FCC PART 15E TEST REPORT FOR CERTIFICATION
On Behalf of

CTOUCH Europe B.V.

WIFI MODULE

Model Number: WIM000AS

FCC ID: 2APQQ-WIM000AS

Prepared for:	CTOUCH Europe B.V.
	Achtseweg Zuid 153R, 5651 GW Eindhoven, Nederlands
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2003023
Date of Test:	Dec. 23, 2019~Mar. 04, 2020
Date of Report:	Mar. 06, 2020

TABLE OF CONTENTS

Description Page

TEST REPORT VERIFICATION 3
1. GENERAL INFORMATION 5
1.1. Description of Device (EUT) 5
1.2. The antenna information for EUT 7
2. SUMMARY OF TEST 8
2.1. Summary of test result 8
2.2. Test Facilities 9
2.3. Measurement uncertainty for EST Technology Co., Ltd. 10
2.4. Assistant equipment used for test 10
2.5. Block Diagram 10
2.6. Test Mode 11
2.7. Channel List 13
2.8. Power Setting of Test Software 13
2.9. Duty Cycle of Test Signal 14
2.10. Test Equipment List 18
3. 6DB BANDWIDTH &26DB BANDWIDTH & 99% OCCUPIED BANDWIDTH 20
3.1. Limit 20
3.2. Test Setup 20
3.3. Spectrum Analyzer Setting 20
3.4. Test Procedure 21
3.5. Test Result 22
3.6. Test Result 23
4. MAXIMUM CONDUCTED OUTPUT POWER 43
4.1. Limit 43
4.2. Test Setup 43
4.3. Test Procedure 43
4.4. Test Result 44
5. PEAK POWER SPECTRAL DENSITY 46
5.1. Limit 46
5.2. Test Setup 46
5.3. Spectrum Analyzer Setting 46
5.4. Test Procedure 46
5.5. Test Result 47
6. UNWANTED EMISSIONS AND BAND EDGE 60
6.1. Limit 60
6.2. Test Setup 61
6.3. Spectrum Analyzer Setting 62
6.4. Test Procedure 63
6.5. Test Result 64
7. FREQUENCY STABILITY 87
7.1. Limit 87
7.2. Test Setup 87
7.3. Spectrum Analyzer Setting 87
7.4. Test Procedure 88
7.5. Test Result 89

8. AC POWER LINE CONDUCTED EMISSIONS 91
8.1. Limit 91
8.2. Test Setup 91
8.3. Spectrum Analyzer Setting 91
8.4. Test Procedure 91
8.5. Test Result 92
9. ANTENNA REQUIREMENTS 96
9.1. Limit 96
9.2. Test Result 96
10. TEST SETUP PHOTO 97
11. EUT PHOTO 99

EST Technology Co., Ltd.

Applicant: **Address:**	CTOUCH Europe B.V. Achtseweg Zuid 153R, 5651 GW Eindhoven, Nederlands
Manufacturer: **Address:**	CTOUCH Europe B.V. Achtseweg Zuid 153R, 5651 GW Eindhoven, Nederlands
E.U.T:	WIFI MODULE
Model Number:	WIM000AS
Power Supply:	DC 12V From Adapter Input AC 100-240V, 50/60Hz
Trade Name:	CTOUCH Serial No.: ------
Date of Receipt:	Dec. 23, 2019 Date of Test: Dec. 23, 2019~Mar. 04, 2020
Test Specification:	FCC Part 15 Subpart E 15.407 ANSI C63.10:2013 FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 FCC KDB 662911 D01 Multiple Transmitter Output v02r01
Test Result:	The device described above is tested by EST Technology Co., Ltd. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart E requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd. **Date:** Mar. 05, 2020

Prepared by:	Reviewed by:	Approved by:
Ring	Shawn	
Ring / Assistant	Shawn / Engineer	Iceman Hu / Manager

Other Aspects:
None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

FCC ID	:	2APQQ-WIM000AS
Product Name	:	WIFI MODULE
Model Number	:	WIM000AS
Software Version	:	V01
Hardware Version	:	V01
Operation frequency	:	U-NII-1: 5150 MHz~5250 MHz U-NII-3: 5725 MHz~5850 MHz
Number of channel	:	U-NII-1: IEEE 802.11a / n HT20 / ac VHT20: 4 Channels; IEEE 802.11n HT40 / ac VHT40: 2 Channels; IEEE 802.11ac VHT80: 1 Channel. U-NII-3: IEEE 802.11a / n HT20 / ac VHT20: 5 Channels; IEEE 802.11n HT40 / ac VHT40: 2 Channels; IEEE 802.11ac VHT80: 1 Channel.
Modulation	:	OFDM(QPSK, BPSK, 16-QAM, 64-QAM,256-QAM)
Transmit Data Rate	:	IEEE 802.11a: 54, 48, 36, 24, 18, 12, 9, 6Mbps; IEEE 802.11n: up 150Mbps; IEEE 802.11ac: up to 866.6Mbps;
Channels Spacing	:	IEEE 802.11a: 20MHz; IEEE 802.11n HT20: 20MHz; IEEE 802.11n HT40: 40MHz; IEEE 802.11ac VHT20: 20MHz; IEEE 802.11ac VHT40: 40MHz; IEEE 802.11ac VHT80: 80MHz;

Transmit Power	:	U-NII-1	IEEE 802.11a: 15.05 IEEE 802.11n HT20: 16.01 IEEE 802.11n HT40: 15.80 IEEE 802.11ac VHT20: 15.67 IEEE 802.11ac VHT40: 15.73 IEEE 802.11ac VHT80: 8.79
		U-NII-3	IEEE 802.11a: 7.00 IEEE 802.11n HT20: 8.73 IEEE 802.11n HT40: 9.53 IEEE 802.11ac VHT20: 9.08 IEEE 802.11ac VHT40: 9.43 IEEE 802.11ac VHT80: 9.01
Sample Type	:	Prototype production	

Note:

For a more detailed features description, please refer to the manufacturer’s specifications or the user's manual.

1.2. The antenna information for EUT

Ant No.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	External antenna	N/A	2
2	N/A	N/A	External antenna	N/A	2

Remark:

(1) The EUT can work as CDD mode in IEEE 802.11n and IEEE 802.11ac,and can operate with one spatial stream.
According to KDB 662911 F 2) f) (i):
Directional gain=2dBi+10×log(2/1)dB=5.01dBi＜6dBi
So,the output power limit and power spectral density no need to be reduced.

(2) After pre-test all antenna configurations,the worst case configuration as list below.

ANT No. / TX Mode	SISO Configuration	MIMO Configuration
IEEE 802.11a	ANT1+ANT2	/
IEEE 802.11n HT20	/	ANT1+ANT2
IEEE 802.11n HT40	/	ANT1+ANT2
IEEE 802.11ac VHT20	/	ANT1+ANT2
IEEE 802.11ac VHT40	/	ANT1+ANT2
IEEE 802.11ac VHT80	/	ANT1+ANT2

2. SUMMARY OF TEST

2.1. Summary of test result

Report Section	Description of Test Item	FCC Standard Section	Results
3	6dB Bandwidth &26dB Bandwidth & 99% Occupied Bandwidth	15.407(a) 15.407(e)	PASS
4	Maximum Conducted Output Power	15.407(a)	PASS
5	Peak Power Spectral Density	15.407(a)	PASS
6	Unwanted Emissions and Band Edge	15.205 15.209 15.407(b)	PASS
7	Frequency Stability	15.407(g)	PASS
8	AC Power Line Conducted Emissions	15.207 15.407(b)(6)	PASS
9	Antenna Requirement	15.203	PASS

Note:

(1) “N/A” denotes test is not applicable in this test report

2.2. Test Facilities

EMC Lab	:	Certificated by CNAS, CHINA Registration No.: L5288 Date of registration: November 13, 2017 Certificated by FCC, USA Designation Number: CN1215 Test Firm Registration Number: 722932 Date of registration: November 21, 2017 Certificated by A2LA, USA Registration No.: 4366.01 Date of registration: November 07, 2017 Certificated by Industry Canada CAB identifier No.: CN0035 Date of registration: January 04, 2019 Certificated by VCCI, Japan Registration No.: R-13663; C-14103 Date of registration: July 25, 2017 This Certificate is valid until: July 24, 2020 Certificated by TUV Rheinland, Germany Registration No.: UA 50413872 0001 Date of registration: July 31, 2018 Certificated by TUV/PS, Shenzhen Registration No.: SCN1017 Date of registration: January 27, 2011 Certificated by Intertek ETL SEMKO Registration No.: 2011-RTL-L2-64 Date of registration: April 28, 2011 Certificated by Nemko, Hong Kong Registration No.: 175193 Date of registration: May 4, 2011
Name of Firm	:	EST Technology Co., Ltd.
Site Location	:	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

2.3. Measurement uncertainty for EST Technology Co., Ltd.

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.54dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.62
Uncertainty for Radiation Emission test (1GHz to 18GHz)	4.86
Uncertainty for spurious emissions test (18GHz to 40GHz)	4.67
Uncertainty for radio frequency	7×10-8
Uncertainty for conducted RF Power	0.20dB
Uncertainty for Power density test	0.26dB
Temperature	±0.6°C
Humidity	±4.0 %
Volatage DC	±1.0%
Volatage (AC, <10KHz)	±1.5%

Note:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

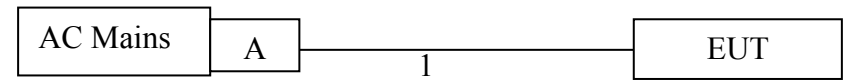
2.4. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
A	Adapter	FSP GROUP INC.	FSP065-10AABA	-	-

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	2.4m	DC Cable

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground.



AC 120V/60Hz

(EUT: WIFI MODULE)

2.6. Test Mode

Pre-scan has been combined all possible modulations and date rates to determine the worst case test mode,the worst case test mode was selected for the final test as listed below.

Test Item	Test Mode	Channel	Modulation	Data rate
6dB Bandwidth	IEEE 802.11a	149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	155	OFDM	MCS0
26dB Bandwidth	IEEE 802.11a	36/44/48/	OFDM	6Mbps
	IEEE 802.11n HT20	36//44/48	OFDM	MCS0
	IEEE 802.11n HT40	38/46	OFDM	MCS0
	IEEE 802.11ac VHT20	36/44/48	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46	OFDM	MCS0
	IEEE 802.11ac VHT80	42	OFDM	MCS0
99% Occupied Bandwidth	IEEE 802.11a	36/40/48/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/155	OFDM	MCS0
Maximum Conducted Output Power	IEEE 802.11a	36/40/48/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/155	OFDM	MCS0

Peak Power Spectral Density	IEEE 802.11a	36/40/48/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/155	OFDM	MCS0
Unwanted Emissions and Band Edge(Above 1GHz)	IEEE 802.11a	36/40/48/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/155	OFDM	MCS0
Unwanted Emissions Below 1GHz	IEEE 802.11a	36	OFDM	6Mbps
Frequency Stability	Unmodulation	36/149	N/A	N/A
AC Power Line Conducted Emissions	IEEE 802.11a	36	OFDM	6Mbps

Note:

1. In radiated measurement,the EUT had been pre-scan on the positioned of each 3 axis(X,Y,Z), the worst case was found when positioned on **X-plane.**

2.7. Channel List

Band	Mode	Channel	Frequency (MHz)
U-NII-1	IEEE 802.11a & n HT20 & ac VHT20	36	5180
		40	5200
		44	5220
		48	5240
	IEEE 802.11n HT40 & ac VHT40	38	5190
		46	5230
	IEEE 802.11ac VHT80	42	5210
U-NII-3	IEEE 802.11a & n HT20 & ac VHT20	149	5745
		153	5765
		157	5785
		161	5805
		165	5825
	IEEE 802.11n HT40 & ac VHT40	151	5755
		159	5795
	IEEE 802.11ac VHT80	155	5775

2.8. Power Setting of Test Software

Software Name	MTool2.0.0.7		
Frequency(MHz)	5745	5785	5825
IEEE 802.11a Setting	40,40	40,40	40,40
IEEE 802.11n HT20 Setting	40,40	40,40	40,40
IEEE 802.11ac VHT20 Setting	40,40	40,40	40,40
Frequency(MHz)	5755	5795	
IEEE 802.11n HT40 Setting	40,40	40,40	
IEEE 802.11ac VHT40 Setting	40,40	40,40	
Frequency(MHz)	5775		
IEEE 802.11ac VHT80 Setting	40,40		

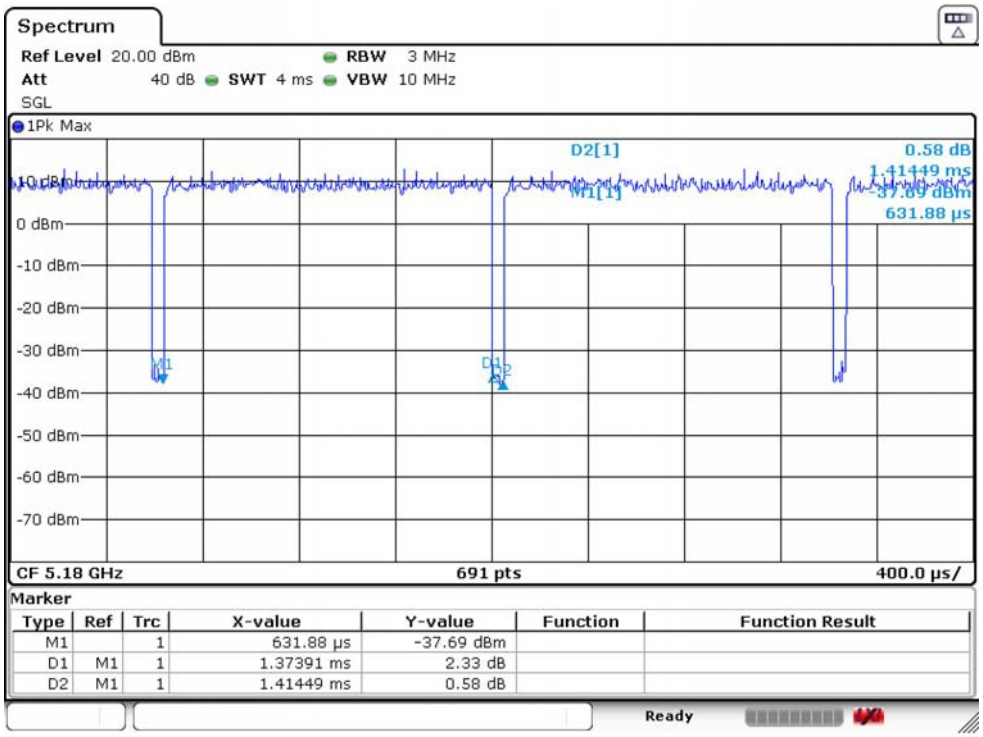
2.9. Duty Cycle of Test Signal

Temperature	24.8℃	Relative Humidity		56%	Test Voltage		120V/60Hz
Mode	Frequency (MHz)	On time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T (Hz)	VBW Setting (dB)
IEEE 802.11a	5180	1.37391	1.41449	97.13	0.13	1952	1952
IEEE 802.11n HT20	5180	1.28116	1.32754	96.51	0.15	1952	1952
IEEE 802.11n HT40	5190	1.29275	1.33333	96.96	0.13	1952	1952
IEEE 802.11ac VHT20	5180	0.64058	0.68696	93.25	0.30	1952	1952
IEEE 802.11ac VHT40	5190	0.64348	0.68986	93.28	0.30	1952	1952
IEEE 802.11ac VHT80	5210	0.32464	0.37101	87.50	0.58	1952	1952

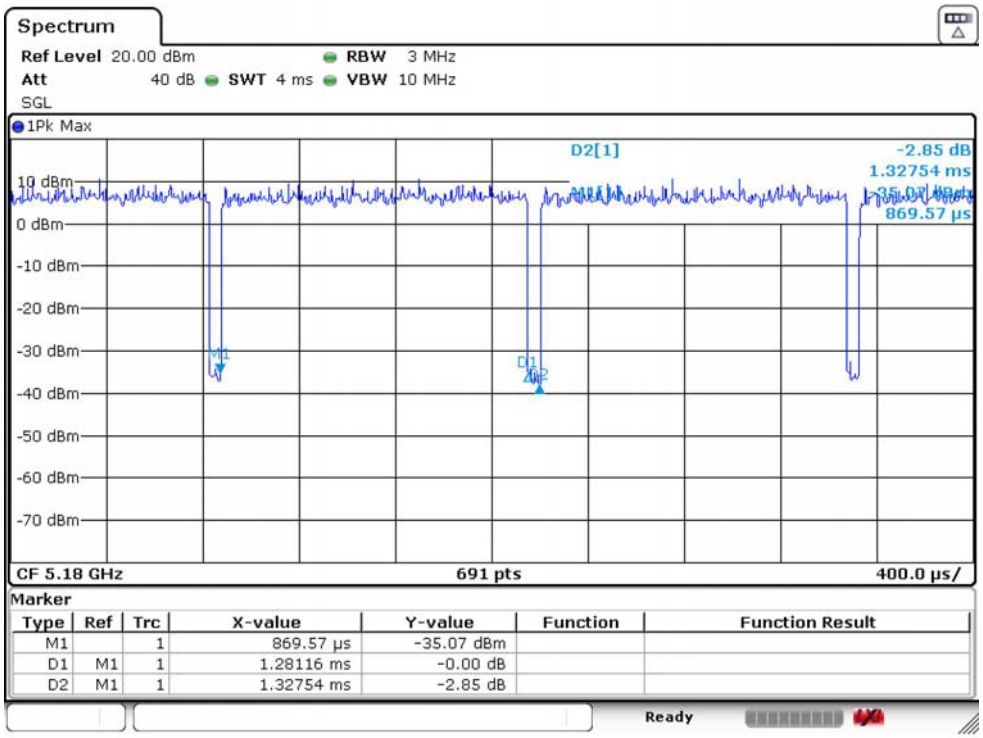
Note:

1. Duty Cycle=On Time/Total Time×100%.
2. Duty Factor=10×Log(1/Duty Cycle).
3. If duty cycle <98 %, the conducted average output power and average power spectral density should be add duty factor.
4. If duty cycle⩾98 %,the EUT is consider to be transmitting continuously,the conducted average output power and average power spectral density no need to add duty factor.
5. The on-time time is transmission duration(T).
6. The VBW Setting is use for RMS measurement in unwanted emissions and band edge(Above 1GHz) test.

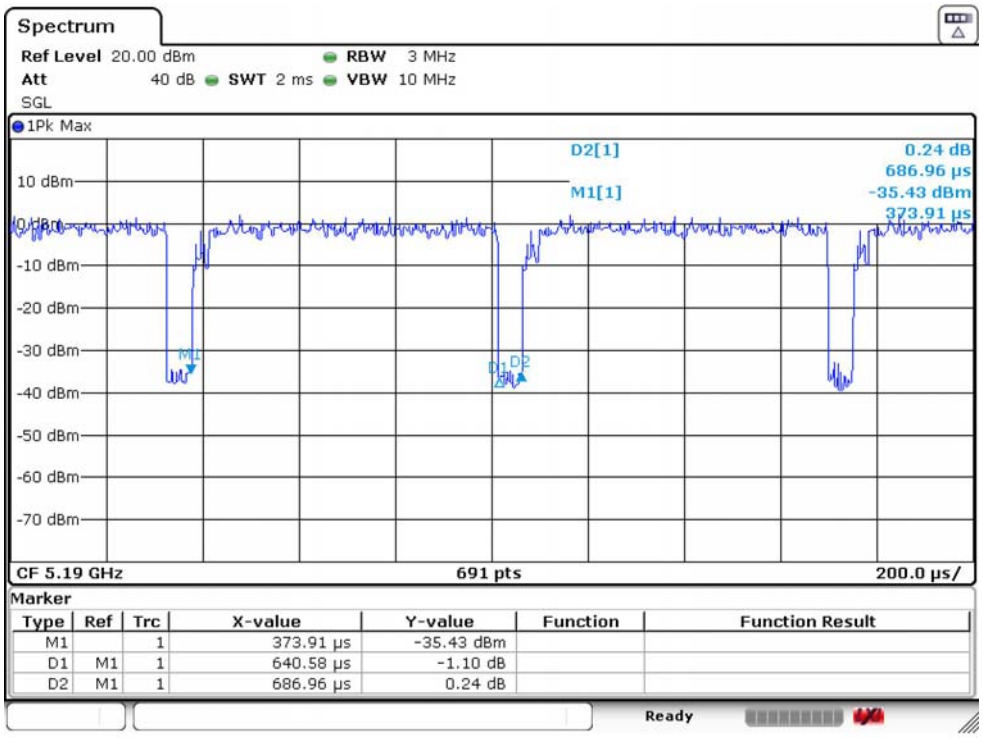
IEEE 802.11a 5180MHz



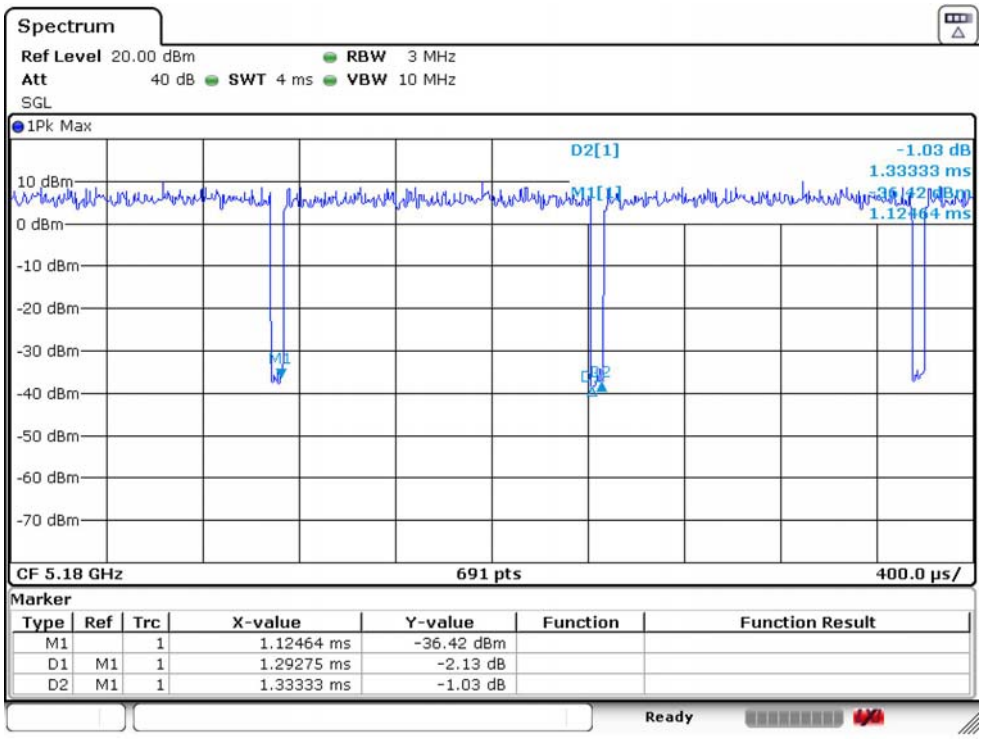
IEEE 802.11n HT20 5180MHz



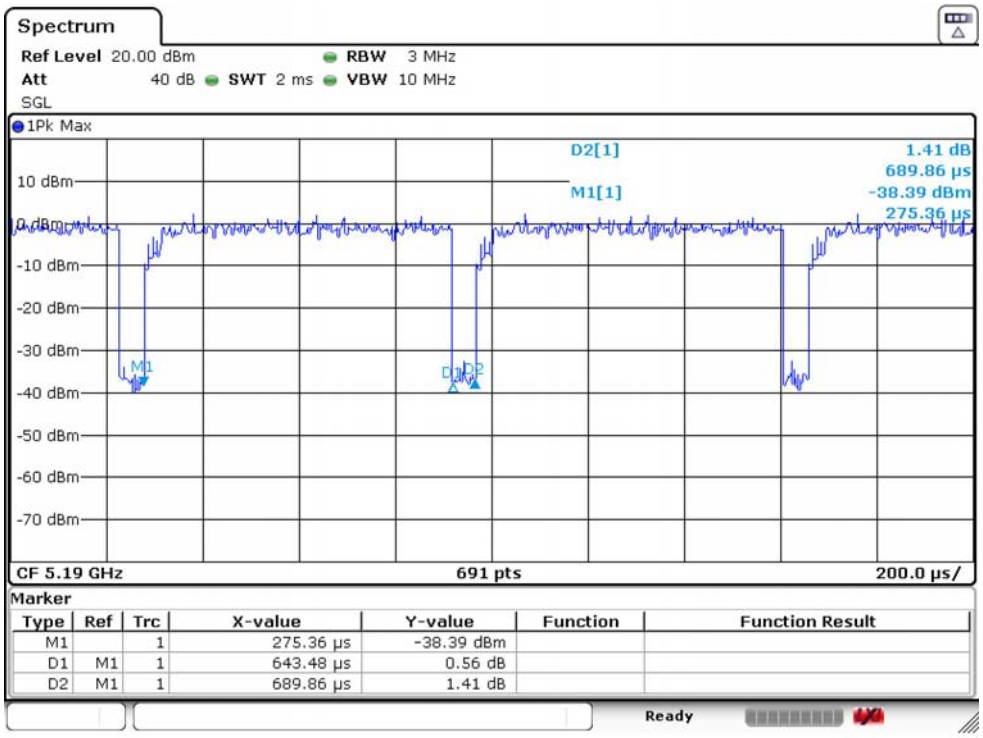
IEEE 802.11n HT40 5190MHz



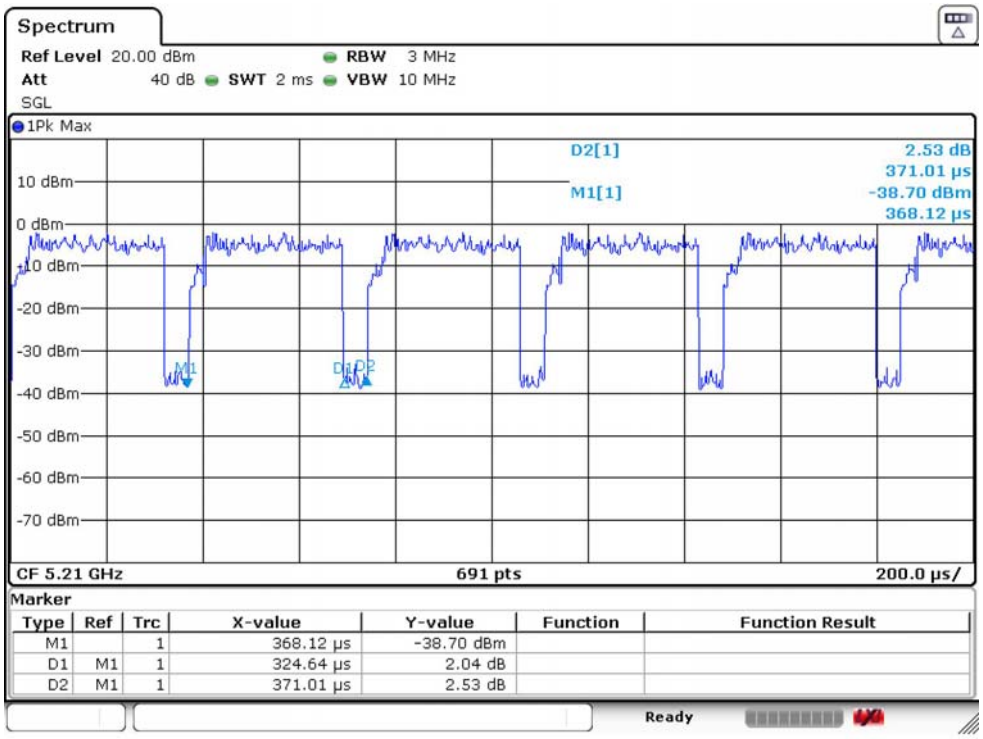
IEEE 802.11ac VHT20 5180MHz



IEEE 802.11ac VHT40 5190MHz



IEEE 802.11ac VHT80 5210MHz



2.10. Test Equipment List

For AC power conducted emissions test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	EST-E001	LISAI	June 14,19	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	EST-E002	LISAI	June 14,19	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	EST-E078	LISAI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

For radiated emissions test(9KHz-30MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 14,19	1 Year
Active Loop Antenna	SCHWAREB ECK	FMZB 1519B	EST-E054	LISAI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
9kHz-30MHz Cable	N/A	EST-001	N/A	N/A	N/A	N/A

For radiated emissions test(30MHz-1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 14,19	1 Year
Bilog Antenna	Teseq	CBL 6111D	EST-E034	LISAI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
30-1000MHz Cable	N/A	EST-002	N/A	N/A	N/A	N/A

For radiated emissions test(Above 1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	EST-E031	LISAI	June 14,19	1 Year
Signal Amplifier	SCHWARZB ECK	BBV9718	EST-E032	LISAI	June 14,19	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV40	EST-E069	LISAI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
Above 1GHz Cable	N/A	EST-003	N/A	N/A	N/A	N/A

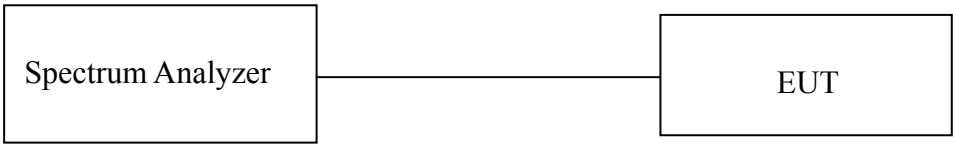
For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
TS 8997	Rohde &Schwarz	/	/	/	/	/
Open Switch and Control Unit	Rohde &Schwarz	OSP-B157WB	EST-E036	LISAI	June 14,19	1Year
Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	EST-E037	LISAI	June 14,19	1 Year
Signal Generator	Rohde &Schwarz	SMB100A	EST-E038	LISAI	June 14,19	1 Year
Vector Signal Generator	Rohde &Schwarz	SMBV100A	EST-E039	LISAI	June 14,19	1Year
Test Software	Rohde &Schwarz	WMS32	V10.50.00	N/A	N/A	N/A
Temperature controller	Terchy	MHQ	EST-E101	LISAI	June 14,19	1 Year

3. 6dB Bandwidth &26dB Bandwidth & 99% Occupied Bandwidth

3.1. Limit

Band	Frequency (MHz)	Test Item	Limit
U-NII-1	5150-5250	26dB Bandwidth&99% Occupied Bandwidth	N/A
U-NII-2A	5250-5350	26dB Bandwidth&99% Occupied Bandwidth	N/A
U-NII-2C	5470-5725	26dB Bandwidth&99% Occupied Bandwidth	N/A
U-NII-3	5725-5850	6dB Bandwidth&99% Occupied Bandwidth	6dB Bandwidth≥500KHz

3.2. Test Setup



3.3. Spectrum Analyzer Setting

6dB Bandwidth	
Spectrum Parameters	Setting
RBW	100KHz
VBW	300KHz
Span	40MHz(20MHz Bandwidth mode) 60MHz(40MHz Bandwidth mode) 120MHz(80MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

26dB Bandwidth	
Spectrum Parameters	Setting
RBW	approximately 1% of the emission bandwidth
VBW	＞RBW
Span	40MHz(20MHz Bandwidth mode) 60MHz(40MHz Bandwidth mode) 120MHz(80MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

99% Occupied Bandwidth	
Spectrum Parameters	Setting
RBW	1% to 5% of the OBW
VBW	approximately three times the RBW
Span	between 1.5 times and 5.0 times the OBW
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

3.4. Test Procedure

For 26dB Bandwidth Measurement :

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 3.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, measure the maximum width of the emission that is 26 dB down from the peak of the emission.Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

For 6dB Bandwidth Measurement :

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 3.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, 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.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

For 99% Occupied Bandwidth Measurement :

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 3.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the 99% power bandwidth function to measure bandwidth.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

3.5. Test Result

Temperature	24.8℃	Relative Humidity	56%	Test Voltage	120V/60Hz

26dB Bandwidth&99% Occupied Bandwidth

BAND	Test Mode	Fre (MHz)	26dB Bandwidth (MHz)		99% Occupied Bandwidth（MHz）		Calculate Power Limit (W)	Calculate Power Limit (dBm)
			Ant 1	Ant 2	Ant 1	Ant 2		
U-NII-1	IEEE 802.11a	5180	22.402	21.534	17.077	16.845	0.2500	23.98
		5200	22.402	21.592	17.077	16.845	0.2500	23.98
		5240	22.460	21.592	16.961	16.903	0.2500	23.98
	IEEE 802.11n HT20	5180	22.055	21.302	17.771	17.713	0.2500	23.98
		5200	21.534	21.418	17.771	17.713	0.2500	23.98
		5240	21.418	21.592	17.771	17.713	0.2500	23.98
	IEEE 802.11ac VHT20	5180	21.997	21.36	17.829	17.771	0.2500	23.98
		5200	21.823	21.302	17.829	17.713	0.2500	23.98
		5240	21.766	21.418	17.771	17.771	0.2500	23.98
	IEEE 802.11n HT40	5190	44.631	44.457	37.511	37.511	0.2500	23.98
		5230	44.284	44.544	37.742	37.511	0.2500	23.98
	IEEE 802.11ac VHT40	5190	44.284	44.284	37.395	37.395	0.2500	23.98
		5230	44.023	44.284	37.627	37.511	0.2500	23.98
	IEEE 802.11ac VHT80	5210	83.36	83.18	75.716	75.543	0.2500	23.98

Temperature	24.8℃	Relative Humidity	56%	Test Voltage	120V/60Hz

6dB Bandwidth&99% Occupied Bandwidth

BAND	Test Mode	Fre (MHz)	6dB Bandwidth (MHz)		99% Occupied Bandwidth（MHz）		6dB BW Min Limit (MHz)	Result
			Ant 1	Ant 2	Ant 1	Ant 2		
U-NII-3	IEEE 802.11a	5745	16.314	16.314	16.903	16.845	0.5	PASS
		5785	16.314	16.316	16.903	16.845	0.5	PASS
		5825	16.317	16.313	16.961	16.903	0.5	PASS
	IEEE 802.11n HT20	5745	16.933	16.686	17.771	17.771	0.5	PASS
		5785	16.926	16.686	17.829	17.771	0.5	PASS
		5825	16.901	16.685	17.771	17.887	0.5	PASS
	IEEE 802.11ac VHT20	5745	16.929	16.554	17.771	17.829	0.5	PASS
		5785	16.931	16.558	17.829	17.771	0.5	PASS
		5825	16.927	16.555	17.887	17.945	0.5	PASS
	IEEE 802.11n HT40	5755	35.821	36.045	37.858	37.742	0.5	PASS
		5795	35.827	36.031	37.742	37.742	0.5	PASS
	IEEE 802.11ac VHT40	5755	36.043	35.833	37.858	37.627	0.5	PASS
		5795	36.029	35.831	37.742	37.627	0.5	PASS
	IEEE 802.11ac VHT80	5775	75.138	75.11	75.716	75.543	0.5	PASS

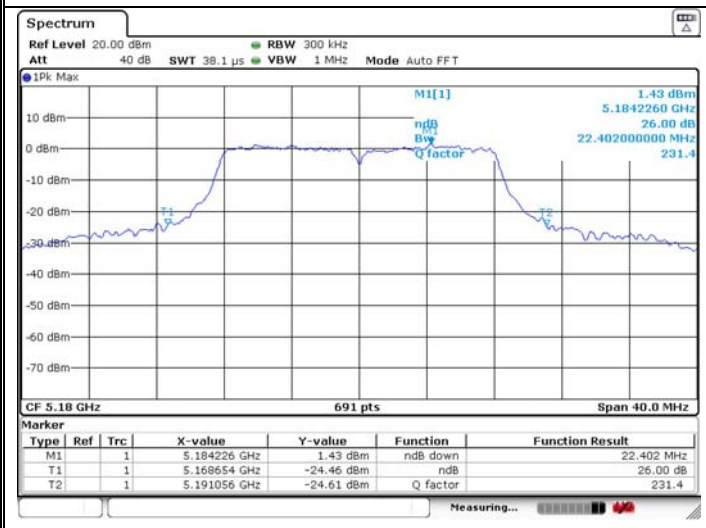
Note :

For Band U-NII-2A and U-NII-2C,the maximum conducted output power limit is 250mw or 11+10×Log B, which is lesser,where B is the 26dB Bandwidth in MHz.So in this section,the maximum conducted output power limit can calculate with 26dB Bandwidth.

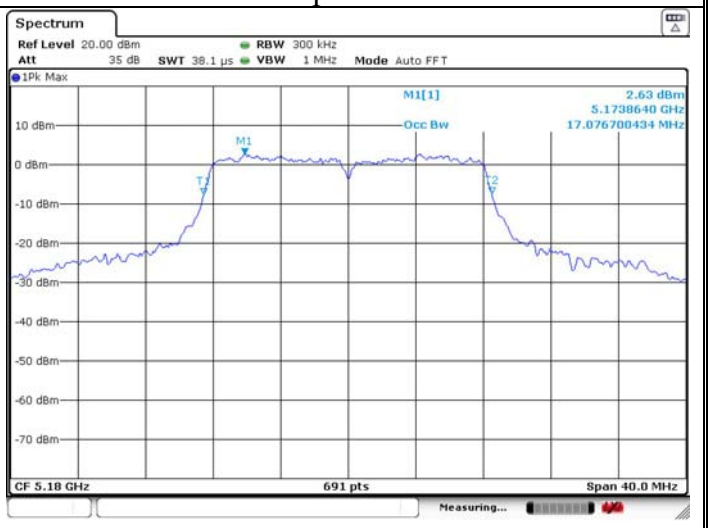
3.6. Test Result

U-NII-1 IEEE 802.11a 5180MHz_Ant 1

26dB Bandwidth

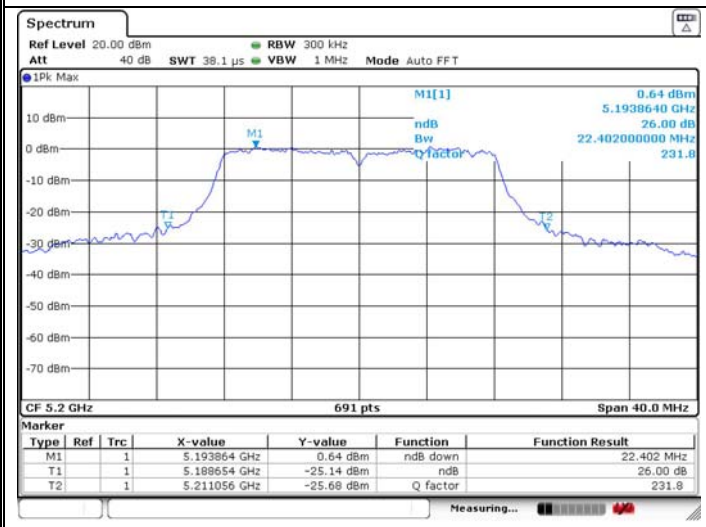


99% Occupied Bandwidth

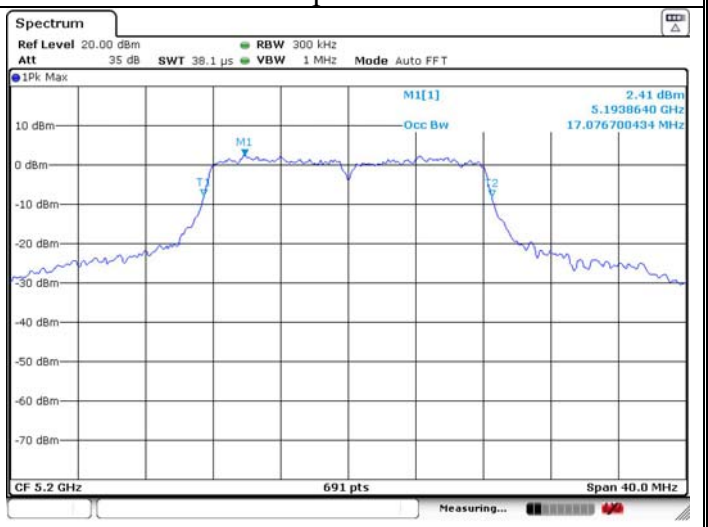


U-NII-1 IEEE 802.11a 5200MHz_Ant 1

26dB Bandwidth

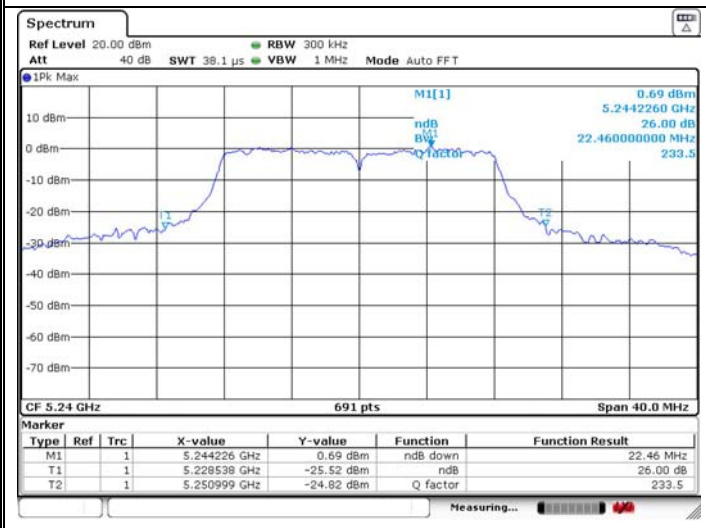


99% Occupied Bandwidth

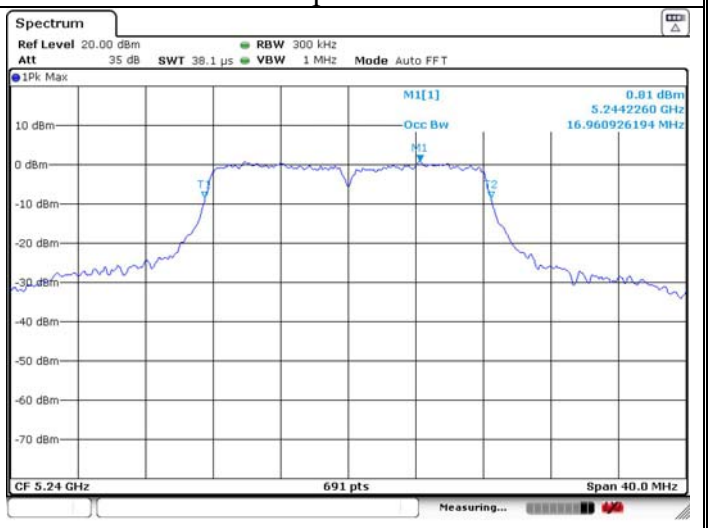


U-NII-1 IEEE 802.11a 5240MHz_Ant 1

26dB Bandwidth

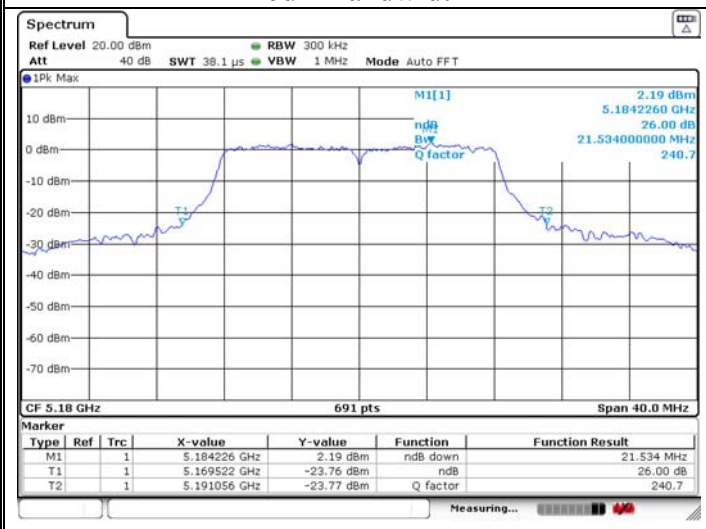


99% Occupied Bandwidth

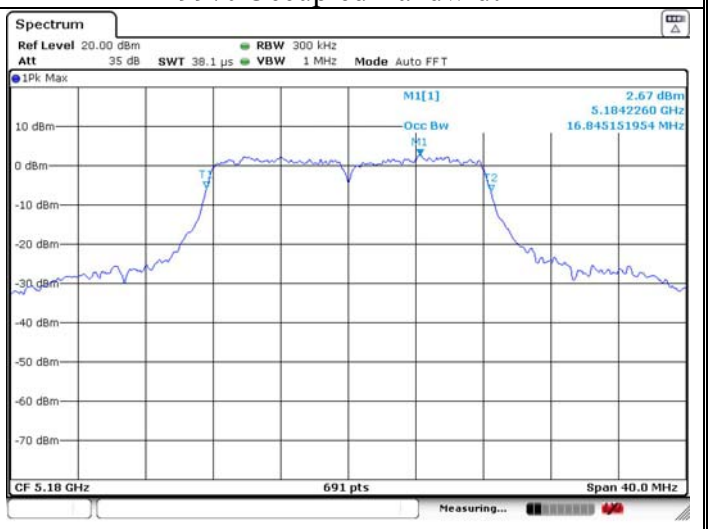


U-NII-1 IEEE 802.11a 5180MHz_Ant 2

26dB Bandwidth

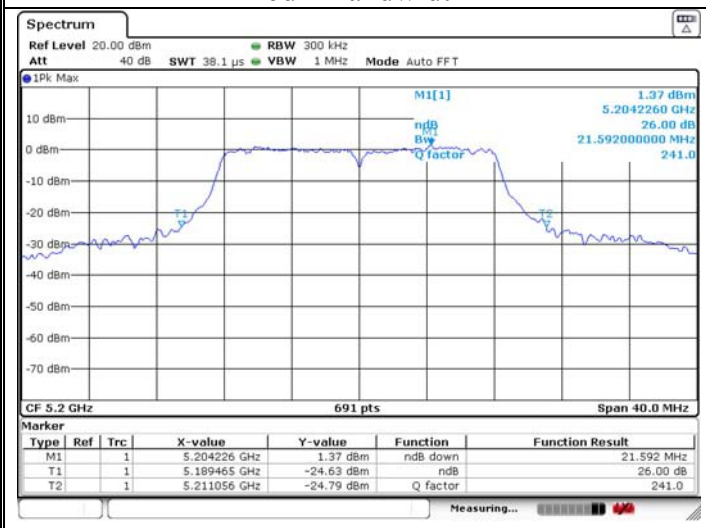


99% Occupied Bandwidth

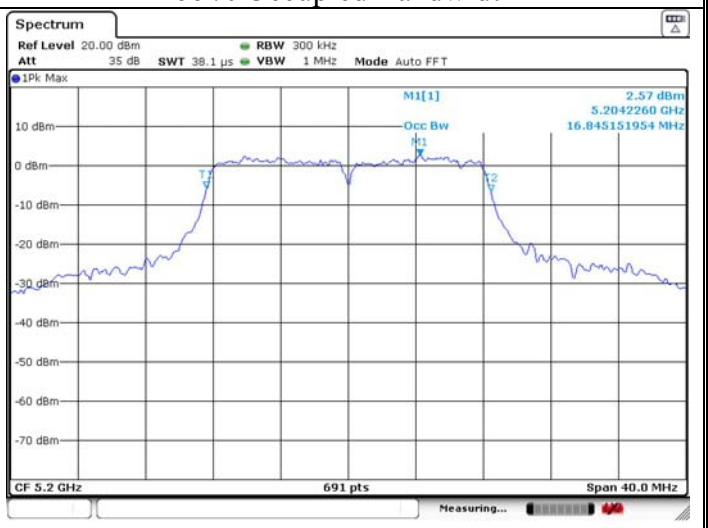


U-NII-1 IEEE 802.11a 5200MHz_Ant 2

26dB Bandwidth

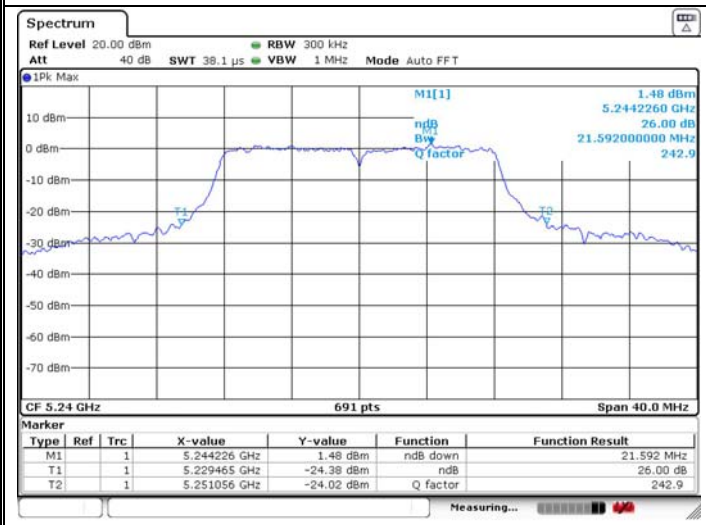


99% Occupied Bandwidth

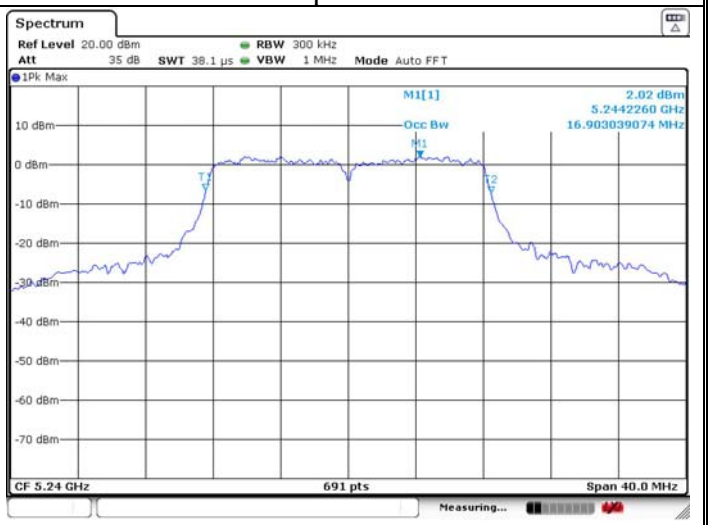


U-NII-1 IEEE 802.11a 5240MHz_Ant 2

26dB Bandwidth

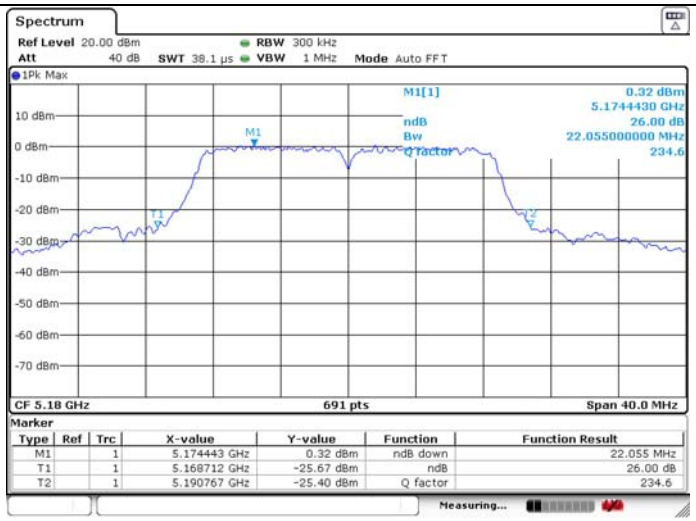


99% Occupied Bandwidth

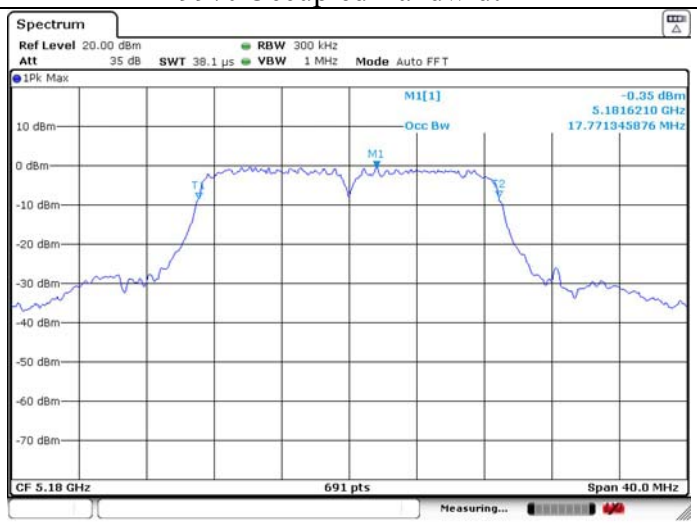


U-NII-1 IEEE 802.11n HT20 5180MHz_Ant 1

26dB Bandwidth

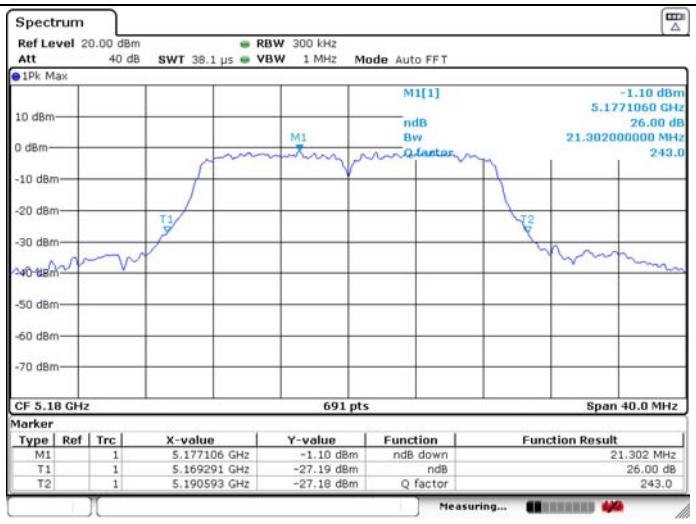


99% Occupied Bandwidth

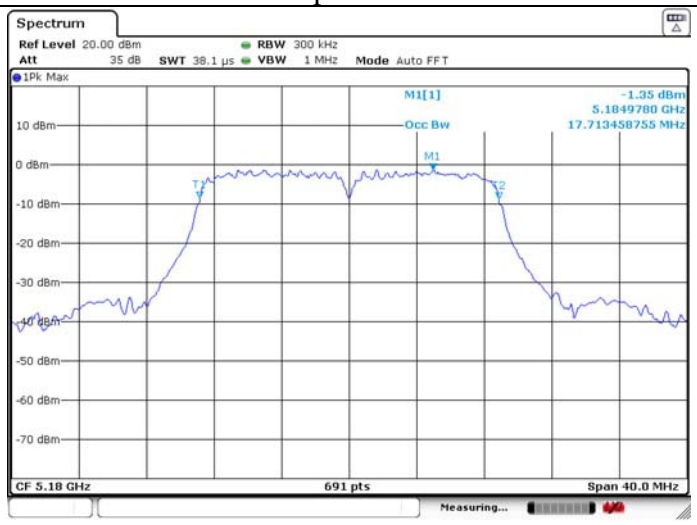


U-NII-1 IEEE 802.11n HT20 5180MHz_Ant 2

26dB Bandwidth

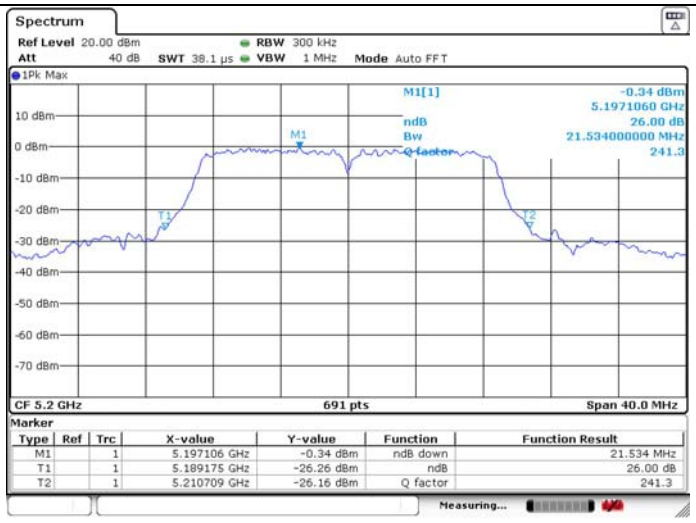


99% Occupied Bandwidth

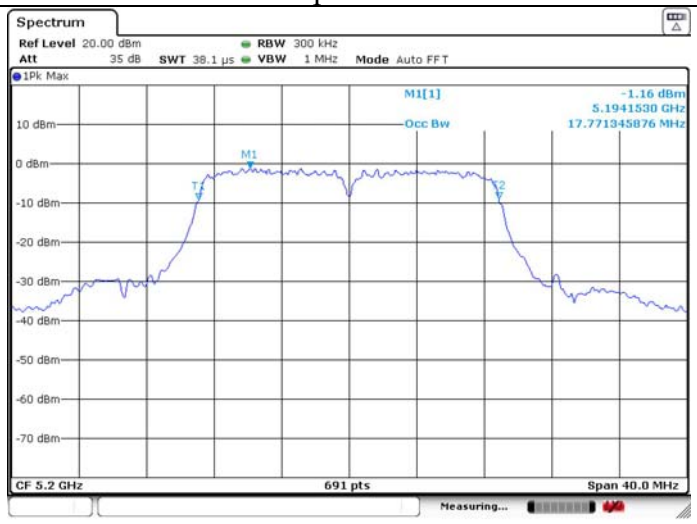


U-NII-1 IEEE 802.11n HT20 5200MHz_Ant 1

26dB Bandwidth

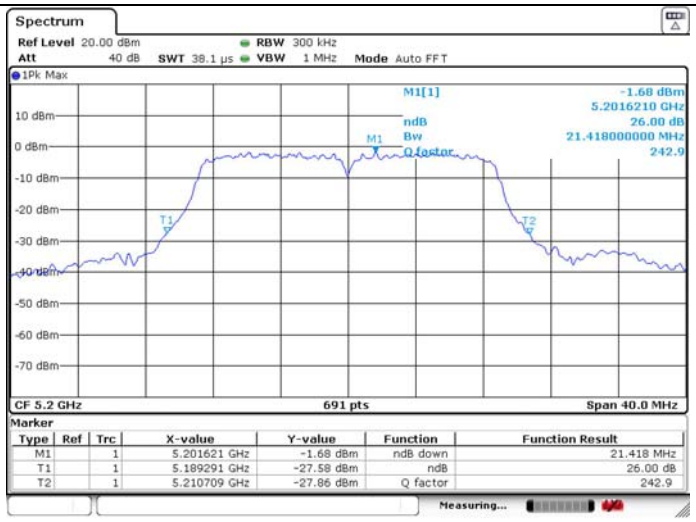


99% Occupied Bandwidth

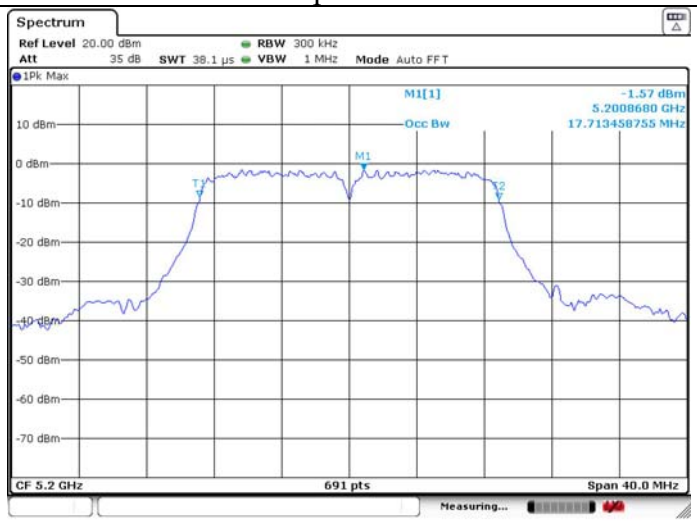


U-NII-1 IEEE 802.11n HT20 5200MHz_Ant 2

26dB Bandwidth

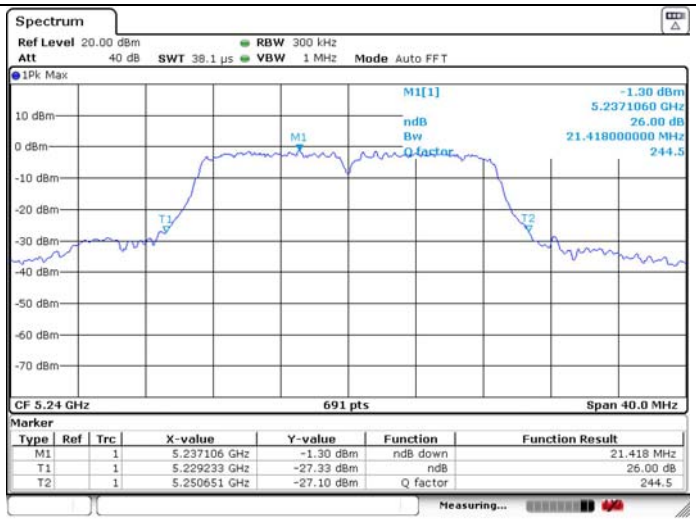


99% Occupied Bandwidth

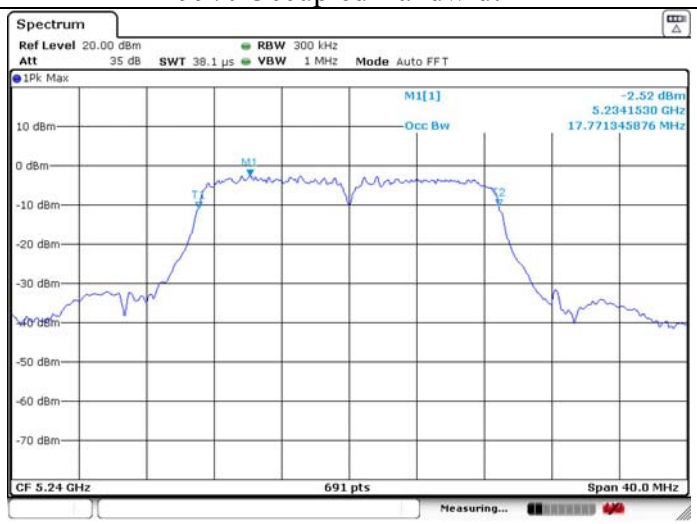


U-NII-1 IEEE 802.11n HT20 5240MHz_Ant 1

26dB Bandwidth

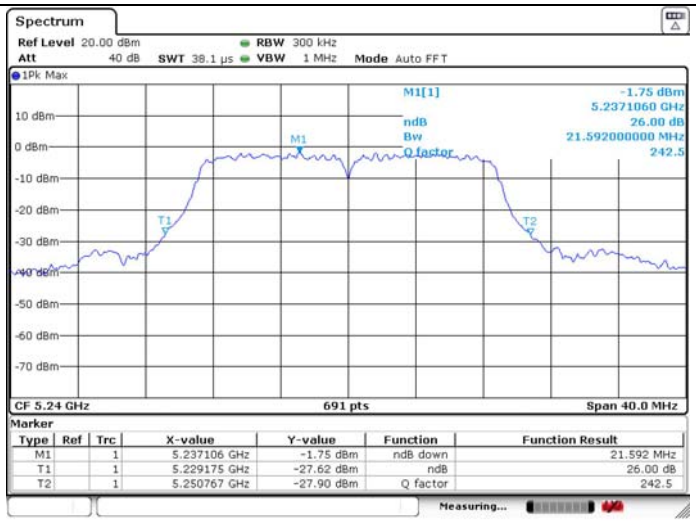


99% Occupied Bandwidth

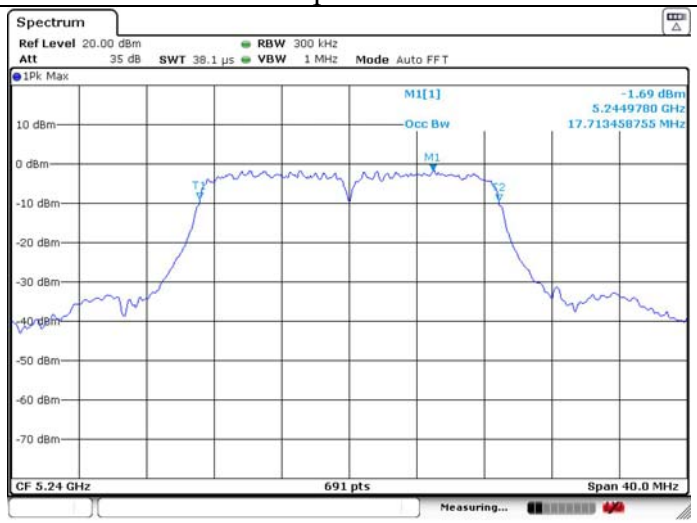


U-NII-1 IEEE 802.11n HT20 5240MHz_Ant 2

26dB Bandwidth

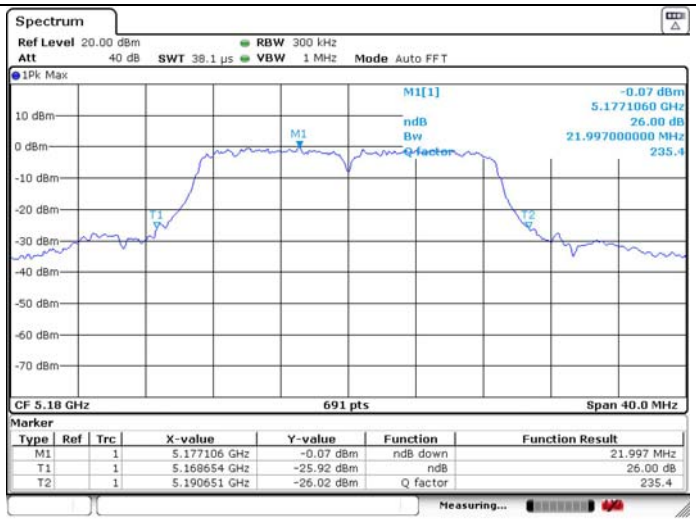


99% Occupied Bandwidth

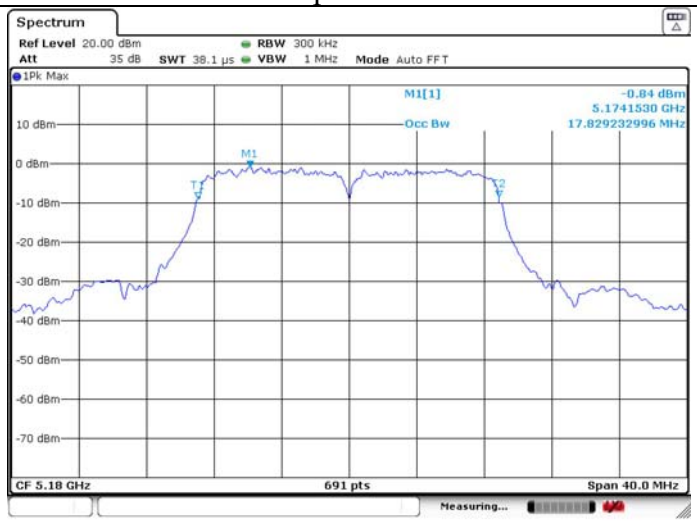


U-NII-1 IEEE 802.11ac VHT20 5180MHz_Ant 1

26dB Bandwidth

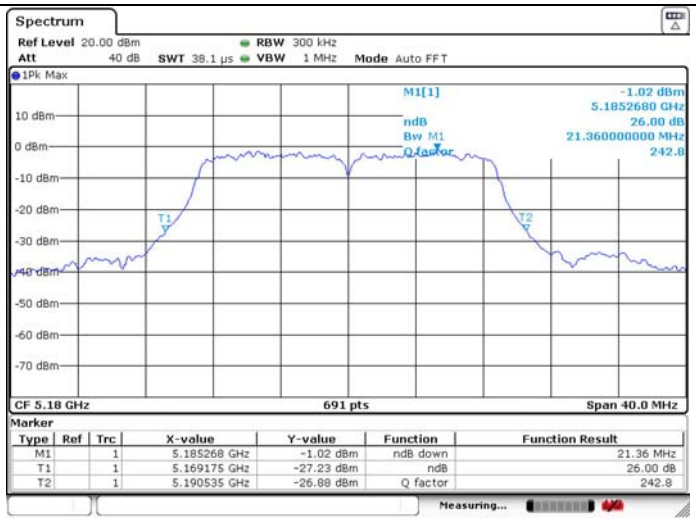


99% Occupied Bandwidth

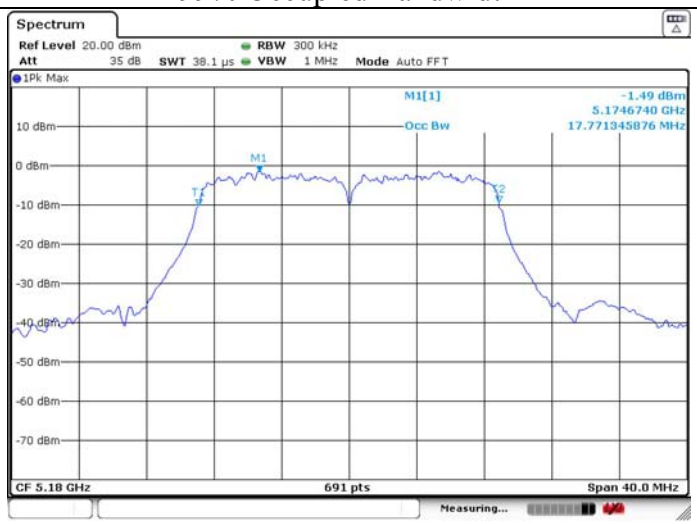


U-NII-1 IEEE 802.11ac VHT20 5180MHz_Ant 2

26dB Bandwidth

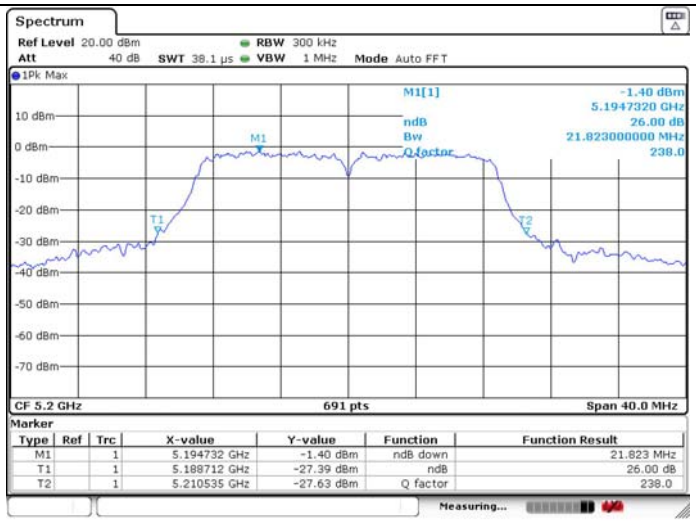


99% Occupied Bandwidth

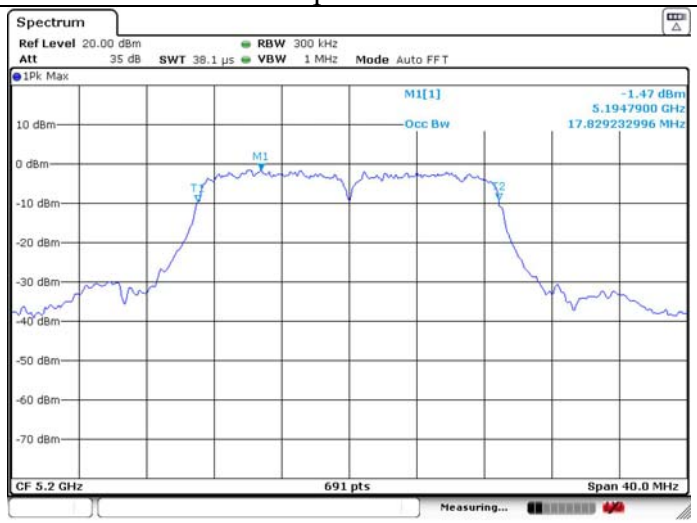


U-NII-1 IEEE 802.11ac VHT20 5200MHz_Ant 1

26dB Bandwidth

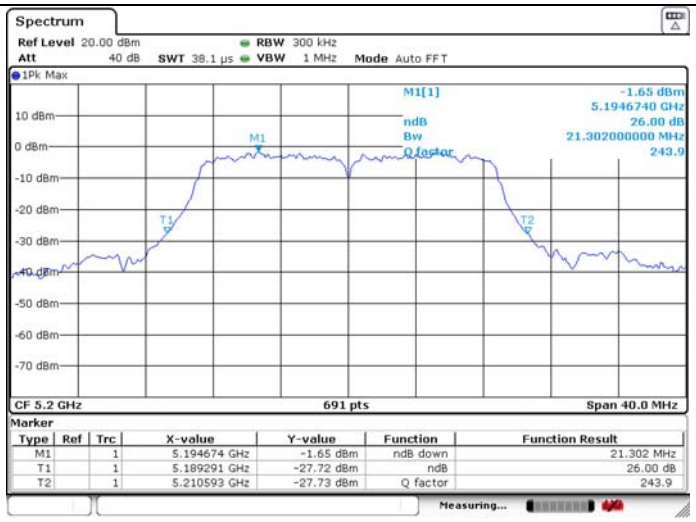


99% Occupied Bandwidth

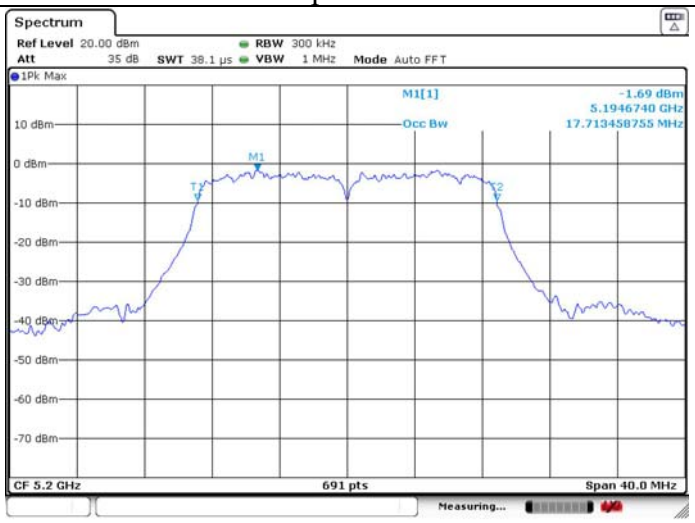


U-NII-1 IEEE 802.11ac VHT20 5200MHz_Ant 2

26dB Bandwidth

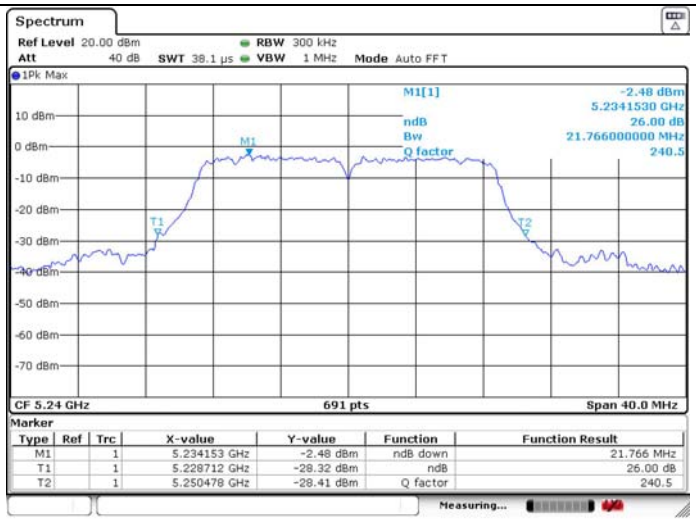


99% Occupied Bandwidth

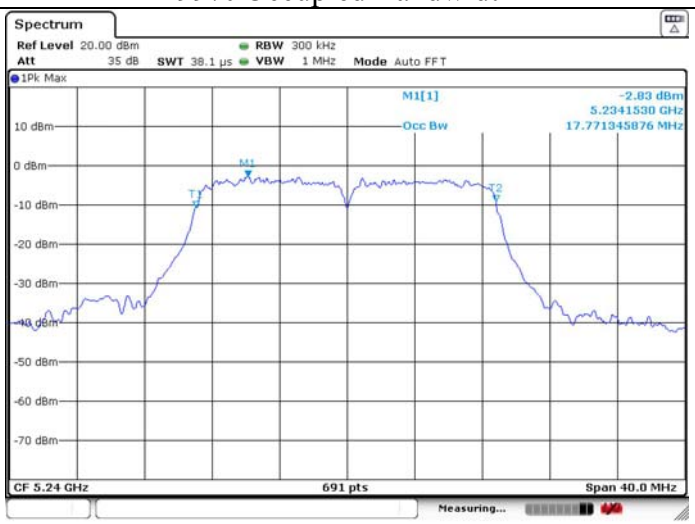


U-NII-1 IEEE 802.11ac VHT20 5240MHz_Ant 1

26dB Bandwidth

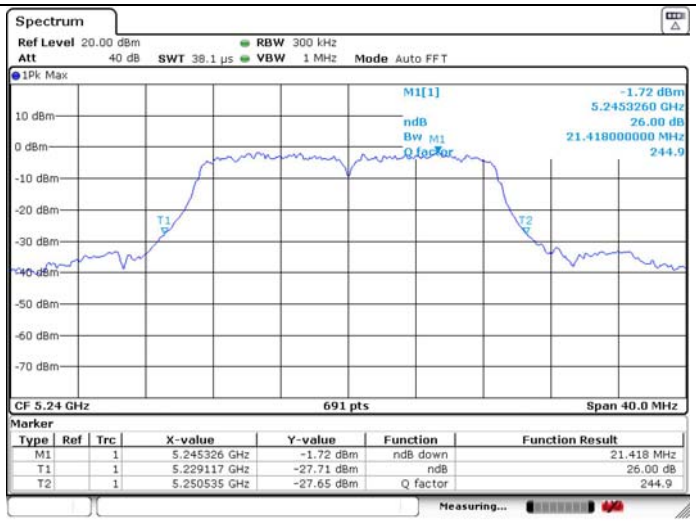


99% Occupied Bandwidth

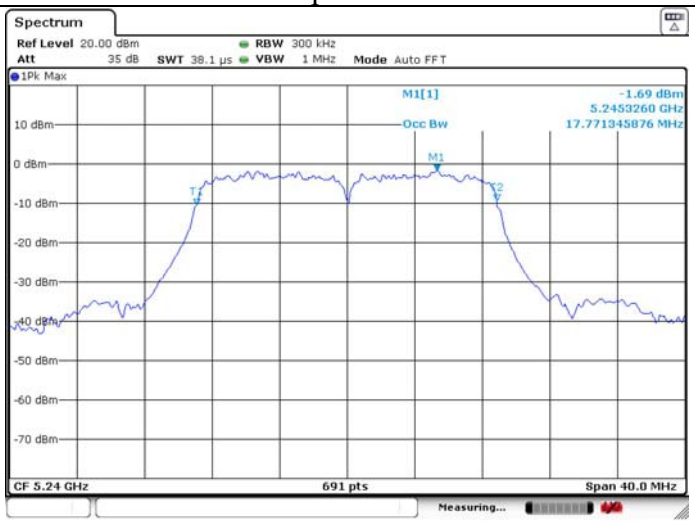


U-NII-1 IEEE 802.11ac VHT20 5240MHz_Ant 2

26dB Bandwidth

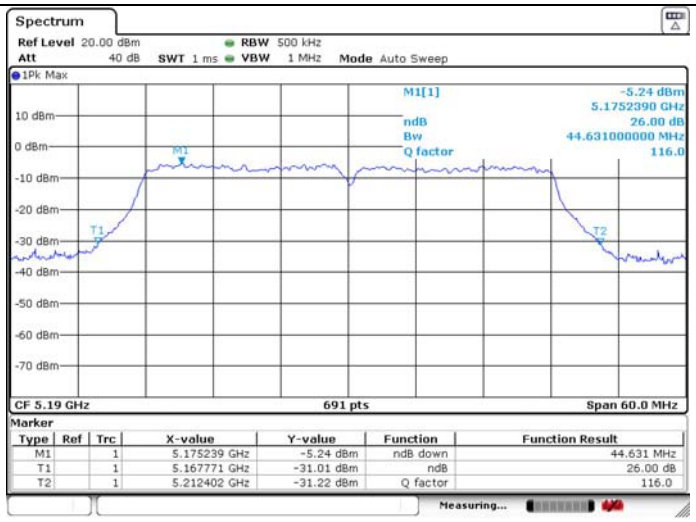


99% Occupied Bandwidth

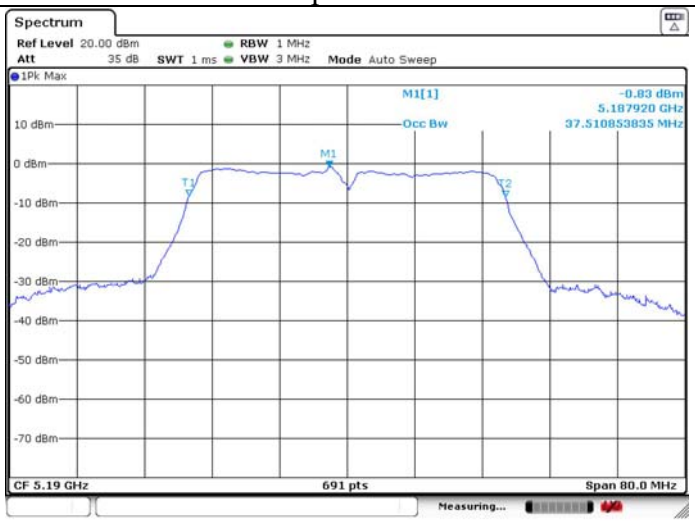


U-NII-1 IEEE 802.11n HT40 5190MHz_Ant 1

26dB Bandwidth

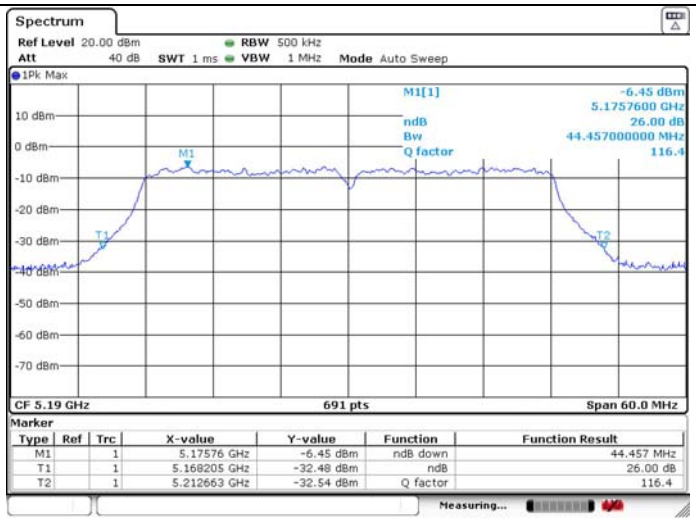


99% Occupied Bandwidth

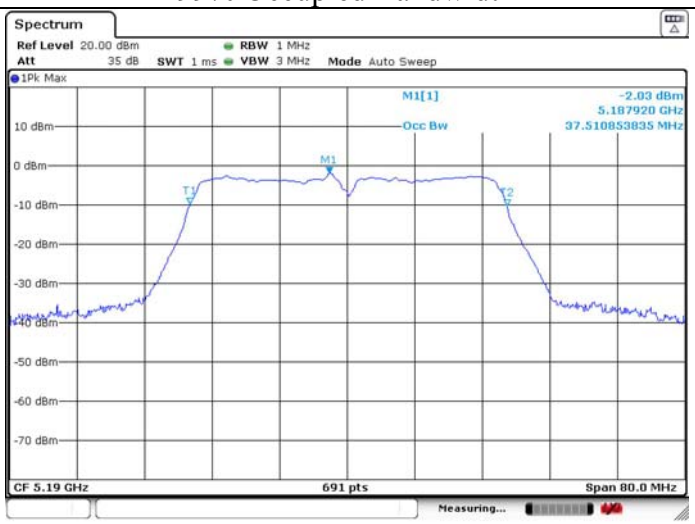


U-NII-1 IEEE 802.11n HT40 5190MHz_Ant 2

26dB Bandwidth

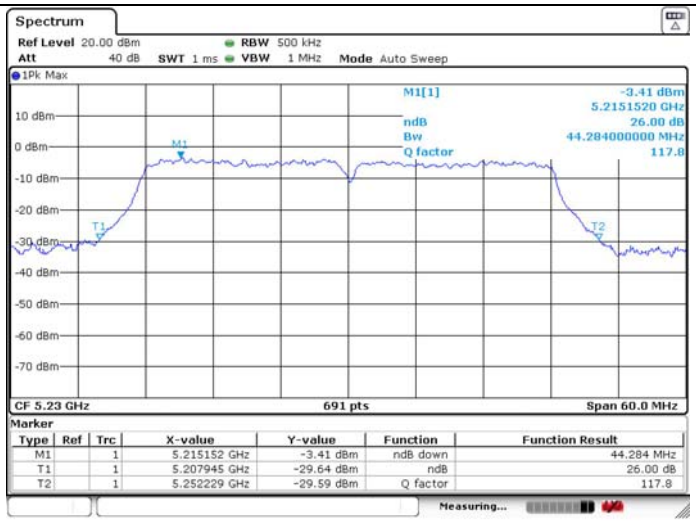


99% Occupied Bandwidth

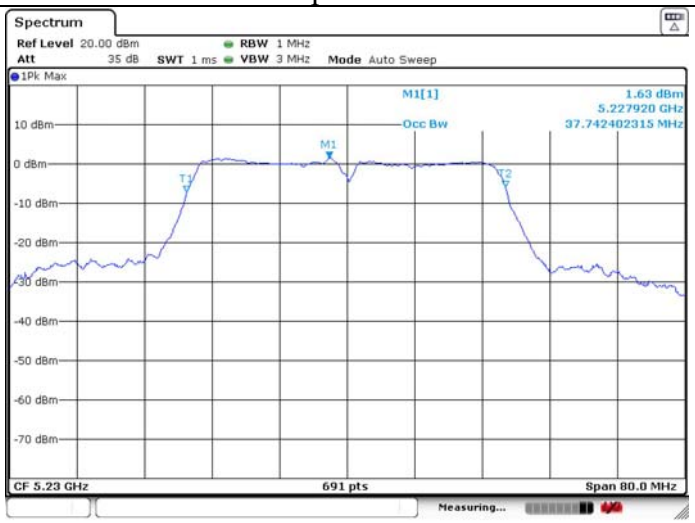


U-NII-1 IEEE 802.11n HT40 5230MHz_Ant 1

26dB Bandwidth

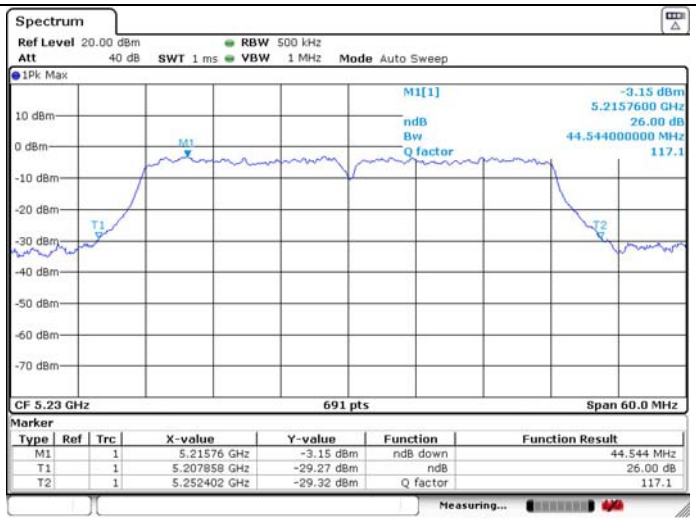


99% Occupied Bandwidth

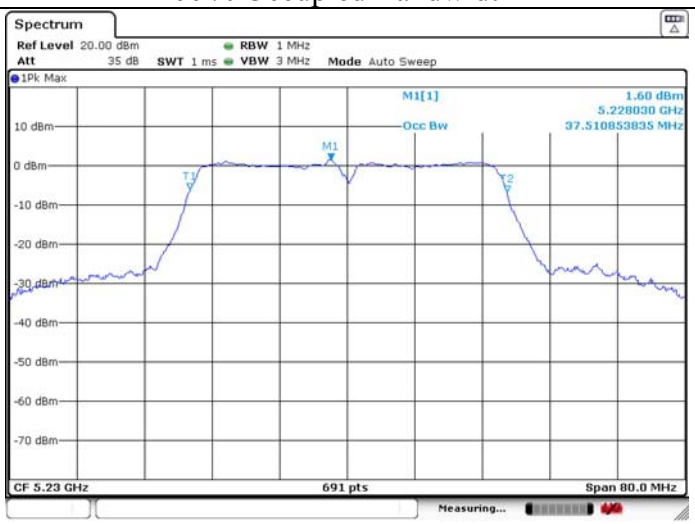


U-NII-1 IEEE 802.11n HT40 5230MHz_Ant 2

26dB Bandwidth

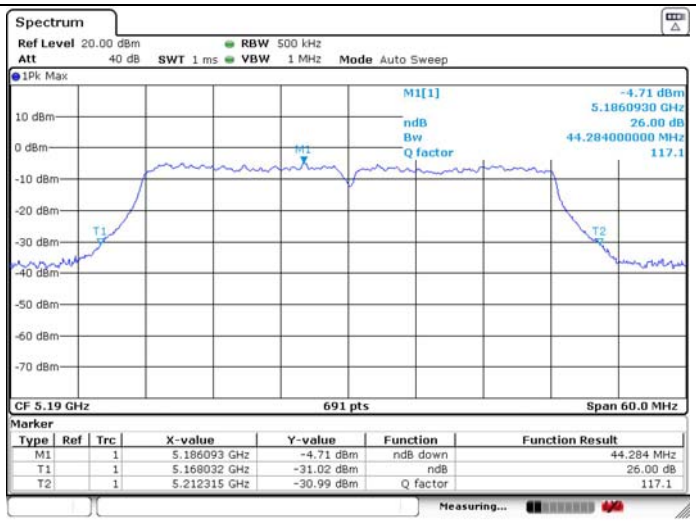


99% Occupied Bandwidth

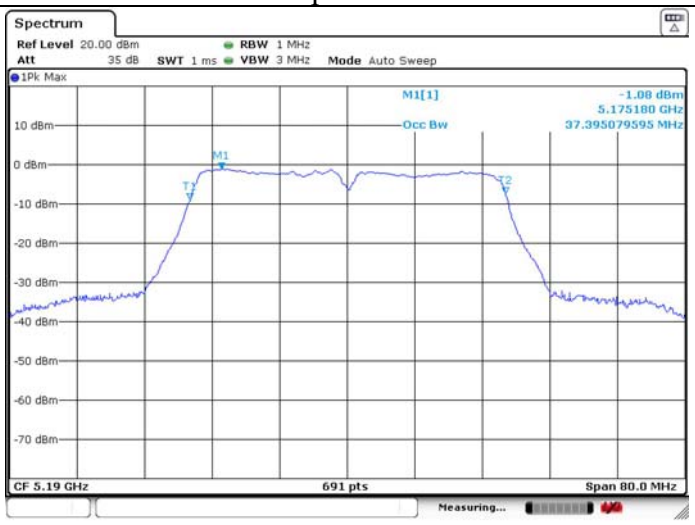


U-NII-1 IEEE 802.11ac VHT40 5190MHz_Ant 1

26dB Bandwidth

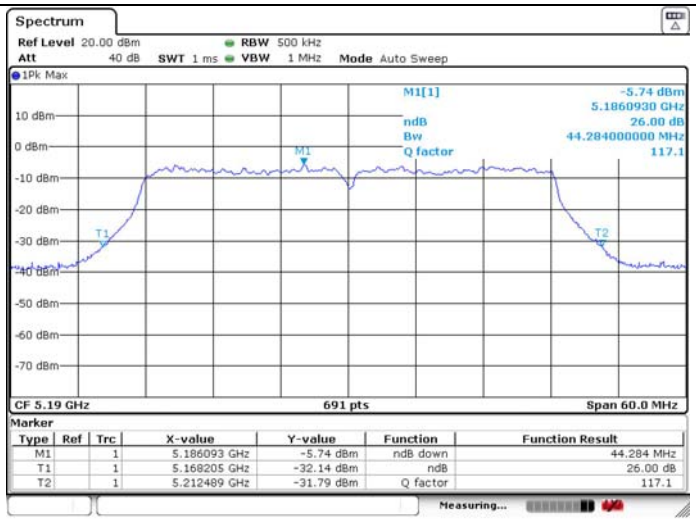


99% Occupied Bandwidth



U-NII-1 IEEE 802.11ac VHT40 5190MHz_Ant 2

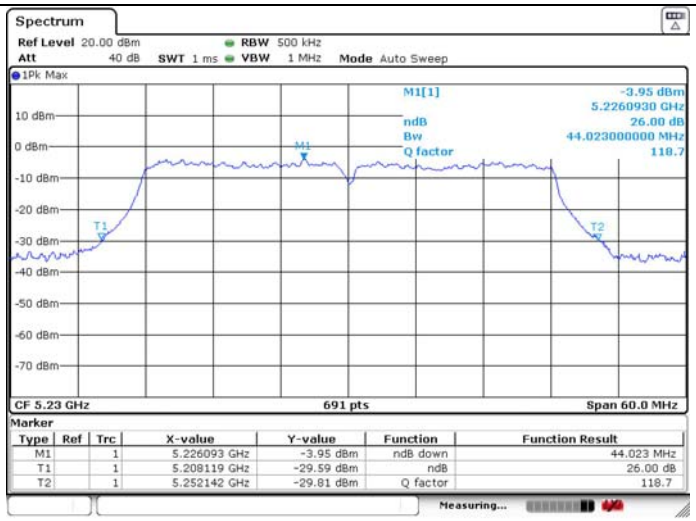
26dB Bandwidth



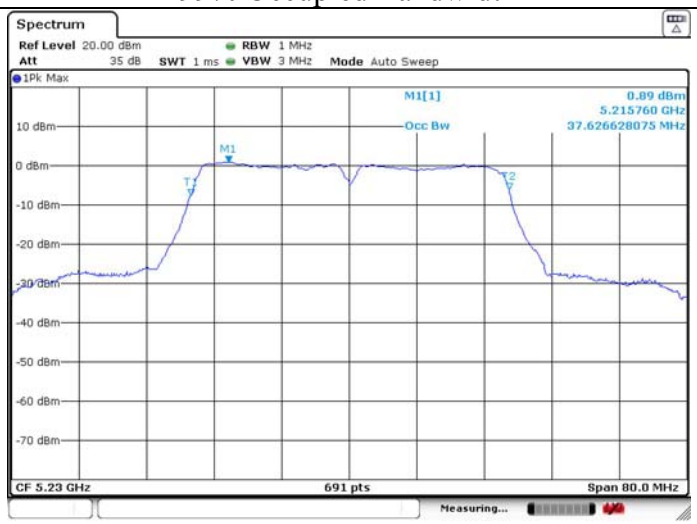
99% Occupied Bandwidth

U-NII-1 IEEE 802.11ac VHT40 5230MHz_Ant 1

26dB Bandwidth

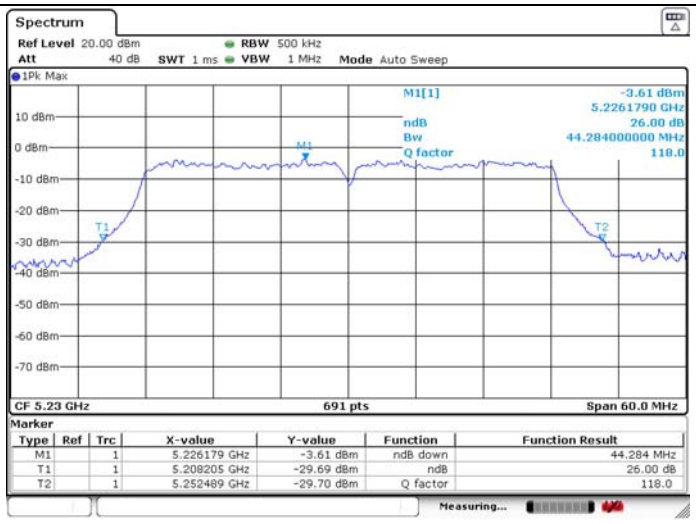


99% Occupied Bandwidth

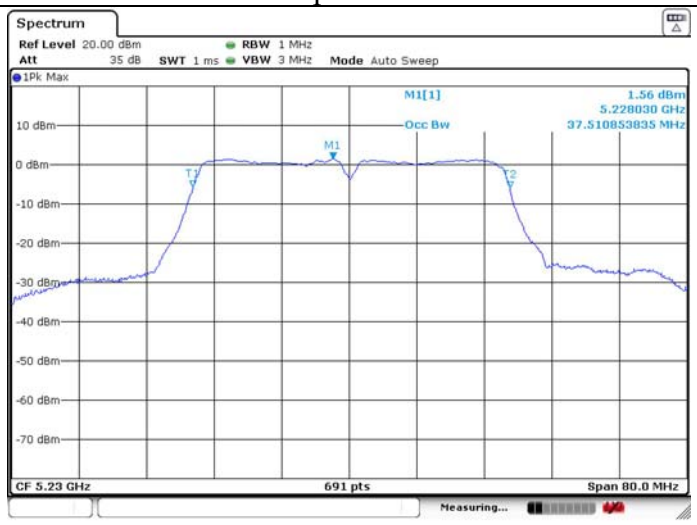


U-NII-1 IEEE 802.11ac VHT40 5230MHz_Ant 2

26dB Bandwidth

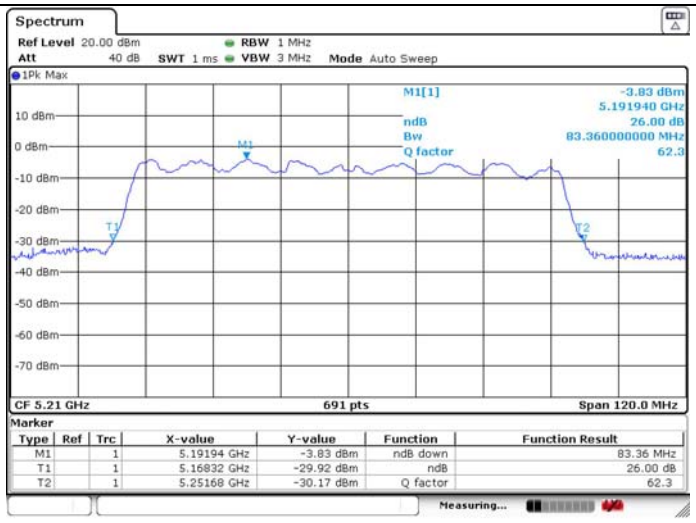


99% Occupied Bandwidth

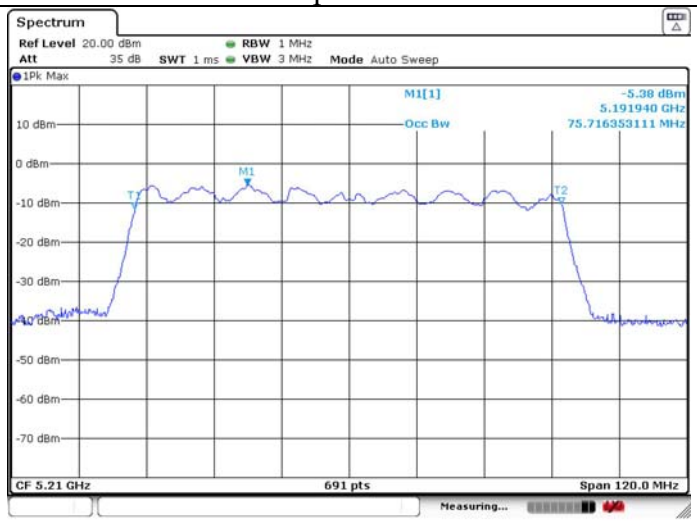


U-NII-1 IEEE 802.11ac VHT80 5210MHz_Ant 1

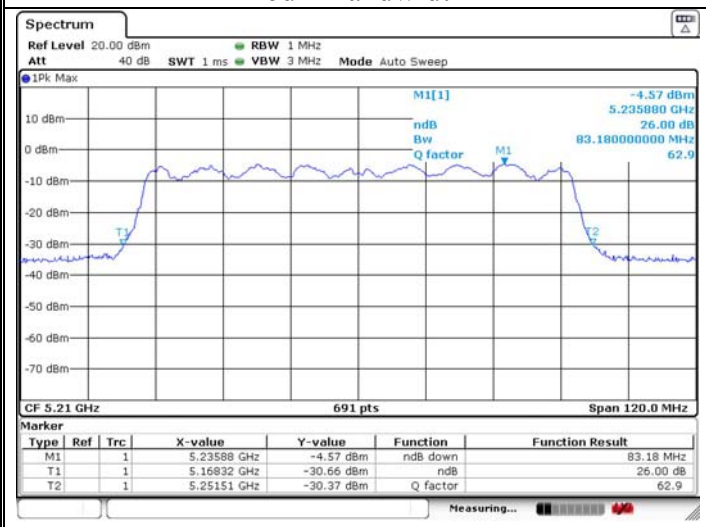
26dB Bandwidth

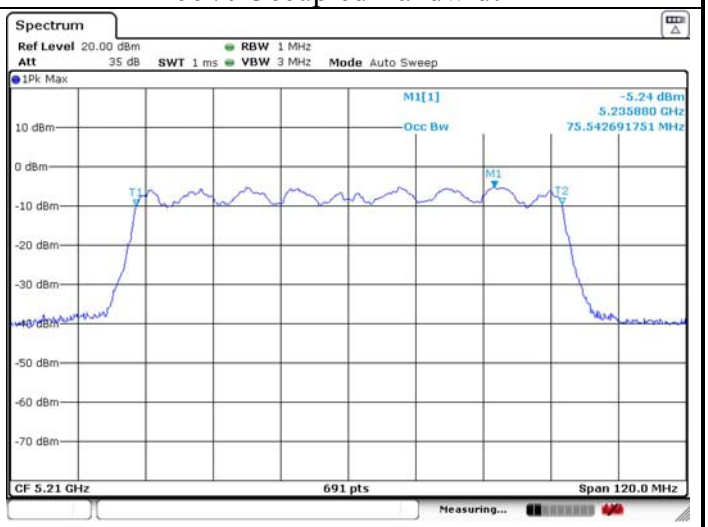


99% Occupied Bandwidth



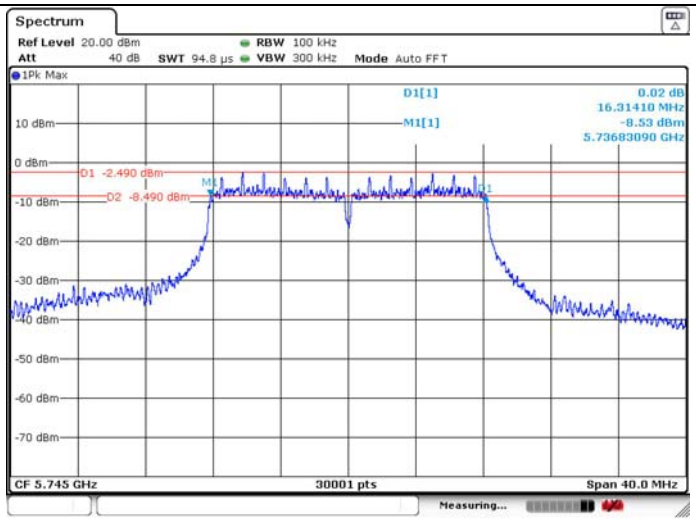
U-NII-1 IEEE 802.11ac VHT80 5210MHz_Ant 2	
26dB Bandwidth	99% Occupied Bandwidth



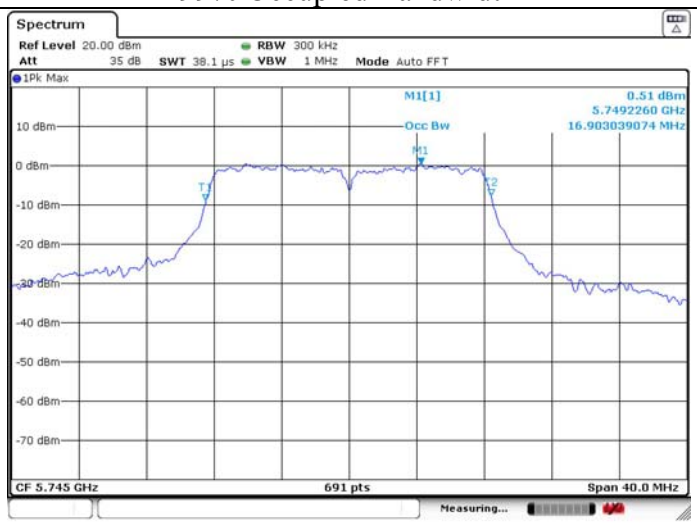


U-NII-3 IEEE 802.11a 5745MHz_Ant 1

6dB Bandwidth

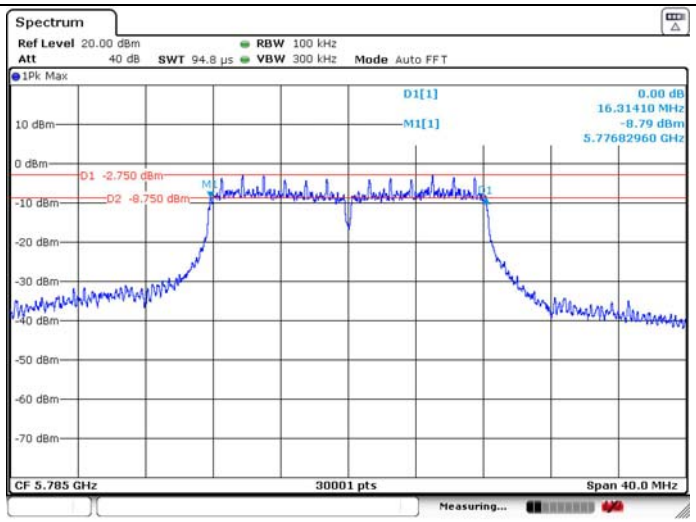


99% Occupied Bandwidth

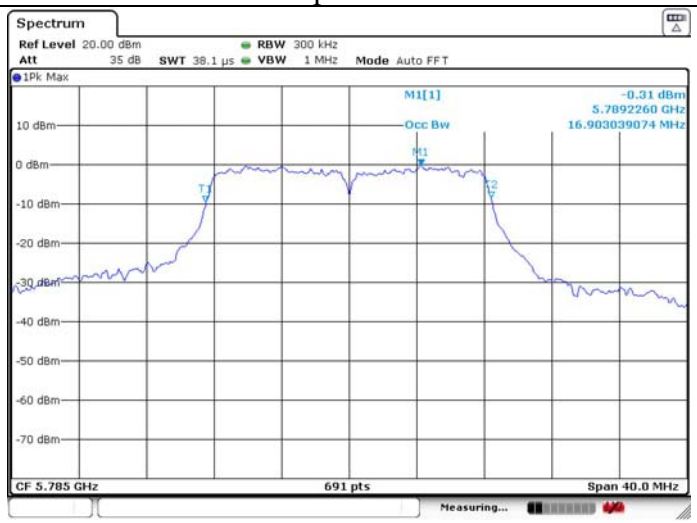


U-NII-3 IEEE 802.11a 5785MHz_Ant 1

6dB Bandwidth

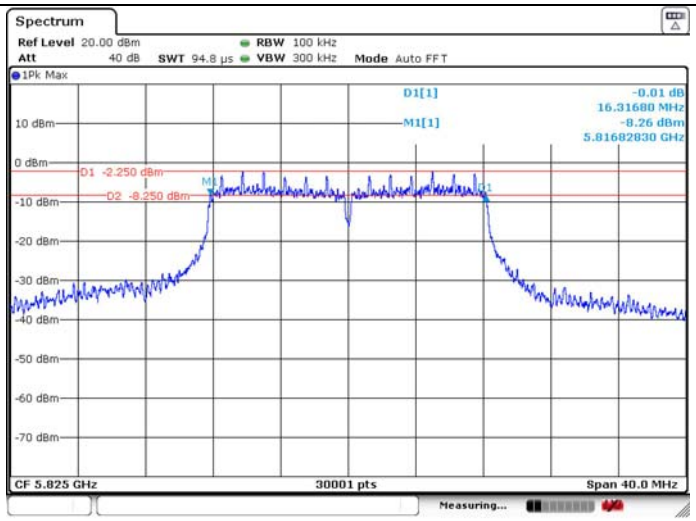


99% Occupied Bandwidth

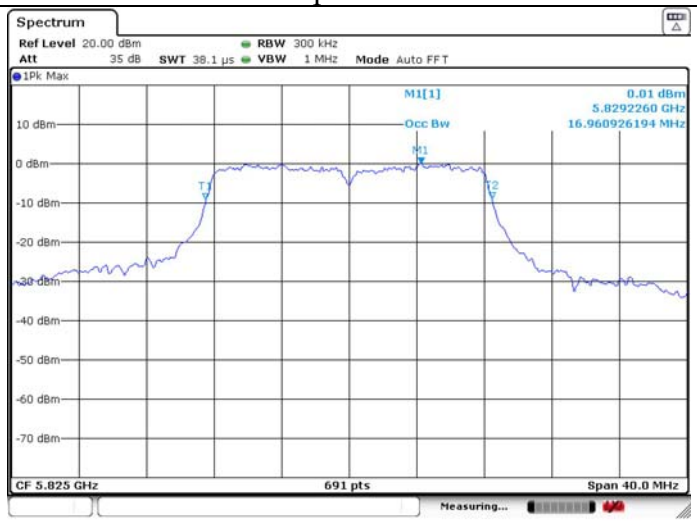


U-NII-3 IEEE 802.11a 5825MHz_Ant 1

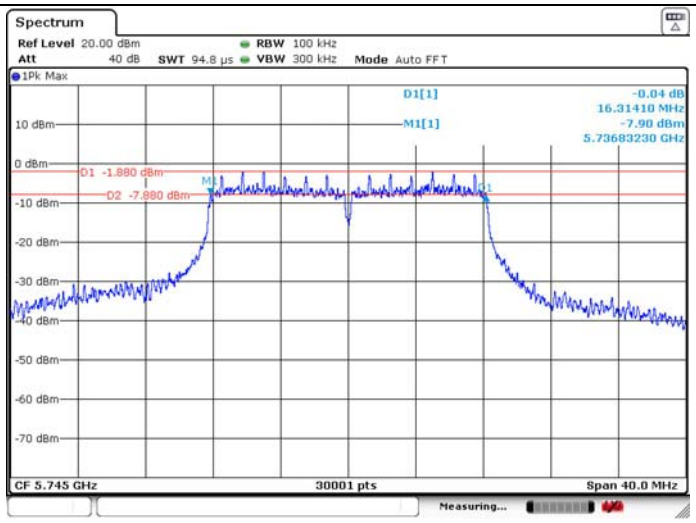
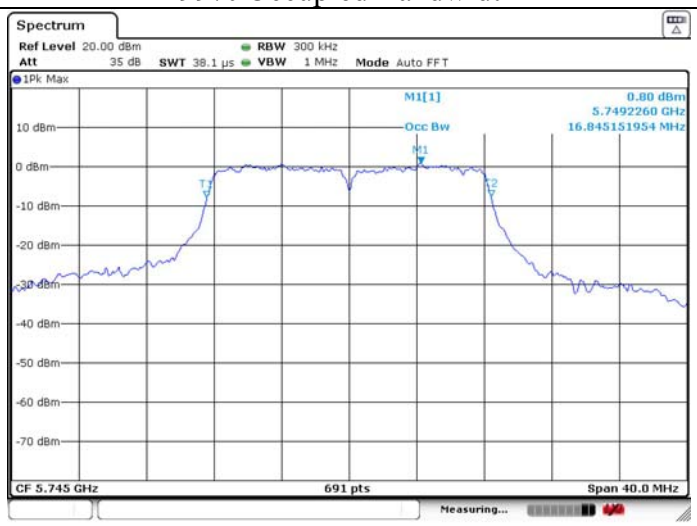
6dB Bandwidth



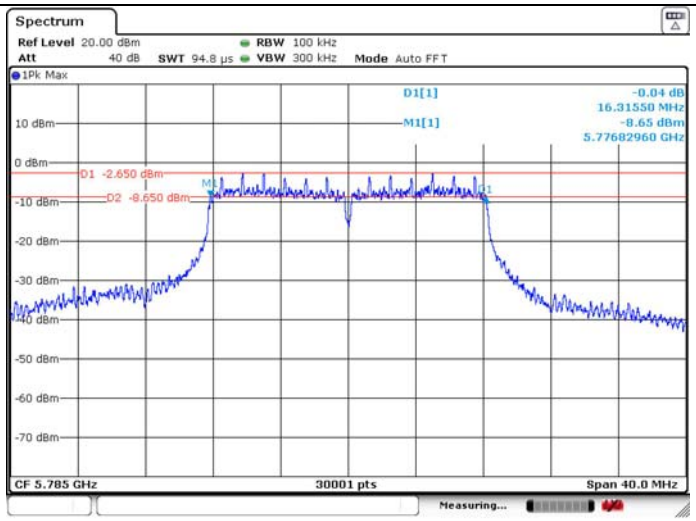
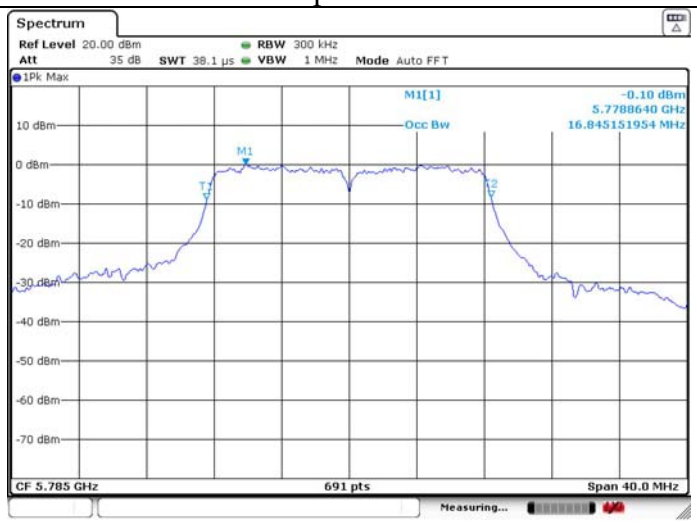
99% Occupied Bandwidth



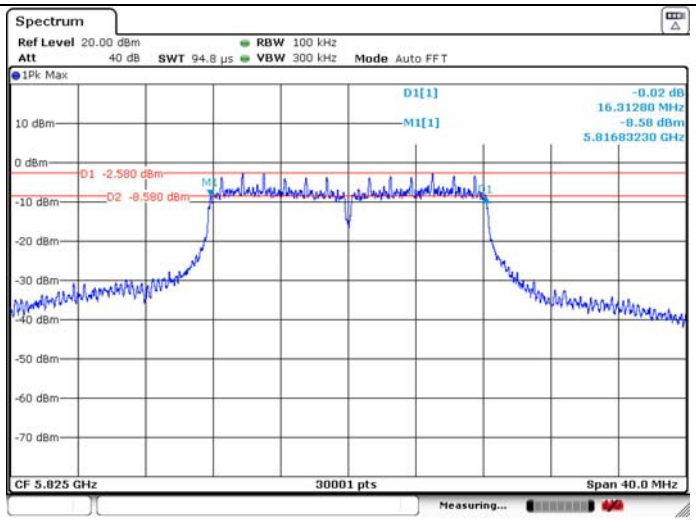
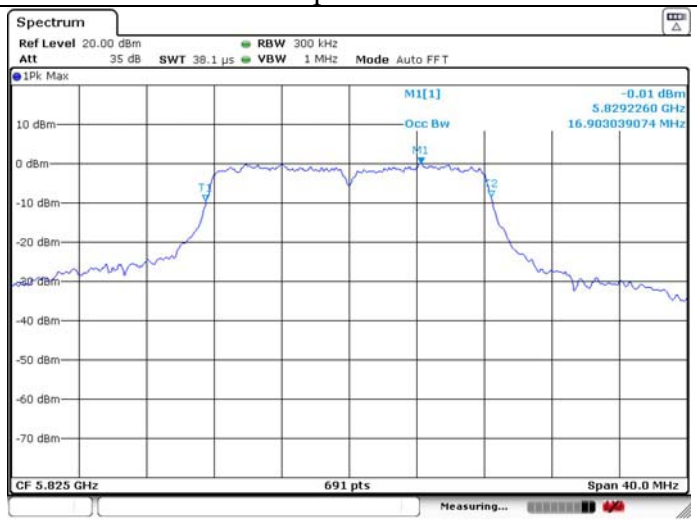
U-NII-3 IEEE 802.11a 5745MHz_Ant 2

6dB Bandwidth	99% Occupied Bandwidth
	

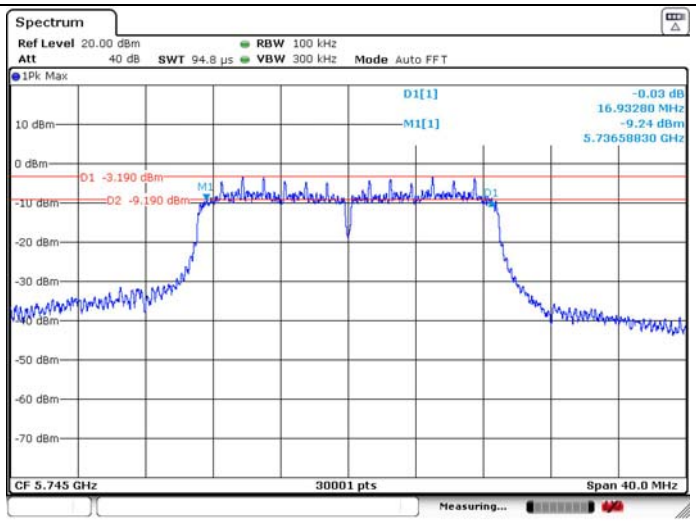
U-NII-3 IEEE 802.11a 5785MHz_Ant 2

6dB Bandwidth	99% Occupied Bandwidth
	

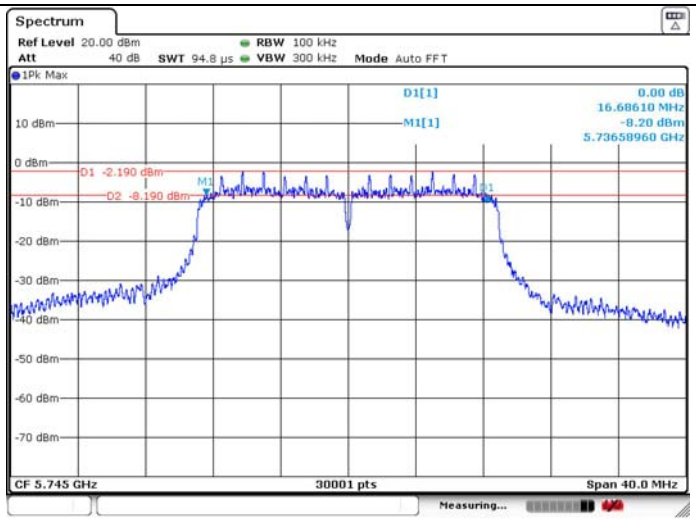
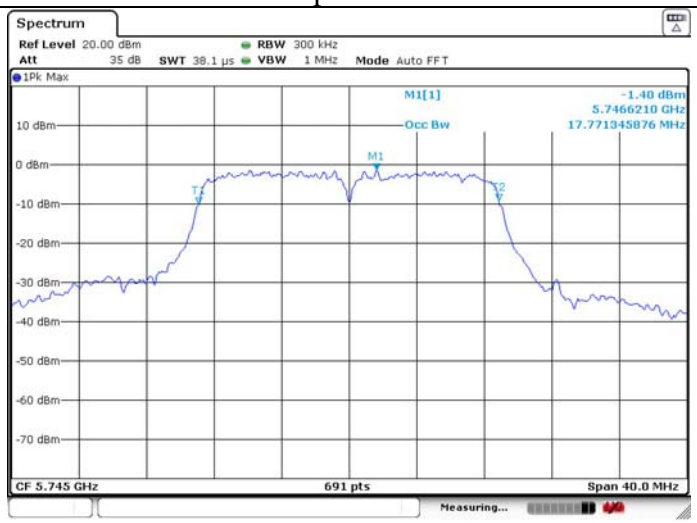
U-NII-3 IEEE 802.11a 5825MHz_Ant 2

6dB Bandwidth	99% Occupied Bandwidth
	

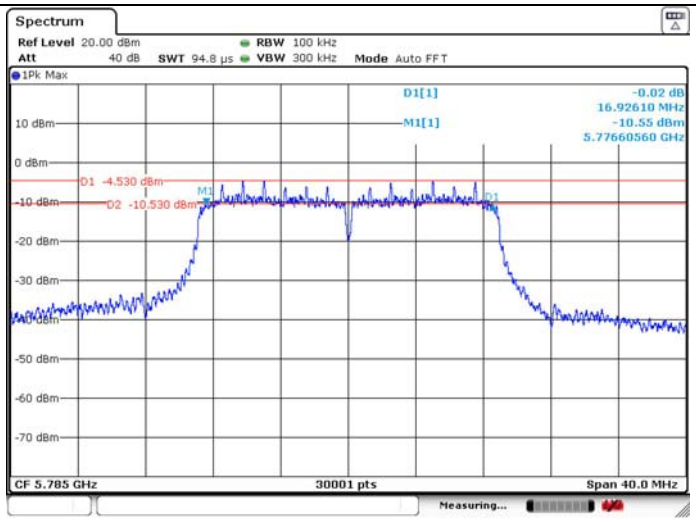
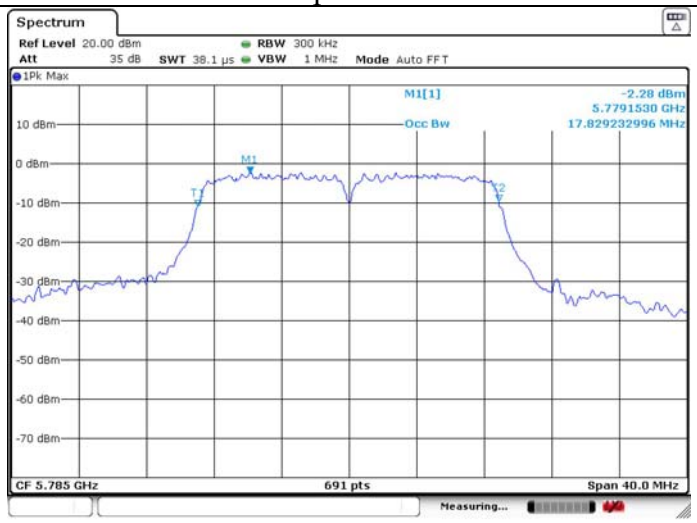
U-NII-3 IEEE 802.11n HT20 5745MHz_Ant 1

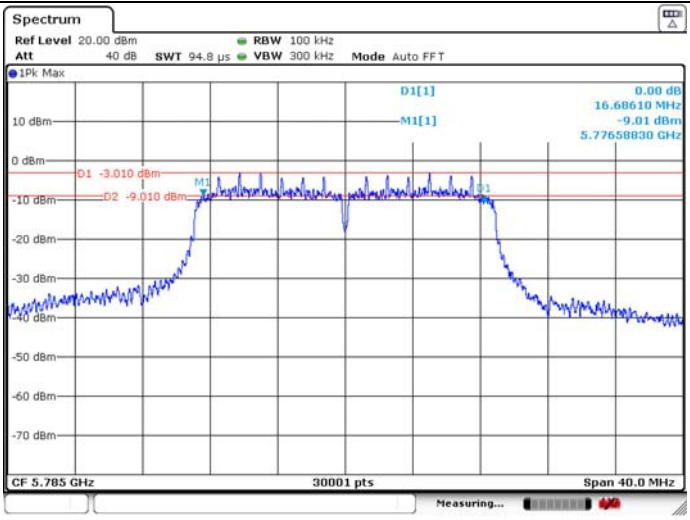
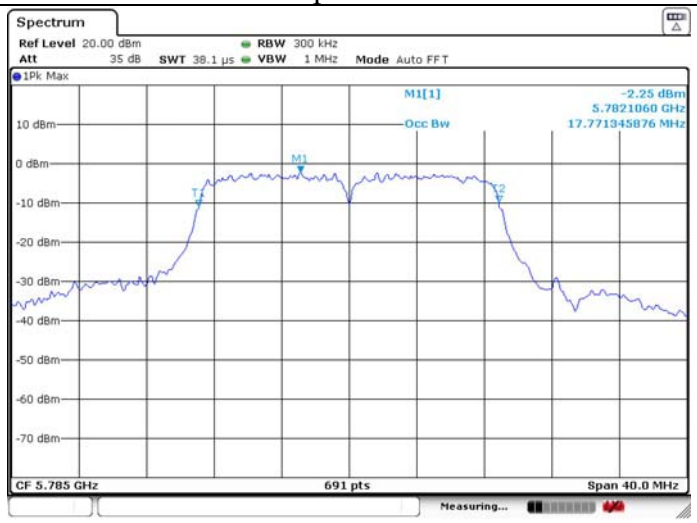
6dB Bandwidth	99% Occupied Bandwidth
	

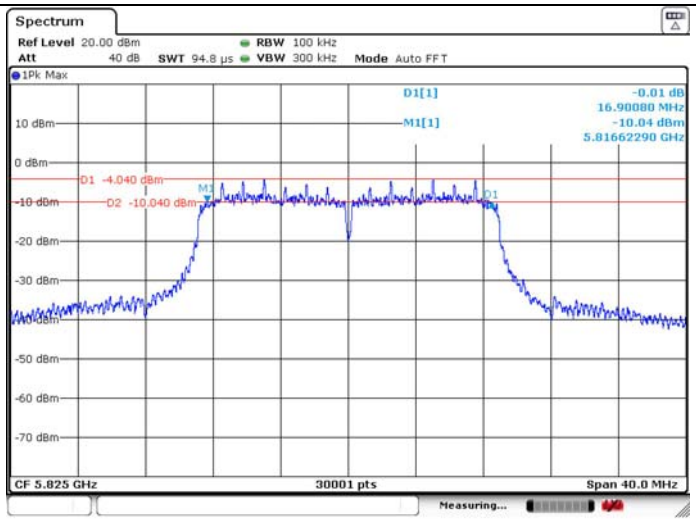
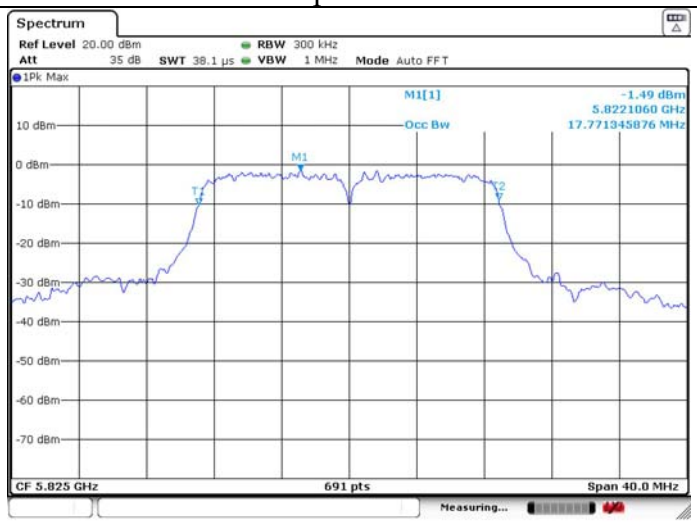
U-NII-3 IEEE 802.11n HT20 5745MHz_Ant 2

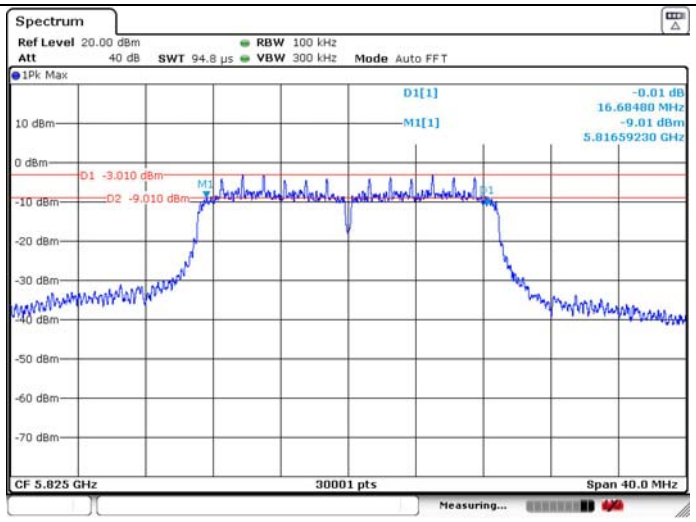
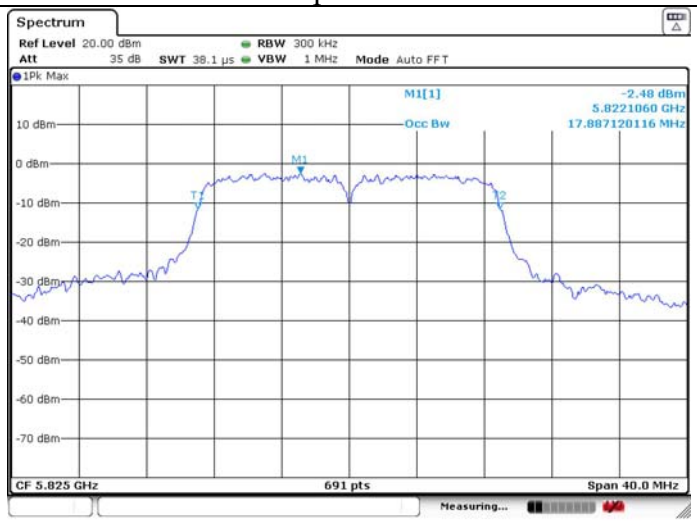
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11n HT20 5785MHz_Ant 1

6dB Bandwidth	99% Occupied Bandwidth
	

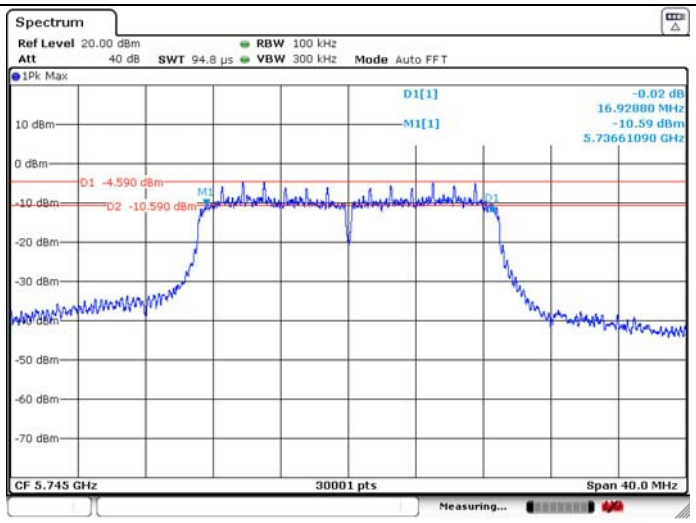
U-NII-3 IEEE 802.11n HT20 5785MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11n HT20 5825MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

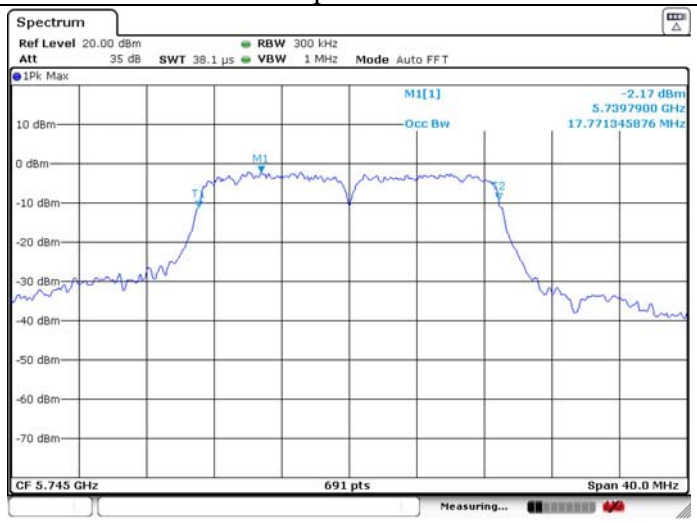
U-NII-3 IEEE 802.11n HT20 5825MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT20 5745MHz_Ant 1

6dB Bandwidth

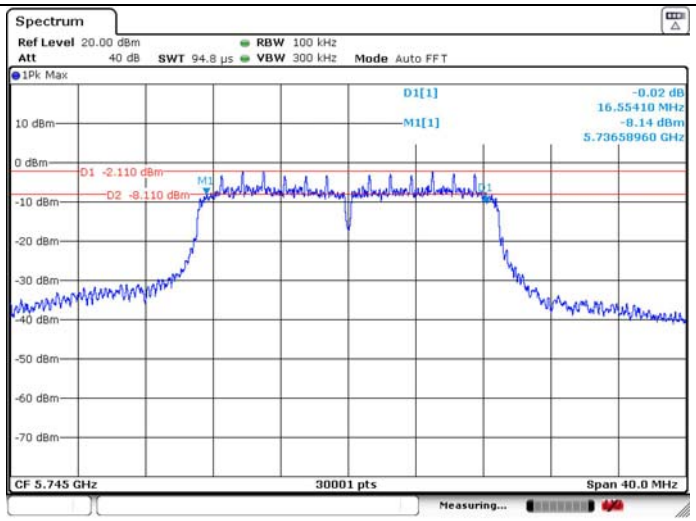


99% Occupied Bandwidth

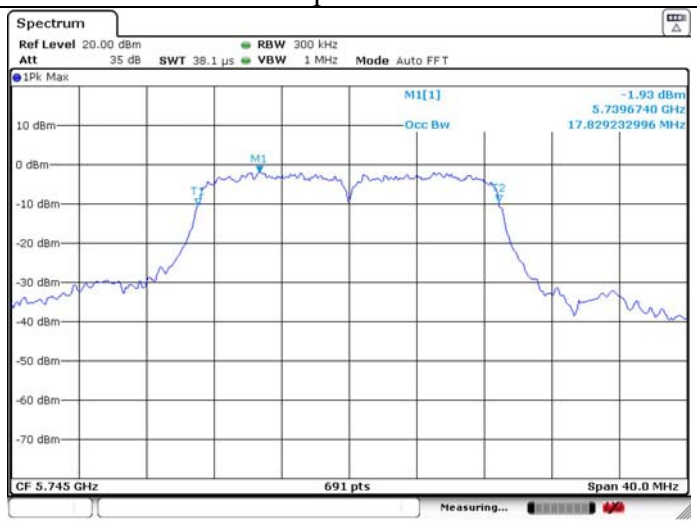


U-NII-3 IEEE 802.11ac VHT20 5745MHz_Ant 2

6dB Bandwidth

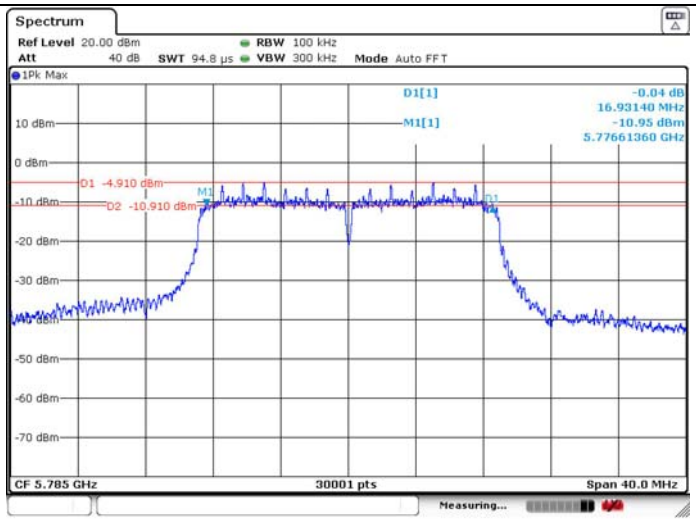


99% Occupied Bandwidth

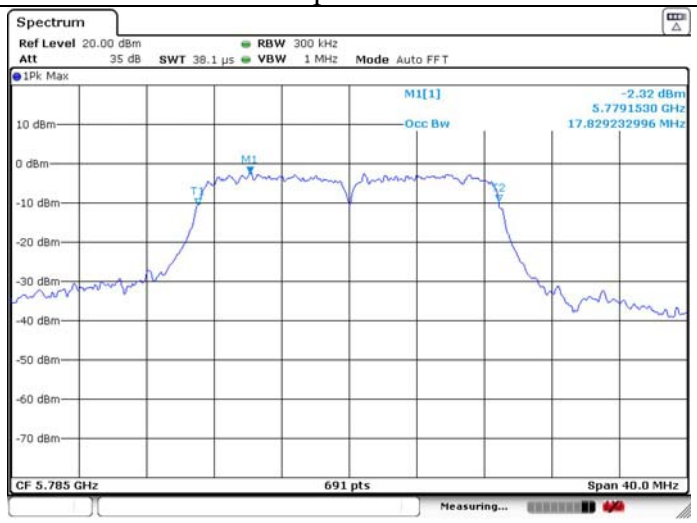


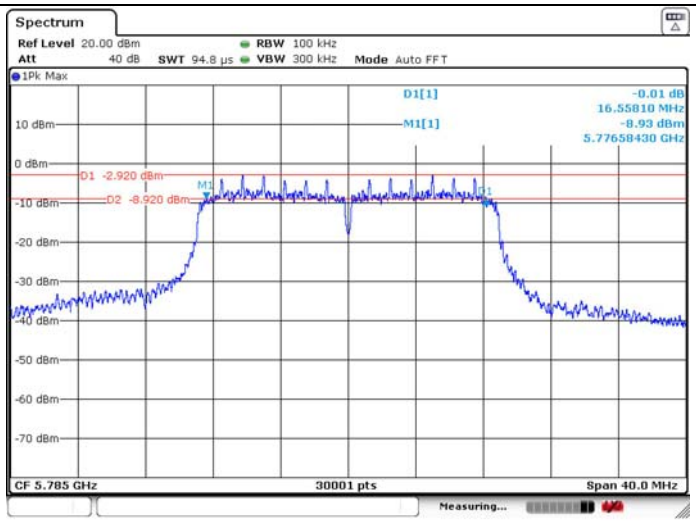
U-NII-3 IEEE 802.11ac VHT20 5785MHz_Ant 1

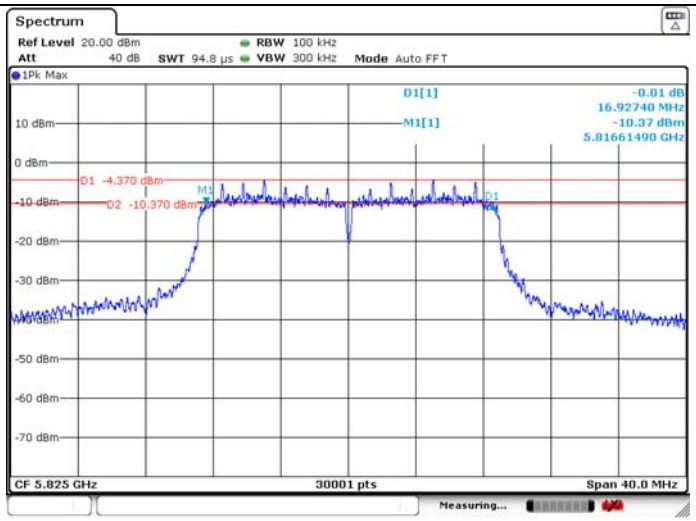
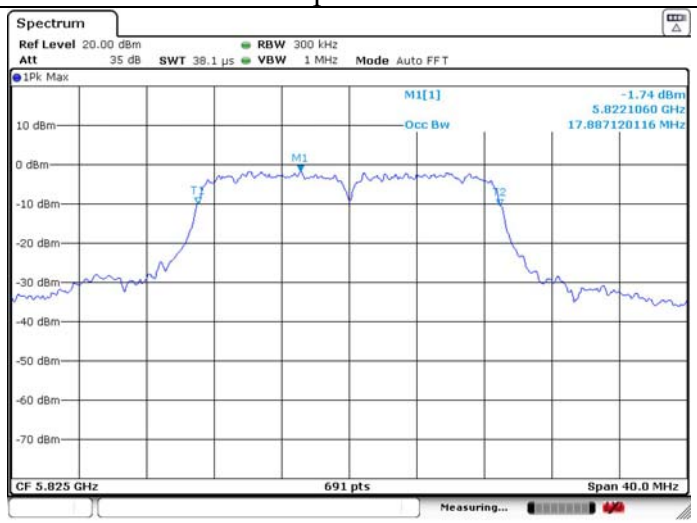
6dB Bandwidth

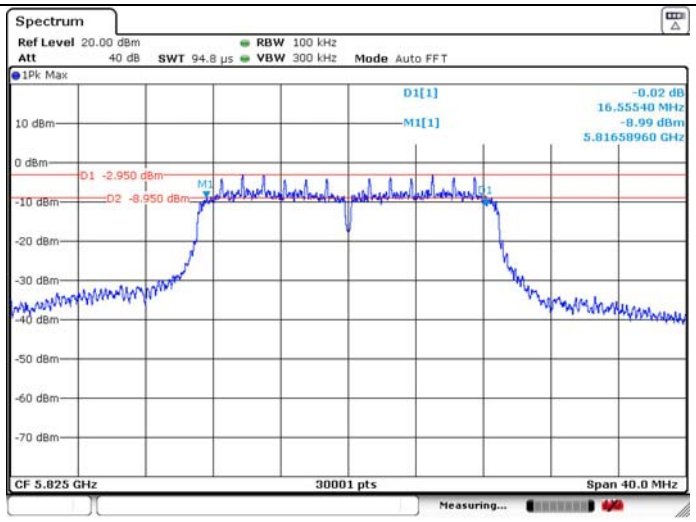
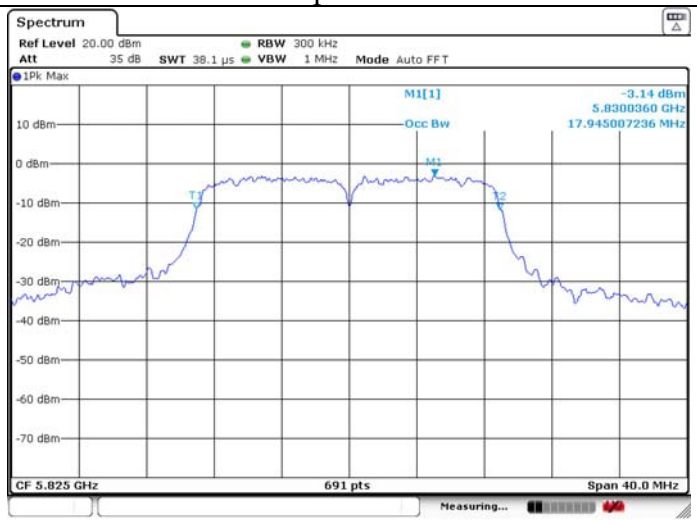


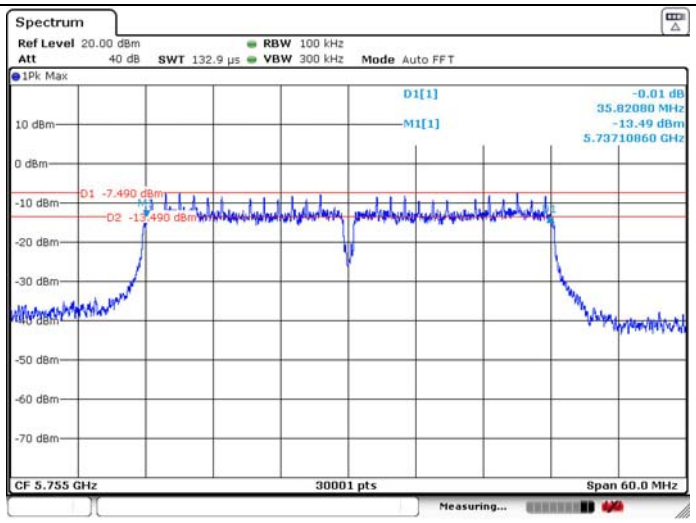
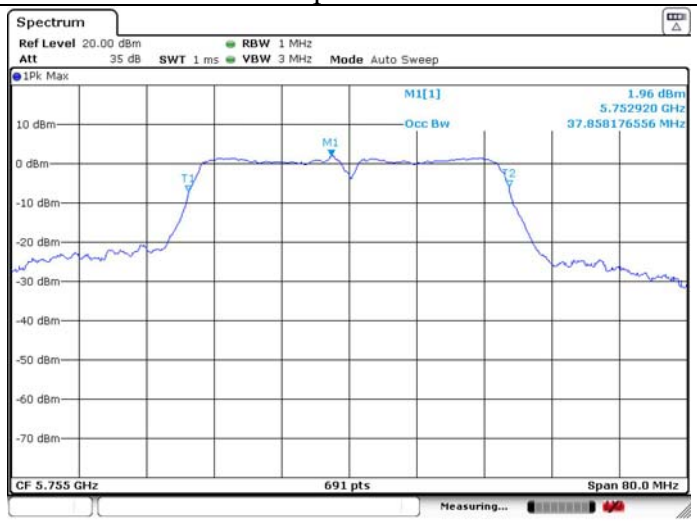
99% Occupied Bandwidth

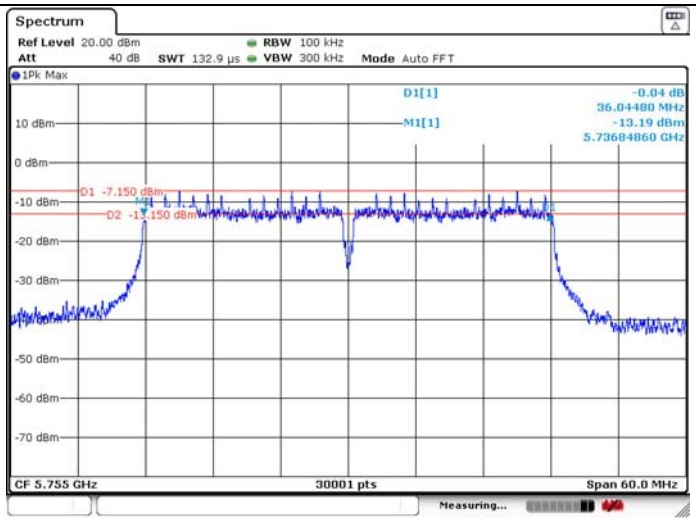
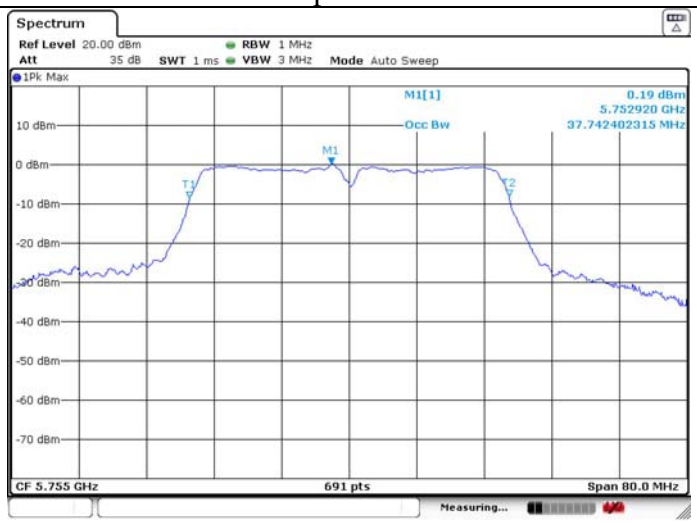


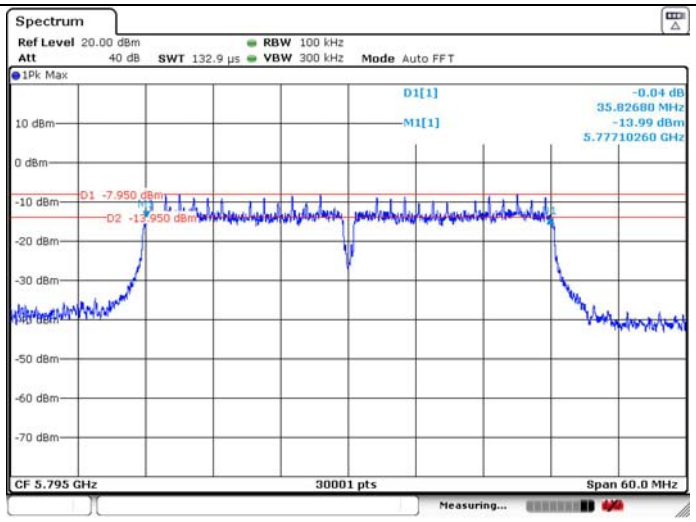
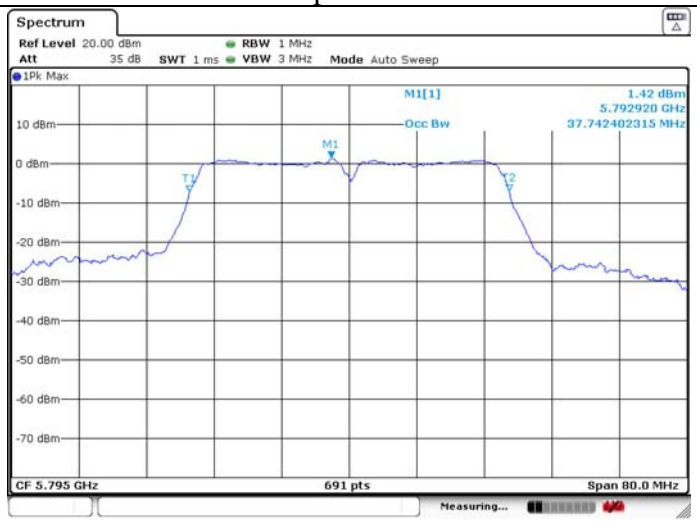
U-NII-3 IEEE 802.11ac VHT20 5785MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

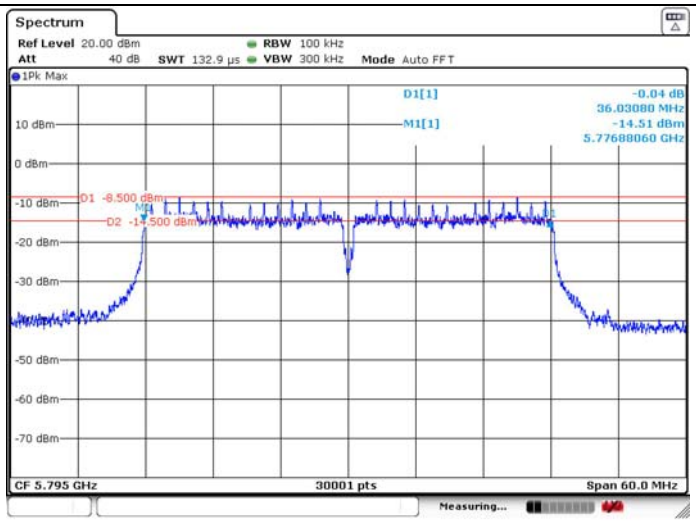
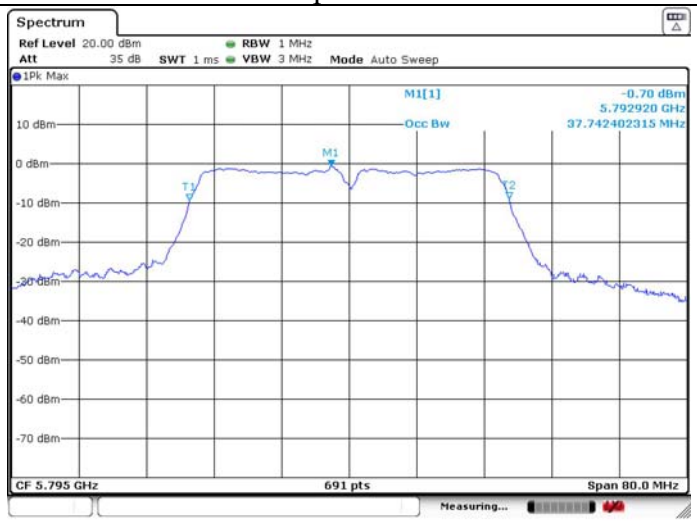
U-NII-3 IEEE 802.11ac VHT20 5825MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

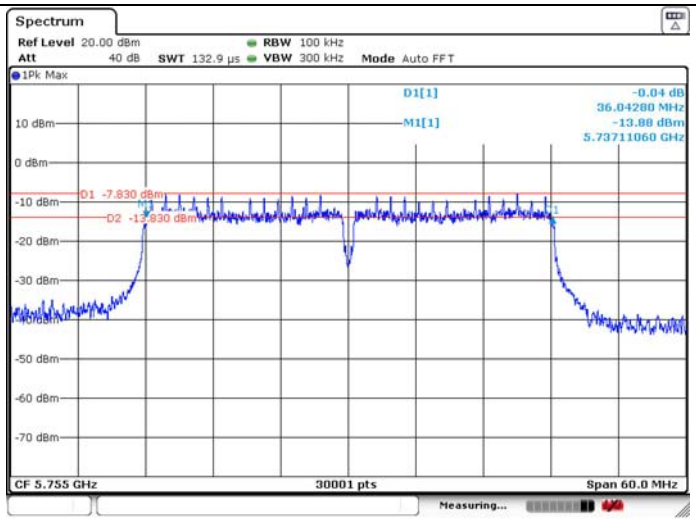
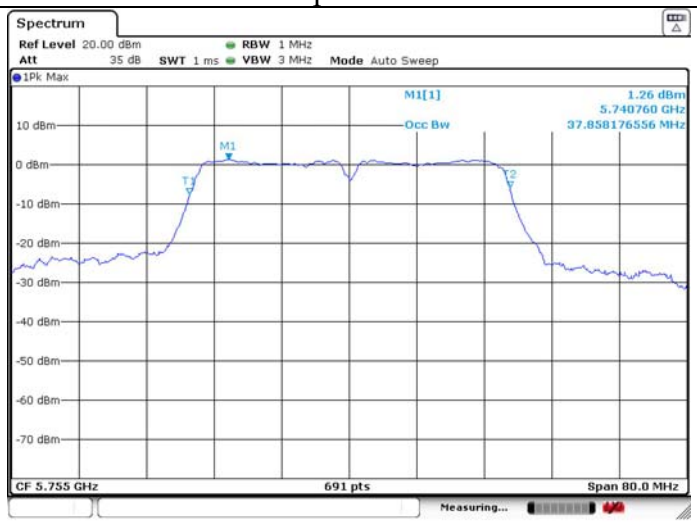
U-NII-3 IEEE 802.11ac VHT20 5825MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

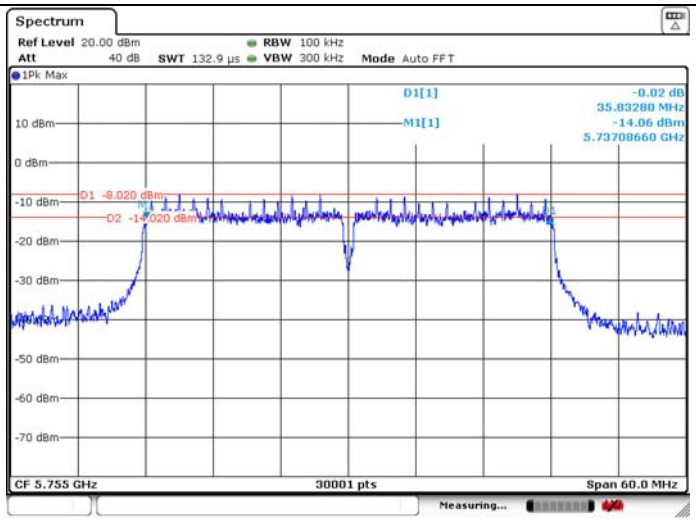
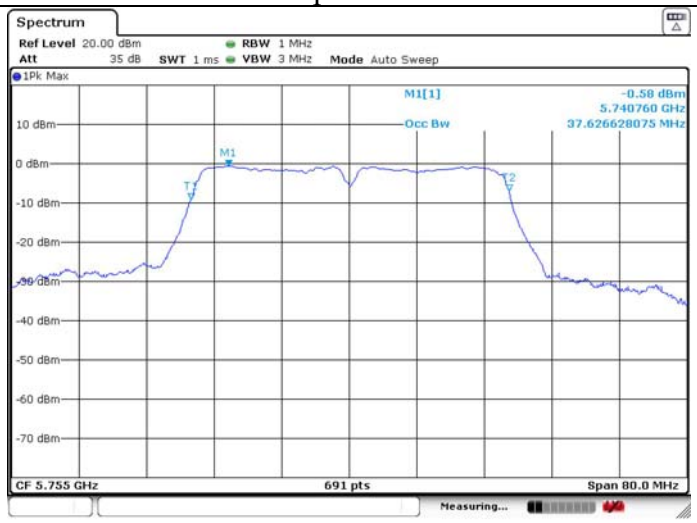
U-NII-3 IEEE 802.11n HT40 5755MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

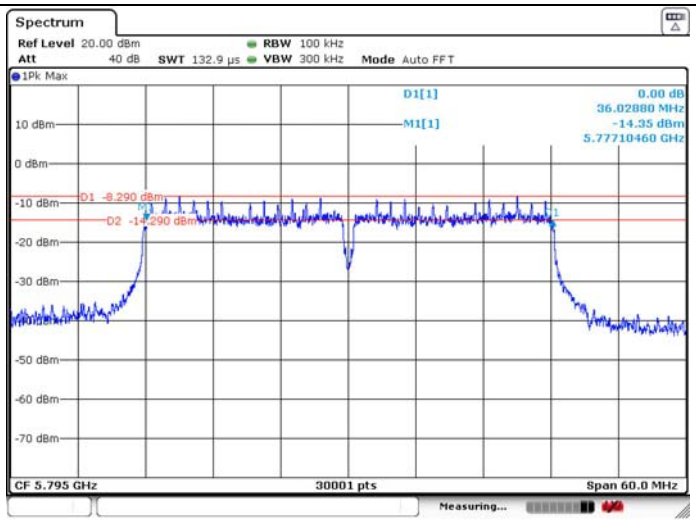
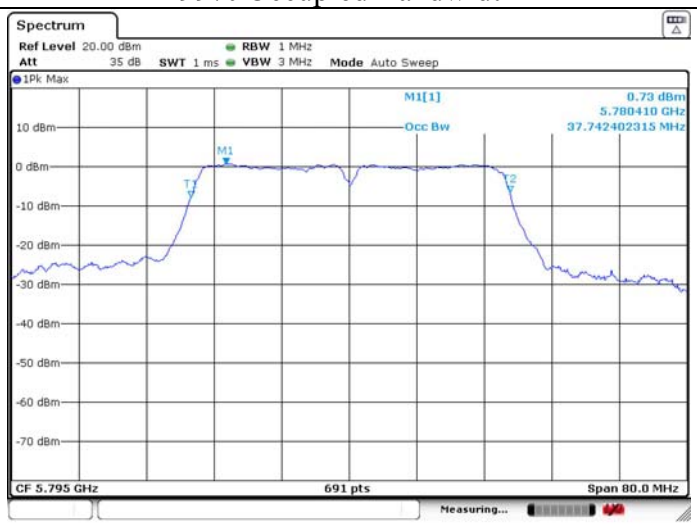
U-NII-3 IEEE 802.11n HT40 5755MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

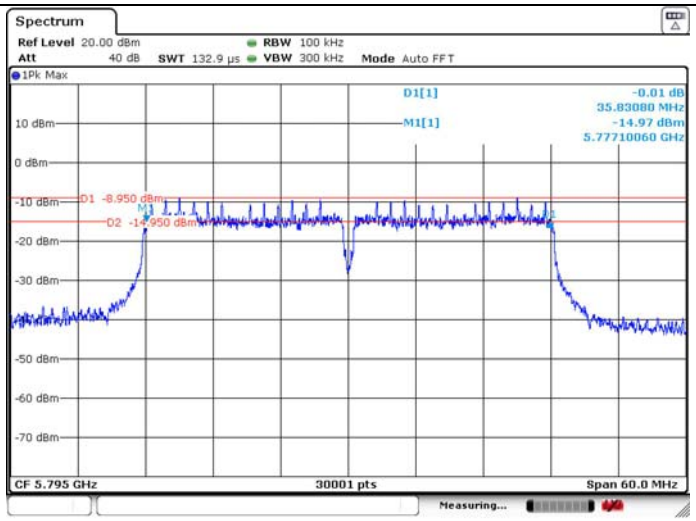
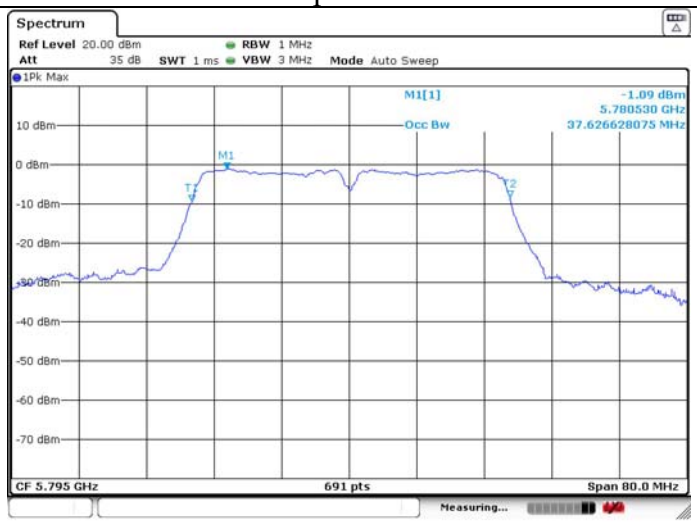
U-NII-3 IEEE 802.11n HT40 5795MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

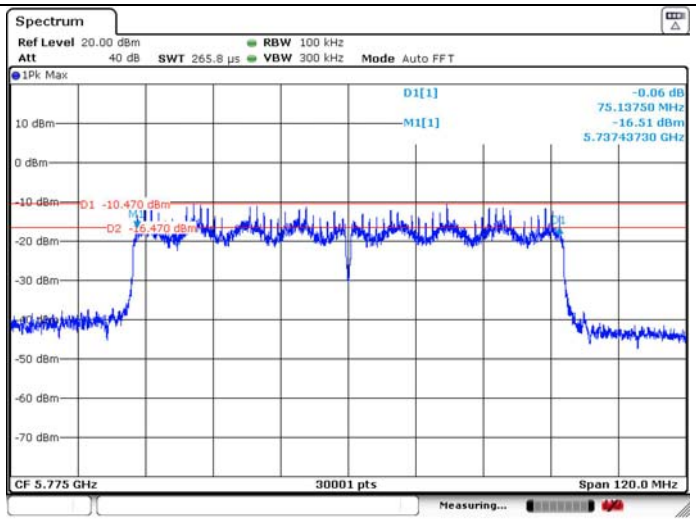
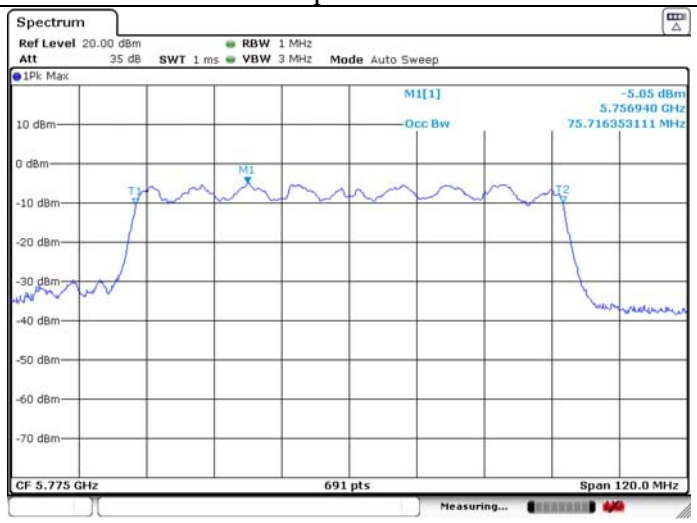
U-NII-3 IEEE 802.11n HT40 5795MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

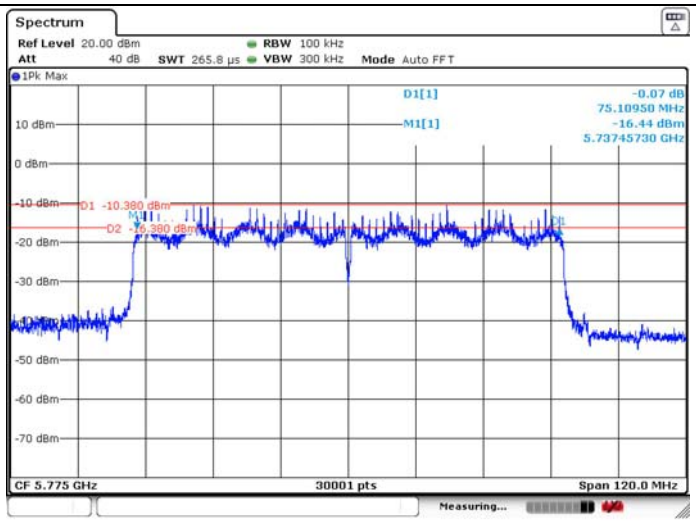
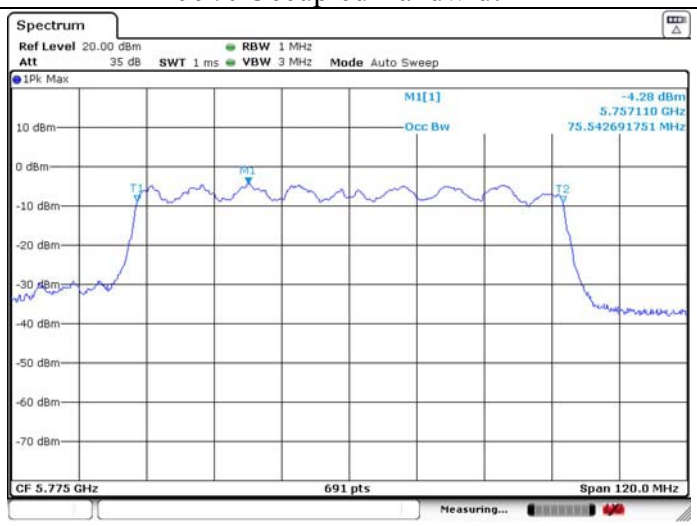
U-NII-3 IEEE 802.11ac VHT40 5755MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT40 5755MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT40 5795MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT40 5795MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT80 5775MHz_Ant 1	
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT80 5775MHz_Ant 2	
6dB Bandwidth	99% Occupied Bandwidth
	

4. MAXIMUM CONDUCTED OUTPUT POWER

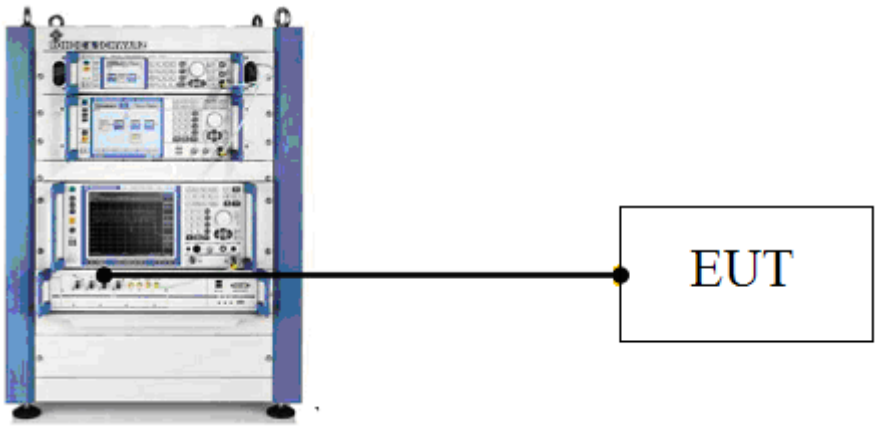
4.1. Limit

Band	EUT Type	Limit
U-NII-1	Outdoor Access Point	1W(30dBm) (Max. e.i.r.p≦125mW at any elevation angle above 30 degrees as measured from the horizon)
	Indoor Access Point	1W(30dBm)
	Fixed point-to-point Access Point	1W(30dBm)
	Mobile and Portable Client Device	250mW(23.98dBm)
U-NII-2A	All Device	250mW(23.98dBm) or 11dBm+10 log B,Which is lesser. (B is 26dB Bandwidth in MHz)
U-NII-2C	All Device	250mW(23.98dBm) or 11dBm+10 log B,Which is lesser. (B is 26dB Bandwidth in MHz)
U-NII-3	All Device	1W(30dBm)

Note:

For the Band U-NII-2A and U-NII-2C,the maximum conducted output power limit calculate result refer to section 3.5.

4.2. Test Setup



4.3. Test Procedure

a. Connect EUT antenna terminal to the OSP-B157WB with RF cable.
b. Set the EUT transmit continuously with maximum output power.
c. Through the test software in TS8897 to control a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
d. Repeat above procedures until all modes and channels were measured.
e. Record the results in the test report.

4.4. Test Result

Temperature	24.8℃	Relative Humidity			56%	Test Voltage	120V/60Hz	
BAND	Test Mode	Fre (MHz)	Conducted AVG Output Power (dBm)		Total Conducted Output Power (W)	Total Conducted Output Power (dBm)	Limit (dBm)	Result
			Ant 1	Ant 2				
U-NII-1	IEEE 802.11a	5180	13.99	15.05	0.0320	15.05	23.98	PASS
		5200	14.25	14.99	0.0316	14.99	23.98	PASS
		5240	12.56	14.40	0.0276	14.40	23.98	PASS
	IEEE 802.11n HT20	5180	12.98	13.03	0.03994	16.01	23.98	PASS
		5200	12.31	12.89	0.03646	15.62	23.98	PASS
		5240	10.82	12.63	0.03038	14.83	23.98	PASS
	IEEE 802.11ac VHT20	5180	12.34	12.96	0.03689	15.67	23.98	PASS
		5200	12.35	12.95	0.03690	15.67	23.98	PASS
		5240	10.78	12.52	0.02984	14.75	23.98	PASS
	IEEE 802.11n HT40	5190	9.56	9.74	0.01845	12.66	23.98	PASS
		5230	12.00	13.46	0.03801	15.80	23.98	PASS
	IEEE 802.11ac VHT40	5190	9.40	9.82	0.01831	12.63	23.98	PASS
		5230	11.96	13.37	0.03743	15.73	23.98	PASS
	IEEE 802.11ac VHT80	5210	5.39	6.13	0.00756	8.79	23.98	PASS

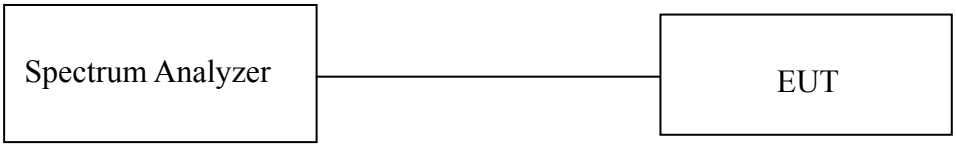
BAND	Test Mode	Fre (MHz)	Conducted AVG Output Power (dBm)		Total Conducted Output Power (W)	Total Conducted Output Power (dBm)	Limit (dBm)	Result
			Ant 1	Ant 2				
U-NII-3	IEEE 802.11a	5745	6.64	4.51	0.00461	6.64	30.00	PASS
		5785	7.00	4.60	0.00501	7.00	30.00	PASS
		5825	5.86	3.40	0.00385	5.86	30.00	PASS
	IEEE 802.11n HT20	5745	6.72	4.43	0.00746	8.73	30.00	PASS
		5785	6.83	4.18	0.00743	8.71	30.00	PASS
		5825	5.71	3.28	0.00585	7.67	30.00	PASS
	IEEE 802.11ac VHT20	5745	6.74	4.80	0.00774	8.89	30.00	PASS
		5785	7.08	4.74	0.00809	9.08	30.00	PASS
		5825	5.85	3.38	0.00602	7.79	30.00	PASS
	IEEE 802.11n HT40	5755	7.53	5.19	0.00897	9.53	30.00	PASS
		5795	7.20	4.51	0.00807	9.07	30.00	PASS
	IEEE 802.11ac VHT40	5755	7.37	5.20	0.00876	9.43	30.00	PASS
		5795	7.20	4.48	0.00805	9.06	30.00	PASS
	IEEE 802.11acVHT80	5775	7.19	4.35	0.00796	9.01	30.00	PASS

5. PEAK POWER SPECTRAL DENSITY

5.1. Limit

Band	EUT Type	Limit
U-NII-1	Outdoor Access Point	17dBm/MHz
	Indoor Access Point	17dBm/MHz
	Fixed point-to-point Access Point	17dBm/MHz
	Mobile and Portable Client Device	11dBm/MHz
U-NII-2A	All Device	11dBm/MHz
U-NII-2C	All Device	11dBm/MHz
U-NII-3	All Device	30dBm/500KHz

5.2. Test Setup



5.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	1MHz(For U-NII-1&U-NII-2A&U-NII-2C) 500KHz(For U-NII-3)
VBW	3MHz(For U-NII-1&U-NII-2A&U-NII-2C) 2MHz(For U-NII-3)
Span	encompass the entire 26 dB EBW or 99% OBW of the signal
Sweep Time	Auto
Number of Sweep Point	⩾2×SPAN/RBW
Detector	RMS(power averaging)
Trace Average	⩾100 traces

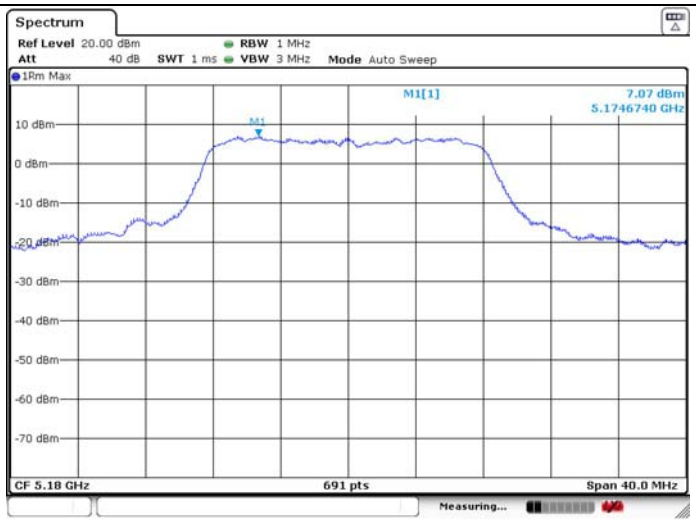
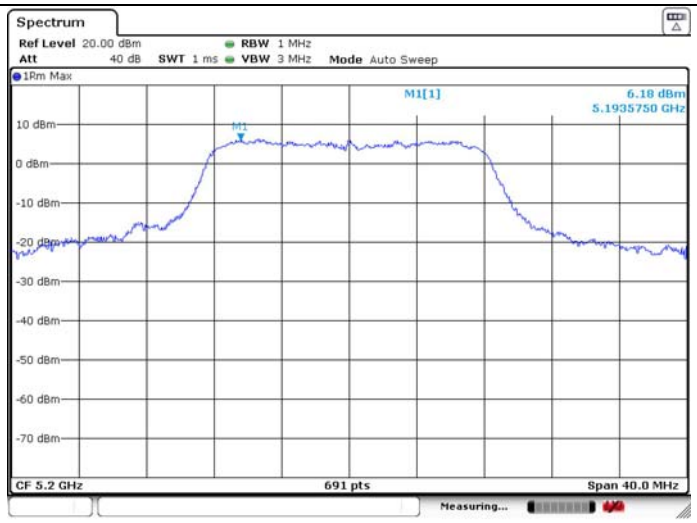
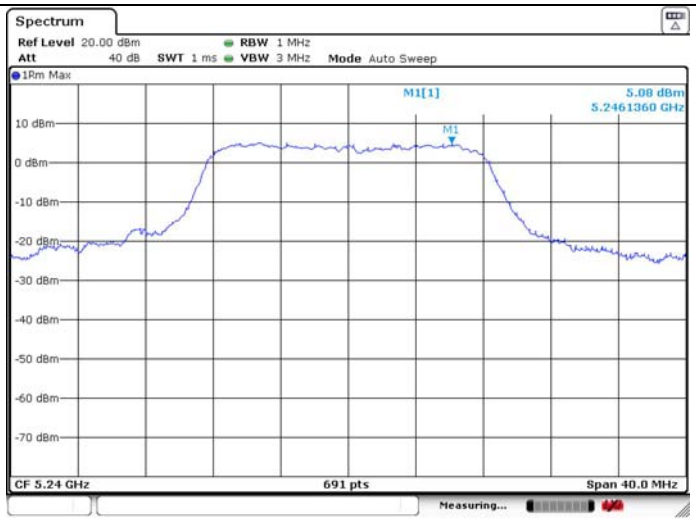
5.4. Test Procedure

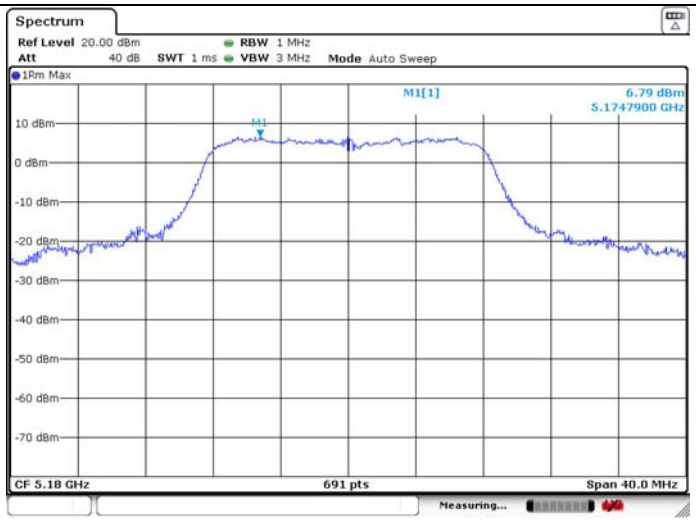
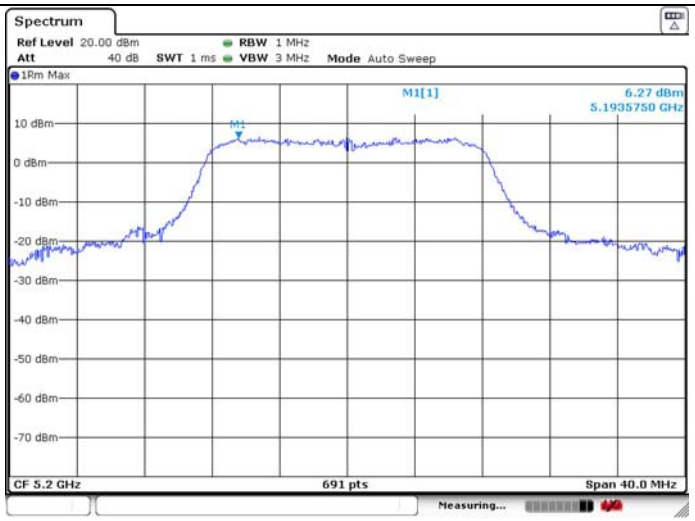
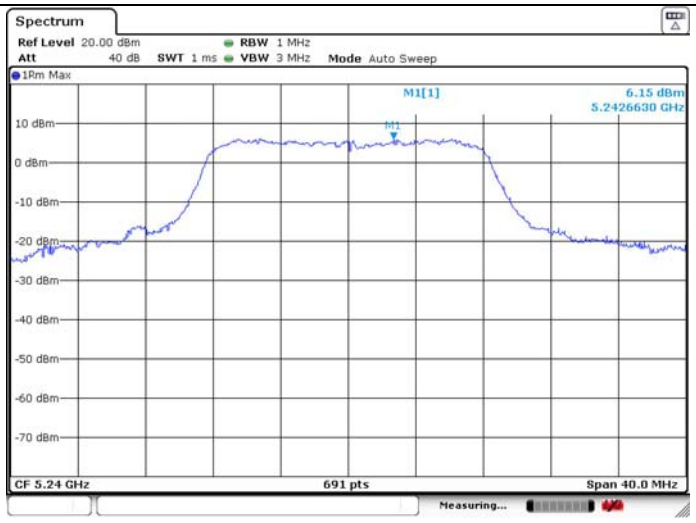
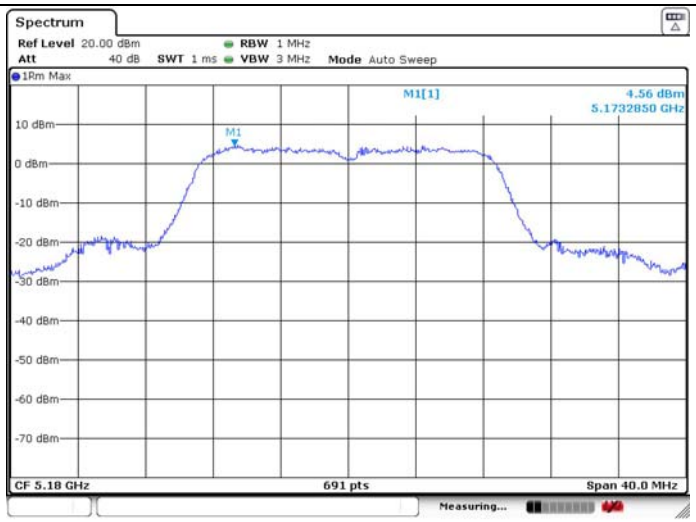
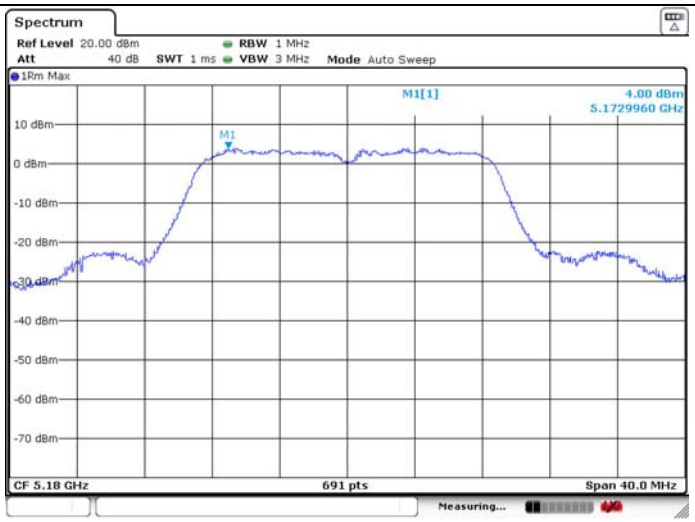
a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 5.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the marker-to-peak function to set the marker to the average of the emission.
e. If the duty cycle of test siganl＜98%,the result=max measured value+10×log(1/duty cycle);
   If the duty cycle of test siganl⩾98%,the esult=max measured value.
f. Repeat above procedures until all modes and channels were measured.
g. Record the results in the test report.

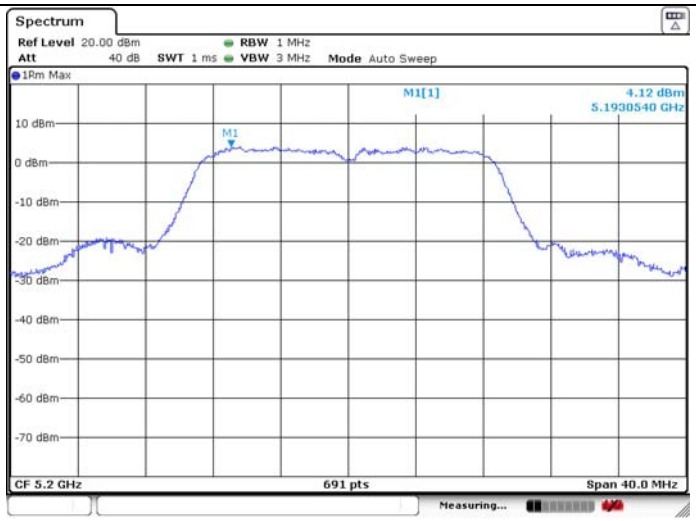
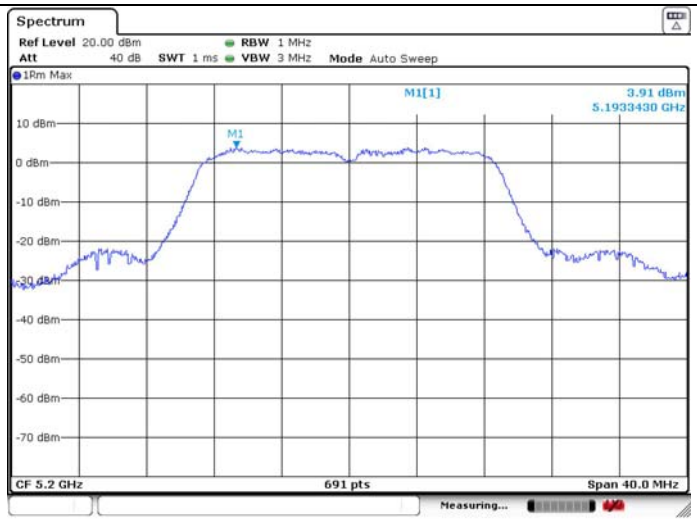
5.5. Test Result

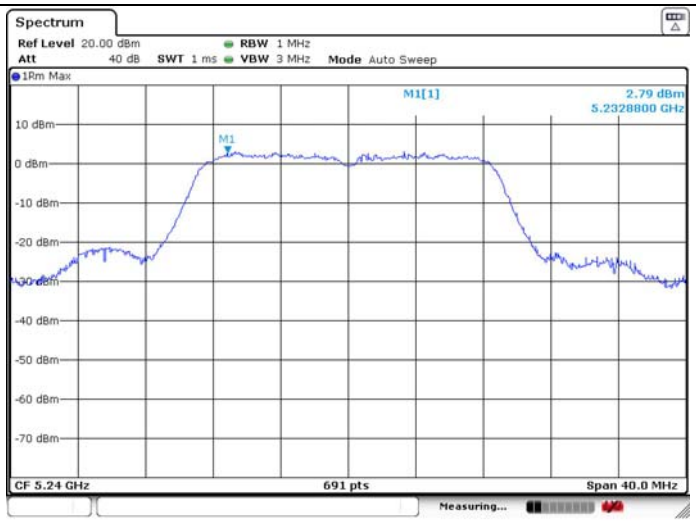
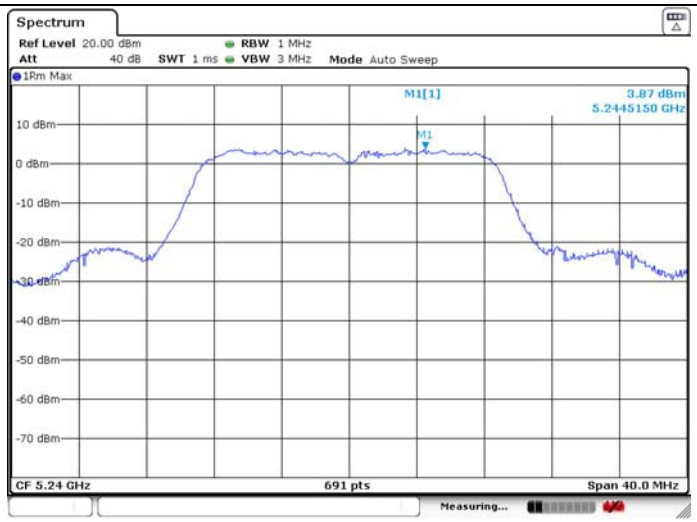
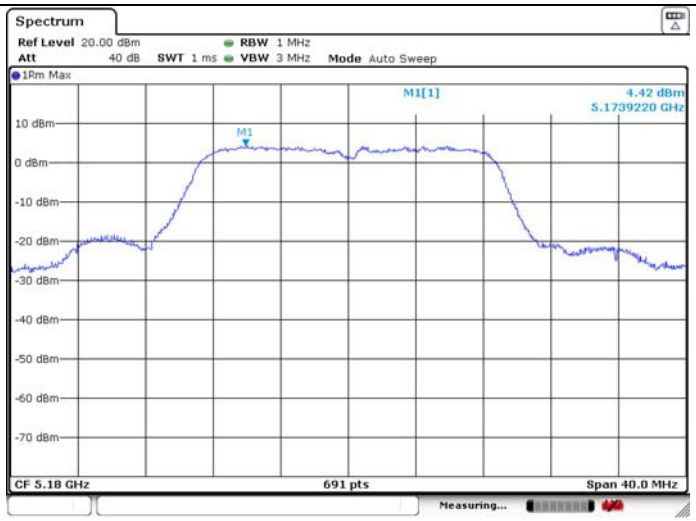
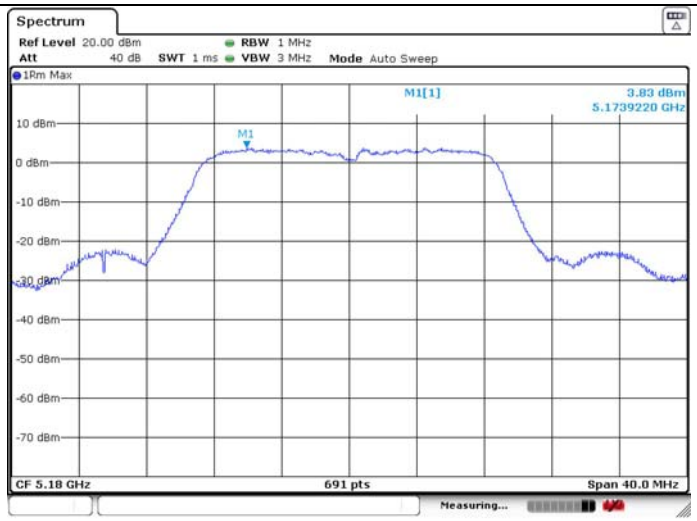
Temperature		24.8℃	Relative Humidity		56%	Test Voltage	120V/60Hz	
BAND	Test Mode	Fre (MHz)	Power Density (dBm/MHz)		Duty Factor (dB)	Total Power Density (dBm/MHz)	Limit (dBm/MHz)	Result
			Ant 1	Ant 2				
U-NII-1	IEEE 802.11a	5180	7.07	6.79	0.13	7.20	11.00	PASS
		5200	6.18	6.27	0.13	6.31	11.00	PASS
		5240	5.08	6.15	0.13	5.21	11.00	PASS
	IEEE 802.11n HT20	5180	4.56	4.00	0.15	7.45	11.00	PASS
		5200	4.12	3.91	0.15	7.18	11.00	PASS
		5240	2.79	3.87	0.15	6.53	11.00	PASS
	IEEE 802.11ac VHT20	5180	4.42	3.83	0.13	7.28	11.00	PASS
		5200	3.73	3.65	0.13	6.83	11.00	PASS
		5240	2.67	3.79	0.13	6.41	11.00	PASS
	IEEE 802.11n HT40	5190	-1.37	-2.15	0.30	1.57	11.00	PASS
		5230	0.84	1.36	0.30	4.42	11.00	PASS
	IEEE 802.11ac VHT40	5190	-1.42	-1.86	0.30	1.68	11.00	PASS
		5230	0.81	1.52	0.30	4.49	11.00	PASS
	IEEE 802.11ac VHT80	5210	-8.36	-8.39	0.58	-4.78	11.00	PASS

BAND	Test Mode	Fre (MHz)	Power Density (dBm/500KHz)		Duty Factor (dB)	Total Power Density (dBm/500KHz)	Limit (dBm/500KHz)	Result
			Ant 1	Ant 2				
U-NII-3	IEEE 802.11a	5745	3.13	3.56	0.13	3.26	30.00	PASS
		5785	2.68	2.58	0.13	2.81	30.00	PASS
		5825	3.07	2.56	0.13	3.20	30.00	PASS
	IEEE 802.11n HT20	5745	1.97	2.36	0.15	5.33	30.00	PASS
		5785	2.00	1.72	0.15	5.03	30.00	PASS
		5825	2.44	1.96	0.15	5.37	30.00	PASS
	IEEE 802.11ac VHT20	5745	1.61	2.29	0.13	5.11	30.00	PASS
		5785	1.54	1.46	0.13	4.64	30.00	PASS
		5825	1.99	1.60	0.13	4.94	30.00	PASS
	IEEE 802.11n HT40	5755	-2.66	-2.15	0.30	0.92	30.00	PASS
		5795	-2.41	-2.71	0.30	0.76	30.00	PASS
	IEEE 802.11ac VHT40	5755	-2.45	-2.18	0.30	1.00	30.00	PASS
		5795	-2.56	-2.73	0.30	0.67	30.00	PASS
	IEEE 802.11ac VHT80	5775	-7.64	-6.87	0.58	-3.65	30.00	PASS

U-NII-1 IEEE 802.11a 5180MHz	U-NII-1 IEEE 802.11a 5200MHz
ANT 1	**ANT 1**
	
U-NII-1 IEEE 802.11a 5240MHz	
ANT 1	
	

U-NII-1 IEEE 802.11a 5180MHz	U-NII-1 IEEE 802.11a 5200MHz
ANT 2	ANT 2
	
U-NII-1 IEEE 802.11a 5240MHz	
ANT 2	
	
U-NII-1 IEEE 802.11n HT20 5180MHz	
ANT 1	ANT 2
	

U-NII-1 IEEE 802.11n HT20 5200MHz	
ANT 1	**ANT 2**
	

U-NII-1 IEEE 802.11n HT20 5240MHz	
ANT 1	**ANT 2**
	

U-NII-1 IEEE 802.11ac VHT20 5180MHz	
ANT 1	**ANT 2**