TEST REPORT

Reference No.	:	WTX21X03021602W-1
FCC ID	:	2AZES-AC5L
Applicant	:	BrosTrend Technology LLC
Address	:	8 The Green, Suite A, Dover City, Delaware, U.S.A., Zip Code 19901
Product Name	:	USB Wi-Fi Adapter
Test Model	:	AC5L
Standards	:	FCC Part 15.407
Date of Receipt sample	:	Mar.18, 2021
Date of Test	:	Mar.18, 2021 to Apr.09, 2021
Date of Issue	:	Apr.09, 2021
Test Result	:	**Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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Rev.00	Apr.09, 2021	Original
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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	BrosTrend Technology LLC
Address of applicant:	8 The Green, Suite A, Dover City, Delaware, U.S.A., Zip Code 19901
Manufacturer:	BrosTrend Technology LLC
Address of manufacturer:	Room 205, Building No. 5, YaoXing HuaYuan, XinHuiDaDao No. 45, XinHui District, JiangMen City, GuangDong Province, CHINA, Postage Code:529100

General Description of EUT	
Product Name:	USB Wi-Fi Adapter
Trade Name:	BrosTrend
Model No.:	AC5L
Adding Model(s):	AC5
Rated Voltage:	DC 5V
Battery Capacity:	/
Power Adapter:	/
Software Version:	1030.40.128.2019
Hardware Version:	BL-W8811CU3 V1.1
Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model AC5L, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n(HT20) , 802.11n-HT40,802.11ac-HT80
Frequency Range:	5150-5250MHz, 5725-5850MHz
RF Output Power:	14.80dBm (Conducted)
Type of Modulation:	BPSK, QPSK,16QAM,64QAM, 256QAM
Quantity of Channels:	15
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, SUBPARTE.

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

Use “SecureCRT.exe” and follow the instructions given by the manufacturer, 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	48	48	48	/	/	/	/	/	/	/	47	46	46
802.11n-HT20 MCS0	49	49	45	/	/	/	/	/	/	/	45	45	45

Mode	NCB: 40MHz									
	5190	5230	5270	5310	5510	5550	5670	5710	5755	5795
802.11n-HT40 MCS0	47	45	/	/	/	/	/	/	45	43

Mode	NCB: 80MHz					
	5210	5290	5530	5610	5690	5775
802.11ac-VH80 MCS0/Nss2	40	/	/	/	/	43

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: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) 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 maintain ed 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 Waltek Testing Group (Shenzhen) 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
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:	45~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / 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
Notebook	Lenovo	E445	/

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	2020-04-28	2021-04-27
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2020-04-28	2021-04-27
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2020-04-28	2021-04-27
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2020-04-28	2021-04-27
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2020-04-28	2021-04-27
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	2020-04-28	2021-04-27
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2020-04-28	2021-04-27
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2020-04-28	2021-04-27
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2020-04-28	2021-04-27
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2020-04-28	2021-04-27
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2020-04-28	2021-04-27
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2020-04-28	2021-04-27
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2020-04-28	2021-04-27
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2020-04-28	2021-04-27
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/

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
15.407 (c)	Automatically Discontinue Transmission	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. Antenna Requirement

3.1 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.

3.2 Evaluation Information

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

4. Automatically Discontinue Transmission

4.1 Standard Applicable

According to FCC Part 15.407(c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

4.2 Summary of Test Results

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

5. Power Spectral Density

5.1 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.

5.2 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.

5.3 Summary of Test Results/Plots

Please refer to Appendix A

6. Emission Bandwidth and Occupied Bandwidth

6.1 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.

6.2 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.

6.3 Summary of Test Results/Plots

Please refer to Appendix B

7. Maximum Conducted Output Power

7.1 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.

7.2 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.

7.3 Summary of Test Results/Plots

Please refer to Appendix C

8. Radiated Spurious Emissions

8.1 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.

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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.

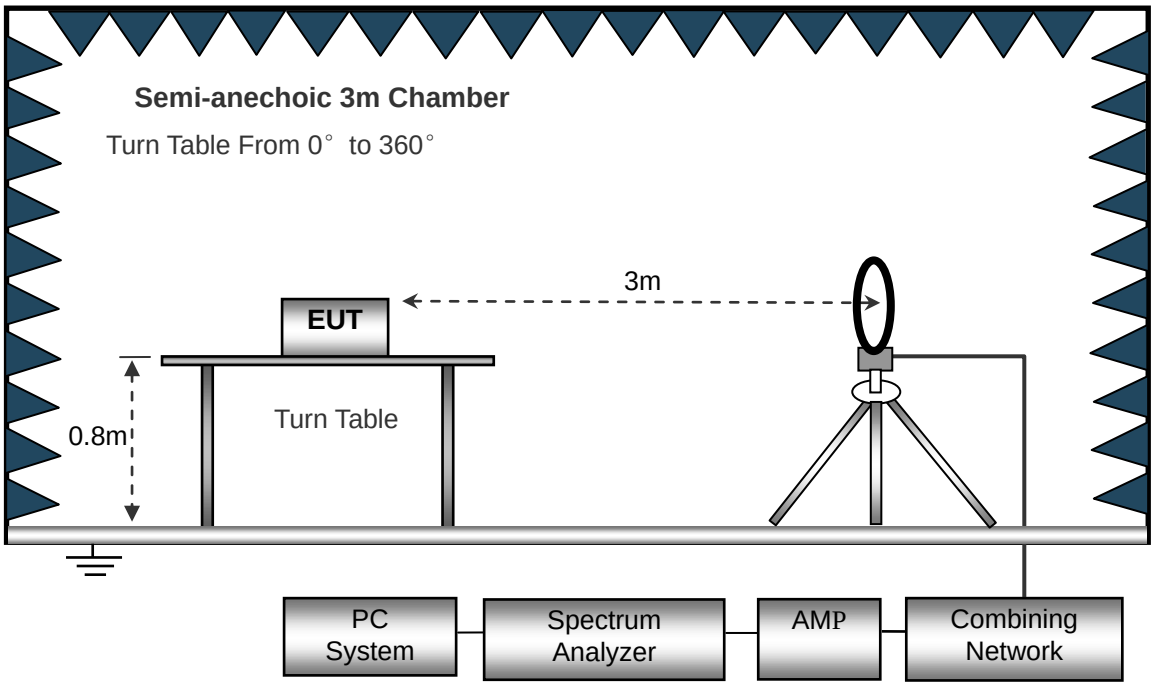
8.2 Test Procedure

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..

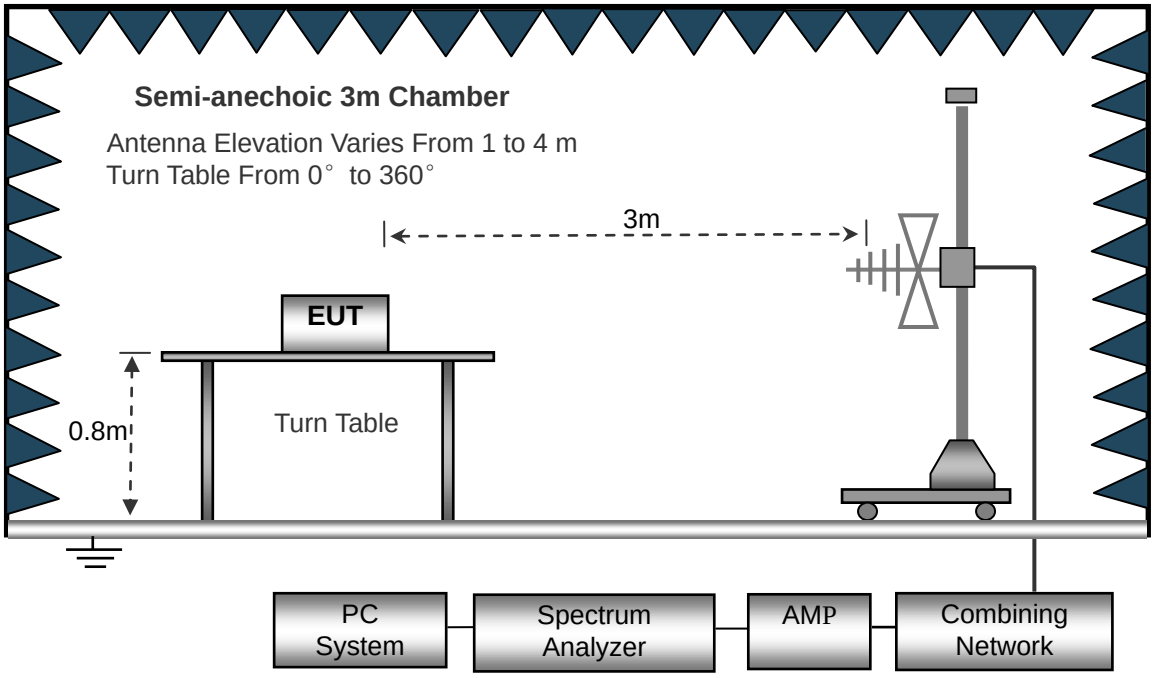
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

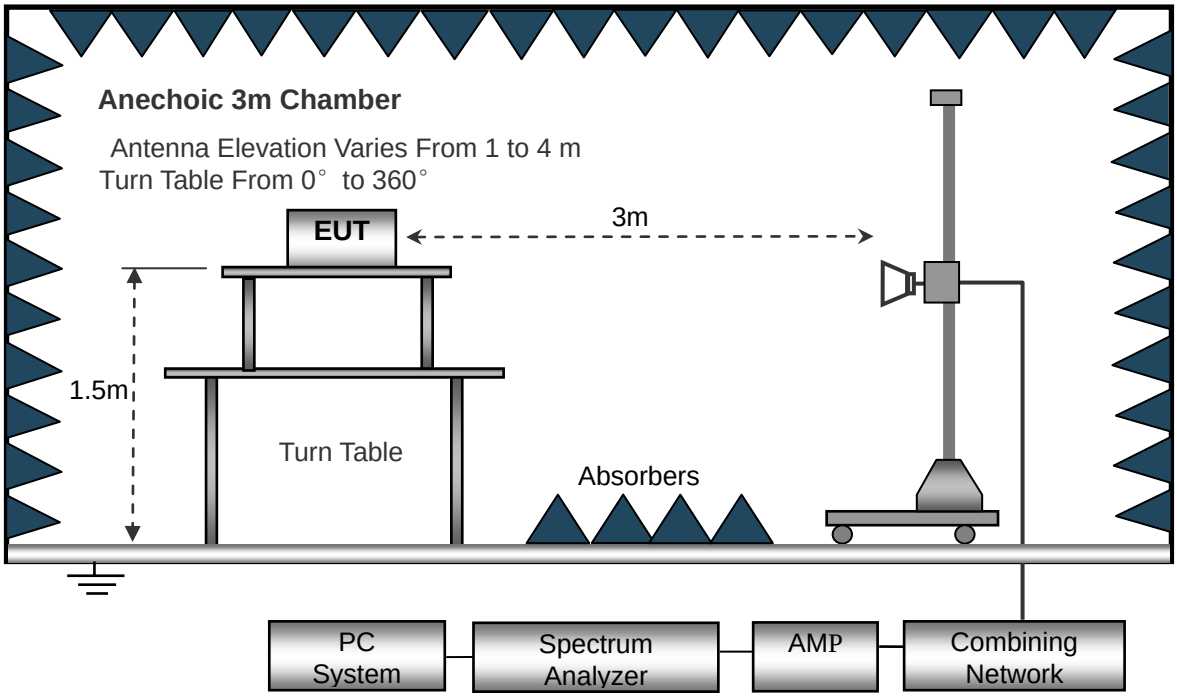
The test setup for emission measurement below 30MHz..



The test setup for emission measurement from 30 MHz to 1 GHz..



The test setup for emission measurement above 1 GHz..



8.3 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

8.4 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:

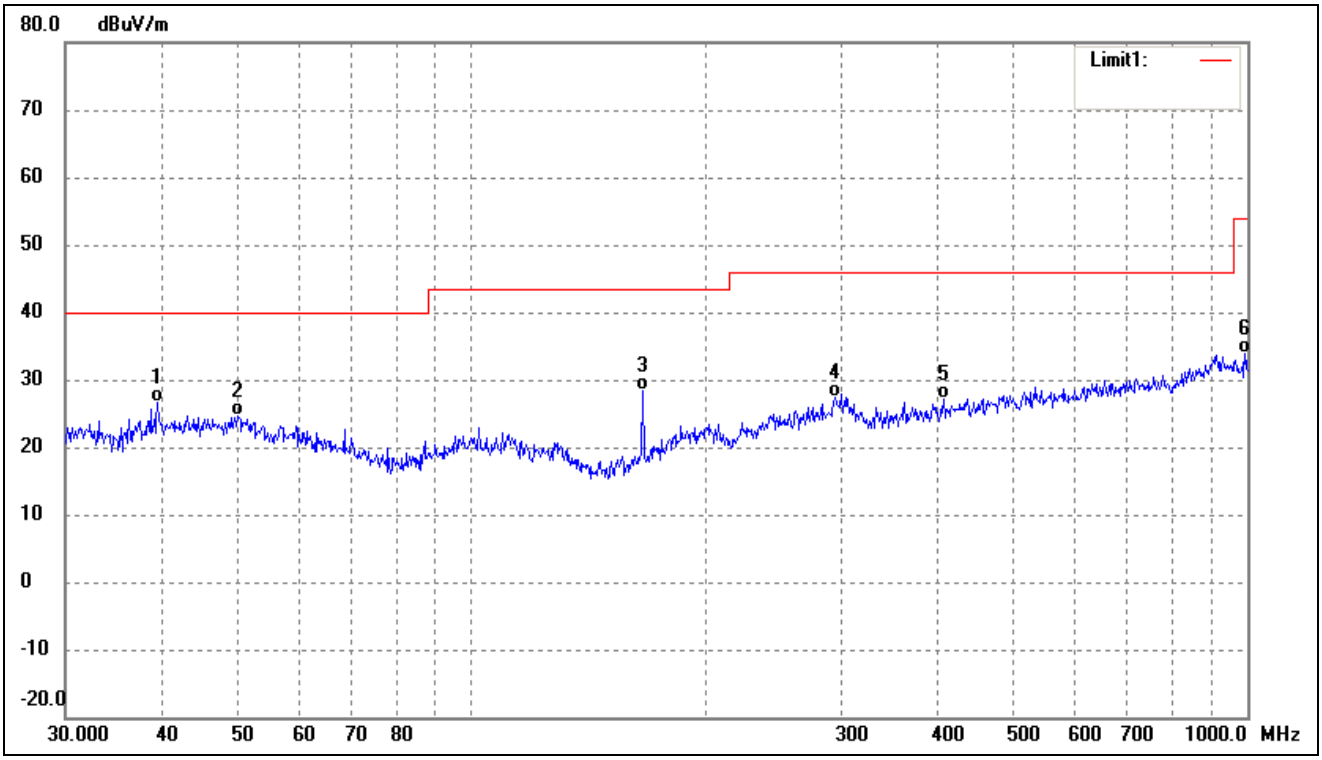
Margin = Corr. Ampl. – FCC Part 15 Limit

8.5 Summary of Test Results/Plots

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

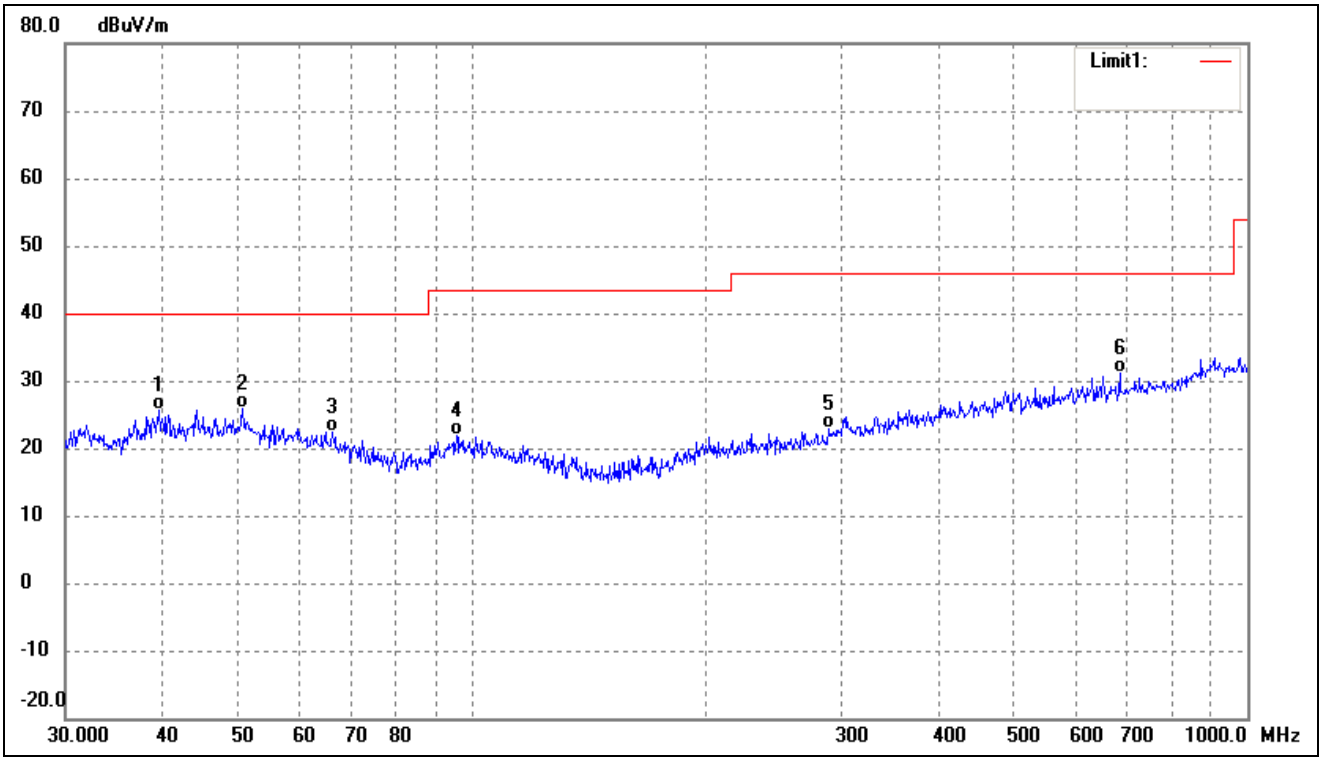
- Spurious Emission From 30 MHz to 1 GHz
- 5150-5250MHz

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



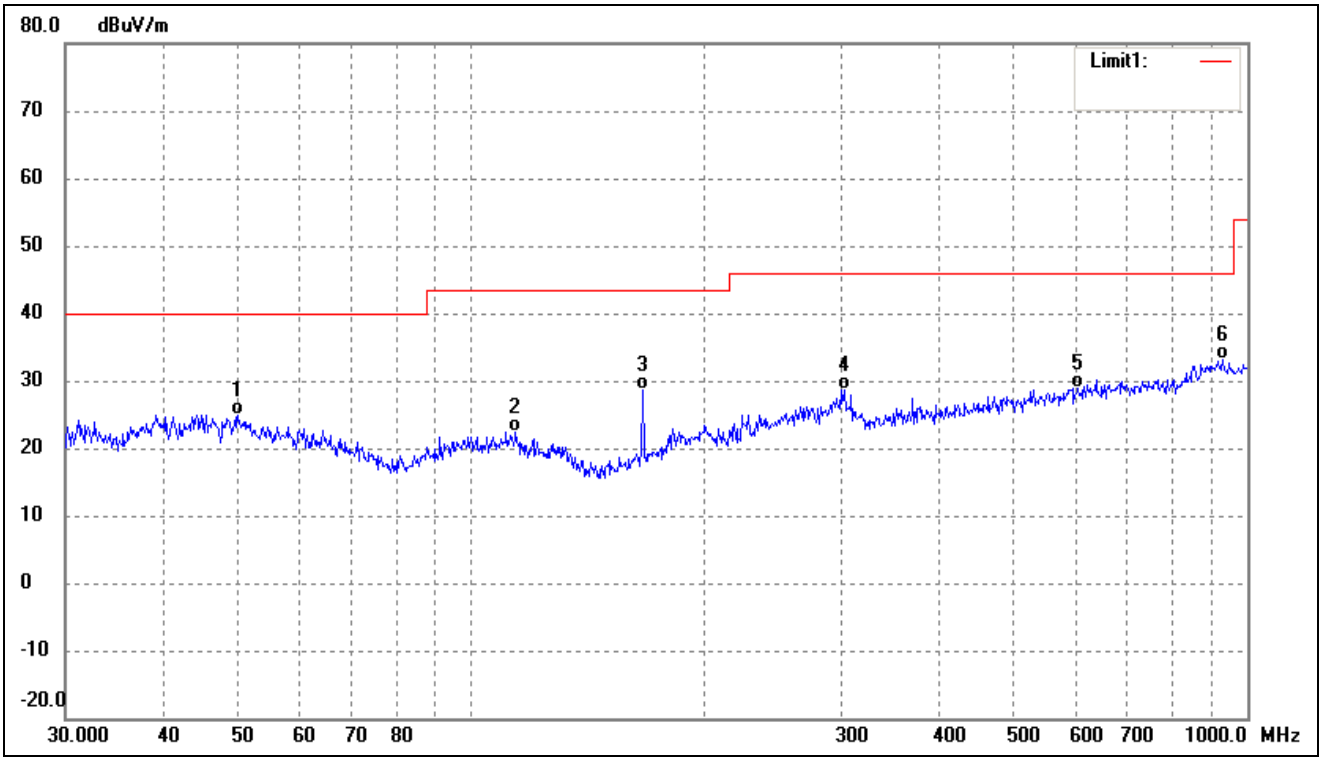
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	39.4372	38.77	-12.19	26.58	40.00	-13.42	-	-	QP
2	50.0566	36.21	-11.55	24.66	40.00	-15.34	-	-	QP
3	166.0680	43.63	-15.23	28.40	43.50	-15.10	-	-	QP
4	294.1137	36.70	-9.36	27.34	46.00	-18.66	-	-	QP
5	406.0880	33.56	-6.31	27.25	46.00	-18.75	-	-	QP
6	993.0114	32.21	1.78	33.99	54.00	-20.01	-	-	QP

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



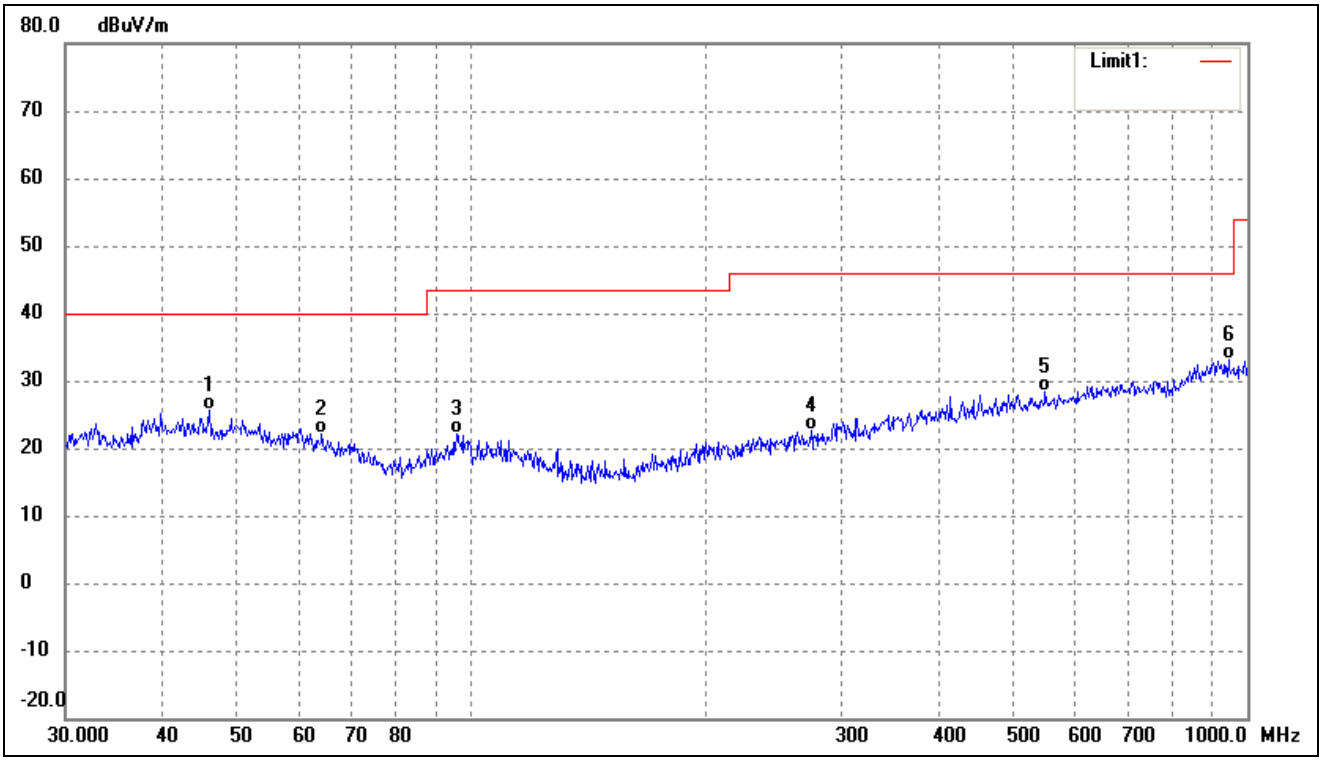
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	39.5757	37.86	-12.14	25.72	40.00	-14.28	-	-	QP
2	50.7637	37.62	-11.75	25.87	40.00	-14.13	-	-	QP
3	66.2662	36.47	-14.12	22.35	40.00	-17.65	-	-	QP
4	95.7622	35.88	-14.03	21.85	43.50	-21.65	-	-	QP
5	289.0021	32.48	-9.72	22.76	46.00	-23.24	-	-	QP
6	684.7454	32.95	-1.86	31.09	46.00	-14.91	-	-	QP

802.11a(worst case)			
Test Channel	5200MHz	Polarity:	Horizontal



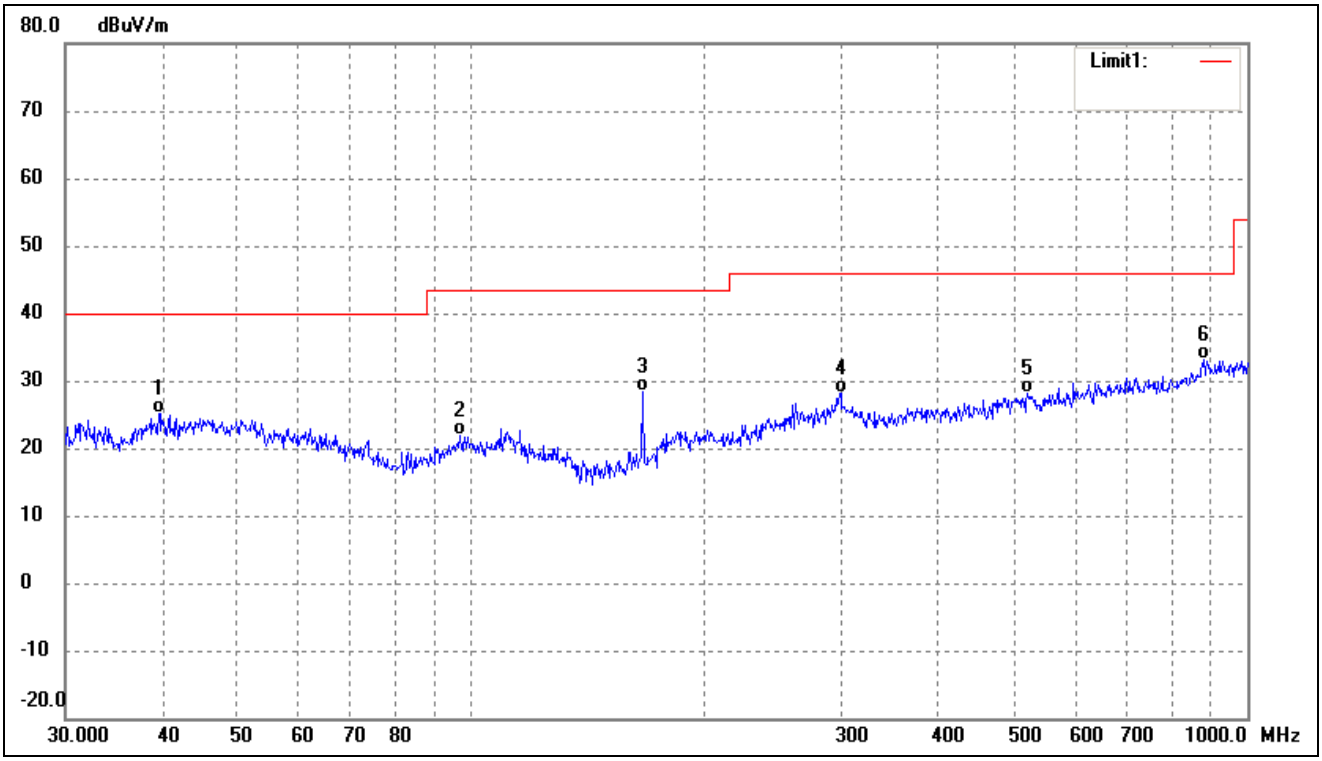
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	50.0566	36.54	-11.55	24.99	40.00	-15.01	-	-	QP
2	114.1138	36.15	-13.72	22.43	43.50	-21.07	-	-	QP
3	166.6514	43.90	-15.20	28.70	43.50	-14.80	-	-	QP
4	302.4812	37.55	-8.93	28.62	46.00	-17.38	-	-	QP
5	605.6592	30.88	-1.98	28.90	46.00	-17.10	-	-	QP
6	929.0082	31.41	1.77	33.18	46.00	-12.82	-	-	QP

802.11a(worst case)			
Test Channel	5200MHz	Polarity:	Vertical



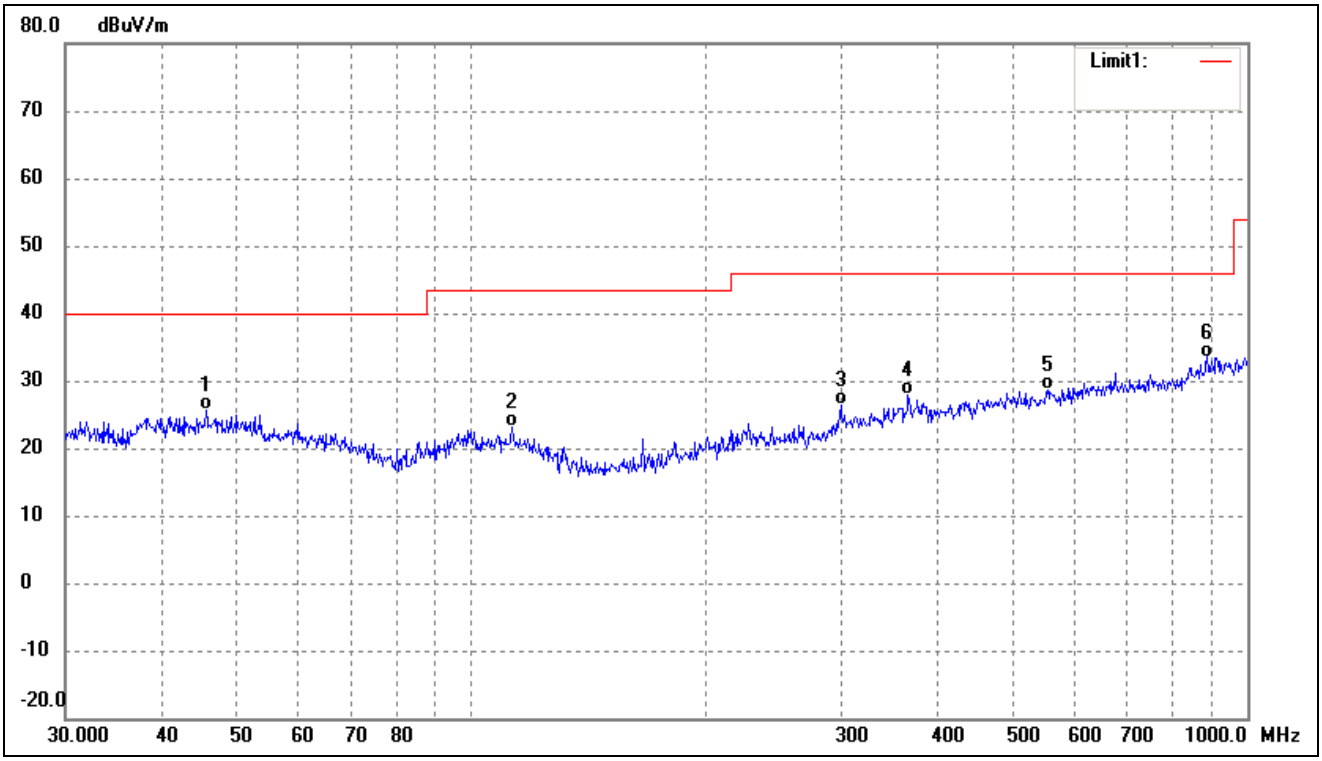
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	46.0164	37.38	-11.74	25.64	40.00	-14.36	-	-	QP
2	64.2075	35.99	-13.77	22.22	40.00	-17.78	-	-	QP
3	95.7622	36.11	-14.03	22.08	43.50	-21.42	-	-	QP
4	274.1939	33.52	-10.77	22.75	46.00	-23.25	-	-	QP
5	549.0195	32.26	-3.81	28.45	46.00	-17.55	-	-	QP
6	945.4399	31.67	1.45	33.12	46.00	-12.88	-	-	QP

802.11a(worst case)			
Test Channel	5240MHz	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	39.5757	37.26	-12.14	25.12	40.00	-14.88	-	-	QP
2	96.7749	35.63	-13.86	21.77	43.50	-21.73	-	-	QP
3	166.0680	43.73	-15.23	28.50	43.50	-15.00	-	-	QP
4	299.3158	37.05	-8.96	28.09	46.00	-17.91	-	-	QP
5	520.8882	32.38	-4.15	28.23	46.00	-17.77	-	-	QP
6	878.3214	32.35	0.67	33.02	46.00	-12.98	-	-	QP

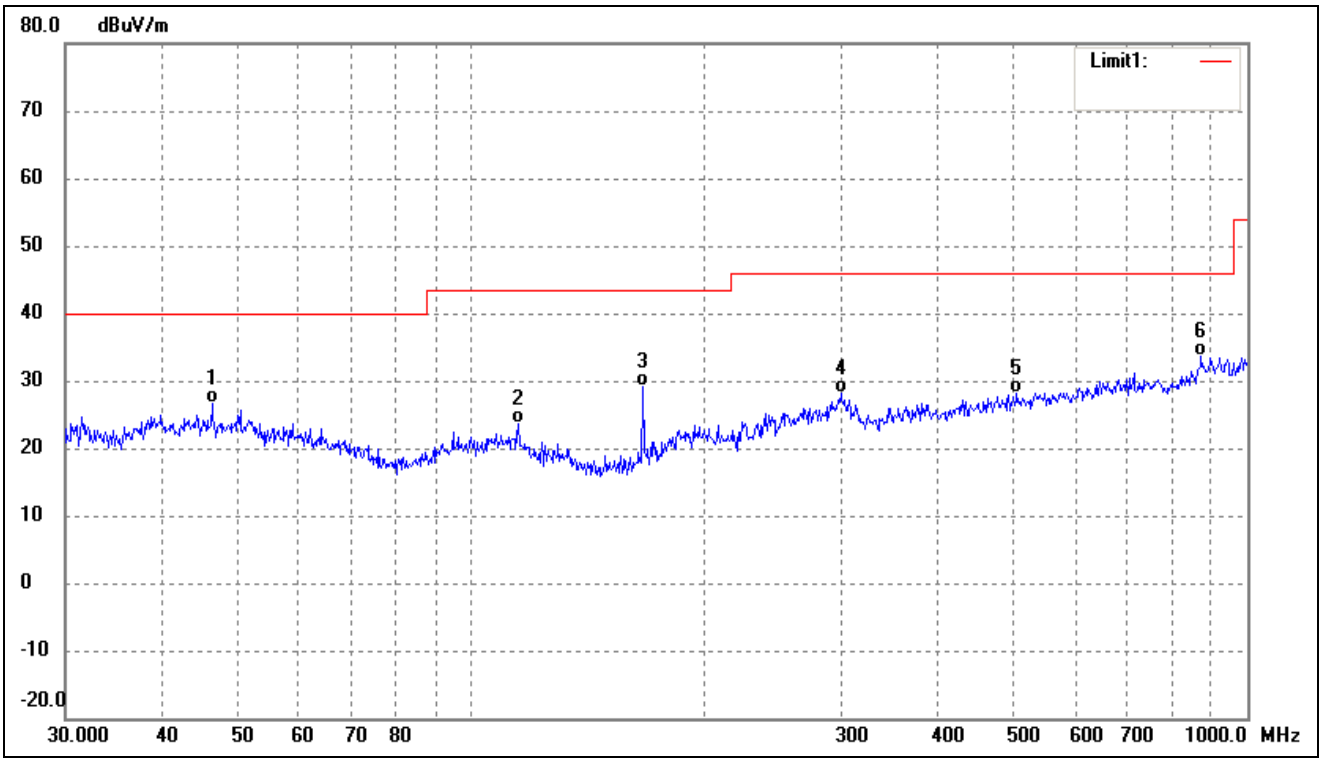
802.11a(worst case)			
Test Channel	5240MHz	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	45.5348	37.50	-11.77	25.73	40.00	-14.27	-	-	QP
2	112.9196	36.69	-13.60	23.09	43.50	-20.41	-	-	QP
3	299.3158	35.26	-8.96	26.30	46.00	-19.70	-	-	QP
4	365.5391	35.27	-7.29	27.98	46.00	-18.02	-	-	QP
5	552.8833	32.27	-3.65	28.62	46.00	-17.38	-	-	QP
6	887.6099	32.45	1.05	33.50	46.00	-12.50	-	-	QP

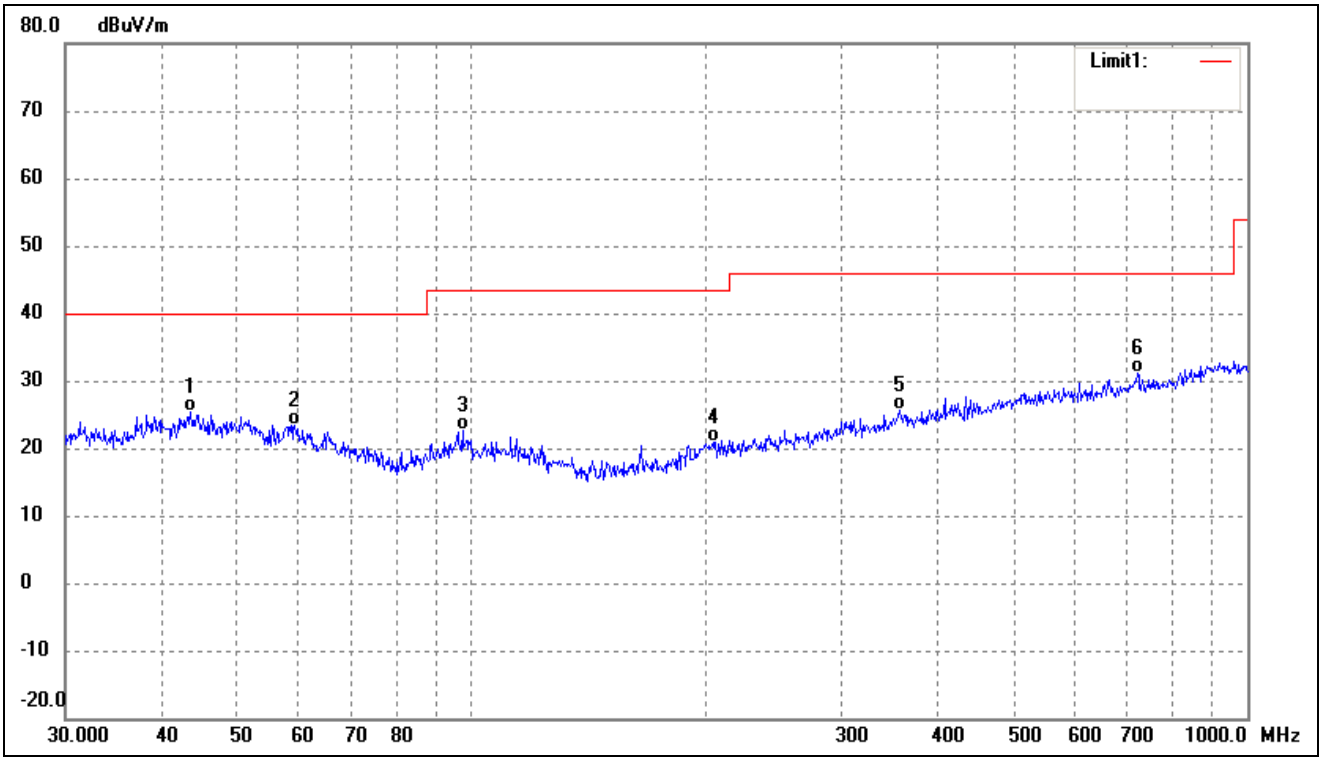
➢ 5725-5850MHz

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



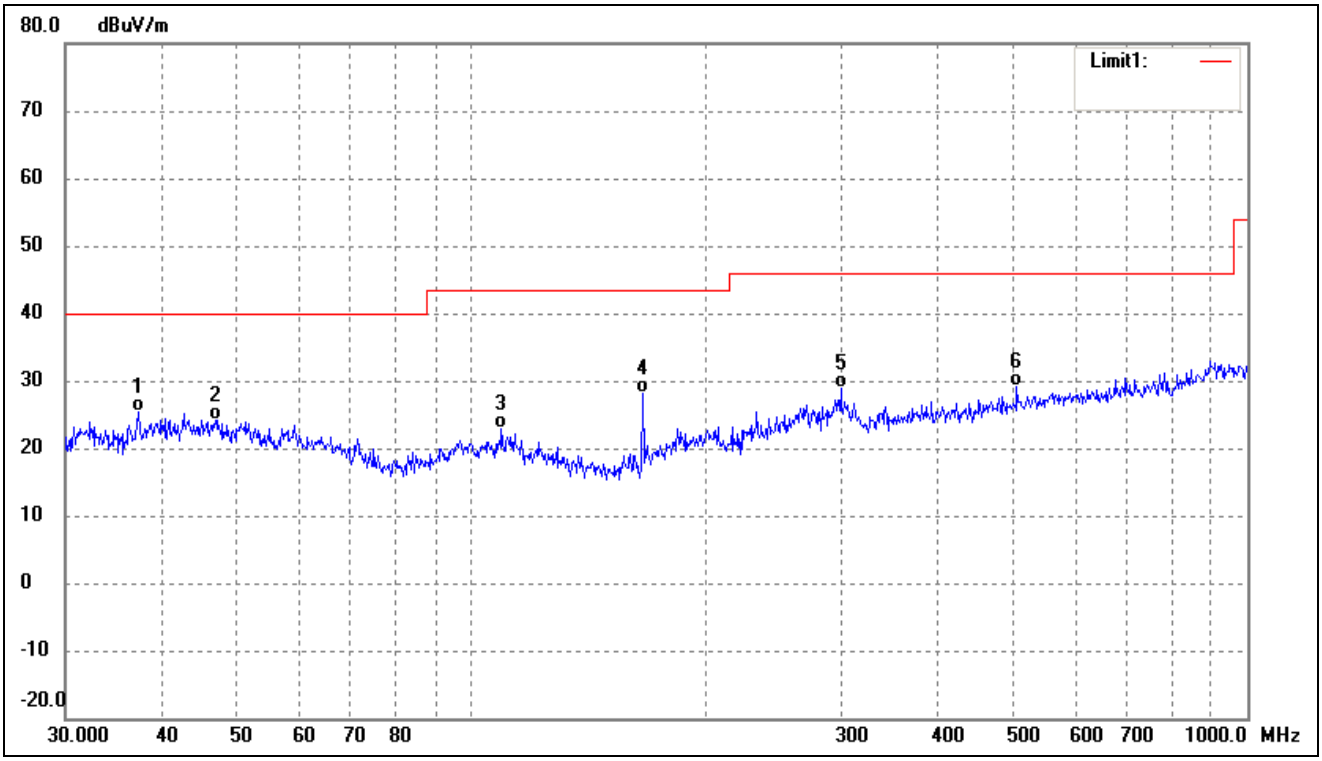
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	46.3402	38.43	-11.73	26.70	40.00	-13.30	-	-	QP
2	114.9169	37.44	-13.79	23.65	43.50	-19.85	-	-	QP
3	166.6514	44.29	-15.20	29.09	43.50	-14.41	-	-	QP
4	299.3158	37.02	-8.96	28.06	46.00	-17.94	-	-	QP
5	504.7062	32.28	-4.07	28.21	46.00	-17.79	-	-	QP
6	872.1832	33.03	0.51	33.54	46.00	-12.46	-	-	QP

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



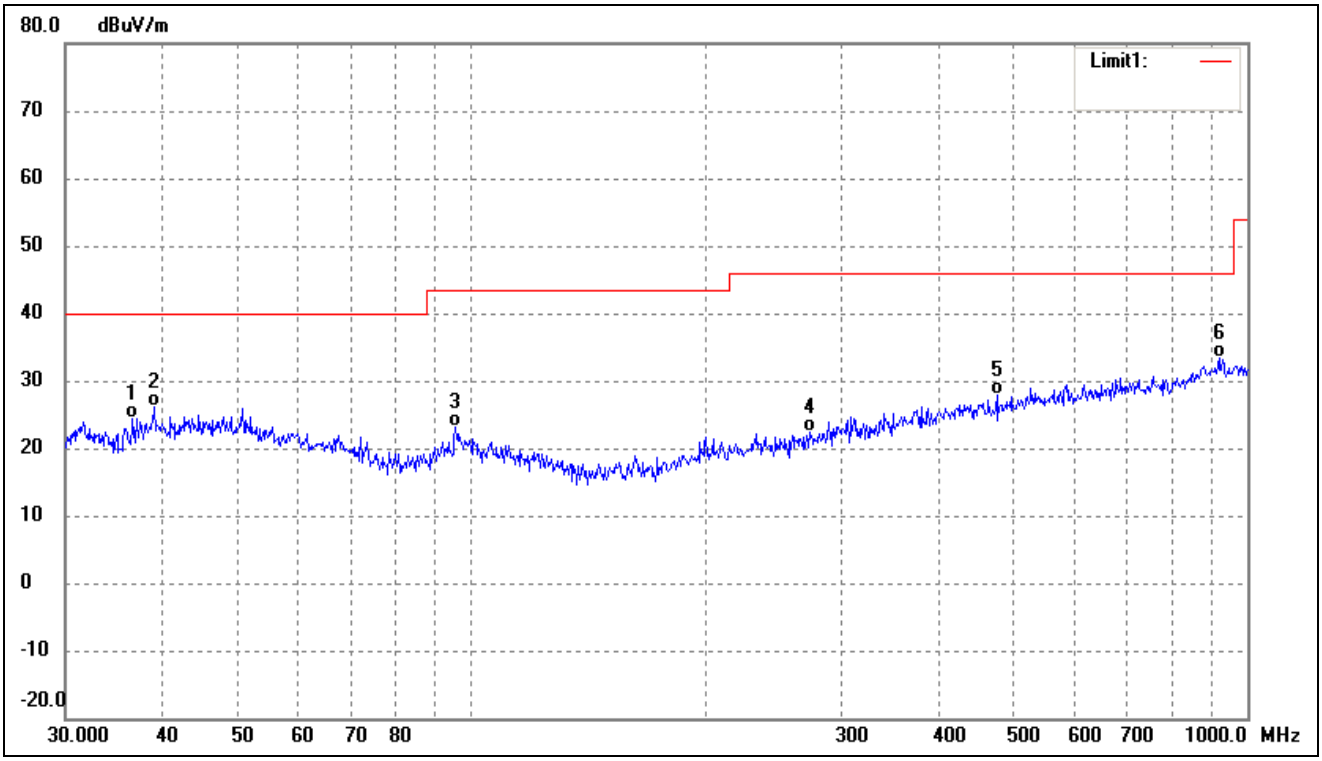
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	43.5057	37.15	-11.85	25.30	40.00	-14.70	-	-	QP
2	59.2325	36.35	-12.98	23.37	40.00	-16.63	-	-	QP
3	97.4560	36.34	-13.75	22.59	43.50	-20.91	-	-	QP
4	204.9551	33.22	-12.37	20.85	43.50	-22.65	-	-	QP
5	356.6758	32.90	-7.37	25.53	46.00	-20.47	-	-	QP
6	721.7259	32.15	-1.10	31.05	46.00	-14.95	-	-	QP

802.11a(worst case)			
Test Channel	5785MHz	Polarity:	Horizontal



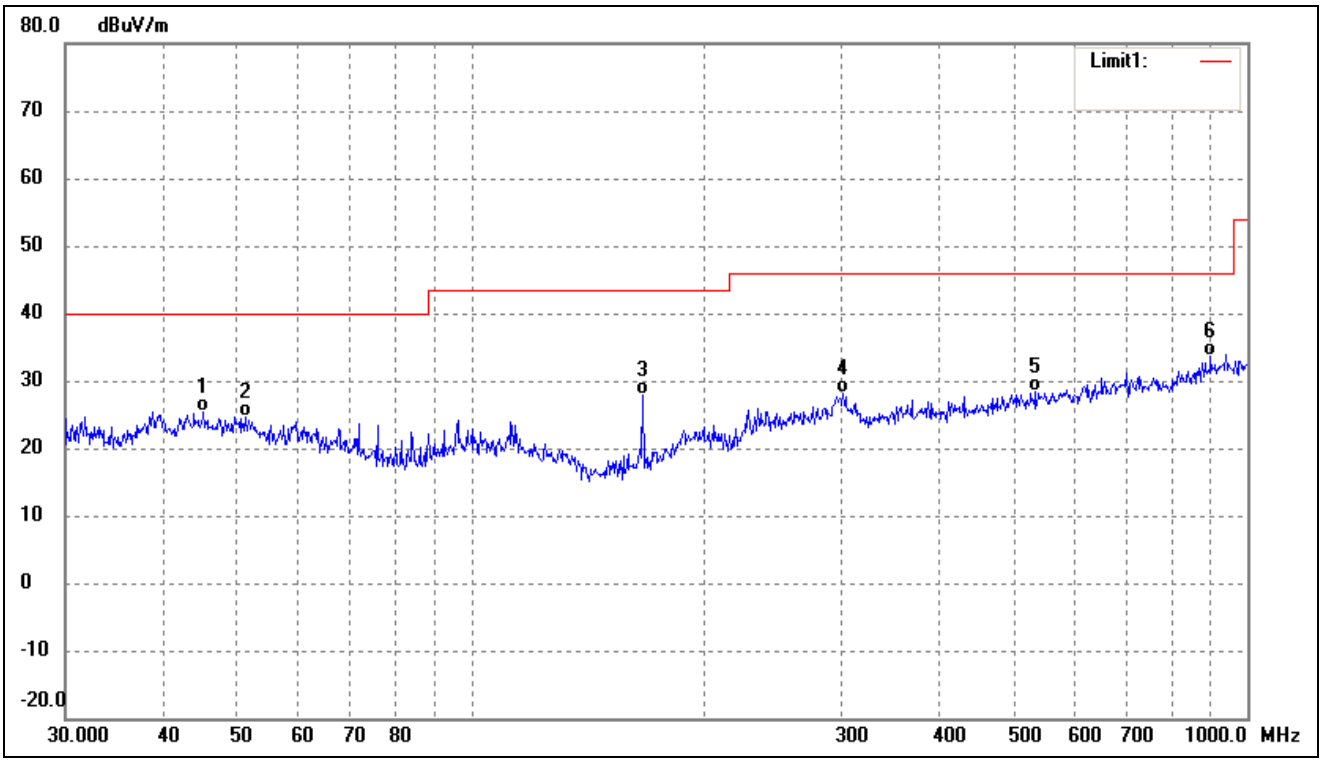
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	37.2855	38.43	-13.01	25.42	40.00	-14.58	-	-	QP
2	46.8303	35.87	-11.70	24.17	40.00	-15.83	-	-	QP
3	109.4116	36.18	-13.31	22.87	43.50	-20.63	-	-	QP
4	166.6514	43.38	-15.20	28.18	43.50	-15.32	-	-	QP
5	299.3158	37.84	-8.96	28.88	46.00	-17.12	-	-	QP
6	504.7062	33.11	-4.07	29.04	46.00	-16.96	-	-	QP

802.11a(worst case)			
Test Channel	5785MHz	Polarity:	Vertical



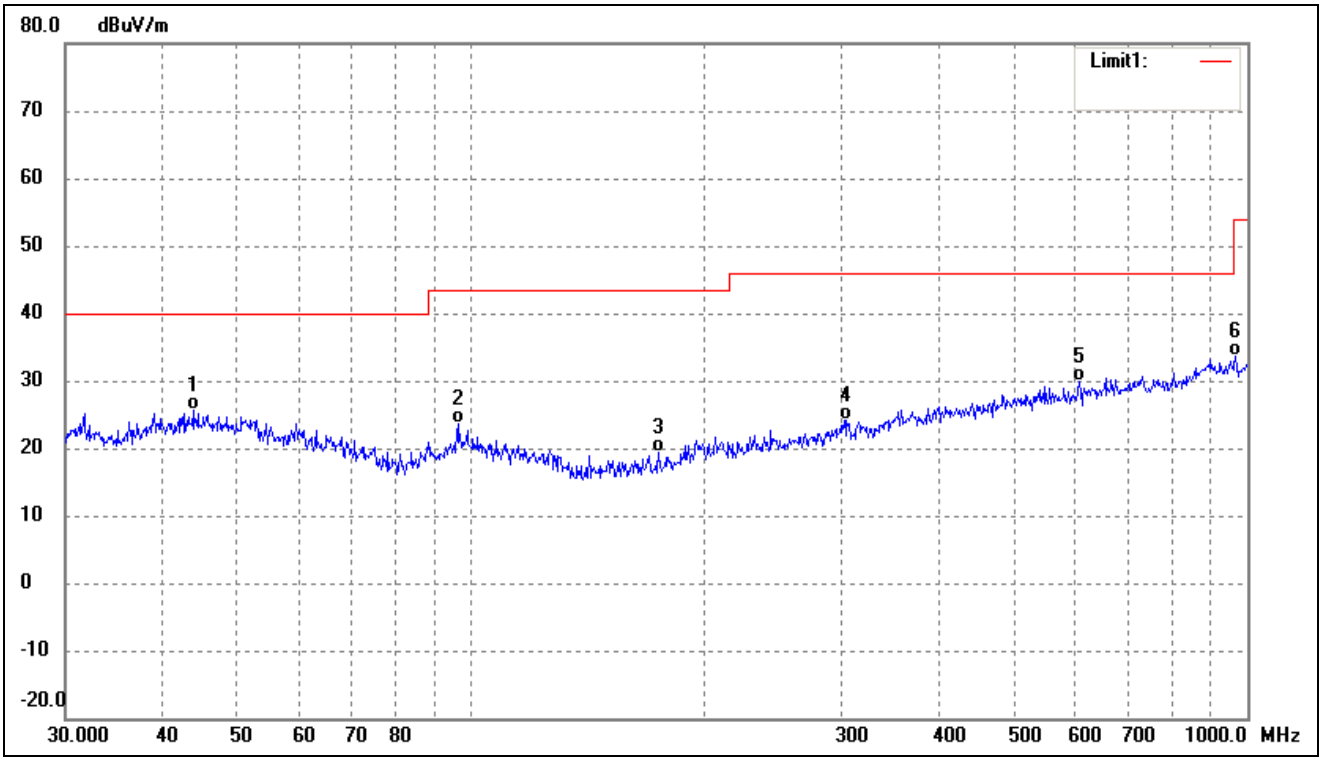
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	36.6375	37.71	-13.26	24.45	40.00	-15.55	-	-	QP
2	39.0245	38.58	-12.35	26.23	40.00	-13.77	-	-	QP
3	95.4270	37.22	-14.08	23.14	43.50	-20.36	-	-	QP
4	273.2341	33.07	-10.76	22.31	46.00	-23.69	-	-	QP
5	475.4991	32.74	-4.80	27.94	46.00	-18.06	-	-	QP
6	919.2866	31.68	1.78	33.46	46.00	-12.54	-	-	QP

802.11a(worst case)			
Test Channel	5825MHz	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	45.2166	37.26	-11.79	25.47	40.00	-14.53	-	-	QP
2	51.1209	36.53	-11.85	24.68	40.00	-15.32	-	-	QP
3	166.0680	43.09	-15.23	27.86	43.50	-15.64	-	-	QP
4	301.4224	37.15	-8.92	28.23	46.00	-17.77	-	-	QP
5	533.8321	32.53	-4.04	28.49	46.00	-17.51	-	-	QP
6	896.9965	32.25	1.42	33.67	46.00	-12.33	-	-	QP

802.11a(worst case)			
Test Channel	5825MHz	Polarity:	Vertical

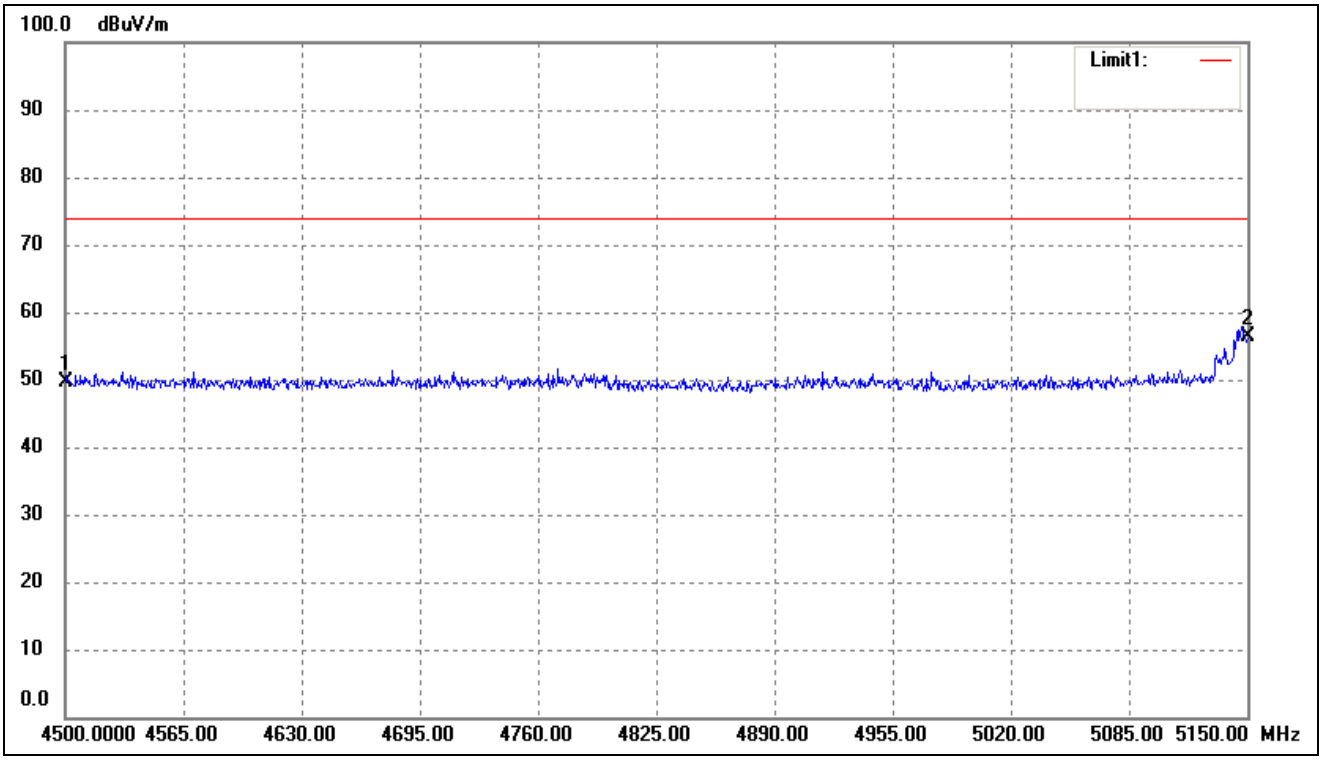


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	43.8119	37.36	-11.84	25.52	40.00	-14.48	-	-	QP
2	96.0986	37.56	-13.96	23.60	43.50	-19.90	-	-	QP
3	174.4241	34.12	-14.71	19.41	43.50	-24.09	-	-	QP
4	304.6100	33.18	-8.93	24.25	46.00	-21.75	-	-	QP
5	607.7867	31.99	-2.00	29.99	46.00	-16.01	-	-	QP
6	965.5421	32.27	1.43	33.70	54.00	-20.30	-	-	QP

Remark: '-'Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

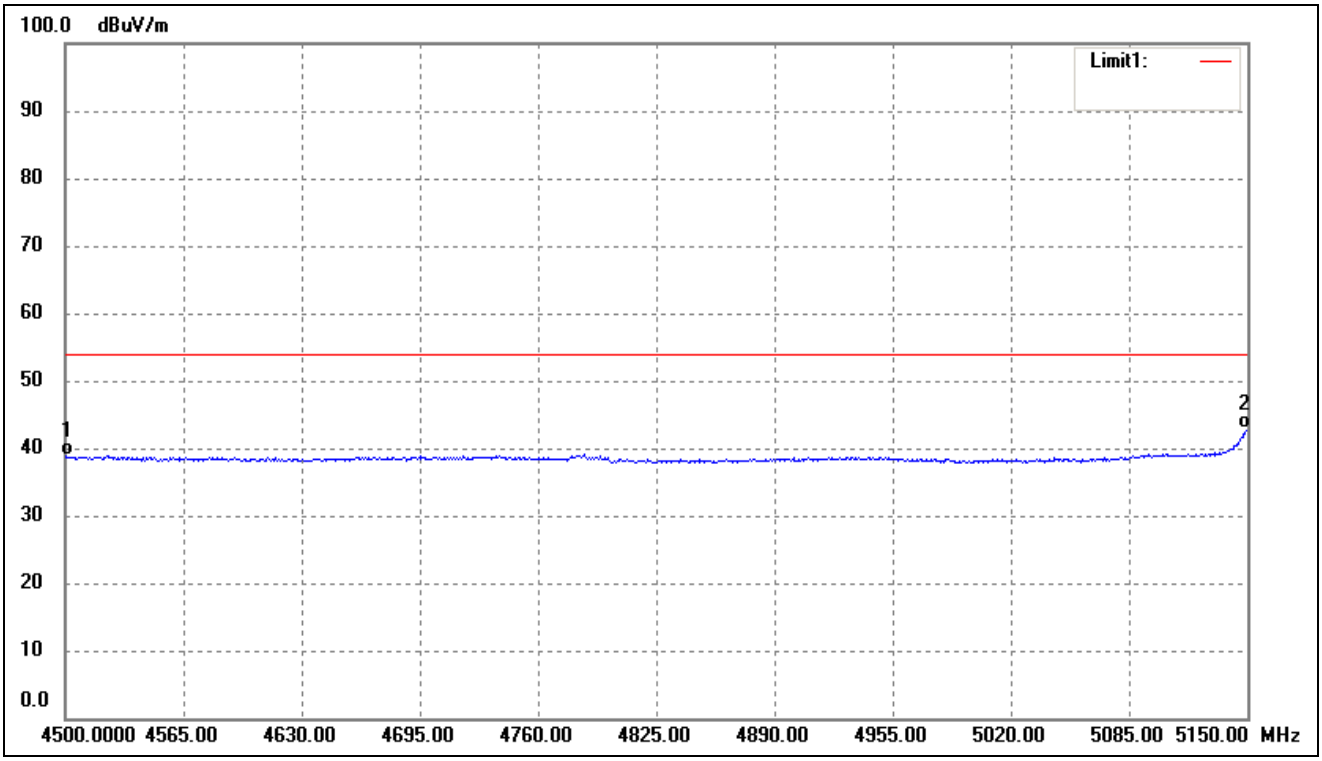
➢ Spurious Emission above 1GHz

802.11a- Restricted Bandedge (worst case)			
Test Channel	band 4.50-5.15GHz	Polarity:	Vertical(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	54.23	-4.71	49.52	74.00	-24.48	-	-	peak
2	5150.000	60.69	-4.32	56.37	74.00	-17.63	-	-	peak

802.11a- Restricted Bandedge (worst case)			
Test Channel	band 4.50-5.15GHz	Polarity:	Vertical(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	43.49	-4.71	38.78	54.00	-15.22	-	-	AVG
2	5150.000	47.27	-4.32	42.95	54.00	-11.05	-	-	AVG

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

Remark: '-'Means' the test Degree and Height is not recorded by the test software and only show the worst case in the test report.

- 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	56.85	7.11	63.96	74	-10.04	H	PK
15540	37.92	8.22	46.14	54	-7.86	H	AV
10360	57.04	7.11	64.15	74	-9.85	V	PK
15540	38.99	8.22	47.21	54	-6.79	V	AV
Middle Channel (5200MHz)							
10400	55.19	7.22	62.41	74	-11.59	H	PK
15600	34.22	8.67	42.89	54	-11.11	H	AV
10400	54.25	7.22	61.47	74	-12.53	V	PK
15600	37.73	8.67	46.40	54	-7.60	V	AV
High Channel (5240MHz)							
10480	54.23	7.69	61.92	74	-12.08	H	PK
15720	39.08	8.93	48.01	54	-5.99	H	AV
10480	58.64	7.69	66.33	74	-7.67	V	PK
15720	38.25	8.93	47.18	54	-6.82	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5745MHz)							
10520	55.66	9.45	65.11	74	-8.89	H	PK
15780	33.10	10.36	43.46	54	-10.54	H	AV
10520	53.20	9.45	62.65	74	-11.35	V	PK
15780	37.33	10.36	47.69	54	-6.31	V	AV
Middle Channel (5785MHz)							
10560	55.64	9.62	65.26	74	-8.74	H	PK
15840	36.93	10.67	47.60	54	-6.40	H	AV
10560	56.84	9.62	66.46	74	-7.54	V	PK
15840	36.05	10.67	46.72	54	-7.28	V	AV
High Channel (5825MHz)							
10640	56.51	9.84	66.35	74	-7.65	H	PK
15960	32.71	10.95	43.66	54	-10.34	H	AV
10640	53.78	9.84	63.62	74	-10.38	V	PK
15960	35.92	10.95	46.87	54	-7.13	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-35.94	-27
Highest	Above 5350	-43.49	-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	-37.15	-27
	5715 to 5725	-40.14	-17
Highest	5850 to 5860	-42.11	-17
	Above 5860	-42.52	-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	55.88	7.11	62.99	74	-11.01	H	PK
10360	38.93	8.22	47.15	54	-6.85	H	AV
10360	58.45	7.11	65.56	74	-8.44	V	PK
10360	39.71	8.22	47.93	54	-6.07	V	AV
Middle Channel (5200MHz)							
10400	57.35	7.22	64.57	74	-9.43	H	PK
10400	37.96	8.67	46.63	54	-7.37	H	AV
10400	58.57	7.22	65.79	74	-8.21	V	PK
10400	36.13	8.67	44.80	54	-9.20	V	AV
High Channel (5240MHz)							
10480	55.45	7.69	63.14	74	-10.86	H	PK
10480	35.94	8.93	44.87	54	-9.13	H	AV
10480	60.28	7.69	67.97	74	-6.03	V	PK
10480	38.25	8.93	47.18	54	-6.82	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	58.82	9.45	68.27	74	-5.73	H	PK
11490	35.64	10.36	46.00	54	-8.00	H	AV
11490	57.16	9.45	66.61	74	-7.39	V	PK
11490	34.01	10.36	44.37	54	-9.63	V	AV
Middle Channel (5785MHz)							
11570	58.48	9.62	68.10	74	-5.90	H	PK
11570	35.36	10.67	46.03	54	-7.97	H	AV
11570	54.38	9.62	64.00	74	-10.00	V	PK
11570	37.76	10.67	48.43	54	-5.57	V	AV
High Channel (5825MHz)							
11650	55.91	9.84	65.75	74	-8.25	H	PK
11650	33.01	10.95	43.96	54	-10.04	H	AV
11650	56.91	9.84	66.75	74	-7.25	V	PK
11650	35.78	10.95	46.73	54	-7.27	V	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-29.03	-27
Highest	Above 5350	-39.10	-27
Note: the data just list the worst cases			

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-45.19	-27
	5715 to 5725	-32.57	-17
Highest	5850 to 5860	-38.87	-17
	Above 5860	-41.86	-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	56.00	7.25	63.25	74	-10.75	H	PK
10380	38.15	8.33	46.48	54	-7.52	H	AV
10380	57.79	7.25	65.04	74	-8.96	V	PK
10380	37.17	8.33	45.50	54	-8.50	V	AV
High Channel (5230MHz)							
10460	56.47	7.54	64.01	74	-9.99	H	PK
10460	38.53	8.86	47.39	54	-6.61	H	AV
10460	57.92	7.54	65.46	74	-8.54	V	PK
10460	38.29	8.86	47.15	54	-6.85	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5755MHz)							
10540	54.44	9.65	64.09	74	-9.91	H	PK
10540	37.45	10.87	48.32	54	-5.68	H	AV
10540	58.10	9.65	67.75	74	-6.25	V	PK
10540	35.54	10.87	46.41	54	-7.59	V	AV
High Channel (5795MHz)							
10620	56.86	9.81	66.67	74	-7.33	H	PK
10620	34.36	10.89	45.25	54	-8.75	H	AV
10620	54.86	9.81	64.67	74	-9.33	V	PK
10620	34.38	10.89	45.27	54	-8.73	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-35.82	-27
Highest	Above 5350	-40.14	-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	-41.17	-27
	5715 to 5725	-39.98	-17
Highest	5850 to 5860	-41.87	-17
	Above 5860	-43.40	-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	59.12	7.33	66.45	74	-7.55	H	PK
10420	34.83	8.75	43.58	54	-10.42	H	AV
10420	55.46	7.33	62.79	74	-11.21	H	PK
10420	38.89	8.75	47.64	54	-6.36	H	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5775MHz							
11550	56.72	9.54	66.26	74	-7.74	H	PK
11550	37.19	10.59	47.78	54	-6.22	H	AV
11550	57.66	9.54	67.20	74	-6.80	V	PK
11550	34.56	10.59	45.15	54	-8.85	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-33.98	-27
Highest	Above 5350	-34.16	-27
Note: the data just list the worst cases			

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-45.93	-27
	5715 to 5725	-30.78	-17
Highest	5850 to 5860	-30.62	-17
	Above 5860	-38.27	-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.

9. Frequency Stability

9.1 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.

9.2 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.

9.3 Summary of Test Results/Plots

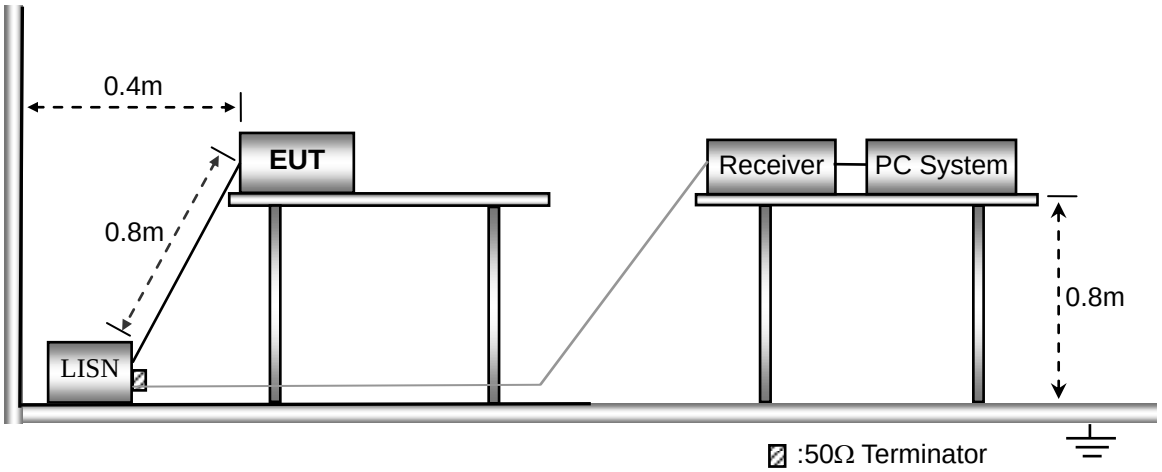
Please refer to Appendix D

10. Conducted Emissions

10.1 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.

10.2 Basic Test Setup Block Diagram



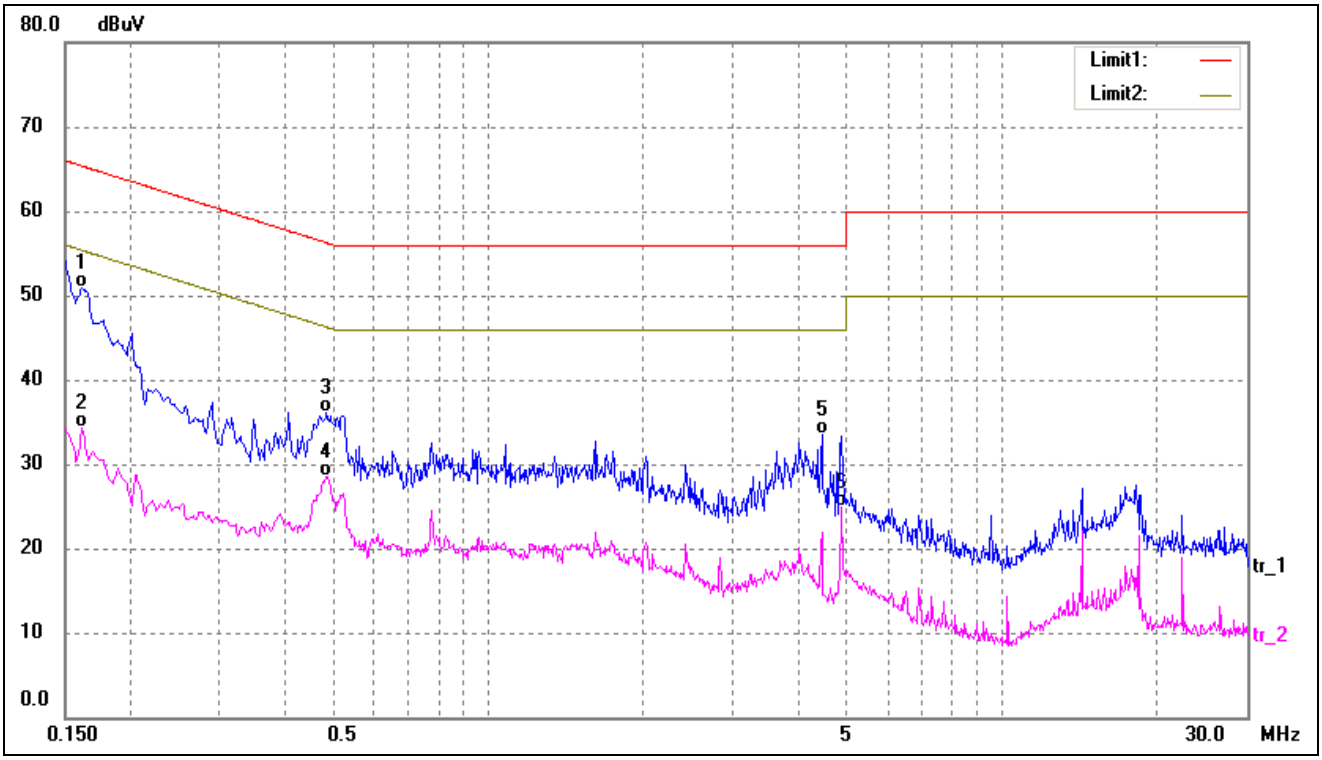
10.3 Test Receiver Setup

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

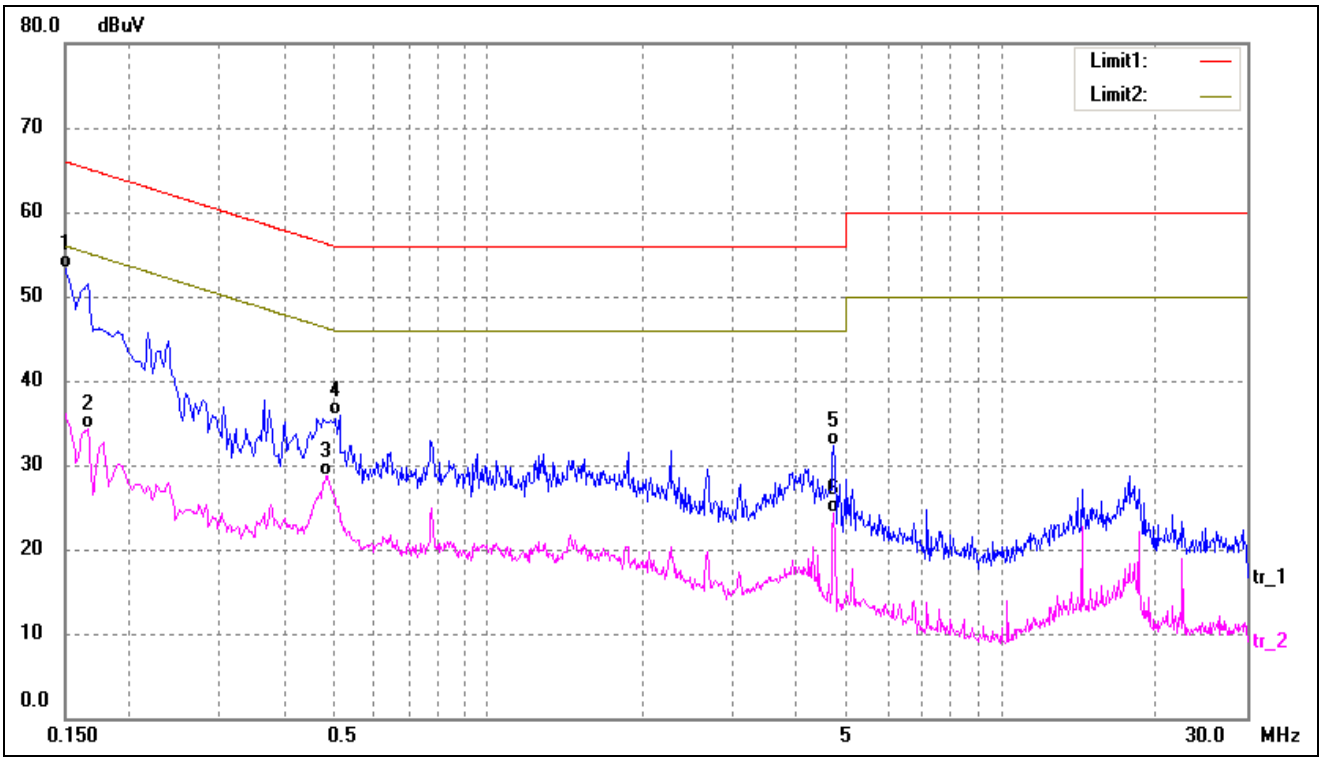
10.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1620	40.59	10.26	50.85	65.36	-14.51	QP
2	0.1620	24.01	10.26	34.27	55.36	-21.09	AVG
3	0.4860	25.80	10.22	36.02	56.24	-20.22	QP
4	0.4860	18.36	10.22	28.58	46.24	-17.66	AVG
5	4.4620	23.18	10.23	33.41	56.00	-22.59	QP
6	4.8740	14.76	10.23	24.99	46.00	-21.01	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1500	43.14	10.25	53.39	66.00	-12.61	QP
2	0.1660	24.02	10.26	34.28	55.16	-20.88	AVG
3	0.4860	18.55	10.22	28.77	46.24	-17.47	AVG
4	0.5140	25.64	10.22	35.86	56.00	-20.14	QP
5	4.7020	22.12	10.23	32.35	56.00	-23.65	QP
6	4.7020	14.10	10.23	24.33	46.00	-21.67	AVG

APPENDIX SUMMARY

Project No.	WTX21X03021602W	Test Engineer	Moon
Start date	2021/03/27	Finish date	2021/03/27
Temperature	23.7℃	Humidity	48%
RF specifications	U-NII		

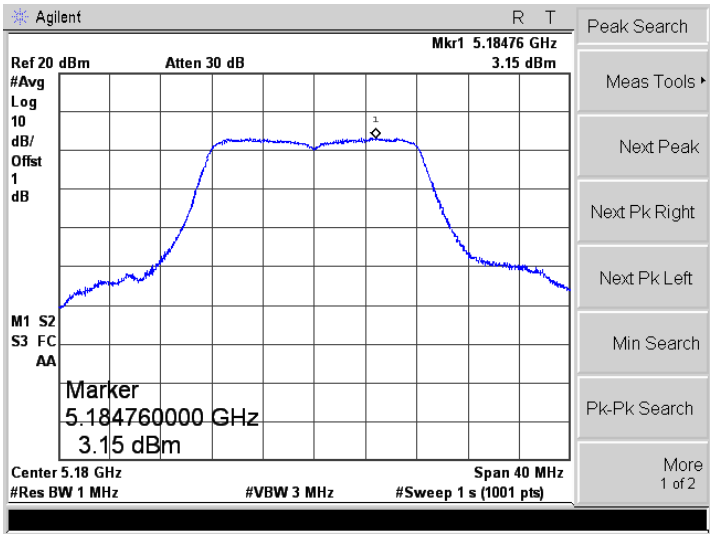
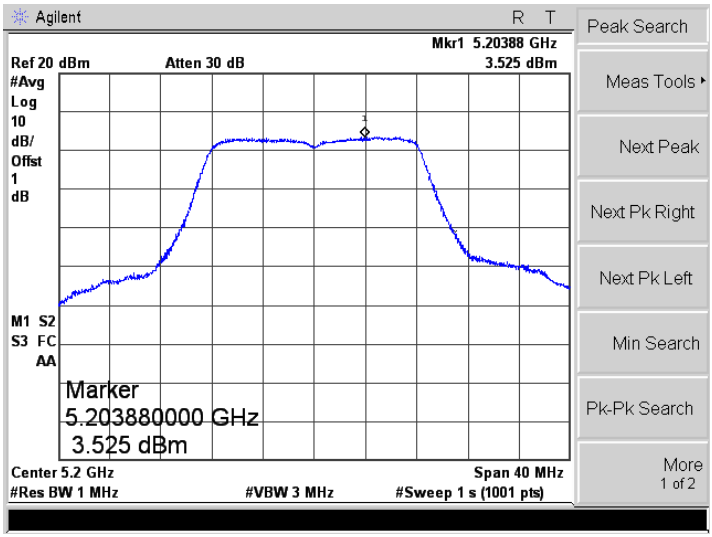
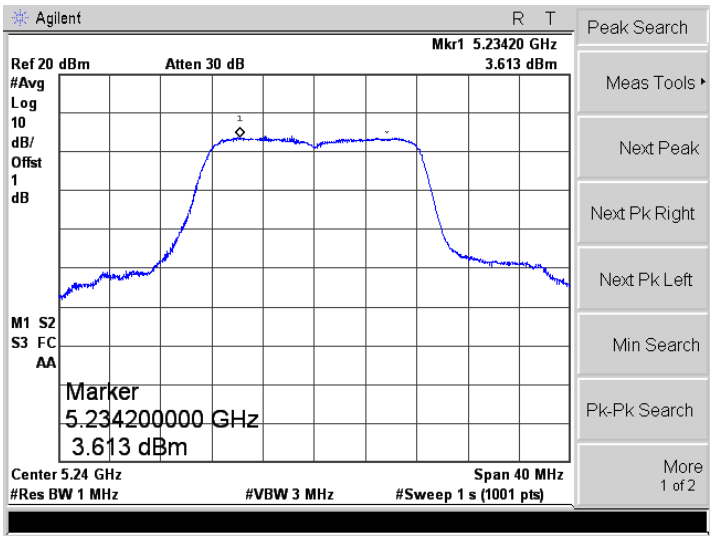
APPENDIX	Description of Test Item	Result
A	Power Spectral Density	Compliant
B	Emission Bandwidth and Occupied Bandwidth	Compliant
C	Maximum Conducted Output Power	Compliant
D	Frequency Stability	Compliant

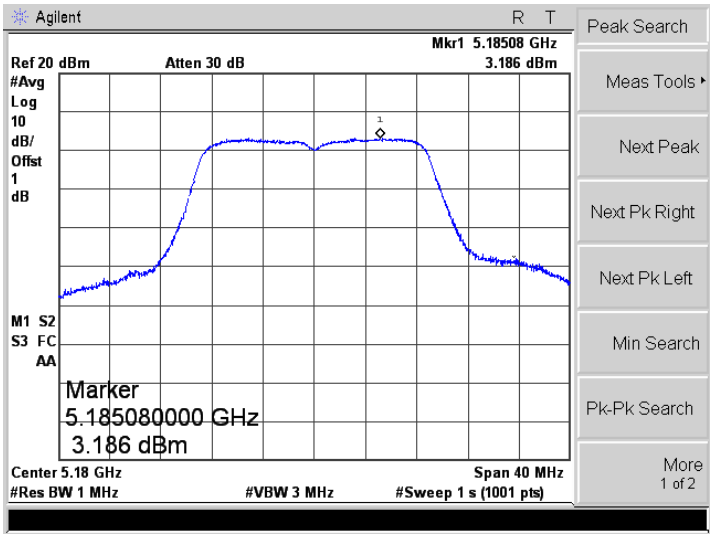
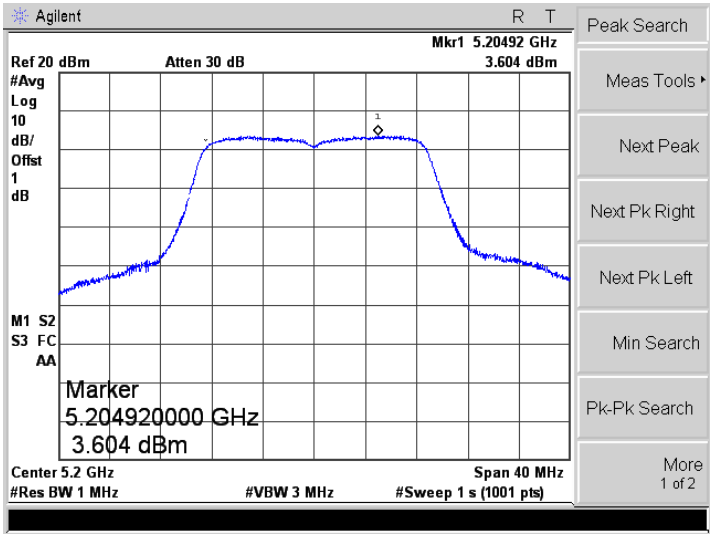
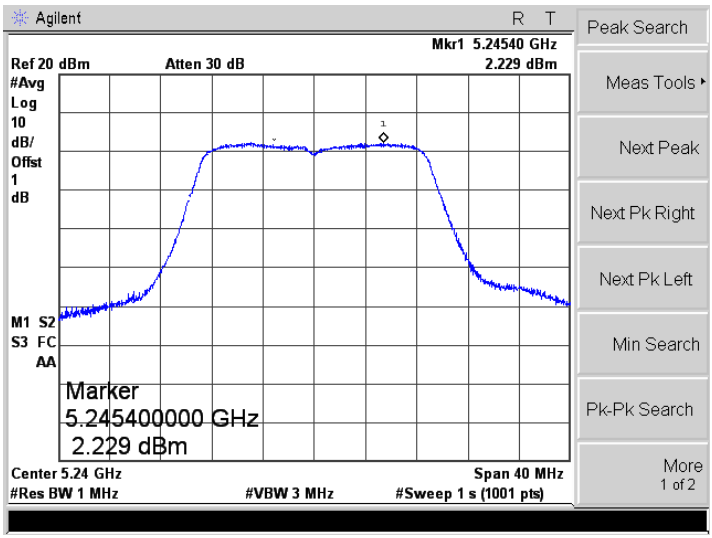
APPENDIX A

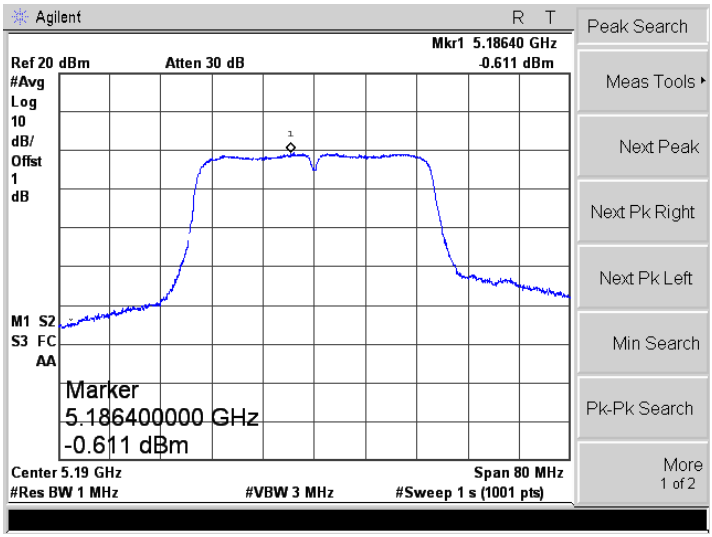
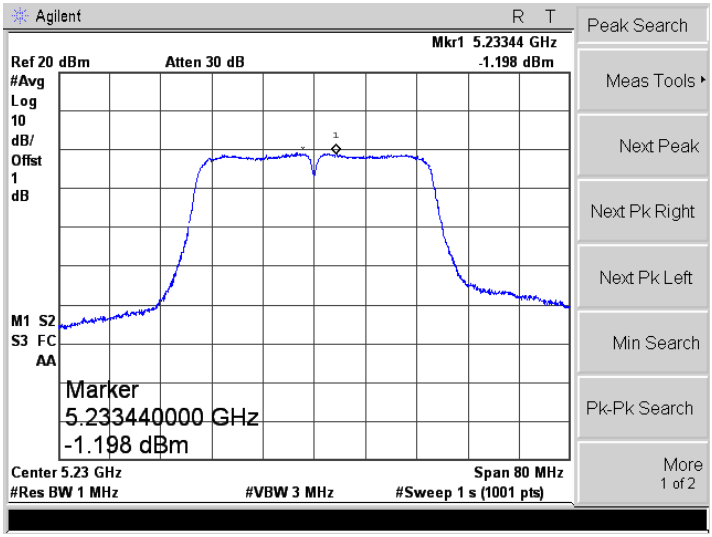
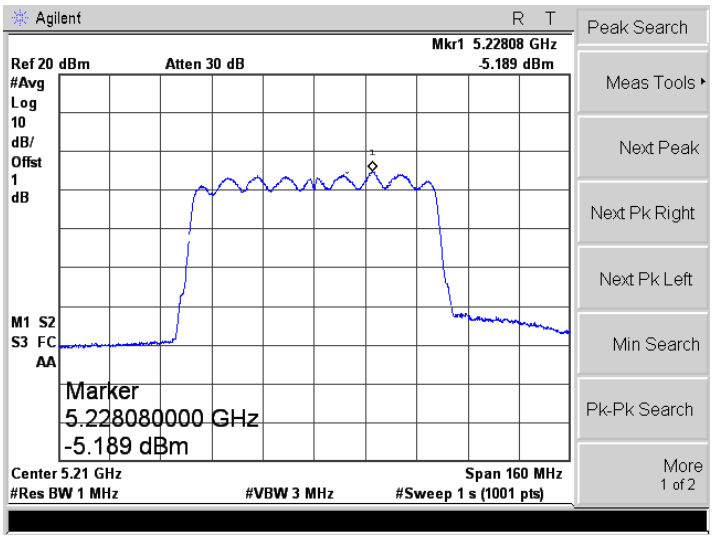
Power Spectral Density			
U-NII-1:5150-5250MHz			
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	3.150	11
	5200	3.525	11
	5240	3.613	11
802.11n-HT20	5180	3.186	11
	5200	3.604	11
	5240	2.229	11
802.11n-HT40	5190	-0.611	11
	5230	-1.198	11
802.11ac-HT80	5210	-5.189	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	-4.417	2.22	-2.197	30
	5785	-4.231	2.22	-2.011	30
	5825	-3.584	2.22	-1.364	30
802.11n-HT20	5745	-5.273	2.22	-3.053	30
	5785	-5.054	2.22	-2.834	30
	5825	-4.323	2.22	-2.103	30
802.11n HT40	5755	-8.498	2.22	-6.278	30
	5795	-8.861	2.22	-6.641	30
802.11ac VH80	5775	-11.350	2.22	-9.130	30
*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22					

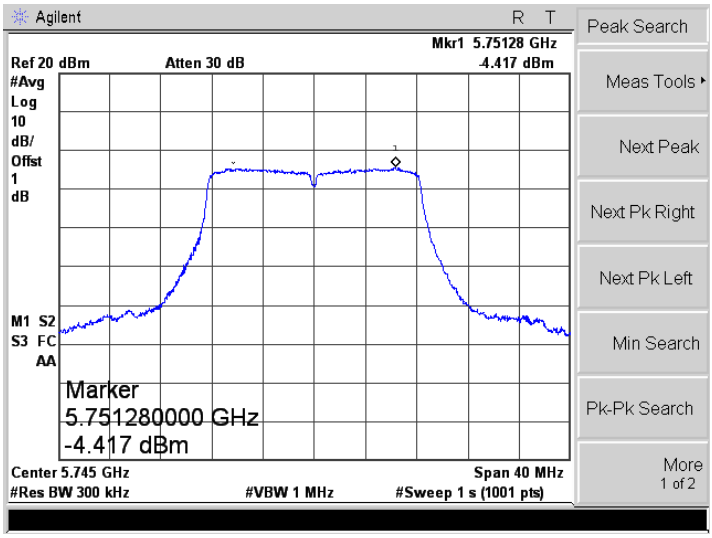
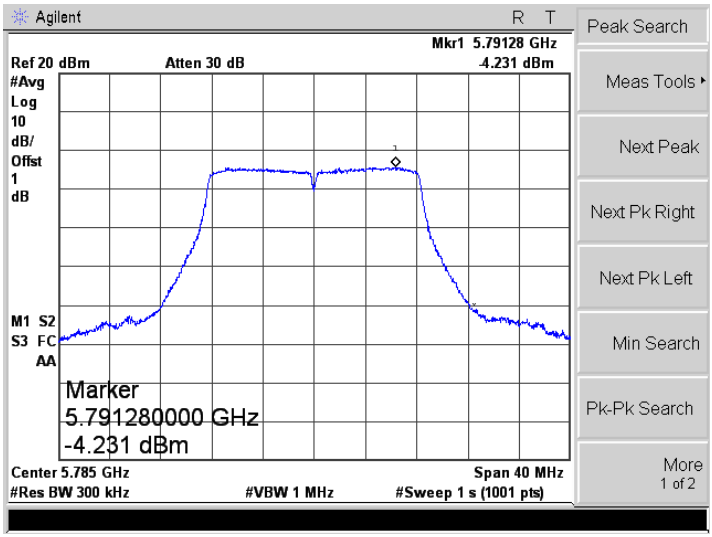
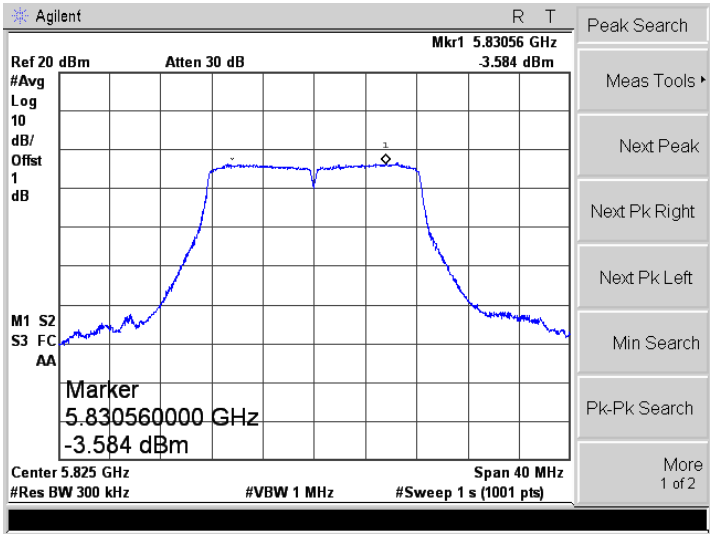
5150-5250MHz

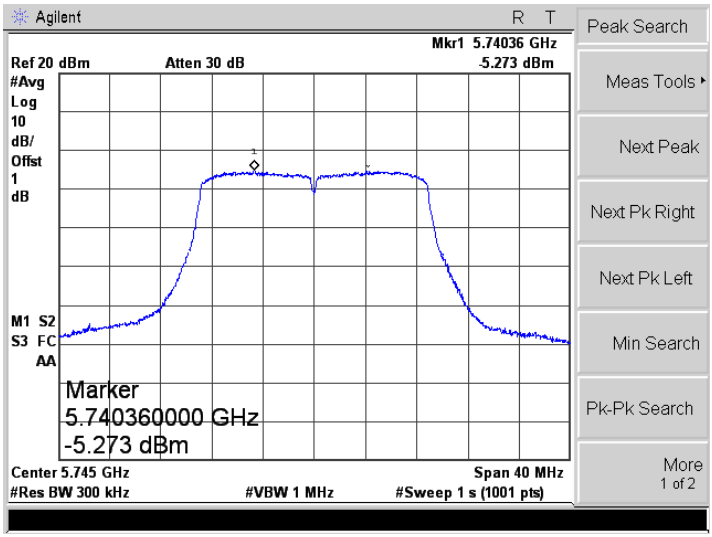
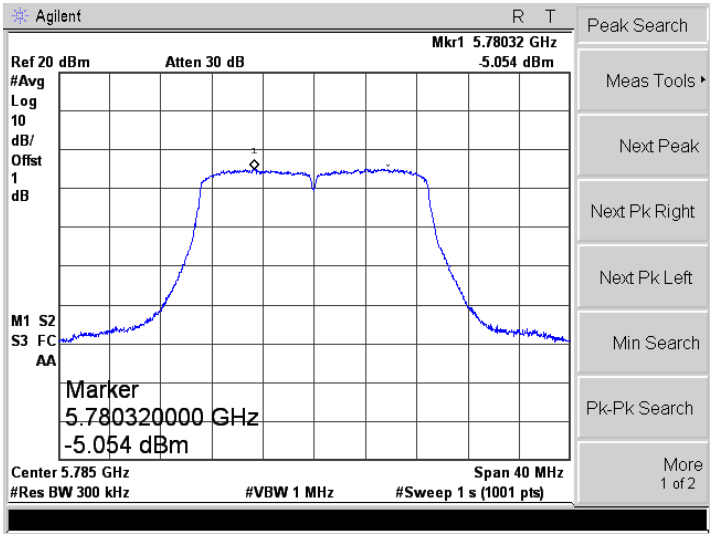
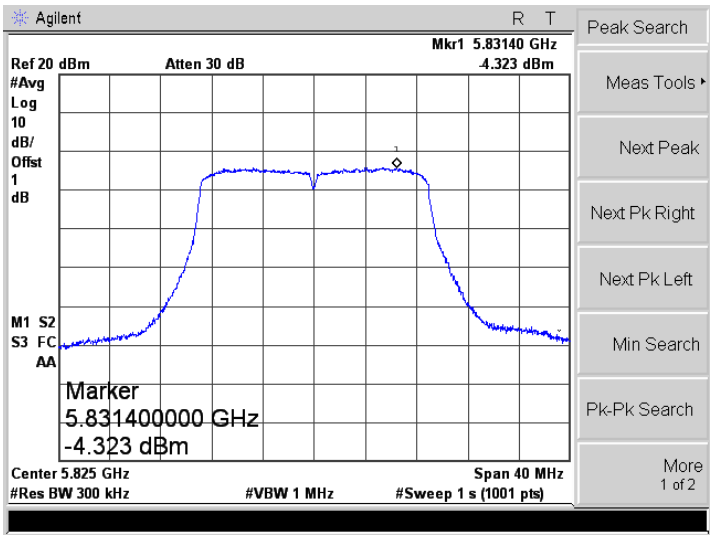
802.11a-Low	
802.11a-Middle	
802.11a-High	

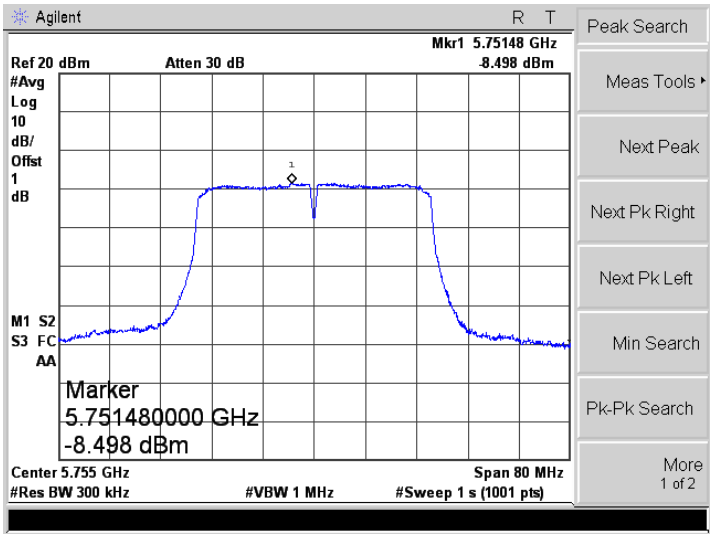
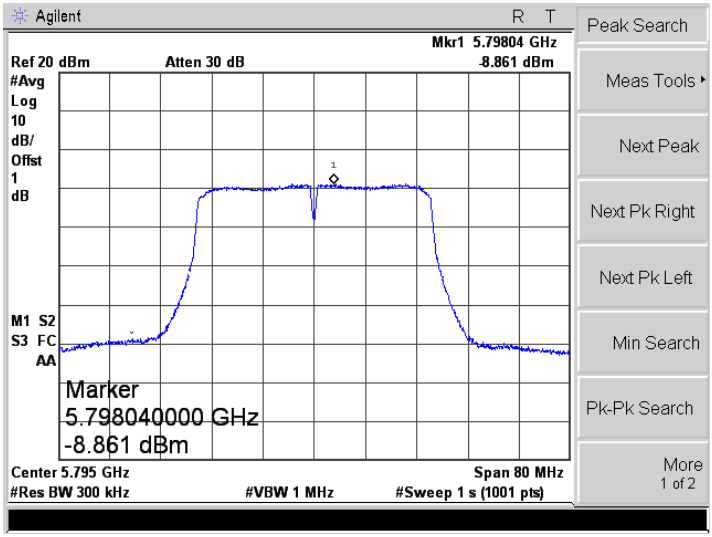
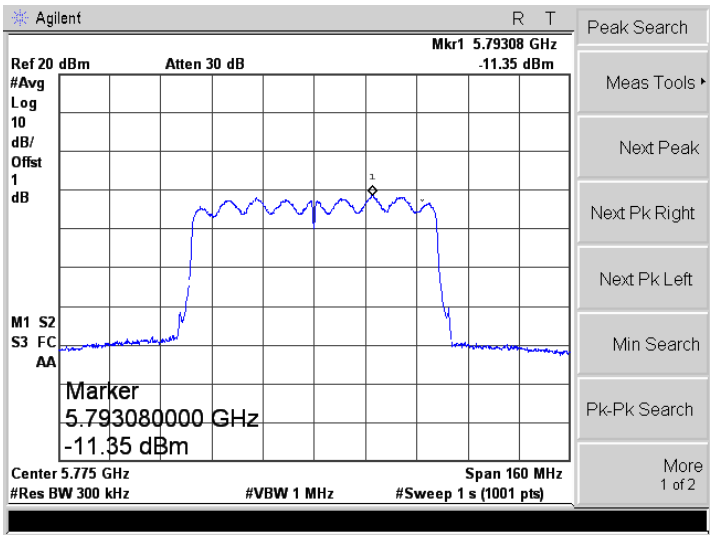
802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

5725-5850MHz

802.11a-Low	
802.11a-Middle	
802.11a-High	

802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

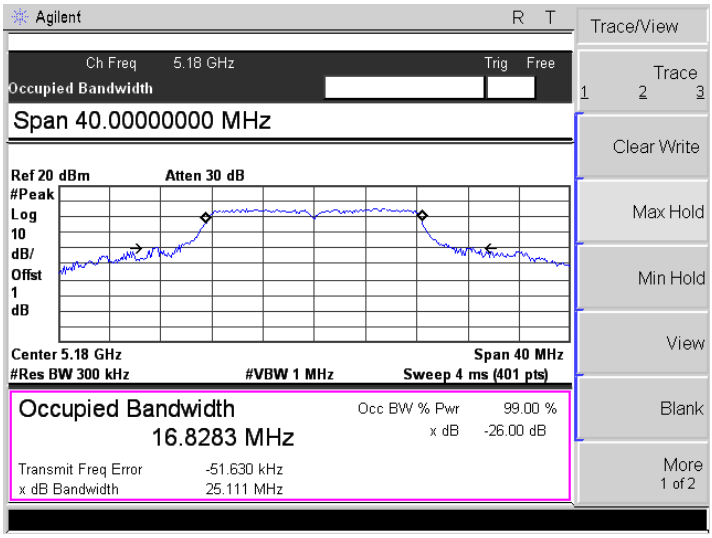
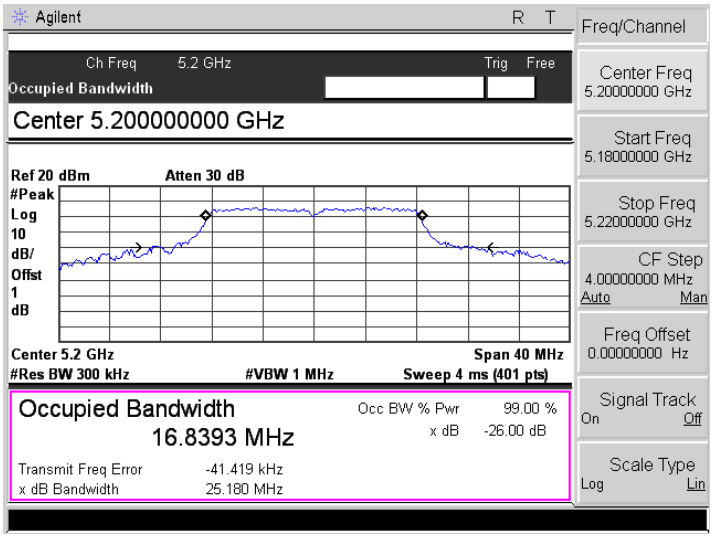
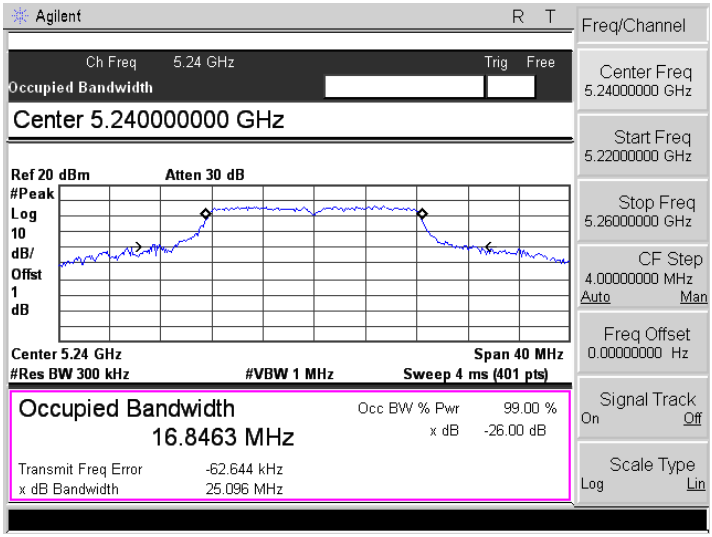
APPENDIX B

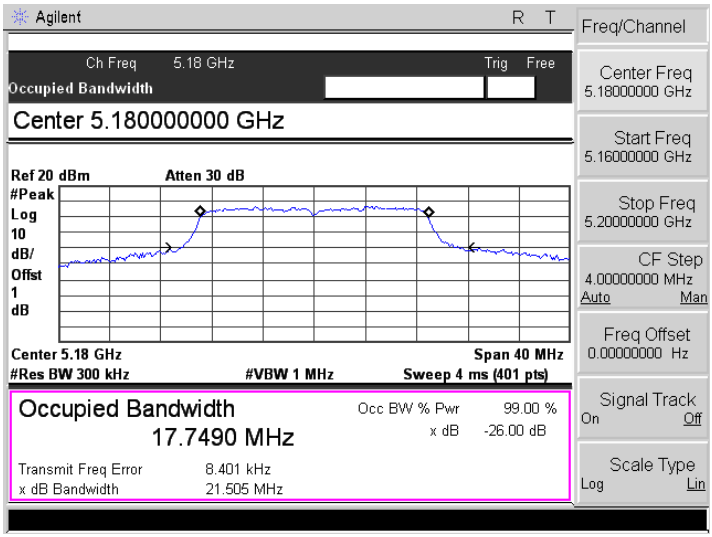
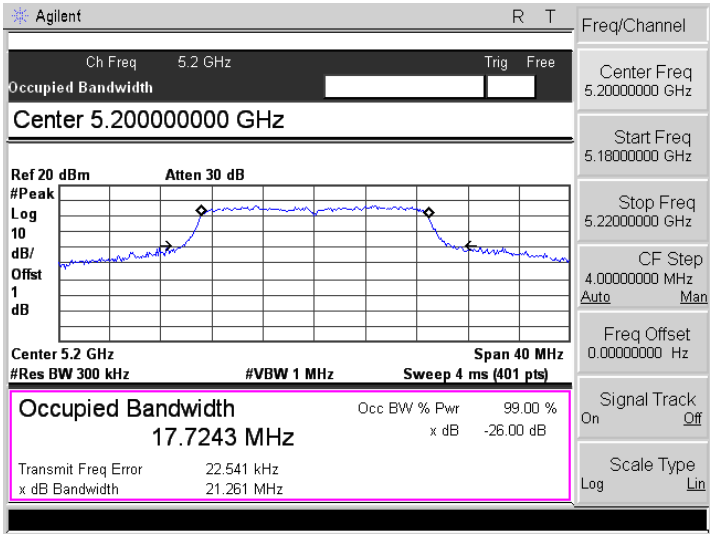
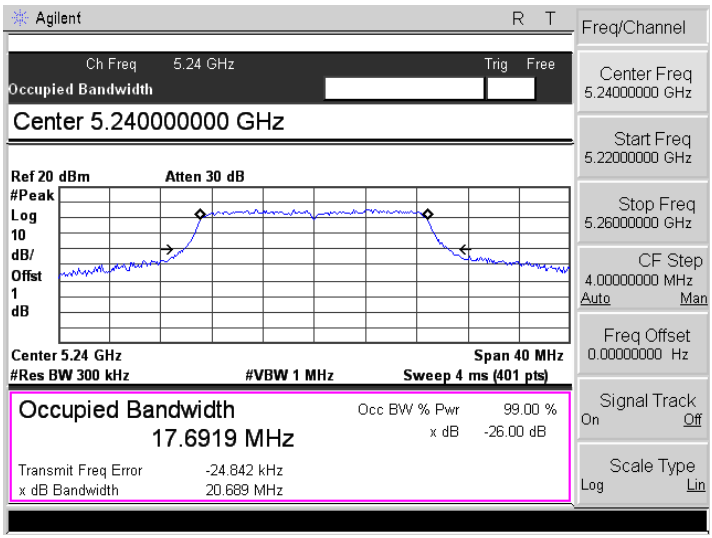
Emission Bandwidth and Occupied Bandwidth

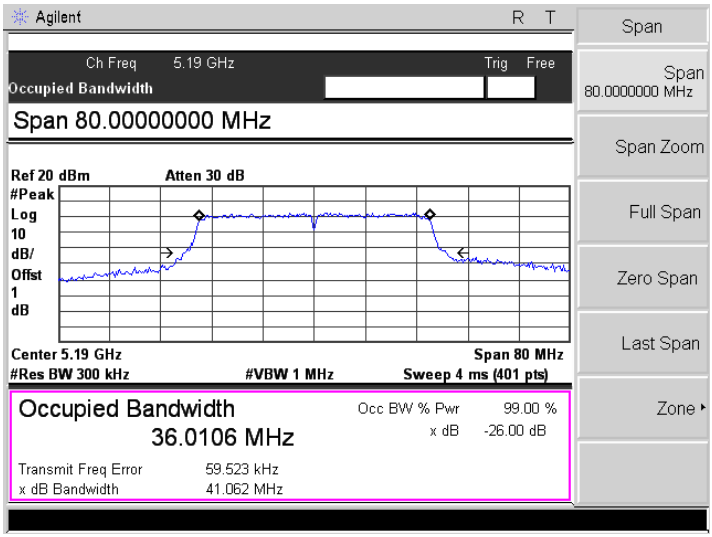
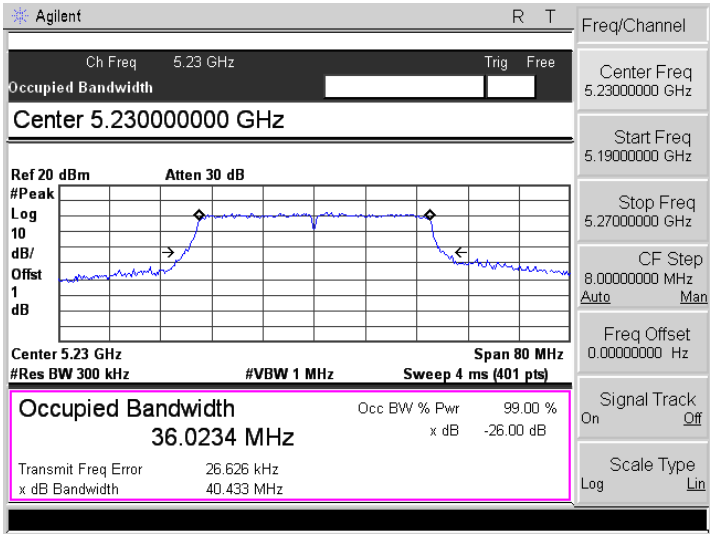
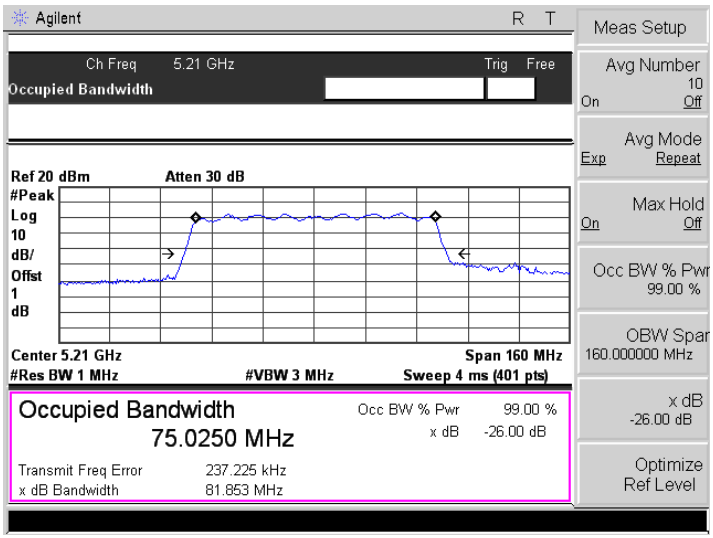
U-NII-1:5150-5250MHz				
Test Mode	**Test Channel MHz**	**26 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5180	25.111	16.828	Pass
	5200	25.180	16.839	Pass
	5240	25.096	16.846	Pass
802.11n-HT20	5180	21.505	17.749	Pass
	5200	21.261	17.724	Pass
	5240	20.689	17.692	Pass
802.11n-HT40	5190	41.062	36.011	Pass
	5230	40.433	36.023	Pass
802.11ac-HT80	5210	81.853	75.025	Pass

U-NII-3: 5725-5850MHz				
Test Mode	**Test Channel MHz**	**6 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit MHz**
802.11a	5745	16.447	16.763	≥500
	5785	16.496	16.736	≥500
	5825	16.469	16.746	≥500
802.11n-HT20	5745	17.696	17.702	≥500
	5785	17.643	17.695	≥500
	5825	17.725	17.696	≥500
802.11n-HT40	5755	36.396	36.027	≥500
	5795	36.372	36.026	≥500
802.11ac VH80	5775	75.620	75.127	≥500

5150-5250MHz

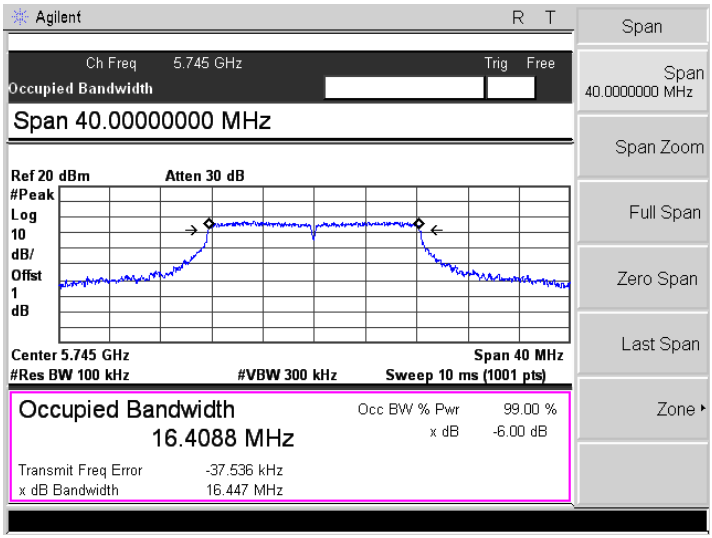
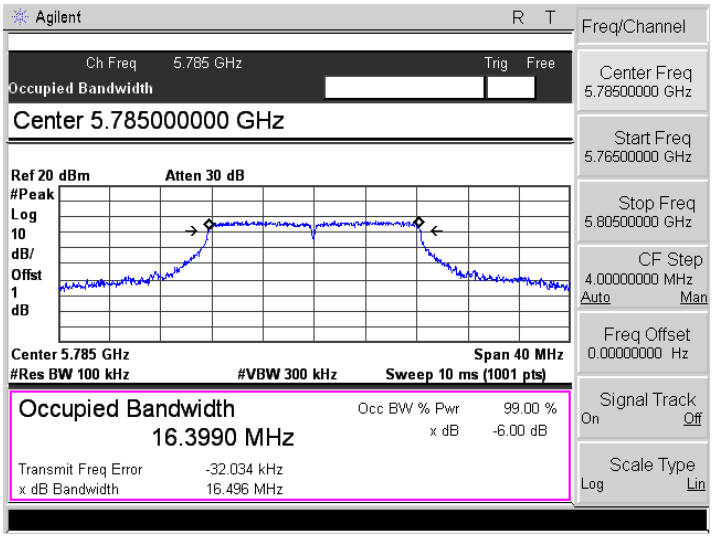
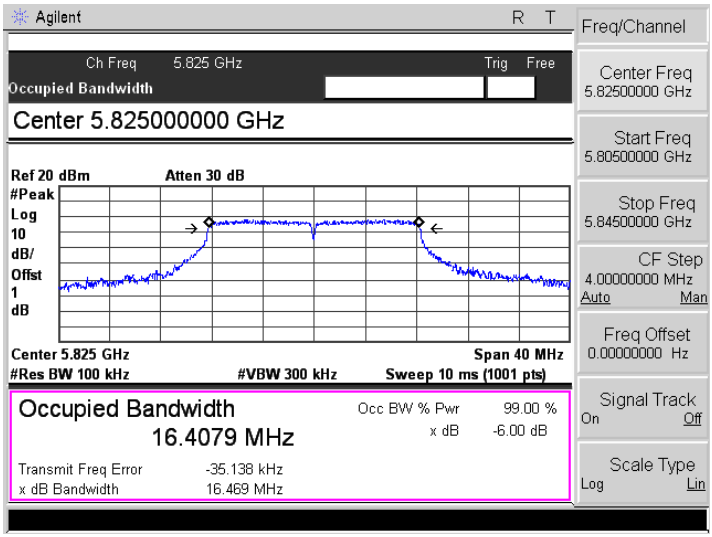
802.11a-Low	
802.11a-Middle	
802.11a-High	

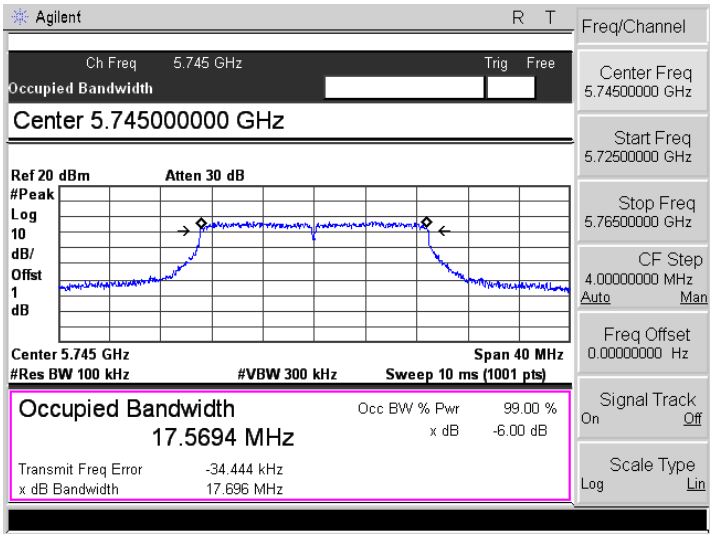
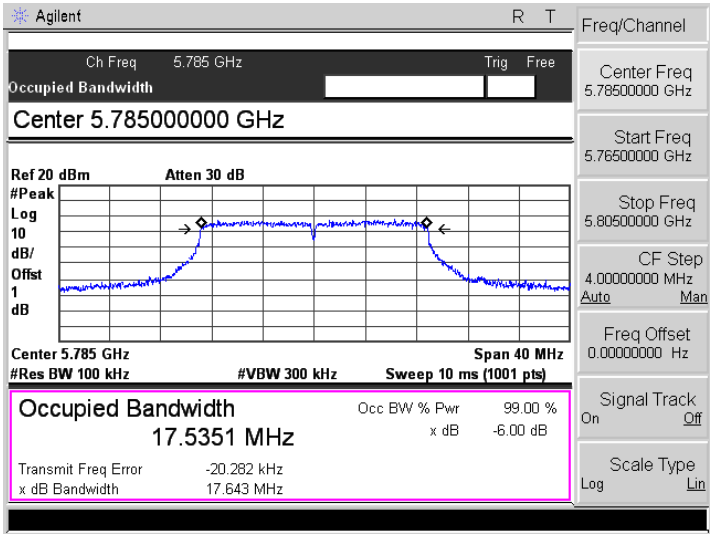
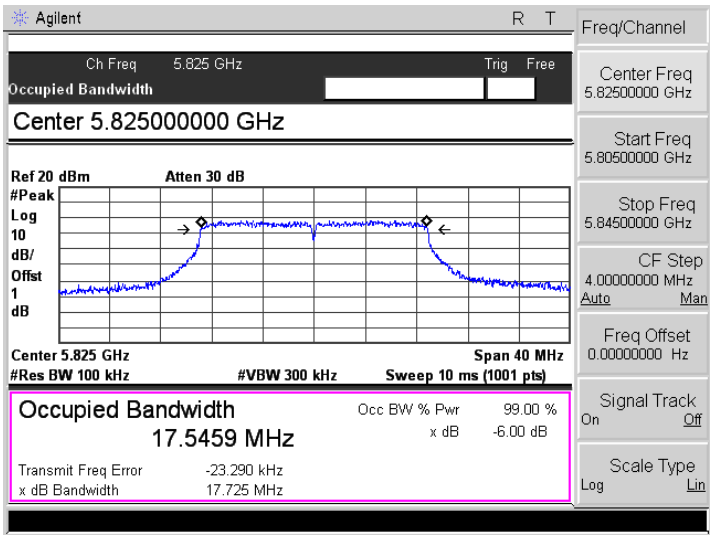
802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

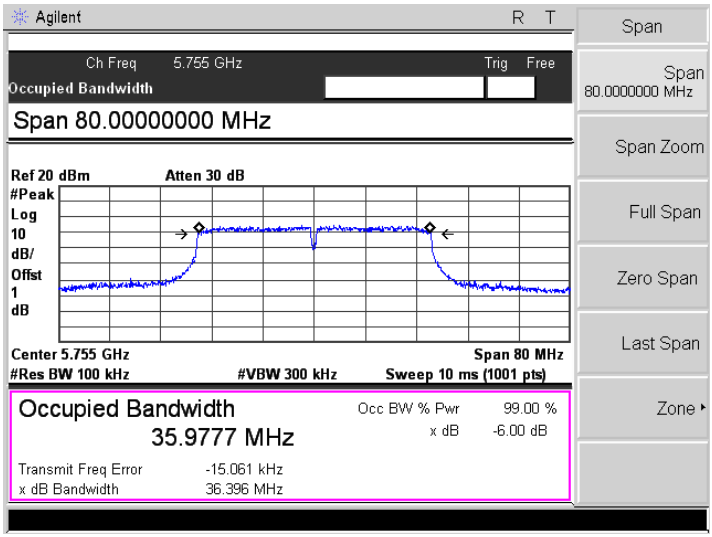
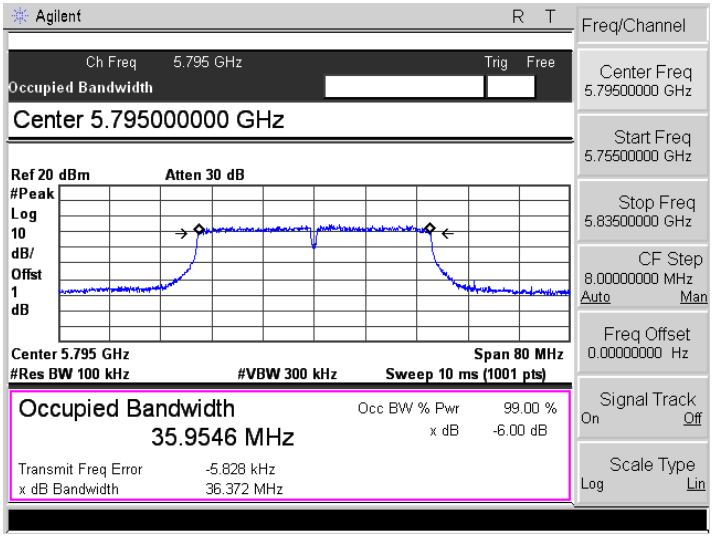
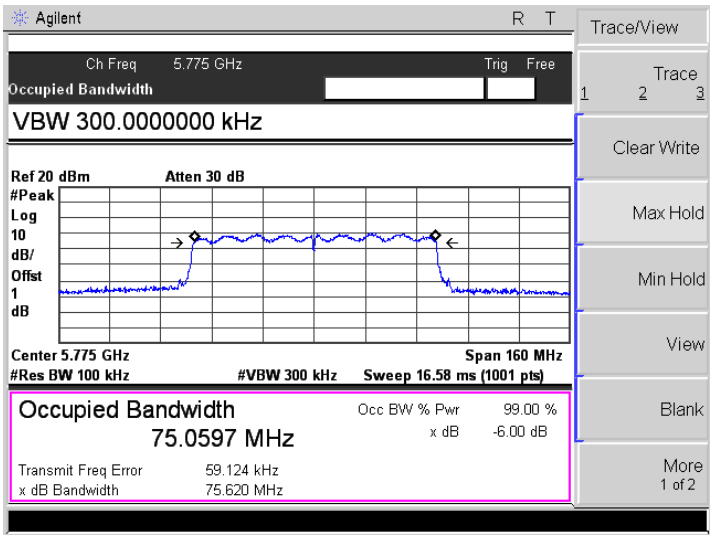
802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

5725-5850MHz

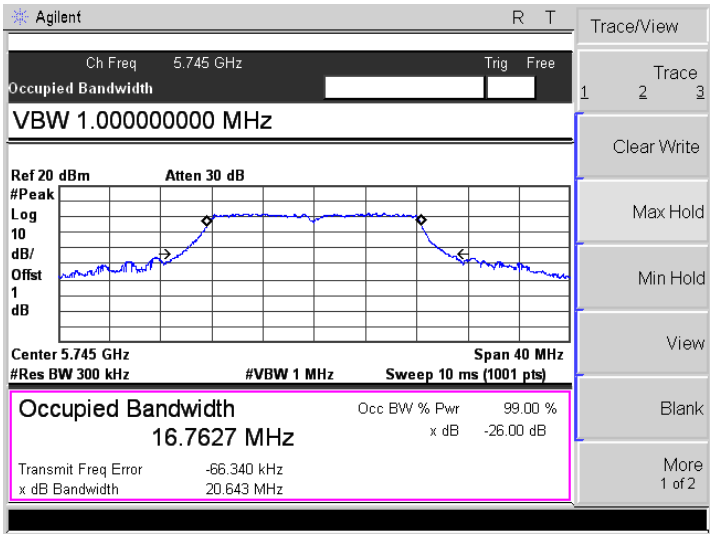
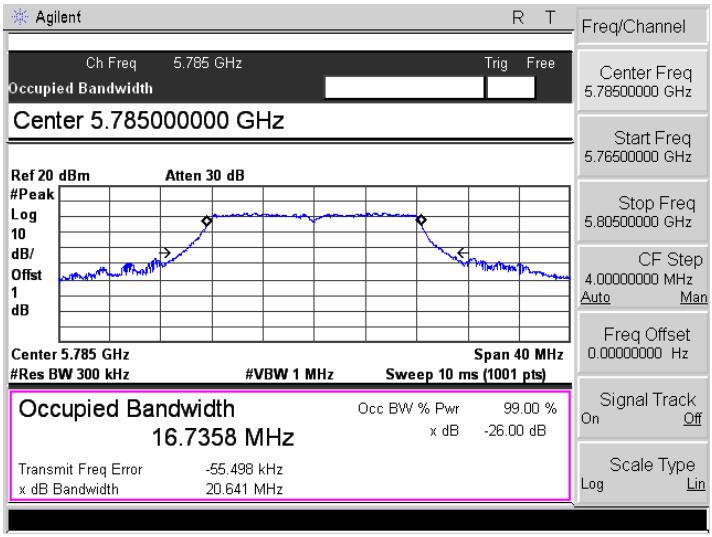
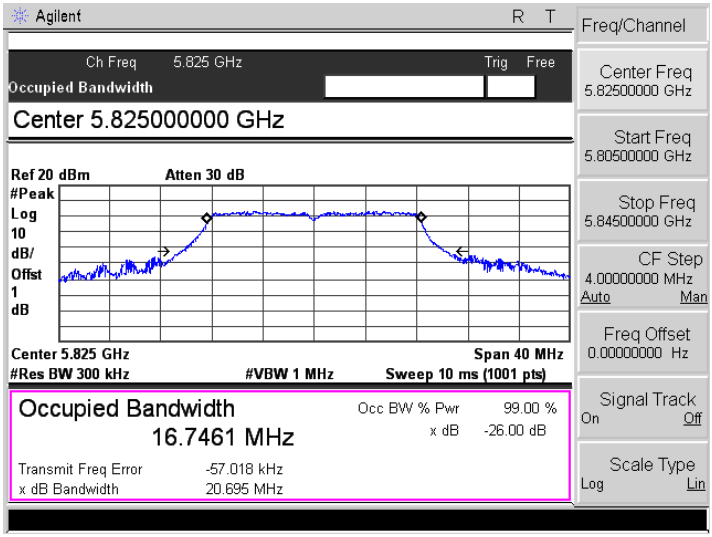
6 dB Bandwidth

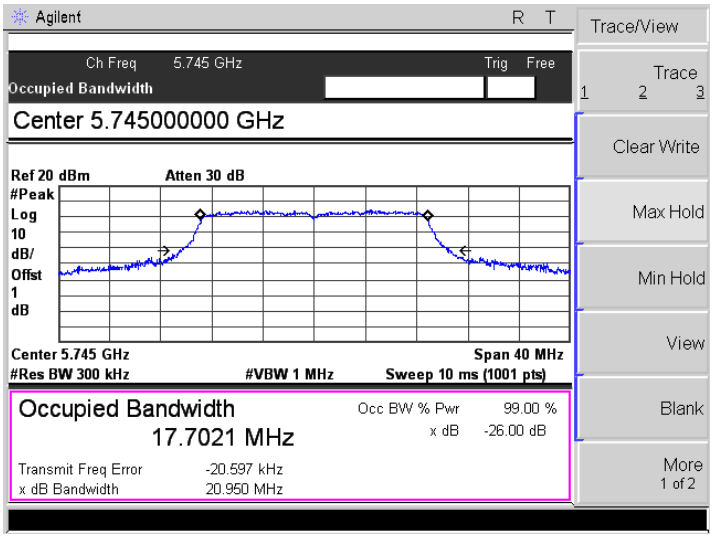
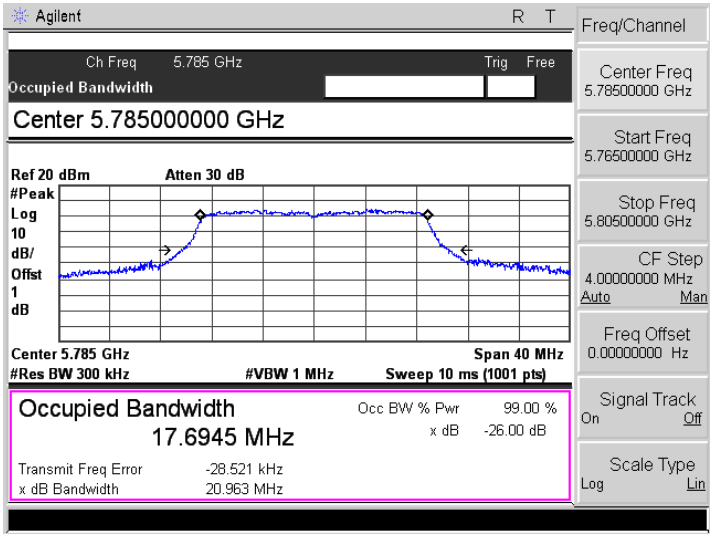
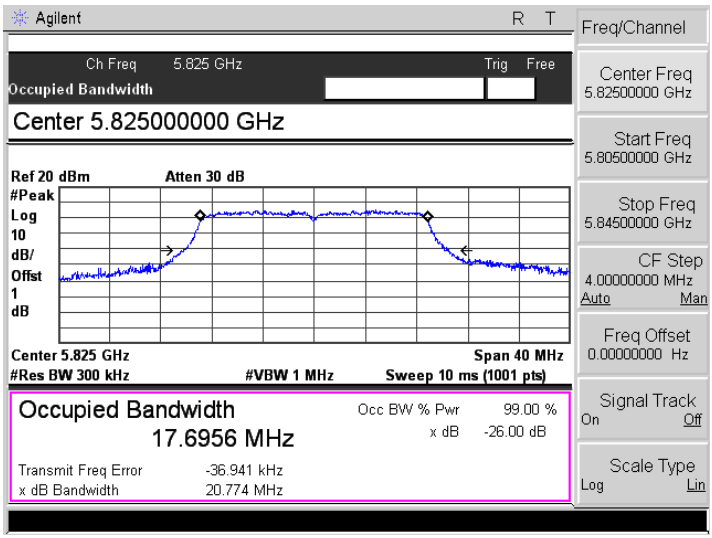
802.11a-Low	
802.11a-Middle	
802.11a-High	

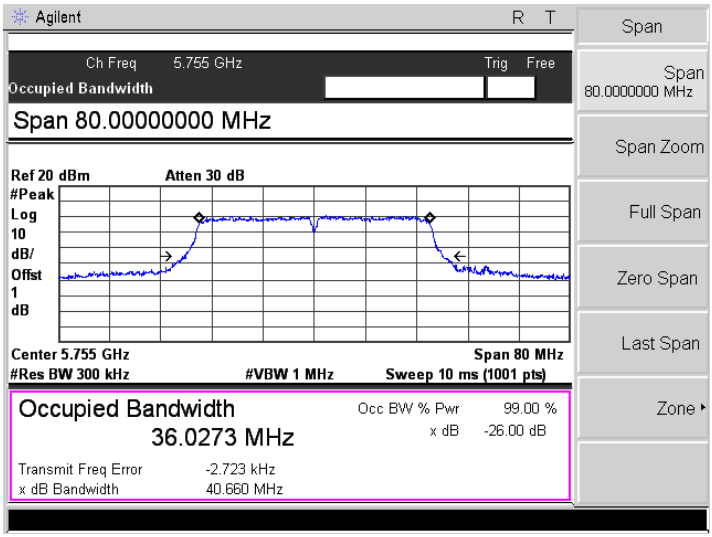
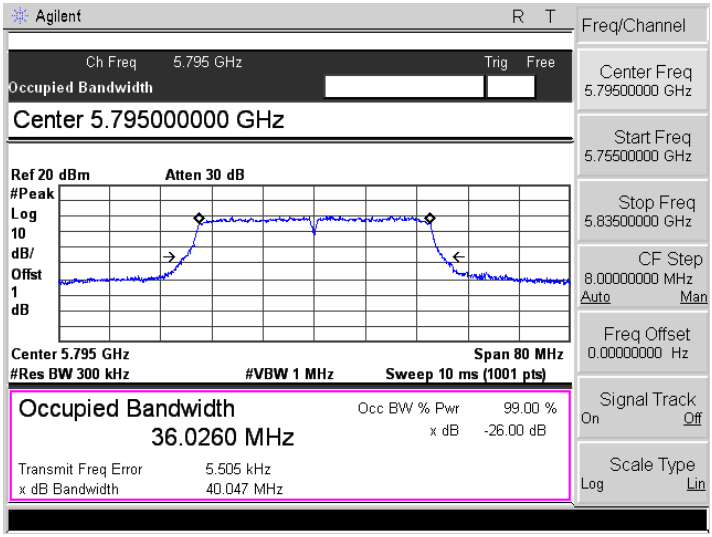
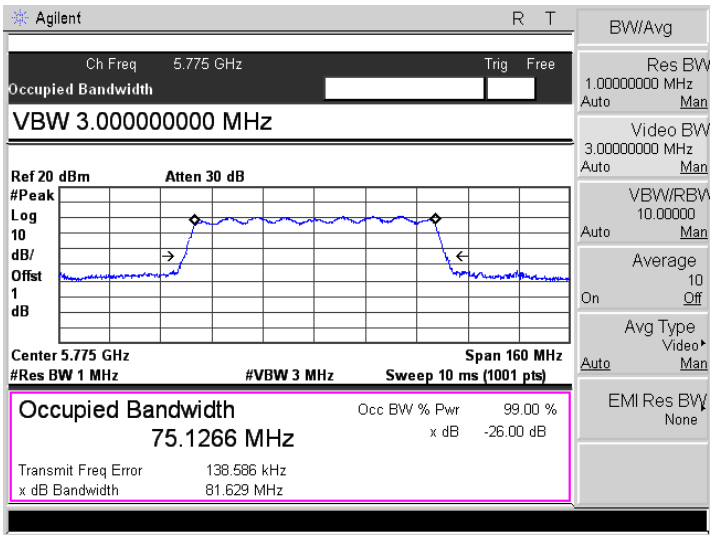
802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

99% Bandwidth

802.11a-Low	
802.11a-Middle	
802.11a-High	

802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

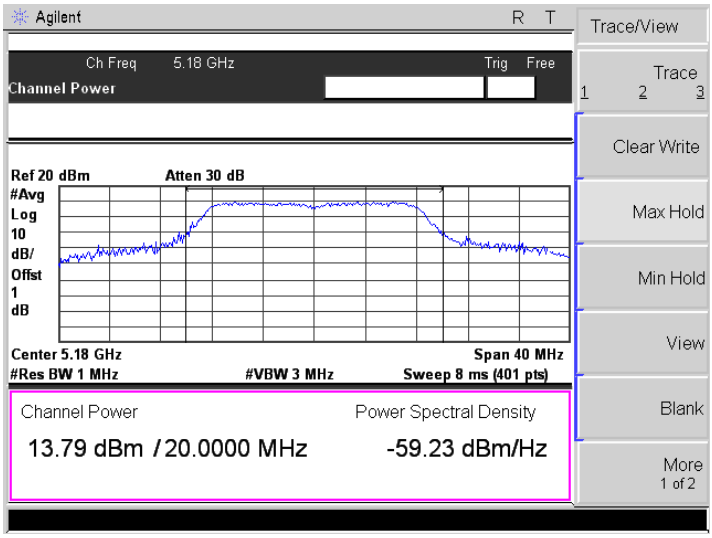
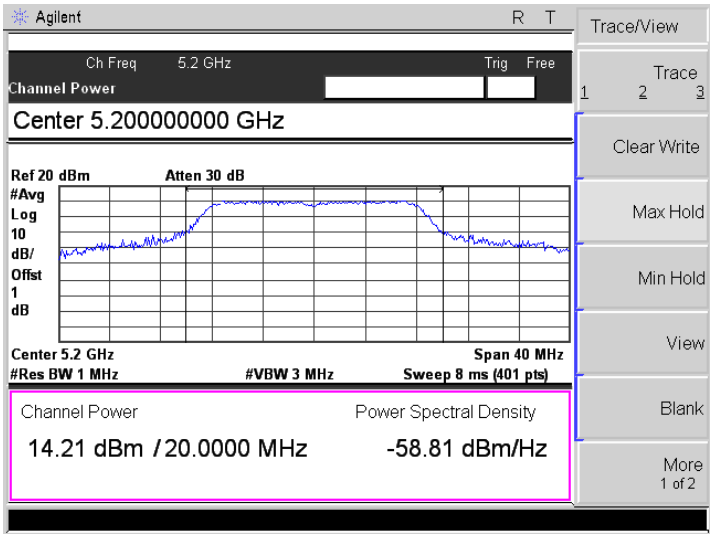
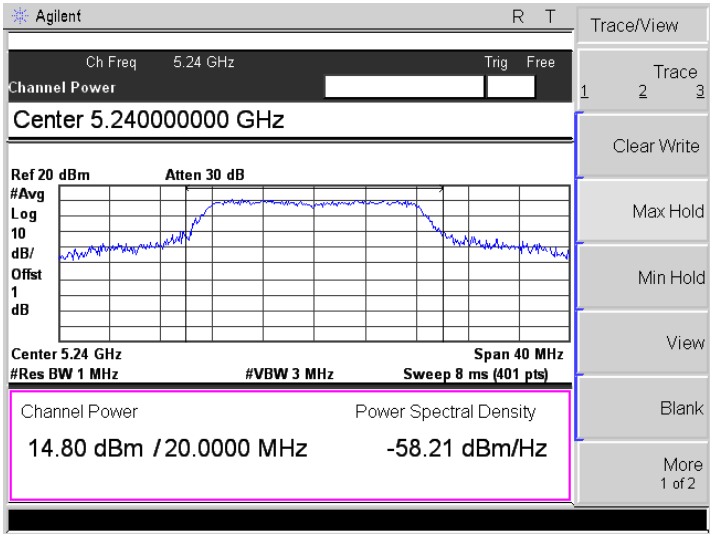
APPENDIX C

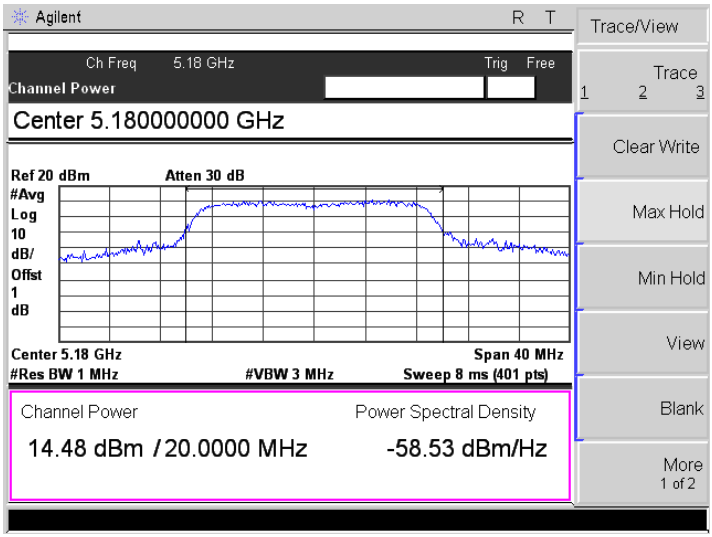
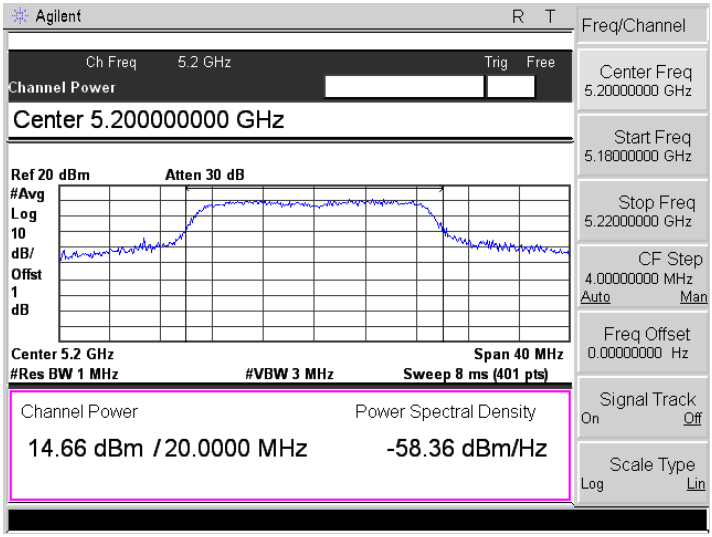
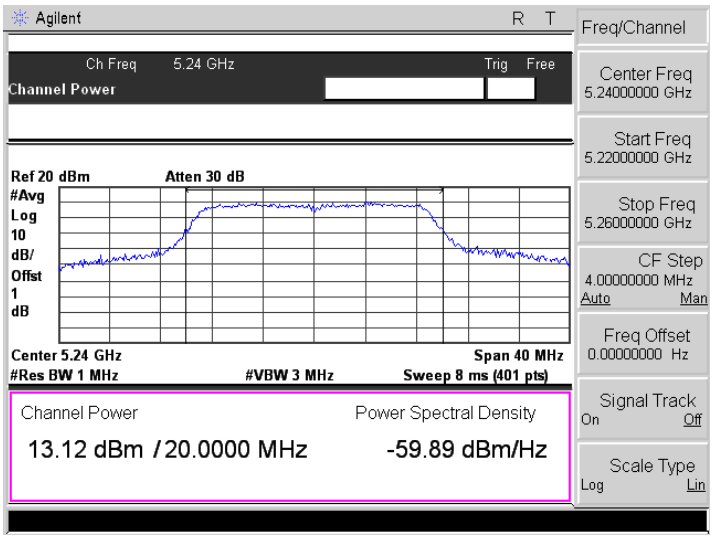
Maximum Conducted Output Power

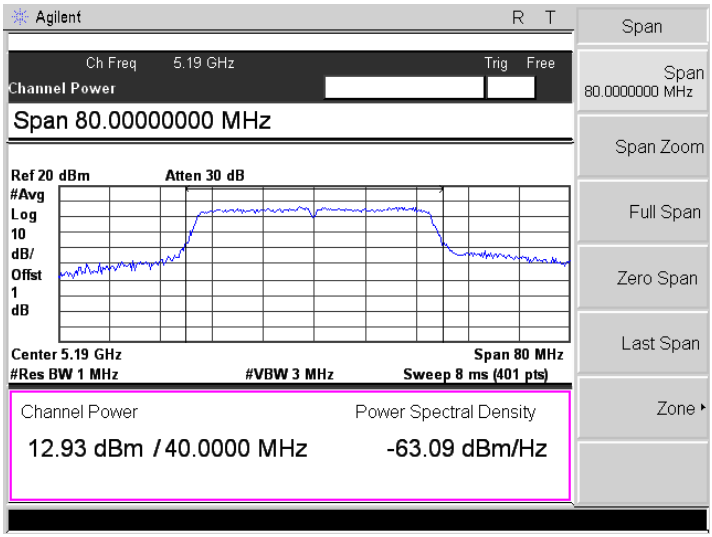
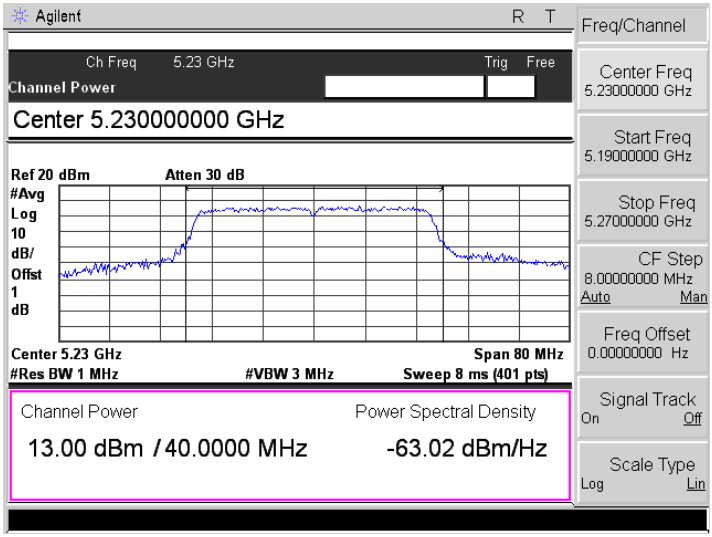
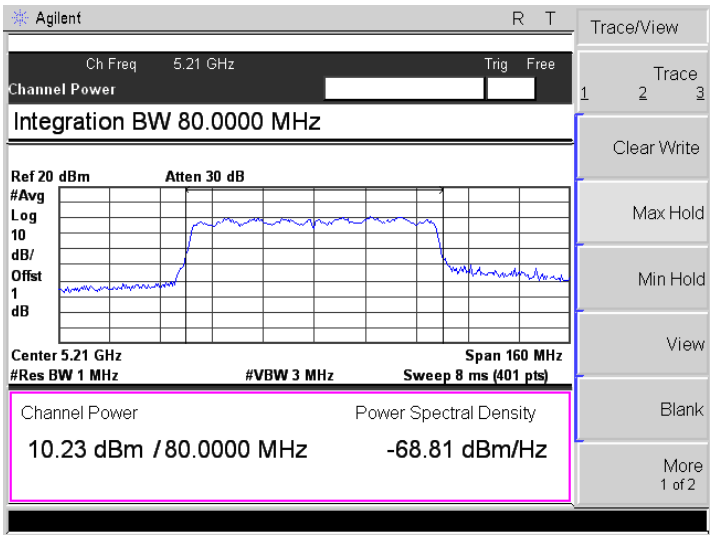
U-NII-1:5150-5250MHz			
Test mode	Frequency MHz	Output Power dBm	Limit dBm
802.11a	5180	13.79	23.98
	5200	14.21	23.98
	5240	14.80	23.98
802.11n-HT20	5180	14.48	23.98
	5200	14.66	23.98
	5240	13.12	23.98
802.11n-HT40	5190	12.93	23.98
	5230	13.00	23.98
802.11ac VH80	5210	10.23	23.98

U-NII-3: 5725-5850MHz			
Test mode	Frequency MHz	Output Power dBm	Limit dBm
802.11a	5745	10.07	30.00
	5785	10.07	30.00
	5825	11.02	30.00
802.11n-HT20	5745	8.94	30.00
	5785	9.71	30.00
	5825	10.19	30.00
802.11n-HT40	5755	9.26	30.00
	5795	9.17	30.00
802.11ac VH80	5775	8.09	30.00

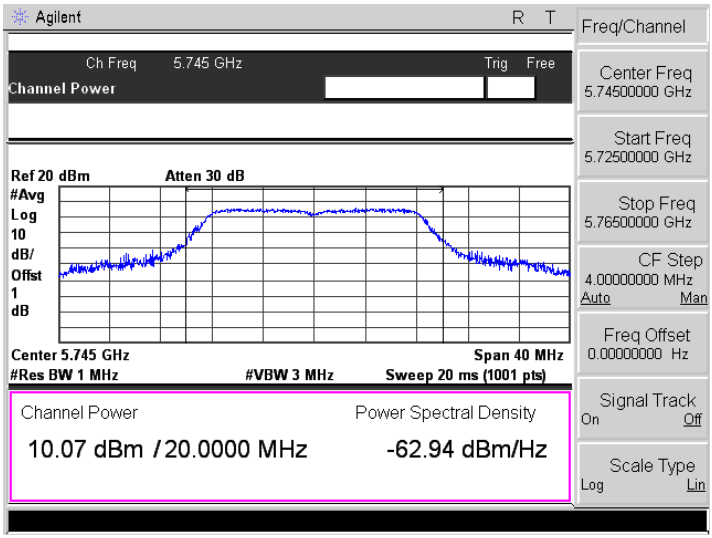
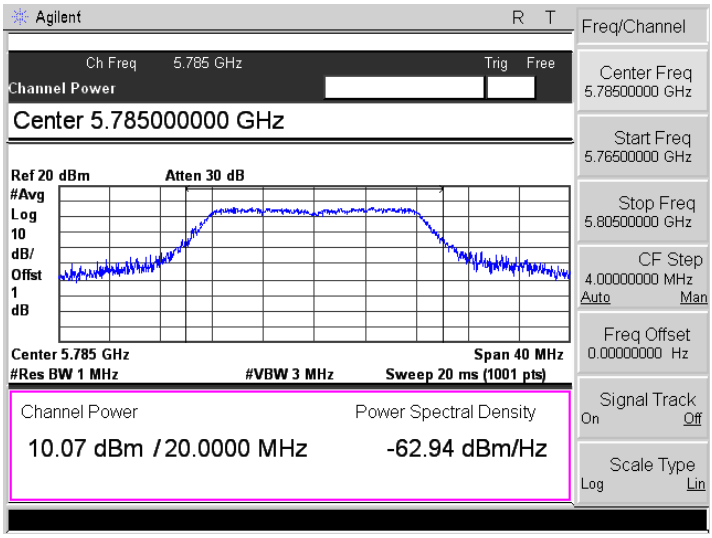
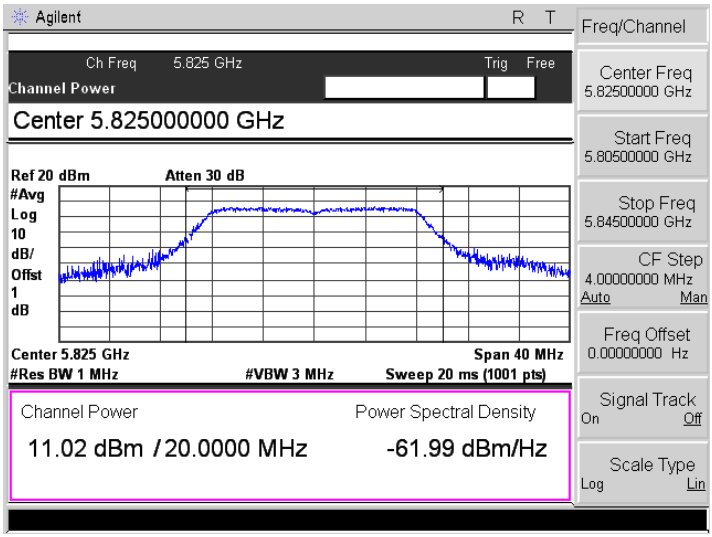
5150-5250MHz

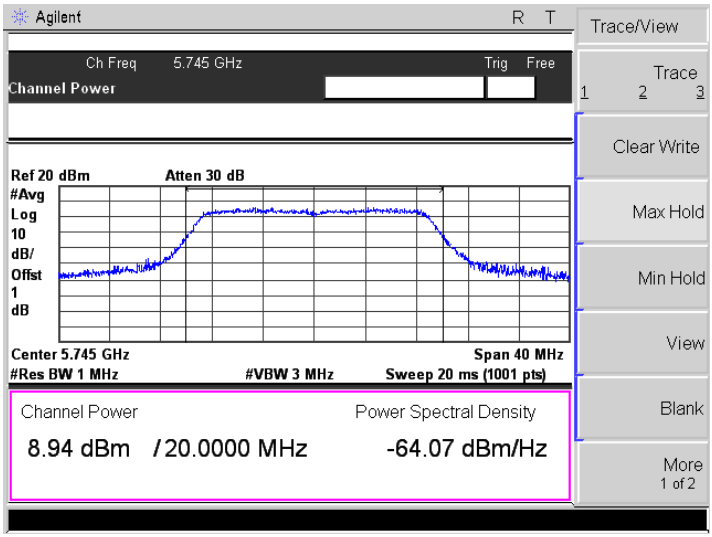
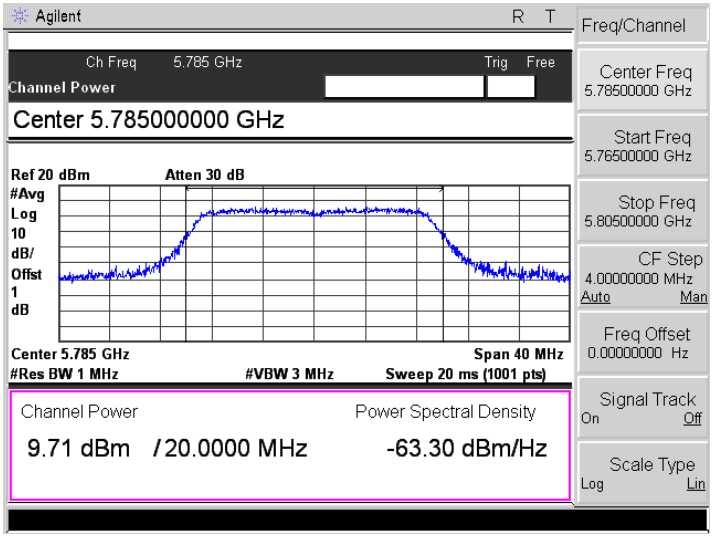
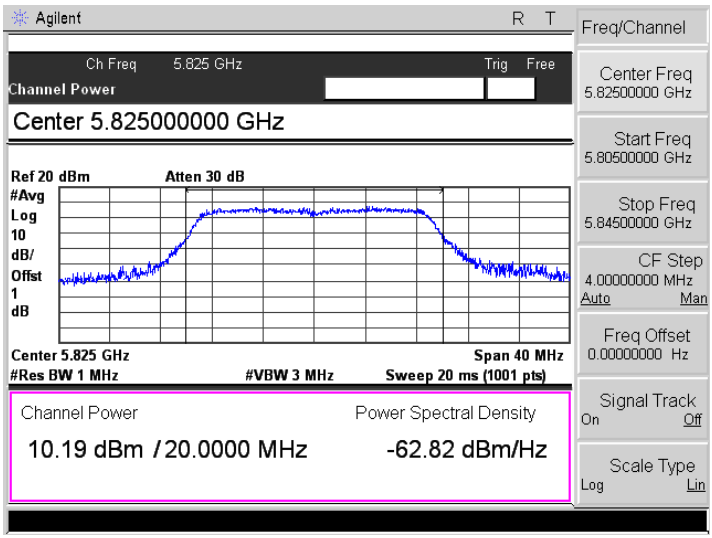
802.11a-Low	
802.11a-Middle	
802.11a-High	

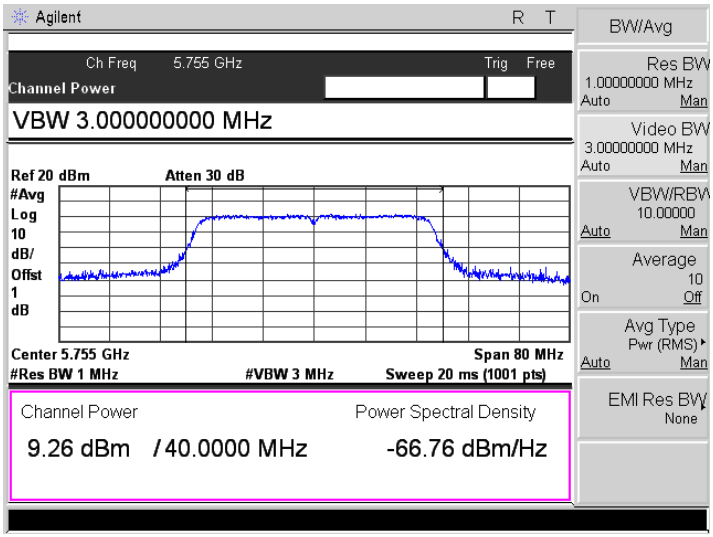
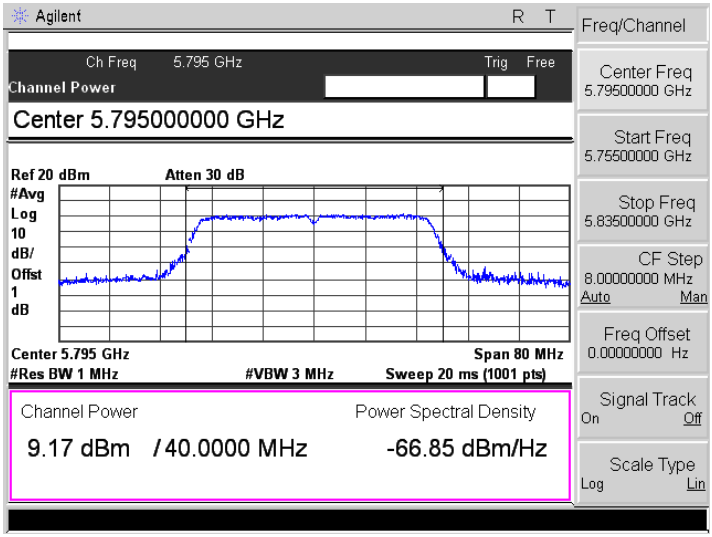
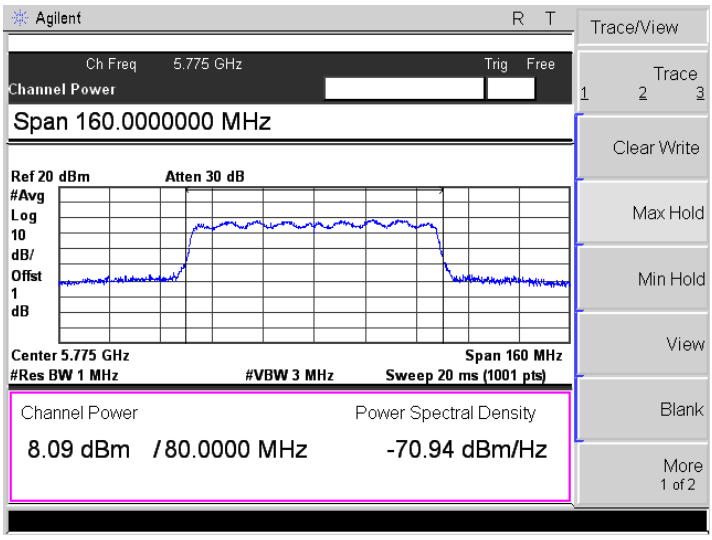
802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

5725-5850MHz

802.11a-Low	
802.11a-Middle	
802.11a-High	

802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

802.11n-HT40-Low	
802.11n-HT40-High	
802.11ac-HT80-Low	

APPENDIX D

Frequency Stability

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(℃)	Freq.Dev(Hz)	Deviation
100%	5.0	-30	1496	0.2876
100%		-20	1285	0.2471
100%		-10	1447	0.2783
100%		0	1345	0.2586
100%		+10	1216	0.2338
100%		+20	1509	0.2903
100%		+30	1029	0.1980
100%		+40	1563	0.3005
100%		+50	1331	0.2559
Low Battery power	5.50	+20	1557	0.2994
High Battery power	4.50	+20	1495	0.2875

U-NII-1:5725-5850MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(℃)	Freq.Dev(Hz)	Deviation
100%	5.0	-30	1498	0.2589
100%		-20	1279	0.2211
100%		-10	1439	0.2487
100%		0	1341	0.2317
100%		+10	1219	0.2108
100%		+20	1505	0.2601
100%		+30	1035	0.1788
100%		+40	1567	0.2709
100%		+50	1328	0.2296
Low Battery power	5.50	+20	1558	0.2694
High Battery power	4.50	+20	1499	0.2591

APPENDIX PHOTOGRAPHS

Please refer to "ANNEX"

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