channel	5745MHz(worst case)	Polarity:	Horizontal



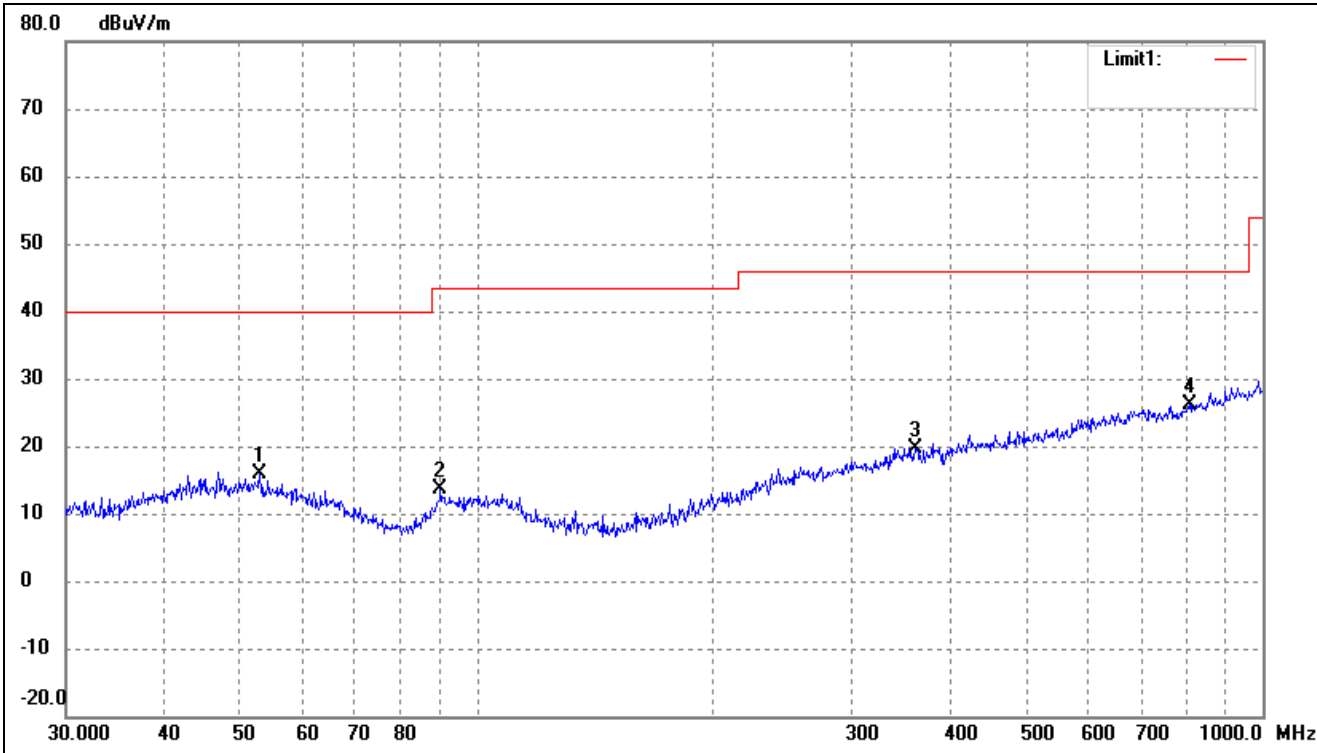
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	49.7068	27.54	-11.61	15.93	40.00	-24.07	134	100	peak
2	104.9033	26.93	-13.39	13.54	43.50	-29.96	111	100	peak
3	303.5437	25.98	-8.22	17.76	46.00	-28.24	57	100	peak
4	599.3213	27.73	-3.33	24.40	46.00	-21.60	149	100	peak

802.11a			
Test Channel	5745MHz(worst case)	Polarity:	Vertical



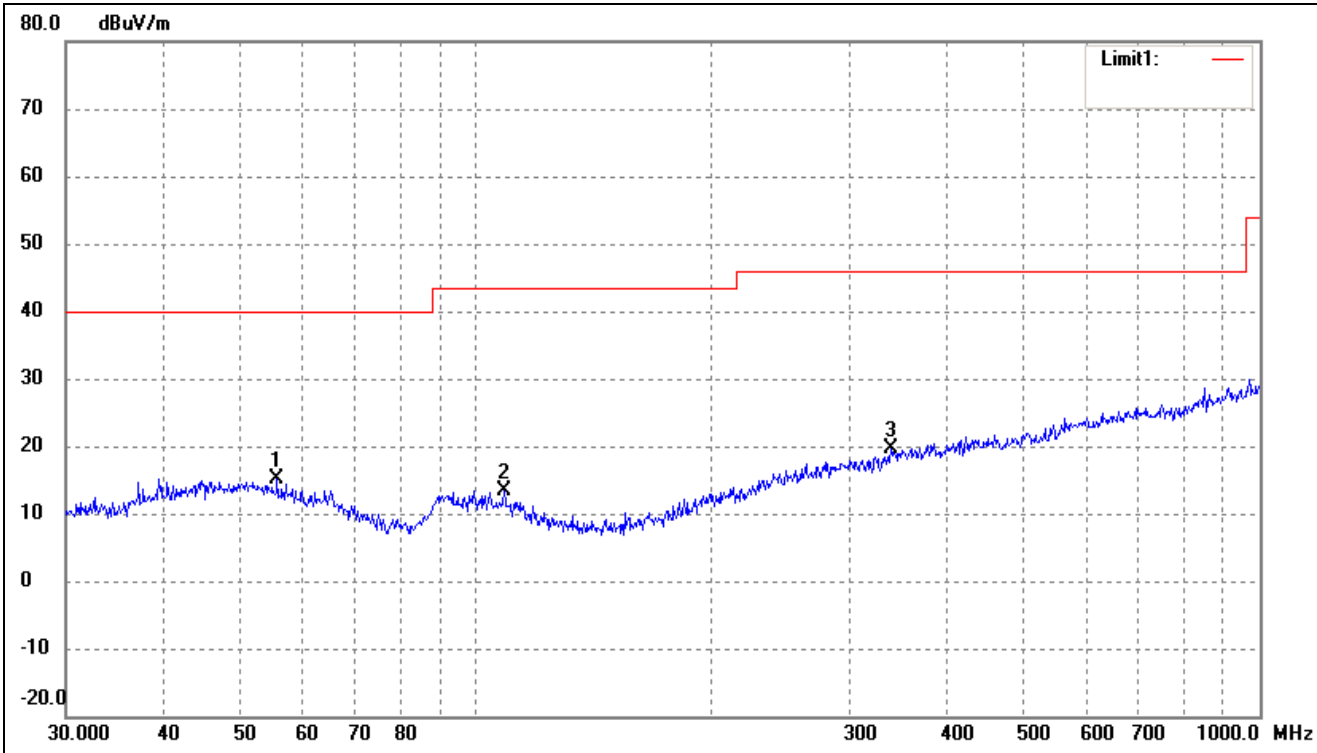
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	46.1780	27.25	-11.80	15.45	40.00	-24.55	51	100	peak
2	110.1816	27.58	-13.90	13.68	43.50	-29.82	124	100	peak
3	283.9792	27.27	-8.83	18.44	46.00	-27.56	58	100	peak

802.11n-HT20			
Test Channel	5745MHz(worst case)	Polarity:	Horizontal



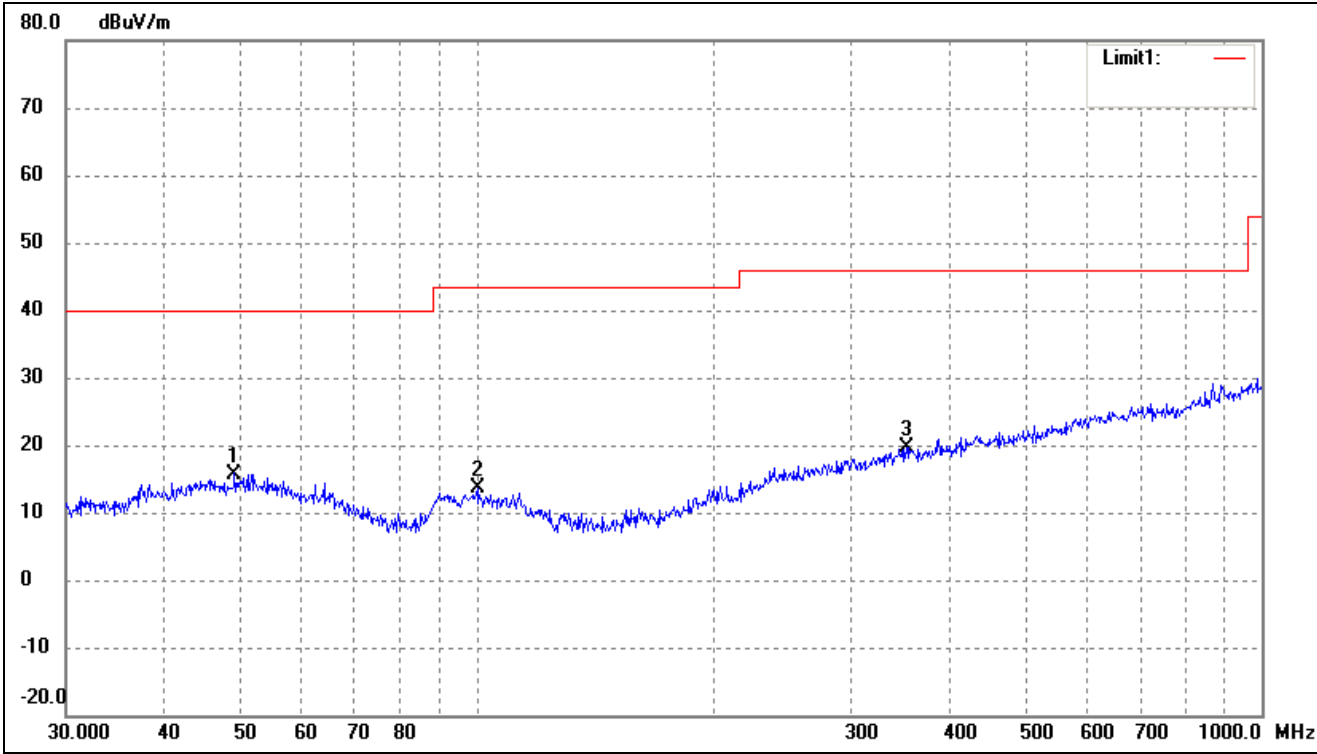
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	52.9453	27.61	-11.72	15.89	40.00	-24.11	180	100	peak
2	89.9047	27.13	-13.47	13.66	43.50	-29.84	91	100	peak
3	361.7139	26.93	-7.19	19.74	46.00	-26.26	127	100	peak
4	807.4291	26.81	-0.57	26.24	46.00	-19.76	120	100	peak

802.11n-HT20			
Test Channel	5745MHz(worst case)	Polarity:	Vertical



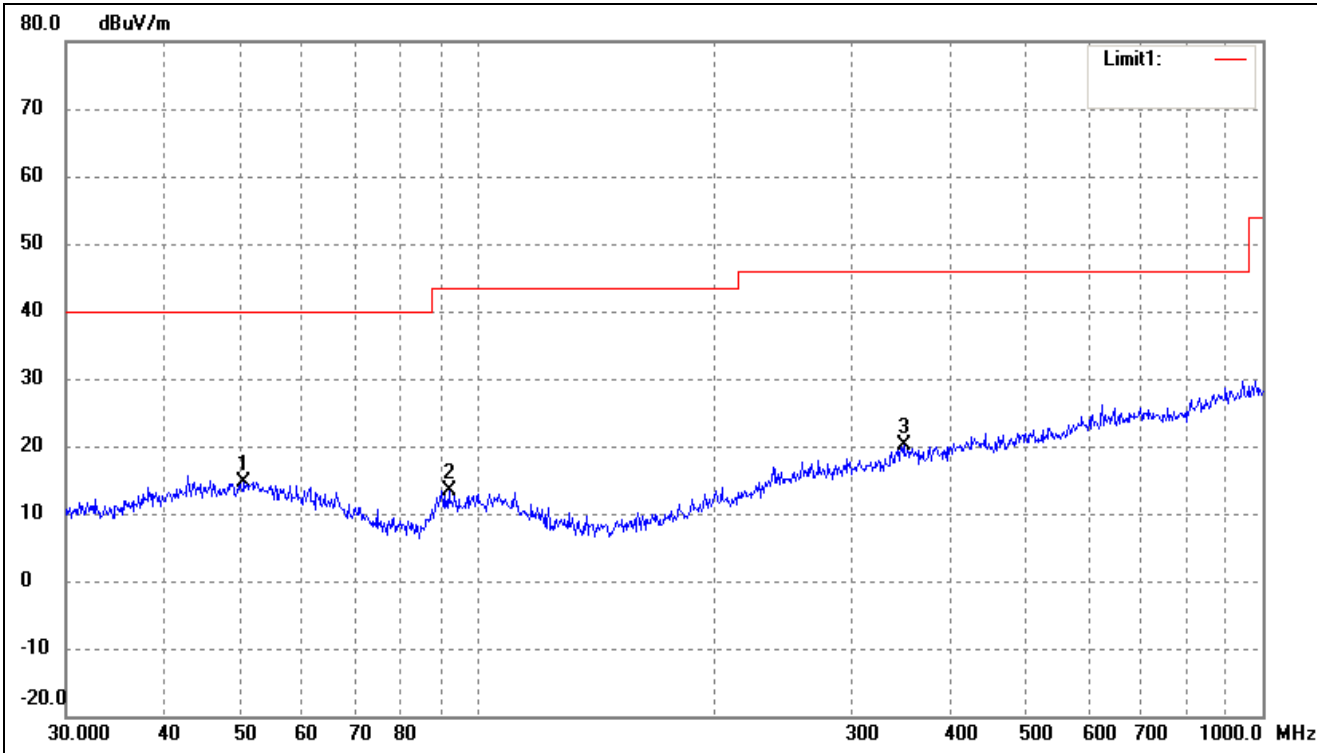
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	55.8047	27.56	-12.31	15.25	40.00	-24.75	79	100	peak
2	108.6470	27.16	-13.73	13.43	43.50	-30.07	91	100	peak
3	338.4001	26.94	-7.36	19.58	46.00	-26.42	132	100	peak

802.11n-HT40			
Test Channel	5755MHz(worst case)	Polarity:	Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	49.1866	27.38	-11.63	15.75	40.00	-24.25	229	100	peak
2	100.2286	27.53	-13.78	13.75	43.50	-29.75	92	100	peak
3	352.9434	26.60	-6.96	19.64	46.00	-26.36	149	100	peak

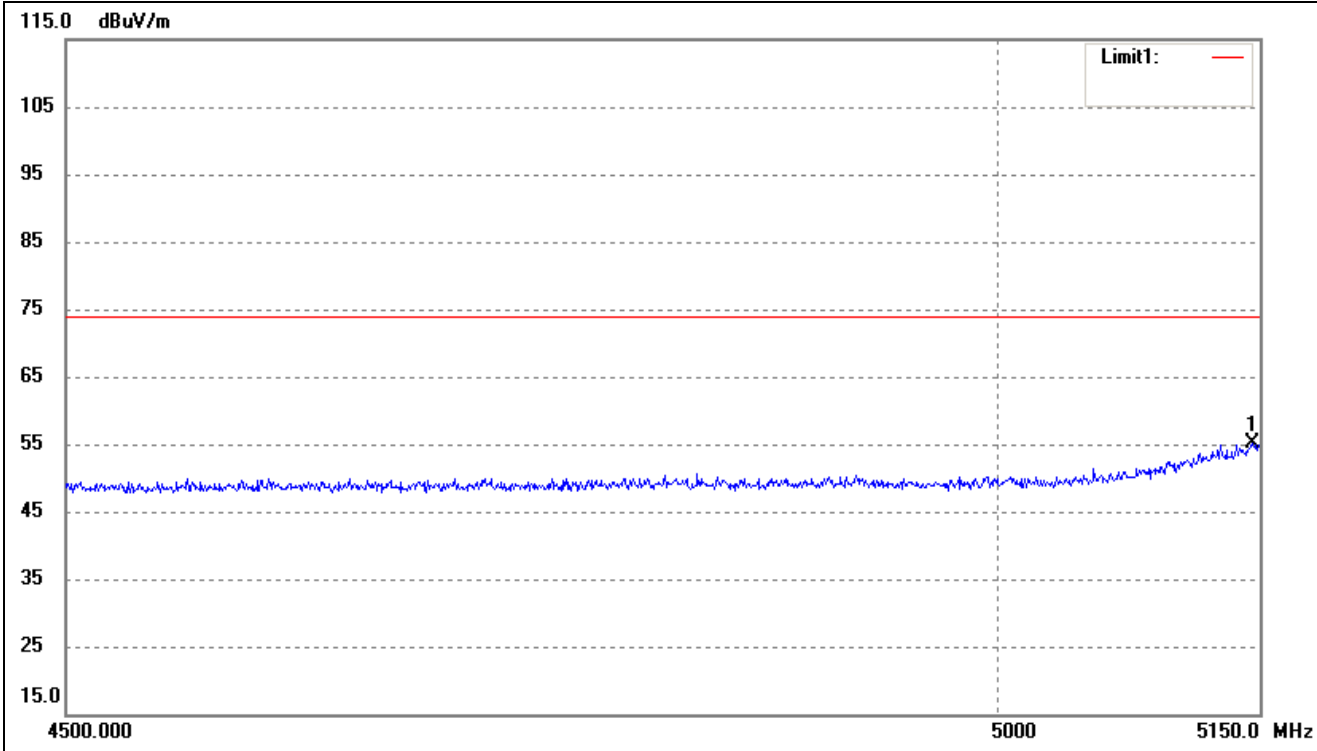
802.11n-HT40			
Test Channel	5755MHz(worst case)	Polarity:	Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	50.5860	26.33	-11.60	14.73	40.00	-25.27	136	100	peak
2	92.1388	27.19	-13.83	13.36	43.50	-30.14	107	100	peak
3	349.2500	26.97	-6.91	20.06	46.00	-25.94	87	100	peak

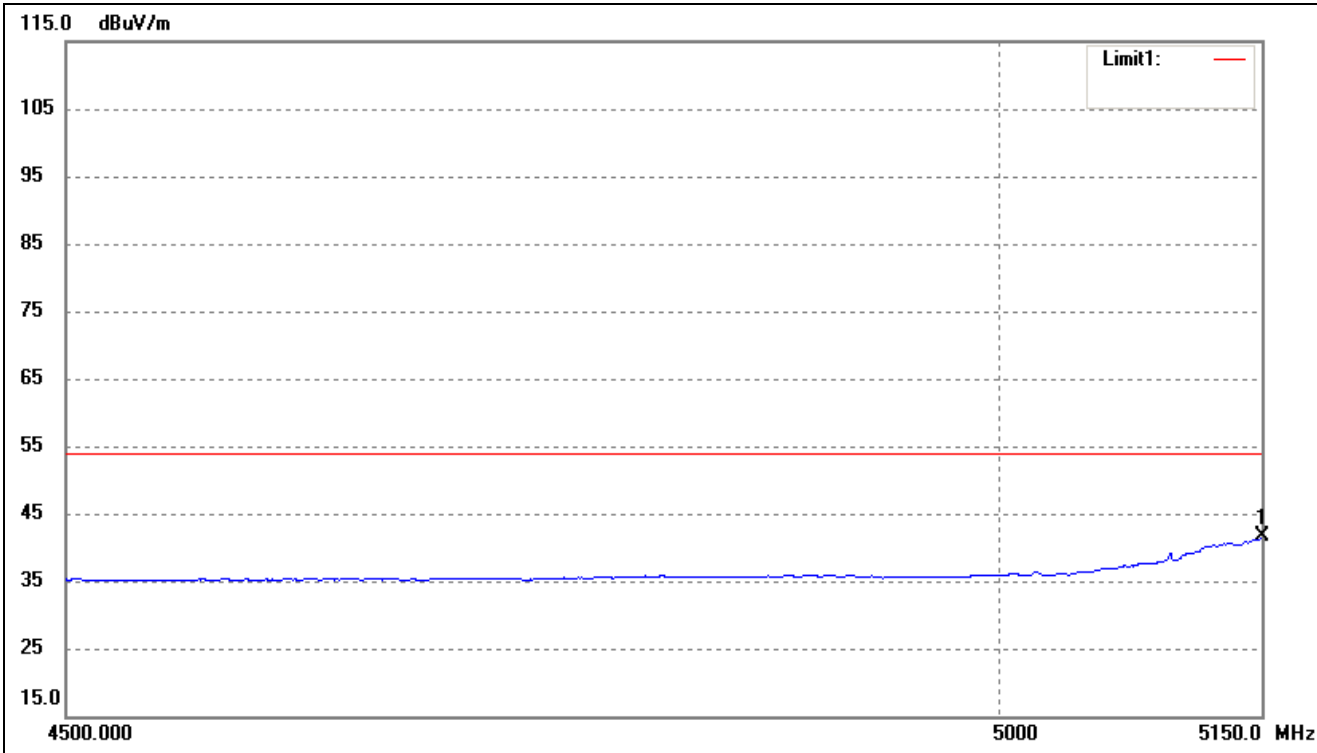
➤ Spurious Emission above 1GHz

802.11a- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5145.833	58.13	-3.00	55.13	74.00	-18.87	217	100	peak

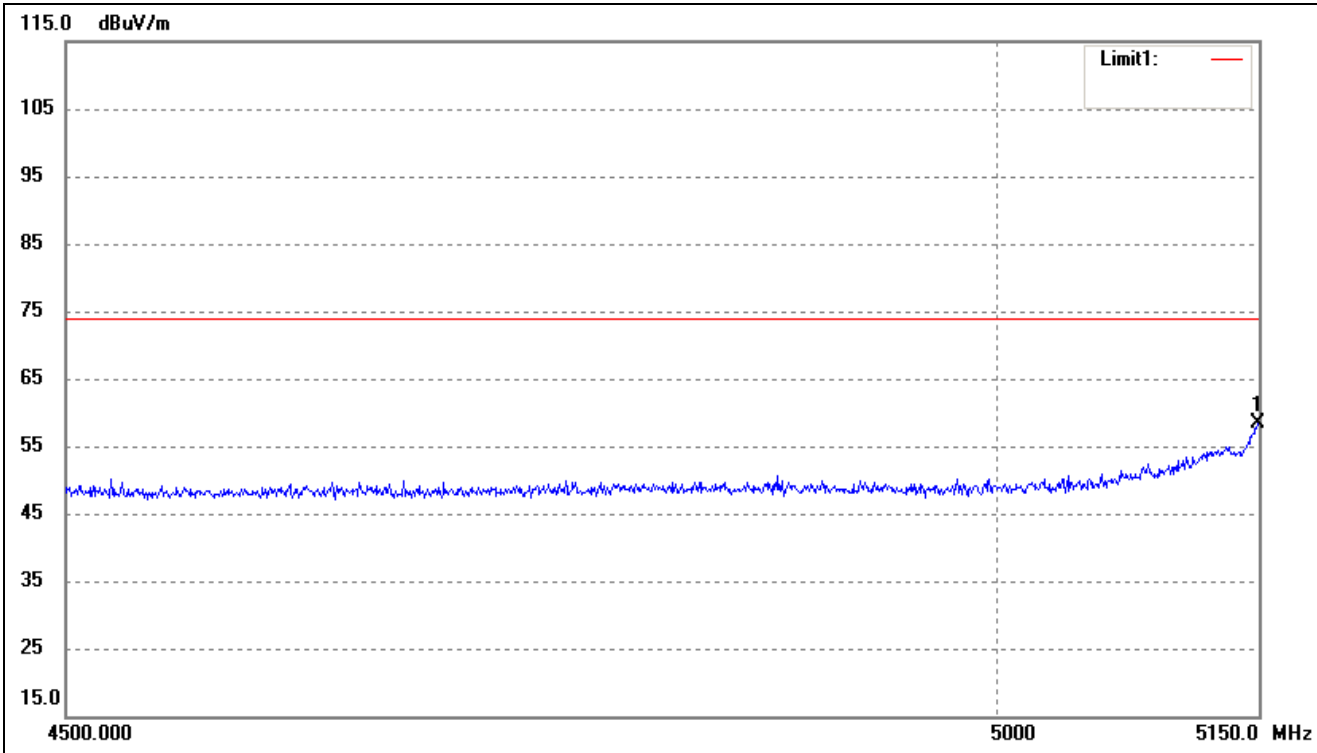
802.11a- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5150.000	44.71	-2.99	41.72	54.00	-12.28	84	100	peak

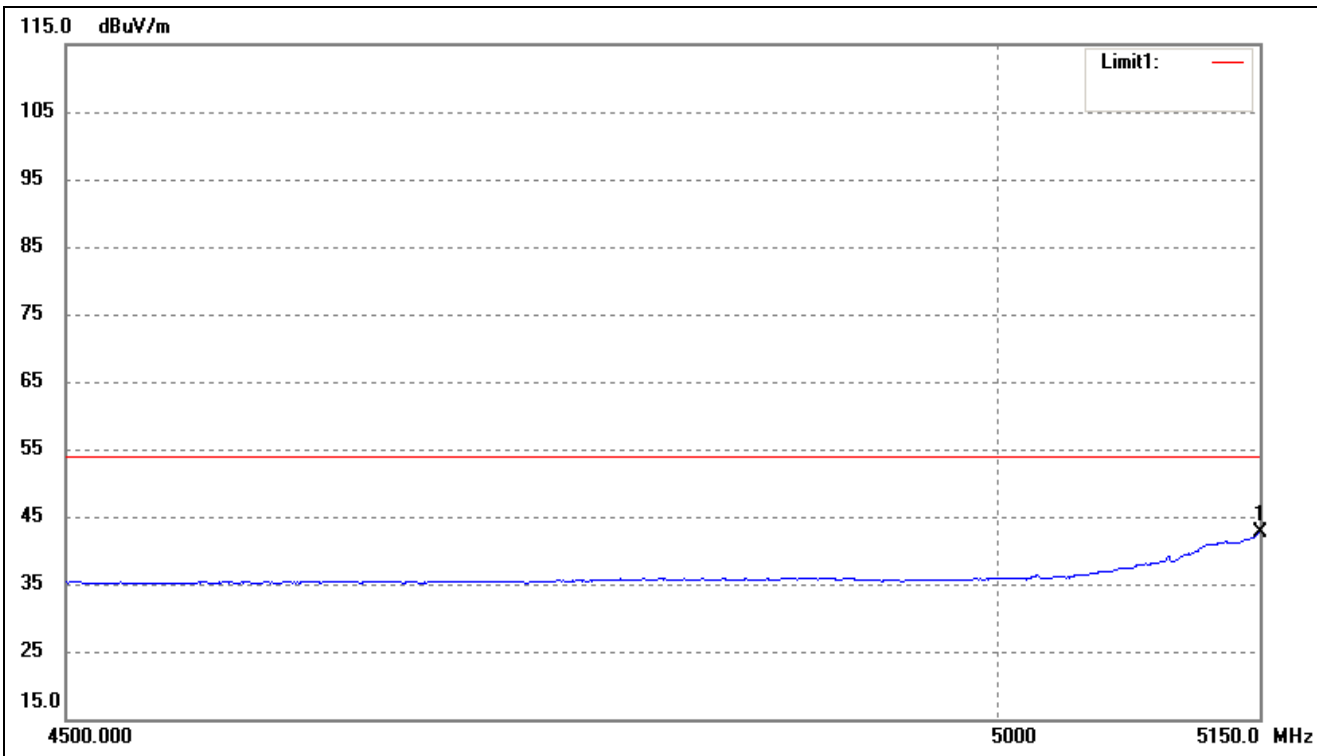


802.11n-HT20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



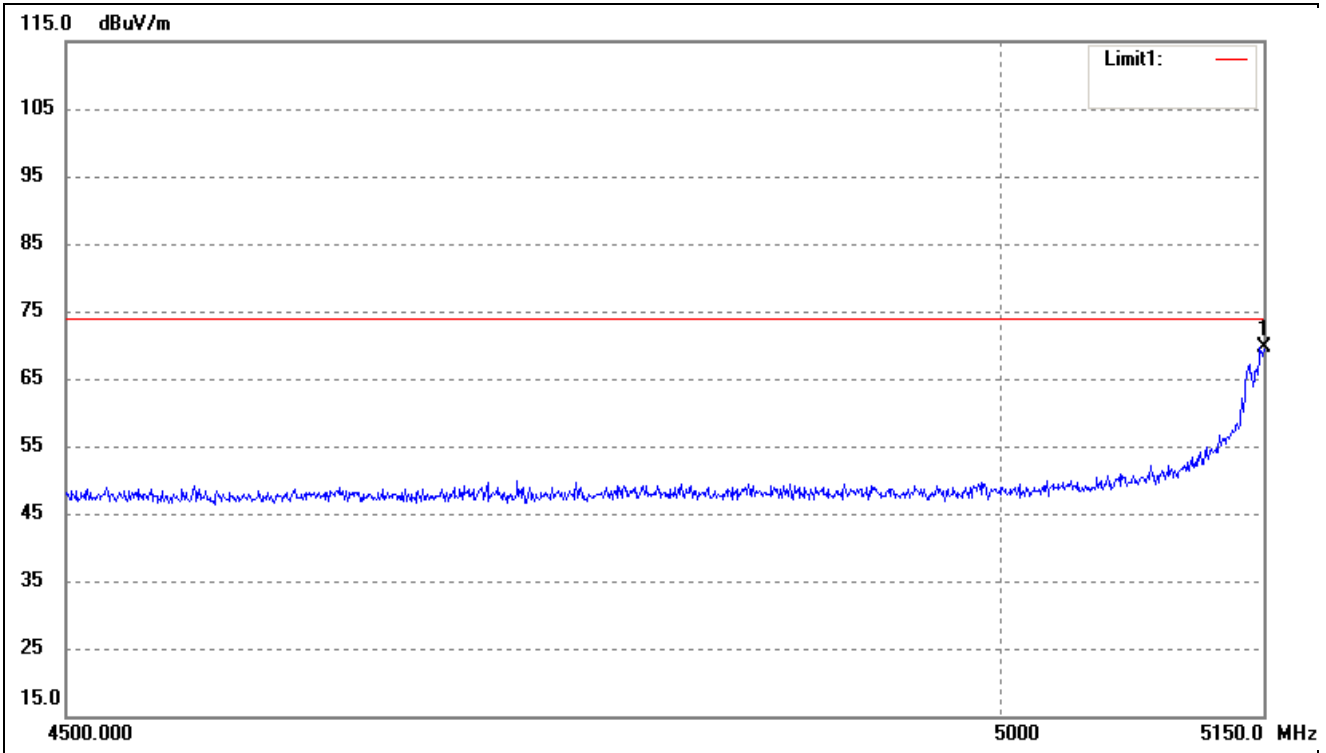
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5149.305	61.26	-2.99	58.27	74.00	-15.73	79	100	peak

802.11n-HT20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



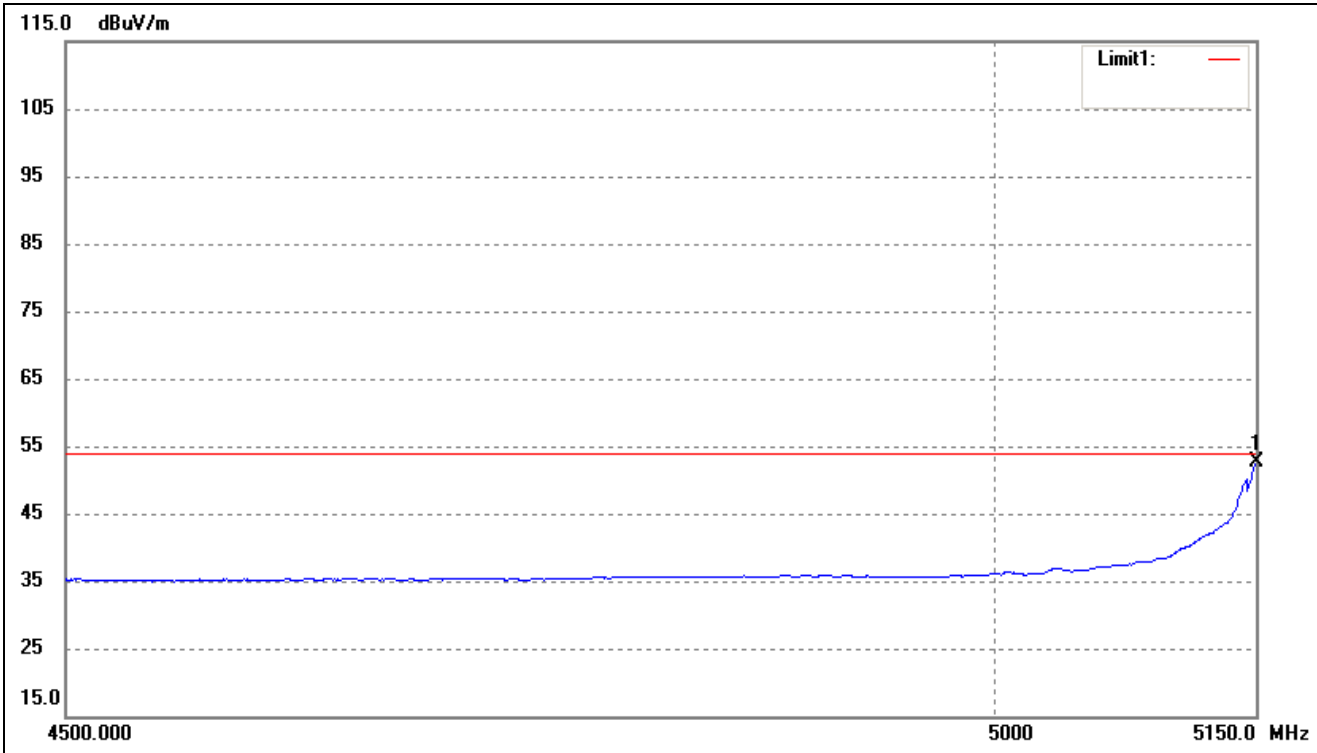
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5150.000	45.68	-2.99	42.69	54.00	-11.31	172	100	peak

802.11n-HT40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5150.000	72.64	-2.99	69.65	74.00	-4.35	103	100	peak

802.11n-HT40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	5150.000	55.68	-2.99	52.69	54.00	-1.31	140	100	peak

Note: The Restricted Bandedge was tested in Horizontal /Vertical and the worst case position data was reported.

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11a)
- Harmonics And Spurious Emissions
- Test Mode: 802.11a

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel (5180MHz)							
10360	53.52	7.11	60.63	74	-13.37	H	PK
10360	38.15	7.11	45.26	54	-8.74	H	AV
10360	55.98	7.11	63.09	74	-10.91	V	PK
10360	37.05	7.11	44.16	54	-9.84	V	AV
High Channel (5240MHz)							
10480	54.21	7.10	61.31	74	-12.69	H	PK
10480	37.65	7.10	44.75	54	-9.25	H	AV
10480	54.21	7.10	61.31	74	-12.69	V	PK
10480	35.21	7.10	42.31	54	-11.69	V	AV
Low Channel (5745MHz)							
11490	52.02	9.02	61.04	74	-12.96	H	PK
11490	34.28	9.02	43.30	54	-10.70	H	AV
11490	53.92	9.02	62.94	74	-11.06	V	PK
11490	36.29	9.02	45.31	54	-8.69	V	AV
High Channel (5825MHz)							
11610	54.58	8.94	63.52	74	-10.48	H	PK
11610	35.63	8.94	44.57	54	-9.43	H	AV
11610	54.28	8.94	63.22	74	-10.78	V	PK
11610	35.51	8.94	44.45	54	-9.55	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-32.87	-27
Highest	Above 5350	-33.98	-27

Note: the data just list the worst cases

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-39.32	-27
	5715 to 5725	-41.25	-17
Highest	5850 to 5860	-37.25	-17
	Above 5860	-42.35	-27

Note: the data just list the worst cases

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11n HT20)
- Harmonics And Spurious Emissions
- Test Mode: 802.11n-HT20

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel (5180MHz)							
10360	54.05	7.11	61.16	74	-12.84	H	PK
10360	36.28	7.11	43.39	54	-10.61	H	AV
10360	51.28	7.11	58.39	74	-15.61	V	PK
10360	35.32	7.11	42.43	54	-11.57	V	AV
High Channel (5240MHz)							
10480	52.28	7.10	59.38	74	-14.62	H	PK
10480	34.58	7.10	41.68	54	-12.32	H	AV
10480	50.31	7.10	57.41	74	-16.59	V	PK
10480	37.02	7.10	44.12	54	-9.88	V	AV
Low Channel (5745MHz)							
11490	53.84	9.02	62.86	74	-11.14	H	PK
11490	36.32	9.02	45.34	54	-8.66	H	AV
11490	52.21	9.02	61.23	74	-12.77	V	PK
11490	34.58	9.02	43.60	54	-10.40	V	AV
High Channel (5825MHz)							
11610	55.02	8.94	63.96	74	-10.04	H	PK
11610	37.32	8.94	46.26	54	-7.74	H	AV
11610	53.55	8.94	62.49	74	-11.51	V	PK
11610	35.52	8.94	44.46	54	-9.54	V	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-35.54	-27
Highest	Above 5350	-39.25	-27

Note: the data just list the worst cases

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-35.15	-27
	5715 to 5725	-42.25	-17
Highest	5850 to 5860	-39.32	-17
	Above 5860	-41.28	-27

Note: the data just list the worst cases

Note: this EUT was tested in the low, high channel and the worst case position data was reported.

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11n HT40)
- Harmonics And Spurious Emissions
- Test Mode: 802.11n-HT40

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel (5190MHz)							
10380	53.98	7.11	61.09	74	-12.91	H	PK
10380	34.05	7.11	41.16	54	-12.84	H	AV
10380	55.52	7.11	62.63	74	-11.37	V	PK
10380	32.28	7.11	39.39	54	-14.61	V	AV
High Channel (5230MHz)							
10460	54.28	7.1	61.38	74	-12.62	H	PK
10460	32.21	7.1	39.31	54	-14.69	H	AV
10460	56.87	7.1	63.97	74	-10.03	V	PK
10460	36.28	7.1	43.38	54	-10.62	V	AV
Low Channel (5755MHz)							
11510	51.02	9.04	60.06	74	-13.94	H	PK
11510	35.47	9.04	44.51	54	-9.49	H	AV
11510	56.78	9.04	65.82	74	-8.18	V	PK
11510	35.69	9.04	44.73	54	-9.27	V	AV
High Channel (5795MHz)							
11590	53.65	8.96	62.61	74	-11.39	H	PK
11590	31.25	8.96	40.21	54	-13.79	H	AV
11590	54.87	8.96	63.83	74	-10.17	V	PK
11590	33.65	8.96	42.61	54	-11.39	V	AV

## Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-42.21	-27
Highest	Above 5350	-41.08	-27
Note: the data just list the worst cases			

## ➤ Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-45.11	-27
	5715 to 5725	-39.21	-17
Highest	5850 to 5860	-42.82	-17
	Above 5860	-38.36	-27
Note: the data just list the worst cases			

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*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*



## 10. Frequency Stability

### 10.1 Standard Applicable

According to §15.407(g), 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 users manual.

### 10.2 Test Procedure

According to §2.1055, the following test procedure was performed.

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

### 10.3 Summary of Test Results/Plots

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP( °C)	Freq.Dev(Hz)	Deviation
100%	3.7	-30	133	0.026
100%		-20	164	0.032
100%		-10	139	0.027
100%		0	166	0.032
100%		+10	112	0.022
100%		+20	125	0.024
100%		+30	168	0.032
100%		+40	111	0.021
100%		+50	132	0.025
Low Battery power		3.5	+20	133
High Battery power	4.2	+20	164	0.032

<b>U-NII-1:5725-5850MHz worst case at 802.11a middle channel</b>				
Voltage(%)	Power(VDC)	TEMP( °C)	Freq.Dev(Hz)	Deviation
100%	3.7	-30	110	0.019
100%		-20	144	0.025
100%		-10	153	0.026
100%		0	128	0.022
100%		+10	154	0.027
100%		+20	137	0.024
100%		+30	140	0.024
100%		+40	127	0.022
100%		+50	123	0.021
Low Battery power		3.5	+20	110
High Battery power	4.2	+20	144	0.025

\*\*\*\*\* END OF REPORT \*\*\*\*\*