FCC Part 15E
Measurement and Test Report

For

Open Garden

1 Kaiser Plaza Suite 525, Oakland, California, United States

FCC ID: 2AQ25CB-0001

FCC Rule(s):	FCC Part 15.407
Product Description:	WiFi Sharing Device
Tested Model:	CB-0001
Report No.:	STR18098001I
Sample Receipt Date:	2018-08-31
Tested Date:	2018-09-01 to 2018-09-18
Issued Date:	2018-11-06
Tested By:	Jason Su/ Engineer
Reviewed By:	Silin Chen / EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager

Prepared By:

Shenzhen SEM Test Technology Co., Ltd.
1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C.（518101）
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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.

TABLE OF CONTENTS

1. GENERAL INFORMATION 3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
1.2 TEST STANDARDS 4
1.3 TEST METHODOLOGY 4
1.4 TABLE FOR PARAMETERS OF TEST SOFTWARE SETTING 4
1.5 EUT OPERATING DURING TEST 5
1.6 TEST FACILITY 5
1.7 EUT SETUP AND TEST MODE 6
1.8 MEASUREMENT UNCERTAINTY 7
1.9 TEST EQUIPMENT LIST AND DETAILS 8
2. SUMMARY OF TEST RESULTS 9
3. RF EXPOSURE 10
3.1 STANDARD APPLICABLE 10
3.2 TEST RESULT 10
4. ANTENNA REQUIREMENT 11
4.1 STANDARD APPLICABLE 11
4.2 EVALUATION INFORMATION 11
5. CONDUCTED EMISSIONS 12
5.1 TEST PROCEDURE 12
5.2 BASIC TEST SETUP BLOCK DIAGRAM 12
5.3 TEST RECEIVER SETUP 12
5.4 SUMMARY OF TEST RESULTS/PLOTS 12
6. POWER SPECTRAL DENSITY 15
6.1 STANDARD APPLICABLE 15
6.2 TEST PROCEDURE 15
6.3 SUMMARY OF TEST RESULTS/PLOTS 16
7. EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH 34
7.1 STANDARD APPLICABLE 34
7.2 TEST PROCEDURE 34
7.3 SUMMARY OF TEST RESULTS/PLOTS 36
8. MAXIMUM CONDUCTED OUTPUT POWER 54
8.1 STANDARD APPLICABLE 54
8.2 TEST PROCEDURE 54
8.3 SUMMARY OF TEST RESULTS/PLOTS 55
9. RADIATED SPURIOUS EMISSIONS 73
9.1 STANDARD APPLICABLE 73
9.2 TEST PROCEDURE 73
9.3 TEST RECEIVER SETUP 74
9.4 CORRECTED AMPLITUDE & MARGIN CALCULATION 74
9.5 SUMMARY OF TEST RESULTS/PLOTS 74
10. FREQUENCY STABILITY 101
10.1 STANDARD APPLICABLE 101
10.2 TEST PROCEDURE 101
10.3 SUMMARY OF TEST RESULTS/PLOTS 101

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Open Garden
Address of applicant: 1 Kaiser Plaza Suite 525, Oakland, California, United States

Manufacturer: Open Garden
Address of manufacturer: 1 Kaiser Plaza Suite 525, Oakland, California, United States

General Description of EUT	
Product Name:	WiFi Sharing Device
Brand Name:	/
Model No.:	CB-0001
Adding Model(s):	/
Rated Voltage:	DC12V
Battery Capacity:	/
Power Adapter:	RD1201000-C55-35GB Input:AC100-240V 50/60Hz 0.6A MAX Output: DC12V 1.0A
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
Type of Modulation:	QPSK, 16QAM, 64QAM
Data Rate:	6-54Mbps, up to 200Mbps
Type of Antenna:	External Antenna
Antenna Gain:	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 MT76xxE_AP(1.0.3.14) 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	10	10	10	/	/	/	/	/	/	/	10	10	10
802.11n-HT20 MCS0	10	10	10	/	/	/	/	/	/	/	10	10	10

Mode	NCB: 40MHz									
	5190	5230	5270	5310	5510	5550	5670	5710	5755	5795
802.11n-HT40 MCS0	10	10	/	/	/	/	/	/	10	10

Mode	NCB: 80MHz					
	5210	5290	5530	5610	5690	5775
802.11ac-VH80 MCS0/Nss2	10	/	/	/	/	10

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
TM4	802.11ac-VH80	5210MHZ; 5775MHz
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
DC Cable	1.5	Unshielded	Without CoreX

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	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

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	2017-08-15	2018-08-14
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)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

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)	Conducted Spurious 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

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 MPE 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

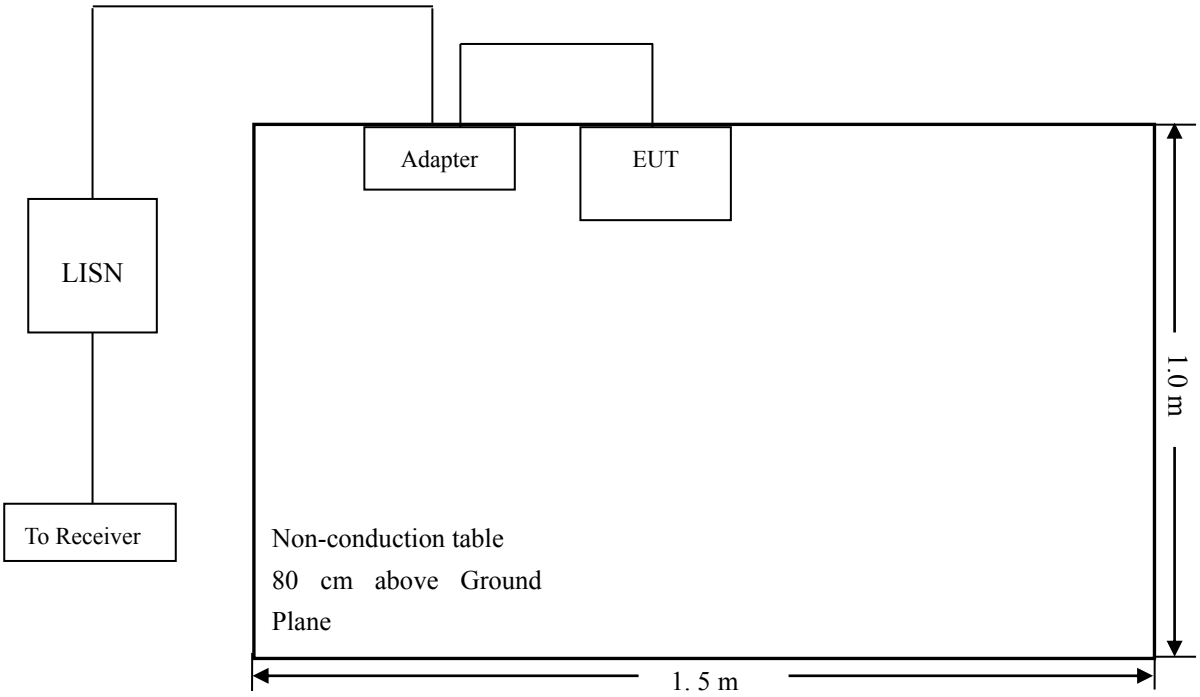
This product has an External Antenna, fulfill the requirement of this section.

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



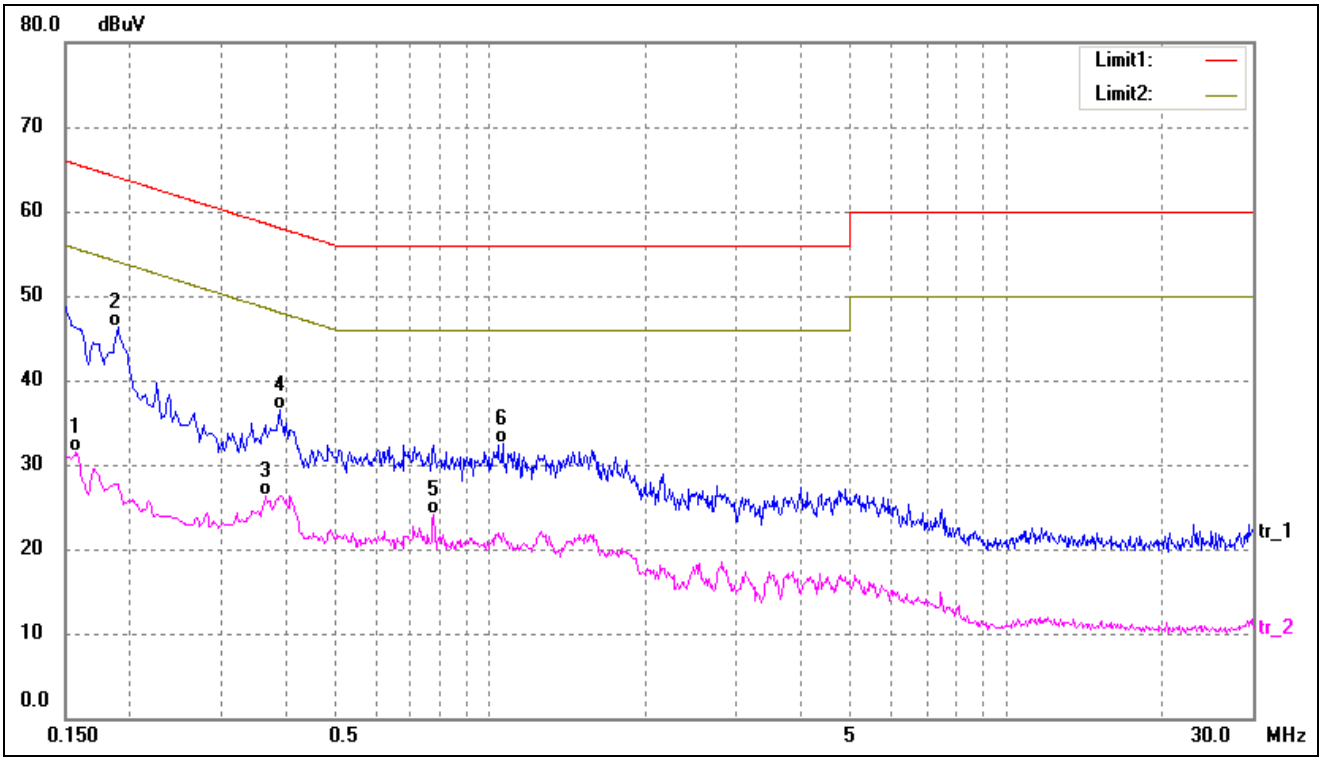
5.3 Test Receiver Setup

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

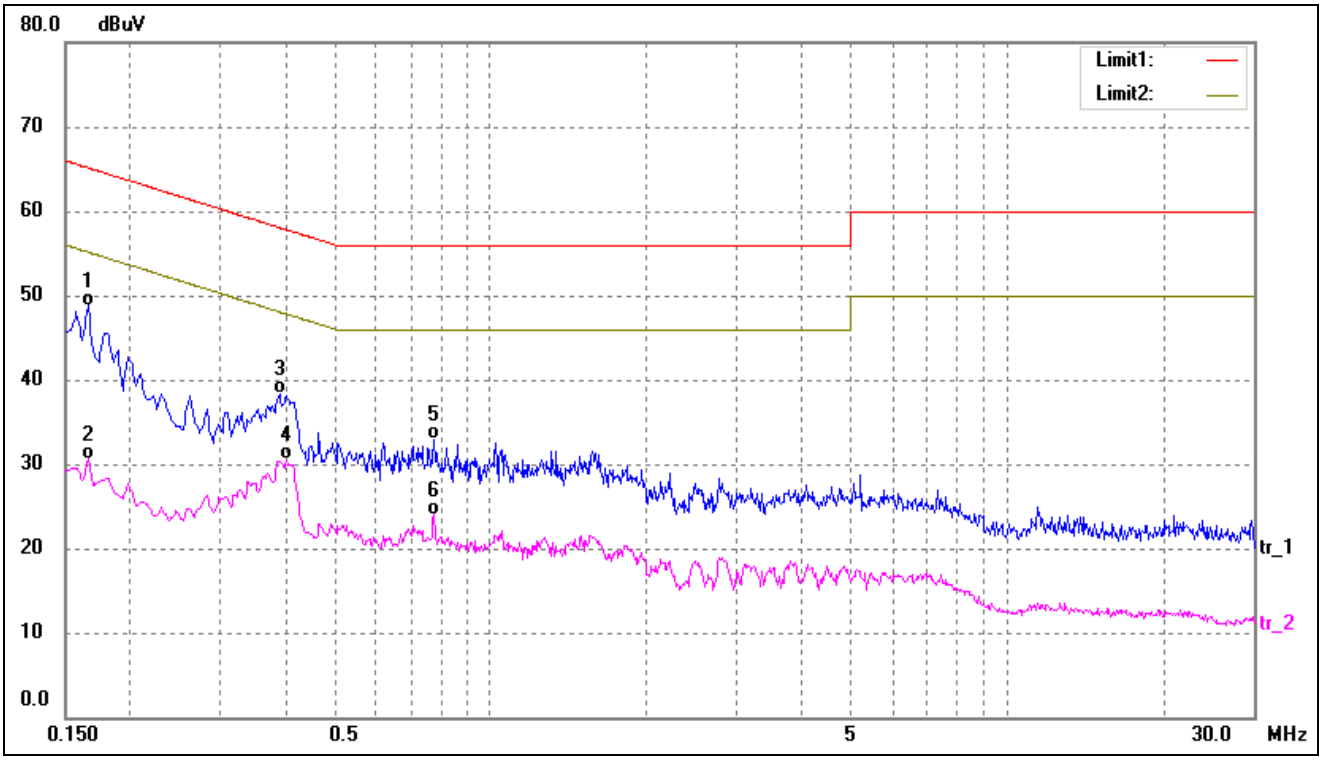
5.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1580	21.33	10.10	31.43	55.57	-24.14	AVG
2*	0.1900	36.22	10.12	46.34	64.04	-17.70	QP
3	0.3660	16.12	10.23	26.35	48.59	-22.24	AVG
4	0.3900	26.27	10.25	36.52	58.06	-21.54	QP
5	0.7780	13.64	10.42	24.06	46.00	-21.94	AVG
6	1.0580	22.00	10.51	32.51	56.00	-23.49	QP

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1660	38.69	10.11	48.80	65.16	-16.36	QP
2	0.1660	20.49	10.11	30.60	55.16	-24.56	AVG
3	0.3900	28.09	10.25	38.34	58.06	-19.72	QP
4	0.4020	20.26	10.25	30.51	47.81	-17.30	AVG
5	0.7780	22.48	10.42	32.90	56.00	-23.10	QP
6	0.7780	13.58	10.42	24.00	46.00	-22.00	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 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 ≥ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/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 10log(1MHz/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.

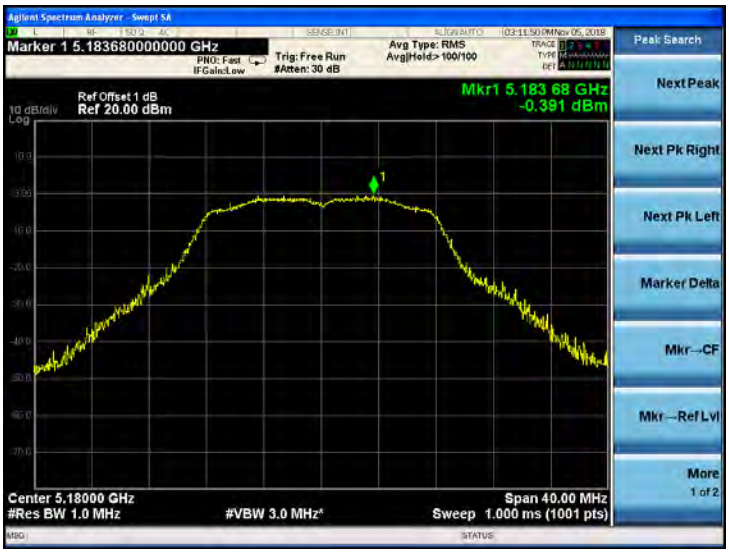
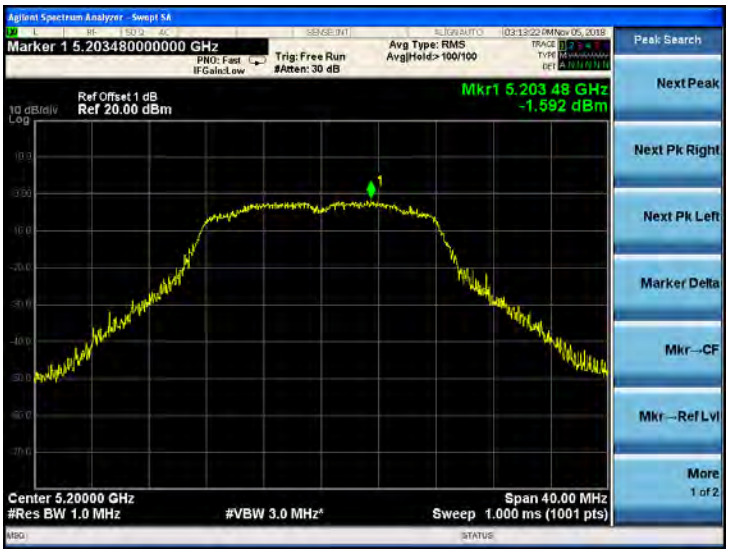
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHZ is available on nearly all spectrum analyzers.

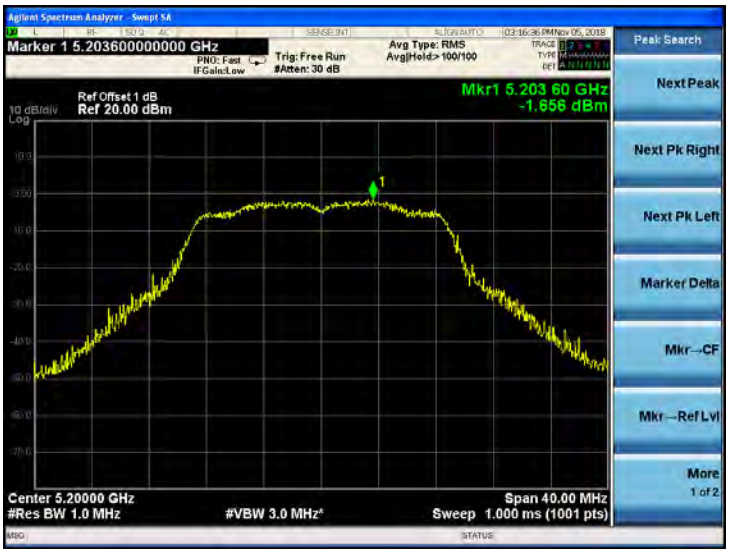
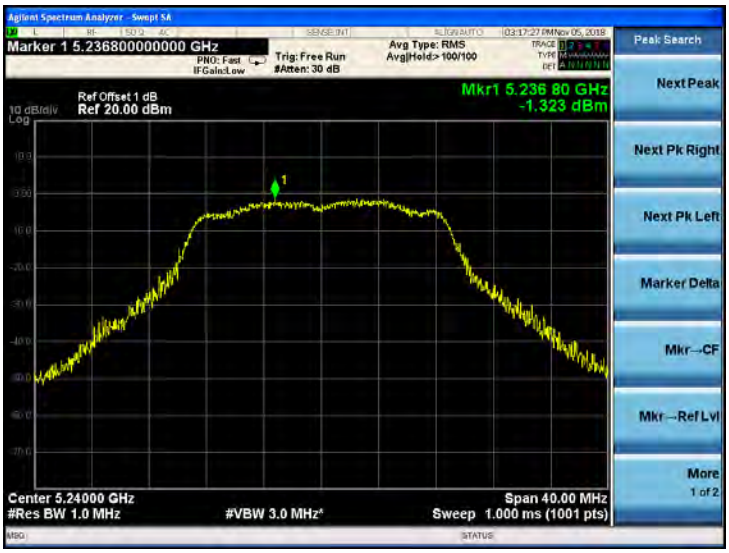
6.3 Summary of Test Results/Plots

U-NII-1:5150-5250MHz					
Operating mode	Test Channel MHz	Power Spectral Density dBm/MHz			Limit (dBm/MHz)
		Chain 0	Chain 1	Total	
802.11a	5180	-0.391	-1.318	/	11
	5200	-1.592	-1.818	/	11
	5240	-1.128	-0.985	/	11
802.11n-HT20	5180	-0.884	-1.194	1.976	11
	5200	-1.656	-1.539	1.414	11
	5240	-1.323	-1.454	1.620	11
802.11n-HT40	5190	-3.920	-4.007	-0.953	11
	5230	-4.080	-4.191	-1.124	11
802.11ac-HT80	5210	-8.016	-8.075	-5.035	11

U-NII-3: 5725-5850MHz								
802.11a								
Test Channel	Power Spectral Density*							Limit
	ANT 0			ANT 1			Total	
	dBm/300kHz	Factor	dBm/500kHz	dBm/300kHz	Factor	dBm/500kHz	dBm/500kHz	dBm/500kHz
5745	-5.491	2.22	-3.271	-5.581	2.22	-3.361	/	30
5785	-6.049	2.22	-3.829	-6.445	2.22	-4.225	/	30
5825	-6.828	2.22	-4.608	-6.864	2.22	-4.644	/	30
802.11n-HT20								
5745	-4.615	2.22	-2.395	-4.705	2.22	-2.485	0.57	30
5785	-5.083	2.22	-2.863	-5.657	2.22	-3.437	-0.13	30
5825	-5.589	2.22	-3.369	-5.965	2.22	-3.745	-0.54	30
802.11n-HT40								
5755	-8.499	2.22	-6.279	-8.744	2.22	-6.524	-3.39	30
5795	-9.178	2.22	-6.958	-8.648	2.22	-6.428	-3.67	30
802.11ac-HT80								
5775	-11.824	2.22	-9.624	-11.825	2.22	-9.605	-6.604	30
*Note: Maximum PSD=PSD(dBm/500kHz)+10log(500kHz/300kHz)=2.22								

➢ Antenna 0: 5150-5250MHz

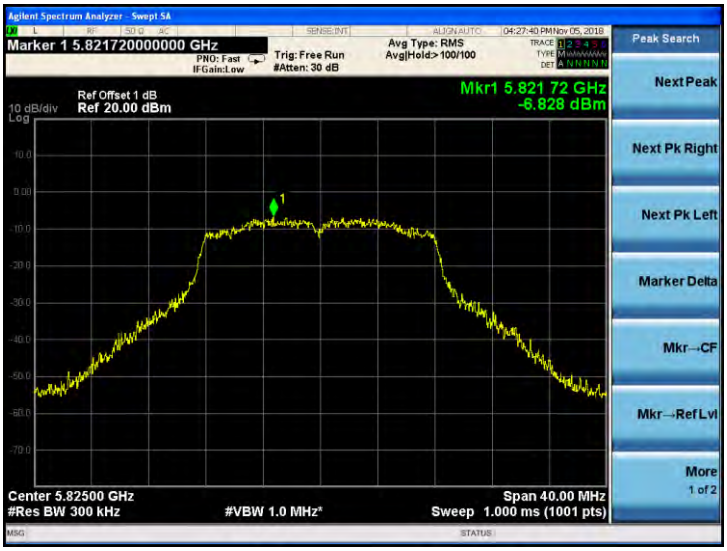
Mode:	802.11a
5180MHz	
5200MHz	
5240MHz	

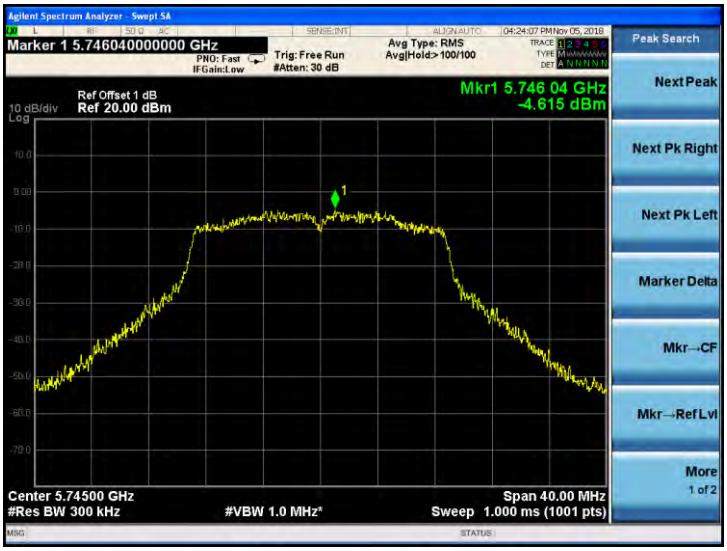
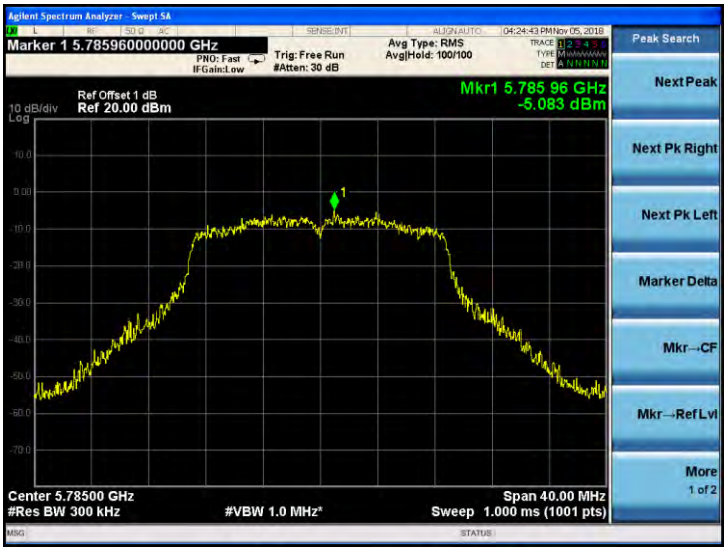
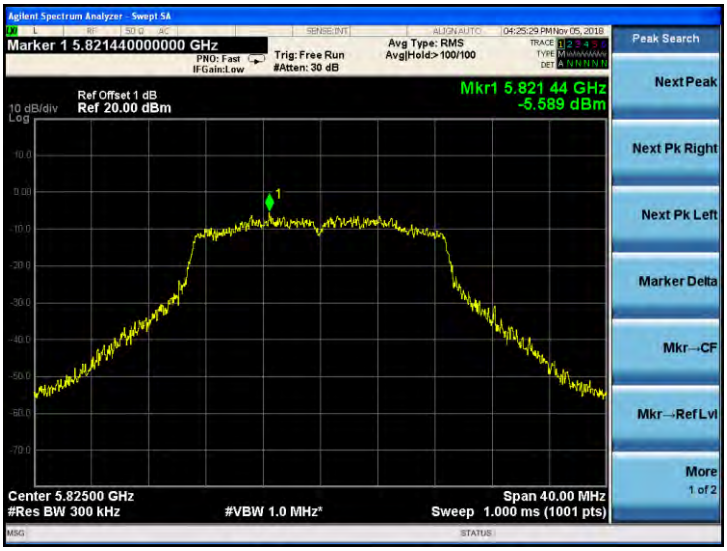
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

Mode:	802.11ac VH80
5210MHz	

➢ Antenna 0: 5725-5850MHz

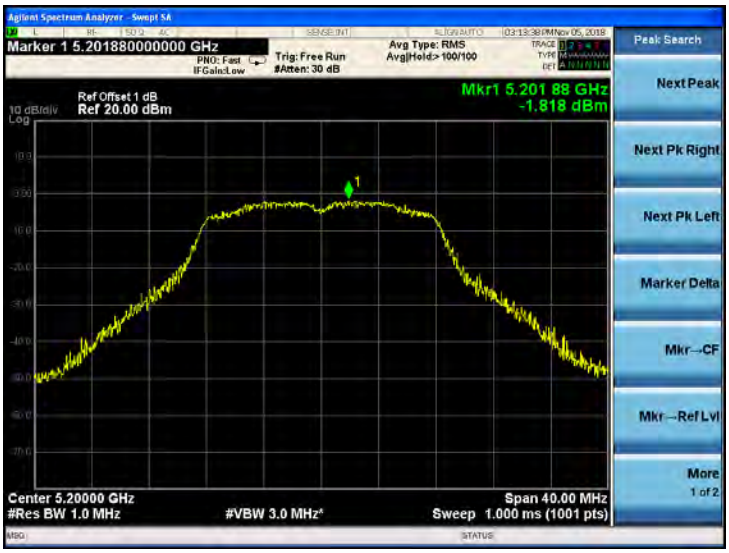
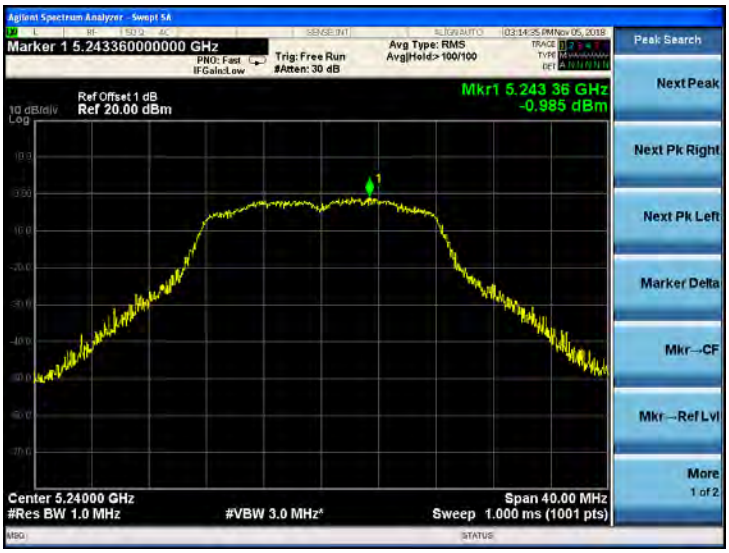
Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

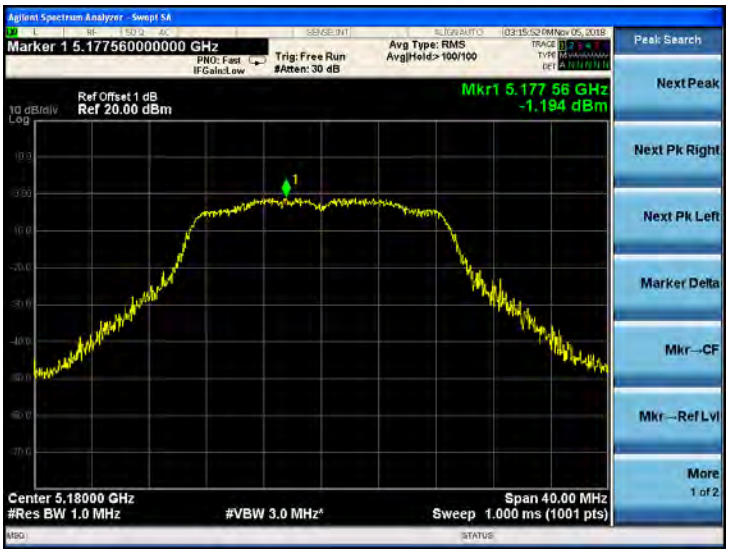
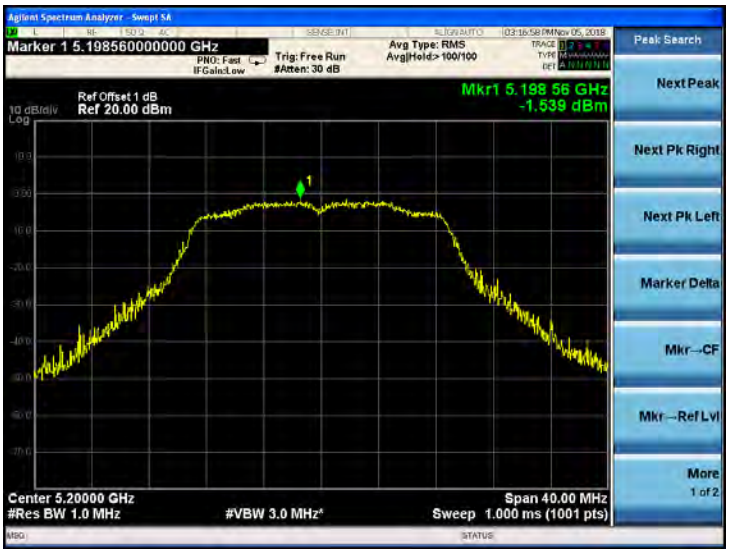
Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

➢ Antenna 1: 5150-5250MHz

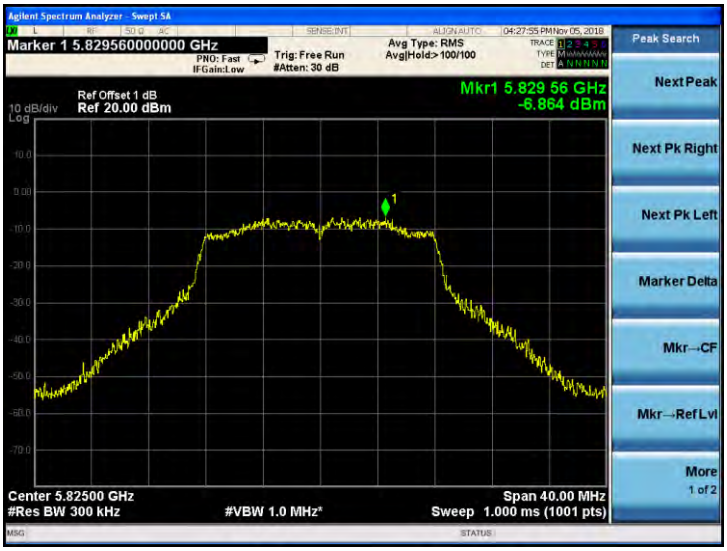
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

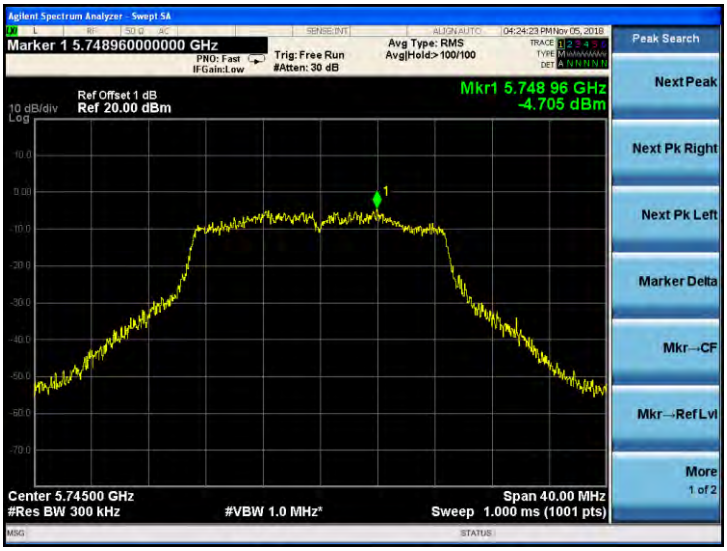
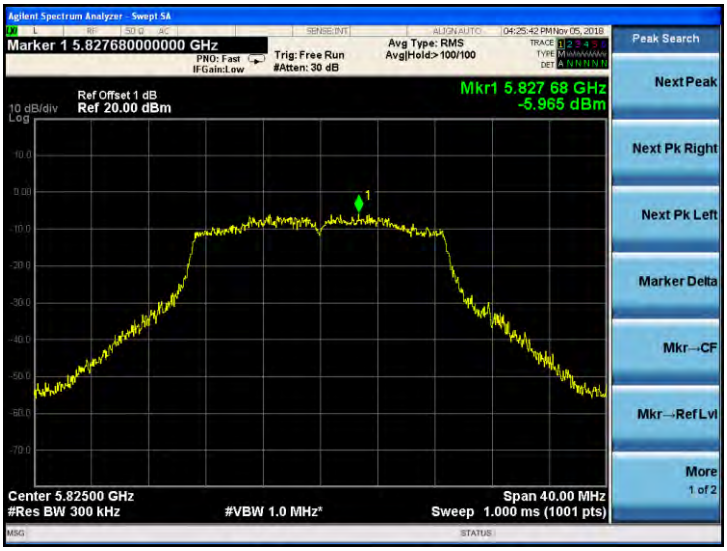
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

Mode:	802.11ac VH80
5210MHz	

➢ Antenna 1: 5725-5850MHz

Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

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

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

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 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) ≥ 3 × 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 ≥ 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

Antenna 0:

U-NII-1:5150-5250MHz				
Test Mode	**Test Channel MHz**	**26 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5180	23.61	16.704	Pass
	5200	23.89	16.645	Pass
	5240	23.70	16.649	Pass
802.11n-HT20	5180	24.91	17.848	Pass
	5200	23.66	17.795	Pass
	5240	24.66	17.794	Pass
802.11n-HT40	5190	44.98	36.320	Pass
	5230	44.16	36.280	Pass
802.11ac-HT80	5210	86.49	75.087	Pass

Antenna 0:

U-NII-3: 5725-5850MHz				
Test Mode	**Test Channel MHz**	**6 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5745	16.14	16.635	≥500
	5785	16.11	16.642	≥500
	5825	16.24	16.552	≥500
802.11n-HT20	5745	17.39	17.726	≥500
	5785	17.33	17.797	≥500
	5825	17.14	17.748	≥500
802.11n-HT40	5755	35.80	36.291	≥500
	5795	35.92	36.397	≥500
802.11ac VH80	5775	74.99	75.034	≥500

Antenna 1:

U-NII-1:5150-5250MHz				
Test Mode	**Test Channel MHz**	**26 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5180	23.70	16.627	Pass
	5200	22.61	16.592	Pass
	5240	23.59	16.585	Pass
802.11n-HT20	5180	23.81	17.729	Pass
	5200	24.14	17.819	Pass
	5240	23.35	17.721	Pass
802.11n-HT40	5190	44.67	36.263	Pass
	5230	45.00	36.366	Pass
802.11ac-HT80	5210	86.09	75.000	Pass

Antenna 1:

U-NII-3: 5725-5850MHz				
Test Mode	**Test Channel MHz**	**6 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5745	16.04	16.625	≥500
	5785	16.17	16.561	≥500
	5825	16.10	16.570	≥500
802.11n-HT20	5745	17.11	17.713	≥500
	5785	17.43	17.795	≥500
	5825	17.46	17.768	≥500
802.11n-HT40	5755	35.60	36.236	≥500
	5795	35.76	36.306	≥500
802.11ac VH80	5775	75.51	75.176	≥500

➢ Antenna 0: 5150-5250MHz

Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

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

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

Mode:	802.11ac VH80
5210MHz	

➢ Antenna 0: 5725-5850MHz

Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

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

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

➢ Antenna 1: 5150-5250MHz

Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

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

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

Mode:	802.11ac VH80
5210MHz	

➢ Antenna 1: 5725-5850MHz

Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

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

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 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 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 ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ 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

Antenna 0:

U-NII-1:5150-5250MHz				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5180	8.24	6.668	250
	5200	7.93	6.209	250
	5240	8.05	6.383	250
	5745	7.91	6.180	1000
	5785	7.60	5.754	1000
	5825	7.52	5.649	1000

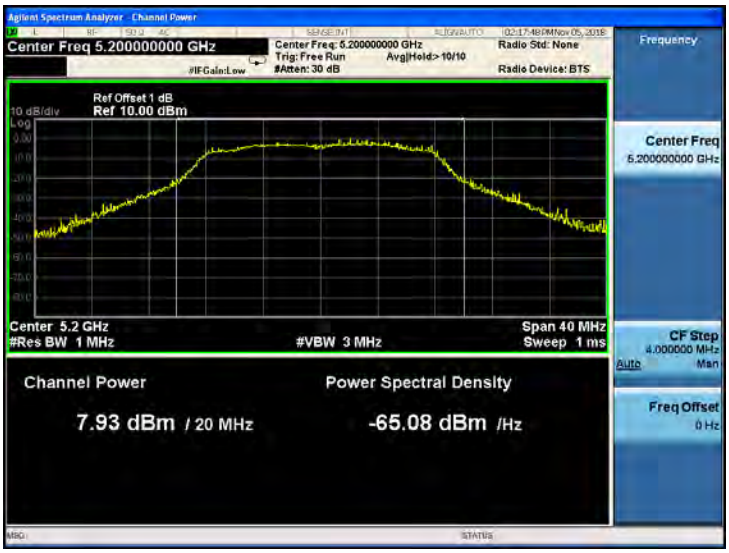
Antenna 1:

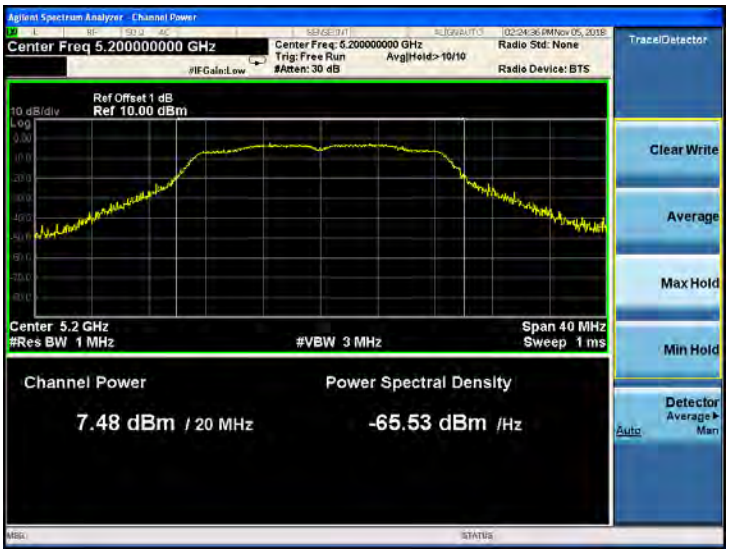
U-NII-1:5150-5250MHz				
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
802.11a	5180	7.90	6.166	250
	5200	7.75	5.957	250
	5240	7.85	6.095	250
	5745	8.24	6.668	1000
	5785	8.18	6.577	1000
	5825	7.63	5.794	1000

Antenna 0+ Antenna 1

Test mode	Frequency MHz	Power 0 dBm	Power 1 dBm	Total Power dBm	Output Power mW	Limit mW
802.11n-HT20	5180	7.83	7.55	10.703	11.76	250
	5200	7.48	7.69	10.597	11.47	250
	5240	7.72	7.47	10.607	11.50	250
	5745	7.61	7.37	10.502	11.226	1000
	5785	7.53	7.43	10.491	11.196	1000
	5825	7.60	7.42	10.521	11.275	1000
802.11n-HT40	5190	7.91	7.64	10.787	11.988	250
	5230	7.51	7.61	10.571	11.404	250
	5755	7.53	7.67	10.611	11.51	1000
	5795	7.63	7.83	10.741	11.861	1000
802.11ac-HT80	5210	7.11	7.41	10.273	10.648	250
	5775	7.41	7.16	10.297	10.708	1000

➢ Antenna 0: 5150-5250MHz

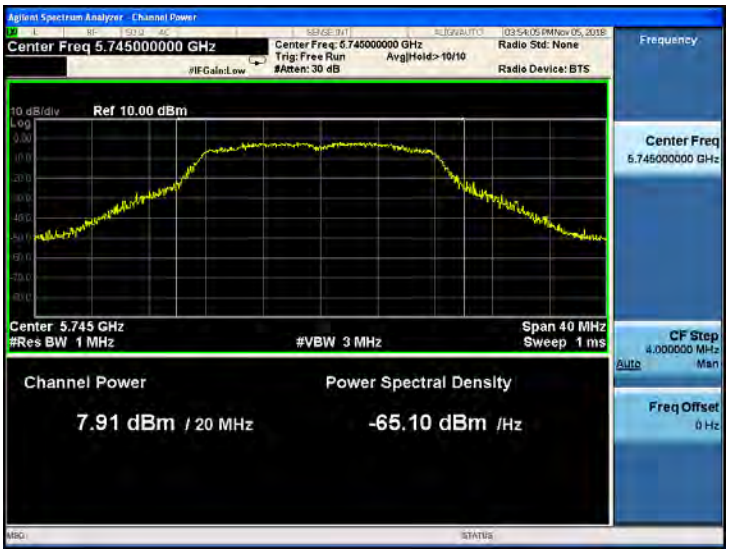
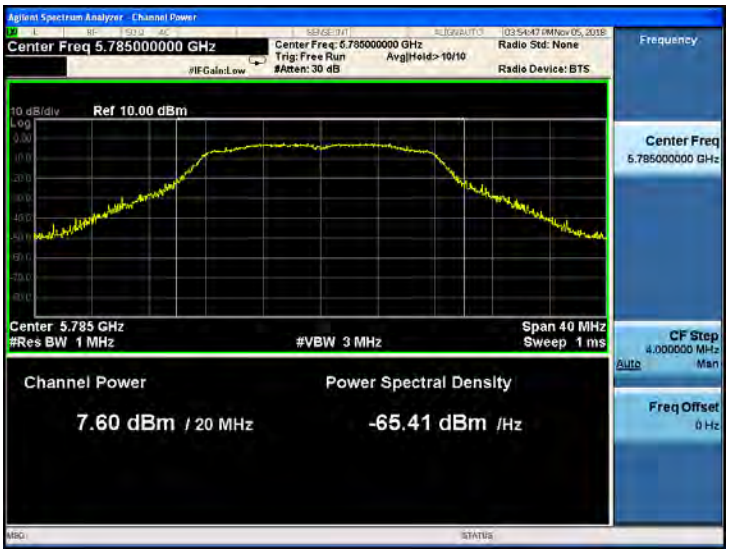
Mode:	802.11a
5180MHz	
5200MHz	
5240MHz	

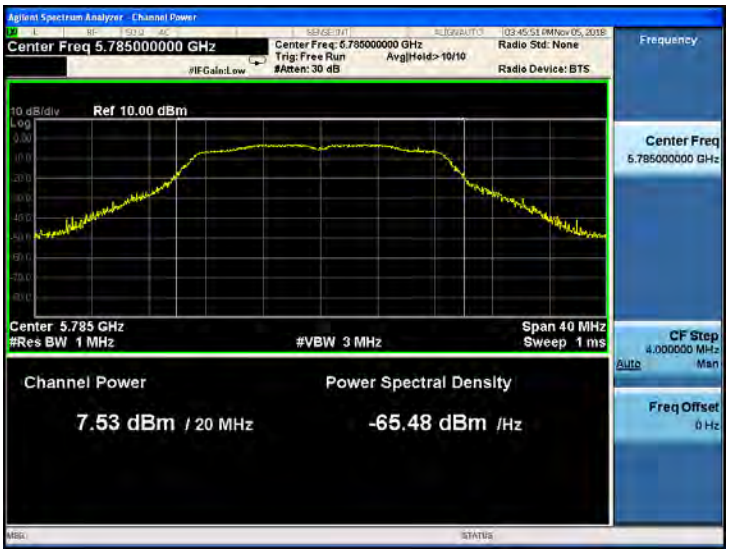
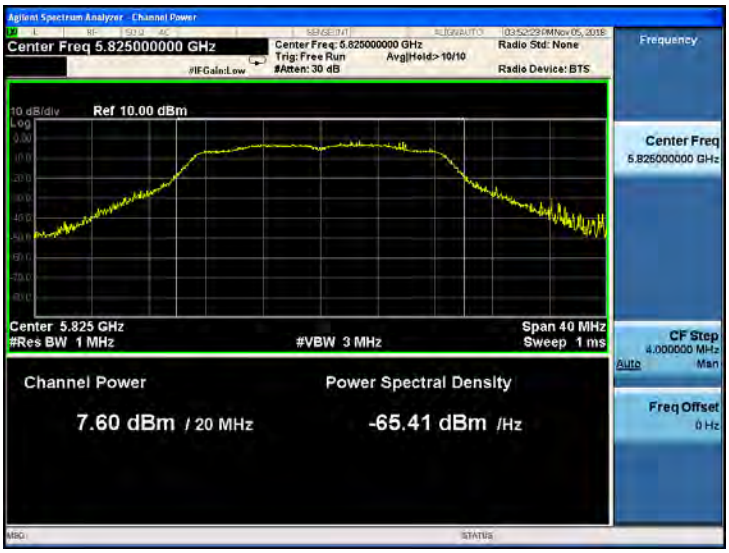
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

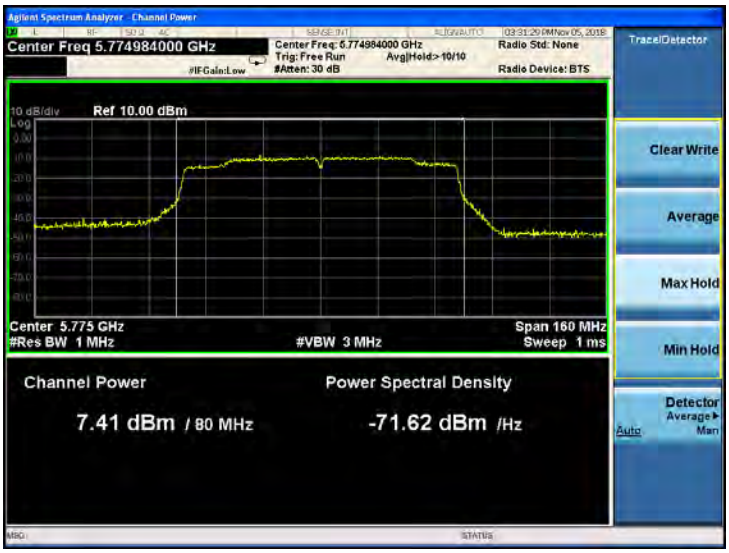
Mode:	802.11ac VH80
5210MHz	

➢ Antenna 0: 5725-5850MHz

Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

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

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

➢ Antenna 1: 5150-5250MHz

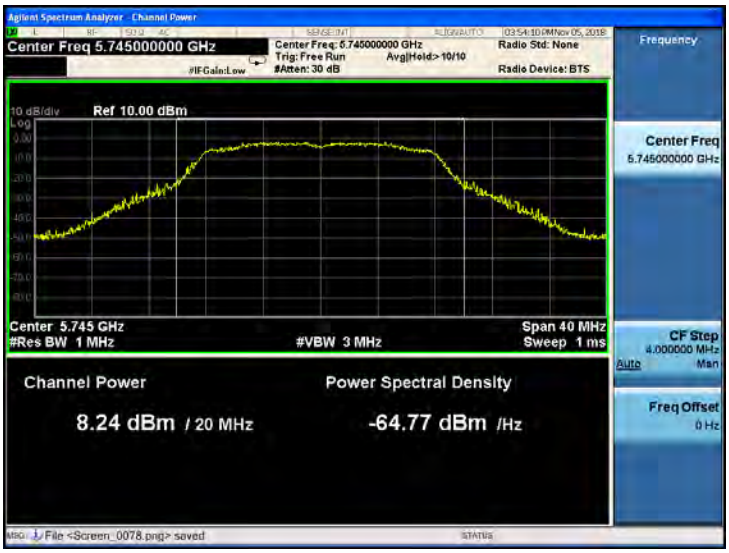
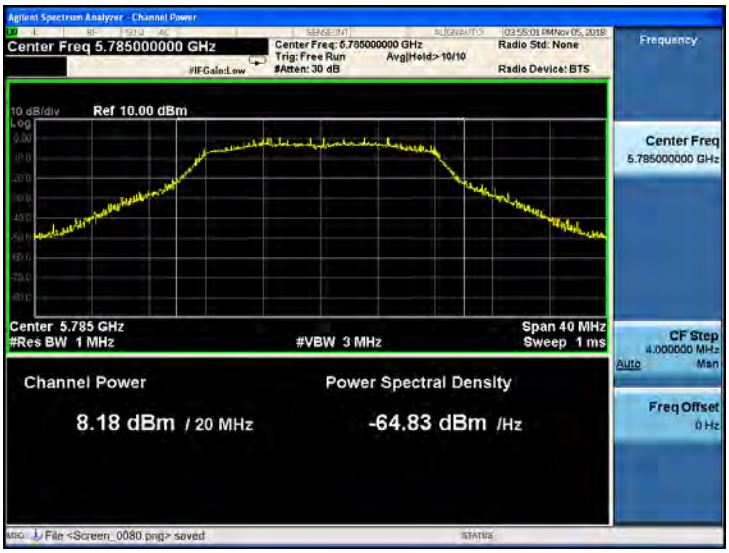
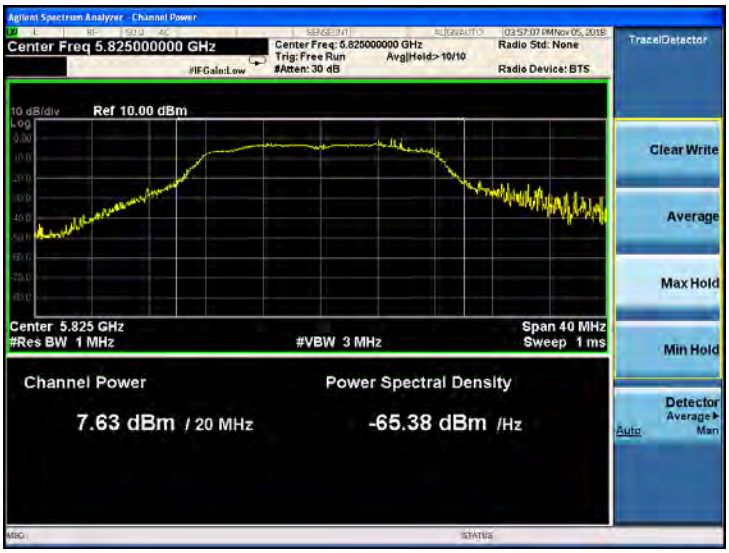
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

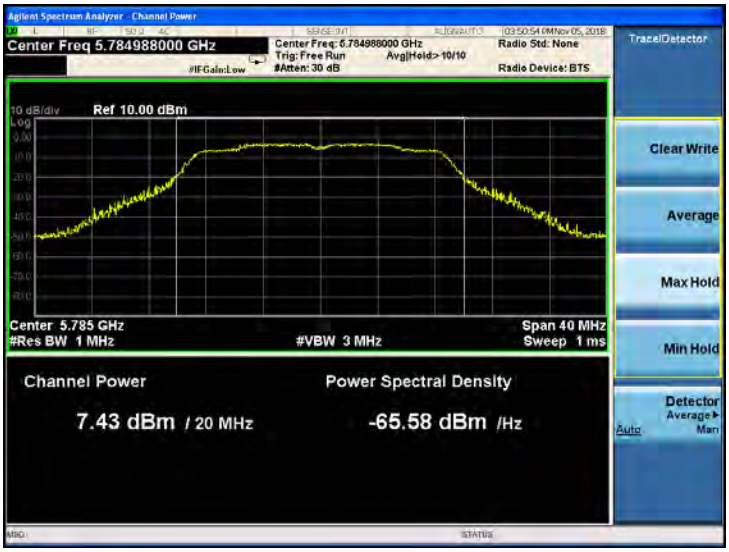
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

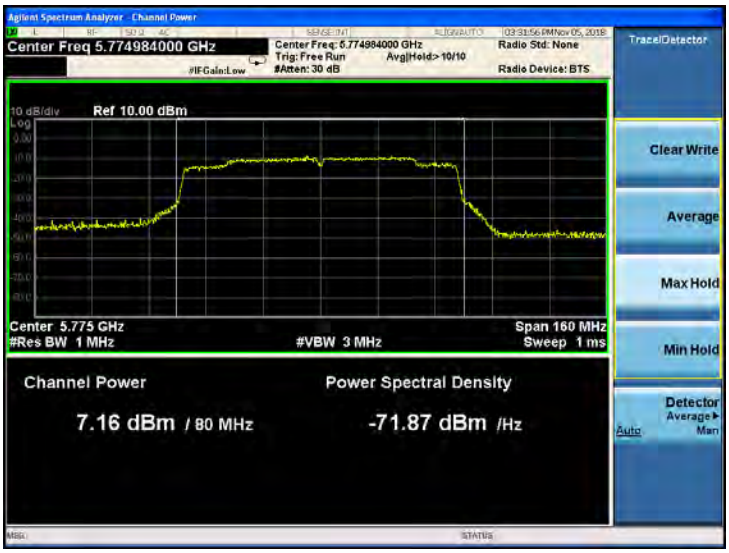
Mode:	802.11ac VH80
5210MHz	

➢ Antenna 1: 5725-5850MHz

Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

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

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

9. Radiated Spurious Emissions

9.1 Standard Applicable

According to §15.407(b)(6), Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209.
According to §15.407(b)(7),The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
789033 D02 v02r01 General UNII Test Procedures New Rules v02
If radiated measurements are performed, field strength is then converted to EIRP as follows:

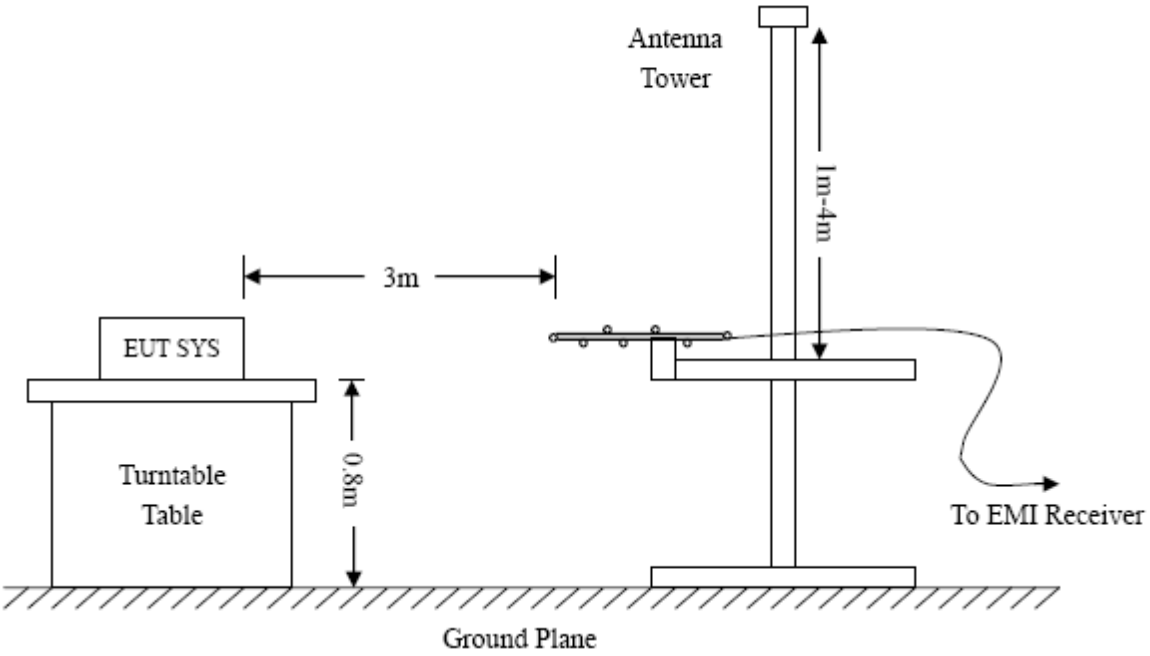
EIRP = ((E*d)^2) / 30

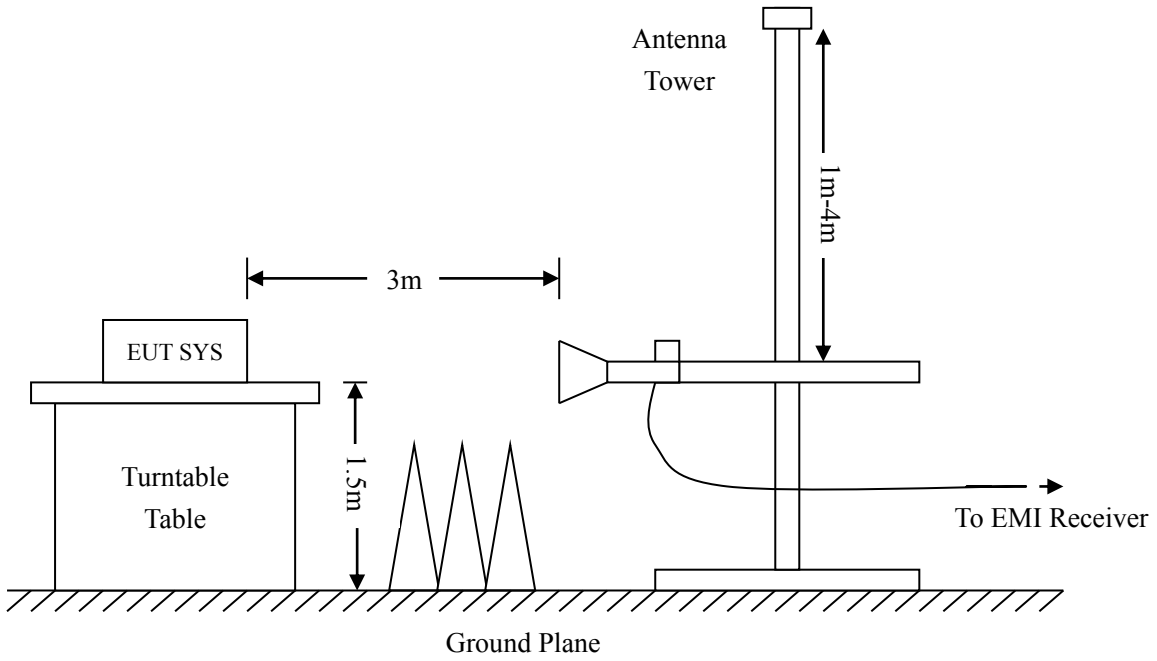
where:

- 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:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

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

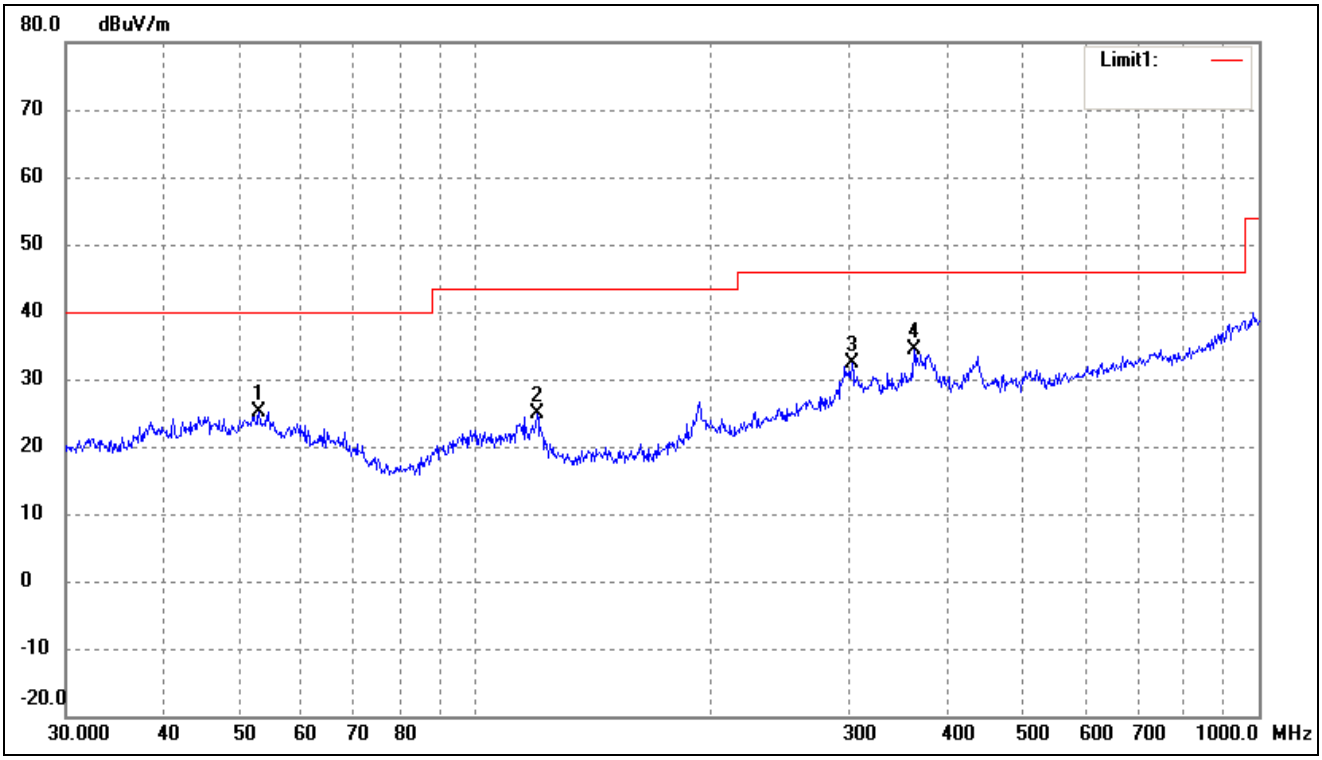
Margin = Corr. Ampl. – FCC Part 15 Limit

9.5 Summary of Test Results/Plots

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

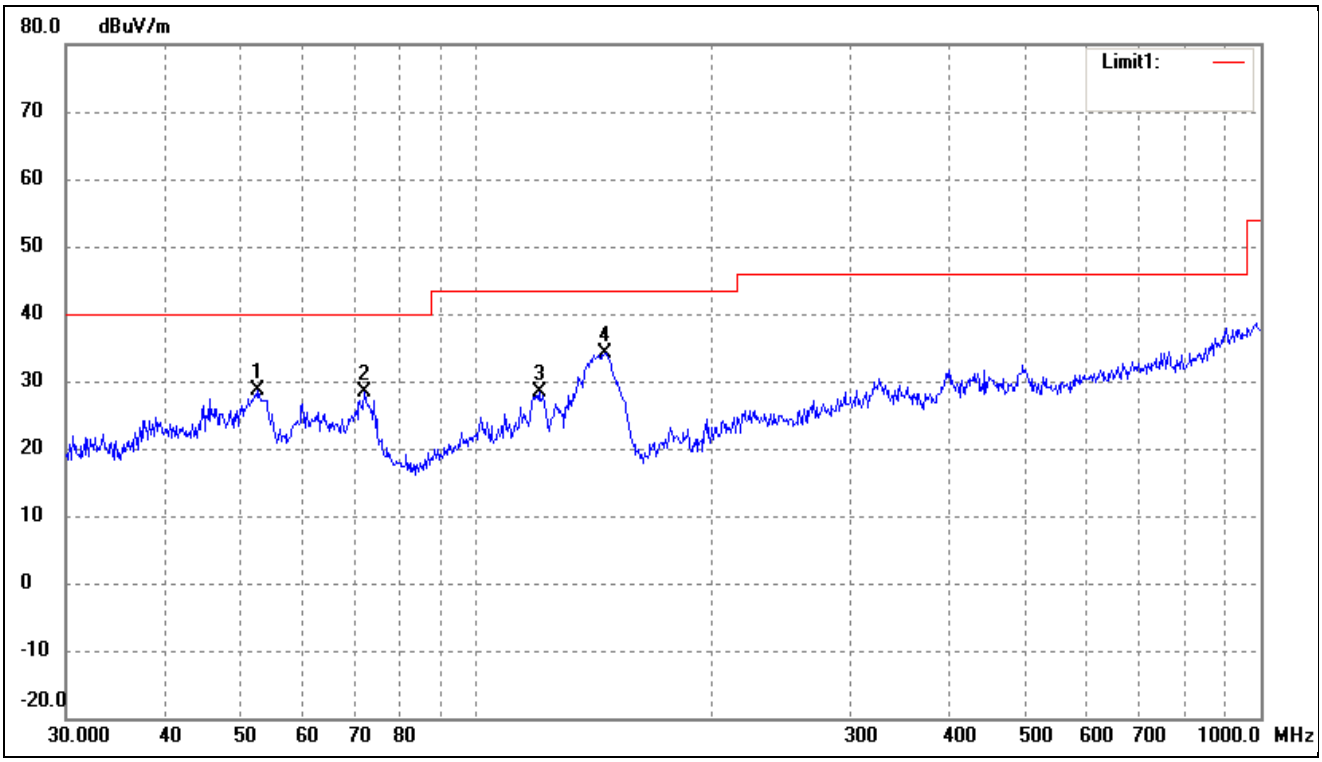
- Spurious Emission From 30 MHz to 1 GHz
- Antenna 0: 5150-5250MHz

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.9453	38.08	-12.88	25.20	40.00	-14.80	355	100	peak
2	119.8556	40.33	-15.44	24.89	43.50	-18.61	90	100	peak
3	302.4812	39.85	-7.37	32.48	46.00	-13.52	266	100	peak
4	362.9845	41.20	-6.88	34.32	46.00	-11.68	99	100	peak

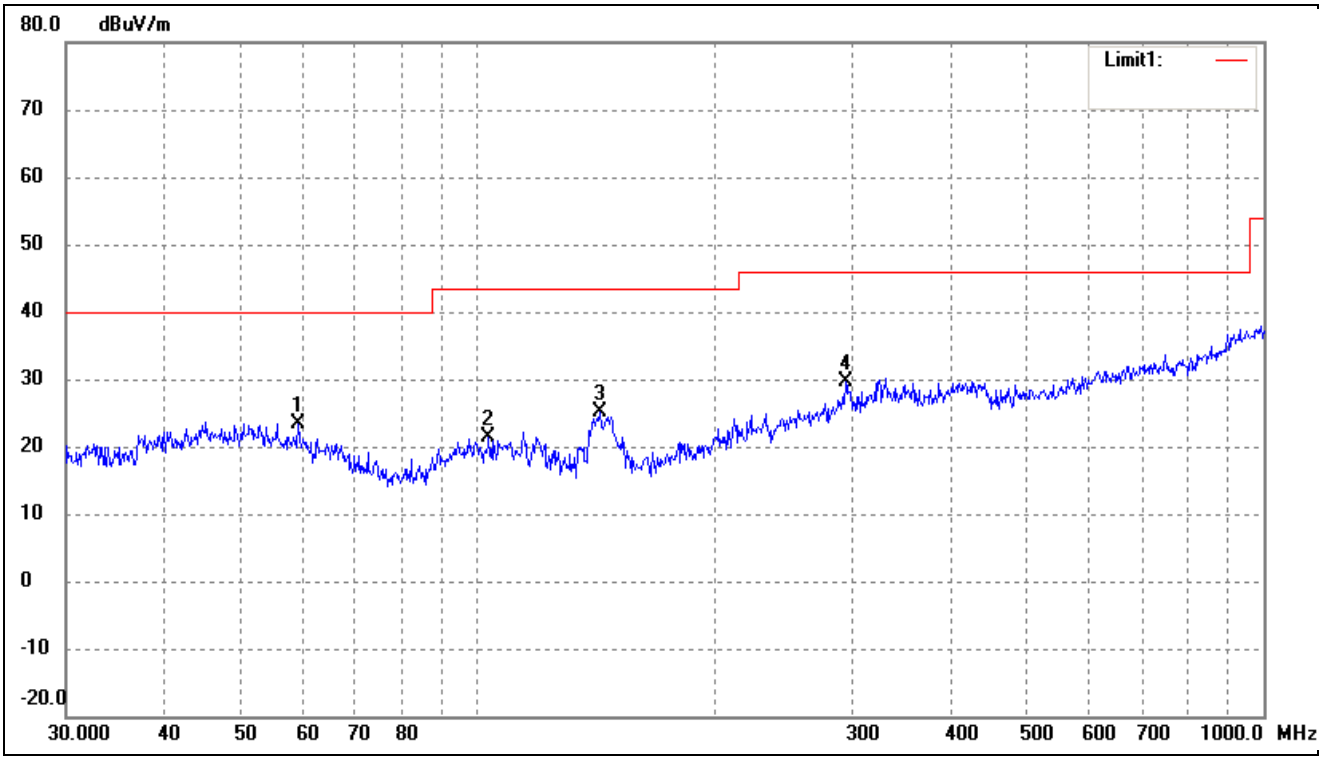
802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.7600	41.58	-12.87	28.71	40.00	-11.29	356	100	peak
2	72.0843	46.06	-17.78	28.28	40.00	-11.72	95	100	peak
3	120.2766	44.00	-15.52	28.48	43.50	-15.02	344	100	peak
4	145.8611	51.13	-17.05	34.08	43.50	-9.42	111	100	peak

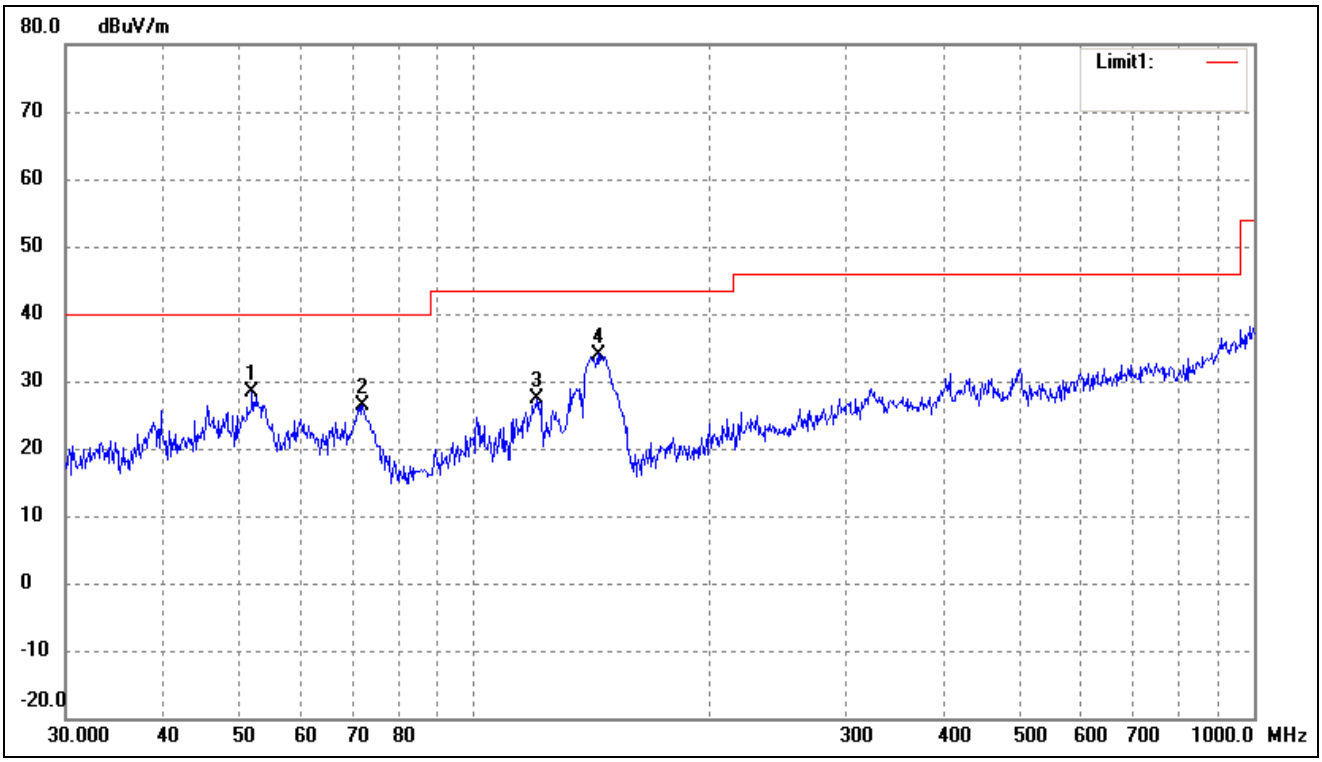
➢ Antenna 1: 5150-5250MHz

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	59.2325	37.93	-14.46	23.47	40.00	-16.53	264	100	peak
2	103.4421	35.43	-14.16	21.27	43.50	-22.23	265	100	peak
3	143.3261	42.25	-17.06	25.19	43.50	-18.31	54	100	peak
4	294.1137	37.24	-7.58	29.66	46.00	-16.34	294	100	peak

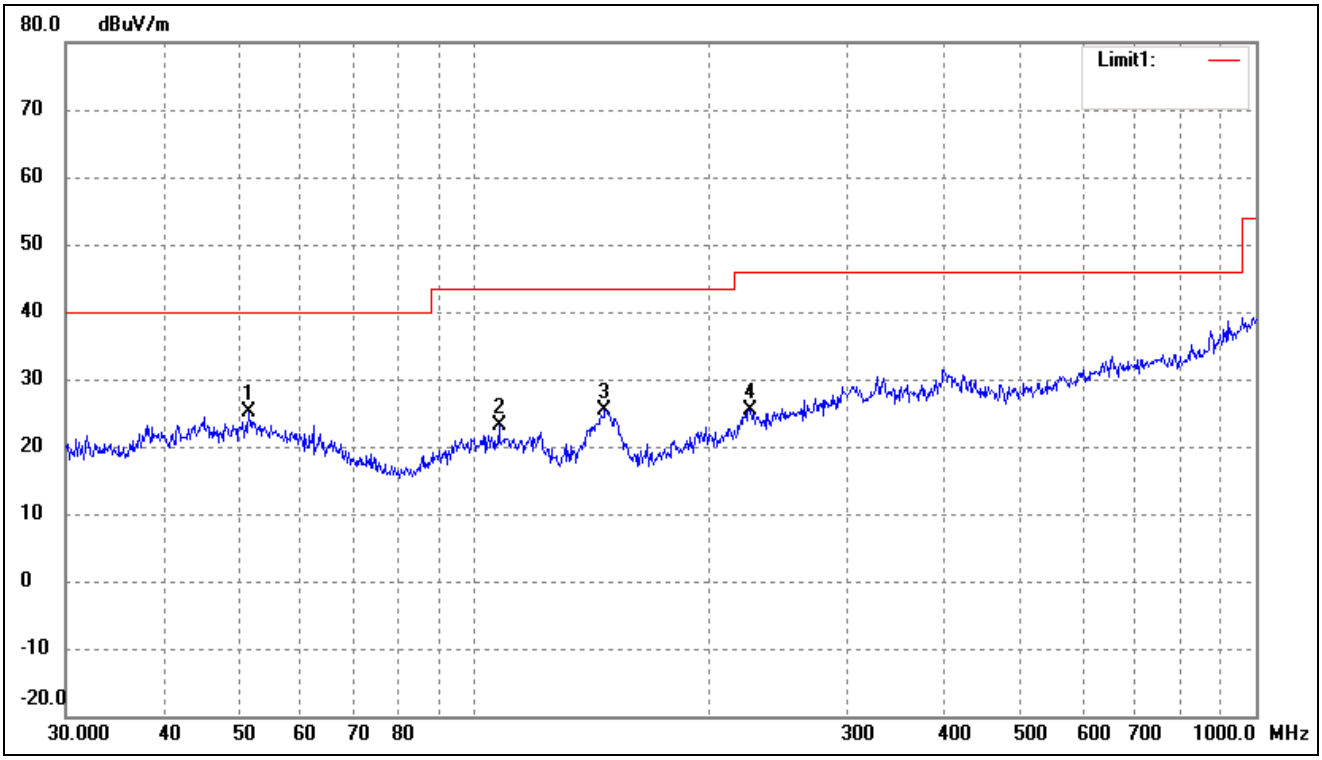
802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.0251	41.11	-12.80	28.31	40.00	-11.69	335	100	peak
2	72.0843	44.27	-17.78	26.49	40.00	-13.51	291	100	peak
3	120.6991	42.99	-15.60	27.39	43.50	-16.11	63	100	peak
4	144.3348	51.08	-17.08	34.00	43.50	-9.50	169	100	peak

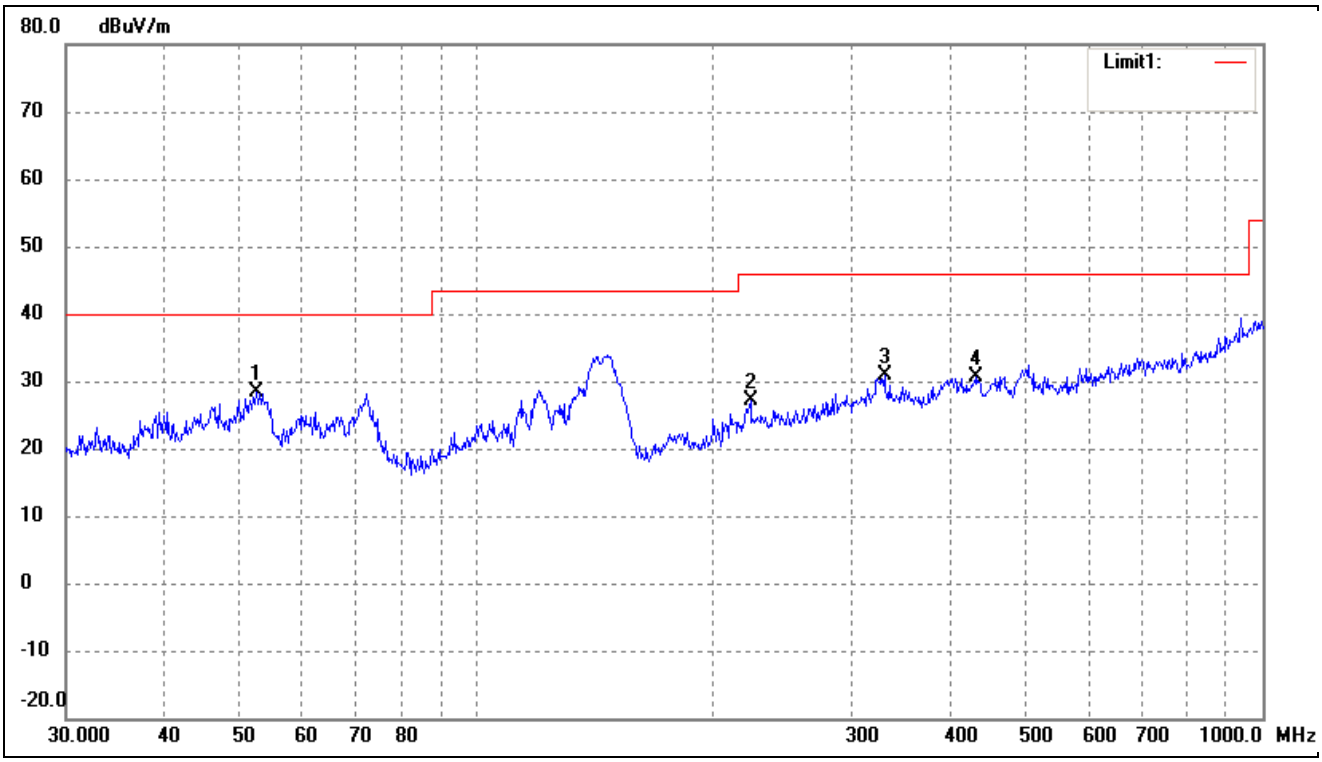
➢ Antenna 0: 5725-5850MHz

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	51.4807	37.86	-12.85	25.01	40.00	-14.99	174	100	peak
2	107.5101	37.06	-13.97	23.09	43.50	-20.41	90	100	peak
3	146.8877	42.44	-16.97	25.47	43.50	-18.03	55	100	peak
4	225.3080	36.64	-11.16	25.48	46.00	-20.52	90	100	peak

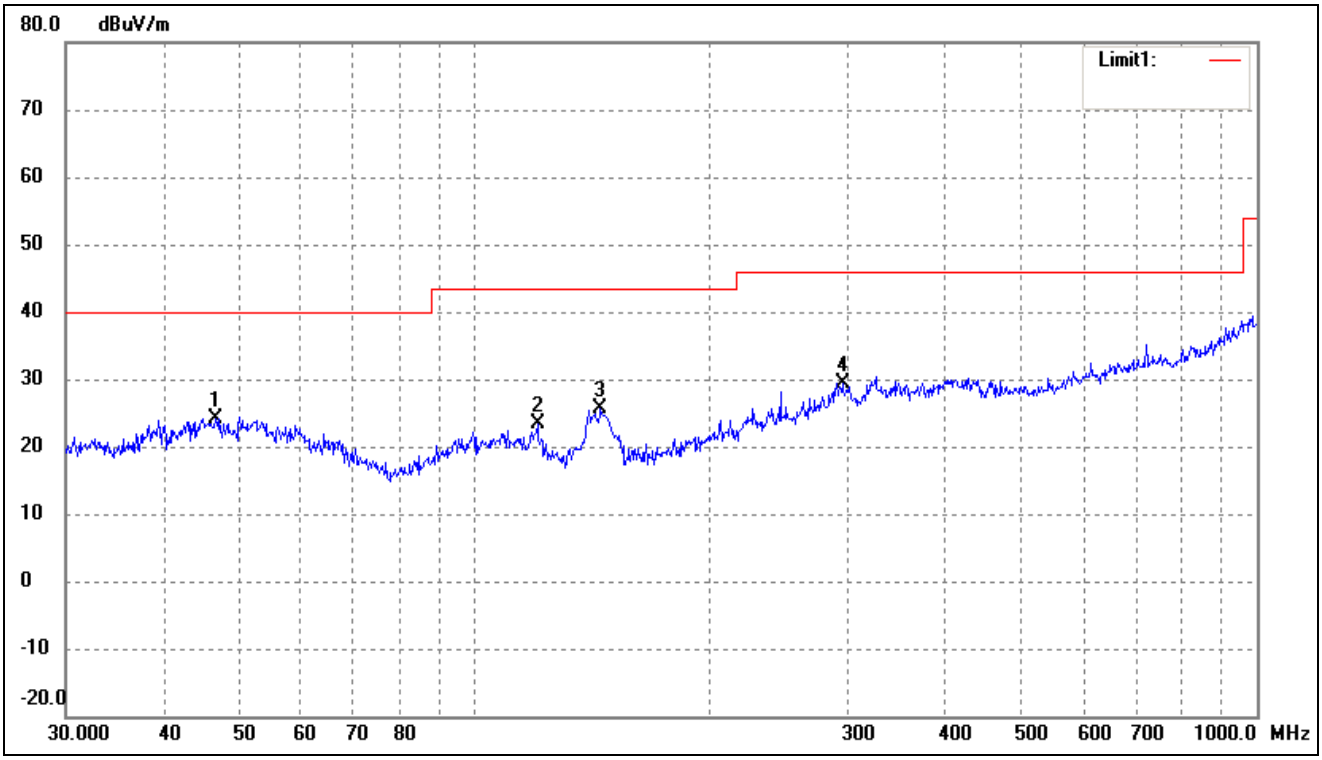
802.11a			
Test Channel	5745MHz(worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.3913	41.12	-12.84	28.28	40.00	-11.72	87	100	peak
2	222.9502	38.27	-11.24	27.03	46.00	-18.97	107	100	peak
3	330.1949	37.68	-6.77	30.91	46.00	-15.09	68	100	peak
4	432.5457	36.94	-6.33	30.61	46.00	-15.39	122	100	peak

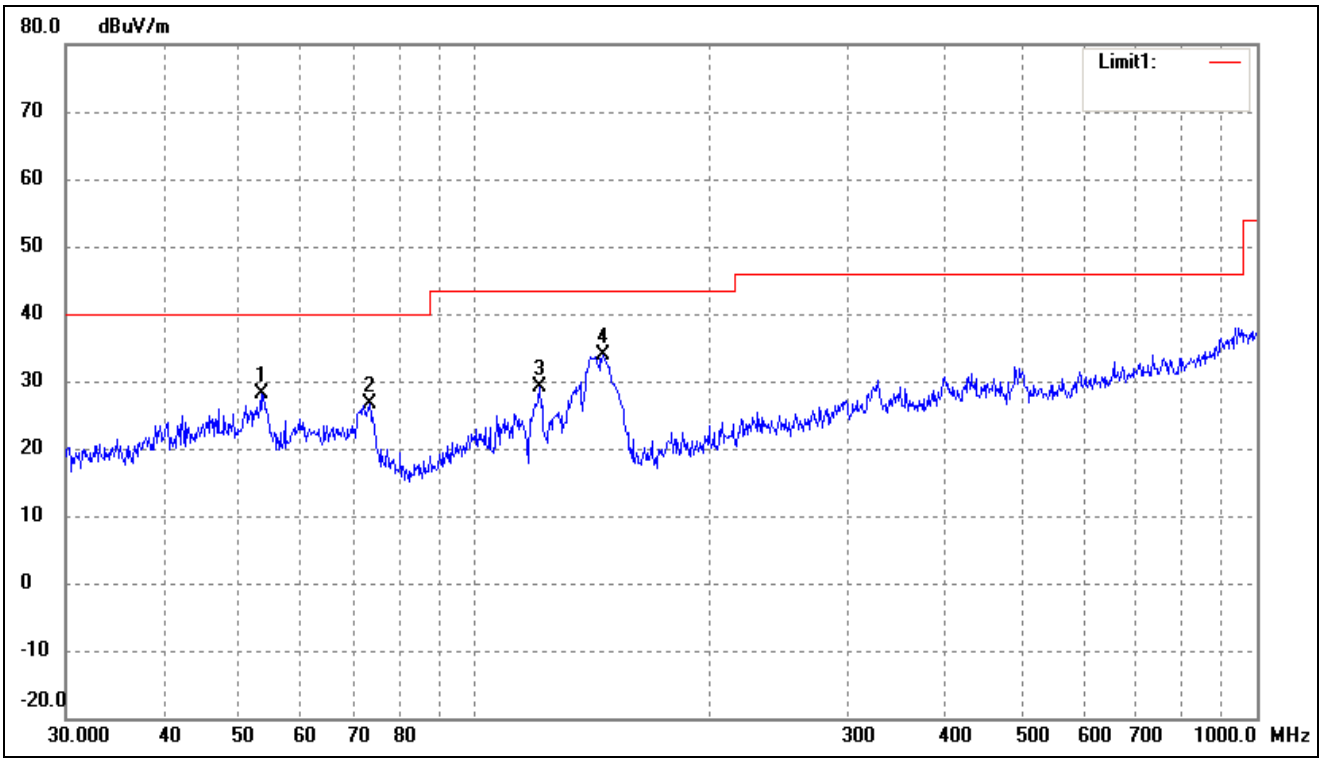
➢ Antenna 1: 5725-5850MHz

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	46.6664	36.99	-12.87	24.12	40.00	-15.88	142	100	peak
2	120.2766	38.94	-15.52	23.42	43.50	-20.08	182	100	peak
3	144.8418	42.81	-17.10	25.71	43.50	-17.79	66	100	peak
4	295.1469	37.00	-7.51	29.49	46.00	-16.51	145	100	peak

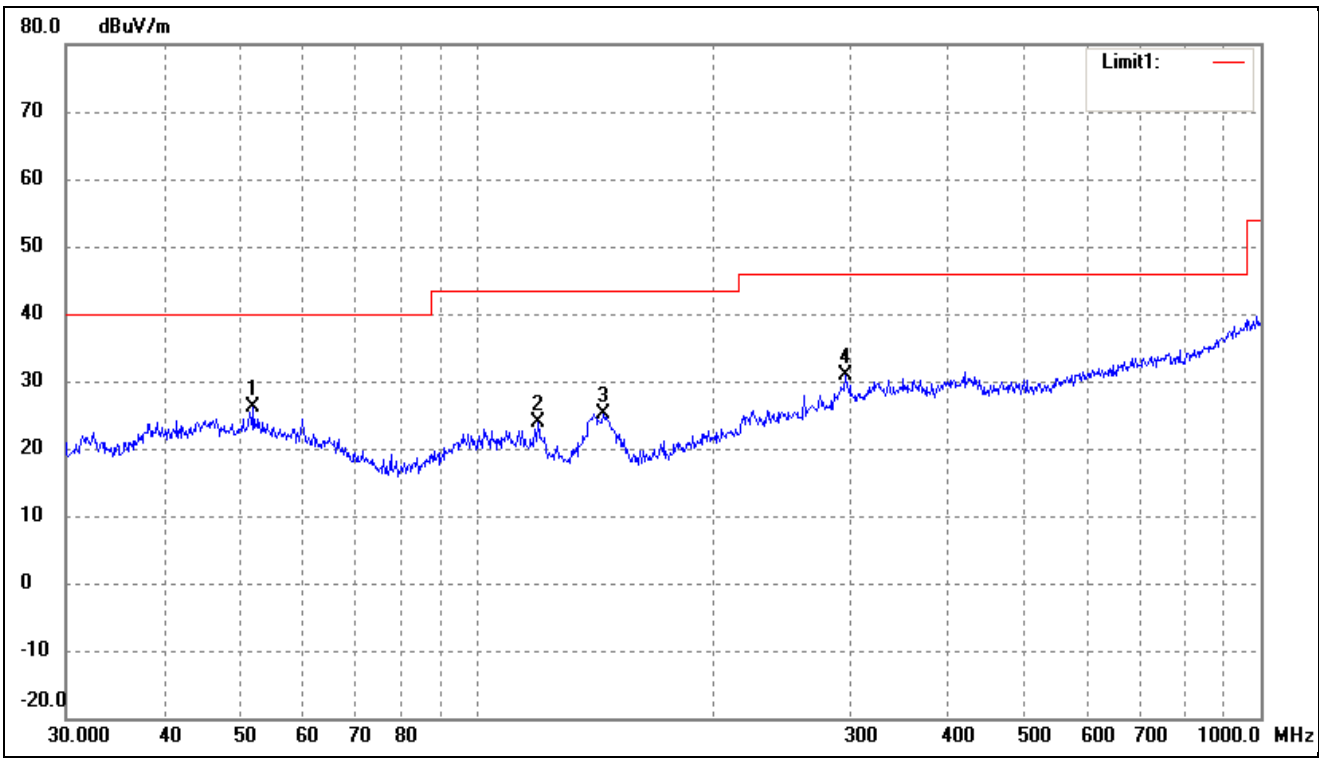
802.11a			
Test Channel	5745MHz(worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	53.3179	40.99	-12.92	28.07	40.00	-11.93	58	100	peak
2	73.3593	44.74	-18.15	26.59	40.00	-13.41	147	100	peak
3	121.1231	44.76	-15.69	29.07	43.50	-14.43	96	100	peak
4	145.8611	50.96	-17.05	33.91	43.50	-9.59	103	100	peak

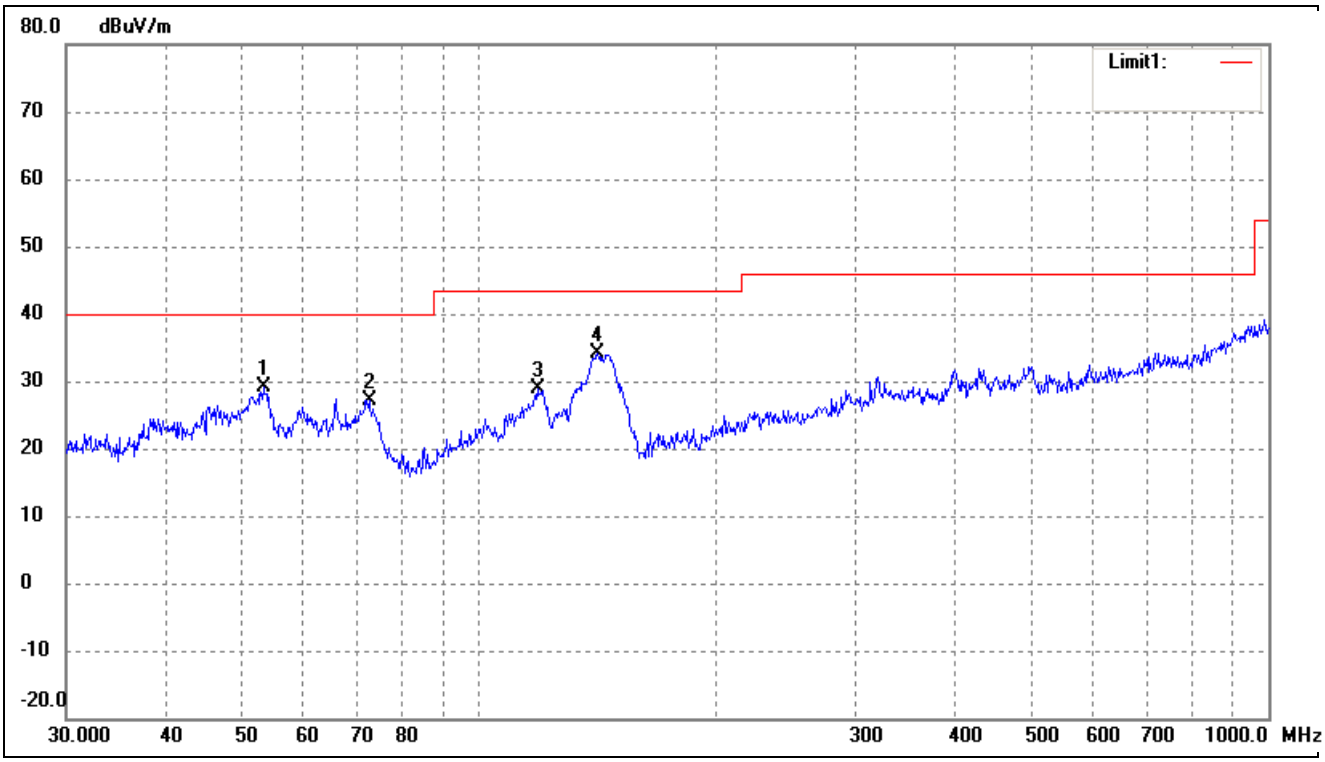
➢ Antenna 0 & Antenna 1: 5150-5250MHz

802.11n-HT20			
Test Channel	5810MHz(worst case)	Polarity:	Horizontal



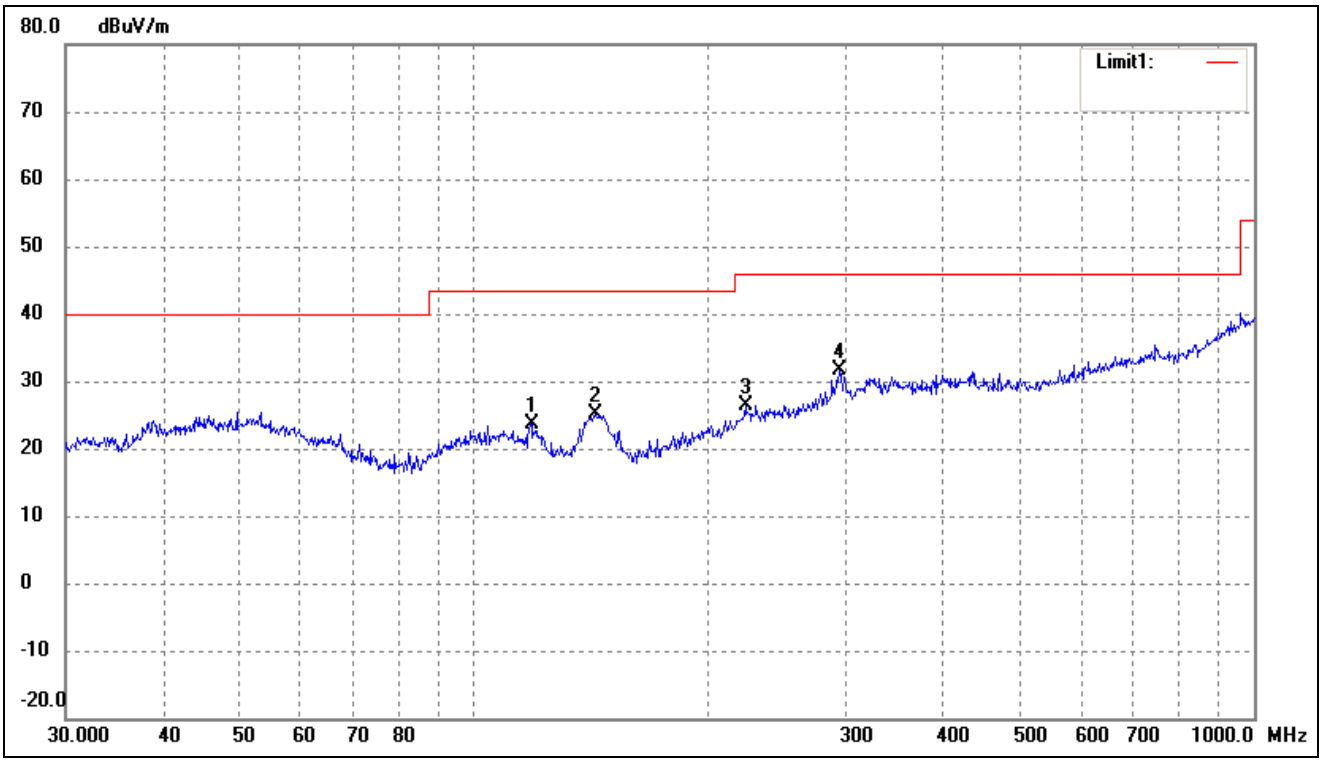
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.0251	38.89	-12.80	26.09	40.00	-13.91	171	100	peak
2	119.8556	39.24	-15.44	23.80	43.50	-19.70	169	100	peak
3	145.3506	42.25	-17.08	25.17	43.50	-18.33	52	100	peak
4	295.1469	38.31	-7.51	30.80	46.00	-15.20	137	100	peak

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



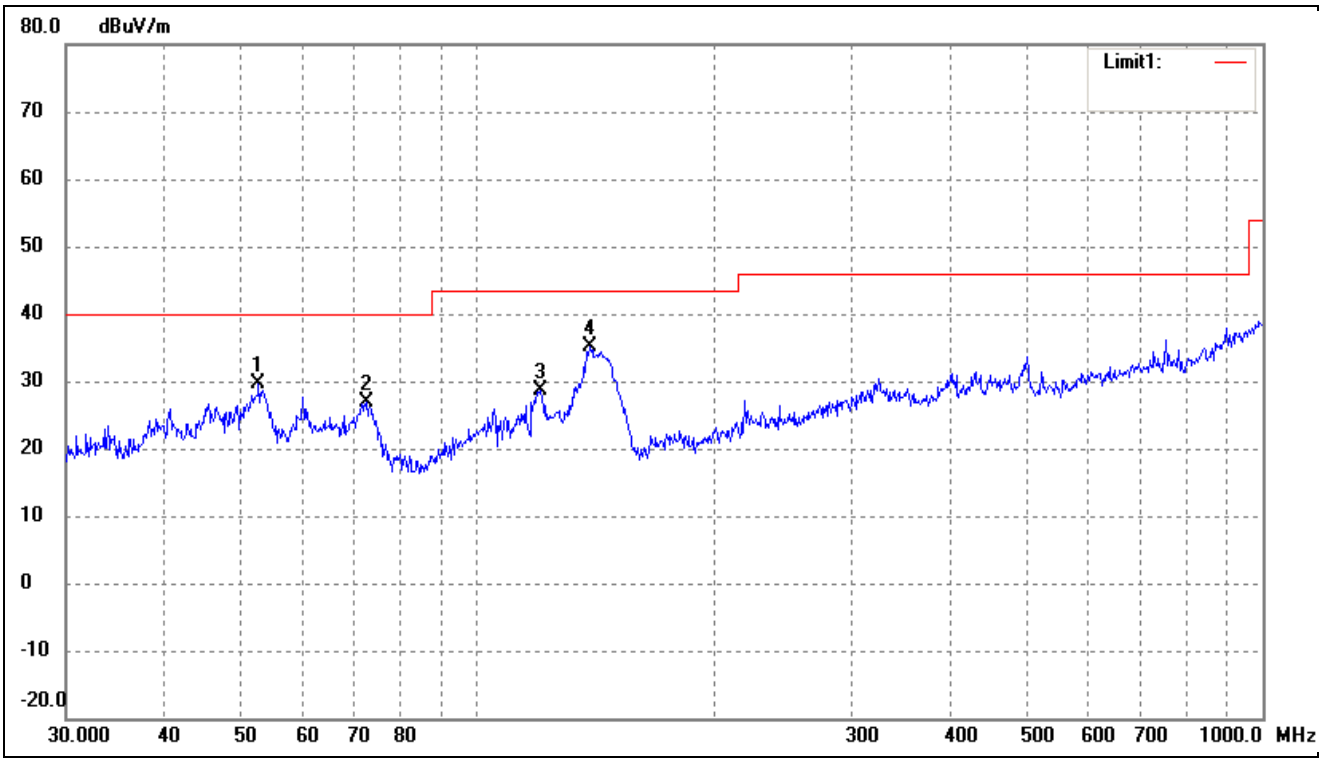
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	53.3179	41.93	-12.92	29.01	40.00	-10.99	98	100	peak
2	72.5917	45.00	-17.92	27.08	40.00	-12.92	189	100	peak
3	118.6014	44.10	-15.28	28.82	43.50	-14.68	108	100	peak
4	141.3298	51.14	-16.99	34.15	43.50	-9.35	107	100	peak

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



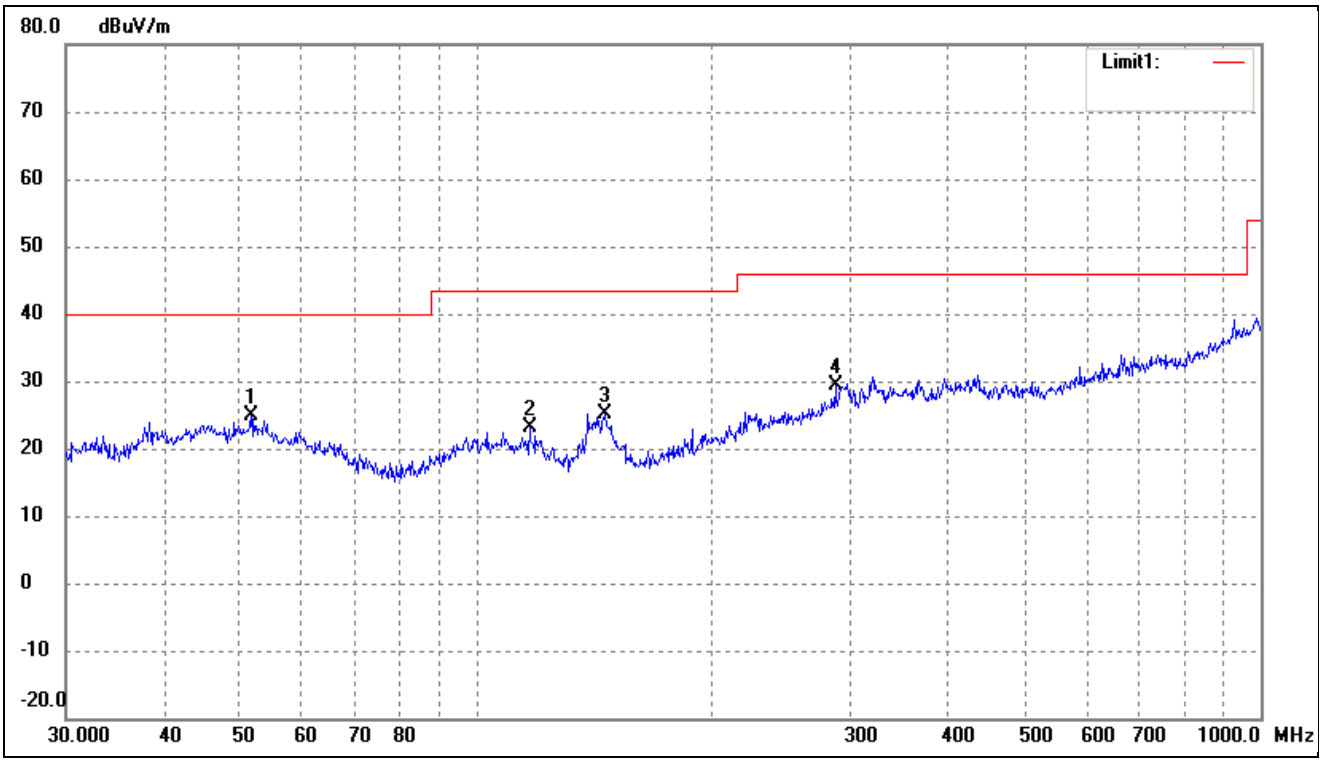
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	118.6014	38.92	-15.28	23.64	43.50	-19.86	227	100	peak
2	143.3261	42.21	-17.06	25.15	43.50	-18.35	99	100	peak
3	222.9502	37.74	-11.24	26.50	46.00	-19.50	238	100	peak
4	294.1137	39.17	-7.58	31.59	46.00	-14.41	106	100	peak

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



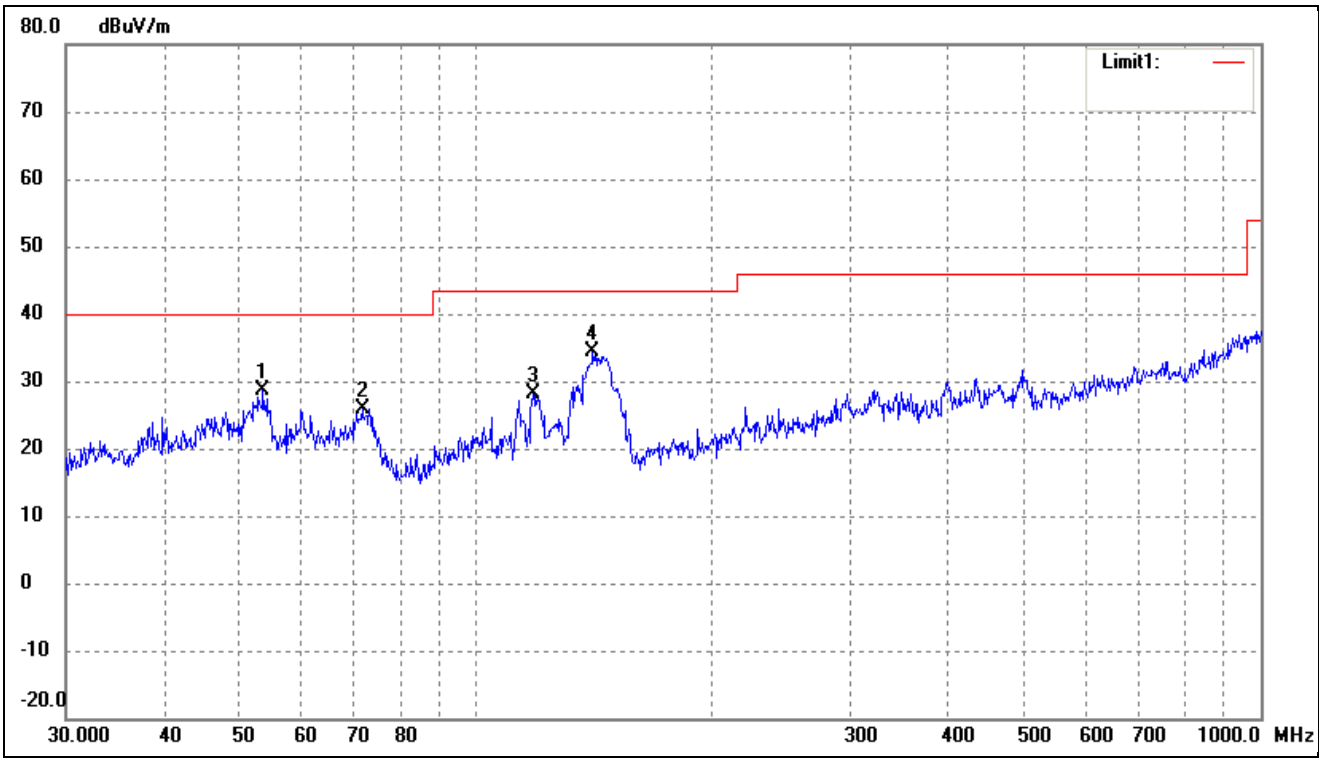
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.7600	42.41	-12.87	29.54	40.00	-10.46	359	100	peak
2	72.3376	44.61	-17.85	26.76	40.00	-13.24	100	100	peak
3	120.2766	44.11	-15.52	28.59	43.50	-14.91	78	100	peak
4	139.3613	52.09	-16.97	35.12	43.50	-8.38	119	100	peak

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	51.6616	37.69	-12.82	24.87	40.00	-15.13	199	100	peak
2	116.9495	38.08	-15.04	23.04	43.50	-20.46	194	100	peak
3	145.8611	42.22	-17.05	25.17	43.50	-18.33	69	100	peak
4	286.9823	37.55	-8.14	29.41	46.00	-16.59	154	100	peak

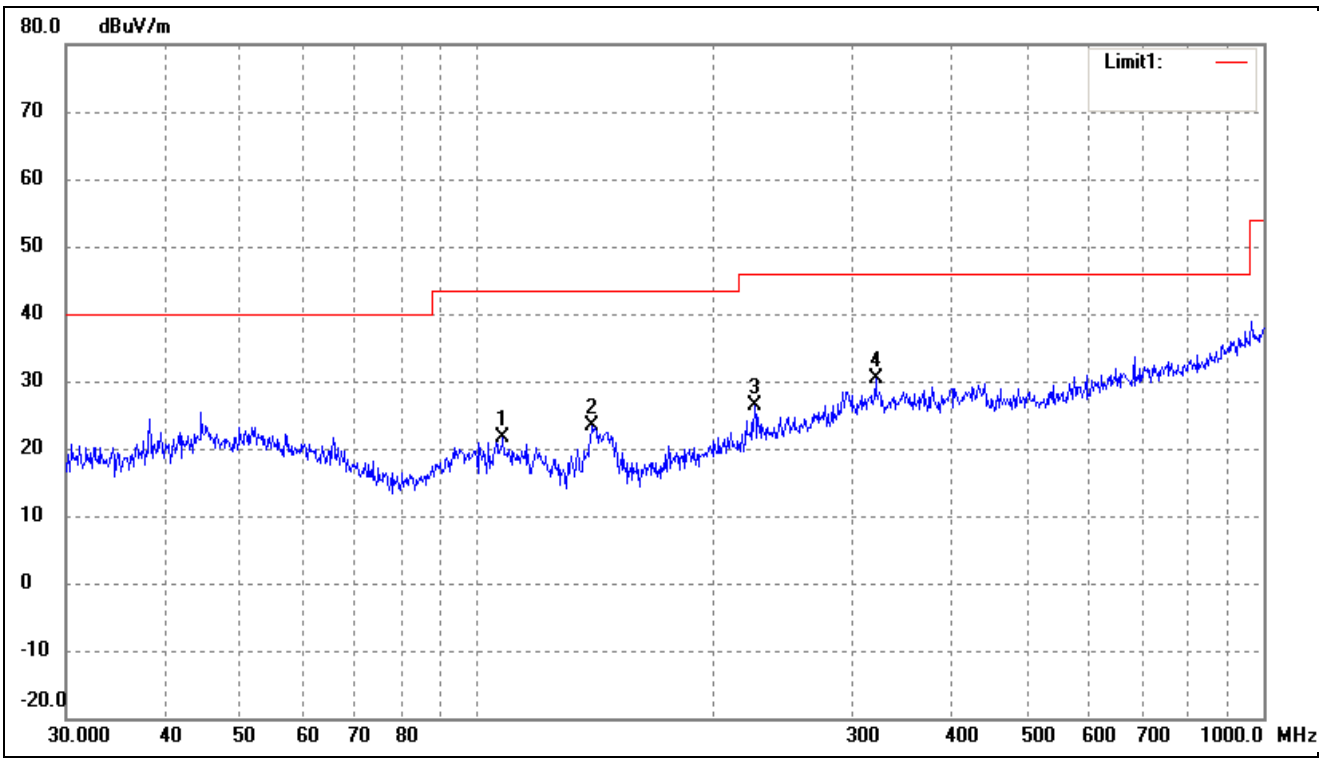
802.11ac-HT80			
Test Channel	5210MHz(worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	53.5052	41.68	-12.93	28.75	40.00	-11.25	242	100	peak
2	71.5806	43.59	-17.63	25.96	40.00	-14.04	169	100	peak
3	118.1862	43.33	-15.21	28.12	43.50	-15.38	50	100	peak
4	140.8351	51.45	-16.97	34.48	43.50	-9.02	153	100	peak

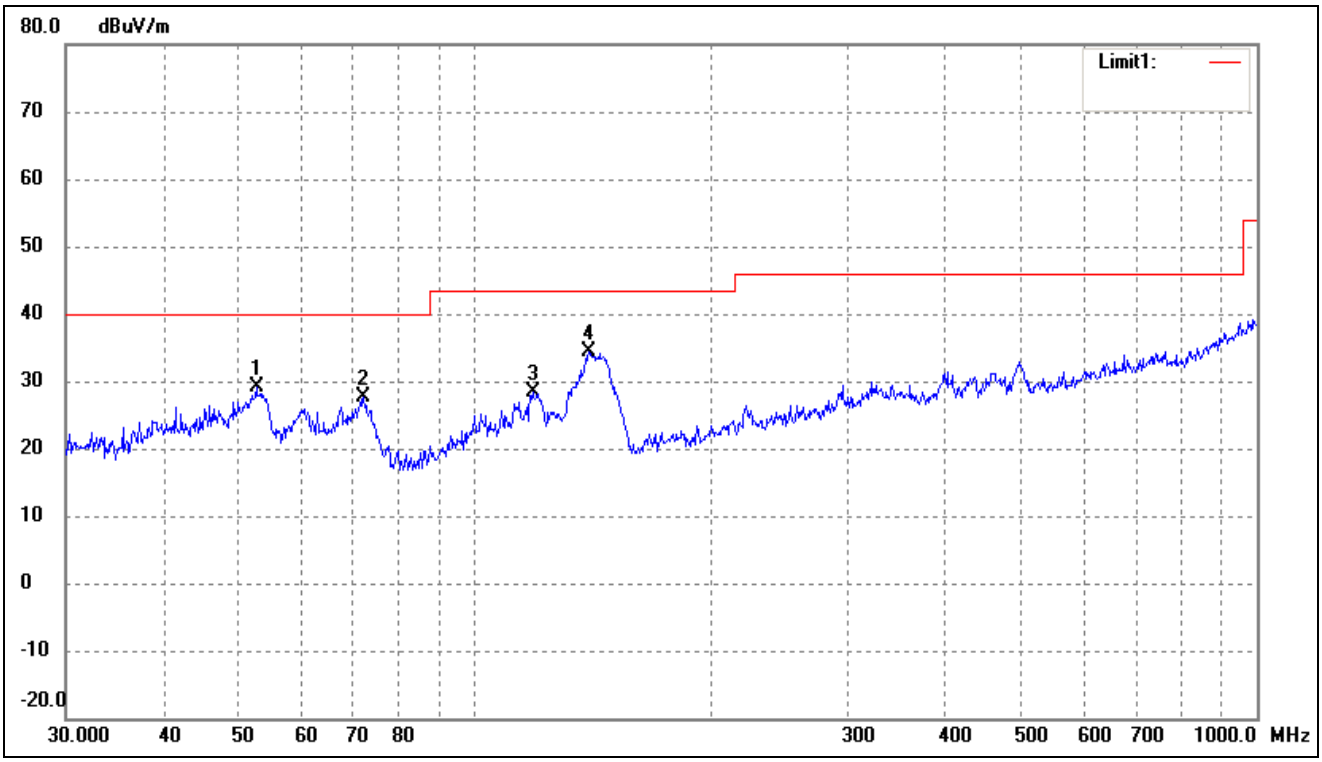
➢ Antenna 0 & Antenna 1: 5725-5850MHz

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



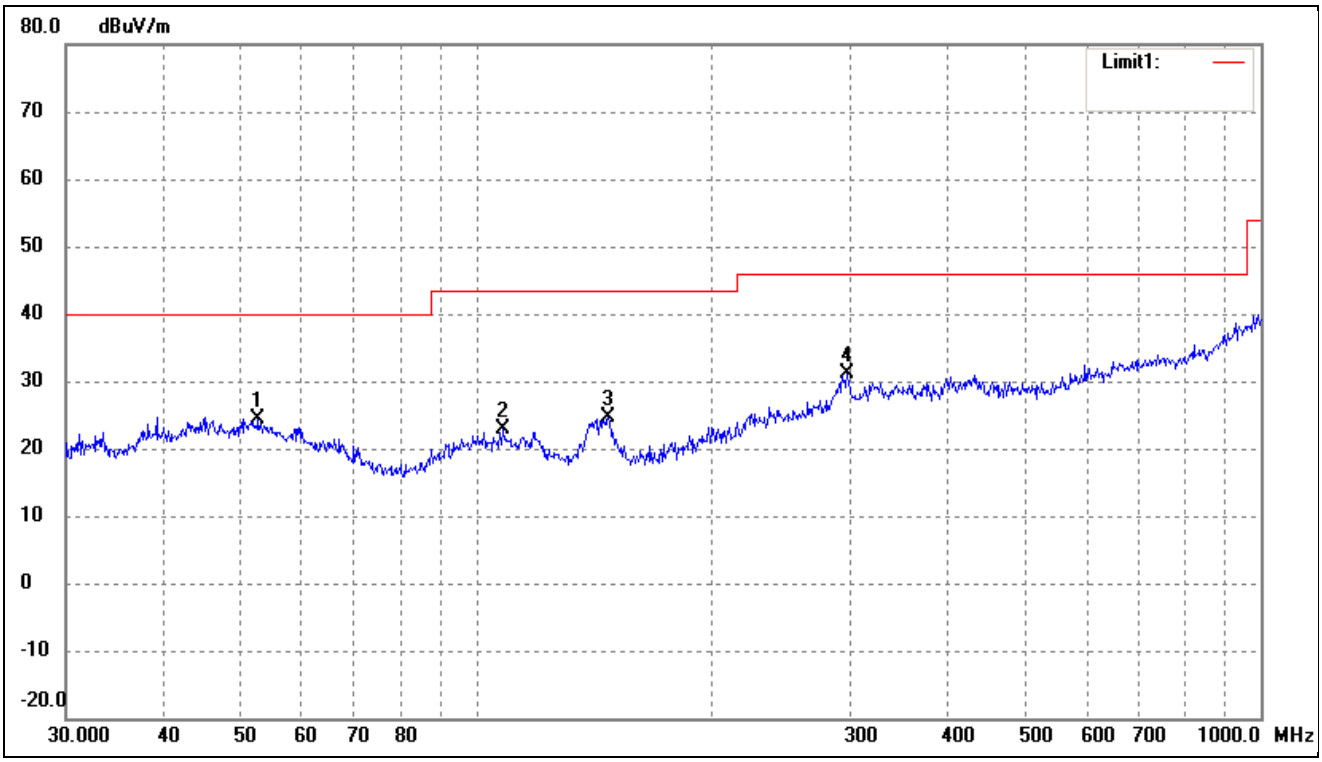
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	107.8877	35.60	-13.97	21.63	43.50	-21.87	178	100	peak
2	139.8508	40.42	-16.95	23.47	43.50	-20.03	153	100	peak
3	225.3080	37.44	-11.16	26.28	46.00	-19.72	112	100	peak
4	321.0608	37.36	-7.10	30.26	46.00	-15.74	129	100	peak

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



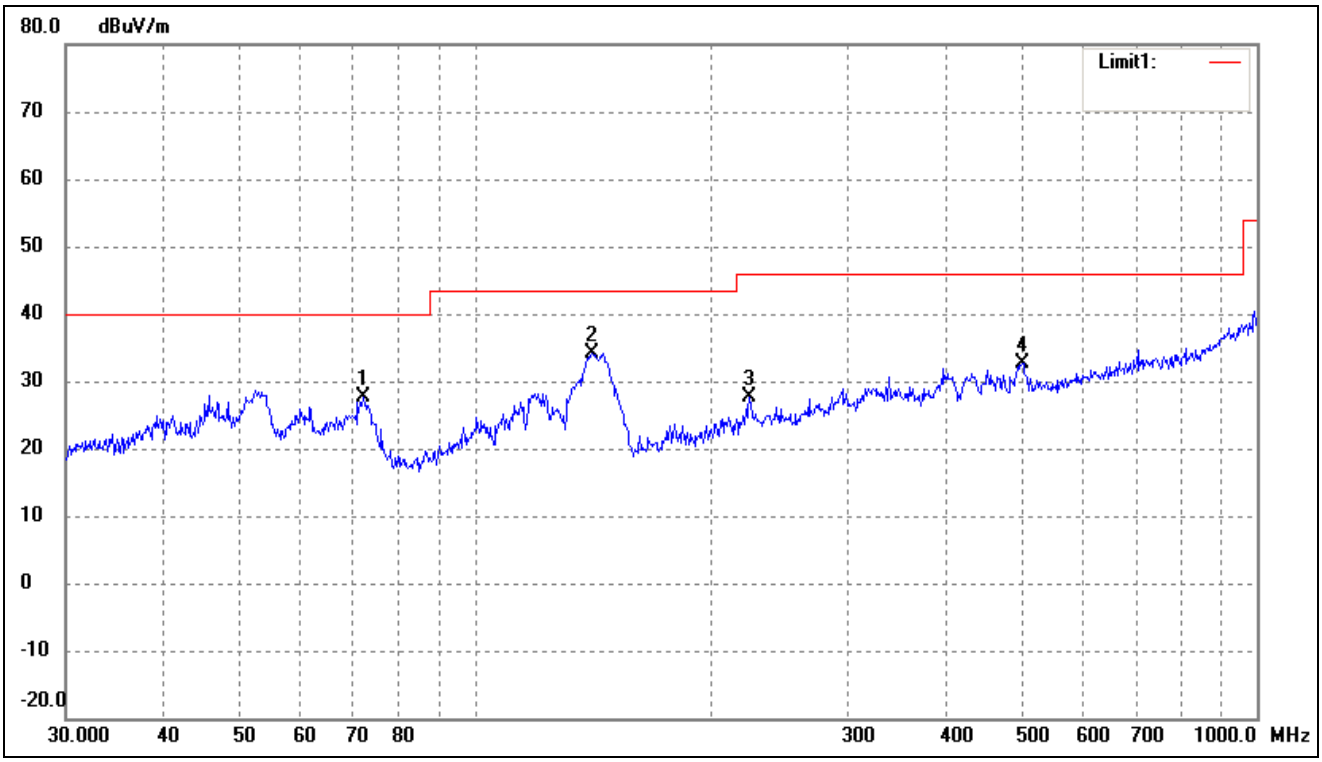
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.5753	41.97	-12.85	29.12	40.00	-10.88	88	100	peak
2	72.0843	45.39	-17.78	27.61	40.00	-12.39	146	100	peak
3	118.6014	43.54	-15.28	28.26	43.50	-15.24	59	100	peak
4	139.8508	51.21	-16.95	34.26	43.50	-9.24	131	100	peak

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



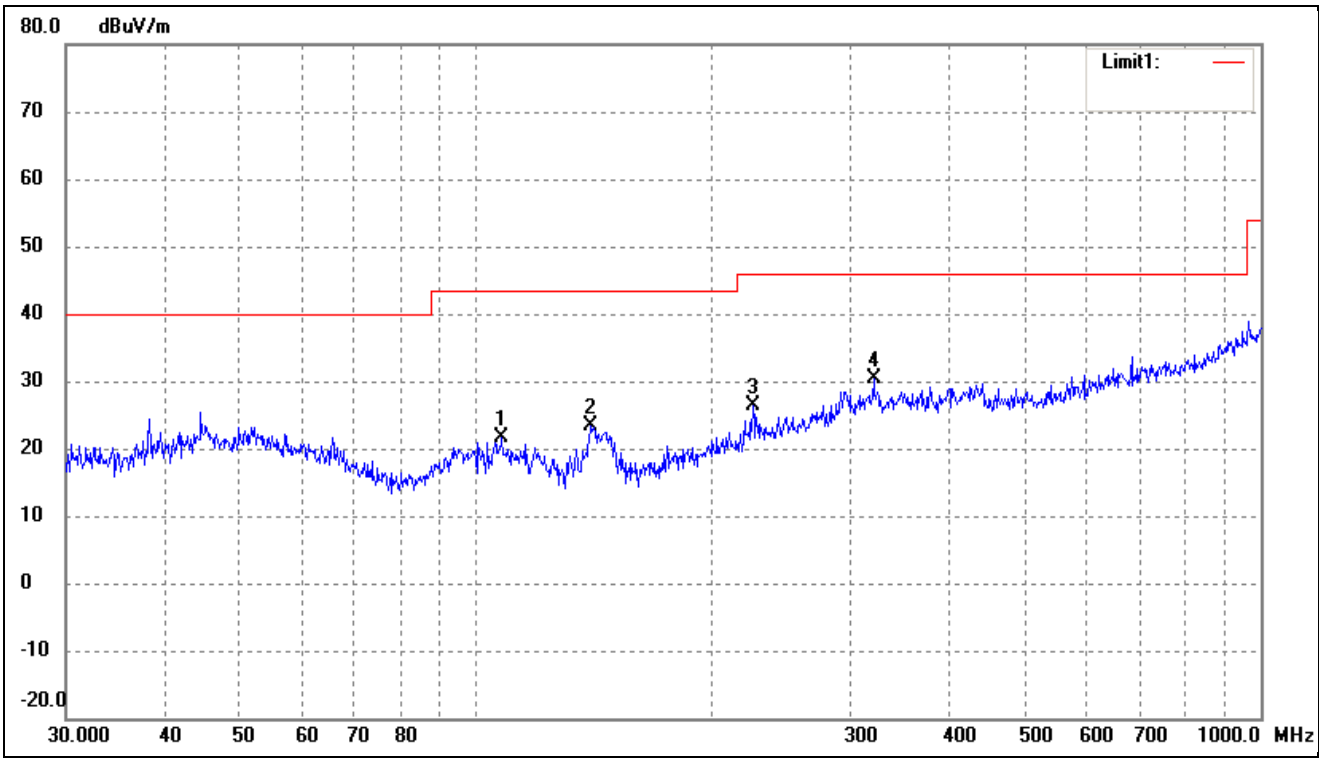
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.7600	37.26	-12.87	24.39	40.00	-15.61	133	100	peak
2	108.2667	36.82	-13.96	22.86	43.50	-20.64	140	100	peak
3	147.4036	41.45	-16.94	24.51	43.50	-18.99	131	100	peak
4	297.2241	38.61	-7.47	31.14	46.00	-14.86	101	100	peak

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



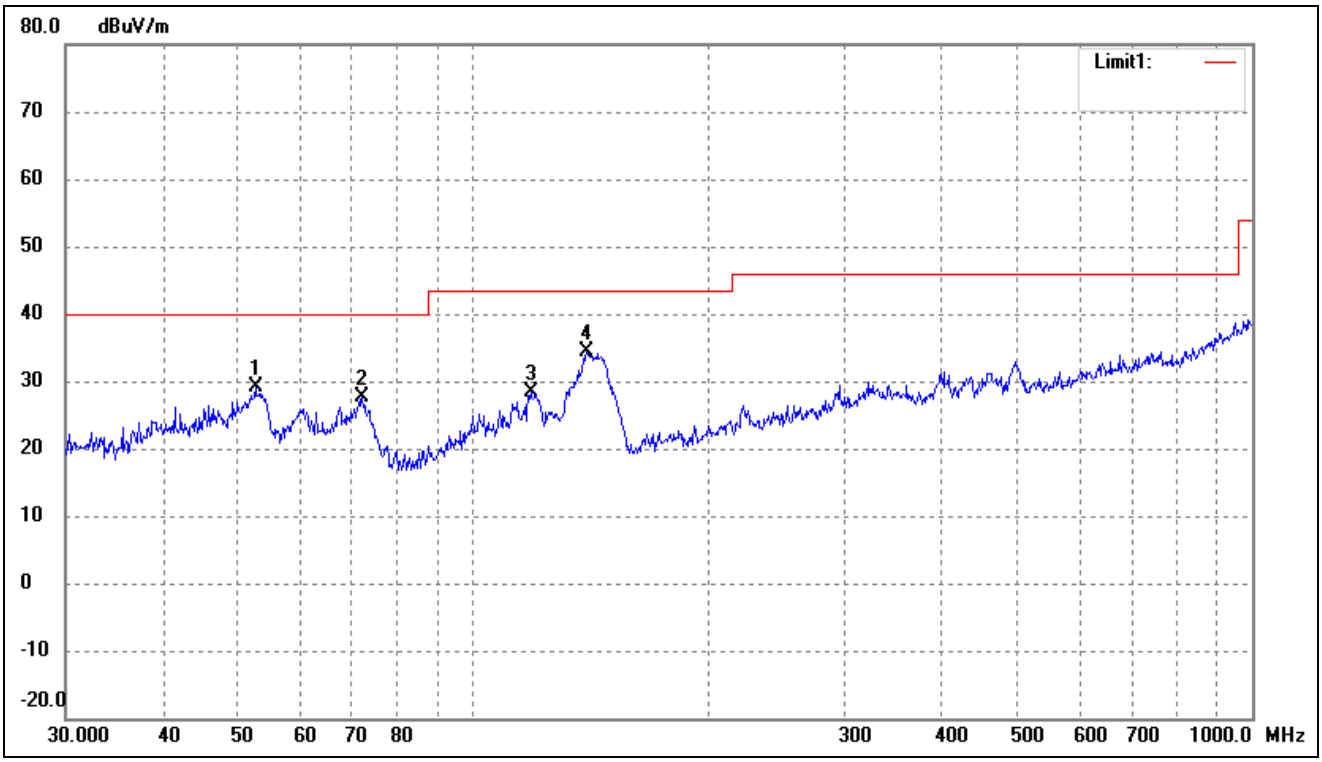
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	72.0843	45.50	-17.78	27.72	40.00	-12.28	85	100	peak
2	141.3298	51.20	-16.99	34.21	43.50	-9.29	112	100	peak
3	224.5193	38.73	-11.20	27.53	46.00	-18.47	127	100	peak
4	501.1790	38.50	-5.98	32.52	46.00	-13.48	113	100	peak

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	107.8877	35.60	-13.97	21.63	43.50	-21.87	107	100	peak
2	139.8508	40.42	-16.95	23.47	43.50	-20.03	103	100	peak
3	225.3080	37.44	-11.16	26.28	46.00	-19.72	95	100	peak
4	321.0608	37.36	-7.10	30.26	46.00	-15.74	150	100	peak

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



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	52.5753	41.97	-12.85	29.12	40.00	-10.88	100	100	peak
2	72.0843	45.39	-17.78	27.61	40.00	-12.39	143	100	peak
3	118.6014	43.54	-15.28	28.26	43.50	-15.24	129	100	peak
4	139.8508	51.21	-16.95	34.26	43.50	-9.24	139	100	peak

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11a)
- Antenna 0:
- Harmonics And Spurious Emissions

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5180MHz)										
15540	PK	51.34	221	V	40.7	10.9	39.6	63.34	74	-10.66
15540	PK	51.08	360	H	40.7	10.9	39.6	63.08	74	-10.92
15540	AV	30.9	47	V	40.7	10.9	39.6	42.9	54	-11.1
15540	AV	30.99	212	H	40.7	10.9	39.6	42.99	54	-11.01
High Channel (5240MHz)										
15720	PK	51.24	36	V	40.7	10.9	39.6	63.24	74	-10.76
15720	PK	53.4	26	H	40.7	10.9	39.6	65.4	74	-8.6
15720	AV	32.07	115	V	40.7	10.9	39.6	44.07	54	-9.93
15720	AV	32.14	258	H	40.7	10.9	39.6	44.14	54	-9.86
Low Channel (5745MHz)										
11490	PK	52.67	147	V	38.9	9.8	40.1	61.27	74	-12.73
11490	PK	52.93	225	H	38.9	9.8	40.1	61.53	74	-12.47
11490	AV	30.88	145	V	38.9	9.8	40.1	39.48	54	-14.52
11490	AV	31.42	22	H	38.9	9.8	40.1	40.02	54	-13.98
High Channel (5825MHz)										
11610	PK	51.79	136	V	38.9	9.8	40.1	60.39	74	-13.61
11610	PK	52.59	25	H	38.9	9.8	40.1	61.19	74	-12.81
11610	AV	30.57	221	V	38.9	9.8	40.1	39.17	54	-14.83
11610	AV	32.67	36	H	38.9	9.8	40.1	41.27	54	-12.73

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-44.65	-27
Highest	Above 5350	-42.39	-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	-43.89	-27
	5715 to 5725	-34.32	-17
Highest	5850 to 5860	-36.32	-17
	Above 5860	-42.08	-27
Note: the data just list the worst cases			

- Antenna 1:
- Harmonics And Spurious Emissions

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5180MHz)										
15540	PK	50.53	224	V	40.7	10.9	39.6	62.53	74	-11.47
15540	PK	53.71	152	H	40.7	10.9	39.6	65.71	74	-8.29
15540	AV	32.7	221	V	40.7	10.9	39.6	44.7	54	-9.3
15540	AV	30.69	136	H	40.7	10.9	39.6	42.69	54	-11.31
High Channel (5240MHz)										
15720	PK	52.41	226	V	40.7	10.9	39.6	64.41	74	-9.59
15720	PK	52.9	221	H	40.7	10.9	39.6	64.9	74	-9.1
15720	AV	31.32	154	V	40.7	10.9	39.6	43.32	54	-10.68
15720	AV	30.58	223	H	40.7	10.9	39.6	42.58	54	-11.42
Low Channel (5745MHz)										
11490	PK	52.34	132	V	38.9	9.8	40.1	60.94	74	-13.06
11490	PK	51.17	224	H	38.9	9.8	40.1	59.77	74	-14.23
11490	AV	32.92	225	V	38.9	9.8	40.1	41.52	54	-12.48
11490	AV	30.37	136	H	38.9	9.8	40.1	38.97	54	-15.03
High Channel (5825MHz)										
11610	PK	51.06	125	V	38.9	9.8	40.1	59.66	74	-14.34
11610	PK	52.06	134	H	38.9	9.8	40.1	60.66	74	-13.34
11610	AV	32.14	226	V	38.9	9.8	40.1	40.74	54	-13.26
11610	AV	32.64	14	H	38.9	9.8	40.1	41.24	54	-12.76

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-42.68	-27
Highest	Above 5350	-43.17	-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	-42.78	-27
	5715 to 5725	-33.65	-17
Highest	5850 to 5860	-35.32	-17
	Above 5860	-41.32	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11n HT20)
- Antenna 0 & Antenna 1:
- Harmonics And Spurious Emissions

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5180MHz)										
15540	PK	50.35	277	V	40.7	10.9	39.6	62.35	74	-11.65
15540	PK	51.49	244	H	40.7	10.9	39.6	63.49	74	-10.51
15540	AV	32.74	128	V	40.7	10.9	39.6	44.74	54	-9.26
15540	AV	31.54	212	H	40.7	10.9	39.6	43.54	54	-10.46
High Channel (5240MHz)										
15720	PK	51.51	186	V	40.7	10.9	39.6	63.51	74	-10.49
15720	PK	50.08	272	H	40.7	10.9	39.6	62.08	74	-11.92
15720	AV	32.93	321	V	40.7	10.9	39.6	44.93	54	-9.07
15720	AV	33.32	155	H	40.7	10.9	39.6	45.32	54	-8.68
Low Channel (5745MHz)										
11490	PK	53.61	221	V	38.9	9.8	40.1	62.21	74	-11.79
11490	PK	50.82	148	H	38.9	9.8	40.1	59.42	74	-14.58
11490	AV	31.89	39	V	38.9	9.8	40.1	40.49	54	-13.51
11490	AV	30.47	294	H	38.9	9.8	40.1	39.07	54	-14.93
High Channel (5825MHz)										
11610	PK	53.41	130	V	38.9	9.8	40.1	62.01	74	-11.99
11610	PK	50.43	197	H	38.9	9.8	40.1	59.03	74	-14.97
11610	AV	32.07	80	V	38.9	9.8	40.1	40.67	54	-13.33
11610	AV	33.26	314	H	38.9	9.8	40.1	41.86	54	-12.14

- Out of Band edge 5150-5250MHz

Test CH.	**Test Segment**	**Result**	**Limit**
	MHz	**dBm/MHz**	**dBm/MHz**
Lowest	Below 5150	-43.36	-27
Highest	Above 5350	-42.02	-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	-44.58	-27
	5715 to 5725	-37.32	-17
Highest	5850 to 5860	-33.32	-17
	Above 5860	-44.08	-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)
- Antenna 0 & Antenna 1:
- Harmonics And Spurious Emissions

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5190MHz)										
15570	PK	51.58	66	V	40.7	10.9	39.6	63.58	74	-10.42
15570	PK	50.79	162	H	40.7	10.9	39.6	62.79	74	-11.21
15570	AV	30.81	18	V	40.7	10.9	39.6	42.81	54	-11.19
15570	AV	31.2	287	H	40.7	10.9	39.6	43.2	54	-10.8
High Channel (5230MHz)										
15690	PK	52.62	99	V	40.7	10.9	39.6	64.62	74	-9.38
15690	PK	50.21	206	H	40.7	10.9	39.6	62.21	74	-11.79
15690	AV	31.46	247	V	40.7	10.9	39.6	43.46	54	-10.54
15690	AV	33.54	180	H	40.7	10.9	39.6	45.54	54	-8.46
Low Channel (5755MHz)										
17265	PK	52.3	320	V	38.9	9.8	40.1	60.9	74	-13.1
17265	PK	50.16	27	H	38.9	9.8	40.1	58.76	74	-15.24
17265	AV	32.88	245	V	38.9	9.8	40.1	41.48	54	-12.52
17265	AV	30.38	203	H	38.9	9.8	40.1	38.98	54	-15.02
High Channel (5795MHz)										
17385	PK	49.63	50.08	238	V	38.9	9.8	40.1	58.68	74
17385	PK	50.11	53.69	74	H	38.9	9.8	40.1	62.29	74
17385	AV	35.25	32.74	81	V	38.9	9.8	40.1	41.34	54
17385	AV	35.14	32.45	95	H	38.9	9.8	40.1	41.05	54

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-41.15	-27
Highest	Above 5350	-43.32	-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	-44.41	-27
	5715 to 5725	-36.28	-17
Highest	5850 to 5860	-35.32	-17
	Above 5860	-42.17	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11ac VH80)
- Antenna 0 & Antenna 1:
- Harmonics And Spurious Emissions

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5210MHz)										
10420	PK	51.78	126	V	40.7	10.9	39.6	63.78	74	-10.22
10420	PK	50.44	354	H	40.7	10.9	39.6	62.44	74	-11.56
10420	AV	31.39	154	V	40.7	10.9	39.6	43.39	54	-10.61
10420	AV	32.8	73	H	40.7	10.9	39.6	44.8	54	-9.2
High Channel (5775MHz)										
11550	PK	53.88	281	V	38.9	10.9	39.6	64.08	74	-9.92
11550	PK	53.92	135	H	38.9	10.9	39.6	64.12	74	-9.88
11550	AV	30.67	297	V	38.9	10.9	39.6	40.87	54	-13.13
11550	AV	31.32	78	H	38.9	10.9	39.6	41.52	54	-12.48

- Out of Band edge for 5150-5250MHz

Test CH.	**Test Segment**	**Result**	**Limit**
	MHz	**dBm/MHz**	**dBm/MHz**
Lowest	Below 5150	-41.65	-27
Highest	Above 5350	-41.98	-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	-42.32	-27
	5715 to 5725	-32.65	-17
Highest	5850 to 5860	-33.78	-17
	Above 5860	-43.36	-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

Antenna 0:

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	12.0	-30	167	0.0321
100%		-20	108	0.0208
100%		-10	157	0.0302
100%		0	175	0.0337
100%		+10	141	0.0271
100%		+20	149	0.0287
100%		+30	158	0.0304
100%		+40	171	0.0329
100%		+50	161	0.0310
Low Battery power	10.8	+20	161	0.0310
High Battery power	13.2	+20	165	0.0317

Antenna 1:

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	12.0	-30	151	0.0290
100%		-20	114	0.0219
100%		-10	148	0.0285
100%		0	147	0.0283
100%		+10	149	0.0287
100%		+20	164	0.0315
100%		+30	162	0.0312
100%		+40	107	0.0206
100%		+50	129	0.0248
Low Battery power	10.8	+20	174	0.0335
High Battery power	13.2	+20	157	0.0302

Antenna 0& Antenna 1:

U-NII-1:5150-5250MHz worst case at 802.11n_HT20 middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	12.0	-30	151	0.0244
100%		-20	114	0.0288
100%		-10	148	0.0303
100%		0	147	0.0217
100%		+10	149	0.0303
100%		+20	164	0.0238
100%		+30	162	0.0307
100%		+40	107	0.0211
100%		+50	129	0.0215
Low Battery power	10.8	+20	174	0.0210
High Battery power	13.2	+20	157	0.0215

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