

FCC Part 15E Measurement and Test Report

For

SC GOLD STANDARD INTERNATIONAL SRL

Buciumat 14, Sector 1, Bucuresti, Romania

FCC ID: 2AU6K-K1

FCC Rule(s): FCC Part 15.407

Product Description: IMPulse

Tested Model: K1

Report No.: WTX19X11077161W-3

Sample Receipt Date: 2019-11-07

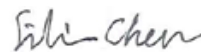
Tested Date: 2019-11-07 to 2019-12-02

Issued Date: 2019-12-02

Tested By: Jason Su / Engineer



Reviewed By: Silin Chen / EMC Manager



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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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Report version

Version No.	Date of issue	Description
Rev.00	2019-12-02	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: SC GOLD STANDARD INTERNATIONAL SRL
Address of applicant: Bucumat 14, Sector 1, Bucuresti, Romania

Manufacturer: Shenzhen KEP Technology Co., Ltd
Address of manufacturer: 4th Floor South, Building B20, Heng Feng Industrial Area,
Xixiang Town, Bao'an District, Shenzhen, Guangdong, China
518126

General Description of EUT	
Product Name:	IMPulse
Brand Name:	Cryptodata
Model No.:	K1
Adding Model(s):	/
Rated Voltage:	DC3.85V
Battery Capacity:	/
Power Adapter:	WB-10G05R INPUT: AC100-240/60Hz, 0.4A, Max; Output: DC5V, 2A
Software Version:	/
Hardware Version:	/
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n(HT20) , 802.11n-HT40, 802.11ac-VH80
Frequency Range:	5150-5250MHz, 5725-5850MHz
RF Output Power:	12.78dBm (Conducted)
Type of Modulation:	BPSK, QPSK,16QAM,64QAM, 256QAM
Data Rate:	6-54Mbps, up to 200Mbps
Quantity of Channels:	15
Type of Antenna:	Integral Antenna
Antenna Gain:	4.8dBi

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 “3646631+=” 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	22	22	22	/	/	/	/	/	/	/	22	22	22
802.11n-HT20 MCS0	22	22	22	/	/	/	/	/	/	/	22	22	22
Mode	NCB: 40MHz												
	5190	5230	5270	5310	5510	5550	5670	5710	5755	5795			
802.11n-HT40 MCS0	22	22	/	/	/	/	/	/	22	22			
Mode	NCB: 80MHz												
	5210		5290		5530		5610		5690		5775		
802.11ac-VH80 MCS0/Nss2	22		/		/		/		/		22		

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

Address of the test laboratory

Laboratory: Shenzhen SEM Test Technology Co., Ltd.

Address: 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101)

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. 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
TM4	802.11ac-VH80	5210MHz,5775 MHz

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-C Cable	1.0	Shielded	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	2019-04-30	2020-04-29
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2019-04-30	2020-04-29
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2019-04-30	2020-04-29
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2019-04-30	2020-04-29
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2019-04-30	2020-04-29
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2019-04-30	2020-04-29
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2019-04-30	2020-04-29
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2019-04-30	2020-04-29
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2019-04-30	2020-04-29
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2019-04-30	2020-04-29
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2019-04-30	2020-04-29
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2019-04-30	2020-04-29
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2019-04-30	2020-04-29
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2019-04-30	2020-04-29
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

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing

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)	Compliant

N/A: not applicable

3. RF Exposure

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 RF exposure, please see the SAR Report.

4. Antenna Requirement

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.

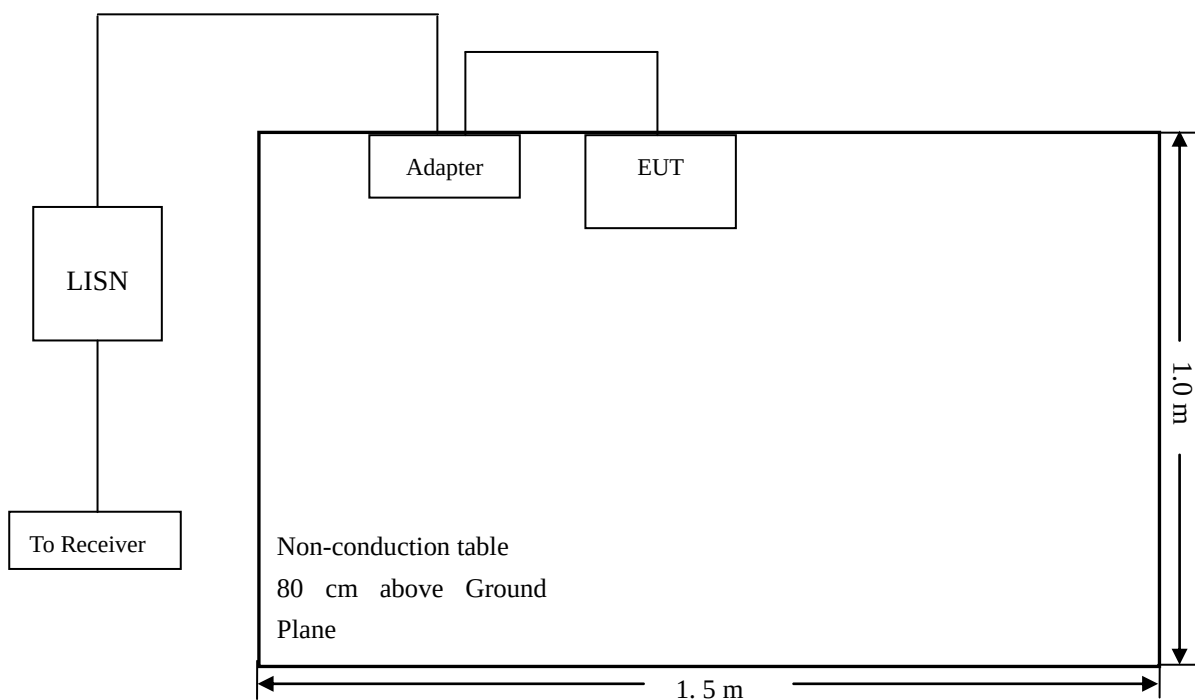
5. Conducted Emissions

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



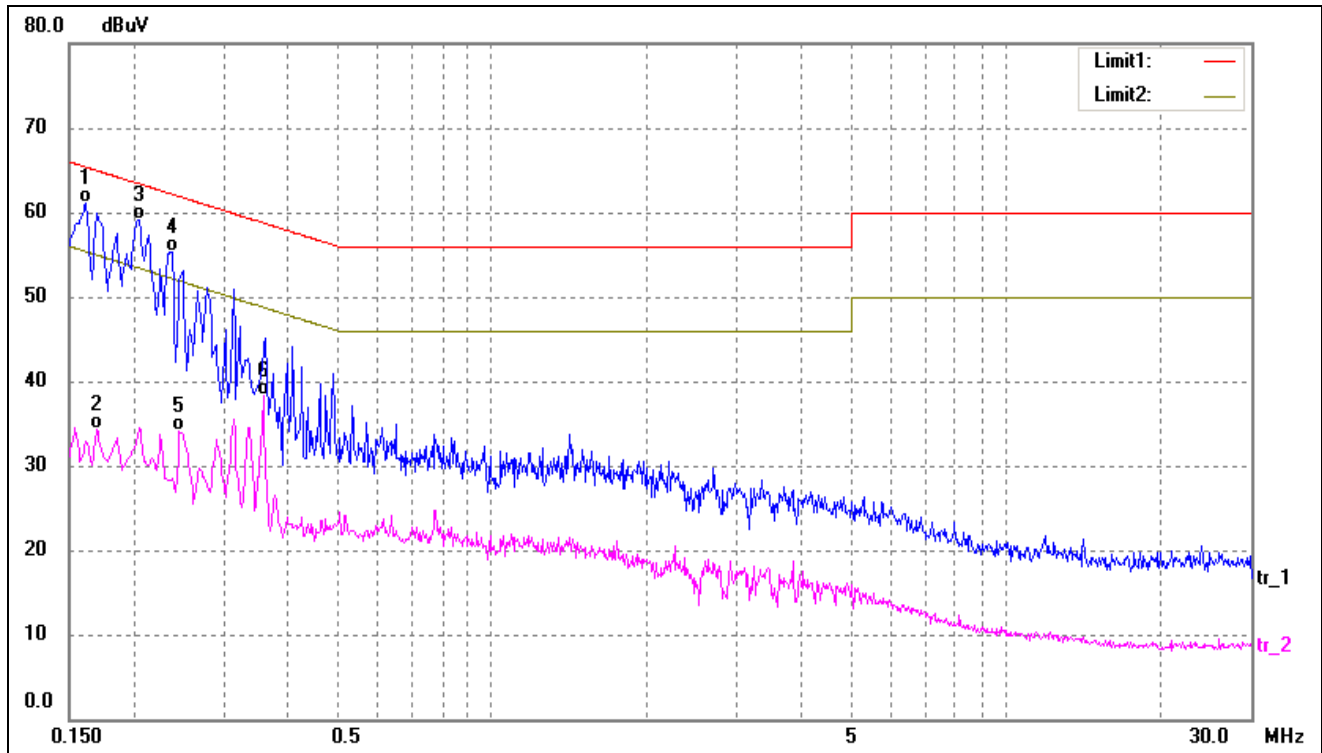
5.3 Test Receiver Setup

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

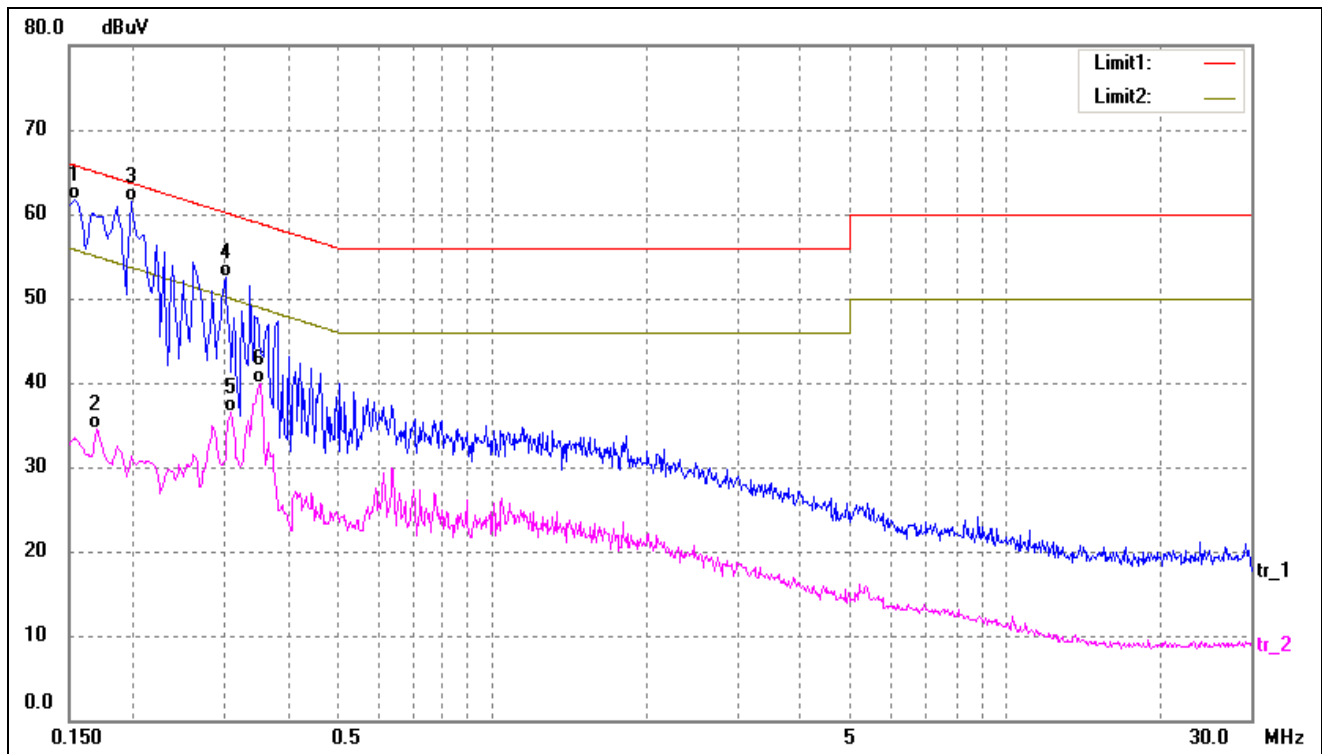
5.4 Summary of Test Results/Plots

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*	0.1620	51.23	9.95	61.18	65.36	-4.18	QP
2	0.1700	24.34	9.95	34.29	54.96	-20.67	AVG
3	0.2060	49.16	9.97	59.13	63.37	-4.24	QP
4	0.2380	45.40	10.00	55.40	62.17	-6.77	QP
5	0.2460	24.01	10.01	34.02	51.89	-17.87	AVG
6	0.3580	28.37	10.03	38.40	48.77	-10.37	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line
-----------	---------------	-------------	-----------	------



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1540	51.84	9.95	61.79	65.78	-3.99	QP
2	0.1700	24.53	9.95	34.48	54.96	-20.48	AVG
3*	0.1980	51.54	9.97	61.51	63.69	-2.18	QP
4	0.3020	42.57	10.01	52.58	60.19	-7.61	QP
5	0.3100	26.44	10.01	36.45	49.97	-13.52	AVG
6	0.3540	29.89	10.03	39.92	48.87	-8.95	AVG

6. Power Spectral Density

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 ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500kHz bandwidth, the following adjustments to the procedures apply:

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

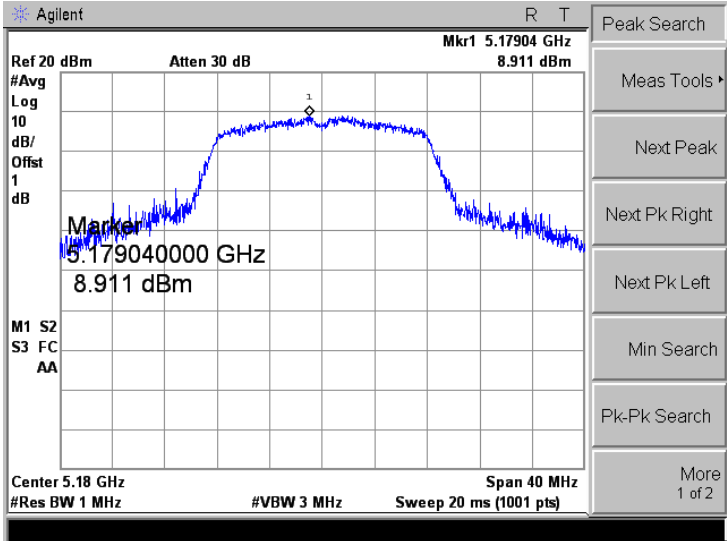
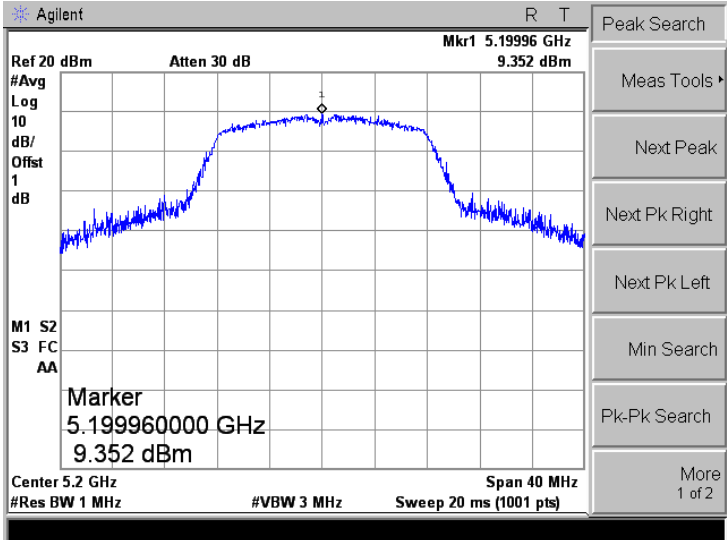
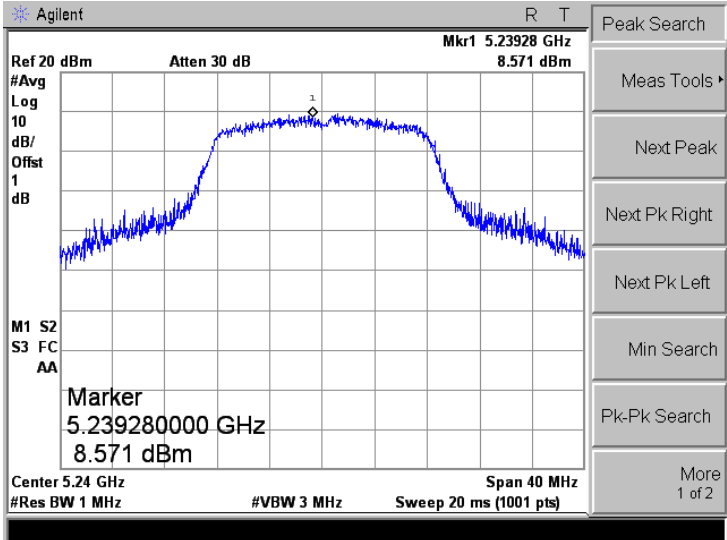
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since $RBW=100 \text{ kHz}$ is available on nearly all spectrum analyzers.

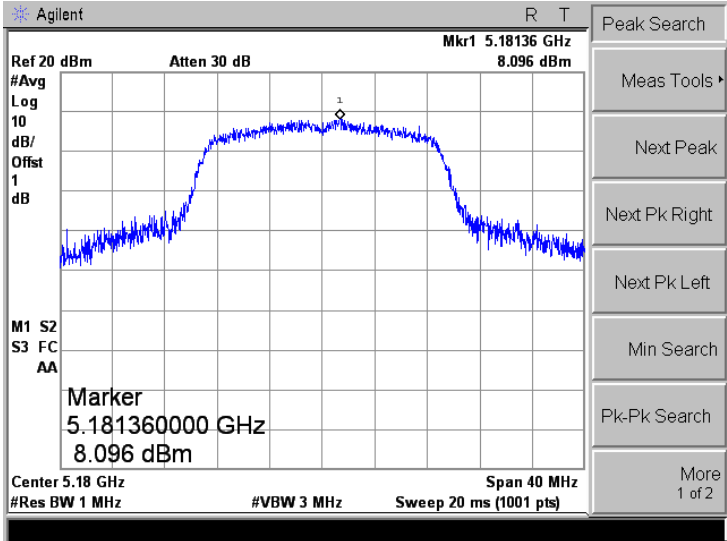
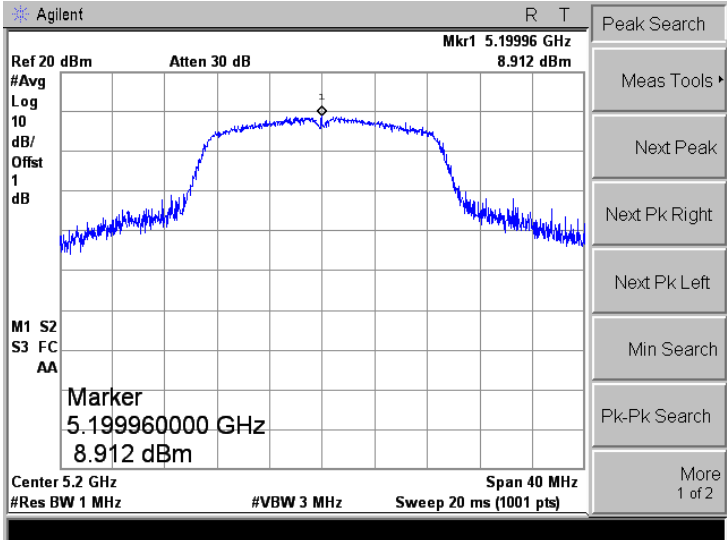
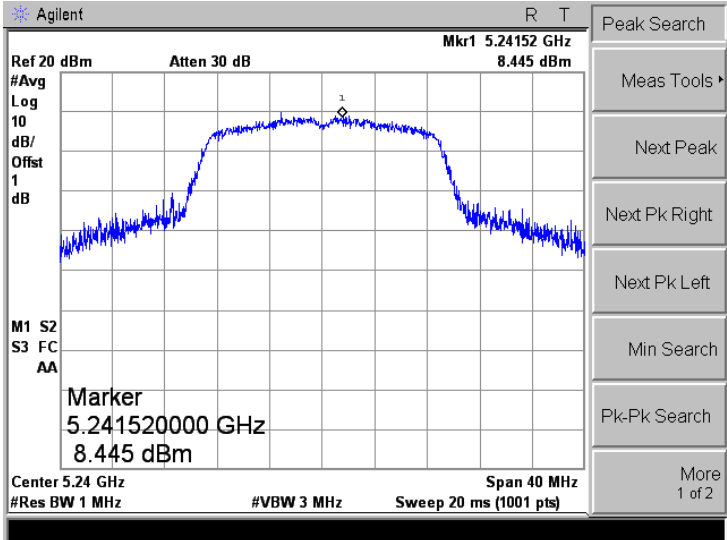
6.3 Summary of Test Results/Plots

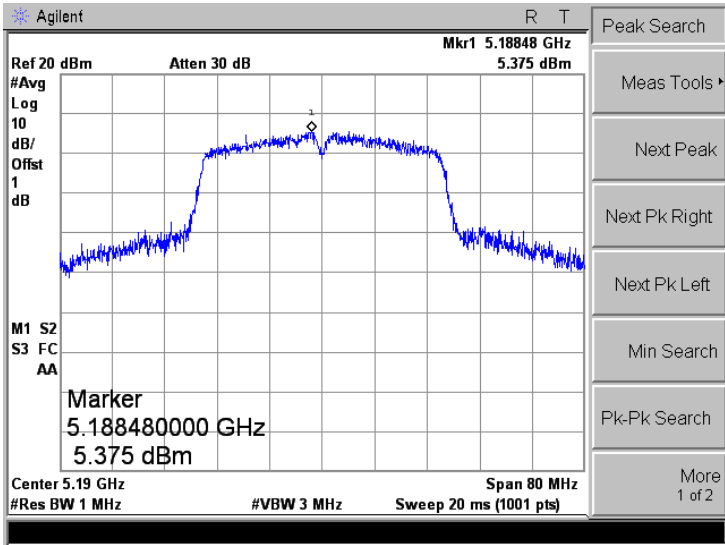
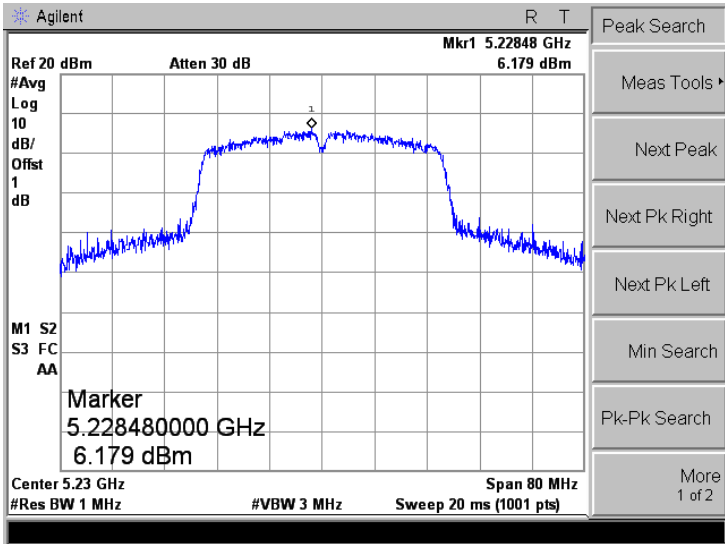
U-NII-1:5150-5250MHz			
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	8.911	11
	5200	9.352	11
	5240	8.571	11
802.11n-HT20	5180	8.096	11
	5200	8.912	11
	5240	8.445	11
802.11n-HT40	5190	5.375	11
	5230	6.179	11
802.11ac-HT80	5210	1.585	11

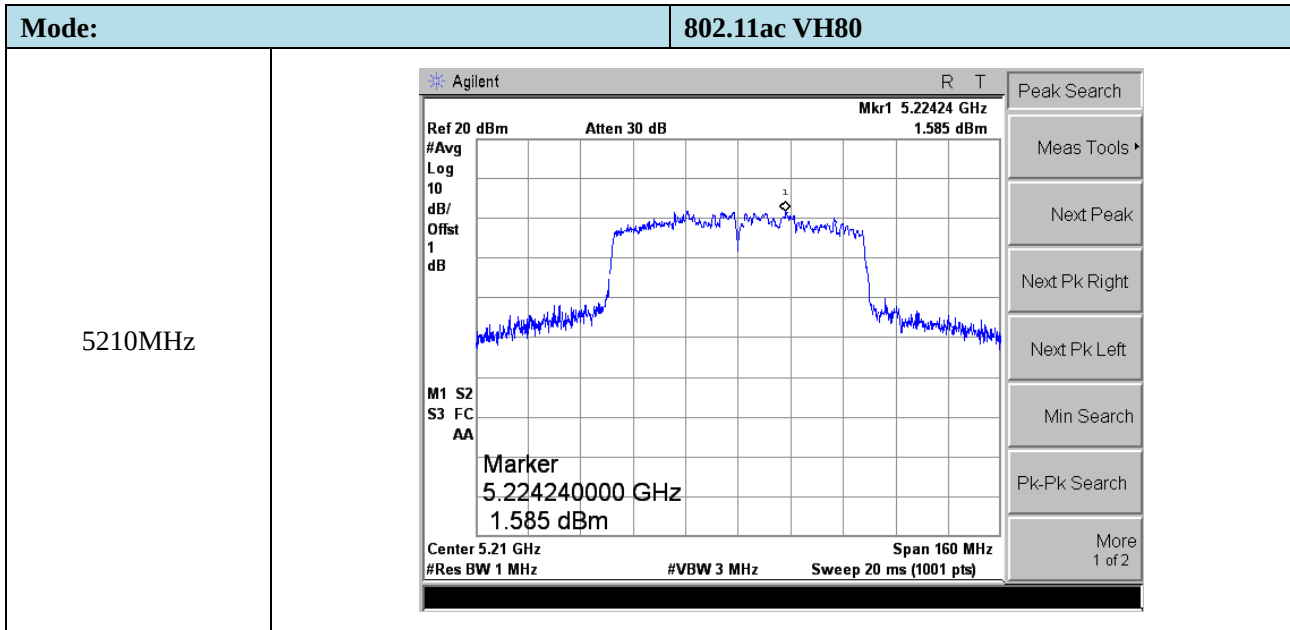
U-NII-3: 5725-5850MHz					
Operating mode	Test Channel	Power Spectral Density dBm/300kHz	Factor	Power Spectral Density* dBm/500kHz	Limit dBm/500kHz
802.11a	5745	3.396	2.22	5.616	30
	5785	3.891	2.22	6.111	30
	5825	3.998	2.22	6.218	30
802.11n-HT20	5745	3.749	2.22	5.969	30
	5785	4.711	2.22	6.931	30
	5825	3.973	2.22	6.193	30
802.11n HT40	5755	0.697	2.22	2.917	30
	5795	0.200	2.22	2.420	30
802.11ac VH80	5775	-3.303	2.22	-1.083	30
*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22					

➤ 5150-5250MHz

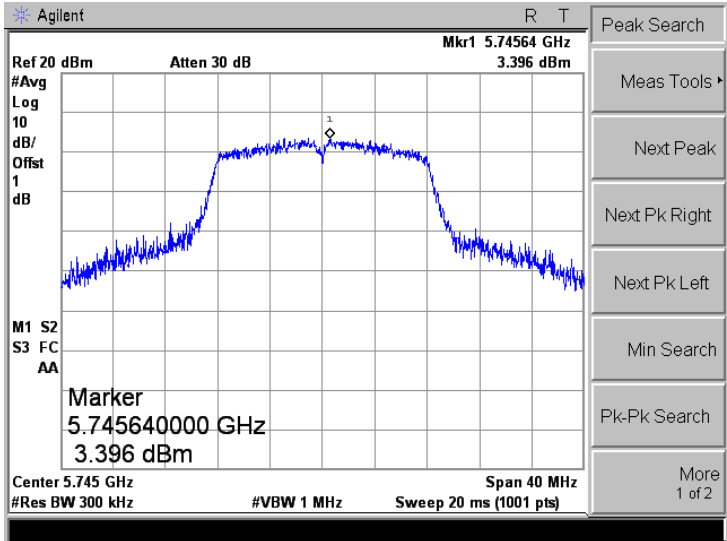
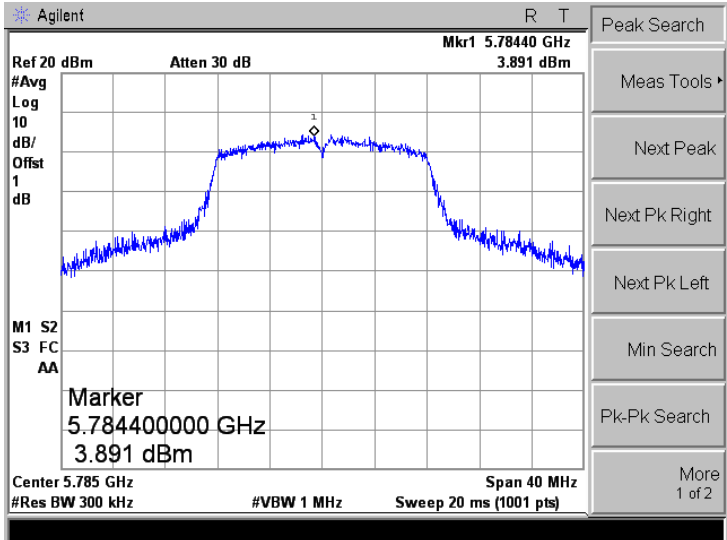
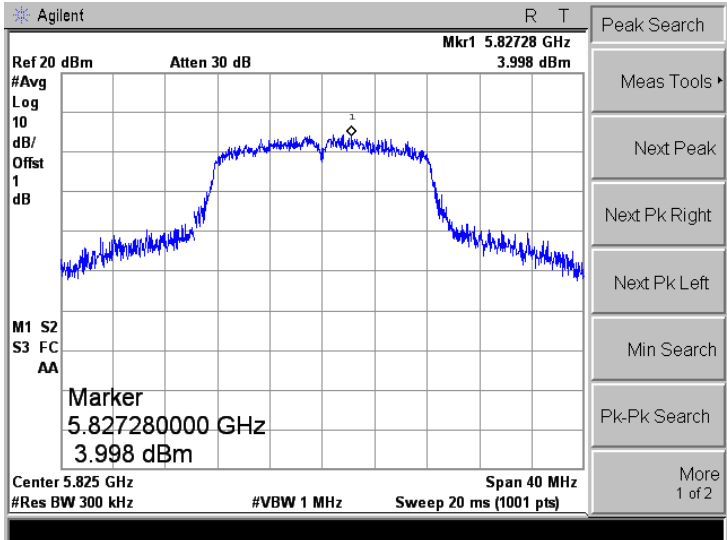
Mode:	802.11a
5180MHz	
5200MHz	
5240MHz	

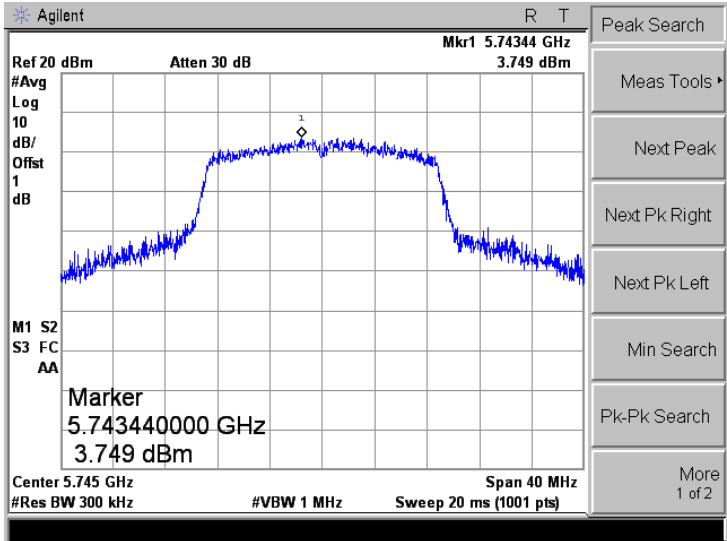
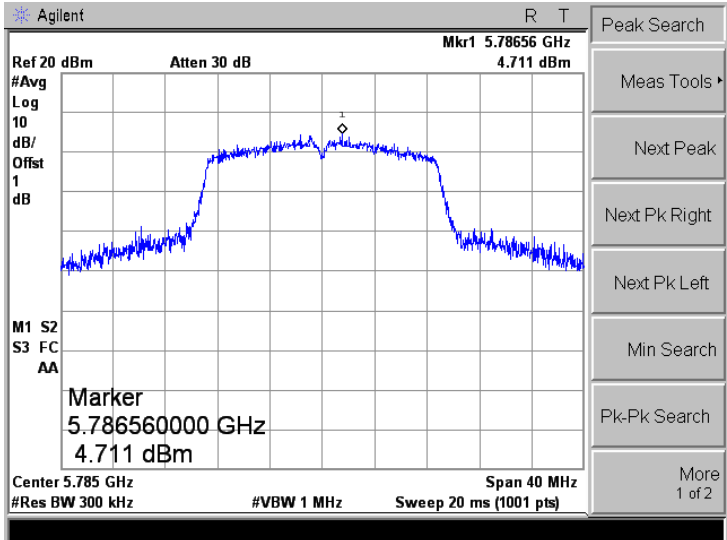
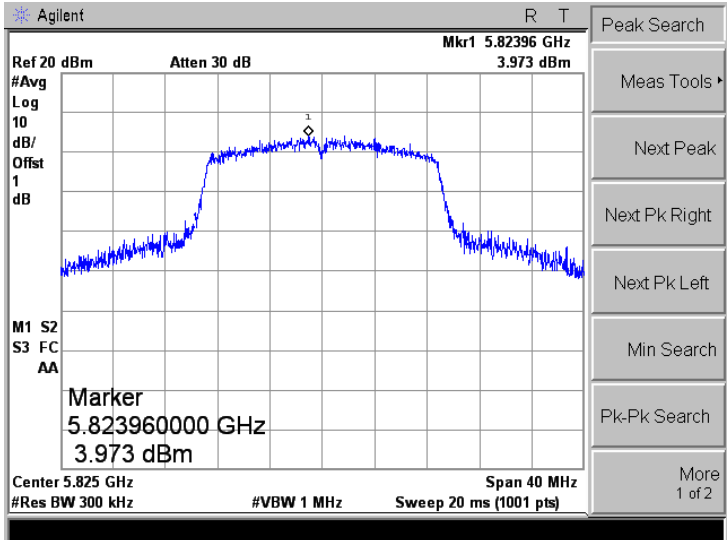
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5180MHz	
5200MHz	
5240MHz	

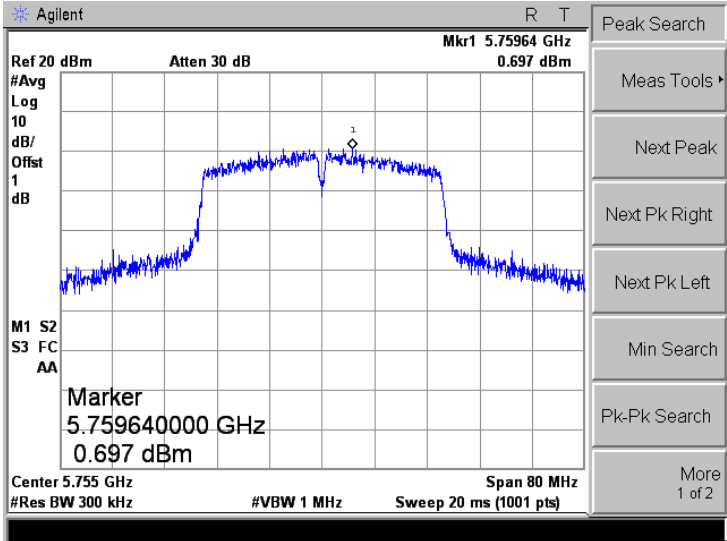
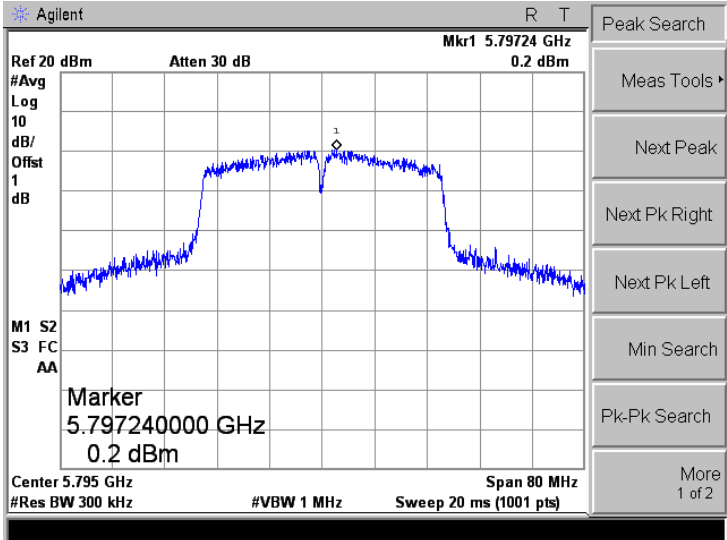
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

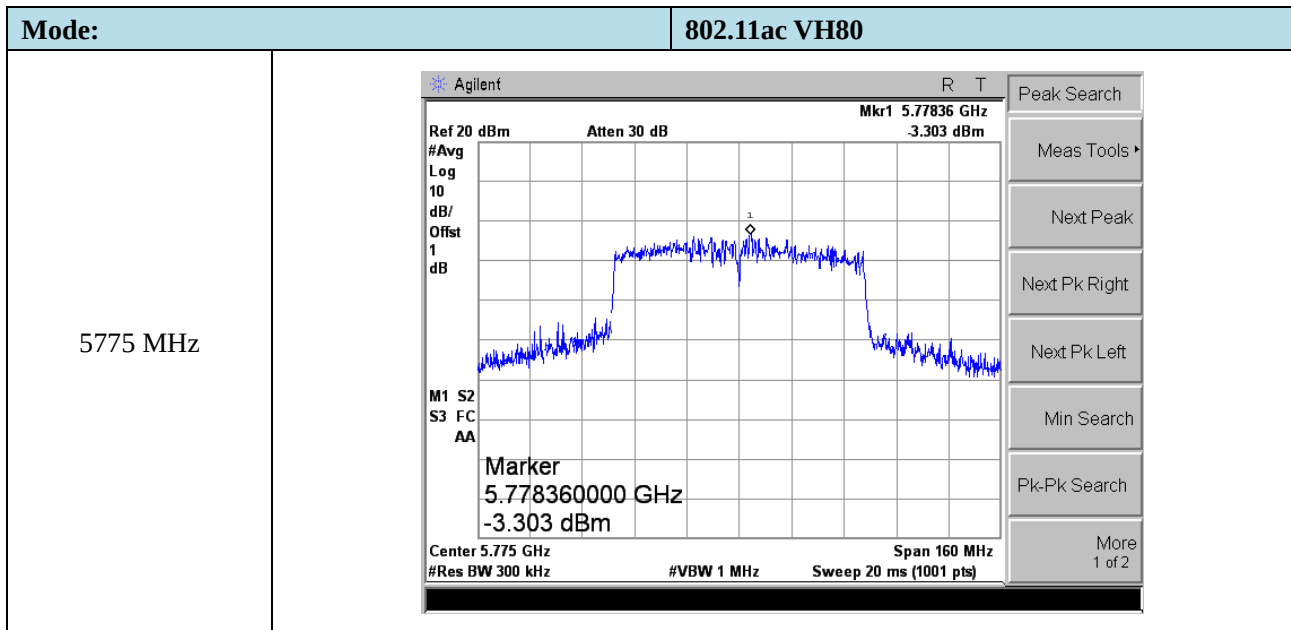


➤ 5725-5850MHz

Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT20
5745MHz	 Agilent R T Ref 20 dBm Atten 30 dB Mkr1 5.74344 GHz 3.749 dBm #Avg Log 10 dB/ Offst 1 dB M1 S2 S3 FC AA Marker 5.743440000 GHz 3.749 dBm Center 5.745 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts) Peak Search Meas Tools Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
5785MHz	 Agilent R T Ref 20 dBm Atten 30 dB Mkr1 5.78656 GHz 4.711 dBm #Avg Log 10 dB/ Offst 1 dB M1 S2 S3 FC AA Marker 5.786560000 GHz 4.711 dBm Center 5.785 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts) Peak Search Meas Tools Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
5825MHz	 Agilent R T Ref 20 dBm Atten 30 dB Mkr1 5.82396 GHz 3.973 dBm #Avg Log 10 dB/ Offst 1 dB M1 S2 S3 FC AA Marker 5.823960000 GHz 3.973 dBm Center 5.825 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts) Peak Search Meas Tools Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2

Mode:	802.11n-HT40
5755 MHz	 Agilent R T Ref 20 dBm Atten 30 dB Mkr1 5.75964 GHz 0.697 dBm #Avg Log 10 dB/ Offst 1 dB M1 S2 S3 FC AA Marker 5.759640000 GHz 0.697 dBm Center 5.755 GHz Span 80 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts) Peak Search Meas Tools Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
5795 MHz	 Agilent R T Ref 20 dBm Atten 30 dB Mkr1 5.79724 GHz 0.2 dBm #Avg Log 10 dB/ Offst 1 dB M1 S2 S3 FC AA Marker 5.797240000 GHz 0.2 dBm Center 5.795 GHz Span 80 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts) Peak Search Meas Tools Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2



7. Emission Bandwidth and Occupied Bandwidth

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) $\geq 3 \times \text{RBW}$.
- 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:

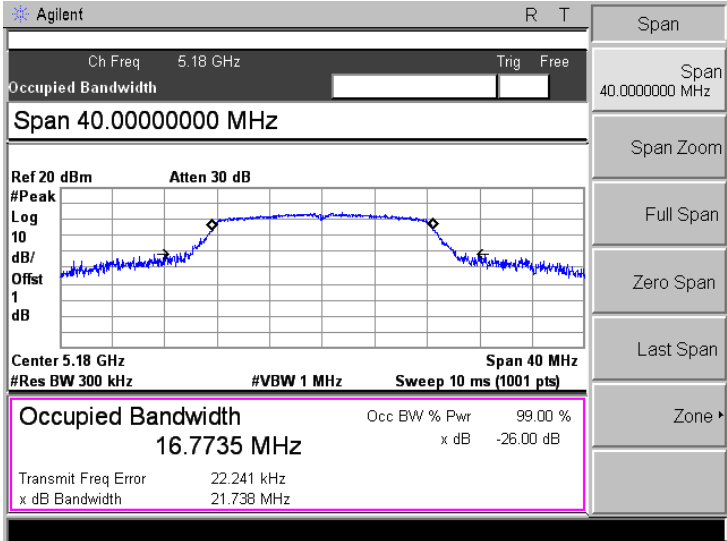
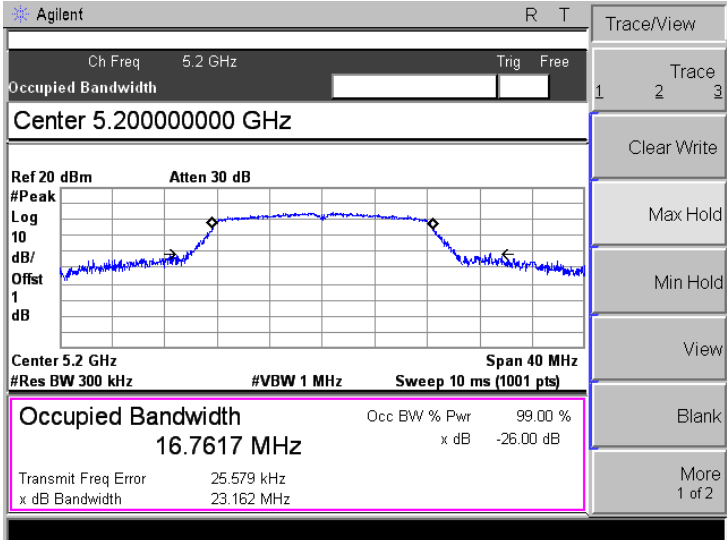
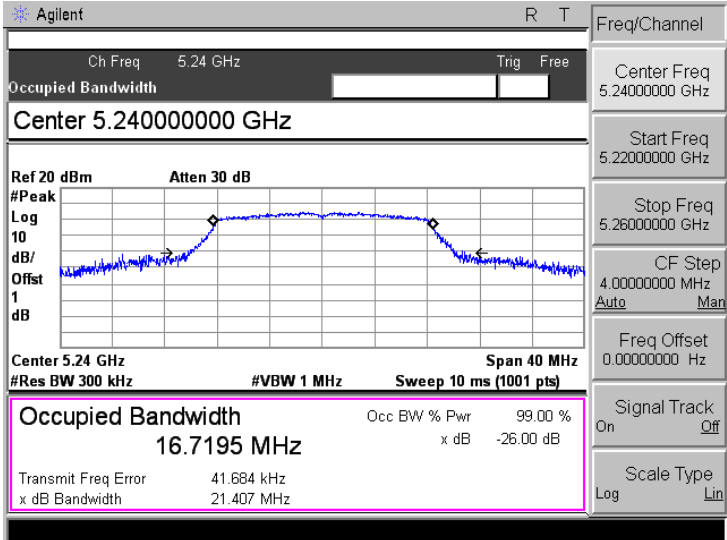
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 * \text{RBW}$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, 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.

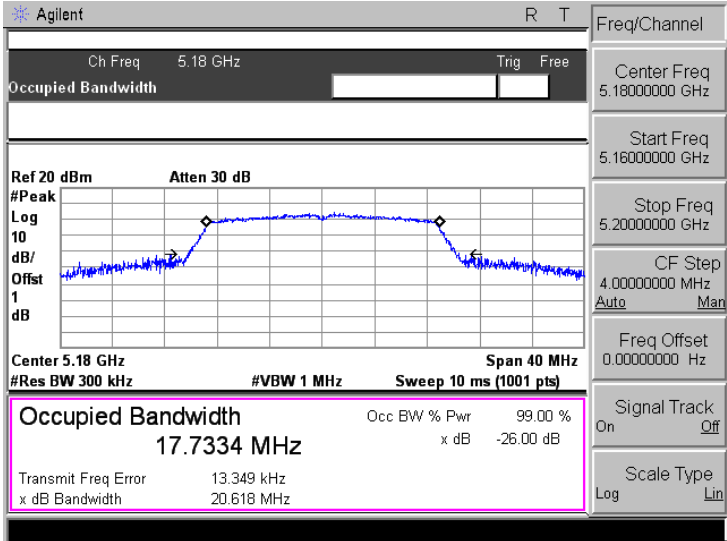
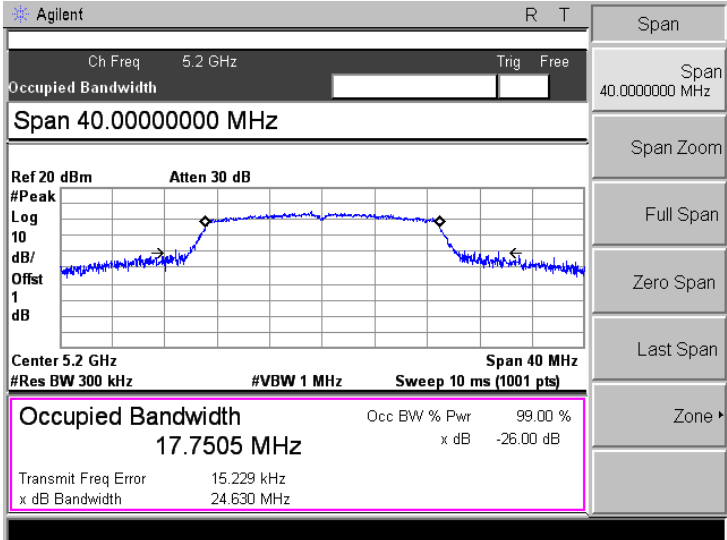
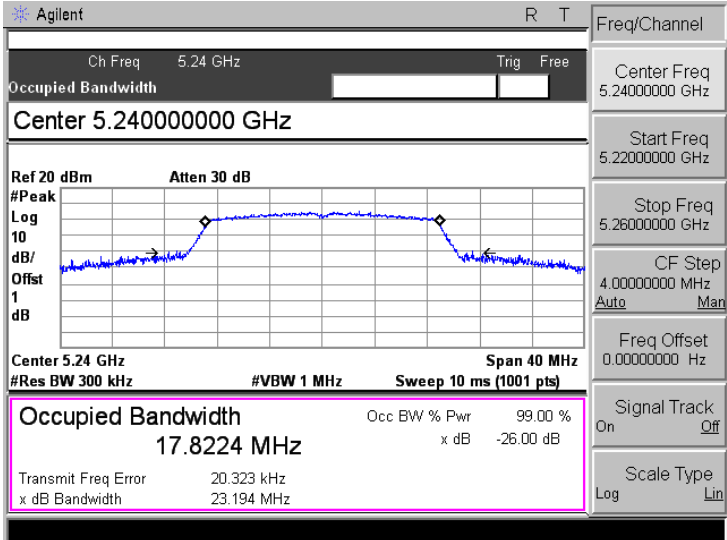
7.3 Summary of Test Results/Plots

U-NII-1:5150-5250MHz				
Test Mode	Test Channel MHz	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5180	21.738	16.7735	Pass
	5200	23.162	16.7617	Pass
	5240	21.407	16.7195	Pass
802.11n-HT20	5180	20.618	17.7334	Pass
	5200	24.630	17.7505	Pass
	5240	23.194	17.8224	Pass
802.11n-HT40	5190	41.806	36.4007	Pass
	5230	49.955	36.3131	Pass
802.11ac-HT80	5210	79.298	75.4667	Pass

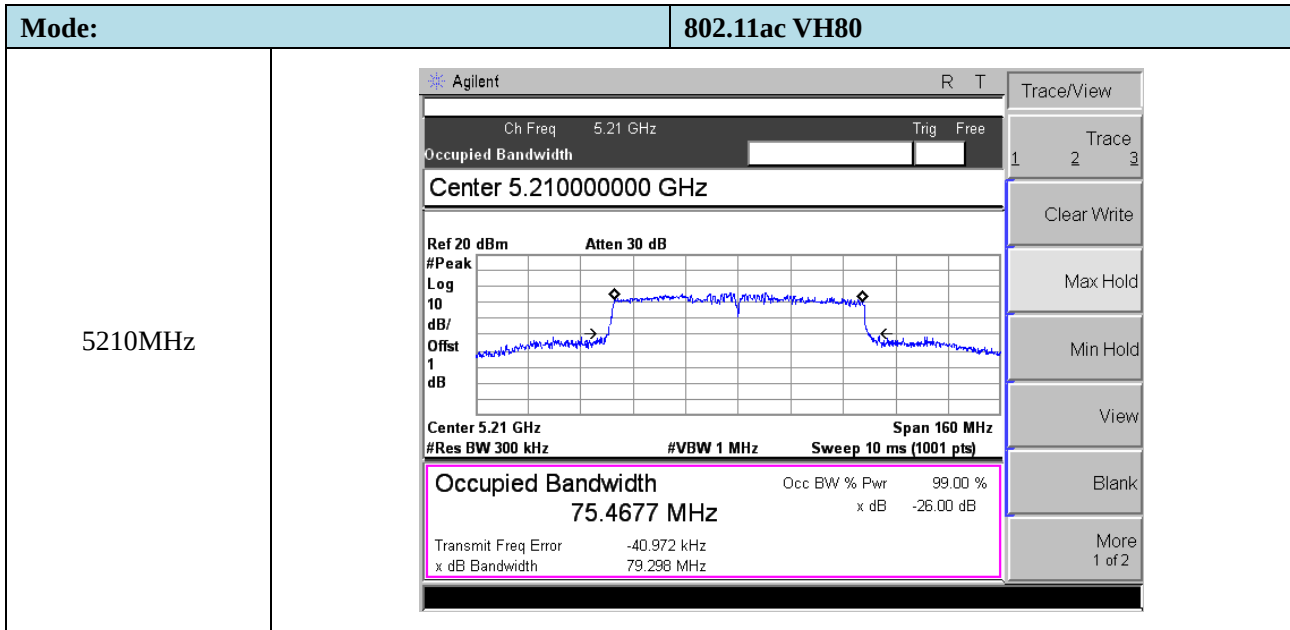
U-NII-3: 5725-5850MHz				
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5745	16.192	17.4257	≥500
	5785	16.003	17.3017	≥500
	5825	16.025	17.2214	≥500
802.11n-HT20	5745	17.334	18.1901	≥500
	5785	17.157	18.0033	≥500
	5825	17.154	17.9587	≥500
802.11n-HT40	5755	35.857	36.3445	≥500
	5795	35.140	36.9863	≥500
802.11ac VH80	5775	75.869	76.9069	≥500

➤ 5150-5250MHz

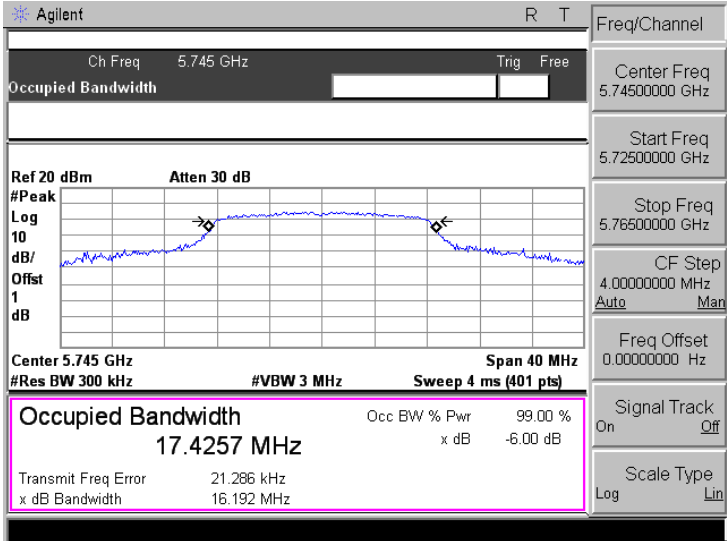
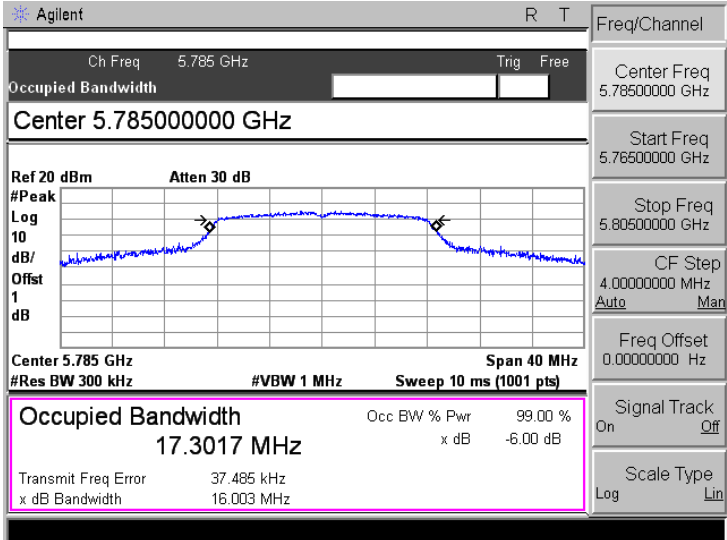
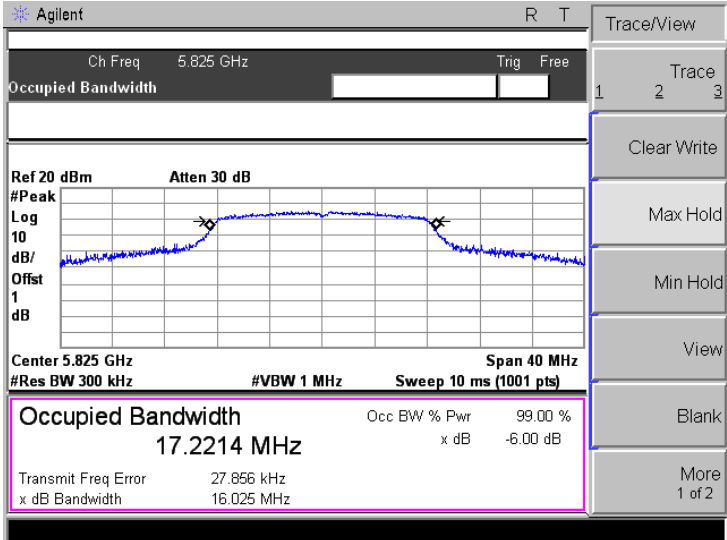
Mode:	802.11a
5180MHz	 Agilent R T Ch Freq 5.18 GHz Trig Free Occupied Bandwidth Span 40.00000000 MHz Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.18 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 10 ms (1001 pts) Occupied Bandwidth 16.7735 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 22.241 kHz x dB Bandwidth 21.738 MHz Span Span 40.00000000 MHz Span Zoom Full Span Zero Span Last Span Zone ▶
5200MHz	 Agilent R T Ch Freq 5.2 GHz Trig Free Occupied Bandwidth Center 5.200000000 GHz Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.2 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 10 ms (1001 pts) Occupied Bandwidth 16.7617 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 25.579 kHz x dB Bandwidth 23.162 MHz Trace/View Trace 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2
5240MHz	 Agilent R T Ch Freq 5.24 GHz Trig Free Occupied Bandwidth Center 5.240000000 GHz Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.24 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 10 ms (1001 pts) Occupied Bandwidth 16.7195 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 41.684 kHz x dB Bandwidth 21.407 MHz Freq/Channel Center Freq 5.24000000 GHz Start Freq 5.22000000 GHz Stop Freq 5.26000000 GHz CF Step 4.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin

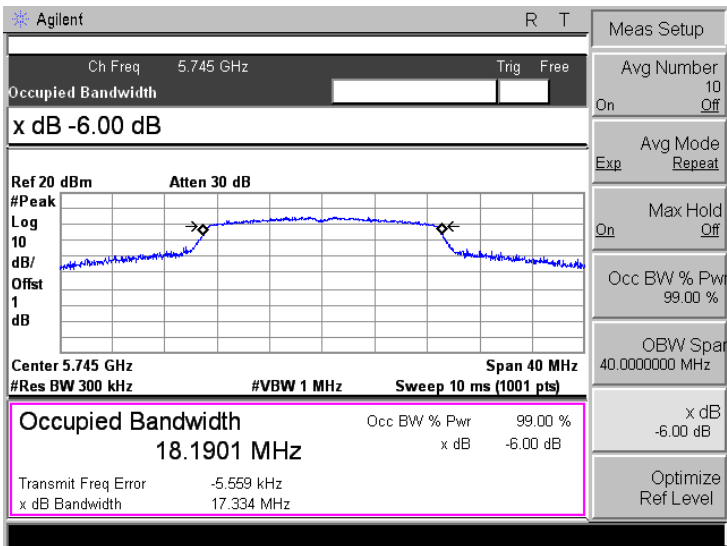
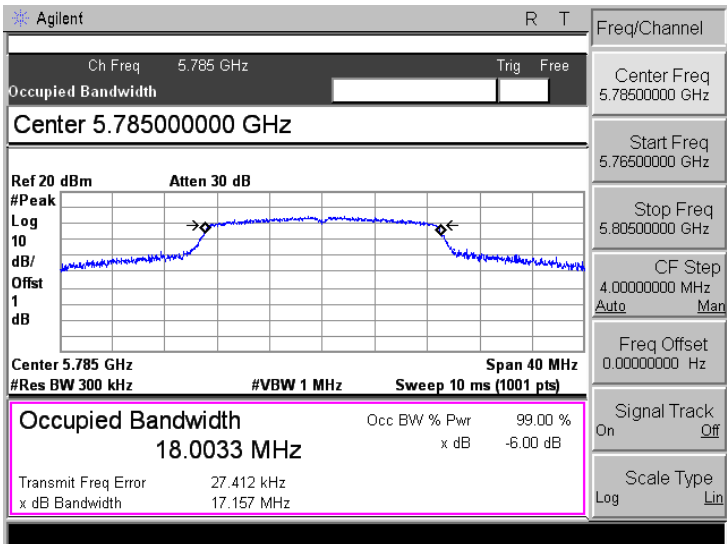
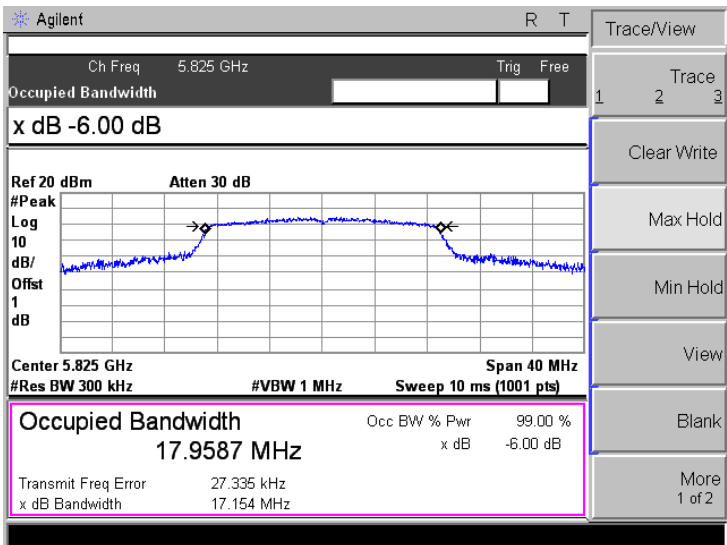
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5180MHz	
5200MHz	
5240MHz	

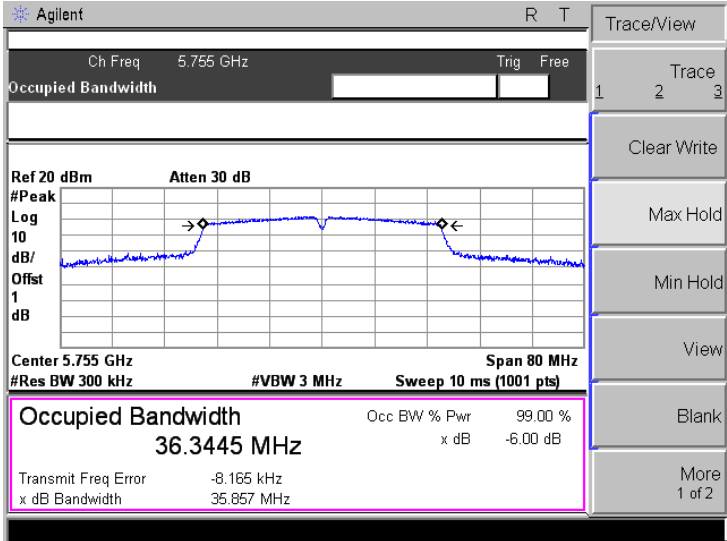
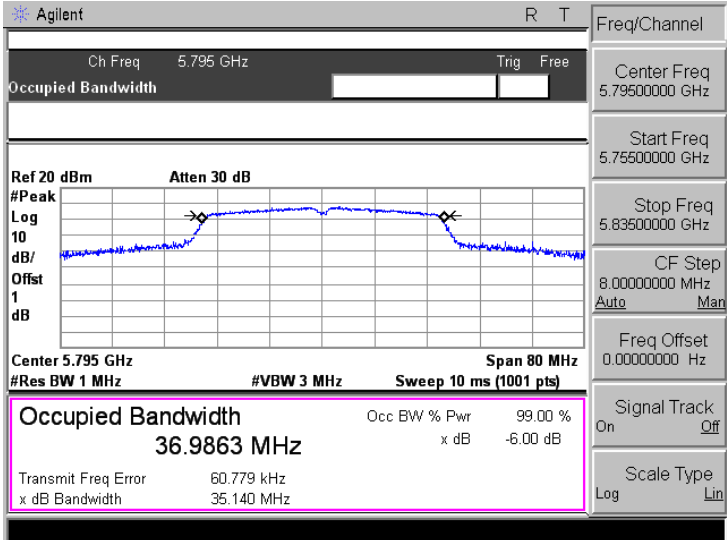
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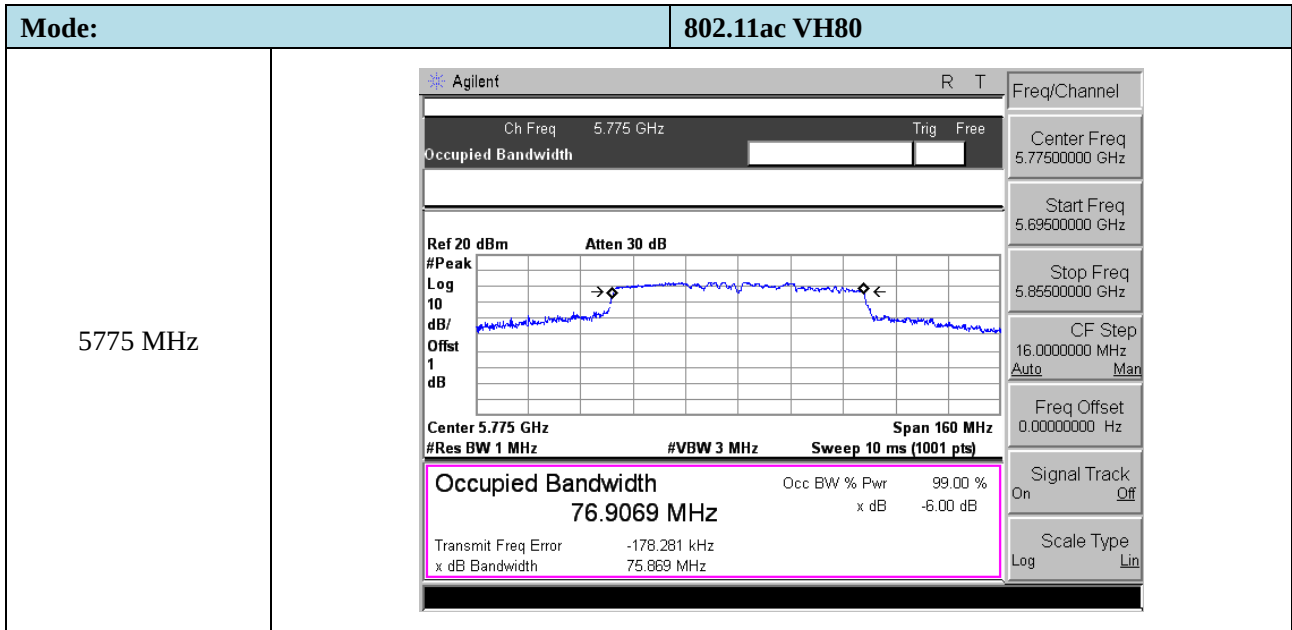


➤ 5725-5850MHz

Mode:	802.11a
5745MHz	 Agilent R T Ch Freq 5.745 GHz Trig Free Occupied Bandwidth Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.745 GHz Span 40 MHz #Res BW 300 kHz #VBW 3 MHz Sweep 4 ms (401 pts) Occupied Bandwidth 17.4257 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 21.286 kHz x dB Bandwidth 16.192 MHz Freq/Channel Center Freq 5.74500000 GHz Start Freq 5.72500000 GHz Stop Freq 5.76500000 GHz CF Step 4.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin
5785MHz	 Agilent R T Ch Freq 5.785 GHz Trig Free Occupied Bandwidth Center 5.785000000 GHz Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.785 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 10 ms (1001 pts) Occupied Bandwidth 17.3017 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 37.485 kHz x dB Bandwidth 16.003 MHz Freq/Channel Center Freq 5.78500000 GHz Start Freq 5.76500000 GHz Stop Freq 5.80500000 GHz CF Step 4.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin
5825MHz	 Agilent R T Ch Freq 5.825 GHz Trig Free Occupied Bandwidth Ref 20 dBm Atten 30 dB #Peak Log 10 dB/ Offst 1 dB Center 5.825 GHz Span 40 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 10 ms (1001 pts) Occupied Bandwidth 17.2214 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 27.856 kHz x dB Bandwidth 16.025 MHz Trace/View Trace 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2

Mode:		802.11n-HT20
5745MHz		
5785MHz		
5825MHz		

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	



8. Maximum Conducted Output Power

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 ≥ 3 MHz.
- (iv) Number of points in sweep $\geq 2 \text{ Span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.

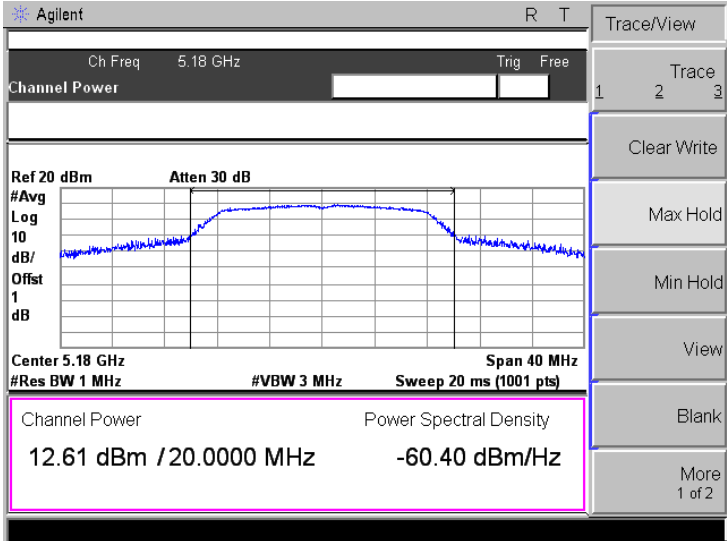
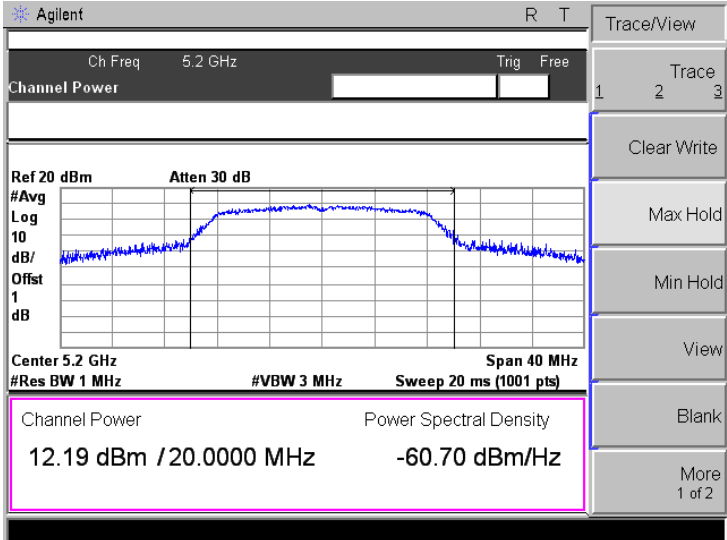
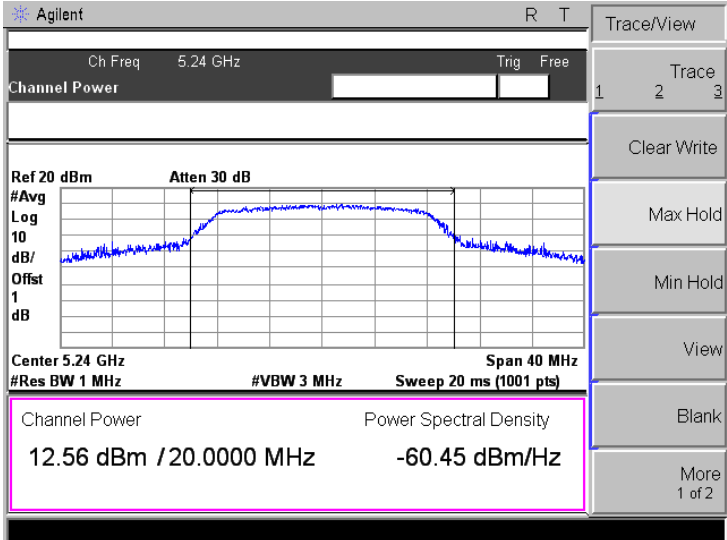
- (vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- (vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 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.

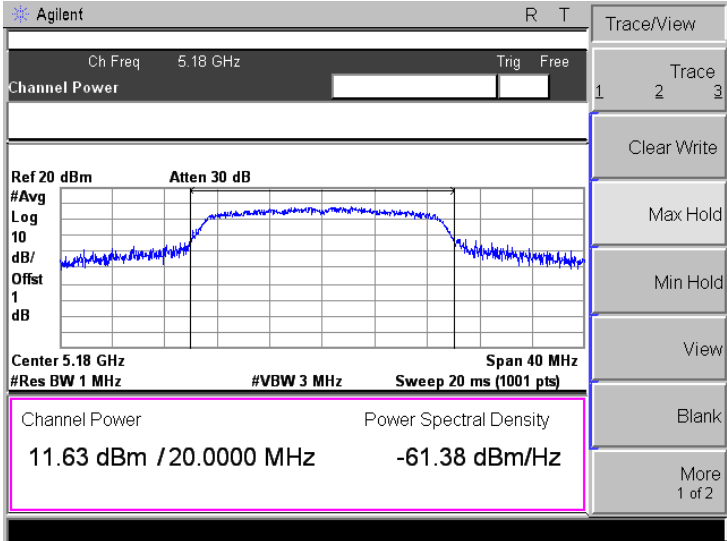
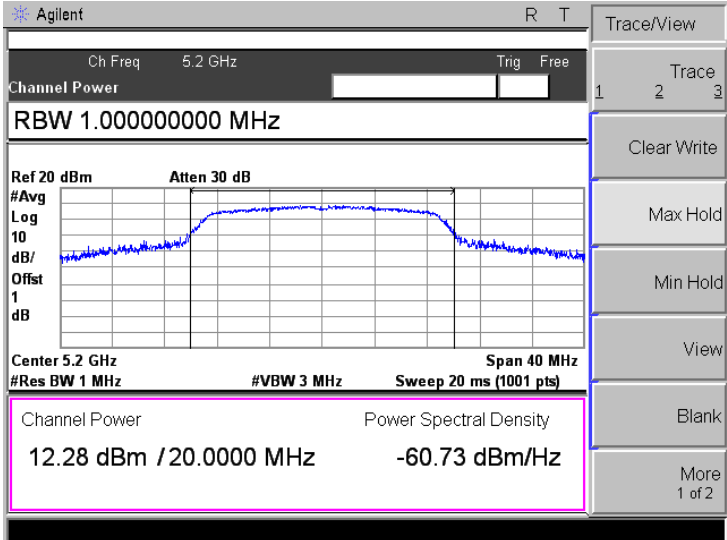
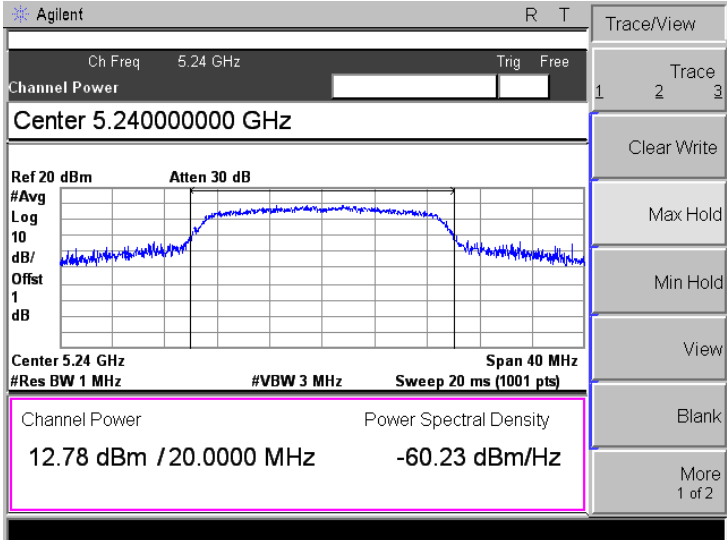
8.3 Summary of Test Results/Plots

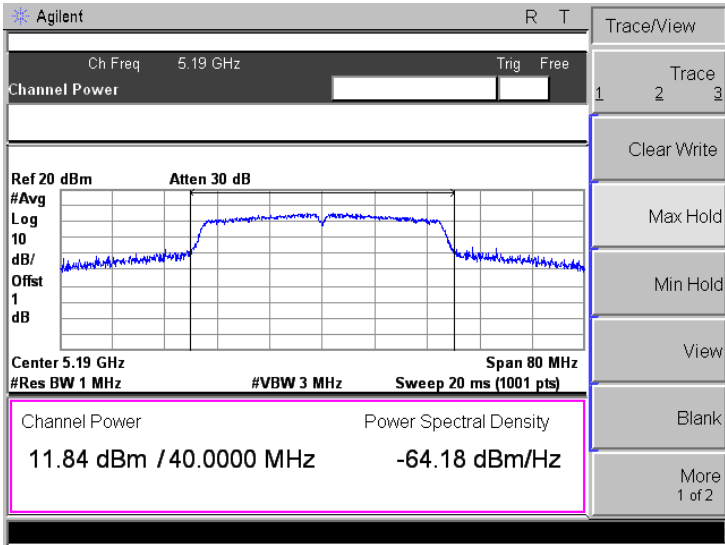
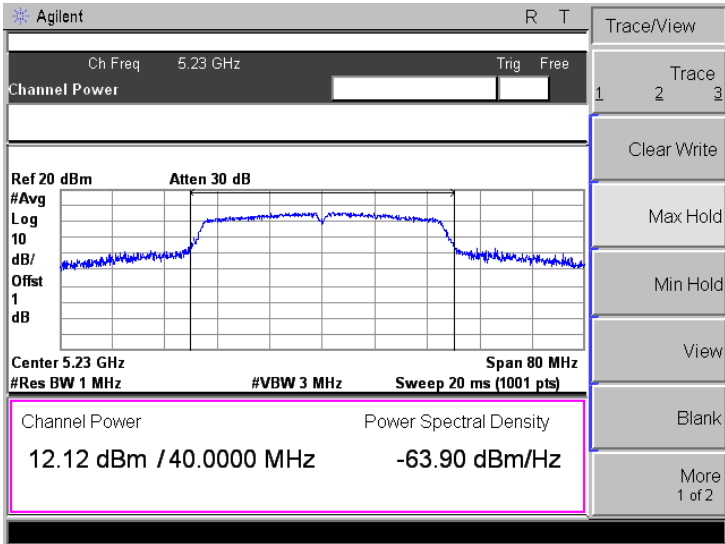
U-NII-1:5150-5250MHz				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5180	12.61	18.24	250
	5200	12.19	16.56	250
	5240	12.56	18.03	250
802.11n-HT20	5180	11.63	14.55	250
	5200	12.28	16.90	250
	5240	12.78	18.97	250
802.11n-HT40	5190	11.84	15.28	250
	5230	12.12	16.29	250
802.11ac VH80	5210	11.36	13.68	250

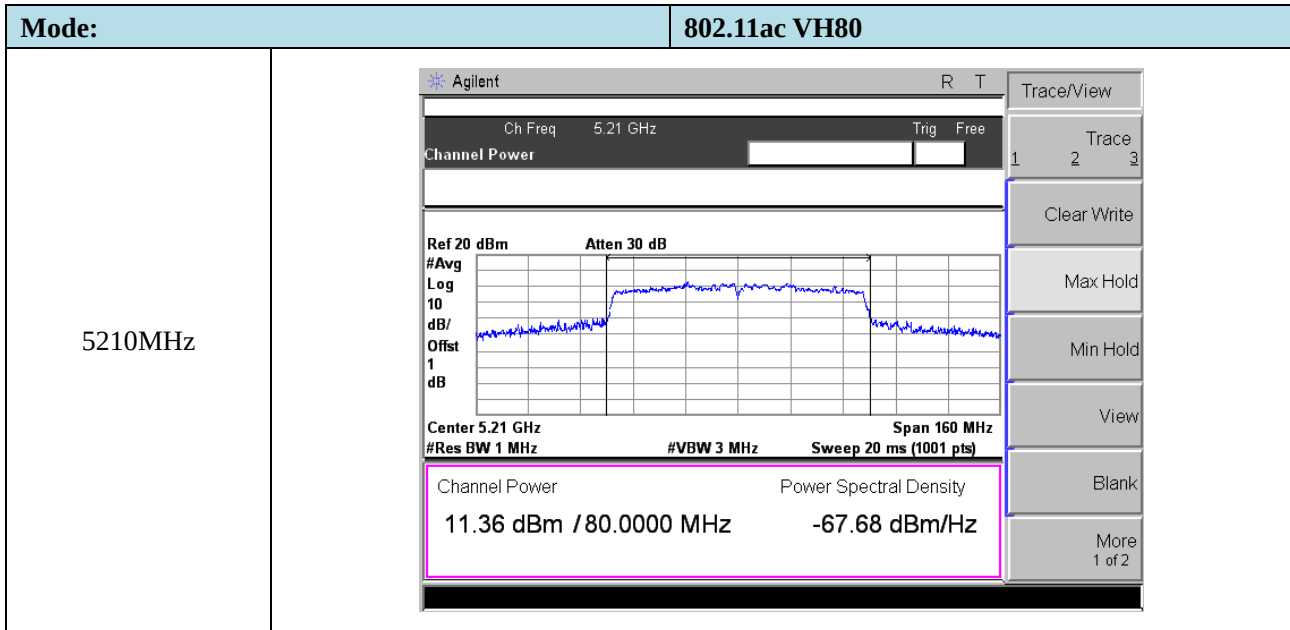
U-NII-3: 5725-5850MHz				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5745	11.21	13.21	1000
	5785	11.86	15.35	1000
	5825	11.65	14.62	1000
802.11n-HT20	5745	11.08	12.82	1000
	5785	11.64	14.59	1000
	5825	11.44	13.93	1000
802.11n-HT40	5755	11.68	14.72	1000
	5795	11.37	13.71	1000
802.11ac VH80	5775	11.06	12.76	1000

➤ 5150-5250MHz

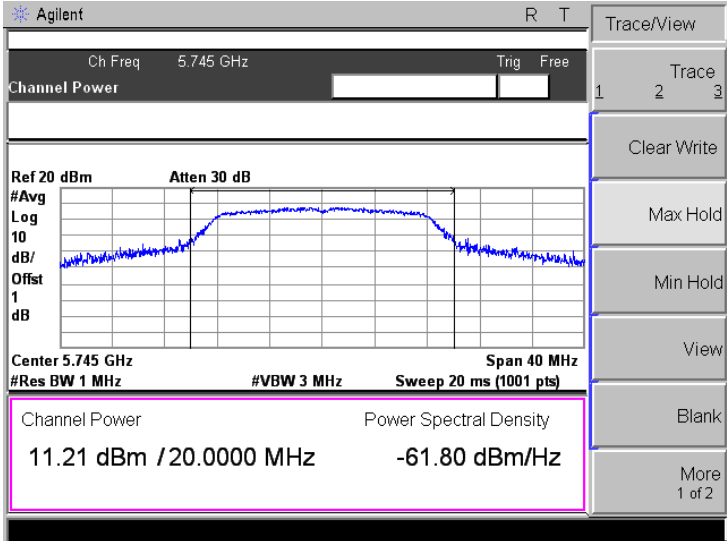
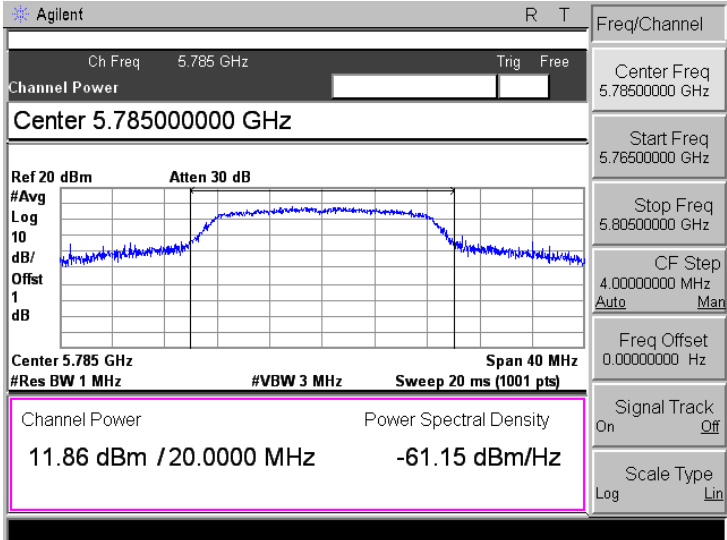
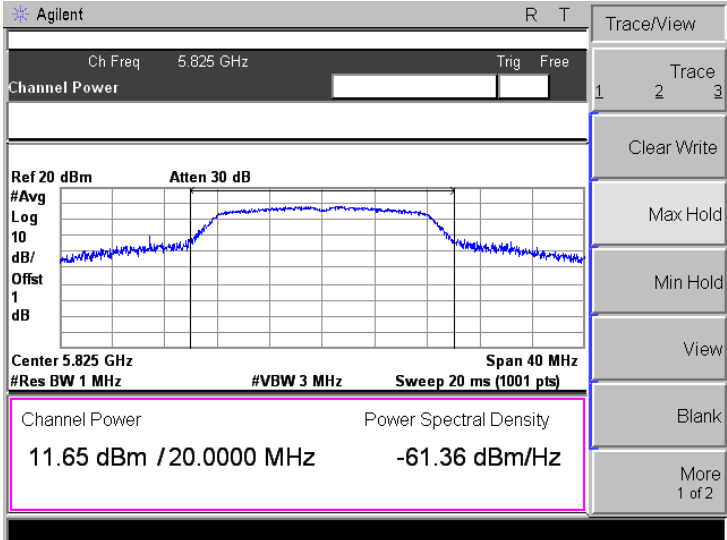
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5200MHz	
5240MHz	

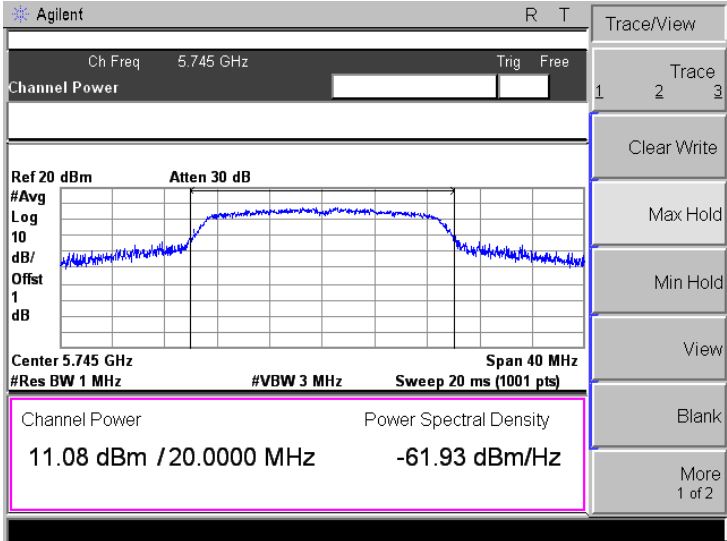
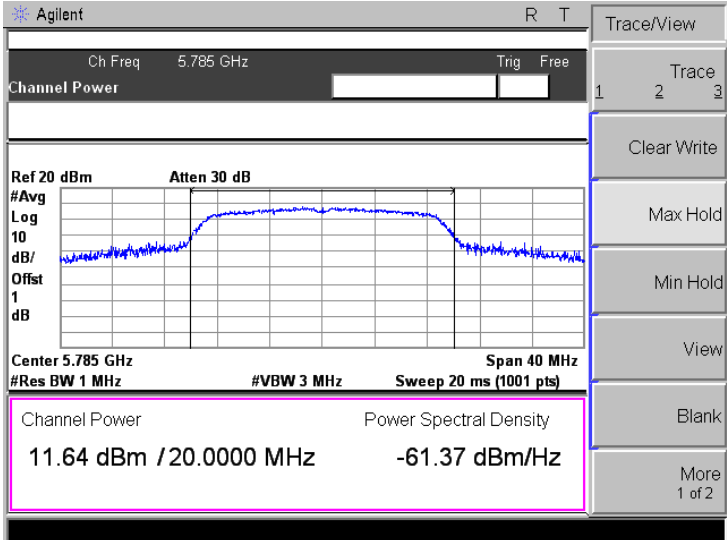
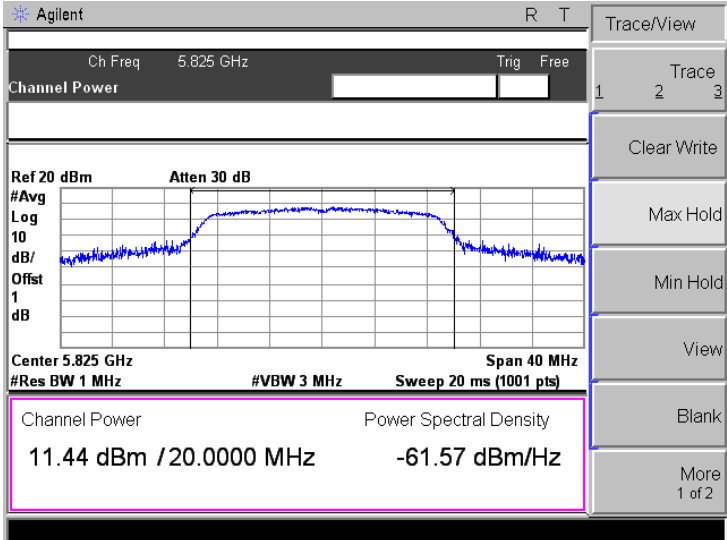
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

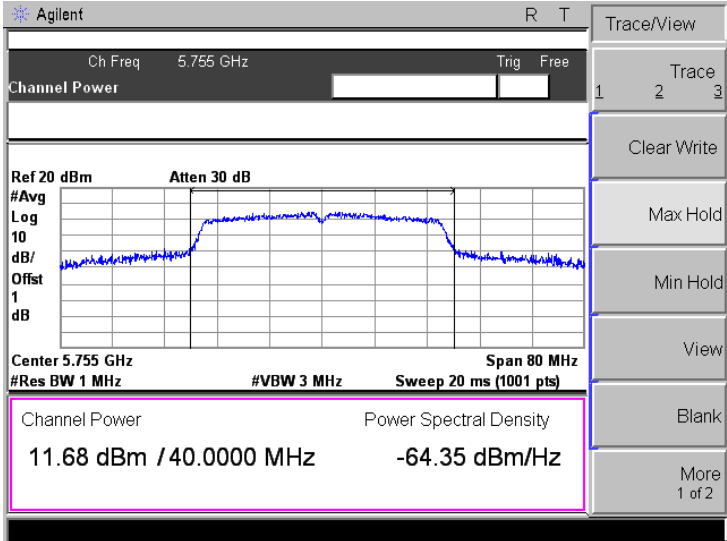
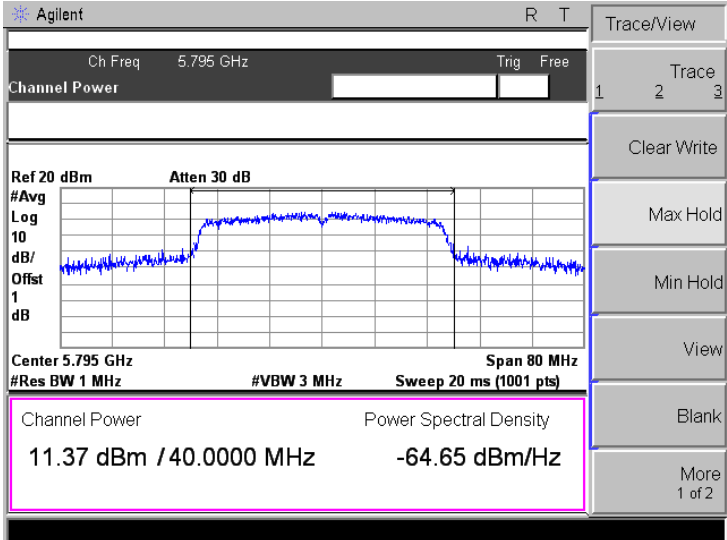
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

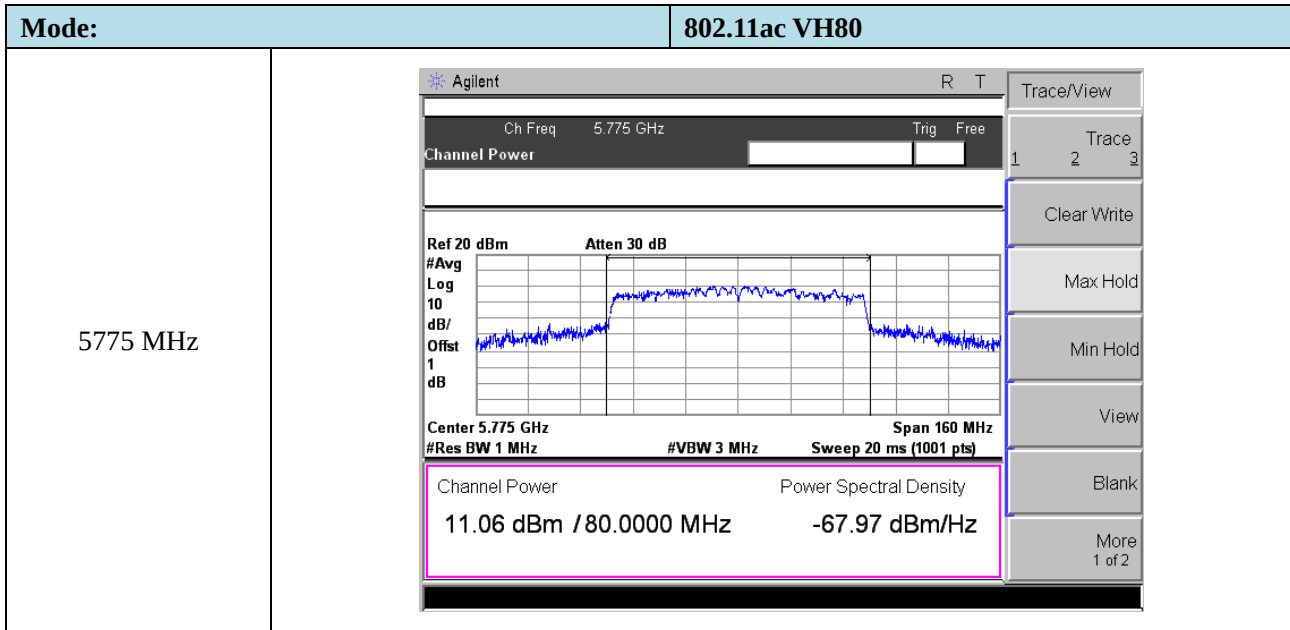


➤ 5725-5850MHz

Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	



9. Radiated Spurious Emissions

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:

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

where:

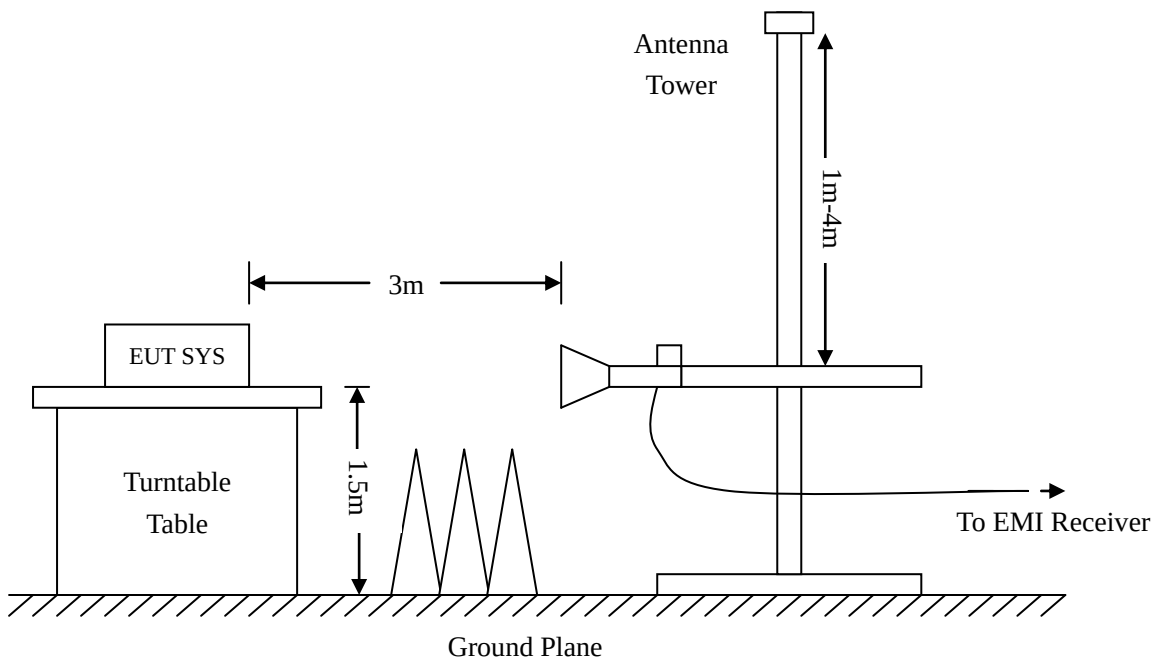
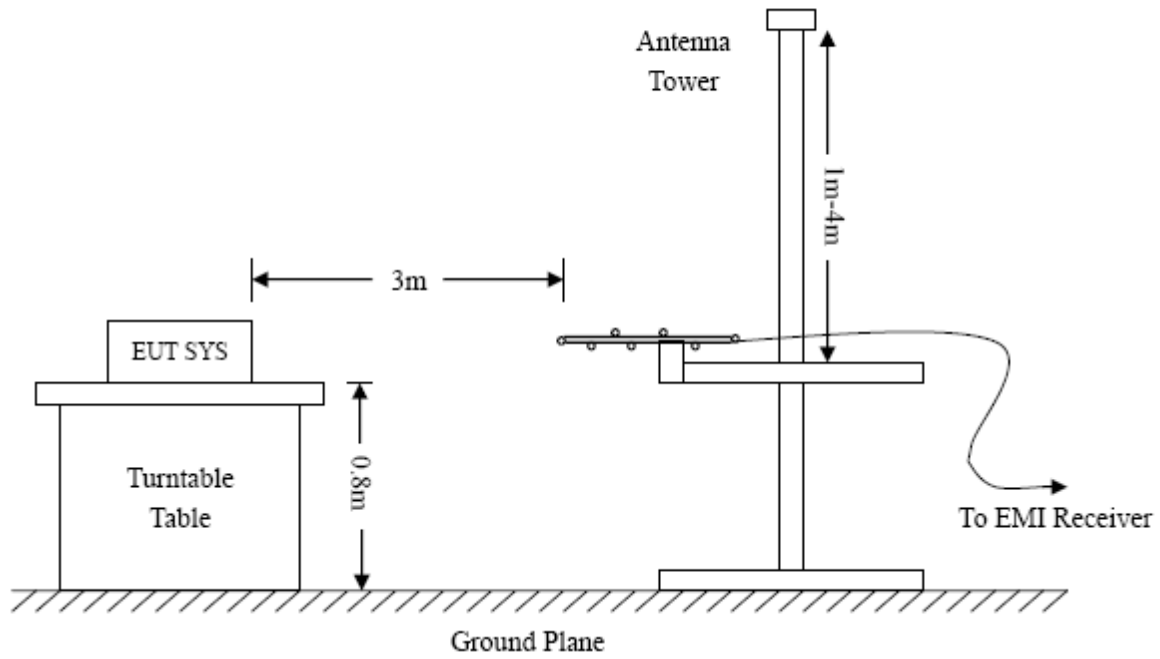
- E is the field strength in V/m;
- d is the measurement distance in meters;
- EIRP is the equivalent isotropically radiated power in watts.

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 μ V means the emission is 6dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

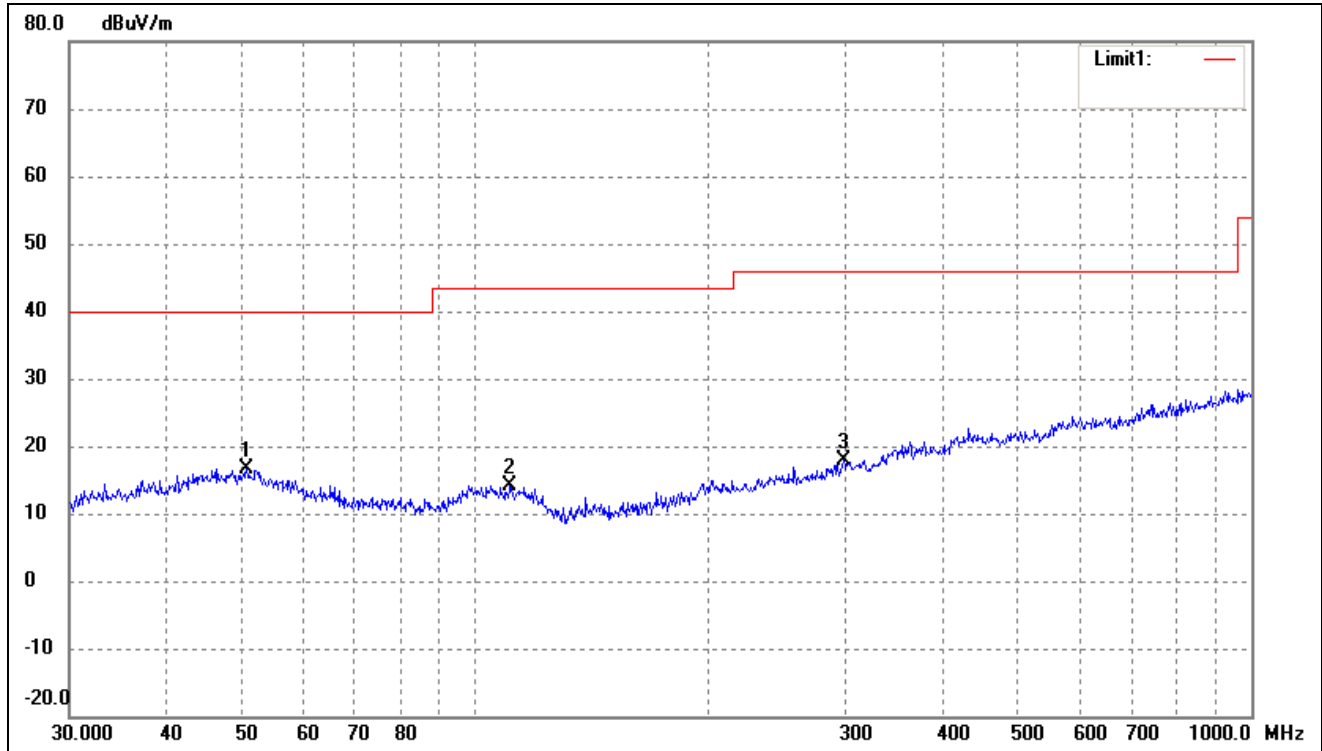
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

9.5 Summary of Test Results/Plots

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

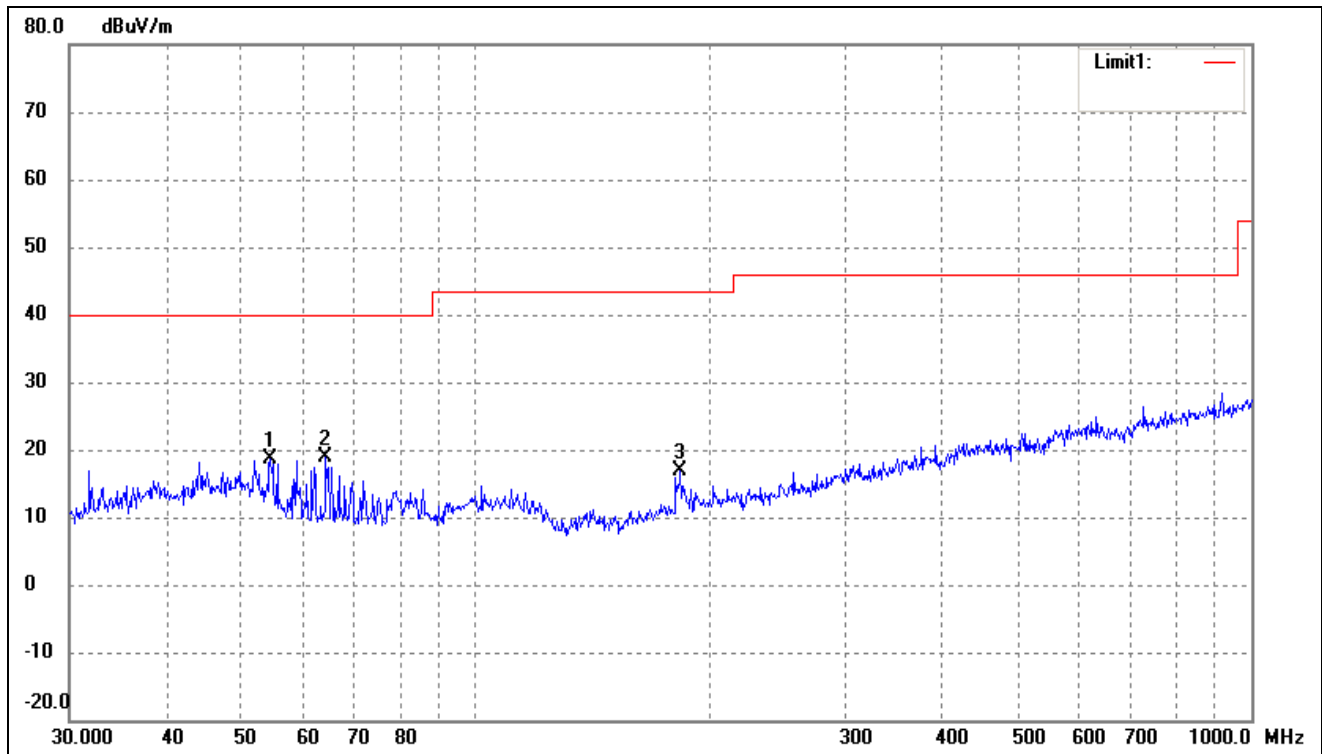
- Spurious Emission From 30 MHz to 1 GHz
- 5150-5250MHz

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



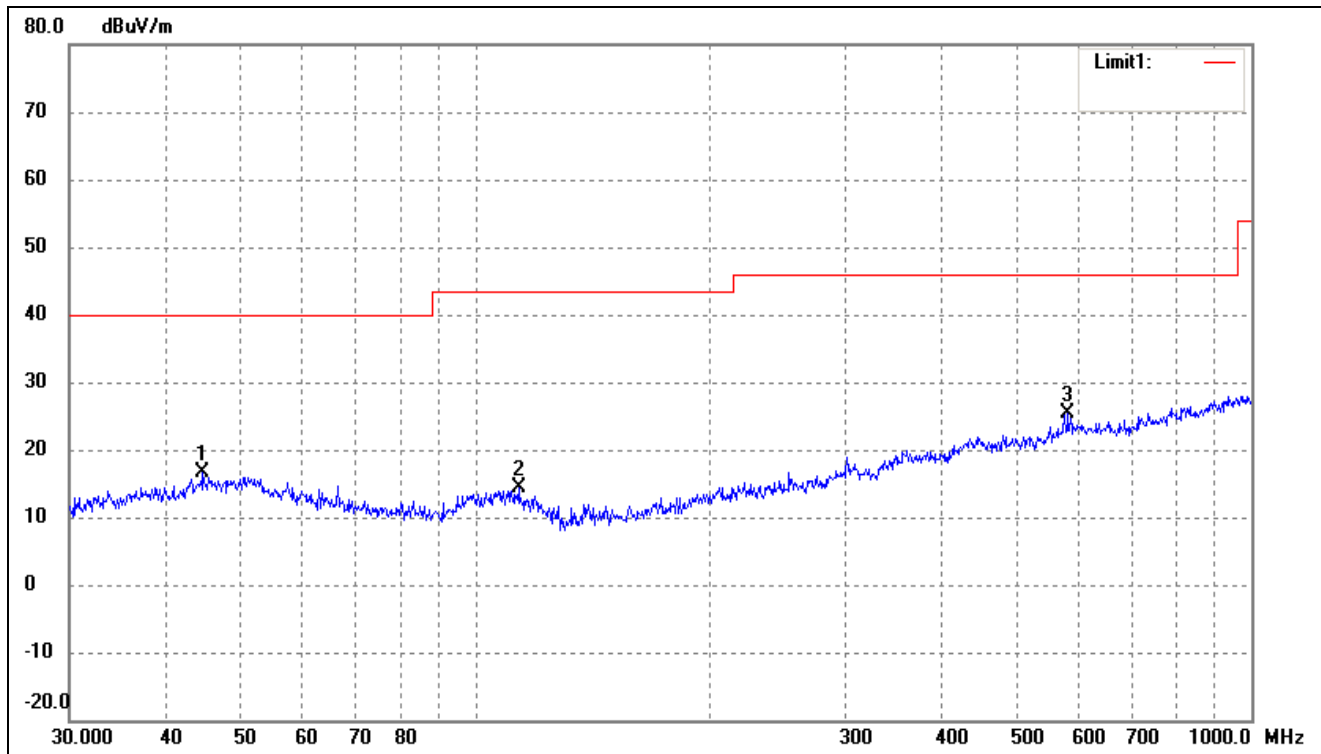
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	50.7637	27.88	-11.17	16.71	40.00	-23.29	213	100	peak
2	110.9571	27.35	-13.12	14.23	43.50	-29.27	160	100	peak
3	298.2681	27.18	-9.33	17.85	46.00	-28.15	112	100	peak

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



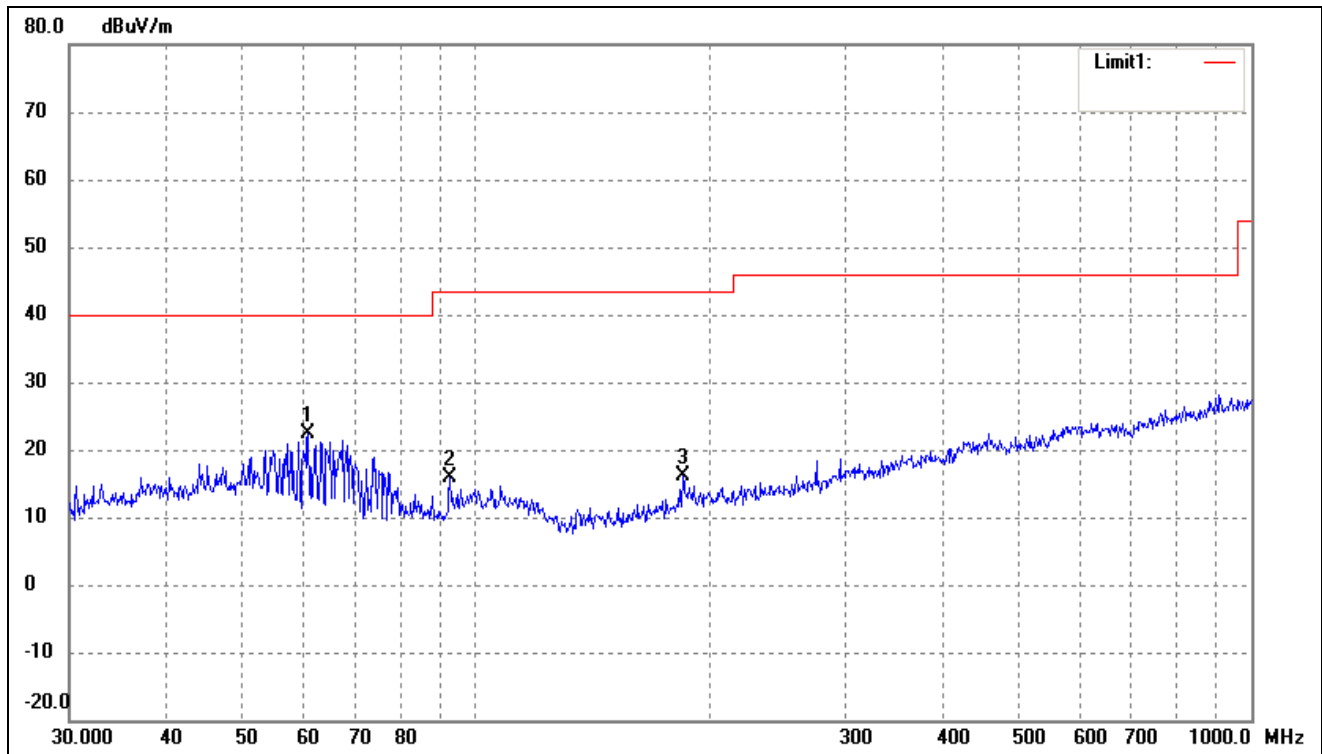
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	54.4516	30.57	-12.02	18.55	40.00	-21.45	91	100	peak
2	64.2075	32.86	-13.95	18.91	40.00	-21.09	347	100	peak
3	183.8440	30.92	-14.14	16.78	43.50	-26.72	106	100	peak

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



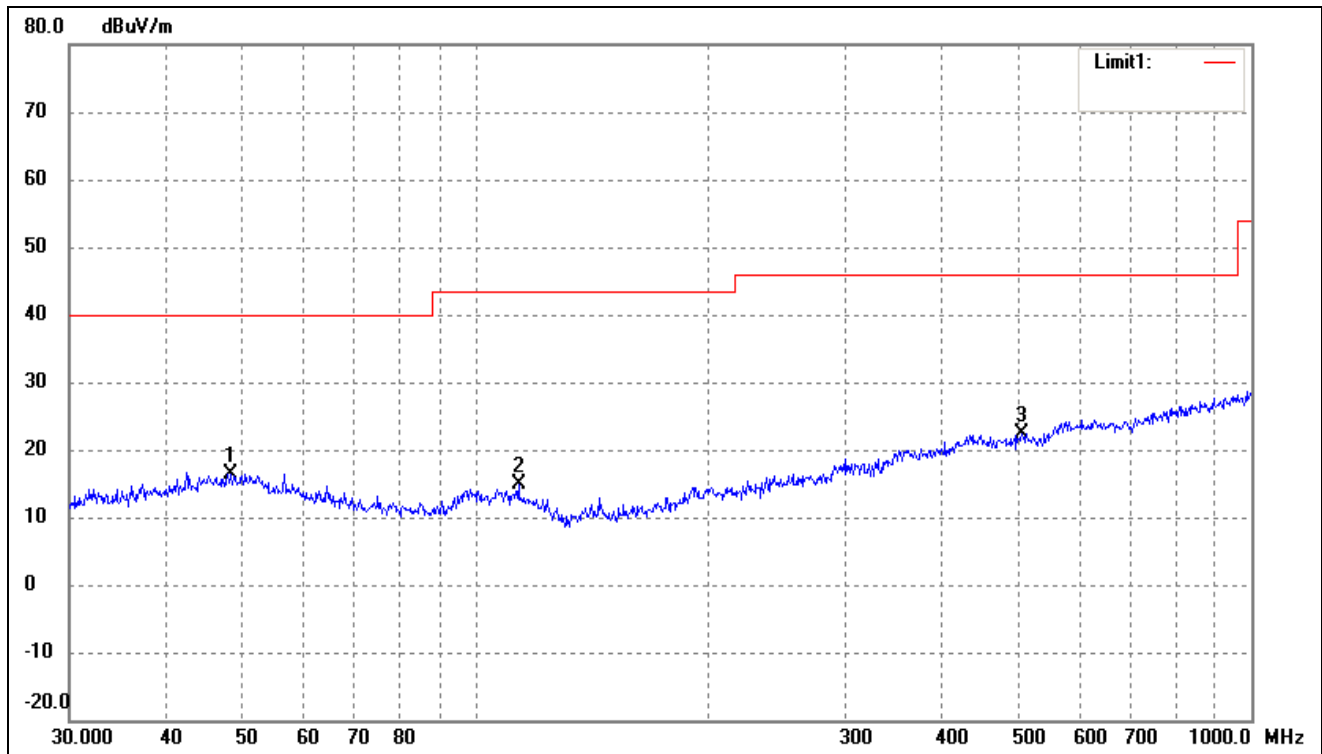
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	44.5868	27.97	-11.43	16.54	40.00	-23.46	80	100	peak
2	113.7143	27.76	-13.44	14.32	43.50	-29.18	283	100	peak
3	580.7026	29.49	-4.20	25.29	46.00	-20.71	111	100	peak

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



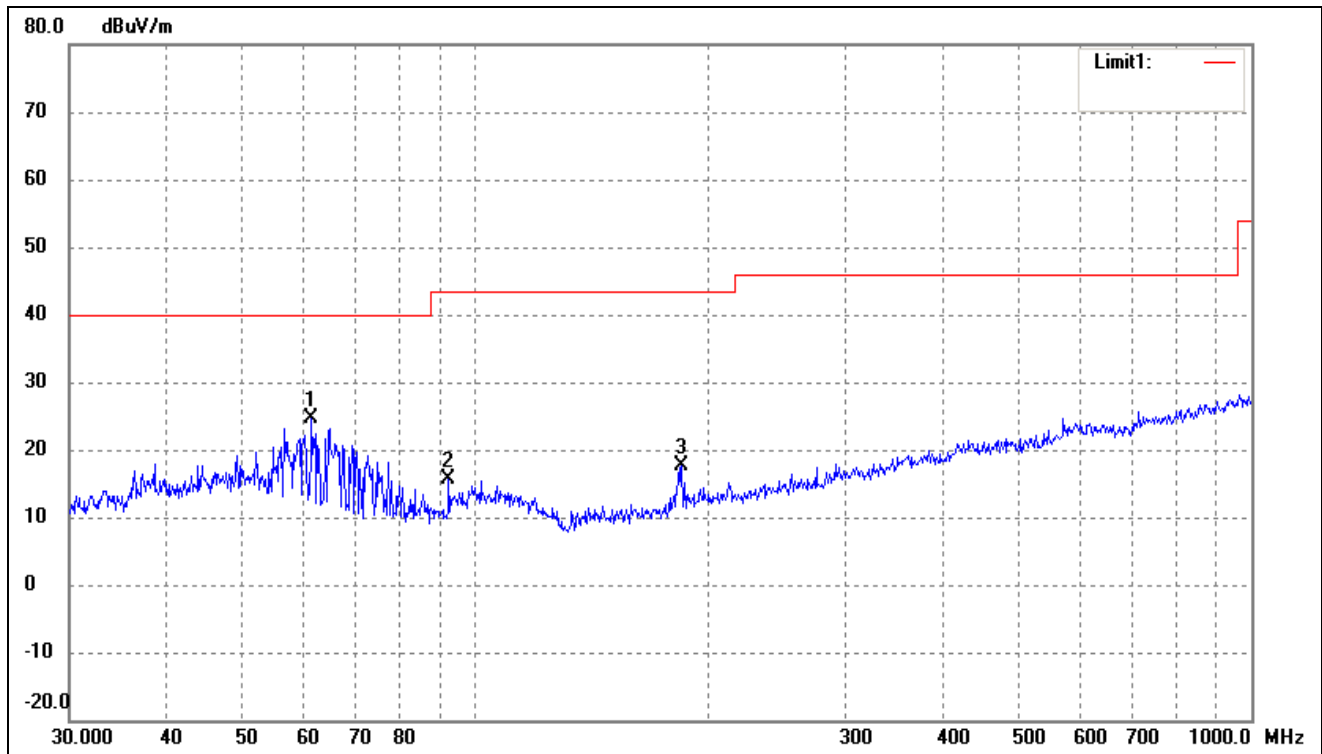
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.9176	35.77	-13.47	22.30	40.00	-17.70	66	100	peak
2	92.7872	30.66	-14.89	15.77	43.50	-27.73	177	100	peak
3	185.1379	29.99	-13.97	16.02	43.50	-27.48	84	100	peak

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



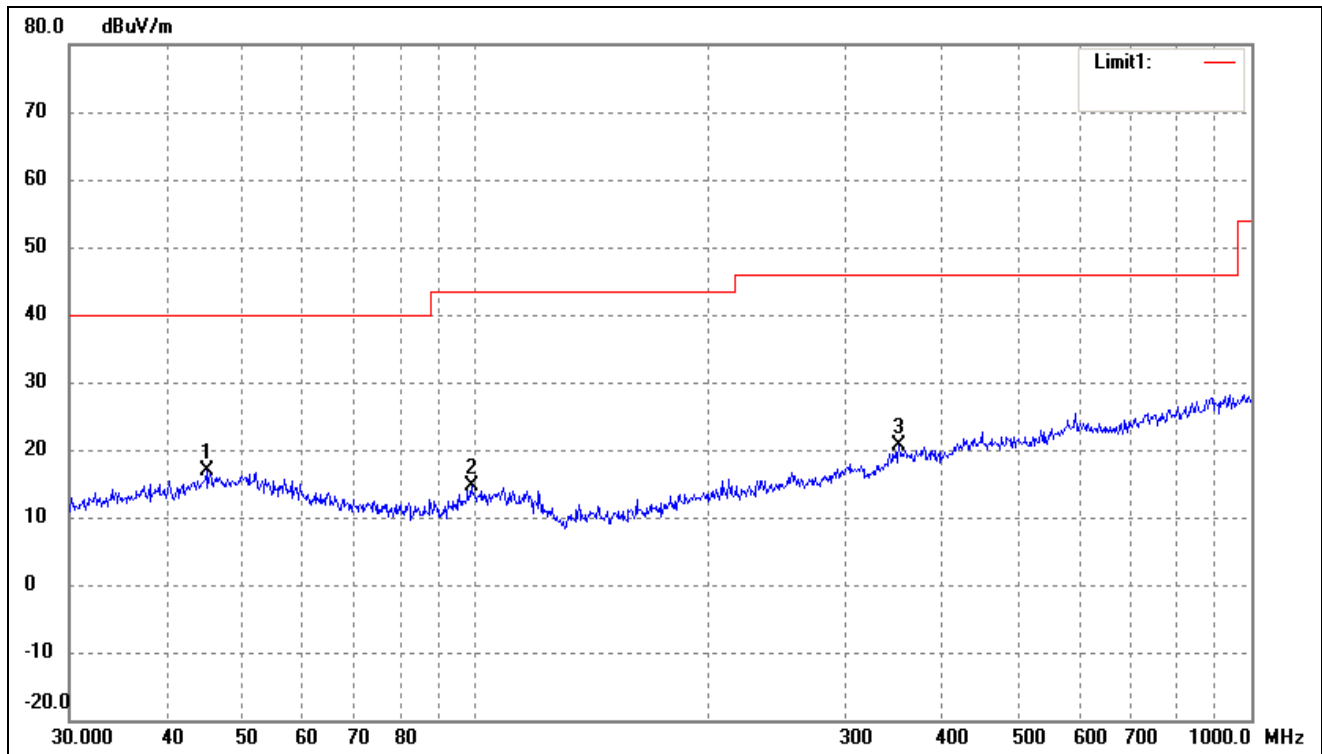
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	48.5016	27.54	-11.09	16.45	40.00	-23.55	302	100	peak
2	113.7143	28.33	-13.44	14.89	43.50	-28.61	285	100	peak
3	506.4791	28.63	-6.17	22.46	46.00	-23.54	76	100	peak

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



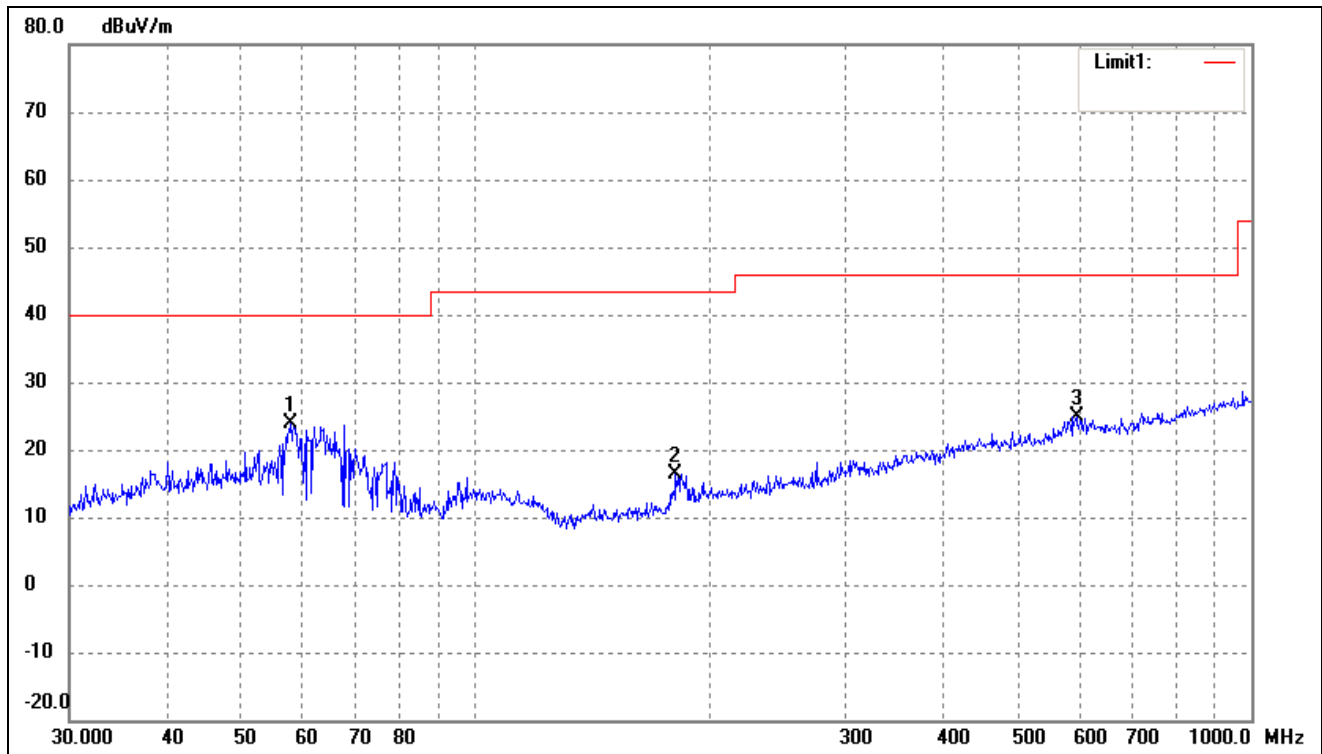
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	61.5618	38.27	-13.56	24.71	40.00	-15.29	70	100	peak
2	92.4624	30.61	-14.97	15.64	43.50	-27.86	188	100	peak
3	184.4898	31.67	-14.07	17.60	43.50	-25.90	88	100	peak

802.11ac-HT80			
Test Channel	5210MHz(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	45.0583	28.32	-11.34	16.98	40.00	-23.02	83	100	peak
2	98.8326	28.12	-13.45	14.67	43.50	-28.83	118	100	peak
3	351.7079	28.69	-8.01	20.68	46.00	-25.32	58	100	peak

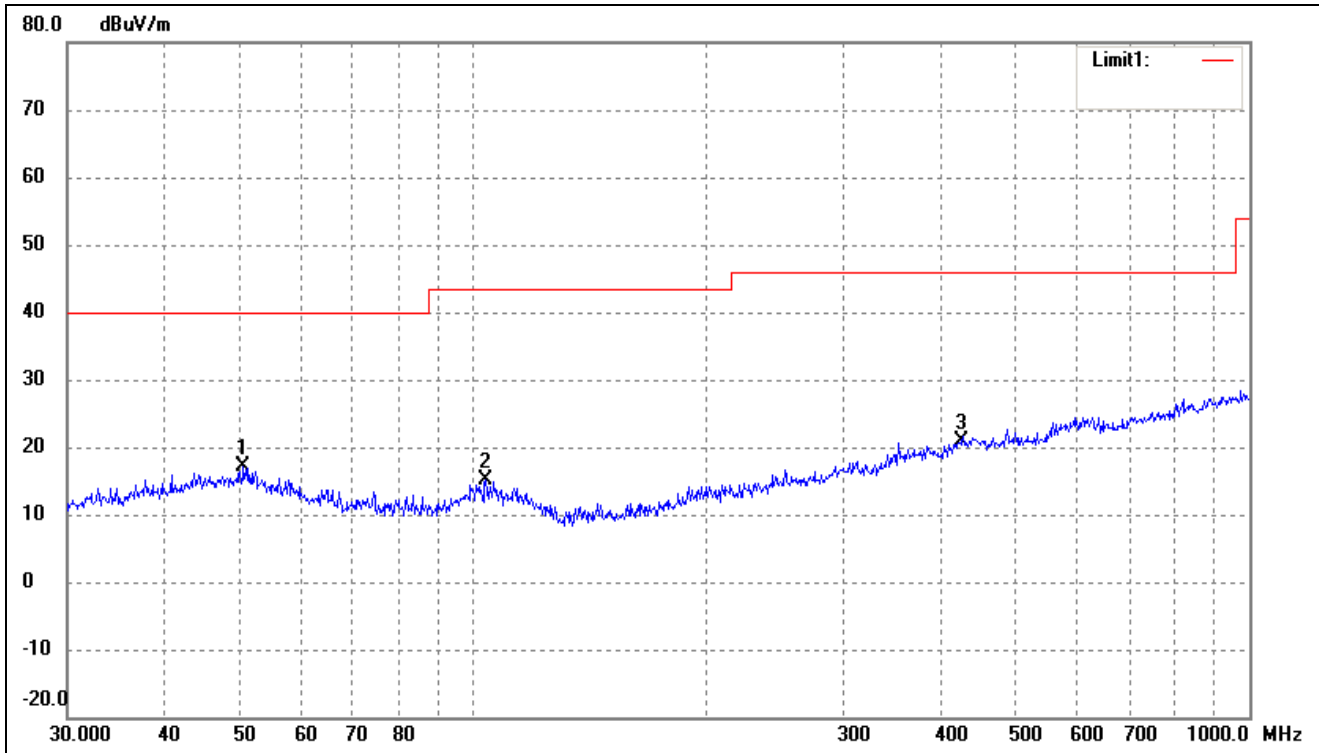
802.11ac-HT80			
Test Channel	5210MHz(worst case)	Polarity:	Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	57.7962	36.69	-12.82	23.87	40.00	-16.13	66	100	peak
2	181.2834	30.93	-14.45	16.48	43.50	-27.02	191	100	peak
3	595.1329	28.99	-4.06	24.93	46.00	-21.07	115	100	peak

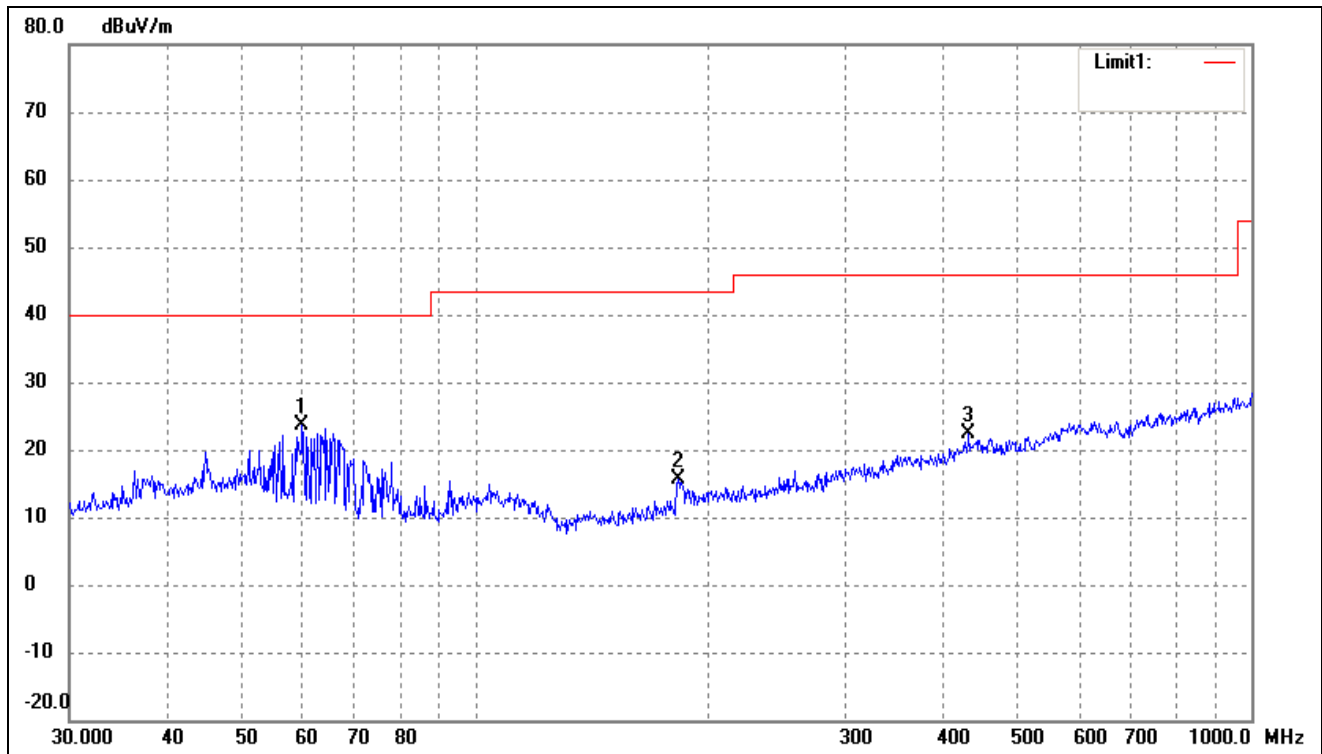
➤ 5725-5850MHz

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



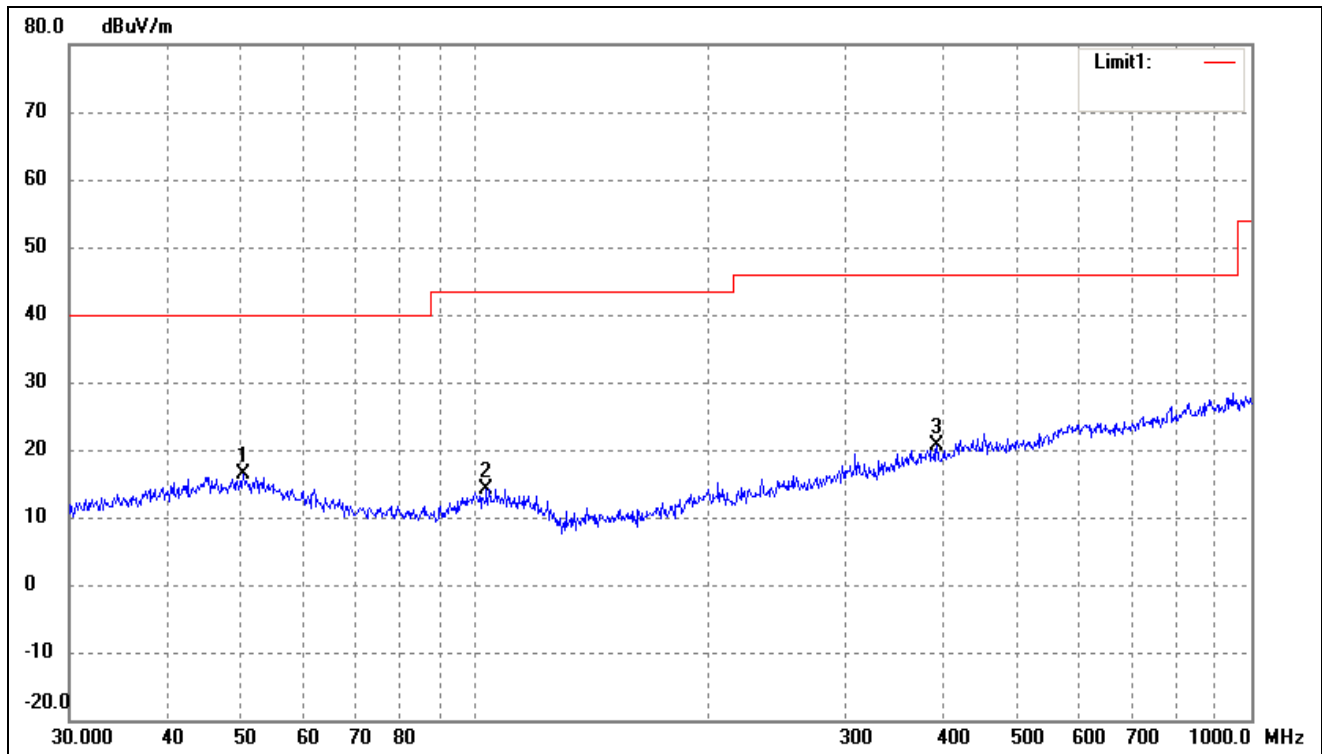
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	50.5860	28.23	-11.13	17.10	40.00	-22.90	151	100	peak
2	103.8055	28.14	-13.12	15.02	43.50	-28.48	230	100	peak
3	426.5210	27.14	-6.19	20.95	46.00	-25.05	79	100	peak

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



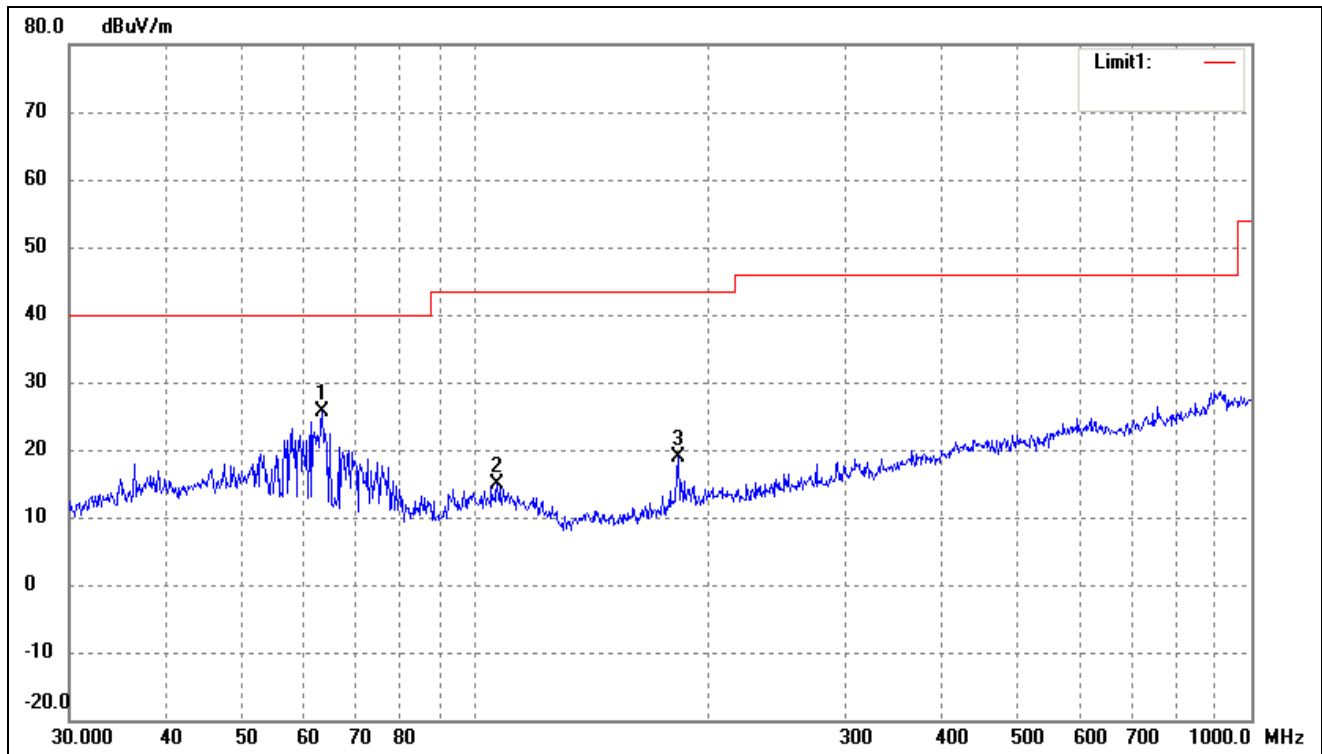
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	59.8588	37.00	-13.30	23.70	40.00	-16.30	345	100	peak
2	182.5592	30.01	-14.29	15.72	43.50	-27.78	150	100	peak
3	432.5457	28.51	-6.19	22.32	46.00	-23.68	56	100	peak

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



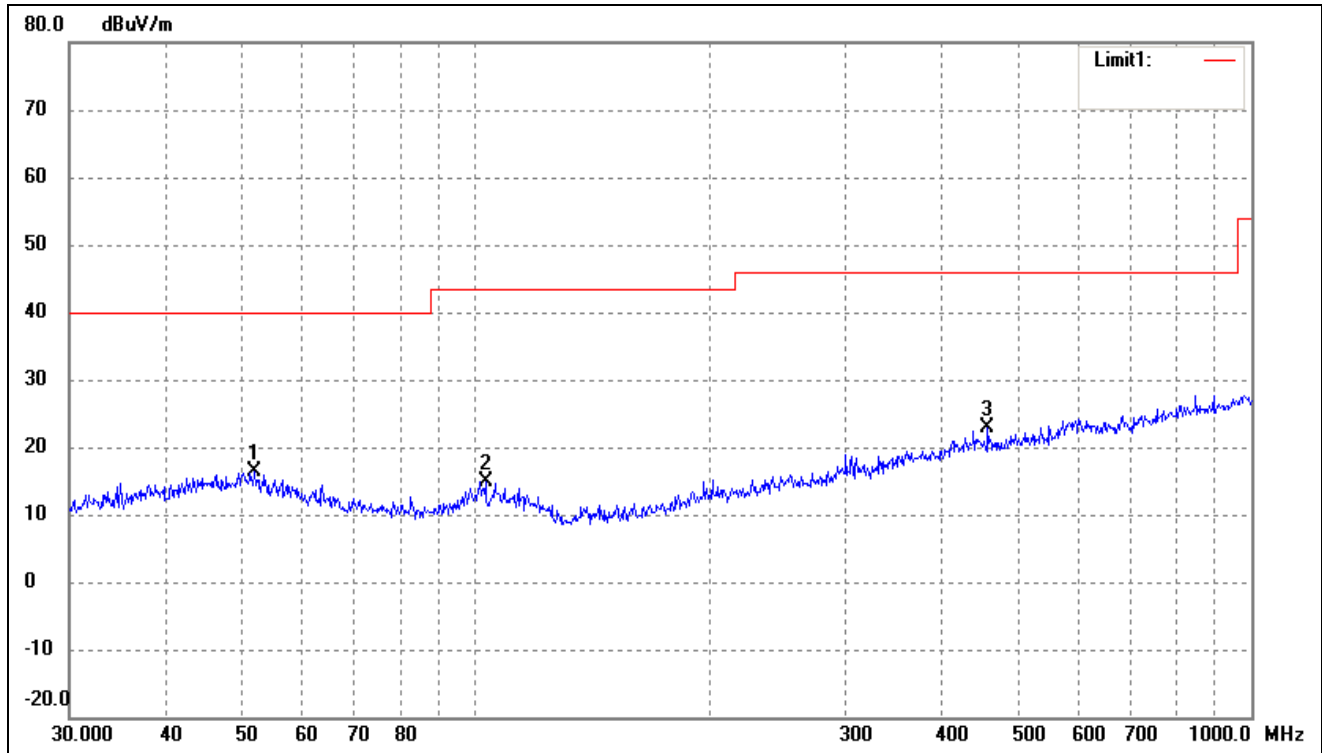
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	50.2325	27.38	-11.04	16.34	40.00	-23.66	114	100	peak
2	103.4421	27.33	-13.13	14.20	43.50	-29.30	50	100	peak
3	393.4724	28.32	-7.66	20.66	46.00	-25.34	129	100	peak

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



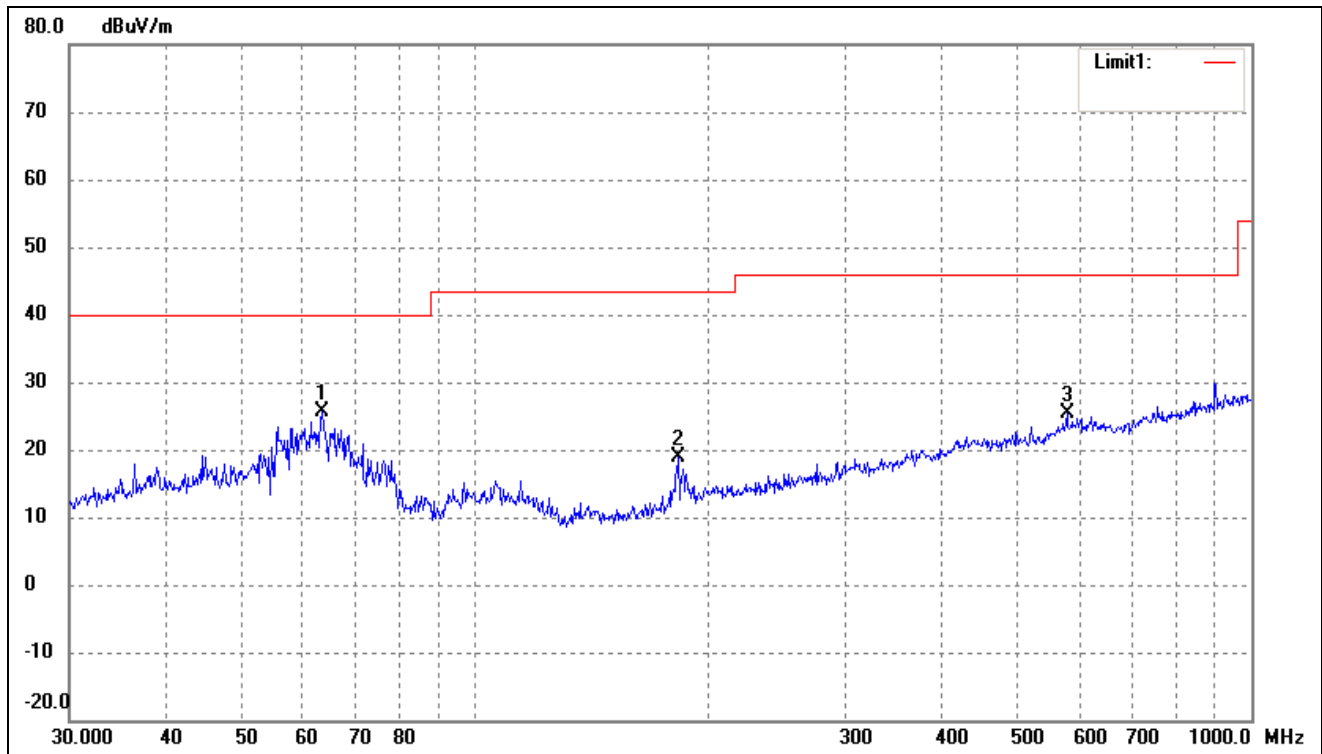
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	63.5356	39.50	-13.86	25.64	40.00	-14.36	332	100	peak
2	106.7587	27.95	-13.07	14.88	43.50	-28.62	58	100	peak
3	182.5592	33.08	-14.29	18.79	43.50	-24.71	155	100	peak

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



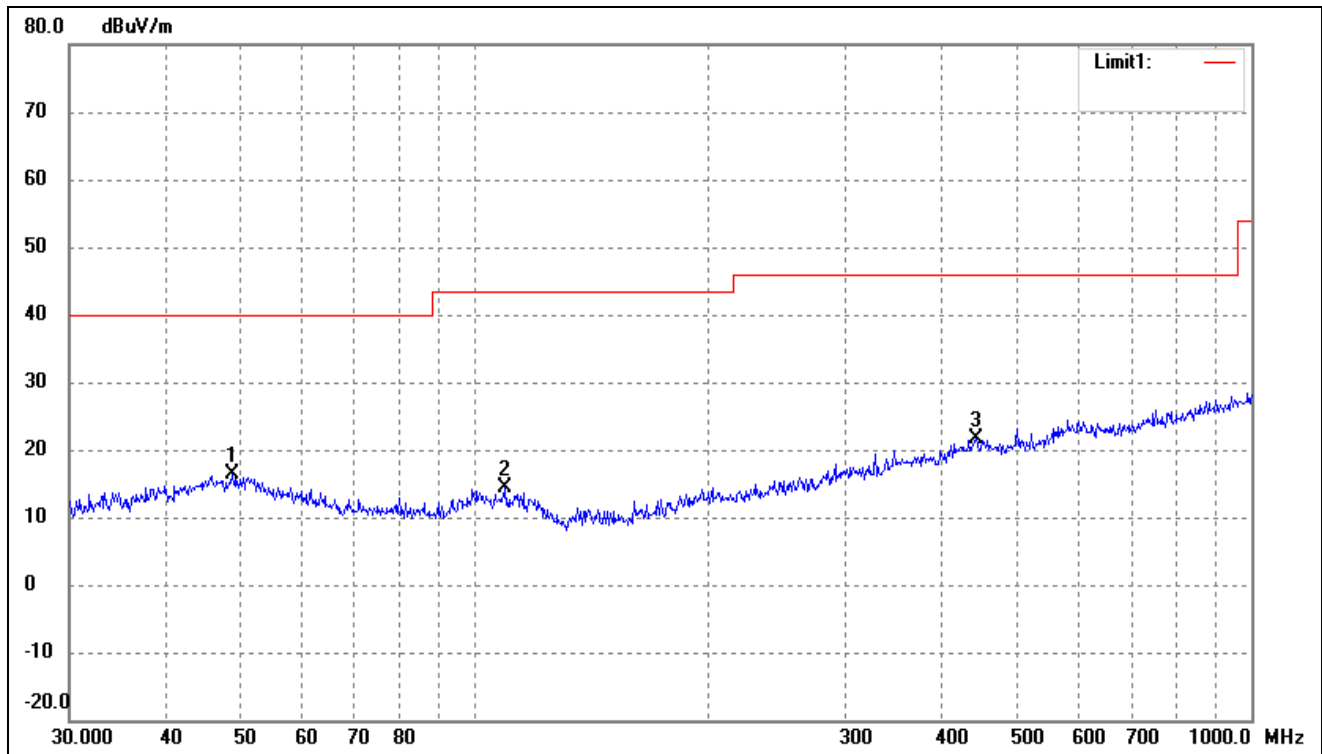
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	52.0251	27.78	-11.46	16.32	40.00	-23.68	92	100	peak
2	103.0800	28.12	-13.13	14.99	43.50	-28.51	320	100	peak
3	457.5073	29.40	-6.54	22.86	46.00	-23.14	112	100	peak

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



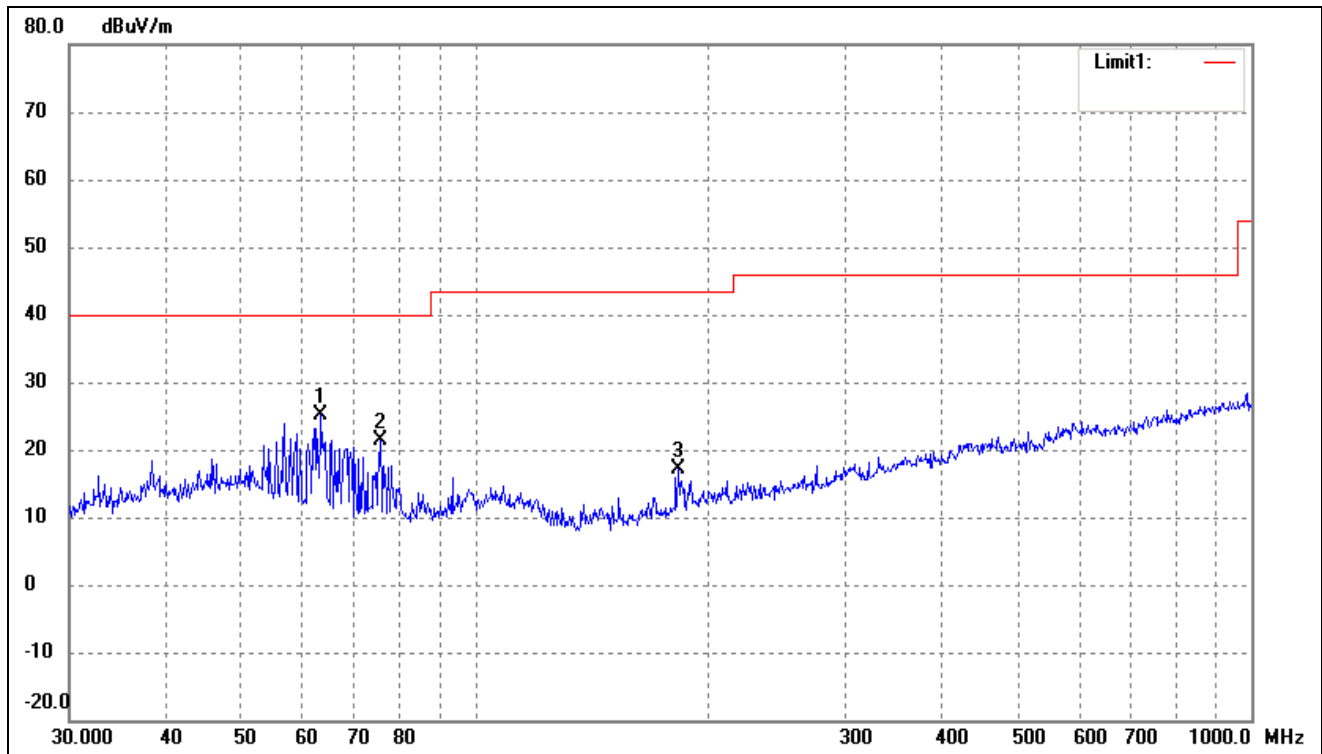
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	63.5356	39.50	-13.86	25.64	40.00	-14.36	95	100	peak
2	182.5592	33.08	-14.29	18.79	43.50	-24.71	50	100	peak
3	578.6699	29.59	-4.23	25.36	46.00	-20.64	120	100	peak

802.11ac-HT80			
Test Channel	5775MHz(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	48.6719	27.45	-11.08	16.37	40.00	-23.63	337	100	peak
2	109.4116	27.46	-13.03	14.43	43.50	-29.07	92	100	peak
3	441.7426	27.83	-6.23	21.60	46.00	-24.40	60	100	peak

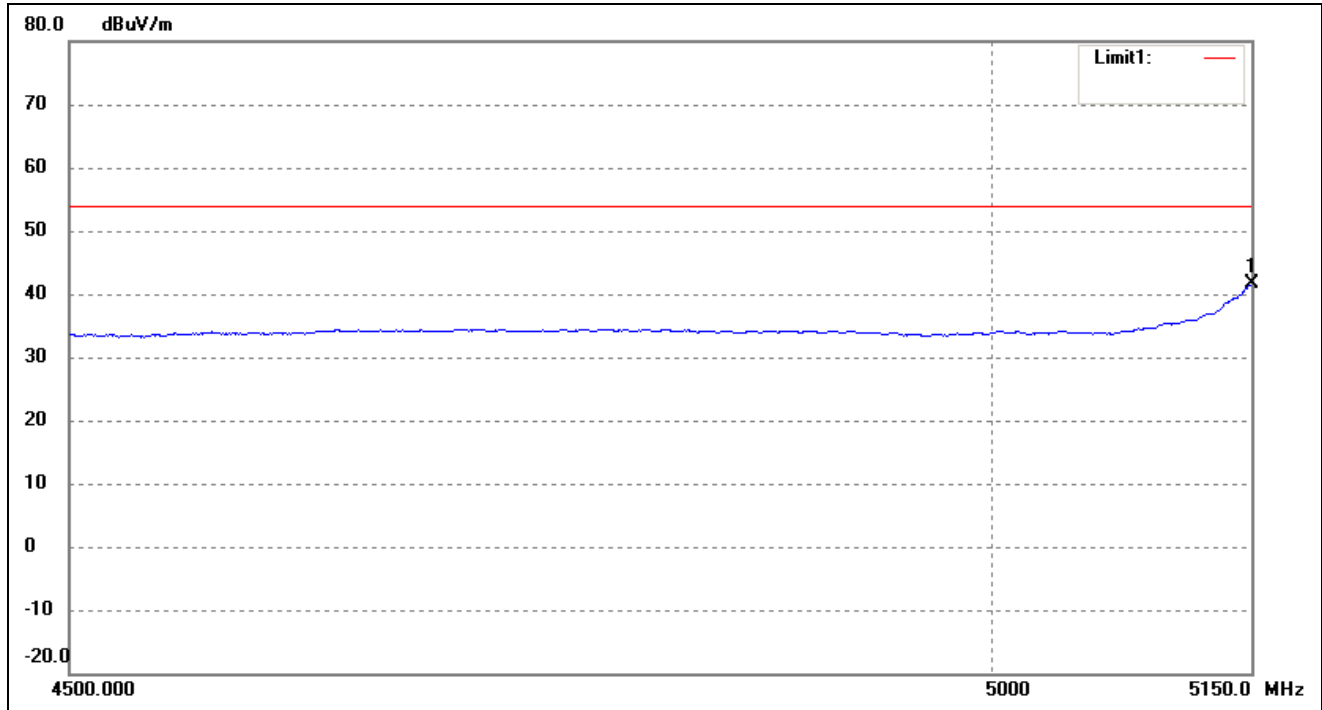
802.11ac-HT80			
Test Channel	5775MHz(worst case)	Polarity:	Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	63.3132	39.03	-13.82	25.21	40.00	-14.79	313	100	peak
2	75.4464	36.48	-15.16	21.32	40.00	-18.68	216	100	peak
3	182.5592	31.52	-14.29	17.23	43.50	-26.27	55	100	peak

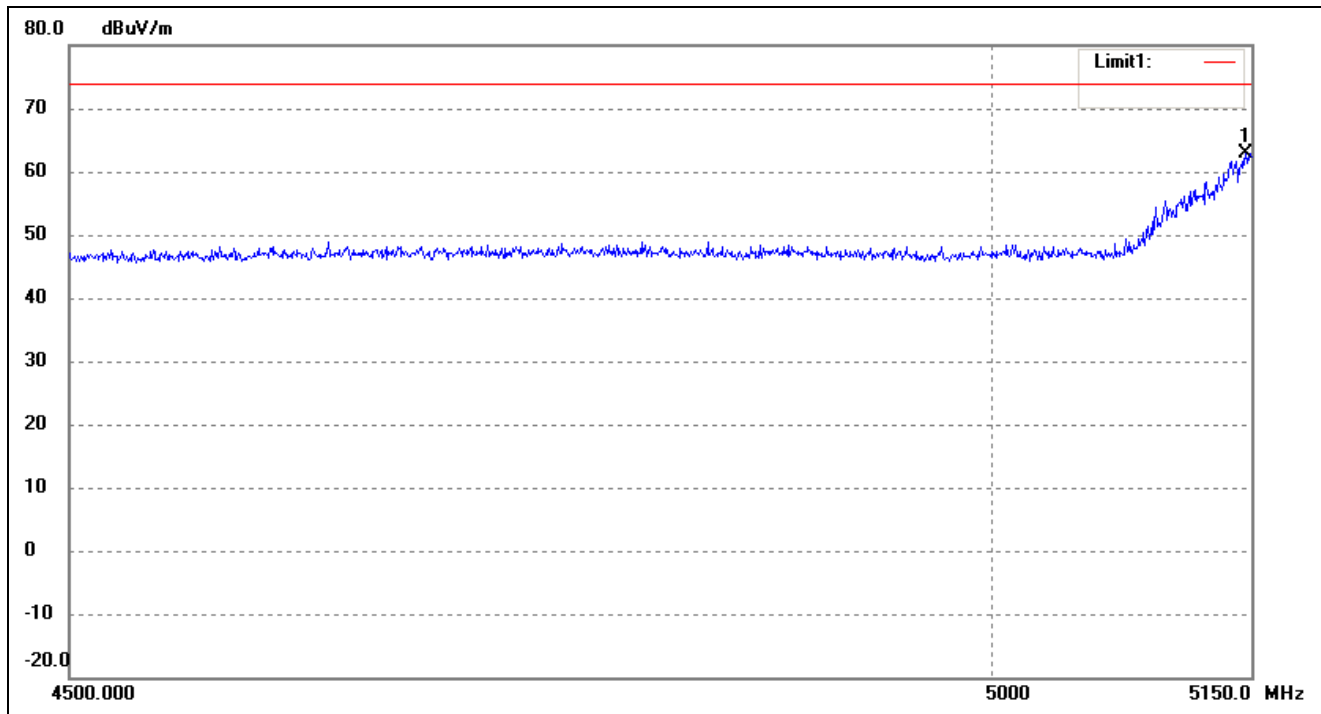
➤ Spurious Emission above 1GHz

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



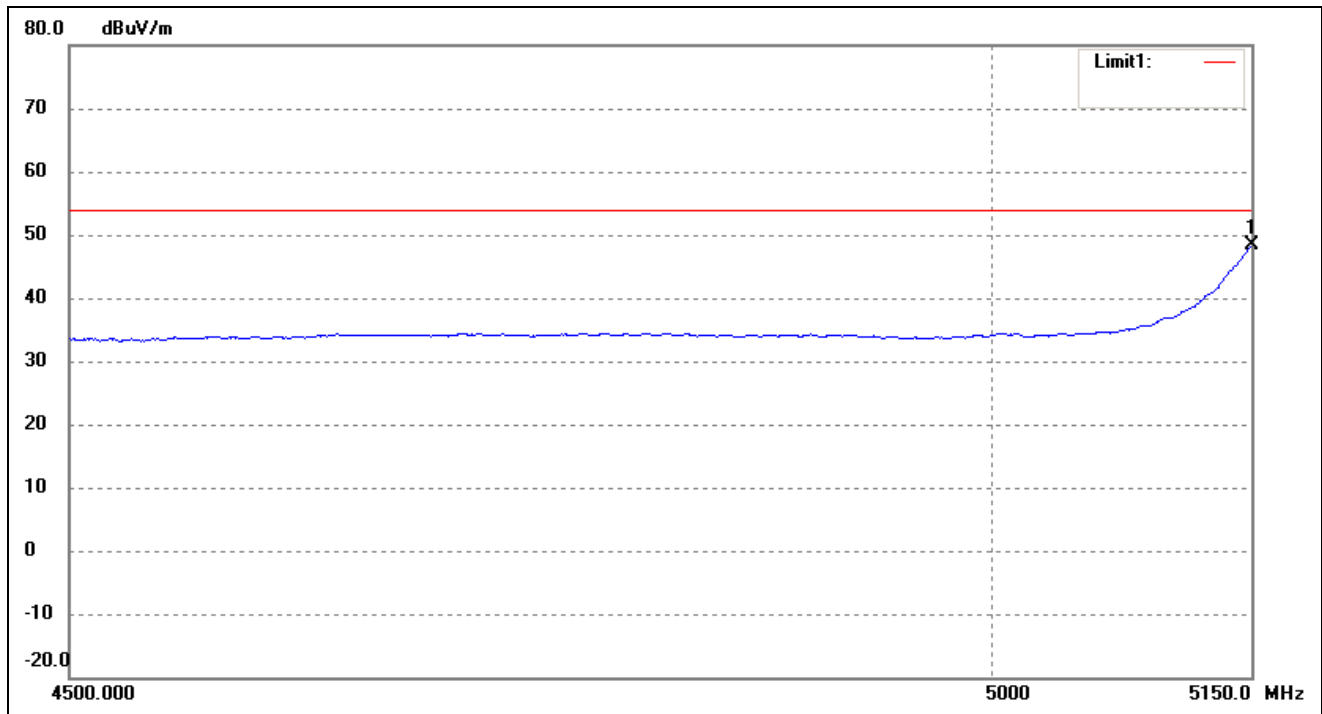
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5150.000	45.86	-4.32	41.54	54.00	-12.46	136	100	peak

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



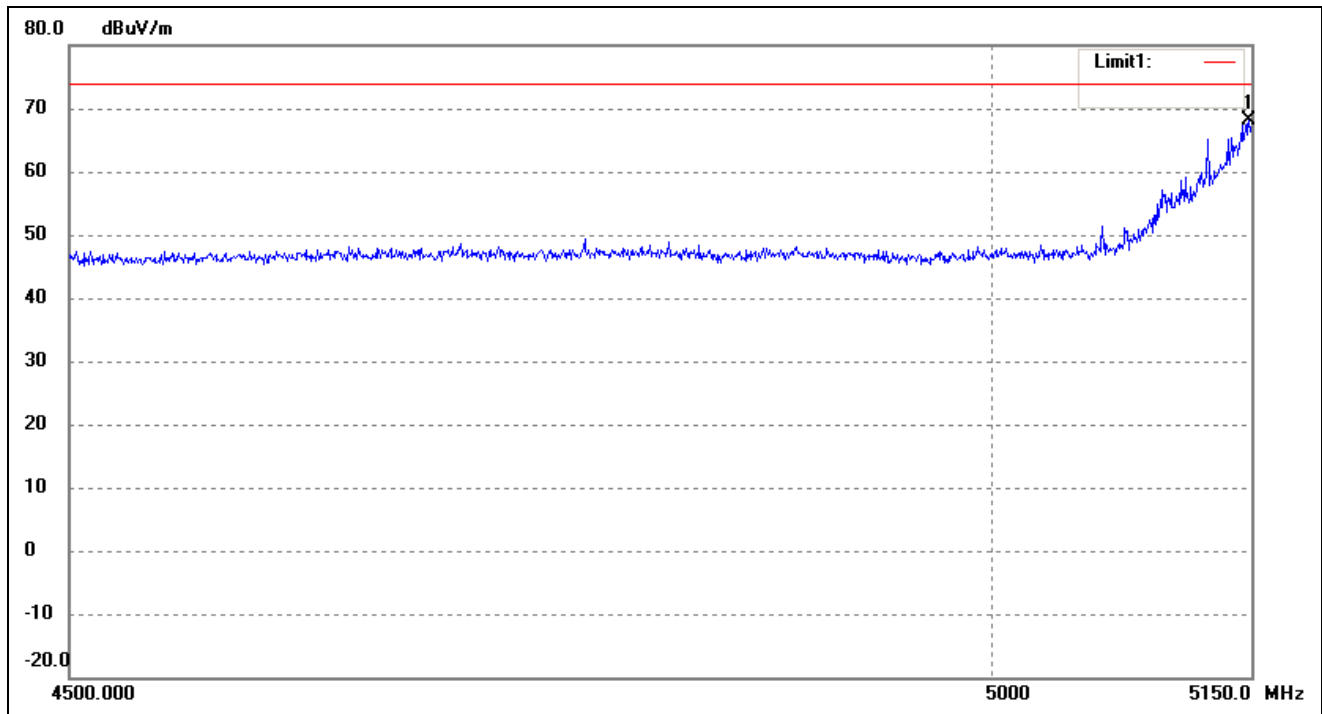
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5146.527	67.17	-4.32	62.85	74.00	-11.15	86	100	peak

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



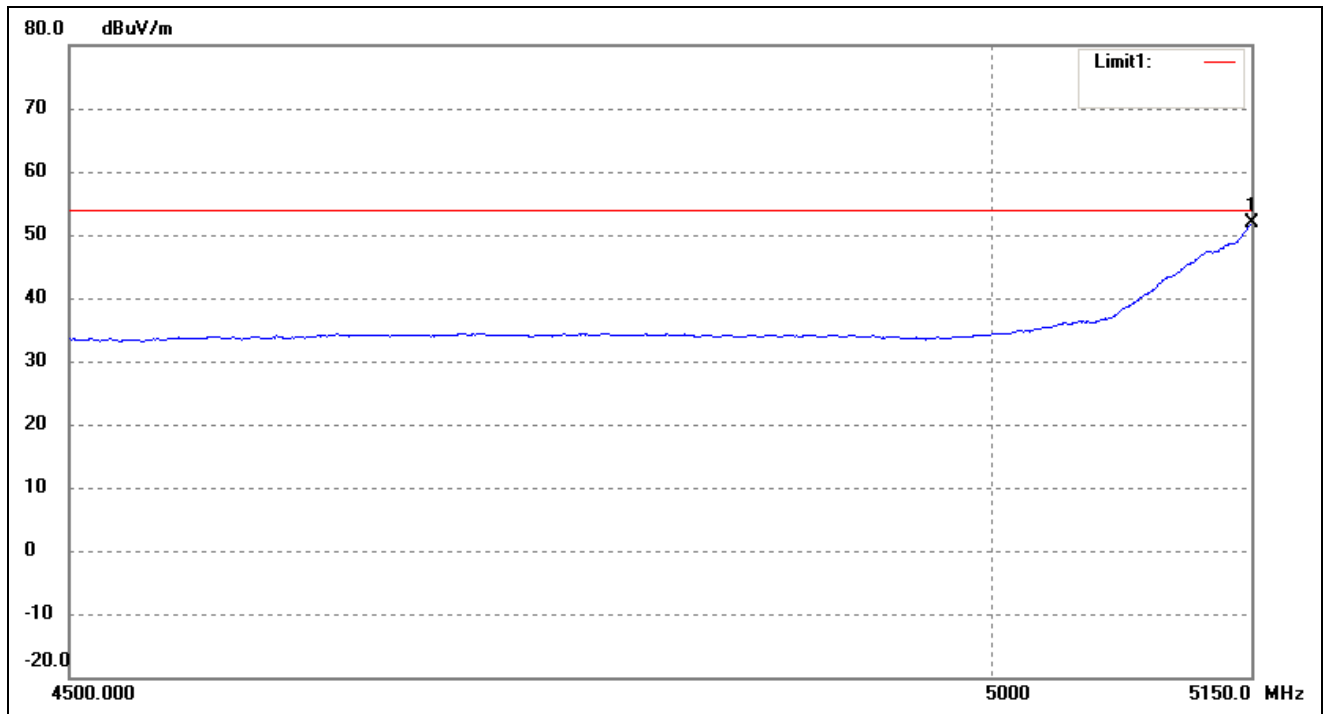
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5150.000	52.73	-4.32	48.41	54.00	-5.59	178	100	peak

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



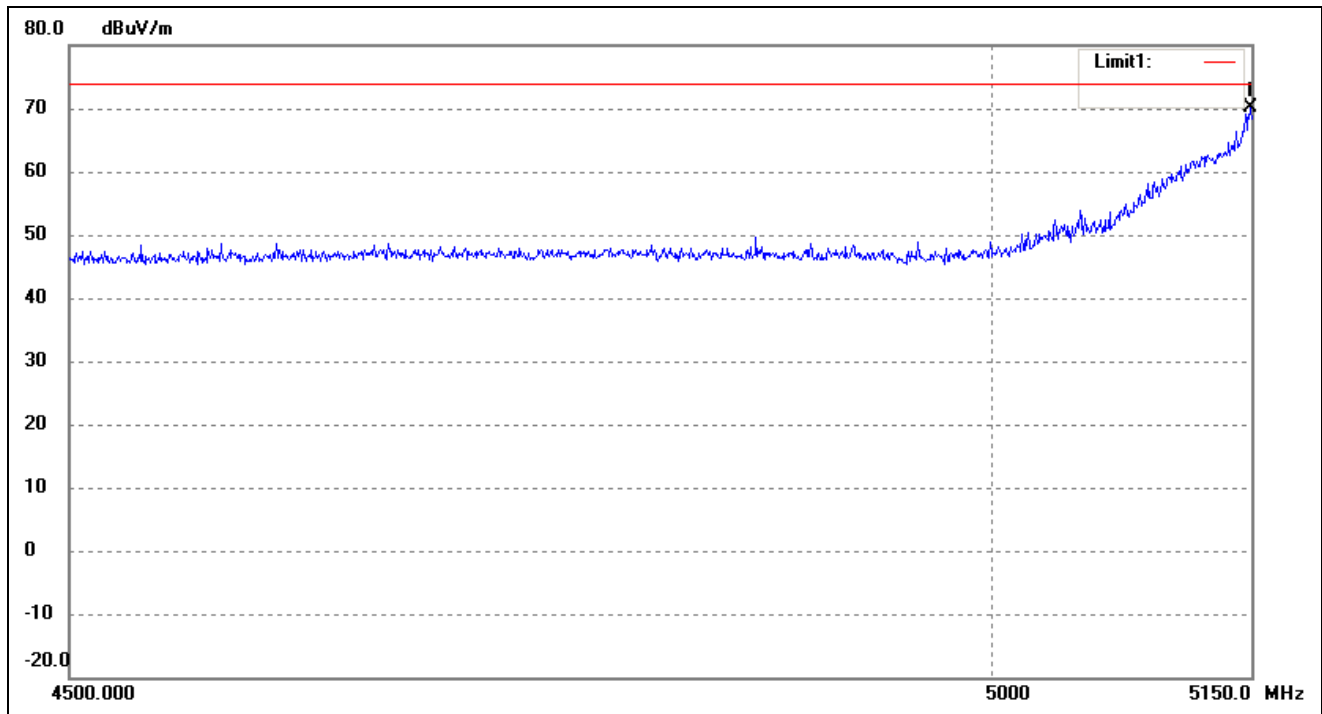
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5148.610	72.40	-4.32	68.08	74.00	-5.92	323	100	peak

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



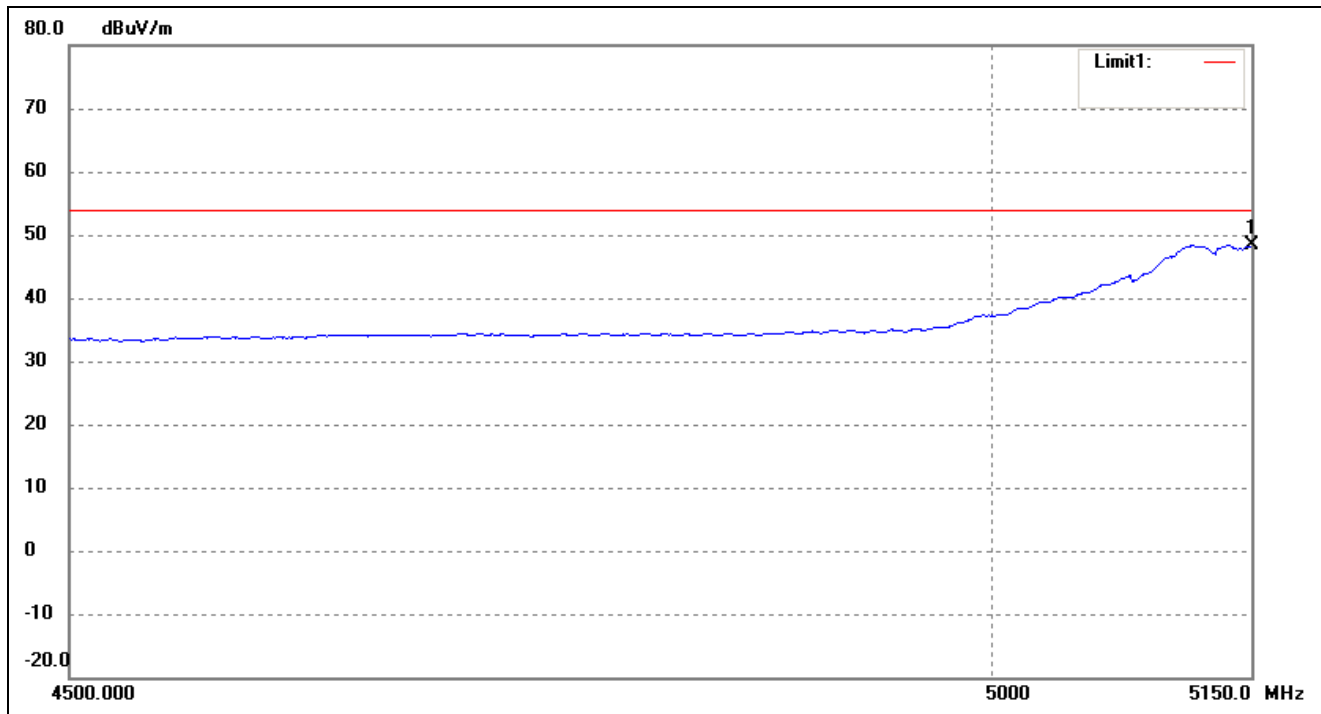
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5150.000	56.18	-4.32	51.86	54.00	-2.14	344	100	peak

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



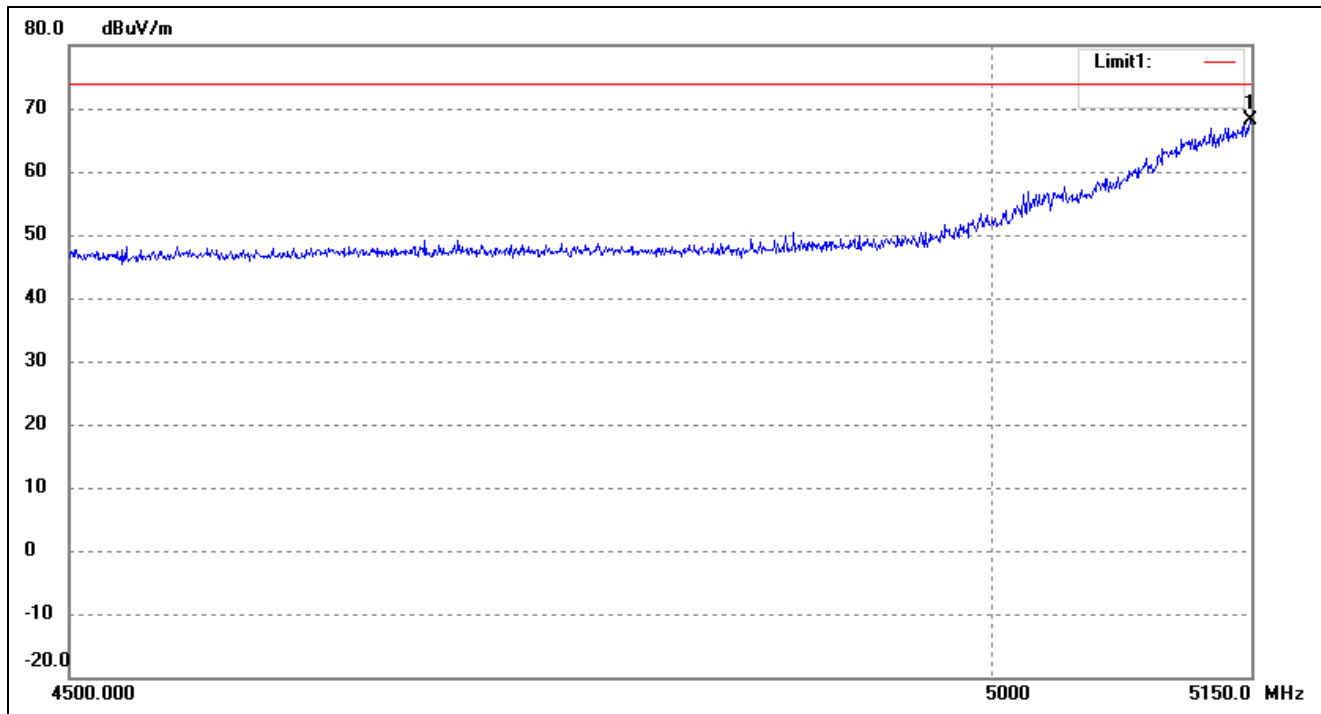
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	5149.305	74.37	-4.32	70.05	74.00	-3.95	133	100	peak

802.11ac-HT80- 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	52.76	-4.32	48.44	54.00	-5.56	72	100	peak

802.11ac-HT80- 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	72.48	-4.32	68.16	74.00	-5.84	316	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

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	53.97	7.11	61.08	74	-12.92	H	PK
10360	40.65	7.11	47.76	54	-6.24	H	AV
10360	54.98	7.11	62.09	74	-11.91	V	PK
10360	38.42	7.11	45.53	54	-8.47	V	AV
High Channel (5240MHz)							
10480	54.39	7.10	54.39	74	-12.51	H	PK
10480	37.41	7.10	37.41	54	-9.49	H	AV
10480	52.39	7.10	52.39	74	-14.51	V	PK
10480	38.21	7.10	38.21	54	-8.69	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5745MHz)							
11490	55.98	9.02	65.00	74	-9.00	H	PK
11490	35.65	9.02	44.67	54	-9.33	H	AV
11490	54.01	9.02	63.03	74	-10.97	V	PK
11490	34.62	9.02	43.64	54	-10.36	V	AV
High Channel (5825MHz)							
11610	53.35	8.94	62.29	74	-11.71	H	PK
11610	34.98	8.94	43.92	54	-10.08	H	AV
11610	55.59	8.94	64.53	74	-9.47	V	PK
11610	37.64	8.94	46.58	54	-7.42	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-31.98	-27
Highest	Above 5350	-33.73	-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	-32.39	-27
	5715 to 5725	-39.42	-17
Highest	5850 to 5860	-34.35	-17
	Above 5860	-32.11	-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

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	53.54	7.11	60.65	74	-13.35	H	PK
10360	38.63	7.11	45.74	54	-8.26	H	AV
10360	54.17	7.11	61.28	74	-12.72	H	PK
10360	36.31	7.11	43.42	54	-10.58	H	AV
High Channel (5240MHz)							
10480	54.28	7.10	61.38	74	-12.62	H	PK
10480	35.67	7.10	42.77	54	-11.23	H	AV
10480	54.59	7.10	61.69	74	-12.31	H	PK
10480	36.65	7.10	43.75	54	-10.25	H	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5745MHz)							
11490	54.29	9.02	63.31	74	-10.69	H	PK
11490	35.46	9.02	44.48	54	-9.52	H	AV
11490	54.35	9.02	63.37	74	-10.63	H	PK
11490	34.42	9.02	43.44	54	-10.56	H	AV
High Channel (5825MHz)							
11610	52.32	8.94	61.26	74	-12.74	H	PK
11610	33.59	8.94	42.53	54	-11.47	H	AV
11610	53.41	8.94	62.35	74	-11.65	H	PK
11610	35.36	8.94	44.30	54	-9.70	H	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-36.98	-27
Highest	Above 5350	-37.14	-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	-39.34	-27
	5715 to 5725	-37.49	-17
Highest	5850 to 5860	-38.64	-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

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5190MHz)							
10380	56.78	7.11	63.89	74	-10.11	H	PK
10380	37.65	7.11	44.76	54	-9.24	H	AV
10380	53.31	7.11	60.42	74	-13.58	H	PK
10380	36.27	7.11	43.38	54	-10.62	H	AV
High Channel (5230MHz)							
10460	53.87	7.1	53.87	74	-13.03	H	PK
10460	35.09	7.1	35.09	54	-11.81	H	AV
10460	53.98	7.1	53.98	74	-12.92	H	PK
10460	35.78	7.1	35.78	54	-11.12	H	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5755MHz)							
11510	55.35	9.04	64.39	74	-9.61	H	PK
11510	36.18	9.04	45.22	54	-8.78	H	AV
11510	54.20	9.04	63.24	74	-10.76	H	PK
11510	34.65	9.04	43.69	54	-10.31	H	AV
High Channel (5795MHz)							
11590	54.78	8.96	63.74	74	-10.26	H	PK
11590	35.56	8.96	44.52	54	-9.48	H	AV
11590	52.32	8.96	61.28	74	-12.72	H	PK
11590	36.21	8.96	45.17	54	-8.83	H	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-37.87	-27
Highest	Above 5350	-33.64	-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	-34.78	-27
	5715 to 5725	-32.63	-17
Highest	5850 to 5860	-37.25	-17
	Above 5860	-38.36	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11ac VH80)
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5210MHz							
10420	57.79	7.11	64.90	74	-9.10	H	PK
10420	38.86	7.11	45.97	54	-8.03	H	AV
10420	53.36	7.11	60.47	74	-13.53	H	PK
10420	34.78	7.11	41.89	54	-12.11	H	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5775MHz							
11550	55.85	9.00	64.85	74	-9.15	H	PK
11550	34.26	9.00	43.26	54	-10.74	H	AV
11550	53.74	9.00	62.74	74	-11.26	H	PK
11550	34.39	9.00	43.39	54	-10.61	H	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-38.62	-27
Highest	Above 5350	-39.04	-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	-36.87	-27
	5715 to 5725	-29.56	-17
Highest	5850 to 5860	-32.02	-17
	Above 5860	-33.39	-27
Note: the data just list the worst cases			

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%	3.85	-30	169	0.0325
100%		-20	111	0.0213
100%		-10	114	0.0219
100%		0	118	0.0227
100%		+10	109	0.0210
100%		+20	169	0.0325
100%		+30	103	0.0198
100%		+40	160	0.0308
100%		+50	145	0.0279
Low Battery power	3.5	+20	147	0.0283
High Battery power	4.35	+20	172	0.0331

U-NII-1:5725-5850MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	3.85	-30	150	0.0288
100%		-20	170	0.0327
100%		-10	180	0.0346
100%		0	134	0.0258
100%		+10	161	0.0310
100%		+20	154	0.0296
100%		+30	157	0.0302
100%		+40	113	0.0217
100%		+50	143	0.0275
Low Battery power	3.5	+20	133	0.0256
High Battery power	4.35	+20	160	0.0308

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